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100 YEARS SERIES

A HUNDRED YEARS OF INLAND TRANSPORT

1830 - 1933

by

C. E. R. SHERRINGTON

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NOTE

Where the spelling of place-names has changed, the Author has employed the spelling of the period with which he is dealing.

INTRODUCTION

WITH the opening to public traffic of the Liverpool and Manchester Railway in September, 1830, there dawned a new era for the world. It is true that the Stockton and Darlington Railway had been opened with much pomp and ceremony five years earlier, but the latter had not been designed primarily for the carriage of passengers, and, whilst one must not detract from the importance of the world's first public steam-operated railway, later generations have come to regard the opening of the Liverpool and Manchester as a landmark of equal, if not greater, importance in railway history.

More than one hundred years have elapsed since Huskisson met his death in the first railway accident, which sadly marred what would otherwise have been a day of much rejoicing; with railways throughout the world challenged vigorously by road transport through the advent of the internal combustion engine, one may be pardoned for regarding 1933 as a year from which it is eminently suitable to look back and survey the conquest of continents and the opening up of new sources of supply, which the development of the steam locomotive has alone made possible. To-day, just as rail transport is challenged by road transport, so the supremacy of the steam locomotive is challenged by its electric rival, or, alternatively, by the heavy oil engine of diesel or other design, employing a mechanical or electric drive. Whilst one cannot foretell the future, one can attempt to outline historical events in their true sequence,

and, until one reaches the events of recent years, make every endeavour to preserve a faithful perspective, free from the controversies which surround the transport problems of the present time.

It is a common cry that transport should be regarded as a coherent whole, not divided into the watertight compartments of rail, road and water movement; in practice, it is doubtful if transport has ever been regarded other than in its co-ordinated form. Few transport movements during the last hundred years, so far as Great Britain is concerned, could have been undertaken without the use of the road and the railway, and sea transport, too, if the movement was international. The early railway history of the United Kingdom was closely linked to water-transport, both inland and coastal, and the need for the carriage of coal and other minerals as cheaply as possible to navigable water was almost invariably the main incentive to the construction of the earliest tram lines, and later rail-roads, as they used to be called in Britain and still are called in the United States.

This book is designed not as a text-book of transport principles but rather as a chronicle of achievement showing the effect of transport on the social organization of Great Britain—how it has changed habits and ways, how it has permitted the city worker to reap the benefits to be derived from changed surroundings, and how it has brought the Scottish fisher lass into contact with the East Anglian country folk, and the Welsh miner into touch with the Birmingham artisan. One reads so much of the romance of other parts of the world that one is apt to let the romance which lies at one's own door pass unnoticed. No section of industry is so steeped in romance as transport, whether on the highway, the railway or at the docks, for all these stand on the high road from the producer to the consumer, and without the clockwork precision of this delicately balanced machine human wants as they are known to-day cannot be assuaged.

One is apt to regard transport with its corporations of unwieldy size, employing hundreds of thousands, as an inanimate and lifeless thing, yet in reality transport is dynamic and one small piece of grit on one of its many cog-wheels would throw the lives of thousands out of their normal course and cause untold distress. Machine-like it may be, because to any large transport concern time is the most inexorable master, but inhuman it can never be, for its work has to be adjusted daily to the needs of others, and the machine must be adapted to supply the requirements of their whims and respond to the vagaries of that past master of rapid changes, the weather. Perhaps the greatest contrast between the conditions of 1830 and those which face the citizen of 1933 lies within the realm of speed. Transport by road was many hundreds of years old when our story commences, if one regards the term road in its wider sense; transport on navigable streams was probably far older still, but the coming of the steam engine not only ushered in the railway, but also changed the whole conception of speed on the road and on navigable waterways. A heavy machine, the steam locomotive, registered its main progress on tracks reserved for its use, apart from the special forms of steam rollers and fire engines, though there are many hundreds of heavy steam road vehicles usefully employed on road haulage. The real revolution in speed has come to road transport through the lighter internal combustion engine, which is rapidly proving its worth for inland navigation. At present it is supreme for aerial movement, a form of transport which is not regarded as coming within the confines of this book, and indeed it holds the speed records for air, water, road and rail movement.

There will be many passenger transport problems in Great Britain yet to be solved, especially in the relationship of one means of transport to its alternatives, and the purpose of this book will have been served if it offers to the reader some

picture in perspective of the events of the last hundred years. It is only from a study of the past, which explains the why and the wherefore of the present, that there can be designed the truest policy for the future, a policy which should have as its objective the maximum assistance to the social welfare of the nation as a whole.

The story of the railway age, a century of social progress, is a fascinating one: It may be on the eve of an eclipse, but such an eclipse was foretold too often at its birth to be taken very seriously to-day, when the international trade of the world is decreasing daily through national restrictions, and the progress of a hundred years is temporarily stayed, the clock being set back. This book, it is hoped, will succeed in reminding the reader of the debt he owes to transport efficiency. It is not replete with statistical tables, inhuman in themselves but so necessary as a prelude to the shaping of policy, but it is hoped that it will leave some picture, however inadequate, of a great and mighty structure surely and steadily built up stone by stone, but not yet complete; stories will be added to the edifice by future generations and no one can estimate when, if ever, the time will come to add a final coping-stone.

The sources from which the information contained in this book has been derived are many and varied; some of them will be found in the bibliography at the conclusion, which may prove helpful to the reader who desires to delve more deeply than this circumscribed outline can do into any one particular phase of transport, or into the transport situation in Great Britain at any one particular period. This system has been considered preferable to the inclusion of numberless footnotes which might only annoy the reader. The bibliography is admittedly incomplete and embodies a mere selection of the available data, but the author wishes to record the debt he owes to those, many of them now dead, who have described transport events during the last hundred years.

Though every care has been taken to check each date, there are many instances in which authorities diverge widely; in these cases the general policy has been adopted of giving preference to the date given by the most contemporary writer, and it is hoped that but comparatively few errors will be found.

CHAPTER I

PRE-VICTORIAN TRANSPORT—A GLANCE BACKWARD FROM 1830

THOUGH this outline begins with the application of machine-power to transport, we have to remember that much progress had been made in this field during the preceding hundred years. The arrival of steam locomotion was, of necessity, a revolutionary event; it meant, as do most transport inventions, a faster and more regular service, along with a tendency towards reduction of the charge per ton mile and thereby extension of the market for a local product. It is, however, easy to overestimate the reduction of cost which new inventions bring. One is surprised to find that in the early fifteenth century grain was moved by land at a cost of only one penny per ton mile. True, the speed was slow and the penny a very different one from to-day. Moreover, the service was very irregular as compared with the present time. Lack of good highways made the cost of transport much higher in winter than in summer.

By the seventeenth century inland highway transport had become far better organized. Regular services of waggons operated on many of the highways radiating from London. On the Yarmouth road, when James VI of Scotland became also James I of England, there were two waggons carrying the trade of Ipswich to and from London, and their services were controlled by the citizens of Ipswich; to-day the citizen suffers severely from virtually uncontrolled competition between road hauliers. Thomas Lane, who "shall set forth with his carriage on Monday, and return on Wednesday", would doubtless envy his present-day successor,

not only for having at his disposal the power of fifty horses instead of six, but also for freedom to charge any price he can get, and for a schedule uncontrolled by the authorities of the town of Ipswich. On the other hand, the father of Thomas Lane would have taken about six days for the journey of the seventy miles from Ipswich to London, though with a change of horses every ten miles this speed could have been doubled. In the reign of Elizabeth an average of twenty miles a day for eight consecutive days was regarded as a very fine achievement. The news of the death of the last of the Tudors reached Edinburgh within three days; but despatch carrying is little guide to commercial transport. Private coaches did not come into favour in London until after the Restoration; Samuel Pepys, ever in the fashion, started his in 1668. Some years later came the incorporation of the Worshipful Company of Coach and Harness Makers.

The Post Office of England had been set up by Act of Parliament in 1657; from that date onward runs the long line of Postmasters-General. The Postmaster-General superseded the Master of Posts, but his exclusive right of carrying letters consisted in practice simply of the privilege of supplying post horses. So it remained until much later when the letters were carried by mail coach.

Communication depended upon the condition of the roads, provision had therefore to be made for their upkeep, which had been left since the Roman occupation to the casual will of those using them. In our chronicle of nineteenth century transport we shall refer from time to time to the Turnpike Acts. The first of these was passed in 1663, primarily to get financial support for the Great North Road. Before the end of that century came legislation providing that the rates of carriage by highway should be settled annually by the Justices of each county. These rates had to be posted up in public places for all to see. The combination of paying load

with a relatively low charge to the customer seems to have been achieved even before 1700, for the size of waggons had become so great as to require regulation by a law forbidding more than eight horses to one waggon. By 1706 it had become possible to travel from London to York by stage coach in four days, and in 1712 the public was informed that the "Edinbro', Berwick, Newcastle, Durham and London stage-coach begins on Monday, the 13th of October, 1712. All that desire to pass from Edinbro' to London, or any place on that road, let them repair to Mr. John Baillie's, at the Coach and Horses, at the head of Canongate, Edinbro', every other Saturday; or to the Black Swan in Holborn, every other Monday; at both of which places they may be received in the stage-coach, which performs the whole journey in *thirteen* days, without any stoppages (if God permits), having eighty able horses to perform the whole journey: each passenger paying *four pounds ten shillings*, allowing each passenger 20 lb. of luggage; all above, 6d. per lb. The coach sets off at six o'clock in the morning".

Under Queen Anne the administration of the turnpikes was handed over to bodies of trustees instead of the Justices of the Peace. Charges made at the toll-gates on the various turnpikes anticipated the ton-mile tax at present levied in certain countries. The Turnpike Trustees were authorized to install weighing machines and to levy a charge based on weight; loads of over three tons were charged at the rate of twenty shillings per hundredweight, additional to the toll itself. This last was virtually a mileage charge since the toll-gates were placed at every so many miles along the turnpike. In 1751 the same problem seems to have arisen as is the subject of public inquiry to-day; namely, the basis on which the very heavy vehicle should be made to pay its fair share of road maintenance. Even at that period the prosperity of some of the Turnpike Trusts did not always

secure adequate maintenance of the highway, and there is little doubt that the administration of many turnpikes was very inefficient. Receipts in certain cases totalled £200 per mile, whereas it is estimated that it only cost fifty per cent of this sum to keep such a road in good or adequate repair. The bad condition of many of the turnpikes naturally raised the cost of movement considerably; one case is recorded where the cost rose to twelve pence per mile for a load of even inferior grade goods. On the best maintained turnpikes, however, there was much traffic and it moved at a fair speed. By 1740 the coaching industry had advanced enough to run fast and slow coaches; the former took two days, the latter three, between London and Bristol. Jackman in his excellent and authoritative work "Transportation in Modern England" notes that as early as 1669 a flying coach had been inaugurated between London and Oxford, which travelled at nearly five miles per hour, so that the University city was for the first time brought within one day of London; to-day the rail distance of sixty-three miles is occasionally accomplished in sixty minutes, when time has to be made up after a late start. Nevertheless, there were many routes upon which no regular public service by road was in operation even towards the end of the eighteenth century; merchandize had still to be carried by packhorse, a fact mentioned at an investigation into the Calder Navigation in 1758.

All earlier attempts to improve inland water navigation had aimed at the betterment of river-navigation. To the energy and courage of Francis Duke of Bridgewater the country owes its network of canals. He applied in 1758 for power to construct a canal which should "cross dry land" and was, in consequence, considered by public opinion to be mad. But it was owing to his determination and the work of his able assistants, James Brindley and John Gilbert, that the charge for merchandize was reduced from twelve

shillings per ton by river to six shillings per ton by canal from Manchester to Liverpool. At that time the charge by road was forty shillings a ton.

It is true that wool may have had to wait at Wakefield and Leeds several months before being carried to comparatively near destinations, but there was a road passenger service which may be called good, considering the times, from Leeds to London by the "Flying Coach" of 1760, which professed to cover the 196 miles in three days, taking the route by Barnsley, Wakefield and Sheffield; in practice the trip seems usually to have taken about four days. The Liverpool "Flying Machine" had been put on the road two years earlier and covered the 206½ miles to London in three days, the fares working out at roughly twopence-halfpenny per mile. Shrewsbury was a great coach-centre at this time, and in 1753 the "Birmingham and Shrewsbury Long Coach" occupied only four days in covering the 152 miles to London. The fare was eighteen shillings and the draught was six horses, but by its competitor, "Fowler's Shrewsbury Stage-Coach", the time of transit was reduced to three and a half days, with a fare of twenty-one shillings inside and half a guinea outside. Those who paid half a guinea probably had to travel in "the basket", sometimes termed a "conveniency behind", depicted in Hogarth's prints of the period. A few years afterwards, in 1764, the "Machine" was put into service. Ten years later the "Original London and Salop Machine" was provided with steel springs and "bows on the top", presumably for the passengers to hold on by, but mail coaches did not carry outside passengers until much later.

The lot of a letter-carrier at this time was not one to be envied. A little book by J. Wilson Hyde, published in 1891, gives us the following particulars concerning a Mr. Johnson, a letter-carrier of London, being evidence given on oath before a Commission

just one hundred years earlier. "He receives at present a salary as a letter-carrier of 14s. per week, making £36. 19s. per annum; he likewise receives certain perquisites, arising from such pence as are collected in the evening by letters delivered to him after the Receiving Houses are shut, amounting in 1784 to £38. 11s., also from acknowledgments from the public for sending letters by another letter-carrier not immediately within his walk, amounting in the same year to £5. He likewise receives in Christmas boxes £20.—the above sums, making together £100., was the whole of his receipts of every kind whatever by virtue of his office in 1784 (312 candles and a limited allowance of stationery excepted), out of which he pays a person for executing his duty as a letter-carrier, at the rate of 8s. a week, being £20. 16s. per annum, and retains the remainder for his own use entirely." However, a few years previously, in July, 1784, the Post Office Secretary had issued the following order: —"His Majesty's Postmasters-General, being inclined to make an experiment for the more expeditious conveyance of mails of letters by stage-coaches, machines &c., have been pleased to order that a trial shall be made upon the road between London and Bristol, to commence at each place on Monday, the 2 of August next". Lewins in "Her Majesty's Mails" states that attached to this order was a list of places, letters for which could be sent by these mail coaches. The order concluded with the following explanation: —"All persons are therefore to take notice, that the letters put into any receiving-house before six of the evening, or seven at this chief office, will be forwarded by these new conveyances; all others for the said post-towns and their districts put in afterwards, or given to the bellmen, must remain until the following post at the same hour of seven". Actually the coaches appear to have started on August 8th, not August 2nd: they left London at 8 a.m. and reached Bristol at eleven o'clock the same night. The distance from London

to Bath was covered in fourteen hours, though the first east-bound coach from Bristol took sixteen hours. This achievement proved a great victory for the worthy Post Office Secretary, Mr. Palmer, for it had been pronounced an impossibility "that the Bath mail could be brought to London in sixteen or eighteen hours".

The twentieth century cannot claim a monopoly of inquiries into the Post Office administration; a Commission which sat with this subject under consideration in 1788 refers as follows to certain practices which then existed: —"The custom of giving certain annual feasts to the officers and clerks of this office (London) at the public expense ought to be abolished; as also what is called the feast and drink money; and, as the Inland Office now shuts at an early hour, the allowances of lodging money to some of the officers, and of apartments to others, ought to be discontinued. But of all allowances, those of coals and candles are the most enormous; for, besides those consumed in the official apartments, there are allowed to sundry officers for their private use in town or country above three hundred chaldrons of coals, and twenty thousand pounds of candles, which several of them commute with the tradesmen for money or other articles; the amount of the sums paid for these two articles in the year 1784 was £4418. 4s. 1d.". Further criticisms of a similar kind may be found in "A Hundred Years by Post", already mentioned, from which the above extract is taken. An Act of 1780 had rescinded the monopoly held by the Post Office in regard to post-horses, but it is reasonable to suppose that the value of this monopoly had by that date become very small.

In London itself there were several hundred hackney coaches and four hundred sedan chairs plying for hire two years before the Battle of Waterloo. In 1751 sedan chairs could be hired for a guinea a week, or one shilling an hour, with bearers, who were usually Irishmen, and such chairs

were used not only by ladies and beaux but by robust men also; wherries were also much in demand to reach the coffee houses which were moored afloat, one of the most famous being opposite Somerset House. Sedans were easily outnumbered in 1813 by the three thousand Thames wherries which provided the bulk of the city transport services. Hackney coachmen seem to have achieved ill-fame by circulating counterfeit money, and the country cousin was advised to regard with care the change he received. In the early nineteenth century hackney coaches were very strictly regulated, as may be seen from "Leigh's New Picture of London", published in 1824-5.

"No horse shall be used with a hackney-coach, or chariot, which shall be under 14 hands high."

"By 9 Ann, c. 23, the drivers of coaches, and carriers of chairs, on demanding more than their fare, or giving abusive language, are to forfeit not more than 5L.; and in default of the payment, they are to be sent to the house of correction seven days."

"And they shall be compellable on every day, and at any hour of the night, although they may have been out twelve hours, to go with any person or persons desirous of hiring them, and no more than the regular fare allowed on such occasions."

"By 39 and 40 Geo. III c. 47, the commissioners may appoint inspectors of hackney coaches and horses, and suspend the license of any person whose coach shall be defective or horses unfit; and may annul licenses if the inspectors are refused to examine coaches." With regard to the one-horse chaise, we are told that "It will likewise be lawful in the commissioners, with the approbation and direction, in writing, of the lords of his majesty's treasury, or any three or more of them, to license such number of carriages with two wheels, and drawn by one horse, as shall be specified by them, subject to the same laws and regulations

as hackney coaches and chariots; and they shall be entitled to demand and take two-thirds of the amount of fares, rates, and benefits, as established by law for hackney coaches and chariots, and not compellable to carry more than two persons".

Though railways did not become an important means of passenger travel until 1830, there were many tram or railroads worked by gravity and horse-power in various parts of Great Britain before the nineteenth century. A "Waggon-Way on Wooden Rails" in Glamorganshire is mentioned as early as 1705, and another "Waggon-Way" existed at Whitehaven in 1738. Stone was carried at Bath by a Waggon-Way owned by a Mr. Allen in the 'forties of that century. Waggon-ways for coal transport had been developed on Tyneside and Clydeside by 1770. "Railway Literature 1556-1830", by R. A. Peddie, mentions a coal-waggon described in the "London Magazine" for 1764. There seem to have been at least a score of waggon-ways in use by 1790, and the British Museum Library contains copies of Acts for many new ones projected during the last decade of the eighteenth century. One finds in 1797 a report "On Iron Roads or Waggon Ways" among "Communications to the Board of Agriculture". "Communications" to the same board in 1800 include a report "On Iron Rail-Ways". But the genesis of the modern railway lay in what has come to be known as the Surrey Iron Railway, which, like so many early lines, was planned to connect a centre of production with tidewater. The first Act for this line was passed in 1801 "for a Railway from Wandsworth to Croydon (41 Geo. III c. XXXIII)". This line never used locomotive power, but it is of much historic interest. As early as 1825 there was published in London "A Practical Treatise on Railroads and Carriages" by Thomas Tredgold; its appearance is evidence that railways already existed by that date.

The Liverpool and Manchester Railway scheme does not appear in the Acts of Parliament until 1827; it then obtained authority to raise money, and it was forced to do so again two years later. It is curious to think that the little Nantlle Railway in Wales at the other end of the scale was also empowered to raise money during the earlier year. The "Local and Personal and Private Acts" of the last twenty-two years of George the Third's reign and of the decade of George the Fourth's contain many of these embryo railway-schemes. Some of them proved of lusty growth, and finally blossomed out into the London Midland and Scottish, the London and North Eastern, the Great Western and the Southern Railways of to-day. Some of them came to nothing and may be omitted from this outline.

Rail transport, which has so changed the industrial and social organization of the world, really came into existence during the two decades immediately before the period which forms our theme. Its early development by England, Scotland and Wales placed those countries several years ahead of the other European nations in the race for industrial supremacy. In 1820 appeared the "Observations on a General Iron Railway" by Thomas Gray, a remarkable little book which during the next few years ran through several editions. Its "Plan of a General Iron Rail-Way for Great Britain" shows the projected scheme for rail-routes radiating from London to Dover, Portsmouth, Falmouth, Bristol, Birmingham, Holyhead, Liverpool, Glasgow, Edinburgh, Newcastle, Nottingham, Leicester, Norwich and Harwich, with a line connecting Holyhead through Liverpool, Manchester and Leeds with Scarborough and Hull. There is an engraving of "J. Blenkinsop's Patent Steam Carriage at Middleton near Leeds" which is "capable of moving One Hundred Tons 3½ Miles an Hour on a Level Rail Road". This is a reminder that Blenkinsop's rack railway at the Middleton Collieries was of extreme im-

portance in proving the ability of the steam locomotive to deal with heavy traffic, and in giving opportunity for experience in the construction of such locomotives. Only after George Stephenson had seen one of Blenkinsop's engines at work at Coxlodge in 1813 did he approach Lord Ravensworth, at that time the leading partner in the firm which had leased the Killingworth Colliery, where Stephenson was engine-wright. Stephenson had also studied Mr. Blackett's "Puffing Billy" at Wylam, and the fruition of his plans came in 1814 when his first "Travelling Engine" was placed on rails at Killingworth Colliery. On its first test the engine drew thirty tons at four miles per hour, and it proved once and for all the fallacy of supposing that adhesion would be insufficient on smooth rails and that a rack or toothed rail such as Blenkinsop had used was essential.

As with so many of the inventions destined to change the face of the world, it is difficult to date precisely the actual birth of the locomotive. Trevithick's experiments at Pen-y-daren, George Stephenson's travelling engine at Killingworth, the opening of the Stockton and Darlington Railway by "Locomotion No. 1" in 1825, and the Rainhill Trials, won by Stephenson's "Rocket" in 1829, are all landmarks in the evolution of the locomotive. It would be invidious to choose between them, whilst mention should also be made of Boulton and Watt, whose earlier experiments had made possible the work of Trevithick, and later of Stephenson. Whichever date we take, one thing is clear, that by 1830 the steam-locomotive had proved its worth, and the death knell of the coach and waggon had been rung, at any rate for other than very short distance travel.

There had, however, concurrently been a steady improvement in the coaches carrying mails. Speed had much increased; the Bristol Mail did its whole journey throughout at a rate double that of Stephenson's travelling

engine during its first test at Killingworth. Stephenson's success lay in the attention he paid to the financial side of his invention, and he was wise enough to realise that the steam-locomotive could only oust horse power if it proved more economical. Advocates of newer forms of traction to-day, who make wild claims of greater technical efficiency, would make much greater progress with their endeavours if they followed George Stephenson more closely and insisted more upon the financial savings which greater technical efficiency should bring in its train; after all, financial economy is the practical means of measuring technical efficiency.

By 1812 the mail-coach journey from London to Glasgow had been reduced to fifty-seven hours, exclusive of stops; in the next twenty-four years it was further decreased to forty-two hours. The inside fare in 1812 for the somewhat over four hundred miles, via Ferrybridge, Greta Bridge, and Carlisle, was £10 8s., with only 20 lbs. of luggage carried free. The outside fare for a servant was £6 5s. and the tips for an inside and outside passenger were no less than £2 17s. This total of £19 10s. provided no allowance for food and shelter. The inside fare by this coach amounted to sixpence-halfpenny per mile and the average conveyance cost per mile on turnpike roads to something between twopence and four-pence, whereas the earliest railways charged a passenger not more than three-halfpence a mile. The present era of competition between the railways and motor coaches is sometimes depicted as comparable with this period of over one hundred years ago, but the differences in cost of conveyance between the two competitors are far less to-day than they were in 1830.

Improvement in mail-coach speeds was naturally dependent upon the betterment of road surfaces and in this respect the coach services were at a disadvantage, since they did not own their own highway. They were at the mercy of

the Turnpike Trusts or in reality on the degree of pressure exercised on the latter by Parliament. The railways possessed from the first the supreme advantage of owning their own right of way, though they were forced to acquire it at exorbitant prices. In fact it was not until the coming of the internal combustion engine and its universal ownership one hundred years later that the public pressure on Parliament was sufficient to enforce a very high standard of road maintenance, mainly paid for by the property owner in the form of local rates. It is true that mail-coaches had been relieved from payment of tolls before the end of the eighteenth century, and this financial loss to the turnpikes, estimated at £50,000 in 1810, made their upkeep a matter of difficulty. In spite of several agitations these toll charges were never reimposed. The opening of the Stockton and Darlington Railway happened at a time when the fast day-coaches were actually improving on the speed and regularity of the famous Mails. This period was in truth the golden age of coaching, and some of the individual coaches contained actual luxuries, notably gas illumination, as in the Glasgow and Paisley coaches in 1827. In fact, they reached their zenith during the decade which applied the spur of competition to them.

One of the main difficulties confronting coach services was the uncertainty, for intending passengers could never be sure whether seats would be obtainable. Relatively to a train the coach could provide only a quite limited number of seats. John Constable, writing to his wife from Dedham on Easter Sunday, 1821, remarks that " There is a coach passes here about 2 o'clock which arrives in London about 9 or 10 evening. I think I shall come by it but it is so often full perhaps I may not be able to get a place ". A journey by coach during the early nineteenth century could provide plenty of incident, especially in winter time, while in the summer races between rival coaches added considerably to

the zest of travel. In 1810 one such race between Brighton and Worthing coaches ended in disaster, one of the coaches being upset and the coachman killed. Sometimes the horses got out of control; collisions occurred; thus, the "Coburg", a Brighton coach, was upset after collision with a waggon near Cuckfield in 1819 and all eleven "outsides" were injured, a Mr. Blake dying from injuries the following day at the "King's Head", Cuckfield. There is, however, no record of any serious accident to another "Coburg" coach, "Prince of Saxe-Coburg", which in 1817 began running between the Crown Inn, Redcross Street, Liverpool, and the "Swan with Two Necks", Lad Lane, London. It carried four "insides"; it covered the whole distance via Warrington, Congleton and Burslem in thirty-two hours. Dinner was taken at Burslem, supper at Lichfield; Towcester was passed at 5 a.m.; there was a stop for breakfast at Stratford, and London was reached at 3 p.m. via Redburn and Mimms. On this service, run by Samuel Henshaw, insistence was laid on strict punctuality; should the scheduled times not be strictly kept "the Passengers are particularly requested not to give the Coachman or Guard their usual perquisite". Apparently the "Swan with Two Necks" was a great coach centre, since the bill advertising the above new Post Coach service drew attention to the fact that "From the above Inn, Coaches proceed to every part of the Kingdom". The Crown Inn at Liverpool seems equally to have been an important centre, since the London coach connected there with the "Commodore", a new and elegant Post Coach which started to run in 1816 from Liverpool to Lancaster, in connection with other daily coach services to Carlisle and Whitehaven, with further connections for Edinburgh and Glasgow, Dumfries and Portpatrick for Ireland via Donaghadee. From the Crown Inn coaches also ran daily for Hull and York.

Within the cities themselves there were as yet no public

passenger services, and we have to turn to Paris for the first examples of the urban omnibus. One of the earliest of town omnibuses, if one excepts the "Carosses à Cinq Sous" of Pascal in 1662, which are interesting for their adoption, in the middle of the seventeenth century, of a uniform fare, was running on the boulevards of Paris just prior to the opening of our chronicle. On January 30th, 1828, Monsieur Beaudry drove his "omnibus" from the Bastille to the Madeleine. To him we owe the word "omnibus", an innovation as original as his vehicle itself. He seems to have had at first some difficulty in persuading fourteen Parisians to pay 25 centimes each for the convenience of a fast transit down the famous boulevard. History records that it was the gay and attractive widow of the Duc de Berry who brought fame and prosperity to M. Beaudry by riding in his "bus" from the Madeleine. Did she pay her 25 centimes? Alas, fame brought imitation, that truest form of flattery, and M. Beaudry found himself jostled by competitors. He is said to have committed suicide in 1829, a ruined man. But he opened up a new path of public service, and one that even after a century is still extending. The Paris omnibuses of to-day are a memorial to him and more numerous and probably more vocal than ever before.

Mr. George Shillibeer, once a midshipman in the British Navy, initiated his omnibus service for the Londoner on July 4th, 1829. We may regard him as the father of the British bus. There can be little doubt that he got the idea from Paris: he had been trained in coach-building with a firm in Long Acre, and then started in business for himself in Paris. One of the orders obtained by him there was from Jaques Lafitte, who had put some poorly-designed vehicles on the streets of Paris in 1819. It was in order to replace these by better vehicles that Shillibeer was instructed to build two new coaches. Returned to London, Shillibeer opened his new service from the New Road, now the

Marylebone Road, to the Bank, the original western terminus being the "Yorkshire Stingo" in the New Road. The new vehicles carried twenty-two passengers inside and were drawn by three horses abreast. Passengers were provided with newspapers free of charge and the two conductors were sons of naval officers and dressed as midshipmen; they spoke French fluently though there is no record that by extra payment those passengers who wished to improve their linguistic attainments could employ the opportunity. As a result of the popularity of Shillibeer's venture, rivals appeared on the scene almost at once. Competition drove him off his original route and he made a fresh start by offering a service between London, Greenwich and Woolwich, but only to meet with taxation difficulties; he concluded his transport career as an undertaker.

Shillibeer's original fare was 1s. between the "Yorkshire Stingo" and the Bank, a fee much below the Hackney Coach fares then in force. In 1805 the Hackney Coach fare from the Bank to Hyde Park Corner had been 3s. 2d., and from Fleet Street to the same place 2s. 4d. During the succeeding twenty years the level of such fares virtually remained the same, though the scale altered slightly with distance, as: —for one mile in London 1s., for twelve miles 15s. On a time basis it worked out at 2s. per hour. From the Bank to Hyde Park Corner the fare in 1824 had risen to 4s., i.e., somewhat more than in 1805. Many persons travelled by boat and the charge for a wherry was based on distance, payments being made by the number of oars, while a sculler cost half as much as two men with an oar apiece. Thus in 1805 from London Bridge or from Strand Lane to Vauxhall cost by oars 1s. and by sculler 6d., and the regulated charge from the Temple to Chelsea Bridge worked out at exactly double these figures. These fares by water persisted unaltered in 1825, though with an additional provision that when the boat was hired "With Company" the fare from

London Bridge to Chelsea Bridge was 2s. 6d. for oars and 4d. for each person, while from London Bridge to Windsor the equivalent fares were 2s. and 3s., respectively.

At the beginning of the nineteenth century it was a matter of comment that the country, although richly intersected by canals, had only the Grand Junction Canal extending for commercial purposes to the capital. This state of things was ascribed to the policy of the Government which was desirous of giving every encouragement to the "nursery of seamen in the Newcastle trade", and, therefore, prohibited the introduction of coals into the metropolis by other means than coastal shipping. It was claimed that coals could be delivered by canal at a lower price. Since coal transport was the staple source of profit to the canal owners this prohibition obviously discouraged them from providing inland navigation to serve London. The freight and expenses of sending Tyneside coal to London by sea at the end of the eighteenth century were about 10s. 6d. per London chaldron of 27 cwt.* and the selling prices in London fluctuated widely, from 44s. 1d. per London chaldron in 1794, to 57s. 1d. in 1799, and from 60s. to 70s. in 1800. A record rise to 73s. 6d. occurred during a scarcity. Owing to the Continental War in 1809 there was a great shortage of ships for the Tyne-Thames coal-trade, because many of them were taken from the trade and hired at twenty-five shillings per ton per month for the naval transport service and coals consequently became scarce in London, and rose to 34s. per Newcastle chaldron on board ship. In 1799 Newcastle despatched 332,165, Sunderland 75,232, and Hartley and Blyth 26,642 Newcastle chaldrons of coal to London, so that this protected and very flourishing trade provided an excellent nursery for seamanship.

Canals, however, continued to acquire traffic. There was

* Though the London chaldron was only 27 cwt. the Newcastle chaldron of the same period consisted of 53 cwt.

a packet-boat service on the Grand Junction Canal between Uxbridge and Paddington, reached by a cut through from Bull Bridge, with extra boats available " for select parties, fitted with every possible convenience ". The fare on the packet or passage boat for the whole distance, upwards of fifteen miles either way, was 2s. 6d. in 1805. The Canal Company won favour by providing accommodation at the Canal Head at Paddington for cattle and hay on market days, thereby diminishing " the detestable nuisance of Smithfield ". Paddington, then a little village in Middlesex about one mile from London, remained the canal terminus until August 1st, 1820, when the Regent's Canal was opened, linking the Grand Junction with the new docks at Wapping. The Regent's Canal, nine miles long, cost £500,000 and took seven years to construct, being executed under the superintendence of Mr. Nash. It had thirty-seven bridges and twelve locks, and it was claimed that a barge could pass through any one of the latter in three and a half minutes. Of the docks at Wapping, St. George's could accommodate 200 ships of the type in general use during the early years of the nineteenth century; Shadwell Dock could accommodate another fifty; an outstanding feature was the largest tobacco warehouse in the world, covering six acres. The trade of the Port of London in 1800 was, for the period, enormous. Imports were assessed officially at £18,843,172, exports at £25,428,922, but of the latter sum only £13,272,494 represented British merchandize. The importance of the re-export trade was clearly very high.

Before the railway era inland waterways in England carried a passenger traffic far from negligible. They acted as feeders to the river ports where they ended. Passenger boats, modelled on the Dutch ones of that time, had daily been carrying numbers of persons to and from Manchester on the Duke of Bridgewater's Canal and were doing so from shortly after its open-

ing in July, 1761. The first object of this early British inland navigation had been to provide better transit between the Duke's collieries at Worsley and the town of Manchester. The last quarter of the eighteenth century was a period of great prosperity for the bulk of the canal companies. There was, so to say, a period of canal mania; the canals, like the railways at a later date, were overbuilt, and by the middle of the nineteenth century over 2,400 miles of navigable waterways existed in England; in later years several of them returned dividends varying from 20 per cent. to 30 per cent.

In all the Canal Acts the various charges which the owning company was allowed to levy were set out in detail, which consisted chiefly of the form of tonnage rates. An interest attaches to this to-day from the fact that one finds here the continuation of the earlier system of charging in which merchandize was classified according to its value, its adaptability to load well or the probability of claims for compensation arising from its transport. In these days when road-transport throughout the world largely departs from such bases of rate-fixing, it is important to realise that the railway freight-classification, which fixes the charges a railway can make for transporting different classes of goods, was simply a further evolution, in somewhat greater detail, of the canal rates system in force at the time of the railways' birth. Thus, the Acts for the Grand Junction Canal specify the following tonnage rates: —

	d. per ton, per mile.
Lime and Limestone . .	¼ " "
Cattle, Sheep, Swine, and other Beasts, Flint and other Stone, Bricks, Tiles, Slate, Sand, Fuller's-earth, Iron-stone, Pig-iron, Pig-lead, and all kinds of Manure, (except Lime) . . .	½ " "

	d.	per ton,	per mile.
Coke and Coal . . .	¼	„	„
All other Goods, Wares and Merchandize whatsoever .	1	„	„
For all Goods, Wares and Merchandize, passing from the Canal into the Thames or *vice versa* . . .	½	„	
All Barges and other Vessels whatsoever, navigated on the Thames, or any Part thereof Westward of London Bridge to Strand on the Green, or Brentford, by an Act of the 17th George III pay to the Lord Mayor, Aldermen and Commons of the City of London	½	„	

Fractions to be considered as One Mile, and all Fractions of a Ton to be taken according to the Quarters of a Ton contained therein.

Forty Cubic Feet of Oak, Ash, or Elm, and Fifty Cubic Feet of Fir, Deal, Plank, Poplar, Beech or Birch, to be rated as One Ton; One Hundred and Twenty Pounds, Avoirdupois, of Coal or Coke, as One Hundred Weight; and One Hundred and Twelve Pounds of any other Article.

Proprietors may fix the Price of Carriage for any Parcel not exceeding Five Hundred Weight, affixing the same on every Wharf of the said Canal.

How similar the methods of charging permitted to the early railways were is evident from the following Tonnage

Rates sanctioned in the case of the Liverpool and Manchester Railway by its Act of 1826: —

	d. per ton, per mile.
For all Limestone . . .	1 „ „
For all Coal, Lime, Dung, Compost, Manure and Materials for Roads . .	1½ „ „
For all Coke, Culm, Charcoal, Cinders, Stone, Sand, Clay, Building, Paving and Pitching-stones, Flags, Bricks, Tiles and Slates . .	2 „ „
For all Sugar, Corn, Grain, Flour, Dyewoods, Timber, Staves, Deals, Lead, Iron and other Metals . . .	2½ „ „
For all Cotton and other Wool, Hides, Drugs, Manufactured Goods, and all other Wares, Merchandize, Matters or Things	3 „ „

In the case of this line charges were also published to cover the carriage of goods, etc., by the proprietors of the line, and they were fixed as follows: —

	s. d. per ton
For all Lime, Limestone, Dung, Compost, Manure and Materials for Roads, Stone, Sand, Clay, Building, Pitching and Paving-stones, Tiles, Slates, Timber, Staves and Deals	8 0 „

	s.	d.	per ton
For all Sugar, Corn, Grain, Flour, Dyewoods, Lead, Iron and other Metals .	9	0	„
For all Cotton and other Wools, Hides, Drugs, Groceries and Manufactured Goods . . .	11	0	„
For all Wines, Spirits, Vitriol, Glass and other hazardous Goods . .	14	0	„
For all Coal, Coke, Culm, Charcoal and Cinders .		2½	„ per mile

All shorter Distances in Proportion.

The Tonnage Rates laid down in the Canterbury and Whitstable Railway Act of 1825 were very similar: —

	d.	per ton, per mile.
Limestone, Materials for the Repair of Road, Dung, Compost, and all Sorts of Manure, except Chalk and Lime .	3	„ „
Coal, Coke, Culm, Charcoal, Cinders, Stone, Marl, Sand, Lime, Clay, Ironstone, and other Minerals, Building-stone, Pitching and Paving-stone, Bricks, Tiles, Slate, Chalk, Timber, Staves, Deals, Lead, Iron, and other Metals, and all Gross and Unmanufactured Articles, and Building Materials . .	4	„ „

	d. per ton, per mile.
Cotton, Wool, Hides, Drugs, Drywoods, Sugar, Corn, Grain, Flour, Manufactured Goods, Agricultural Produce, and all other Goods, Commodities, Wares and Merchandize . . .	6 „ „

These facts have been set out in some detail here because the point is of great importance at the present time, when the whole theory of rate-fixing, based on classification of goods by value, is being disregarded in the competition between the railways, whose charges are based on this system, and the road-motor vehicles, whose operators base their charges mainly on the cost of movement irrespective of the value of the goods transported.

Numerous contrasts are given by Jackman in his "Transportation in Modern England" between the relative cheapness of inland water movement and the much higher cost of carriage by land, prior to the construction of railroads; thus, from Manchester to Birmingham canal carriage worked out at £1 10s. per ton, whereas by road vehicle the charge was £4. In the southern counties the situation was very similar, and generally the charge for land movement averaged three times the cost by water; for example, groceries from London to Bath, carried on the Kennet and Avon Canal, had to pay £2 10s. per ton, but if carried by road £7 10s. per ton. From the same source one learns that the freight on valuable goods on the river route from London to Reading averaged $2\frac{3}{4}$ pence per ton per mile, and by the canal route from London to Birmingham averaged $4\frac{1}{2}$ pence per ton per mile. In both cases charges materially lower were applicable to so-called heavy goods. The present competition between the railway and the road motor

vehicle has made for reduction of railway freight rates on those commodities which can be carried easily by the newer competitor. This very circumstance has had the effect of keeping up the rates on heavy goods, such as coal, which are not subject to such diversion. Similarly, railway competition in the 1830's brought about important reductions in the charges by canal. This point will be considered more fully in a later chapter. But there seems little evidence of any serious effort on the part of the various canal companies to improve their methods and develop more scientific operation, though at the time they must have foreseen in some measure the competition the next twenty years would bring. True, steam power had been tested experimentally on the Forth and Clyde Canal in 1802, but mechanical power proved so damaging to the canal banks that further trials were delayed until the banks had been protected; and it was not until thirty years later that any real success attended the introduction of steam-powered vessels. Rennie, who designed the beautiful and much-maligned Waterloo Bridge, conducted certain tests on the Grand Junction Canal to determine the effect of speed on the erosion of canal banks. The majority of canals were content, however, to rely on horses for traction; even so, they frequently achieved a steady ten miles per hour.

One may date the beginning of the era of public railroads, carrying passengers and freight, approximately from the opening of the Liverpool and Manchester Railway in September, 1830. It was then that the inland waterways probably attained their zenith of prosperity. Much has been written about their supposed extinction by the rapidly extending networks of railways, but closer study of contemporary history fails to bear it out. Some of them undoubtedly suffered total eclipse, but those were cases where the supply of water was unreliable, or where numbers of locks had to be used to overcome differences in gradients.

The more important inland water routes carried on usefully their share of transport work; and are still carrying it on to-day, on a somewhat reduced scale, it is true. The recent renovation of the Grand Union Canal system shows how valuable a link in the country's internal transport system such a waterway can be. Unfortunately for themselves, the railways had, as part of the price to pay for overcoming opposition to their Acts, to take over many of the least profitable of the canals. Though many miles of these are now owned by the railways, the most important canals have always remained independent links in the transport system of the country, and have been serving a useful economic function without break for the last hundred years. With the road motor vehicle as a feeder, though under the existing lack of regulation it is more often a competitor, the canal companies may have in fact entered upon a new lease of life; their charges are low and even now there are many classes of goods which are not required at the distribution point in any very immediate urgency. Unlike the early railways, few of the canal companies were themselves carriers; they relied on outside carriers for their receipts.

Perhaps the most important of the large carrying firms of the early nineteenth century was Pickfords, which even then was an organization nearly one hundred years old, having taken over certain of the original packhorse carriers. At any rate, as early as 1777, Pickford's Flying Waggons set out twice a week, Wednesday and Saturday, at six o'clock in the evening from the "Swan and Saracen's Head" at Manchester for the "Swan Inn", Lad Lane (now Gresham Street), London. This road service, which catered both for passengers and merchandize was scheduled to complete the journey in four and a half days, exclusive of the Sunday. Mr. Matthew Pickford, at that time the head of the firm, was careful to advise his clients that he would not be held accountable for any "Money, Plate, Watches, Jewels,

Writings, Glass or China, etc., unless entered as such, and paid for accordingly". This, once again, is evidence that the road carrier of those days distinguished in no uncertain fashion between the differing values of the merchandize entrusted to his care. By 1820 Baxendale, a native of Lancaster, had gained virtual control of the Pickford business, and was offering a thirty-six hour service over the 186 miles which separated Manchester from London, by means of "Caravans on Springs and Guarded". These carried no passengers; they left to posterity their title in the word "van", which still endures as a term for both railway and road vehicles after a century and a quarter. That Baxendale was thoroughly awake to the value of canals is clear from the fact that wharves carrying the name "Pickford & Co." were all ready for use at the City Basin on the day that the Regent's Canal was opened on August 1st, 1820. From the chronicles of that time it seems that the urge for speed was already insistent, for Baxendale, not content with the earlier "Flying Waggons" of his firm and the later fly-vans on the roads, added "fly boats" on the inland waters to hasten the movement of goods entrusted to his firm. There can be little question that with the growth of industry in England at that time the lot of the road carrier was a happy one; there seems to have been comparatively little strict regulation of charges, and rates of £5 per ton could be quoted with success for a waggon or caravan load between London and Birmingham. The rates charged by the canal boats worked out at rather over half this figure; small parcels were still being carried by coach at the rate of about a penny a pound for a distance of one hundred miles.

It is not difficult to understand, in view of the growing expansion of trade, why railway proposals were welcomed heartily by the business community. For the land-owning gentry they had less appeal. Baxendale is typical of the far-sighted English businessmen of the early nineteenth

century, and there were many of them. He was a strict disciplinarian, but keenly alive to the welfare of his widely-scattered staff; he provided clubrooms and coffee rooms for his carmen, and insisted on the value of system, method and punctuality in business organization. His policy might to-day be styled that of scientific management. In full vigour at the time of the Napoleonic wars, he was a strong apostle of peace and goodwill, but unlike many others he gave an example, as head of his great business, of the virtues which he extolled. An early riser, he christened his private "canal yacht" the "Lark". He worked long hours and spent much of his time travelling between his beloved Lancashire and London on visits to his men or on business. Whether business acumen, foresight, or his desire for peace was responsible for his agreements with the new railways the records of the time do not divulge; probably all of them helped to lay the foundation of that policy of road and rail co-ordination which became a fact when the directors and management of the Liverpool and Manchester entered into an alliance with Pickfords. The Grand Junction and the London and Birmingham Railways followed the example of the Liverpool and Manchester. The story of the alliance, of the opening of the railways themselves, and of the somewhat similar agreement between the railroads and William Chaplin, the coach king of the 'thirties, must be left to the following chapter.

CHAPTER II

1830—1839

THE COMING OF THE RAILWAY—EFFECT ON TURNPIKES AND CANALS

THESE first few years of the railway era witnessed the death of Richard Trevithick, the designer of the first practicable steam road-carriage, which made its inaugural trip on Christmas Eve, 1801. He also designed the first railway locomotive, tested out on the Pen-y-daren tramway in 1803. Passing away in April, 1833, he had lived sufficiently long to see the triumph of his endeavours, and to-day he, not George Stephenson, is regarded by many as the true father of the steam locomotive. Trevithick's renown would certainly not have suffered such comparative eclipse in the world during the later nineteenth century if he had paid the same attention to the engineering problem of his permanent way as did the elder Stephenson. That George Stephenson possessed the attributes of a great man, as well as of a great engineer, is shown by his foresight with regard to a standard gauge and to the development of passenger traffic; the records of his life display no such errors of judgment as led Brunel, his great rival, to recommend the atmospheric railway.

In December 1831, the report of a select committee on the much-discussed question of steam carriages was made public. After searching inquiries the Committee had come to the following conclusions: "(1) That carriages can be propelled by steam on common roads at an average rate of ten miles

an hour. (2) That at this rate they have conveyed upwards of fourteen passengers. (3) That their weight, including engine, fuel, water and attendants, may be under three tons. (4) That they can ascend and descend hills of considerable inclination with facility and ease. (5) That they are perfectly safe for passengers. (6) That they are not (or need not be if properly constructed) nuisances to the public. (7) That they will become a speedier and cheaper mode of conveyance than carriages drawn by horses. (8) That as they admit of greater breadth of tire than other carriages, and as the roads are not acted on so injuriously as by the feet of horses in common draught, such carriages will cause less wear of roads than coaches drawn by horses. (9) That rates of toll have been imposed on steam-carriages which would prohibit their being used on several lines of roads were such charges permitted to remain unaltered". Nevertheless, contemporary public opinion preferred to have the steam engine confined to its own particular right of way, properly fenced in, though it was not until 1835 that Parliament dealt with this matter, in the Highways Act of that year.

Prior to 1830 only fifty-one miles of railway had been opened to traffic, consisting of many small and widely scattered lines, of which the most important was the Stockton and Darlington Railway; others of very local importance were the Kilmarnock and Troon and the Monkland and Kirkintilloch in Scotland. Anybody interested in the detailed history of these and many other early railways will find an attractive account in "Early British Railways", an historical survey by H. G. Lewin, the recognized authority on railway history of that period. Many of these lines were not true railways in the modern sense for they employed horse-traction either for the whole of their traffic or for passenger traffic, as indeed the Stockton and Darlington continued to do for some time after its opening. Concerning the

Stockton and Darlington Railway, there exists a very charming "Retrospect", by Randall Davies, written for the centenary of its opening, celebrated in 1925, and published by the London and North Eastern Railway. In 1830 the Liverpool and Manchester Railway was opened on September 15th, and by the end of that year the railway mileage in Great Britain totalled all but one hundred miles. The occasion of the opening, a great day for George Stephenson, was marred by the tragic death of Huskisson, at that time a Member of Parliament for Liverpool, who was run over by the locomotive "Rocket" as he stepped back from shaking hands with the Duke of Wellington at Parkside, midway between Liverpool and Manchester, where the engines had stopped to take water. Huskisson was carried the fifteen miles to Eccles, where he died that evening, behind the engine "Northumbrian" in about twenty-five minutes, or roughly thirty-six miles per hour, and as a result of the accident the world for the first time realised the potentialities of the steam railway in point of speed.

Between the sixteenth of September, 1830, and the end of that year no less than 1,433 tons of merchandize had been carried between Liverpool and Manchester, as well as 2,630 tons of coal, while Stephenson's estimate of passenger traffic had been more than realised, for 71,951 passengers had been booked at the company's offices. During the first half of 1831 the number of passengers rose to 188,726, or approximately ninety per passenger-train trip, whilst in the second six months of the year the figure of 250,000 was easily exceeded, though this total was not passed again until the latter half of 1835. The story of the Liverpool and Manchester Railway is one of absorbing interest, all the more so because there are in existence so much financial data with regard to the cost of its construction and operation and its receipts; but its story has been so admirably told in the "Centenary History of the Liverpool and Manchester Rail-

way ", by C. F. Dendy Marshall, that a few paragraphs must suffice here to record some of the most interesting facts. In view of the present extensive use of containers, of which over 7,000 are in daily use on the British railways, it is of interest to note that coal-containers, two of which were carried per wagon, were tried on the Liverpool and Manchester almost at its opening. Unfortunately they did not prove very satisfactory and the system appears to have fallen into disuse, though experiments were also made with containers on the Canterbury and Whitstable Railway, a line mentioned later, where they seem to have been employed with great success. The following figures with regard to the cost of conducting traffic and the net profit obtained under the various Heads of Expenditure relating to the Liverpool and Manchester Railway for the second half of 1833 are of exceptional interest and do not appear to have been reproduced in any of the recent historical works on this subject. An Abstract of the Returns from the Different Departments with reference to salaries or day's wages for the last week of 1833 is also reproduced.

1ST JULY TO 31ST DECEMBER, 1833—DISBURSEMENTS APPORTIONED UNDER THE DIFFERENT HEADS OF EXPENDITURE

	Per Passenger Booked	Per Ton of Merchandize Liverpool & Manchester	Per ton of Coal	Per Ton on Bolton Tonnage
	s. d.	s. d.	s. d.	s. d.
Total Disbursements	2 6¾	6 10¼	1 4¼	0 11¼
Net Profit	2 6¼	2 10	0 11	0 5¼
Gross Receipts	5 1¼	9 8¼	2 3¼	1 4¾

	Coaching Department	Merchandize Department	Coal Department	Bolton Tonnage	Totals
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Total Disbursements	27,345 8 3	27,357 9 3	755 5 0	891 19 3	56,350 1 9
Net Profit	27,339 18 8	11,283 19 7	1,836 1 6	424 8 7	40,884 8 4
Gross Receipts	54,685 6 11	38,641 8 10	2,591 6 6	1,316 7 10	97,234 10 1

ABSTRACT OF THE RETURNS FROM THE DIFFERENT DEPARTMENTS OF THE TOTAL NUMBER OF AGENTS, CLERKS, OVERLOOKERS, AND WORKMEN, RECEIVING SALARIES OR DAY'S WAGES, IN THE SERVICE OF THE LIVERPOOL AND MANCHESTER RAILWAY COMPANY, FOR THE WEEK ENDING 31ST DECEMBER, 1833.

	No. of Agents, Clerks, and Overlookers	No. of Engine Men, Guards, Labourers, etc.	Salaries and Wages Per Week	Totals
			£ s. d.	£ s. d.
Carrying Disbursement—				
Per Mr. Green	23	170	201 11 7	
Mr. Comber	12	76	110 2 9	
Mr. Dixon	..	17	17 13 7	
				329 7 11
Stationary Engine and Tunnel Disbursement—				
Per Mr. Comber	..	7	6 10 2	
Mr. Dixon	..	6	8 7 0	
				14 17
Coach Disbursement—				
Per Mr. Green	5	20	29 9 2	
Mr. Dixon	1	23	30 18 4	
Mr. Purves	1	2	2 16 0	
Mr. Ellwood	3	3	8 0 11	
Mr. Williams	3	19	27 4 10	
				98 9 3
Maintenance of Way—Per Mr. Dixon	3	123	....	117 13 11
Locomotive Power—Per Mr. Dixon	3	152	....	196 14 10
Waggon Disbursement—Per Mr. Dixon	2	11	....	17 8 10
Coal Disbursement—Per Mr. Dixon	..	2	....	2 0 0
Repairs of Walls and Fences—Per Mr. Dixon	..	6	....	4 15 0
Engineering Department—Per Mr. Stephenson and Mr. Dixon	2	..	....	13 11 1
Police and Gate Establishment—Per Mr. Dixon	..	37	....	35 10 6
General Office Establishment	6	1	....	25 1 10
Total	64	675	....	855 10 4

A line of much less national importance was the Canterbury and Whitstable Railway, which was designed to give better facilities for the trade between London and Canterbury, at that time carried largely by sea. Once again there is available a delightful study of this very interesting little line, the first public railway to use a steam locomotive south of the Thames, namely, the "History of the Canterbury and Whitstable Railway", by the Rev. R. B. Fellows, one of the greatest authorities on British railway history; this book was published in 1930 on the occasion of the centenary of the railway's opening. Locomotive engines were only used

for a comparatively short section of level line, the traffic being moved over the heavy gradients at the termini by means of three stationary engines. In view of the shortness of this line—it was only six and a quarter miles long—it is surprising to find in contemporary accounts that, whereas the annual number of persons travelling between Canterbury and Whitstable was only 4,000 before the opening of the line, no less than 26,000 were carried by the railway in 1835, at a charge of ninepence per person. Doubtless many of these travelled to Whitstable and thence by water to the capital, instead of going by the main London road.

While many small railways were being constructed in various parts of England—for instance, the Bolton and Leigh in Lancashire, which was connected with the Liverpool and Manchester by means of the two and a half mile Leigh and Kenyon, and the Bodmin and Wadebridge in Cornwall, finally opened in July, 1834—London did not witness its first steam railway opening until December 1836.

Though railways were being discussed throughout the length and breadth of England in the early 'thirties, the normal form of travel was still the stage-coach, and the same was true of the United States along the eastern seaboard, where the first thirteen miles of the Baltimore and Ohio Railway were not opened until 1830, and the Camden and Amboy, running between New York and Philadelphia, not until 1837. The "New York Evening Post" in its issue of October 4th, 1832, obviously considered it wonderful that one should be able to have breakfast in Philadelphia and dinner in New York, because it pointed out that at half-past three the day before Reeside's new line of stage coaches from Philadelphia had brought up the morning papers of that city. To-day the Ludington Air Lines carry one from New York to Philadelphia—a distance of 90 miles—in less than 60 minutes, and there is virtually an hourly service by rail. Nevertheless, such railways as were open in 1832 were

straining every nerve to serve the public and oust their road competitors. For instance, in the "Evening Post" of April, 1832, one may read that "the Mohawk and Hudson Railroad Company are having constructed and intend putting on the road in a short time a number of carriages of a new and very beautiful and convenient kind. These carriages are of a square form, 15 feet long, with the separate compartments, and will contain eighteen passengers with ease. Passengers, at the same time that they have more room, will be well protected from the smoke and coals of the engine". The Mohawk and Hudson had been opened from Albany to Schenectady in 1831.

British coachbuilders were famous at this time for the quality of their work, and a considerable export trade seems to have been built up; thus in April, 1832, as may be read in "The Times" of that month, there was shipped from the Millwall Docks "an English stage-coach, improved by fixing lattices in the side panels, and by a raised roof, to admit of ventilation and make it better adapted for a hot climate. It is intended to run between Alexandria and Cairo. Two sets of harness for four horses accompanied it. A respectable English coachman, inured to tropical climates, has been engaged to superintend the establishment in Egypt, and he went out in the 'Eamont'. This is the first step to the introduction of public coaches for travelling in Egypt. It has been undertaken, with the sanction of the Pacha, by one of his officers, who visited England many years ago. Orders have been given to make carriage-roads between Alexandria and Cairo, and between Alexandria, Rosetta, and Damietta". Many attempts had been made to improve the road vehicle, notably by Trevithick with his steam-carriage. One of the most curious proposals was that of David Gordon, who took out a patent on February 24th, 1822, with the title "Certain improvements in the construction of wheeled-carriages (by which each wheel is rendered

entirely independent of other wheels)", and in October, 1832, his son, Alexander Gordon, started what was probably the first paper to deal with mechanical road transport; it was known as the "Journal of Elemental Locomotion, a monthly advocate of the advantages to arise from the substitution of inanimate for animate power", but only six issues appear to have seen the light of day. It seems that the very suggestion of the displacing of horses was enough to arouse the keenest opposition of the interests vested in the horse-breeding industry and in the horse-drawn passenger conveyances.

Nevertheless, many types of mechanical road vehicles were subjected to trials, as, for instance, Gibb's Steam Drag of 1831, which was in reality a steam tractor drawing a coach outwardly normal in type but in reality steered by the drawbar. Great opposition was naturally experienced from the Turnpike Trusts, since the weight of such vehicles must have done considerable damage to the road surfaces, such as they were, and a case is on record where Gibb's Steam Drag broke its axle-tree when surmounting a pile of stones on the road between Cheltenham and Gloucester. It is reported that seventeen passengers were being carried that morning and, though a delay of over an hour had been caused by the heaps of stones on the outward journey, it was only on the return journey from Cheltenham that the accident occurred. Whether the condition of the road was due to carelessness or to deliberate intent the records do not divulge. An earlier steam-coach designed by Gurney had appeared in Hyde Park as early as 1827, but though satisfactory in many ways it had proved very cumbersome with its boilers, smoke stacks and heavy machinery. Steam carriages must, however, have been regarded as sufficiently uncommon in London in 1832 to warrant remark; for the newspapers published during the week-end of August 18th and 19th drew attention to the fact that on the previous Friday a

steam-carriage had passed through Kensington on its way from Greenwich to Windsor, carrying nineteen passengers. It was reported that the steam-coach closely resembled an omnibus and that the " conductor appeared to manage it with the greatest facility ".

Of more importance, and referred to in detail later, were the mechanical vehicles which ran as public omnibuses between the Bank and Paddington, starting on April 22nd, 1833, with a fare of sixpence and an average speed of about twelve miles per hour. Gurney also appears to have had some of his vehicles running in London about this time; for a journey of nine miles they took fifty-five minutes, and the cost, £78 for 3,644 miles, averaged out at 4¾d. per vehicle mile. London was not alone in using steam omnibuses, for there were several of very elaborate design with spring wheels and water-tube boilers, for which a certain Dr. Church, of Birmingham, appears to have been responsible. That the problem of road-making and maintenance was also receiving attention from inventive minds appears from the fact that Rowland Hill in 1832 was busy in elaborating machinery for road-making, and it was this study of roads which probably led him to the further step of analysing the cost of carrying letters; in 1836 it appears that the Post Office was charging 1s. 4½d. for carrying a letter from London to Edinburgh, whereas the cost was about one thirtieth of a penny.

At the beginning of 1833 the hackney-carriage trade in London seems to have been thrown open, and within the first six days no less than 500 new hackney-carriage plates had been taken out, so one may learn from a paragraph in the " Sunday Times " of January 13th, 1833, which newspaper then cost sevenpence. In October, 1832, a petition had been presented to the Lords of the Treasury, praying them " to suspend the operation of so much of the hackney-carriage Act as provides for throwing the trade entirely open

in January next, and to issue an order to the Commissioner of Stamps to withhold any licenses which may now fall vacant, until the number shall be reduced to 800", and it is clear from what occurred in January, 1833, that this petition had failed. The following extract from "The Times", which in 1833 also cost sevenpence, shows that the hackney-coach drivers of a hundred years ago were renowned for their rudeness, and to judge from the condition of the horses mentioned in this case the speed of travel was probably somewhat slow: "The driver of a hackney coach was charged (at the Mansion House) with having shoved the cab of a gentleman named Fairly upon the pavement, to the eminent hazard of the complainant. The coachman, who was one of the very rudest even of that class, said: — 'My Lord, he cotched hold of my roller bolt, and pushed me bang upon the pavement with his wheel. Blowed if I didn't think he'd shoved down the Mansion-house wall.' Mr. Hobler: 'Yes, and swallowed your coach and horses!' Coachman: 'Ay, by G—d!' (Loud laughter). The Lord Mayor: 'The case is proved against you'. Coachman: 'How can that be? Why the gemmans' oss was worth a hundred, but my poor creatures was scarce able to drag their legs arter 'em if I didn't give them a little un now and then on the raw' (A laugh)".

A month later in the advertisement columns of "The Times" there was a notice with reference to one of the coach services to Devon and Cornwall. Since it gives a good picture of the road transport conditions of the period it is worth reproducing: "Falmouth, Exeter, and London, in One Day. The Telegraph will resume its station from London, as a Day Coach, on Monday, March 4, leaving the Bull Inn, Aldgate, every morning at a quarter before 5, and Nelson's office, 52, Piccadilly, at the corner of the Burlington Arcade, at 5, through Andover, Amesbury, Wincanton, Ilchester, Ilminster, and Honiton, to Exeter the same

evening. Passengers travelling to Falmouth may, by adopting this coach to Exeter, avoid the night altogether, without being longer on the road between London and Falmouth, or to any part of Cornwall, than by other coaches". Reference has already been made to collisions between coaches, but it is unusual to come across an instance of racing coaches colliding when running on rails; yet the "Scotsman" for October, 1832, shows that this singular event actually took place "on the main railway" between Edinburgh and Dalhousie. The story can best be told in the "Scotsman's" own words: —"On Saturday evening, between 5 and 6, while the Jubilee coach was running from Dalhousie to Edinburgh, on the main railway, another coach was running behind it, the driver of which, having shown a determination to pass the Jubilee at all hazards, was repeatedly called out to not to drive so quick. . . . His coach struck the Jubilee with tremendous force, and drove the latter coach completely off the railway, into a ditch at the side of the road, and precipitated the passengers, among whom were several ladies, into a field. Fortunately, only one gentleman was injured. . . . However popular this mode of conveyance may be, it will soon lose its character if such disgraceful conduct as that described be allowed to pass with impunity".

The main cause of disaster to coaches was overturning, and there are records of no less than nine mail-coaches overturning in the month of February, 1835, alone; this was probably due in part to the policy of speeding-up which was forced upon them as a result of the craze for speed engendered by the railways; as early as 1830 the Liverpool and Manchester had been carrying mail-bags between the two cities, though they were not paid for so doing. The Post Office in 1834 was paying rates to the mail-contractors varying from three-halfpence to fourpence a mile, though one or two actually paid the Post Office for the privilege of carrying the mails. One of the most famous coaches of the

'thirties was the " Quicksilver " Devonport Mail, which continued to Falmouth; it left London at 8 p.m., left Exeter the following day after a ten-minute halt, reached Devonport at 5.14 p.m. and landed the tired traveller at Falmouth after a journey of 29 hours, 5 minutes at 1.5 a.m. on the second morning. The starting point was the Gloucester Coffee House in Piccadilly, and mails were brought thence from St. Martin's-le-Grand in a mail cart, and city passengers in an omnibus. It was the famous William Chaplin who horsed this coach; his general policy was to replace one-third of his horses each year, so that the speed should be kept up and a good punctuality-record achieved. The cost of a horse was about £30. His coachmen were rostered to travel out with a coach about thirty-five miles and to bring back the return coach, sometimes half a day later; in those days there were no regulations as to split shifts and hours of duty. W. J. Chaplin was literally born into the coaching business, as he was the son of a coach-proprietor at Rochester, and the centre of his operations was the " Swan with Two Necks " in Lad Lane, though he had numerous other yards in London and stables situated on the main roads about twelve miles from London. The height of Chaplin's road activities probably synchronized with the opening throughout of the London and Birmingham Railway in 1838, at which time he possessed about 1,800 horses and nearly seventy coaches. Most of his coaches were adorned with the insignia of the " Swan with Two Necks ", or with the sign of one of the other London inns he controlled, and they were all uniformly painted with black upper quarters and red underparts and wheels. Like his great contemporary on the freight-transport side, Baxendale, of Pickford's, Chaplin and his later partner Horne, of the " Golden Cross ", Charing Cross, accurately forecast the future trend of transport policy in England. The crucial point in his career, when he had to decide whether to co-operate with the steam railway or

to fight it, came to him at the age of fifty-one. He had been wise enough to sell most of his coaches on the routes where the railways were under construction, though the others continued to be covered by coaches operated by the newly-formed firm of Chaplin and Horne, carriers. After a long holiday in Switzerland, he took the final plunge and invested a large portion of his cash from coach-sales in the London and Southampton Railway. A directorship of that company was followed in 1839 by the Deputy-Chairmanship and four years later by the Chairmanship of the London and South Western Railway, from which he retired on account of ill-health fifteen years afterwards.

As previously mentioned, the Londoner had already had an opportunity of testing steam traction on the road, thanks to the inventive genius of Walter Hancock, who, on Monday afternoon, April 22nd, 1833, tried out his steam omnibus on the Paddington Road. "The Times" of the succeeding Thursday described the experiment in the following words: "The machine altogether does not exceed the space which an ordinary omnibus with horses attached would occupy, and the appearance is peculiarly neat. The body is capable of accommodating fourteen persons, the engine dividing that from the furnace in the rear. The passengers experience no inconvenience from heat, and coke being the fuel employed, there is no annoyance by smoke. The engine works on a crank, not on the axle, and the propelling power is applied to the wheels by means of iron chains. The chief recommendation, that which timid persons will consider most, is that there can be no possibility of explosion. The propelling power is equal to from 15 to 20 miles an hour, but even when the steam is raised to its very highest pressure there is no risk. . . . . The guide, who sits in front, has complete control of the vehicle, and can arrest its progress instantaneously. It left the Patent Steam-Coach Company's yard, in Charles-street, City-road, at 4 o'clock, with a full

complement of passengers, chiefly ladies. At first it proceeded at a pace of about six miles an hour; but, having cleared the crowd, who assembled in great numbers to witness the exhibition, the velocity was increased to the rate of ten miles an hour. It is intended to ply regularly from Paddington to the Bank". Appropriately known as the "Enterprise", this Hancock steam-coach was scheduled to cover the ten miles from City Road to Paddington and thence via London Wall back to City Road in sixty-eight minutes. The authorities, it seems, refused to grant a hackney-coach license plate to "The Enterprise Steam Omnibus", and, as a consequence, the service was temporarily withdrawn as from May 3rd. The steam-coach, which was intended to be the forerunner of two similar vehicles, seated fourteen passengers who faced one another during the journey, while the "steersman" sat alone outside at the front of the body, the engine and boiler being mounted at the rear.

One of Hancock's steam-coaches had attempted a run to Brighton the previous year, but, in spite of attaining thirteen miles per hour en route, it failed to reduce the record time of the horse-coaches, and even in October, 1833, his "Autopsy" could only achieve a five and a half hours' running time to Brighton. Nevertheless, the "Era", the "Autopsy" and the "Automaton" are reported to have carried 12,761 passengers between Paddington and the City by 1836, and at one time a "London and Birmingham Steam Coach Company" had been formed, with fares of £1 inside and 10s. outside between the two cities. But such projects as this and Gurney's London and Bath service of 1833 met with continual opposition from the Turnpike Trusts, and from all those who regarded machinery as creating unemployment, so that the era of the steam-coaches was unhappy and short, and Gurney, who claimed to have lost £36,000 on his experiments, was granted by the Government £16,000, as the first successful person to use steam-carriages on public

roads. The steam-coaches, or "Tea Kettles" as they were often called, were mainly ruled off the roads by the heavy tolls imposed upon them by the Turnpike Trusts; thus, between Liverpool and Prescot one finds that the toll of 4s. on a horse-coach was raised to 48s. in the case of a steam-coach. Road surfaces were certainly incapable of standing up to a frequent service of such vehicles, but it is apparent that the common accusation that the railways killed road traffic during the 'thirties is by no means correct; what really happened was that those responsible for road-maintenance refused to permit mechanical traction to use the highways, and, consequently, higher speed could only be obtained by the acquisition of a private way, and the reduction thus effected in the cost of operation, at any rate with heavy loads, led directly to railway construction. Incidentally, the attitude of the Turnpike Trusts drove the mechanical engineers from all thoughts of road traction into the hands of the newly-formed railways, who received them with open arms.

The later 'thirties, which saw the construction of the first main line railways leading from London, mark the end of the Golden Age of coaching and of the road, which were destined to remain in eclipse till their revival ninety years later in a new form, which has succeeded in undermining the finances of the world's most important railway systems. The decline of the coaches was tragic; the horses dwindled to three, then two, and many of the old coaches finished their days as one-horse buses "to the railway station". To some extent competition amongst the coaches themselves brought about their decline; for it left many of the proprietors with such small saved-up profits that they were unable to offer any serious competition to the railways, slow and infrequent as these were in the 'thirties. It is probable that even Chaplin's agreement with the railway interests was in no small part due to the cut-throat competition he

had had to suffer in earlier days from Edward Sherman, of the "Bull and Mouth", St. Martin's-le-Grand. Supported financially by Lewis Levy, who is reported to have farmed turnpike tolls to the extent of £500,000 per annum, Sherman's "Shrewsbury Wonder" covered 158 miles in the day, and his "Manchester Telegraph", which commenced to operate in 1833, left London at 5 a.m. and reached Manchester at 11 p.m.; the competition between this coach and Chaplin's "Manchester Defiance", later the "Royal Defiance", which did the journey in about the same time, was exceptionally keen, while there were other fast coaches on the service, notably the "Red Rover", the "Peveril of the Peak" and the "Beehive". The last-named was fitted with numbered seats, to be reserved ahead, and was a night coach with reading lamps; incidentally, travelling by Wolverhampton, it escaped the danger of the steep hills through Derbyshire. Sherman, unlike his great rivals William Chaplin and Benjamin Horne, who with Robert Nelson, another famous coach-operator, had started the "Nimrod" to Shrewsbury in 1834, was strongly opposed to any agreements with the railways then under construction.

The competition between the "Nimrod" and Sherman's "Wonder", and its sister, the "Stag", was as serious as any in the history of coaching; fares were cut by 30 per cent., the rival coaches were "nursed" all along the route, and the speed of eleven and a half miles per hour was so greatly exceeded that Shrewsbury was sometimes reached two hours ahead of time. Finally the coachman of the "Nimrod" was thrown off his coach and killed, and, as the inevitable end of all cut-throat competition in transport, the "Nimrod" was withdrawn and fares by the "Wonder" and the "Stag" were brought back to their old level; but the losses to Sherman and his allies were heavy, being calculated at £1,500 in a year. With the coming of the railways it is usually supposed that the coaches suffered a

sudden eclipse, but contemporary history does not bear out this popular notion. The reason is partly that it was not until the later 'forties and early 'fifties that the network of railways became even moderately complete. For instance, the "Bedford Times", one of Horne's coaches, ran until 1848, and the Amersham and Wendover three-horse coach ran daily to London, returning at five o'clock from the "Old Bell" at Holborn, until 1890! The opening of the London and Birmingham Railway inevitably sounded the death-knell of the long-distance coaches, and within three months of its opening in September, 1838, the number of coaches from Birmingham to London had fallen from twenty-two to four daily, though the railway fares were considerably above those of the coaches that continued to run. Sherman's opposition to the railway went on until 1840, by which time he had lost several thousand pounds, though his "Red Rover" to Manchester had had to admit defeat as soon as the through rail-route by the London and Birmingham had been opened. In 1837, prior to the opening of the London and Birmingham, Chaplin and Horne joined hands, forming a partnership of that name, and with Chaplin strongly in favour of co-operation with the rail interests, the horse-coaches were withdrawn from the Birmingham route as the successive sections of the line were opened. In return for their co-operation, Chaplin and Horne were granted the parcel-agency for the company, and their inn-yards have lasted until recent days, being still well known as London Midland and Scottish Railway parcels offices; indeed, the "Golden Cross" at Charing Cross only disappeared while this book was being planned. Benjamin Horne in the early days of the London and North Western Railway might almost have been described as its goods manager, and his brother, Henry, was still in charge of the parcels work when the railway took over this section of its activities in 1874.

"An Act for Making a Railway from London to Bir-

mingham" had received the Royal Assent on the 6th of May, 1833, so that the coach-operators had about five years before the opening of the complete railway in which to adjust their policies to the new order of things. Though not the first line to enter London, the London and Birmingham was the first important main line to be completed in England. Because opposition to steam-coaches on the highways had been so severe as to prevent the progress of mechanical traction on the roads, it must not be thought that railways using their own right of way did not have to encounter tremendous opposition. The history of almost all the early lines abounds with instances of the opposition of land-owners, and representatives of the Church seem to have been particularly strong in their antagonism, but it is not possible to give more than one or two examples. The London and Birmingham had originally allocated a quarter of a million pounds for land and compensation in its Bill rejected by the House of Lords in 1832, on the motion of Lord Brownlow; but this sum had been increased by two hundred per cent. in the Bill as reintroduced and finally passed in the following year.

This larger sum was calculated to conciliate an important proportion of the "distinguished landowners and proprietors". Thomas Roscoe, assisted by Peter Lecount, who had been connected with the Railway since its commencement, writing about 1839 on the London and Birmingham Railway, quotes the following case of compensation: —"One rather original character sold to the Company some land, and was loud and long in his outcries for compensation, ringing the changes on all sorts of damages which the railway could not fail of bringing upon him. Well, his demand was paid, and his complaints were stopped. A few months afterwards a little additional land was wanted from the same individual, when, surprising as it may appear, for some adjoining parts of this land so deteriorated by the railway, on which the

Company's works had brought such inevitable destruction, and for which reason so high a sum had been paid, he actually required a much larger price than was given him before, and on the Company expressing the surprise which was natural on hearing such a demand, he very coolly replied, 'Oh, I made a mistake *then*, in thinking the railway would injure my property; it has increased its value, and, of course, you must pay me an increased price for it'".

In the railway's early half-yearly reports appeared the words "Payments for obtaining Act of Incorporation £72,868. 18s. 10d.". Another example of this anti-railway attitude is quoted by W. L. Steel in his excellent study "The History of the London and North Western Railway": — "A reverend gentleman who complained that his privacy had been ruined; that his daughters' bedroom windows were exposed to the unhallowed gaze of the men working on the railway; that he must remove his family to a watering-place, to enable him to do which he must engage a curate. All this was considered in the compensation demanded, and paid; yet no curate has been engaged, no lodgings at a watering-place taken. The unhappy family have still dwelt in their desecrated abode, and borne with Christian-like resignation all the miseries heaped upon them. The gilding of the pill, it seems, has rendered it palatable, and we have no doubt that if his daughters' rooms have a back window as well as a front one, he would be exceedingly glad if a railroad was carried across that at the same price".

This, the first main line in the world, was 112½ miles long and was constructed with a double-track throughout by the two Stephensons, father and son, from Camden to Birmingham. At the London end trains were hauled between Camden and Euston Square by stationary engines, as the gradient of 1 in 70 was regarded as too steep for locomotive work. It is of interest that the Act for this company extended to no less than 149 pages, and contains many

important features; thus, the breadth of land to be "taken for the line of the said Railway shall not exceed twenty yards", except where carriages were to wait, load or unload. This breadth is about fifty per cent. of the land taken to-day for many of the new arterial roads. Considerable attention was also given to the possibility of subsidences due to coal-mining operations underneath the line, while the distance was to be not less than four feet eight inches between the inside edges of the rails and not more than five feet between the outside edges. Another clause laid down that the railway had to cross turnpikes by means of under- or over-bridges, with road gradients not steeper than 1 in 30; on other roads level crossing gates had to be provided, which were to be kept closed across the railway, with a representative of the railway to be present to open and shut the gates. Two final points may be mentioned; locomotive engines and steam engines were required to consume their own smoke, and the gross weight of any vehicle was not to exceed four tons, unless in the case of a single article to be conveyed, such as "any one piece of timber, block, or stone, boiler, cylinder, bob, or single piece of machinery", which was not to exceed the weight of eight tons.

The first section was opened to Boxmoor on July 20th, 1837, and onwards to Tring on October 16th, while on April 9th, 1838, the line was opened from London to Denbigh Hall, near Bletchley, and from Birmingham to Rugby, Though some criticism was directed against the palatial station at Euston with its two lodges and the Doric Arch, all to the design of Mr. Hardwick, its total cost of £81,532 was far exceeded by that of the Camden depot and the station and depot at Woolverton, which cost £109,454. The stationary engines at Camden, which used three tons of Welsh coal per diem to handle eleven trains, were started after the engine-man had been given a signal on the pneumatic telegraph from Euston Station. Chaplin and Horne provided

the coaches for the intermediate connection between Denbigh Hall and Rugby until the whole line was opened, and apparently obtained a share with Pickford and Co. in the goods- and parcels-cartage agency for the railway in return for this assistance.

In 1837 the number of mail coaches leaving London nightly was approximately thirty, with average speeds ranging from $7\frac{1}{2}$ miles to $10\frac{1}{2}$ miles per hour, the longest route was that to Glasgow, 396 miles, and the shortest that to Brighton from the Blossoms Inn—incidentally, the last was the slowest, taking nearly seven and a half hours for the fifty-five miles. Indeed, attention must not be monopolized by the services from London to the North; for the first steam railway to enter London came from Greenwich, over a viaduct of 878 arches; virtually the whole line ran along this continuous viaduct, nearly all the arches being of eighteen feet span. The Greenwich line was definitely intended to be the commencement of the railway to Dover, a route on which Benjamin Horne's "Foreign Mail" had been paid 1s. $3\frac{3}{4}$d. for each "double mile" to carry the Continental mails for the Post Office. A detailed statement issued by the South Eastern Railway in October, 1838, gave data concerning the number of coaches running each week in the area between London and Dover. In all there were eighty-two coaches, and the passenger movement was estimated on the following averages: —

for every	Four Horse Coach,	9	Passengers	
„	Two	„	6	„
„	Mail	„	5	„

and converted into passenger miles by railway, in addition to the expected diversion from the steam-boats, the calculated figure totalled 14,510,798. It was estimated that rail facilities would double the movement then existing and

that a further 3,217,472 passengers would be diverted from travel by " Post or in private carriages ". With a passenger fare of twopence per mile, the passenger receipts were expected to reach £268,658. One may compare these estimates with those of the London and Birmingham reproduced in the table at the conclusion of this chapter.

The following interesting table shows the extent of seaborne traffic ninety-five years ago: —

STATEMENT OF THE NUMBER OF PASSENGERS NOW TRAVELLING BY STEAM-BOATS BETWEEN LONDON, CALAIS, BOULOGNE, AND OSTEND; ALSO BETWEEN LONDON, MARGATE, RAMSGATE, AND DOVER.

Places	Passengers in a Year, on an average of Three Years
London and Calais	9,780
Boulogne	7,860
Ostend	2,785
Margate and Ramsgate	97,508
Dover, on an average of Two Years	12,520

In practice, the first rail travellers from Dover did not arrive in London from Greenwich, since the South Eastern Railway made a junction with the Brighton Railway near Reigate, and this latter used the Croydon Railway from near Norwood to a final junction with the Greenwich line one and a half miles from its London terminus, now the site of London Bridge Station. Opened from London Bridge to Deptford in December, 1836, the line was carrying traffic through to Greenwich by 1839. Passenger receipts per diem averaged £141 19s. 4.88d. in 1839, in addition to which the Railway received £20 per annum for carrying the Post Office bags; it employed eight engine drivers and eight firemen, paid the former 40s. and the latter 22s. a week, and succeeded in reducing the price it paid for coke from 40s. to 35s. As with the majority of the early railways, coke was the form of fuel used in the engines, thereby getting over the smoke

difficulty, but raising an alternative problem of unpleasant fumes in tunnels, into which the London and Birmingham undertook an investigation, an account of which reads as follows: —"Great prejudice once existed against tunnels, arising entirely from ignorance; and the directors, in order to quiet the minds of the public, had a special visit to the Primrose-hill Tunnel made by Drs. Paris and Watson, Surgeons Lawrence and Lucas, and Mr. Phillips, the Lecturer on Chemistry, the object being to ascertain the probable effect of such a tunnel on the health and feelings. The atmosphere of the tunnel was found to be dry, of an agreeable temperature, and free from smell. The lamps of the carriages were lighted; and in their transit inwards, and back again to the mouth of the tunnel, the sensation experienced was precisely that of travelling in a coach by night, between the walls of a narrow street. The noise did not prevent easy conversation, nor appear to be much greater in the tunnel than in the open air. Judging from this experiment, and knowing the ease and certainty with which through ventilation may be effected, these gentlemen were decidedly of opinion that no danger occurred in passing through well-constructed tunnels; and that the apprehensions which had been expressed, that such tunnels are likely to prove detrimental to the health, and unpleasant to travellers, were perfectly futile and groundless; and to these opinions they all signed their names".

The problem naturally was not acute on the Greenwich Railway, with its 878 arches, which stood on a long roadway planted with trees shading a gravel path, and said to be incomparably superior to the boulevards of Paris. Writing in 1835, a shareholder pointed out that over twenty million bricks had been laid by that time, and five hundred men were being employed daily. The intention was to make the roadway, policed by the company's servants, a parade for invalids or families of children, but this beautiful avenue was irre-

trievably spoilt by the necessity of widening the arches to carry the Croydon Railway in 1840. For some reason the Greenwich carriages were not provided with buffers, but their floor level was very low, after the Belgian fashion, and the even timing of trains, at every fifteen minutes from either terminus, made the line popular, as the views were magnificent, and on Greenwich fair days policemen were stationed at the turnstiles at the London station so as " to regulate the admission of these disorderly gentry ".

The London and Croydon Railway, which in February had a capital of £527,990, was opened in June, 1839, and was notable in several ways. Following the line of the old Croydon Canal, it branched off from the Greenwich Railway : a signal-house was placed at the junction, and thanks to a judicious arrangement, it was stated " accidents seldom occur " at this point. Passing through New Cross, Sydenham and Norwood, it terminated at Croydon, at what is now West Croydon station; certain of the old buildings still remained until 1933. It was famed for its heavy gradient of 1 in 100; and the coal traffic for Croydon from the company's wharf on the Thames still requires assisting engines as it did in 1839. The Croydon Railway's first-class carriages contained three compartments and seated eighteen persons, while its ten trains per day travelled at an average velocity of 20.78 miles per hour in 1839 with stops averaging .72 of a minute, and earned an enviable reputation for punctuality. The gross receipts per diem verged on £100, and though at a later date the atmospheric system was employed, for some time after its opening six-wheeled locomotives were the means of traction. The capital cost exceeded £70,000 per mile, and on completion of the double line into its London station, situated on the north side of that of the Greenwich line, the toll to the latter company was raised to fourpence halfpenny per passenger. This line, together with the London and Greenwich, was the route by

which passengers from the South Eastern Railway and the London and Brighton Railway, opened at a later date, reached the Metropolis.

The London and South Western Railway, known during its days of construction as the London and Southampton, which was projected in 1832, cost more than double the original estimate per mile, which was about £13,000. Its first Act received the Royal Assent on July 25th, 1834. Starting from Nine Elms, near which station were situated the sixteen coke ovens to supply the fuel, it was opened on May 1st, 1839, to Basingstoke, passengers being carried between that point and Winchester "by common road stages". The line was not opened the whole way to Southampton until May 11th, 1840, so that its story must be chronicled in the succeeding chapter.

An authority on railways writing in 1839 stated that "the Great Western Railway is by far the most gigantic work of the kind, not only in Great Britain, not only in Europe, but, we venture to say, in the whole world". Brunel's name will ever be linked with this masterpiece of railway location and construction, which has enabled the steam locomotive speed record of the world to be collected by the Great Western Railway of the twentieth century, the only company to retain its original name, a name synonymous in the minds of many with enterprise and initiative, coupled with financial prosperity. To Isambard Kingdom Brunel, the more famous son of an illustrious father, the Great Western will always be indebted; a great engineer, he held views on railway construction differing from those of all engineers of his time; he determined on a seven-foot gauge which dovetailed in with his conception of high speed, and at the same time cut off, as with a knife, the territory his railway was to serve from that of the neighbouring lines to the north and south. The battle of the gauges did not really develop during the period covered by this chapter, and, indeed, the early

history of the Great Western Railway itself falls mainly within the years between 1840 and 1849, since it was only opened to Twyford, less than thirty-one miles from London, on July 1st, 1839, and Reading was not reached until March, 1840, though the line as far as Faringdon Road and the Bath to Bristol section had been opened before the end of 1840.

The Act of incorporation of the company received the Royal Assent on August 31st, 1835, and two further Acts were passed in 1837, one providing for an independent terminus at Paddington; additional capital was obtained by a fifth Act of 1839, because the original estimates had been far exceeded. In 1834 the capital required was estimated at £2,500,000, but by 1839 the figure had grown to £4,999,000, thanks in part to Brunel's magnificent scale of construction and the adoption of his broad gauge. Criticized severely at the time, the extra capital expenditure has saved the company millions of pounds in the succeeding years by reduced operating costs and making land acquisition unnecessary. The urge for this line came mainly from the Bristol merchants, and the first proposal for a line dated back to 1824; though that project fell through, it was revived again in 1832, but no real progress was achieved until Brunel, then twenty-seven, was appointed engineer in March, 1833. I. K. Brunel was famous in Bristol even at that age, thanks to the acceptance of his design for the Clifton Suspension Bridge, and he had had considerable engineering experience. The Great Western was also fortunate in its choice of a secretary, only thirty-seven years old when he was appointed, Charles Saunders a scholar of Winchester and New College, though he entered the Civil Service in preference to taking up residence. Just as Stephenson had at one time intended to carry the London and Birmingham to the Strand, so Brunel planned to bring his Bristol line to Vauxhall Bridge, though neither scheme materialized,

thanks to the opposition of landowners. Whether the appointment of a Wykehamist was responsible for the opposition of the Provost of Eton to the proposed line, one cannot tell; Eton saw no public good in it, but Windsor desired its presence as strongly as the London and Southampton opposed its progress. Nowadays it is difficult to conceive the idea of Bristol being adequately served by a branch from the London and Southampton Railway. As with the London and Birmingham, there was great opposition to tunnels, and Brunel's projected one at Box was regarded as almost impracticable; nevertheless, in spite of all difficulties the Acts were finally passed and construction was begun in February, 1836.

The story of the Great Western Railway has been told so admirably by E. T. MacDermot in his recently published "History of the Great Western Railway 1833-1921" that there is little need to enlarge upon the company's development prior to 1840, but the first service of trains totalled eight each way daily in June, 1838, between London and Maidenhead, where they connected with the coaches to Oxford, Gloucester and other places. The posting carriages of this line were spoken of very highly; they held eighteen persons and were unsurpassed by any other railway conveyance in the country, having a table down the centre and cushioned seats all round, except at the doorways. The large first-class carriages were mounted on six wheels, and had four compartments, each seating eight persons. All the early engines were of six-wheeled design, and worked with a steam pressure of fifty to fifty-five pounds to the square inch. Speeds from the first were high on the Great Western; thus, on August 12th, 1839, "Vulcan", leaving London at 1.28 p.m. with eighteen tons, ran thirteen miles in thirty minutes, and touched fifty miles per hour; loads were, however, lighter on this line than on the London and Birmingham main line, where some of the trains even in 1839 loaded to over seventy tons, and were drawn by one

"Bury" type engine with speeds attaining between forty and fifty miles per hour.

At Birmingham the London and Birmingham linked up with the Grand Junction Railway, a line whose Act of incorporation received the Royal Assent on the same day as that of its southern neighbour, May 6th, 1833; but, whereas the London and Birmingham had cost £50,652 per mile, the Grand Junction, which was opened in July, 1837, had only cost £23,202, a figure which does great credit to its engineer, Locke. From Birmingham (Curzon Street), where connection was made with the line to London, the route lay through Stafford, thence on to Crewe, where the Chester line diverged westwards, and terminated just beyond Warrington at Newton, where Tayleur's Vulcan foundry was located. The Vulcan Foundry at Newton le Willows still builds locomotives for the world's railways, and it was near this foundry that there was a curve connecting the Liverpool and Manchester with the Grand Junction. Thus, the rail route from London to Manchester and Liverpool in 1839 was from Euston, via Birmingham, Stafford and Warrington, and the three constituent lines formed the nuclei of the erstwhile London and North Western Railway, the formation of which is discussed in the succeeding chapter. From Birmingham it took four and a half hours to reach the Mersey port or Manchester, a speed of about twenty-one miles per hour, and even before the London line had been opened the transit time of the mails from the capital to Liverpool had been cut down by twelve hours; the all-rail route of two hundred and six miles reduced the total time to a little over eight hours.

The Grand Junction was a great passenger-carrying line, and carried on a yearly basis 464,500 persons in 1837, a figure unexcelled by other railways in that year and only beaten in 1838 by the London and Birmingham and the Great Western. Its total receipts per mile per day, however,

were only £6 5s. 3d., compared with £11 0s. 2d. on the Liverpool and Manchester in 1838. At this period expenses absorbed from fifty-five to sixty-five per cent. of receipts, at least so one judges from a legal case brought against this line in 1838 in connection with rates levied towards the relief of the poor. An interesting event on the London and Birmingham on July 20th, 1838, was a special from Euston to Denbigh Hall, carrying one of the Birmingham directors and Marshal Soult; as the start was made at 4.30 a.m., the Marshal was back for breakfast in London long before 9 a.m.; fortunately—thanks presumably to the early hour—Marshal Soult failed to notice the name of his carriage, which the railway officials afterwards, to their horror, discovered to be "Waterloo". The Grand Junction engines were mostly of six-wheeled design, many with single driving axles; they rejoiced in the names of "Alecto", "Vampire", "Medusa", "Sunbeam", "Shark", "Oberon", and "Basilisk". "Clio" and "Lucifer", down the gradient from Whitmore to Crewe and Warrington, are both recorded as having touched 68.18 miles per hour in October and November of 1839, the latter with about forty tons behind the tender.

North of Warrington the North Union was opened to Preston on October 22nd, 1838, while a link from Manchester to Bolton had been opened for traffic in May of the same year. Branches to St. Helens and Wigan from the Liverpool and Manchester had been completed in the early 'thirties, together with the Bolton and Kenyon of 1831. The only other lines south of Lancashire to be opened before 1840 were the small Leicester and Swannington of 1832, the London and Blackwall and the Birmingham and Derby Junction, which latter connected with the London and Birmingham at Hampton in Warwickshire and was opened to traffic on August 12th, 1839, as far as Derby, though the first section of the Midland Counties, between Derby and

Nottingham, had been opened on June 4th, two months earlier. The Leicester and Swannington was of purely local importance, though it was the earliest section of the erstwhile Midland Railway; its main features were its heavy twenty-four wagon trains, carrying thirty-six tons of coal, and a long tunnel of one and a half miles near Leicester. The Birmingham and Derby Junction was of considerable importance, and later formed part of the route from London to York and the North. Stephenson was responsible for this line and its engines, and the latter, like many of Stephenson's engines, possessed no flanges on their driving wheels; as a contemporary writer points out, "this plan will answer very well on railways free from quick curves". Passenger fares on this line were 2.49 pence per mile first class, 1.87 pence per mile second class, and 1.40 pence per mile third class. The Midland Counties from Derby to Nottingham a few years later connected five towns with an aggregate population of 150,000, according to the last census previous to 1840, and it formed the vital link between the London and Birmingham and the York and North Midland which was opened throughout on July 1st, 1840. Proceeding northwards, and visiting on the way the small Sheffield and Rotherham, opened on November 1st, 1838, the first line to give up second-class accommodation, which it did as early as 1840, a forecast of what was later to become a national policy, one may mention the Leeds and Selby, opened in 1834 and financed by the principal woollen manufacturers in the country. Owing to bad management it proved a poor speculation, but by 1840, thanks to the zeal of an energetic superintendent, affairs became more rosy, and it looked as if the full width of the right of way, sufficient for four lines of railway, might be required to handle the growing traffic. Though the stations at Leeds and Selby were commodious they lacked platforms, the subject of serious criticism from pre-Victorian travellers by rail, though the line achieved

some popularity by providing outside oil lamps on its first-class carriages. In spite of low speeds 358.4 passengers were carried on an average each day during 1838 and 1839, and in the latter year traffic was augmented by the opening on May 30th of the first section of the York and North Midland, linking the cathedral city of York with the Leeds and Selby. The North Riding of Yorkshire could boast the Whitby and Pickering, opened in 1836, which was literally a one-horse affair, because each carriage, the open variety costing £100, and the closed £280, was drawn by one horse. It was one of the few horse-railways to possess a tunnel, 130 yards in length with entrances in the castellated style. The trains in both directions had heavy gradients to overcome, and, since they were contiguous and too steep for horses to surmount, a most ingenious method was employed. As the traffic for each direction was irregular and unequal, a tank was provided, mounted on railway-wheels, at the top of the incline, which could be filled with water to give a greater load than that to be hoisted. When the wagons had been pulled up the ascent the water was allowed to run away at the foot of the descending incline.

Besides the very early Stockton and Darlington Railway of 1825 and the numerous small coal lines in the Tyneside area, of which the most important was the Stanhope and Tyne, opened in 1834, the principal main line in the North was that of the Newcastle and Carlisle, which even by 1840 had earned widespread fame for its punctuality and freedom from accidents. Its Act of incorporation had received the Royal Assent as early as May, 1829, but it was not until June 18th, 1838, that the line was opened from Redheugh to Carlisle, and throughout in October, 1839, from Newcastle. Like all the northern lines, it was of standard gauge, namely, 4ft. 8½in. The first-class carriages were painted yellow and picked out in black, as if to brighten a railway which derived much of its revenue from the haulage of black

diamonds; these carriages were fitted with special glass sashes which eliminated the annoying rattling noise so frequently met with in early first-class travel by rail. The second-class coaches were painted white picked out with green, while some of the coal wagons, or chaldrons, were constructed with metal frames and carried 53 cwt., the imperial chaldron. They were hired at a fixed annual sum by the railway company, which in its turn sublet them. Coal for conversion to coke to be used as locomotive-fuel cost the Newcastle and Carlisle 7s. 6d. per chaldron in 1839 and amounted to nearly ten per cent. of the annual working costs; salaries and wages accounted for 67 per cent. It is curious that this line, which passed the birthplace of George Stephenson at Wylam, witnessed the first important trials of an oil-electric passenger train, just one hundred years later than the passing of the company's second Act.

There were no railways of more than local importance in Scotland at this time; the Monkland and Kirkintilloch had been opened in 1826 and possessed powers to work locomotives. The Ballochney, a 4ft. 6in. line opened in 1828, was virtually an extension of the Monkland and Kirkintilloch, only six miles long and used almost exclusively for coal traffic. It was worked by horses owned by the coal-proprietors for many years after its opening, and connected with the Slamannan Railway, which was notable for the fact that the landowners concerned presented the land required for the line free of charge. A close neighbour of the Slamannan was the Glasgow and Garnkirk, also mainly a mineral and coal line, which was opened in 1831 and used both locomotives and horses for traction. The same year had witnessed the opening of the Edinburgh and Dalkeith Railway, which used horses and a stationary engine. The first railway in the North of Scotland was the Dundee and Newtyle, opened in December, 1831, which employed stationary engines and horse traction, like the Edinburgh and

Dalkeith, until 1834. South-west of Glasgow there was the Ardrossan and Johnstone Railway of 4ft. 6in. gauge; it also was worked by horses, but by 1840 it had been converted to the standard English gauge of 4ft. 8½in. and locomotives were on order. The passenger fare was a penny a mile in the horse-drawn days, and the carriages, which cost £50 each, were not regarded as suitable for high speeds as they had outside seats.

GENERAL RESULTS OF TRAFFIC FOR ONE YEAR—
LONDON AND BIRMINGHAM.

(Extracted from the Minutes of Evidence given before the Committee of the Lords, 1832.)

Means of Transit	Number of Journeys of 110 Miles	No. in each	Total Carried	Expence by the present Means		Expence by the Railway 112½ Miles	Time At Present	Time By the Railway
			Passengers	£		Passengers at 2d. per Mile each.	Hours	Hours
Four-horse Coaches counted on the Road	21,641	9	149,769	316499,6				
Two-horse ditto	4,221	6	25,326	44003,9				
Pairs of Post Horses	7,622	3	22,866	83942,0				
Commercial Gigs ..	5,569	1	5,569	11138,0		£227,819		
					£455,480			
Contingent Coaches, from Stamp Office Returns	23,745	9	213,705	347270,6				
Proportionate number of Pairs of Post Horses	6,998	3	20,994	76978,0			12½	5½
Ditto of Commercial Gigs	5,113	1	5,113	10226,0		£219,827		
					£434,474			
		cwt.	tons					
Private and Stage Vans, counted on the Road	1,600	18 30	2,315½	18522			30	
Stage Waggons, ditto	3,665	70	12,827½	76965			60	
Errand carts, ditto..	11,543	10	5,771½	34629		£58,821	40	
					£130,116			
		tons						
Boats, counted on the canals	11,131½	11	122,428		£506,070	£286,940	72	
					£1,326,143	£793,407		

Returning southwards to London this chapter may fitly conclude with a few remarks on the London and Blackwall Railway, which was at that time under construction. Several of the most important railway engineers of the period, such as George Stephenson and G. P. Bidder were engaged on a

solution of the special problems involved. Cubitt was engineer to the company in 1837, and, in view of its short length of $3\frac{1}{2}$ miles with five intermediate stations and the densely populated area it served, it was judged that the use of locomotive engines would involve too much danger, with "burning coke flying about among the roofs of the contiguous houses", so that stationary engines of marine type were decided upon. The trains were to be hauled by ropes, which weighed about forty tons each and travelled 313 miles daily; but the system of operation must be described in the succeeding chapter, because this unique little line, constructed to a 5ft. gauge, was not opened for traffic until July 4th, 1840.

CHAPTER III

1840—1849

RAILWAY AMALGAMATION AND HIGHWAY TRANSPORT

NEW railway openings came thick and fast in 1840, and it is not possible in a short study of this nature to make mention of more than a brief selection. The Blackwall Railway was opened in July of that year and had cost, to June 30th, £643,343 10s. 2d., of which over 50 per cent. was accounted for by the purchase of property. This little railway was notable for several special features, for instance its equipment with "the beautiful apparatus of Messrs. Wheatstone and Cook, by which instantaneous communication is effected between the terminal stations", as well as the intermediate stations: three persons were employed at the terminal stations to work the electro-galvanic telegraph. Edmondson's ticket-machine had first been used on the Newcastle and Carlisle Railway, but it was introduced with improvements on the London and Blackwall as well as on the Manchester and Leeds. The machine consisted of a number of compartments, one for each station, arranged in two rows, the upper for first-class passengers and the lower one for second-class passengers. The tickets were held in position by a spiral-wire spring, thus enabling the ticket-collector, by the application of his thumb, to deliver the required ticket to the passenger with great promptness. The tickets in each compartment being numbered serially, the ticket-collector could at any given moment account for the number of tickets used. Mr. Edmondson was chief clerk in the Manchester and Leeds Railway booking office.

The train-service on the Blackwall line consisted of fifty-one down and fifty up trains per day, the former having seven carriages each when they left the London terminus. The last carriage was slipped at Shadwell by the guard who removed a pin from the coupling while the train was in motion, successive carriages being slipped at Stepney, Limehouse, the West India Docks and Poplar, so that only two carriages remained on the rope when the train neared Blackwall, where they, too, were slipped from the rope, momentum carrying them on up the terminal incline to Blackwall Station. G. P. Bidder seems to have been responsible for the ingenious method by which the carriages were slipped, but George Stephenson designed the general machinery. This was probably the earliest railway constructed to carry a very heavy suburban passenger traffic, with trains at very close intervals, and it is interesting to observe that the steam locomotive was not considered desirable for such work.

By the middle of 1840 nearly £1,200,000 had been expended on the London and Brighton Railway, with a further estimated expenditure of £633,000 to complete it throughout; or an estimated total cost per mile of £37,568, which was £14,000 in excess of the original estimates. The Shoreham branch which had been opened for public traffic on May 12th, 1840, was carrying about 660 passengers per day soon after its opening, but the main line from London via the Croydon line and Haywards Heath was not ready for traffic until September 21st, 1841. The South Eastern and Brighton Railways ran over the same stretch of line between Redhill and the junction with the Croydon Railway near Norwood, in those days known as the "Jolly Sailors"; the arrangement covering the jointly-used mileage was that the Brighton line should sell to the South Eastern at cost price the southern half of this section, over which no tolls were paid. The main line of the South Eastern Railway, for

which Cubitt was the engineer, ran without any curve from near Redhill to Ashford via Tunbridge, and then on to Folkestone, where the railway purchased the harbour. This line was opened throughout at the end of June, 1843, and a continental service was run in connection with the boats from Folkestone to Boulogne. A year later, in February 1844, Dover was reached, and the Medway traffic tapped at Maidstone by means of a branch from Paddock Wood in September the same year. The Maidstone rail-route to London at that time can only be characterized as circuitous, seeing that it passed through Tunbridge, Redhill and thence by the Croydon Railway to Bricklayers' Arms Station, opened in 1844 and reached by a branch from New Cross to avoid the toll charges over the Greenwich line to London Bridge. Before mention is made of the progress of the London and South Western Railway it may be pointed out that no less than five different routes to Brighton had been proposed, and the parliamentary contest over these various schemes is estimated to have cost £193,000; one of the schemes, known as Palmer's Line, went far to the east of the present main line, passing through Oxted, while Stephenson's proposal involved going through Leatherhead, Horsham and Shoreham: the route proposed by Rennie in 1837 was the one finally chosen, though it involved tunnels at Merstham, Balcombe and Clayton with a long viaduct over the Ouse near Haywards Heath. A westerly route would have brought the Brighton promoters into active opposition to London and South Western interests, but it was not until many years later that the two railways finally engaged in battle on the outskirts of Portsmouth, when the Brighton had completed its West Sussex main line through Horsham and the South Western had opened its route through Guildford and Petersfield.

Portsmouth was originally reached by the South Western via Winchester, and there is no question that this line was

planned to capture an important share of the Anglo-French traffic, since a book published in 1839 concerning this railway shows a line of steamboats running from Southampton and Portsmouth to Havre, whence travellers could proceed to Paris by steamboat, or by the high road through Rouen, since the railway had not yet been constructed from Paris to Havre via Rouen. It seems also to have been planned to capture some of the freight as well as passenger traffic, to judge by the following: —

ORIGINAL STATEMENT OF TRAFFIC AS PUBLISHED IN THE PROSPECTUS AND PROVED BEFORE PARLIAMENT

PRESENT TRAFFIC, ESTIMATED AT RAILWAY PRICES

	£	s.	d.	£	s.	d.
Coach passengers	118,498	18	0			
Posting	7,082	8	0			
Coach parcels	12,711	16	8			
Waggon-traffic	29,768	6	0			
Cattle-traffic	27,155	0	0			
	195,216	8	8			
Cost of maintenance of way and locomotive power	87,798	11	5			
				107,417	17	3

PROSPECTIVE TRAFFIC, ADDITIONAL TO THE ACTUAL TRAFFIC

	£	s.	d.	£	s.	d.
Torbay fishery, upon the present amount of fish caught	23,333	6	8			
100 per cent. increase on passengers	118,498	18	0			
Increase on country-killed meat	4,666	13	4			
Increase on heavy goods	5,569	4	0			
	152,068	2	0			
Cost of maintenance of way and locomotive power on increased trade	52,000	0	0			
				100,068	2	0
Total or supposed profit....				£207,485	19	3

Travellers from Southampton to Havre could, as an alternative to journeying to Paris, embark at Havre on a sailing packet for New York; but the London and South Western Railway cannot at that time have attracted much of the transatlantic traffic, for on July 4th, 1840, the Cunard Line, then known as "The British and North American Royal Mail Steam Packet Company", inaugurated its mail

service from the Mersey to New York with the "Britannia", a steam-propelled wooden paddle wheel ship: like her sisters, the "Acadia", "Caledonia" and "Columbia", she was Clyde-built, and, in spite of superstitious fears, reached Boston in fourteen days, at that time a fast passage, and was given a great welcome by the Bostonians.

The London and South Western Railway was opened the whole way from Nine Elms to Southampton on May 11th, 1840, and the first-class trains, the tickets for which averaged more than three-pence per mile, occupied three hours on the journey. Even before the line was completed for its whole distance the company was carrying 1,266 passengers per day, which gave a foretaste of the enormous passenger traffic which has to be handled by the Southern Railway to-day. From Southampton steam vessels left twice a week for the Channel Islands, where "in January there are peas a foot high and the flowers of narcissus, hyacinthe and rosemary flower". The islanders of Jersey at that time were much distracted by local squabbles and were divided into two parties, the Laurel and Rose, "which are more inveterate that the Whigs and Tories". In spite of such disadvantages there were 3,000 English residents in Jersey in 1838, and many more visitors.

Meanwhile the Great Western Railway had opened its line from London to the city of Merchant Adventurers in June 1841; the last section, which included the famous tunnel at Box, a Brunel masterpiece, had proved exceptionally difficult to construct. This was one of the first lines to be subjected to inspection by officers of the Board of Trade, since the Regulation of Railways Act of 1840 had been passed, in consequence of the recommendations of a select committee of 1839, which had inquired into "the state of communication by railway". A further Act, passed in 1842, dealt more extensively with inspection of new railways, and embodied the amendments of the 1840 Act desired by the Railway Department of the Board of Trade. Thus the new Great Western

main line was duly inspected by Lt.-Col. Sir Frederic Smith, R.E., the Inspector-General of Railways, and the worthy Colonel commented very favourably on the design of signal disks and lamps. It was due to a suggestion of the Great Western, agreed to by the Inspector-General, that it was declared safer to close level crossing gates across the highway than across the railway, a reversal of the earlier procedure; it is interesting that nearly one hundred years later the present Ministry of Transport proposes to grant the railways powers to return to the earlier procedure where rail traffic is very light. On June 14th, 1841, the first section of the Bristol and Exeter had been opened to Bridgwater, and on June 30th the first broad-gauge train left Paddington at 8 a.m. for Bridgwater where it arrived at 1.30 p.m. When the Box tunnel was completed it had originally been intended to light it by reflector lamps, and these were actually fixed by Brunel and inspected by Sir Frederic Smith, but were found, in practice, to be useless, since they neither lighted the carriages of trains passing through the tunnel, nor were sufficiently powerful to enable men to work in the tunnel. Consequently they were abandoned, and the Box tunnel, like other tunnels of the period, was traversed in darkness.

Meanwhile to the north-west the standard gauge had already reached Gloucester from Birmingham in December 1840, in the form of the Birmingham and Gloucester Railway, one of the few cases where the actual cost had scarcely exceeded the original estimates. The Act for this line had received the Royal Assent on April 22nd, 1836, and contained some interesting clauses. It was enacted that where the line crossed the Warwick and Birmingham Canal Navigation the railway should build and at all times maintain a bridge over the canal and towing-paths, with proper approaches, and that should the construction and future repair of the said bridge at any time cause delay or in any way obstruct the free passage of boats on the canal, the railway

company should be held responsible for any such delay or obstruction. Where the railway crossed turnpike roads the railway had to provide and maintain an under- or over-bridge; in the case of other roads it might cross on the level but must provide gates, which were to be kept shut across the highway, with a servant of the Company in charge. Owners of land adjoining the railway could also demand that the railway provide and maintain gates for their use across the line. It was further enacted that directors of the line should own a certain number of shares in the Company and reside within a certain radius of either Birmingham or Gloucester. Owners of carriages using the railway were forced to construct their carriages to the specification of the railway and must at all times display conspicuously on the said carriages their names, places of abode and the weights, numbers and gauges of the carriages; while the Act provided that any damage done by the servants or carriages of those using the railway should be the responsibility of the owners of the said servants or carriages, not of the Company.

Some of the carriages of the Birmingham and Gloucester Railway were of a notable design, having fixed side-lights, of quadrant formation, while certain first-class carriages were furnished with imperials on their roofs and had coupés at each end. The standard gauge interests, mainly represented by the London and Birmingham and their allies, the Birmingham and Derby, achieved an early victory by gaining control of the Bristol and Gloucester, which was opened as a broad-gauge line over its whole course on July 8th, 1844. Bristol and Gloucester thus became two of the most important battle-fields in the gauge war which raged violently during this decade. The Great Western Railway had entered Gloucester with its broad-gauge line from Swindon in 1845, having previously absorbed the Cheltenham and Gloucester Union, a railway-scheme dating back to the 'thirties with a very chequered career and for long the bone of contention between

the broad and the standard gauge interests. With the formation of the Midland Railway, the Act for which was passed on May 10th, 1844, combining the North Midland, the Midland Counties and the Birmingham and Derby, the Midland, or standard gauge, interests were strong enough to take over the Bristol and Gloucester, which had already been constructed with the Great Western, or broad, gauge. However, it was not until after the "Battle of the Gauges" had been won that this section of line was converted to the standard, or 4ft. 8½in., gauge.

As early as 1837 proposals appear to have been made for a mixed gauge, for a certain Mr. Holmes, of Sheffield, proposed "to introduce an extra rail between the two which form the seven-foot gauge", and the editor of the Railway Magazine pointed out in reply to the suggestion that "the directors of the Birmingham, Bristol and Thames Junction Railway are adopting this in their line". During the parliamentary session of 1845 no less than 1,220 miles of new railway of standard gauge had been sanctioned at an estimated cost of £21,736,640, and the position had become so acute that a Royal Commission was appointed the same year to decide upon this vexed question. A study of the evidence given before this Commission by the various railway pioneers such as Robert Stephenson, John Braithwaite, G. P. Bidder, and Nicholas Wood makes very interesting reading, and, although Brunel, Gooch and Saunders put up a very strong case for the Great Western seven-foot gauge, the fact that the standard gauge was already covering the whole country with the exception of a quadrilateral enclosing the area between London, Dorchester, Swansea and Birmingham weighted the scales very heavily in favour of the standard gauge. On the basis of lines sanctioned in 1845, it was expected that there would shortly be ten important gauge breaks, namely: Basingstoke, Salisbury, Dorchester in the south, and Rugby, Gloucester, Worcester, Birmingham, Cardiff and Swansea in

the north. Gloucester, however, was the real centre of the problem, and according to one witness the transfer of merchandise at that point occupied about five hours; the same witness explained that transferable bodies, resembling the modern container, had been proposed by the Midland Counties Railway, but the proposal had not been found practicable. Where the transfer of passengers was concerned great confusion resulted, partly owing to the varying sizes of the carriages between the two gauges, the narrow-gauge carriages seating only three and sometimes only two passengers a side and the wide-gauge four, with a consequent scramble for places where passengers were changing from the wide to the narrow gauge. We are told in the "Illustrated London News" of 1846 that the break of gauge at Gloucester was particularly confusing, and, naturally, with the question then before Parliament neither side made any effort to allay this confusion. Passengers were hurried between the two trains, and in those days, when luggage was not reduced to a minimum, parcels and rugs must often have been left behind; families frequently got separated and anxious mothers rushed about the platforms looking for stray children and dogs, who ran an added danger of being crushed beneath porters' trucks in the fray. Foreigners travelling from Bristol to Birmingham, for instance, found it extremely difficult to understand what was expected of them and schoolchildren going to Cheltenham not infrequently got lost. Passengers who were rash enough to attempt the journey with their carriage-horses had a particularly distressing time, for the high-spirited animals objected violently to the second caging and in many cases had to be left behind.

Judged from an economic point of view the problem of a break of railway gauge is much akin to the restrictions on international trade which have been so much in evidence in recent years, since the cost of transferring the load operates as a levy or tax on all goods passing the gauge frontier. The

break of gauge at the Franco-Spanish frontier has prevented the full development of the Spanish export fruit traffic, and in the 'forties evidence given before the Commission showed very clearly that the towns served by the broad-gauge Great Western were distinctly perturbed at the thought that their trade with other sections of the country should suffer from any artificial levy created by the break of gauge at Gloucester or elsewhere. Whereas comparative cheapness of construction was claimed as one of the great advantages of the standard, then termed narrow, gauge, higher speed and greater safety were claimed by the broad gauge enthusiasts. Nicholas Wood, however, claimed that he had travelled as smoothly at speeds of over sixty miles per hour on the Great North of England Railway, later the North Eastern Railway, as he had experienced on the Great Western, but it is significant that his reply to the question "But if any desperate man should want to run at 100 miles per hour would you recommend him to take the Wide Gauge?" was: "He is more likely to accomplish his object by the Wide gauge than the Narrow. Not with greater safety. I think he is as liable to break his neck on the Broad Gauge as the other". The Commission in its report, which became public in 1846, declared that the 4ft. 8½in. gauge seemed to be the more convenient for the kind of service which was demanded for the country, and by the Act regulating the gauge of railways, passed in 1846, the so-called narrow gauge became the standard gauge for Great Britain, though permission was granted to the Great Western to continue its use of the 7ft. gauge and to lay its newly-proposed extensions to that gauge. As will be seen later the Great Western was forced to place a third rail—this arrangement was the mixed gauge—on many of its lines, and finally to abandon the broad gauge altogether.

It cannot seriously be contended that the British railways have suffered by the use of the 4ft. 8½in. gauge, which has become the world's standard gauge, Spain, Portugal, Finland,

Russia and Ireland being the only five important exceptions in Europe to-day. Any possible advantages in speed and shorter trains would have been more than offset by the added cost of land, longer sleepers and more expensive rolling-stock. The Great Western, nevertheless, had obtained certain advantages from its original broad gauge, for it avoided much additional expenditure on land when it widened its main lines, and it is able to use rolling stock of greater dimensions, that is to say built to a wider loading gauge. It is curious that the highest recorded speed of a steam-hauled train in the world, namely 102.3 miles per hour, should have been attained nearly thirty years ago by a standard-gauge engine travelling over Great Western metals on a section of line which had previously had the broad gauge. The world's fastest steam-hauled train also runs on a line once constructed to the 7ft. gauge. In many minds the high speed of Great Western travel, for which the Company is well known throughout the world, is often connected with its broad gauge achievements. Though Brunel probably cost his company unnecessarily enormous sums by his choice of a broad gauge, he equally saved them even more millions by his location of the line. Brunel was a speed-king in the best sense of the term, and he was a hundred years ahead of his time in seeing that speed of passenger travel was one of the strongest cards a railway company could hold.

In the meantime the railway network was extending rapidly, and the traveller from London could reach Darlington by rail, passing through Derby, Normanton and York, in 1842. "Bradshaw's Railway Companion" seems to have been first issued on October 19th, 1839, at least its Northern section, the Southern section appearing on October 25th; though allusion has also been made to some earlier document of 1838 which was probably not issued for sale. The price of the "Companion" was 1s. in 1841, and from successive issues of these little books, which were only four inches by three

inches, it is possible to trace the growth of the British railway system. These very rare little books, which were described by "The Engineer" about half a century ago as having "been sold for their weight in gold", are interesting documents and bear witness to the development of passenger traffic better than almost any other source. They are human documents also and throw a wealth of light on their period; thus the edition for 1841 gives maps of London, Liverpool, Manchester, Birmingham and Leeds with the hackney-coach and cab fares to and from the stations. Turning to the London and Birmingham time-table, we see that one could leave Euston by the first-class mail at 8.45 a.m. and reach Birmingham at 2.0 p.m., or leave London at 11.0 a.m., reaching Derby at 5.30 p.m. and Leeds at 9.45 p.m. Leaving Leeds again at 1.15 a.m. for York, one could catch the Edinbro' mail for the North leaving that city at 7.20, and changing to a coach at Darlington two hours later, one would make Newcastle the scene for midday dinner. Passengers who desired to read when travelling by rail after dark, owing to the inefficient lighting of the carriages, frequently provided themselves with candle lamps; some of these were fitted with a folding reflector, and an example of one of these lamps may be seen in the Railway Museum at York.

As far as Darlington the line from York belonged to the Great North of England Railway, but from Darlington to Newcastle it had been constructed by the Newcastle and Darlington Junction Railway, whilst the northern extension to Berwick belonged to the Newcastle and Berwick. The railways between York and Newcastle were amalgamated in 1846, and the resulting company took the title of its two termini; a year later this York and Newcastle absorbed the Newcastle and Berwick, and thus was formed the main line of the North Eastern Railway, nowadays the North Eastern area of the London and North Eastern Railway. The

Edinburgh and Glasgow, later to form the backbone of the North British Railway, had been opened in 1842, but it was not until 1846 that the North British Railway itself was opened for traffic from Edinburgh to Berwick, where it made connection with the Newcastle and Berwick by the famous Border Bridge, a masterpiece of Robert Stephenson still carrying the Anglo-Scottish east-coast traffic.

As early as 1841 the Taff Vale Railway in Wales had offered a service from Cardiff to Merthyr, and there were six passenger trains a day running between Liverpool and Manchester. In that year the Londoner had a choice of six trains to Brighton, the quickest of which took two and a quarter hours, and he had to choose between a first-class fare of 14s. 6d. and a second-class fare of 9s. 6d. As on nearly all other railways, some of the trains were " mixed ", that is to say carrying first- and second-class, the 10.45 a.m. was a mail, and the 3.45 p.m. was also first-class only. By the following year the Brighton line had speeded up these two trains and they did the journey in two hours, while a new " Express " had been put on at 4.45 which is shown as running non-stop to Brighton in 105 minutes, but it is understood that this ambitious timing did not remain many months in the public time-tables. The Great Western Railway had succeeded in stretching its broad gauge tentacles to Exeter by May 1st, 1844, while the previous day there were scenes of festivity at Norwich on the opening of the line from that city to Yarmouth.

As regards East Anglia, March, 1843, witnessed the opening of the Eastern Counties Railway to Colchester; its suburban trains shared the station at Fenchurch Street with those of the Blackwall Railway, both lines at that time using a 5ft. gauge. By 1846, Colchester and Ipswich had been joined by a railway known as the Eastern Union, but it was not until the end of the decade, in 1849, that this company's metals penetrated as far north as Norwich. Norwich had,

nevertheless, been connected with London as early as 1845, by means of the route through Brandon and Cambridge formed by the Norfolk Railway, an amalgamation of the Norwich and Yarmouth, mentioned above, and the Norwich and Brandon. By the same circuitous route the traveller from London could reach Lowestoft by rail in 1847. At the beginning of 1844 the Eastern Counties had obtained control, by lease, of its westerly neighbour, the Northern and Eastern, also constructed to the 5ft. gauge but converted to the standard gauge the same year, which linked London with Cambridge, a route which at one time was regarded as the possible southernmost section of the projected East Coast route to Scotland. It was fortunate that this scheme never materialized as the gradients were heavy, and few British main lines were less suited to the high speeds for which the present southern section of the East Coast route has so long been famous. This group of East Anglian lines was destined to form the nucleus of the Great Eastern Railway, the formation of which remains to be discussed in the next chapter.

Railway rule books of this period make interesting and amusing reading; thus rule 47 in the Eastern Counties Railway's Book of Regulations, dated December 20th, 1846, required that "the Engineer of every train must be in attendance half an hour before the appointed time for starting the train; or he will be fined one shilling for every minute exceeding that time, and he must see that his engine is in working order, sufficiently supplied with fuel and water, and properly oiled". It is possible that the reissued regulations of this date resulted from a serious accident which appears to have taken place on the Eastern Counties Railway in August, 1846, and which resulted in the loss of at least one life. William Clare, the driver, and James Quinlan, the stoker of the engine concerned, "Firefly", were taken into custody and charged with manslaughter; they were released on bail, but it was considered that the accident was due to

their negligence. It was at this period that many of the remaining coaches ceased running, as for instance the old-standing Oxford and Cambridge coach, which after having been on the road for thirty years,was taken off in April, 1846; as the "Bedford Times" of that month expressed it, the "Ad Eundem", as the coach was named, "when first started was considered a great accommodation". At that date the Northern and Eastern Railway had 47½ miles of line open, and its £50 shares were selling at 67 to 70; nearly £4,000,000 had been spent upon it, together with the Eastern Counties, and the two lines were carrying about 36,000 passengers per week, or about one seventh of the number who passed through Liverpool Street Station each weekday in 1932. The Eastern Counties was at that time under the control and management of the famous George Hudson, at one time a York draper, and it was said that its prospects were looking up; but that railway shares were the subject of considerable fraud may be gathered from a notice in "The Times" of Thursday, August 20th, 1846: "Scripholders—Anti-Railway League—Measures are now in a state of forwardness organizing a most formidable and just league against the ruinous and nefarious practices of the Managing Committees and Directors of projected railways, by which means the whole of the deposits will be recovered from the hands of the mismanagers. A subscription of 10s. 6d. (3s. only of which must be paid at once) will entitle the party to claim all the useful information he may desire, together with legal advice and enforcement of claim, without any further charge whatever".

The early foreign railways also suffered from accidents, and in August, 1846, there occurred a collision on the line from Paris to Versailles (Rive Droite), when two trains collided head on, but, although the injuries were numerous, none of them was fatal. Though the earliest French railway was in the St. Etienne region, Parisians had been able to

travel to Saint Germain in 1837 and to Versailles in 1840 either by the Rive Gauche or the Rive Droite lines, and the year after the accident on the latter line occurred the line via Rouen to Le Havre was opened. It is of interest that the name of Rothschild, so intimately connected for many years with the Nord Railway of France, also appears amongst the directors of the first railway from Paris, that from St. Lazare to St. Germain in 1837; it is also on record that this early railway hoped to place its Paris terminus at the Madeleine, by means of a viaduct over the rue Tronchet. That, however, was not to be and St. Lazare in 1837 was then as now the terminus of the railway to St. Germain; to-day it is the French gateway to the new world via Le Havre or Cherbourg.

The decade of the 'forties was the decade of amalgamations and witnessed the formation of the parent companies which were destined to survive until 1923. Previous mention has been made in this chapter of the combination of lines radiating from Derby, which became known as the Midland Railway in 1844, and in 1846 the London and Birmingham, the Grand Junction, which included the Liverpool and Manchester, and the Manchester and Birmingham Railways were amalgamated to form the London and North Western Railway, by an Act which received the Royal Assent on July 16th. The first chairman of this railway colossus of the 'forties was George Carr Glynn, afterwards first Baron Wolverton, who had guided the destinies of the London and Birmingham since 1837. The fact that more than four hundred route miles of railway were now under one management and that the £100 shares of the London and Birmingham were selling at over £200 in August, 1846, began to disturb the equanimity of Parliament, and railway problems formed the basis of much discussion. A certain Mr. Morrison in 1846 was stated to be leading the "anti-monopoly" talkers, and the intention of the House of Commons

seems to have been to establish a separate Governmental Department for the transaction of railway business. It is curious that eighty-five years later another Mr. Morrison as Minister of Transport was leading the "monopoly" talkers in connection with London transport.

Important railway legislation had, it is true, been passed during the previous years; in 1842 there had been a Regulation of Railways Act, which was one of the first railway Acts to deal specifically with questions of safety. Of far greater importance was the Act of 1844 which gave the Treasury power to revise charges so as to reduce the profits of a railway to 10 per cent, though equally it provided for the making up of divisible profits to this 10 per cent. level by the Government over a period of twenty-one years. Such provisions, which only applied to railways uncompleted at the date of its passage, show clearly that enormous profits were expected from the railways in future years, and this is borne out by the fact that the year 1844 was commonly known as the year of "railway mania". During the four-year period starting with 1844 no fewer than 637 separate lines, with an authorized length approaching 9,500 miles received their charters. While the provisions of this Act of 1844 regarding the relationship of the Government to new railway construction are of considerable interest to students of transport history, because they effectively delayed any policy of State ownership for twenty-five years, the interest is mainly academic, though they included the liability of the companies to keep accounts and to send copies of their balance-sheets to the Government, for these provisions were never in reality put into practice. Of greater importance were the sections of the Act which stipulated that at least one train in each direction should offer accommodation to third-class passengers in carriages protected from the weather and fitted with seats. These trains were to be known as Cheap Trains, a name by which the Act itself became commonly known in later years.

Though the hours of departure could be fixed by the railway directors, the average speed was not to be less than twelve miles per hour, and the train was to pick up and set down passengers at every station. The fare for each third-class passenger was not to exceed one penny per mile, but the ticket included the privilege of taking fifty-six pounds of personal luggage and the passenger might be accompanied by any children under three years of age. These trains came to be known as Parliamentary Trains, and tickets issued at one period bore the title "Parliamentary". The Act also amended earlier Acts concerning the conveyance of mails and military and police, as well as providing for the passage of Government telegraphs on a railway's right of way.

Legislation in 1845 included the Railway Clauses Consolidation Act, which, dealing only with future railways, standardized the forms which new railway Bills were to take and attempted to eliminate practices which had come to be regarded as discriminatory. This important Act simplified parliamentary procedure very considerably, since it made unnecessary the discussion of each of the three hundred and fifty clauses for each of the six hundred various railways. From about this time onwards one notices a subtle change in the outlook of Parliament towards railway regulation; in place of the rigid requirements in regard to construction of lines one finds a frequently-expressed desire to preserve competition between the various railways. The tendency of railways to amalgamate, thereby reaping the advantages of large-scale operation and lengthening mileage between terminal points, was doubtless responsible for this veering-round of public opinion, and at a time when *laissez-faire* was held in high esteem it was only natural that the forces of controlled competition should be relied upon to curb the power of great transport concerns which were beginning to attain a monopolistic status the like of which had not been possible in the days before steam locomotion. The Royal

Commission appointed in 1845 to report on the question of gauge uniformity made public its conclusions the following year, and the Gauge of Railways Act was passed in 1846. The expense of converting the Great Western lines to the standard gauge was estimated at £1,000,000 in 1846, and it was suggested at the time that the Government might lend the Company that sum, at 3¼ per cent., to be repaid at the rate of £45,000 per annum, which could be obtained from the passenger-tax; thus the whole of the £1,000,000 would be redeemed over forty years. This suggestion, which emanated from a certain Mr. Wyndham Harding, never seems to have received a favourable reception, though it would have saved the Great Western company considerable expense, and it would, one feels, have been only right that the State should take upon itself some responsibility for the consequences of its failure to standardize railway gauges at an earlier date. That the tactics of the broad gauge party were not calculated to make their case very popular may be gathered from an editorial of the "Railway Record" of May, 1846, just before the Board of Trade's report on the subject was laid on the table at Westminster, "We cannot", so reads the editorial, "but reprobate in the strongest terms the extraordinary attempt to 'mob' the Board of Trade, made on Thursday by the partisans of the broad gauge". Indeed, 1846, during which year no less than 250 railway Acts received the Royal Assent, proved a very notable period in railway legislation, for an Act was passed at the end of August providing for the appointment of Commissioners of Railways, who took over the powers, rights and authorities in regard to railways of "Her Majesty's Privy Council for Trade and Foreign Plantations", an earlier and more euphonious title for the Board of Trade. In practice, however, the Commissioners had a very short official life, as the Act of 1846 was repealed in 1851, their powers reverting to the Board of Trade.

It was during the later 'forties that the atmospheric system

for railways came into considerable prominence; an advertisement in a Paris paper in August, 1846, drew attention to the invention of a new method of applying atmospheric power to locomotion. It stated that " the power is to travel with the train ", but this seems somewhat of an exaggeration as the atmospheric system, a patent of Samuda Brothers, consisted of a pipe-line supplied with compressed air from stationary pumping engines, the trains being fitted with air-tight pistons which worked inside the pipe; the trains were propelled or stopped by opening or closing these pistons. Great claims were made for this system, especially in regard to higher speed and greater safety combined with regularity and economy, since locomotives could be dispensed with, but in practice it was found virtually impossible to obtain an air-tight joint, without which the vacuum could not be effective after the passing of a train; consequently there was serious loss of power, and the only important lines to be equipped with this system were a portion of the Croydon Railway, which was using this method in 1846 and had become famous for its punctuality, the Kingstown and Dalkey line in Ireland, and the South Devon Railway from Exeter to Teignmouth and Newton Abbot, which began to be worked atmospherically in September, 1847. The South Devon Railway, having worked in close connection with the Great Western Railway for many years, finally became part of that system in 1876. As early as 1839 a system known as Clegg's Pneumatic Railway had been under discussion for use on the Birmingham, Bristol and Thames Junction Railway. Brunel seems to have been convinced of the desirability of this form of traction, but the working of the South Devon line resulted in a deficit during 1848, and during 1849 locomotives were again employed on this railway as at its opening in May, 1846. There can be no question that the serious financial losses consequent upon this adoption of the atmospheric system did great damage to Brunel's reputation, especially coming so

soon after the report of the Gauge Commission, and Brunel's star as a railway engineer began to wane.

Though Brunel made several serious errors of judgment, which must have cost the Great Western Railway heavy financial losses in its adolescent years, his memory will always be revered by civil engineers and railway officers: possessing a character which it is extremely difficult to analyse exactly owing to the diversity of his achievements which included civil engineering works on land and steamship construction, together with his indomitable courage in carrying out his proposals, he had left, before his early death in 1859, an indelible mark upon rail and ocean transport. The great Saltash Bridge over the Tamar still stands, a glorious memorial to a great engineer, but it should not be forgotten that the voyage of his "Great Western" in 1839 across the Atlantic was characterized in the American papers as by far the greatest triumph of its kind hitherto accomplished. She left Bristol a little before midnight on April 23rd and arrived at her anchorage in New York Harbour at midnight on May 14th. It is not always remembered that this ship was designed with the object of acting as an extension of the Great Western Railway across the Atlantic, and a contemporary account points out the advantage which both countries would receive from "the facilities of frequent intercourse by thousands instead of hundreds, will tend to prevent future wars between people belonging to the same race, speaking the same language, descended from the same progenitors, and closely bound together in those relations which belong peculiarly to large maritime nations, vying with each other in spirit and enterprise, and who only need a more intimate acquaintance with each other to be satisfied that each has been taught to magnify the failings of the other, and that, in fact, there is no reason why the same good feeling should not exist now which we may presume to have existed before the dissolution of the Union".

It was only natural that the " railway mania" should before long result in a period of disappointment and financial crisis, and by 1847 and 1848 this inevitable reaction had arrived. Yet, in spite of a slowing-down in railway construction, it has been estimated that nearly 200,000 navvies, a word derived from those who built inland navigations, were engaged on railway construction. The organization of the living accommodation for this vast army, together with its moral welfare, provided a problem of no small magnitude, and the Church became considerably exercised as to how to look after these members of its flock. On one occasion the Bishop of Chichester is reported to have appointed three clergymen to go among those working on extensions of the Brighton Railway, so as to afford religious instruction to the workmen, the sum of £100 being voted unanimously at the Company's meeting in aid of this laudable design. Even as early as 1837 this problem seems to have been in existence, for the " Railway Magazine " of June in that year tells us that twelve thousand men were employed on the works for the London and Birmingham line. It goes on to say that Saturday nights must make " conspicuous figures " in the cash-book of that company!

From earliest railway days the co-operation between rail and sea transport had been very close, and many of the early lines were constructed to provide short cuts between important towns which could only be reached by sea after slow and tortuous passages to the docks. Thus the Glasgow, Paisley and Greenock Railway in 1839 estimated that it would enable the time between Liverpool and Glasgow to be cut down by two hours out of the nineteen normally occupied by the sea journey at that time, by permitting passengers to embark or disembark at Greenock, a port which could be reached with the greatest of security in all weathers. Yet so rapid was the extension of railways during the twenty years from 1835 to 1855 that many of these co-ordinated

services necessarily lost their importance, as the times by the all-rail routes were reduced and the railway network became more complete. The tendency for increased speeds was in part due to the running of many special trains in connection with the "railway mania", and extraordinary scenes were witnessed just before November 30th, 1845, the date by which the necessary documents in connection with railway proposals to be placed before Parliament during the ensuing session had to be lodged with the Board of Trade. The day in question happened to be a Sunday, but that did not prevent the Great Western from running ten special express trains to ensure that the plans of the newly-projected lines should be deposited in time at the Board of Trade. One of these trains broke down at Maidenhead and was run into by another train carrying several legal lights of the Great Western and the Exeter companies. The running of these specials is made the more notable by the fact that when the Report of the Great Western Railway Bill was under discussion a clause had been proposed, though it was rejected by a majority, that no engines or carriages should be allowed to travel "on this Railway on the Lord's Day," and that the Company or its successors should be liable to a fine of £20 for every engine or carriage infringing this rule. The Eastern Counties also ran nearly twenty special trains for the various projected new lines, and it is reported that one of these trains covered 118 miles in 90 minutes. Even the coaches benefited and it was reported of Worcester that "so many coaches and four have never been seen in one day before, not even in race and festival weeks". Be that as it may, the public were taken with the idea of speed, and the railways endeavoured to satisfy this craving.

No commodity carried by rail is more perishable than newspapers, which become obsolete and therefore unsaleable in a few hours. Some of the fastest British trains have been newspaper expresses, most of them never appearing in the

public time-tables at all. From time to time special runs have been made with these trains, setting up speed records of no mean order; an instance may be quoted from "The Newcastle Journal" of February 26th, 1848, on the occasion of Lord John Russell's financial statement. It will be recalled that the British Government had proposed an income-tax of one shilling—"so grave a decision had rarely been formed by any Government in time of peace"—but this policy was formally abandoned on the 28th, after Louis Philippe and his family had fled from Paris. A special train was run for W. H. Smith & Son from Euston to Glasgow through York and Newcastle, the King's Cross route, of course, not being open at that time, which covered the 472½ miles in ten hours and twenty-two minutes, though the actual travelling time was only just over nine and a half hours. So fast was the service that the train reached Glasgow two hours before the mails which had left Euston the previous night.

At the very time when the possibilities of rail transport were on the point of being appreciated fully by industry and the general public, the man to whom the railways had owed most at the time of their inception passed away, mourned not only in Great Britain, but in countries beyond Europe. George Stephenson, who died on August 12th, 1848, at the age of sixty-eight, had been honoured by Premiers and Princes, indeed, by people in every walk of life. Few pioneers of industry who have risen from quite humble surroundings have lived long enough to enjoy the honours that were the fruit of their persistence. The elder Stephenson, who had left the locomotive side of his business to his son in 1840, was one of them; the last few years of his life have been described as a perpetual ovation, and after his death, which was regarded as a national loss, the eulogies and public tributes were innumerable.

For the railways this decade ended more calmly than the events of the previous years might have led one to expect;

the crescendo of railway projects and construction had reached its peak in 1845, and 1849 began to witness some recovery from the crucial years of 1847 and 1848, when financial panic and losses were suffered by many who had invested nearly all their savings in the promotion of some local railway. Technical improvements had begun to occupy the attention of many railway engineers and amongst them may be mentioned the telegraph, which was destined to do so much to make railway travel more secure. As early as 1837, day and night telegraphs for railways had been patented, the day system consisting of geometrical signs or figures which by night were illuminated and accompanied by strong parabolical reflectors; but it was the electric telegraph of Wheatstone and Cooke that really formed the basis of modern telegraphy and signalling, and made high railway speeds compatible with safety; the use of this system has already been noted in this chapter in the case of the Blackwall Railway. The Great Western was the first main line railway to install the electric telegraph, between Paddington and West Drayton, the wires being extended to Slough in 1843. Both on this line and the Blackwall the system worked excellently, but it was not properly appreciated by railwaymen until in 1845 a certain murderer, Tawell, escaped the police at Salt Hill and travelled by rail to London. The police arrived at Slough too late to catch him, but telegraphed to Paddington, where he was arrested on alighting from the train. This episode aroused public attention sufficiently to make electric telegraphy an assured commercial success. The Delaware and Hudson Canal at an early date made use of a telegraph and, through the assistance of Mr. H. T. Newcomb, Vice-President of the line which now bears the name of the old canal, with which the first railway in the United States, the Carbondale and Honesdale, was connected—incidentally, the first engine to be used on it was an English one, the "Stourbridge Lion"—it has been possible to trace fairly fully the

extent and use of this early telegraph installation. The line, which was constructed between 1847 and 1849, was built by the New York and Erie Telegraph Company, which had been promoted by Ezra Cornell, the founder of Cornell University, and finally became the Western Union Telegraph Company of to-day. The telegraph line stretched along the public roads from New York City to Fredonia, New York; printing telegraph-machines and tape were used, the first telegraph instrument being set up in an hotel bar-room in Goshen, New York, in 1849. In 1853 the wires were transferred from the original poles to those of the present Erie Railroad Company; later, in 1862, the Canal constructed its own telegraph line from Honesdale, Pennsylvania, to Rondout, New York, a distance of 108 miles, the Western Union owning one of the offices. Three years later, the Western Union provided direct communication between New York City and Honesdale with a wire on the Delaware and Hudson poles along the canal, and this line is still used jointly to-day by the Delaware and Hudson and the Western Union.

The years 1824-1848 have been called the Golden Age of Coaching, and as the railway system steadily pushed out its tentacles into the remoter corners of the country the famous coaches were gradually withdrawn, though their demise was by no means sudden. Just as railway transport was born in the North—and Liverpool and Manchester will always be remembered in connection with early rail travel—so it is surprising to find that, before the opening of the Grand Junction Railway, the number of coaches licensed to run from Manchester southward was greater than the number from any other town in the Kingdom except London, Birmingham coming next. By the time the London and North Western Railway had been formed all this road glory of the past had disappeared, and, similarly, the famous coaches to the West Country had been taken off one by one as the London and

South Western Railway and the Great Western Railway reached Exeter, Newton Abbot and Plymouth successively. A survey made by the London and Southampton in 1837 showed that in one month four coaches, the Exeter Mail, the Exeter Herald, the Devonport Mail and the Exeter Coach via Yeovil, carried 1,500 passengers, and of these it was expected that nine hunded would be diverted to the London and Southampton and six hundred to the Great Western and the Bristol and Exeter lines. This route, it will be remembered, was that of Chaplin's famous Devonport " Quicksilver ", the fastest coach out of London during the 'thirties, as also of its great rival, the Nelson-owned " Exeter Telegraph ". The " Telegraph " was withdrawn when the Bristol and Exeter line was opened to Bridgwater in 1841, but for the following three years it was run by its ex-coachman, Ward, between Bridgwater and Devonport, thus feeding the railway at the railhead. When the railway was opened to Exeter on May 1st, 1844, the coach continued between Exeter and Devonport, and even suffered for some time from the fierce competition of a second coach, the " Tally-Ho ", the time for the fifty miles being cut down to three hours and twenty minutes. Meanwhile the railway pushed ever farther westward, and the South Devon trains commenced running into Plymouth on May 1st, 1848; there was not sufficient traffic left for the coaches which were then withdrawn, but Ward, driven still further to the west, started a fast coach, " Tally-Ho ", on the sixty-two mile route from Devonport to Truro and Falmouth, and succeeded in obtaining the mail contract. It was only when the railway from London reached Truro in May, 1859, that Ward gave up the unequal struggle; he became a prosperous proprietor of livery stables in the Brompton Road and lived to see the diamond jubilee of Queen Victoria. This record of one who had driven the Ipswich and Norwich Mail in 1827 would make an epic story, and it is briefly mentioned here as a tribute to the age

of coaching; it proves how gradual the demise of the coach was.

Though Pickford's fly-boats and fly-vans had ceased to fly with the opening of the London and Birmingham Railway, and, though Chaplin's coaches curtailed their runs as the railway extended, the services they offered were carried on at greater speed and with more regularity by rail. Evidence submitted to a Select Committee on Railways in 1839 shows clearly how the transition stage was arranged, at any rate on the London and Birmingham. Mr. Carr Glynn, the chairman, and Mr. R. Creed, the secretary, giving evidence, explained the situation as follows. In view of their very clear explanation of a railway's liability to carry the goods of everybody, a question round which much controversy has recently raged in regard to road transport, it has been thought desirable to reproduce fully this section of their statement: "They took the goods of Golby first, then of Pickford and Co., and lastly of Bache and Co. They would admit any others but had not the means. Their Act prevents partiality; they must carry the goods of all if they have the power, but they may restrict that power, select any carrier as their sole agent, and, as the law stands, there is no remedy against them. Other companies can put locomotives on their line by paying a toll, but they can refuse them coke, water, the use of their stations, and fixed engines, turn-plates, and any assistance from their servants, unless they come to terms with the company. No parties could run on their line without their consent, and make a profit. Horses they refuse to carry unless the owner subscribe a paper taking on himself the entire risk. (We believe many common carriers give notice on their bills to that effect respecting horses.) They consider themselves under the same law as common carriers. The sole control of all the locomotive power, for the safety of persons and goods, they think it needful to hold; a divided control, even in a small degree, they have found to be dangerous.

There is no limit as to the charge they can make for goods but what the word ' reasonable ' implies ".

The evidence on this occasion, submitted on behalf of the London and Birmingham, also dealt with the question of mail payments; they were to be carried the 112½ miles in five hours by day and five and a half hours by night, at a charge of £28 4s. 4d. per day, or £10,340 per annum, a day and night mail working in either direction. The contract was to last for three years, and the London and Birmingham was to find the large Post Office carriages, to carry a guard and two clerks to sort the letters on the journey, the weight being estimated at " nine tons and a fraction ". The problem of payments to railways for the transport of mails had been a burning one during the previous year, and the London and Birmingham had been forced to lodge a petition against the proposed Railway Mails Bill. One of the suggestions made by the Post Office was that it should be given power " to run its own engines upon any railway, with a train containing a limited number of passengers and weight of luggage, if it shall so think fit, without the payment of any tolls; subject, however, to a payment to be fixed, by arbitration, if necessary, for any services and accommodation which may be required from the company by the Post Office ". A further demand by the Post Office was that it should have the power of running the mails on a Sunday, and " that the Postmaster-General have the power of despatching mails and guards by any train the railroad proprietors may run. Postmaster-General to be empowered to demand carriages fitted up in such a manner, and of such dimensions, as he shall direct, or to furnish his own carriage, and the proprietors to find a suitable truck to carry it ". Finally the whole question was taken to arbitration, the arbitrators being Robert Stephenson and Lieutenant Harness, R.E., who made an award on May 30th, 1838, their award drawing attention to the fact that mail coaches were generally exempted from tolls and that,

consequently, the Post Office did not contribute either towards the first cost of roads or bridges or towards their repairs, although it paid all the expenses incurred by contractors in carrying the mails, together with a profit fixed by competition. Hence a similar policy was adopted towards the carriage of mails by rail. This award is of very considerable importance as it represents the first declaration by any Government of a policy in regard to the movement of letters by rail and other postal matters. The agitation, which had existed for some time, aiming at freedom from taxation of all forms of internal communication, naturally meets with the approval of public opinion to-day, especially in so far as postal matters were concerned. A witness in 1837 commenting upon the evidence taken before the Select Committee on Internal Communication Taxation, which sat in May of that year, pointed out that any Government which would have the courage to reduce to the minimum rate the tax on conveyance of letters by post, and at the same time would repeal all taxes on personal intercommunication, would do more to civilize the country in ten years than all the schools they could found would do in fifty, and this without any ultimate injury to the revenue. Translated into international terms, this would hardly be seriously questioned at the present time.

With the withdrawal of the coaches the turnpikes lost a large percentage of their receipts, and "The Times", even prior to 1840, had devoted many long articles to the melancholy and doleful state of the traffic and the incomes of the common turnpike road. In fact, there was an agitation to repeal the duty at that time imposed, so that the coach-proprietors might the more effectively compete with the railways. But the Turnpike Trustees awoke from their long slumber far too late to prevent the railways from taking the bulk of their traffic; the public had lost all patience with the turnpikes, and, just as the canals wherever they were built,

had put an end to the pack horses, so the railway with its speed of twenty to thirty miles per hour rendered the whole turnpike organization, which had a debt of £9,000,000, hopelessly obsolete. The diversion of passenger traffic to the railways was, however, partly due to taxation: it was calculated in 1839 that railway proprietors paid one-eighth of a penny per mile for each passenger, stage-coach proprietors a farthing, postmasters three farthings and water-conveyance nothing. The editor of "The Times" wrote: "What can compensate the public for the loss and inconvenience which the abolition of our admirable coaching and posting system would create throughout the Kingdom?". Another commentator suggested: "Let the Government take the duties off, but certainly not equalize them by putting a tax on railways". Verily the ghosts of 1839 have returned to say their say in the rail and road controversy which is raging now, ninety-three years later! The same commentator also drew attention to the very low rates charged by the steamboats which continually plied between Hull and London; thus coastal competition also played its part in the withdrawal of traffic from the roads. In a little treatize by Graham on "Inland Intercourse" is to be found an interesting comparison of the taxes levied on coaches fitted to carry eighteen passengers each, one passing along a turnpike road, the other along a railway, each thirty miles in length. With eighteen passengers the road coach paid 11s. 3d., and the same sum whether twelve, nine, six or no passengers were carried, whereas the railway coach paid 5s. 7½d. if it carried eighteen passengers, 2s. 9¼d. with nine passengers, 1s. 10½d. with six passengers, and with no passengers nothing. The argument, ingenious though it seemed, was not entirely sound, since it entirely neglected the cost of railway construction, and also the contribution of the State to the upkeep of the road system and its construction in previous centuries.

Nevertheless, it was on account of increasing speed and

reliability that the railway traffic grew at the expense of the road carrier. In 1838 a through run of 45 miles per hour attracted attention and publicity, as, for instance, that recorded in the " Liverpool Times " in the case of " the Sun engine which brought down the seven o'clock train from Manchester, on Friday night June 14th, accomplishing the distance (31 miles from the mouth of the tunnel) in the short space of forty-one minutes. This is at the rate of forty-five miles per hour ". But such a case would have called for no remark in 1849, by which year the Great Western had become famous for the high speed of its expresses over its admirably graded broad-gauge route to the West. The trains were naturally very light, weighing but fifty tons behind the tender, but, for the period, the records of " Wizard ", which achieved an average speed, start to stop, of 53.1 miles per hour on a coke consumption of 38 pounds per mile, were remarkable, and were closely approached by the runs of " Lightning ", most appropriately named, at 52.3 and 50.2 miles per hour, and " Dragon ", " Hirondelle ", and " Emperor " at over 51 miles per hour. All these runs were recorded during the spring of 1849 on the Bristol expresses and were doubtless typical of the best locomotive running of the day. The great distance of Paddington from the City, as compared with the London and Birmingham terminus at Euston Grove, came in for considerable criticism during these years, but it was pointed out that the Great Western Station was nearer to Piccadilly and Oxford Street, and that, as far as the traffic from Oxford and Cheltenham was concerned, since it was not commercial, three-fourths at least of the passengers were destined for the west end of London, while the fares to the City by public conveyance were the same from Euston and Paddington.

One may fitly conclude this chapter, which attempts to outline the main events of one of the most important decades in the history of transport in England, with some reference

to water transport. The assumption that movement on inland navigations was much cheaper than by rail is hardly borne out by the offer of the Grand Junction Railway to carry goods between Liverpool and Birmingham at the rate of thirty shillings a ton, or exactly the same charge as that made by the canal proprietors. In short, the early railways owed much of their success to the canals and the road carriers, who, owing to their exhorbitant charges, ensured that railway construction would be heartily welcomed by the trading interests of the country. In the case of road transport one has the example of the carriers between Manchester and Sheffield, who as late as 1837 gave notice of increases varying from 5s. to 10s. a ton on goods carried between the two cities, which were put into force at once with virtually no notice, and raised the price of carriage on certain goods to 40s. a ton. The trader had no tribunal to appeal to, so that his only method of redress was to use every means in his power to further the rapid construction of the Sheffield and Manchester Railway, which contemplated the carriage of goods and general merchandize at 20s. to 25s. per ton, and steel at about 16s. This line was opened in 1845, an early date considering the engineering difficulties, and it was doubtless pushed on with speed owing to the foolish policy of the road carriers. Though railways had proved expensive to construct —the average formation expense in 1835 had been estimated at £23,000 per mile, while for the Liverpool and Manchester it had approximated to £30,000 owing to physical difficulties and lack of experience—their average maintenance cost per mile, considering the traffic that could be handled, was not excessive; in the case of the Liverpool and Manchester in 1834 it worked out at £623 per mile. George Stephenson, in giving evidence to the Committee on the Western Railway Bill, had stated that 10,000 soldiers might be conveyed from London to Bristol by the proposed railway in four hours. Coming within twenty years of the Battle of Waterloo, one

can well imagine the effect of such a statement upon public opinion. It is hardly, then, a cause for wonder that the railways should have been welcomed on every side, except by those whose landed estates were likely to suffer.

That Bristol should have been anxious to possess railway facilities equally occasions no surprise, for contemporary records show that even in 1837 Hull, with a population of 60,000, had superseded it as the third port of the country, coming after Liverpool which, even then, had a population of 200,000; though London, then, as now, with its population of 1,800,000, if one included its various adjoining villages, far outstripped its provincial rivals as a port. Hull, which had doubled its foreign ship entries in four years, and quadrupled those of coastwise vessels, had been energetic in pushing the Hull and Selby Railway. Steam navigation was indeed developing rapidly all over the world, and even in 1838 it was possible to travel on the Danube from Ratisbon to Constantinople with ease in thirteen days, by means of a service of Bavarian and Wurtemburg boats. France seems to have lagged behind somewhat in this movement, for in 1835 it possessed but one steam-powered commercial vessel of 140 horse-power, whereas at Bristol, London and Liverpool boats were being fitted out with engines of 380 horse-power, and the " British Queen ", completed by 1839, possessed engines of 500 horse-power.

To claim that the railways brought immediate ruin to the canal-owning interests may be controverted quite conclusively by the statement that the Trent and Mersey Canal paid a dividend rate of 30 per cent. in 1846, while the same year the Oxford Canal paid 26 per cent., the Coventry 25 per cent., the Old Birmingham 16 per cent. and the Grand Junction Canal 6 per cent. The many analogies which have recently been drawn between the effect of the coming of the railways on the coaches and canals during the period 1830-1840 and the incidence of the motor vehicle on the railways

during the years 1918-1933 are fundamentally unsound, for they presuppose the almost immediate eclipse of the earlier means of transport, a view which rapidly disappears when any detailed study of contemporary history is undertaken. The transport history of the 'thirties and the 'forties is full of interesting revelations, because during that period were laid the foundations upon which much of the country's present industrial and transport policy is based. One last instance may be quoted, in view of the enormous developments taking place at Southampton to-day. In the November, 1838, issue of the "Railway Magazine" occurs the following announcement: "Southampton Commercial Docks.—The first stone of these docks was laid with masonic honours, October 12th. These docks are expected greatly to benefit the Southampton Railway, and to be benefited in turn by it".

CHAPTER IV

1850—1859

RAILWAY EXTENSION AND THE ROYAL MAIL

THOUGH railway extensions had been the main feature of the transport world during the previous twenty years the Turnpike Trusts were by no means dead by the early 'fifties, and especially not in Scotland. Thus, "An Abstract of the General Statements of the Income and Expenditure of the several Turnpike Trusts in Scotland, between the Term of Whitsunday 1851 and the Term of Whitsunday 1852" records that there were no less than thirty-two such trusts in the County of Aberdeen, twenty-nine in Perthshire and twenty-two in Lanark; the County of Edinburgh alone had six and their revenue and expenditure were no mean sums. Thus, for the twenty-two trusts in Lanark one finds the following figures: —

	£	s.	d.
Balance in Treasurers' Hands on last Account	28,798	14	7
Balance due to the Treasurers on last Account	2,367	11	7

INCOME—	£	s.	d.	£	s.	d.
Revenue received from Tolls	44,864	2	10			
Revenue from Fines	1	2	6			
Revenue from Incidental Receipts ..	1,556	11	5			
Amount of Money borrowed on the Security of the Toll	9,354	3	7			
Total Income				55,776	0	4

EXPENDITURE—	£	s.	d.	£	s.	d.
Manual Labour	9,825	2	10			
Carriage of Materials	514	5	6			
Materials for Surface Repairs	7,959	18	1			
Damage done in obtaining Materials ..	219	8	11			
Tradesmen's Bills	1,166	7	8			
Salaries of Treasurer	517	18	0			
Clerk	743	7	0			
Surveyor	974	2	11			
Law Charges	2,518	18	4			
Interest of Debt	7,294	15	7			
Annuities	105	2	0			
Improvements	15,042	19	0			
Watering of Roads	470	19	10			
Debts paid off	10,203	18	8			
Incidental Expenses	928	12	3			
Total Expenditure				58,485	16	7

			£	s.	d.
DEBTS—					
Bonded or Mortgage debts	273,541	4 4			
Floating Debts	236	16 2			
Unpaid Interest	167,176	9 10			
Balance due to the Treasurers on this Account	2,767	11 2			
Total Debts			443,722	1	6
ARREARS OF INCOME—					
Arrears of Tolls for Current Year ..	862	16 7			
Arrears of other Receipts for Current Year	452	0 0			
Arrears of former Years	15,402	8 7			
Balance in Treasurers' Hands on this Account	26,488	17 11			
Total Assets			43,278	2	1

Nevertheless, the decade beginning with 1850 is marked primarily by the steady extension of railway facilities and the reduction in importance of roads and canals as means of transporting passengers or freight over any distance greater than a few miles. An event of outstanding importance to the railways was the passing of the Railway Clearing Act in 1850, which set the seal upon the efforts made by Mr. Carr Glyn ten years earlier, when he was chairman of the Birmingham Railway, to establish a central office to deal with accounts involving more than one railway. It is not certain whether the idea originated with Mr. Glyn, or with Robert Stephenson, the engineer to the Company, or with Mr. Kenneth Morison, the Chief of the Audit Department; but in view of the fact that Mr. Glyn, as a banker, was familiar with the working of the Bankers' Clearing House it was natural that the idea should make a strong appeal to him even if he did not originate it. Thanks to the assistance of James Allport, who later became General Manager of the Midland Railway, the task of bringing the scheme to fruition was allotted to Mr. Morison, and it became an accomplished fact on January 2nd, 1842, thereby laying sound foundations upon which schemes for the through booking of passengers and freight over more than one company's system could be carried out. Thus, the through running of wagons, without all the disadvantages and added expense of transferring the load at junction stations, was made possible. It was customary for passengers in the early days to change carriages when

their route lay over more than one company's line, but as traffic grew this created considerable inconvenience. The existence of a clearing-house made it easier to run through passenger coaches as well as through wagons, where the traffic was sufficient to warrant it. Great Britain was very early in the field with this far-sighted policy, and the through running of rolling-stock over several companies' lines has been a characteristic of British railway-operation for nearly a century. Nine railway companies participated in the original Railway Clearing House scheme of 1842, covering the territory served by the London and Birmingham in the south to that served by the Great North of England, the Leeds and Selby and the Manchester and Leeds in the north. All were standard-gauge lines, and traffic-receipts could be divided for movements from Darlington to London or Hull to Manchester.

As was to be expected the scheme, which had started in a very small way with a staff of only four, met with instantaneous success, and sixteen railways with a total mileage of 656 miles had become members by 1845. In those early days difficulties arose through the lack of legal authority to enforce payment to the Railway Clearing House of debts owed by the various member companies, and the matter had to be rectified by an appeal for sufficient powers, which could only be granted by Act of Parliament. Hence the Railway Clearing Act of 1850, an important landmark in the history and progress of the British railways, was calculated to assist very materially in drawing together the various parts of the Kingdom and fostering free movement and trade, with the minimum of expense and restriction imposed by accounting procedure. Historians of transport have too frequently overlooked the vital importance of this far-sighted move, which has for many years been the envy of railway administrations in other countries. In recent years it has been popularly supposed that the Clearing House, still situated

at Seymour Street, near Euston, a location which is a constant reminder of its early connection with the London and Birmingham, is engaged solely upon work which would not be required if all the railways were amalgamated into one great organization. Though certain of the work would then doubtless become unnecessary, there are many spheres of Clearing House activity—such as mapping, relations with Continental railways, the meetings of the various departmental officers—for which the Railway Clearing House supplies the clerical staff and which would have to be done whether the railway organization of the country consisted of four railways or only one railway. The early history of the Railway Clearing House showed such rapid growth that, though in 1842 the receipts to be dealt with did not attain £200,000, by 1867 they exceeded £11,000,000. Few figures bear a more striking witness to the vast increase of British trade, as handled by the railways.

While the 'forties had witnessed the amalgamation of the southern partners in what was later to be the West Coast route to Scotland into the London and North Western Railway, the British railway colossus of the nineteenth century, and also the formation of the Midland Railway, centred on Derby and only reaching the Metropolis by means of the line terminating at Euston, the East Coast route was still only in an embryo stage. In fact, the Great Northern did not obtain its Act until 1846, partly because of the many competitive schemes for joining London and York by a direct rail-route, each of which was backed by the towns, such as Newark, Peterborough, Cambridge and Grantham, through which it was to pass. The scheme suffered from the bitter opposition of George Hudson, the Railway King, who in the late 'forties was at the zenith of his power and influence and, though his birthplace was York, had a firm hold over the destinies and policies of the Midland and Eastern Counties Railways. With a character as unattrac-

tive as Stephenson's was attractive, George Hudson was the embodiment of those interests which did much to bring the railway industry into disrepute during the period of its most rapid expansion. To Stephenson the railway was his child and his hobby; to Hudson it was a speculation. Hudson was a ruthless and exceedingly powerful enemy to any scheme which ran contrary to his own interests; the railway boards which he controlled might almost as well have not existed, so completely did he rule them, and in the wild speculations of the "mania" he found ample scope for the amassing of that fortune which finally led to the execration of his name. The friend of princes and peers, he yet remained proud of his humble origin and was ever ready to lend a helping hand to the friends of his youth, and many were the stories of his anonymous charities; but to the railway shareholders of the later 'forties the knowledge of his kindliness to others can hardly have compensated for the fact that he had undoubtedly tampered with accounts and in some cases paid dividends out of capital.

Yet in spite of Hudson's opposition, which had delayed its construction for several years, the Great Northern Railway gradually took shape, beginning in North Lincolnshire with a line between Grimsby and Louth. By the summer of 1850 it had penetrated as far south as Peterborough, and it was evident that before long the somewhat circuitous route from London to Newcastle starting at Euston and passing through Rugby, Normanton and York would give place to a more direct one through Peterborough and Doncaster. Hudson about 1845 had appointed Mr. (afterwards Sir) James Allport, of the Midland, as manager of the York, Newcastle and Berwick, with the special intention of developing the East Coast traffic and keeping it on Midland metals between York and Rugby, and in furtherance of this scheme a through service had been put on in October, 1847, by which Edinburgh could be reached from London in thirteen hours

and ten minutes, in spite of the transfer of passengers at Newcastle and Berwick, pending the completion of the great bridges over the Tyne and the Tweed. This was a great improvement on the twenty-seven hour service of 1843 from Euston via Fleetwood and thence by sea. The West Coast route had reached Carlisle in December, 1846, by means of the Lancaster and Preston Junction and the Lancaster and Carlisle Railways. So that now the traveller could leave Euston at 10 a.m., reach Carlisle at 9.55 p.m. and after a night's rest take the coach in the morning to Edinburgh or Glasgow. By the end of 1847 the Caledonian line had been opened from Carlisle to Beattock, which was reached at 11.16 p.m., and mails and those passengers who were sufficiently eager could reach Glasgow at 5.4 a.m. and Edinburgh at 6.6 a.m.

But 1848 had witnessed the opening throughout of the East Coast route from York to Edinburgh and on February 15th the Caledonian had completed its line from Carlisle to both Edinburgh and Glasgow, at which cities the 10 a.m. from Euston landed passengers at 1.30 a.m. and 1.40 a.m. respectively. The East Coast connection, however, left Euston at 9.30 a.m. and brought the passenger and mails into Edinburgh at 10.35 p.m.; nevertheless, Captain Huish, the energetic manager of the London and North Western Railway, determined to keep as much as possible of the traffic for his line and its northern connection, and in his summer time-tables inserted a new 9 a.m. train from Euston which shortened the journey to Edinburgh and Glasgow considerably, arriving at 9 p.m. and 9.10 p.m. respectively. Once again the Midland and the Berwick interests replied by cutting the time of the 9.30 a.m. from Euston, so that it reached Edinburgh at 9.55 p.m.; thus arose the long-drawn-out rivalry between the East and West Coast routes for the Anglo-Scottish traffic which was to last until the pooling-scheme agreed to by the London, Midland and

Scottish and the London and North Eastern Railways in 1932. It was clear that the East Coast interests had little hope of future success unless they could free themselves from their forced reliance on London and North Western Railway goodwill to arrange suitable times over the eighty miles between Rugby and London, and, human nature being what it is, the nature of this assistance could hardly have been more than grudging under the circumstances. But the East Coast interests were by no means agreed amongst themselves, and Hudson, representing the Midland, endeavoured to obtain an independent entry into London from Leicester via Hitchin; however, those in favour of a direct route through Peterborough and Grantham successfully blocked his scheme of establishing connection with the Eastern Counties and reaching the Metropolis over that company's metals.

Few railway schemes of the period had greater opposition to overcome than that of the Great Northern, which seems to have been cold-shouldered by all existing railways, with the exception of the Manchester, Sheffield and Lincolnshire, commonly known as "The Railway Flirt", which was formed in 1847 and had grown out of the Manchester and Sheffield. It was later to become the Great Central Railway, the last main line from the North to reach London. The Great Northern line was also planned to pass through much good fox-hunting country, and that fact spelled the direst opposition from large landowners. Indeed, Lord Galway, of Serlby Hall, through his seat in the House of Commons, had successfully engineered an amendment on a second reading of a Deviation Bill in 1848, and thereby materially delayed the construction of the Great Northern. Yet in spite of these difficulties the line from Peterborough to London, for which Joseph Cubitt was the engineer and Brassey the contractor, made steady progress, and it was expected that the formation work would be completed by 1850. In the meantime, however, the York, Newcastle and Berwick

interests had begun to show alarm over the activities of Hudson, and at a meeting of the Eastern Counties in March, 1849, his name was hissed and hooted; a month later he resigned his chairmanship of the Midland, and by the end of the year the Railway King had vacated his throne and forsaken his subjects. By the commencement of 1850 the Great Northern was working 143 miles of its line, and by May the tunnels through which the railway entered London had been completed, though work on the great viaduct at Welwyn had been delayed through a severe frost during the winter. Nevertheless the first "Parliamentary" train started from Maiden Lane, the temporary London terminus, at 7 a.m. on August 8th, 1850, and arrived at Peterborough about 9.30 a.m.

Noted for its strict economy at all times, the Great Northern board eschewed the expense of all opening festivities, though Grinling in his excellent history of the line informs us that they did not refuse an invitation of Mr. Brassey to take a trial trip in a double-headed train with seventeen coaches on August 5th and to sit down to a very elegant repast at Peterborough after examining the line. The repast was duly provided by Mr. Brassey. One of the early passengers during August was George Hudson, who travelled first-class to Leeds, and doubtless took a particular interest in the line whose construction he had succeeded in delaying for so long. Rivalry between the Great Northern and the London and North Western Railways went so far that it was claimed on behalf of King's Cross, the former's London terminus, that it had been shown how a good station could be built for less than the cost of the ornamental archway at Euston. In actual fact the cost of King's Cross far exceeded that of the Euston arch, and its magnificence was much criticized by shareholders; its roof was probably the largest in the world at that date and attracted much attention because of its unique design. The cost, exclusive of the

demolition of the smallpox and fever hospital which had previously stood on the site, was £123,000, to which must be added the £30,000 hotel which still adjoins the station. It would be fairer to contrast the £35,000 expended on the Doric arch at Euston with the figure for the King's Cross hotel. The year 1852 was a memorable one for the Great Northern, because in August of that year its line between Peterborough and Retford was opened, and in the following October trains began to use the great station at King's Cross. King's Cross was the natural gateway to Leeds, York and Newcastle, and the train service at that time consisted of thirteen passenger trains each way per day, but from the first much of the line's revenue was derived from the Yorkshire coal traffic; indeed, its prosperity may be said to have been largely bound up with the sale of Yorkshire coal in the Eastern Counties and London. In 1854 the Great Northern's gross receipts from coal traffic totalled as much as £300,000.

Passenger traffic had grown meanwhile, and in 1855 a through service was put on to Perth and Aberdeen, which was made possible partly by inter-railway warfare in Scotland and the amalgamation in 1854 of the York, Newcastle and Berwick with other railways to form the North Eastern Railway. This company, whose headquarters were at York, preserved its identity until the wholesale amalgamations of 1923. Before turning to other railways which were opened with bewildering rapidity during the early 'fifties, mention must be made of the pooling agreement, for which Huish, of the London and North Western Railway, is usually regarded as responsible. The agreement was signed early in 1850 and provided for the pooling of receipts on traffic between London and points north of York; in reality it set up a confederacy of many lines, of which the chief were the London and North Western, the Midland and the Lancashire and Yorkshire, a railway which had developed a

network of lines in the industrial area between Liverpool and Hull, together with the Manchester, Sheffield and Lincolnshire, though the latter appears to have been lukewarm in its adherence. This was natural, as its obvious interests lay in co-operation with the Great Northern which, of course, was the common enemy at whom the pooling agreement was aimed. The ubiquitous Mr. Allport once again comes into the picture, this time as manager of the Manchester, Sheffield and Lincolnshire. Designed to limit as far as possible the traffic which might be deflected to the Great Northern, the agreement was to have lasted for seven years, but towards the end of 1850 an agreement was reached between seven of these railways and the Great Northern known as the "Octuple Agreement", which was signed early in 1851 and provided for the pooling of traffic over the eight lines between London and York. Intended to persist for five years, it was nullified by the fare-cutting policy adopted in 1851 in connection with traffic to the Great Exhibition, five-shilling return tickets being issued between Yorkshire and London. In spite of these many vicissitudes the Great Northern grew and prospered.

Meanwhile the London and North Western Railway, under Lord Wolverton's able direction, had been expanding in every direction, and the line from Chester to Holyhead, involving the construction of Robert Stephenson's magnificent tubular bridge across the Menai Straits, also the smaller tubular bridge across the Conway, had been built. Stephenson had at first intended to construct a cast-iron bridge across the Menai Straits, but this idea was frowned on by the Admiralty, and it is reported that his idea of tubes was influenced by a mishap to a steamship which was being launched at Blackwall. The ship, instead of being floated, hung for the whole of its length between the water and the wharf and was not apparently damaged by being in this position. However that may be, it was decided to construct

the bridge of two tubes, and enormous workshops were built near the Straits for the fifteen-hundred men engaged on the work, which took four years to complete. The bridge, which was made of cast-iron boiler plates, was said to have had two million bolts used in its construction. To fulfil the requirements of the Admiralty and allow of the free passage of ships, the centre tower, which was built on the Britannia rock, the presence of which had been the deciding factor in determining the site of the bridge and had given it its name, was 221 feet high, the tower on either side being 212 feet; the tubes were floated into position by means of pontoons. The Britannia Bridge cost over £500,000, while the smaller Conway Bridge, which was also constructed of two tubes, cost £110,000.

Though working in close agreement with the London and North Western Railway, the Chester and Holyhead was not actually absorbed until 1858. Crewe, which formed the nodal point of the former company's system, became the scene of its locomotive shops in 1843, a move made by the Grand Junction prior to amalgamation, and the son of Richard Trevithick was placed in charge of them. Prior to 1850, by taking over small independent lines, the London and North Western had penetrated to Huddersfield, Dewsbury and Leeds, as well as strengthening its position in the Manchester area; in the south it had tapped the traffic of Aylesbury, Oxford, Leamington and Northampton, while the Trent Valley line, opened before 1848, provided it with a by-pass from Rugby to Stafford, thus enabling fast trains to avoid Birmingham. The London and North Western was also extending its sphere of influence along the Welch Marches, though it was not until the 'sixties that the Company, jointly with the Great Western, took over by lease the Shrewsbury and Hereford.

The broad-gauge South Wales Railway, later to be absorbed by the Great Western, reached Swansea in 1850

and Milford Haven six years later; in the Cardiff area was staged a miniature battle of the gauges, as the much earlier Taff Vale Railway had been constructed on the standard gauge, being an evolution of the tram-line for coal transport in that district, which had witnessed Richard Trevithick's first experiments with a steam locomotive about fifty years previously. The broad-gauge South Devon line, absorbed by the Great Western nearly thirty years later, had reached Millbay, Plymouth, just prior to 1850, but the Cornwall Railway, also of broad gauge, did not provide the through extension to Truro until 1859, the Royal Albert Bridge at Saltash not being completed until February, 1859. Beyond Truro, however, the standard-gauge West Cornwall Railway, which terminated at Penzance, had been opened in 1852; this line was taken over by the Great Western in 1878, and for some years after 1860 possessed a mixed gauge, so that the broad-gauge locomotives and rolling-stock of the South Devon could work trains right through to Penzance. To the north the Great Western broad-gauge main line had reached Birmingham via Banbury and Leamington in 1852; and a mixed-gauge line ran northwards from Birmingham to Wolverhampton. Thus by 1854 the Great Western had penetrated far into the precious preserves of the London and Birmingham, or rather of its successor the London and North Western. The company which had to bear the brunt of the war between the standard and broad gauge systems was the Oxford, Worcester and Wolverhampton, commonly known as the "Old Worse and Worse", which was formed under Great Western influence to build a line of ninety-seven miles connecting Oxford via Worcester with Wolverhampton. The Act for this line, which received the Royal Assent in 1845, contained two clauses round which the bitterest struggle was to be waged for some years—the line was to be constructed to the satisfaction of the engineer of the Great Western Railway, and it was to be of such

gauge that it could be worked continuously with the Great Western, in other words, broad, gauge. But so powerfully had the standard gauge interests opposed its passage through Parliament that a clause was inserted to the effect that where it made a junction with the Birmingham and Gloucester at Abbot's Wood and at the proposed junction with the Grand Junction near Wolverhampton it was to be of standard gauge, that is to say, at these points a mixed gauge was to be laid down. The line was leased to the Paddington interests and proved to be a source of continual annoyance. The board of directors of the Oxford, Worcester and Wolverhampton had apparently never had any intention of running the line as anything but a narrow-gauge railway, and in fact the only broad-gauge train that is known to have run on any section of the line south of Priestfield was that of Captain Galton, of the Board of Trade, on his visit of inspection before the opening of the Wolvercot Junction to Evesham section in June, 1852. Captain Galton had previously inspected this portion of the line but had been informed by the Company that his broad-gauge train could not proceed with safety as only the narrow-gauge rails were properly packed! This extraordinary state of affairs continued; a broad-gauge line was laid on the section from Dudley to Evesham, but since it was only laid on the down line Captain Galton once more reported that the line was unsafe for traffic and postponed the opening. This, however, did not deter the Company from opening the line for traffic, while a continuous correspondence was kept up with the Board of Trade. The same fight continued over each section, until finally the line was sanctioned by the Board of Trade in March, 1855, after the up line of the Evesham to Handborough section had been closed for a year, until the Company should have fulfilled the required regulations for a mixed gauge. Actually, for thirty-seven miles of the line, from Brettell Lane to Evesham, the double track was of standard gauge only, since only

the down line had a third broad-gauge rail and there were no crossing-places. Finally, in 1858, the Great Western gave up its long fight to gain the assistance of Parliament in compelling the Oxford, Worcester and Wolverhampton to run its line as a broad-gauge one; peace was finally brought about when the Great Western agreed to lay a third rail for the use of standard-gauge trains running into Paddington, and thereby kept the allegiance of the Oxford, Worcester and Wolverhampton, which, having amalgamated with the Worcester and Hereford and the Newport and Abergavenny Railways, became in 1860 the West Midland Railway, its first train running into Paddington in August, 1861.

North of Wolverhampton the Shrewsbury and Birmingham had been opened in 1849, only to be swallowed up a few years later by the Great Western, which, however, could not obtain complete control of the Shrewsbury traffic because the Wellington to Shrewsbury section was owned jointly with the Shropshire Union Railway and Canal Company, of which the London and North Western had obtained a lease in 1847. North of Shrewsbury the Great Western again took the offensive and absorbed the Shrewsbury and Chester, at which cathedral city a station, owned jointly with the London and North Western, had been opened in 1848. During the year of the Great Exhibition, when all eyes were turned towards London, the Shrewsbury and Birmingham and the Shrewsbury and Chester had obtained the right to run trains over the Chester and Birkenhead, so that when the Great Western reached Chester, they obtained immediate access to the west bank of the Mersey estuary, though the Birkenhead Company was forced to cancel this agreement as a result of pressure from the London and North Western, with which line it had previously worked in close agreement. The end of this dispute finally came about in 1861 when the line became the joint property of the London and North Western and the Great Western Railways, as did the Lanca-

shire and Cheshire Junction Railway, by which the Great Western forced its entry into Lancashire and Warrington. Seen in perspective this northerly push of the Paddington interests appears as a succession of master-strokes of policy, which must have proved exceedingly annoying to its competitor, the London and North Western; but, if the Great Western won on points of access, it lost on the question of gauge, for broad-gauge trains never appear to have penetrated north of Wolverhampton, and the expense of a mixed gauge between Wolverhampton, Birmingham, Banbury and Oxford must have been a cause of great annoyance, not only to those responsible for track-maintenance, but also to those responsible for the operation of the services.

On its southern boundaries the Great Western assisted the formation of, and finally took over in 1850, the Wilts, Somerset and Weymouth Railway, and thus the broad gauge reached Yeovil in 1856 and Weymouth, where the Channel Island traffic could be tapped, in 1857. This line was converted to standard gauge, one of the earliest Great Western sections to suffer conversion, in 1874. But the penetration of the Paddington interests to Dorchester and Weymouth brought the Company into fierce competition with the London and South Western Railway, which reached Salisbury in 1857. Its entry into Weymouth had been effected in 1856, with the result that the last few miles into that town were constructed on the mixed gauge so as to accommodate both Great Western and London and South Western trains. The Reading branch of the London and South Western had been opened in the previous year. Reading provided an interesting instance of the gauge problem; it was situated on the broad-gauge main line of the Great Western, but a standard gauge branch of the London and South Western approached it from the east, while on the west there existed, and still exists, a loop by which trains from the North to Basingstoke and Southampton can avoid reversing in the

Great Western station. As early as 1846 this loop had been equipped with the mixed gauge, so that standard-gauge trains could traverse Great Western broad gauge territory between Oxford and Basingstoke, at which point they could enter on the standard gauge of the London and South Western Railway. Thus at Reading in 1857 the two sections of standard gauge were only a mile or two apart, but with no connecting line to join them.

If the London and South Western Railway was occupied with a gauge battle on its western front, it was also engaging in a serious competitive problem on its eastern flank, in the neighbourhood of Portsmouth, a town which was, at any rate, well chosen for warlike activities. The greatest strife occurred in January, 1859, at Havant, near which the metals of the London, Brighton and South Coast Railway, the later title of the London and Brighton, joined those of the newly-opened London and South Western route via Guildford and Petersfield to Portsmouth. Just prior to the opening day the London and South Western had announced their intention of running a freight-train over the line to Portsmouth, which the Brighton Company decided to oppose by force. The London and South Western had originally invited the Brighton Company to assist them in running this direct route to Portsmouth; this offer was refused, but apparently the idea that the London and South Western should run it by themselves was bitterly resented, and when the goods train arrived at Havant it was discovered that the Brighton faction had removed the points of the cross-over and placed an engine on the crossing. The London and South Western Company had been prepared for some such action and had arrived with about a hundred navvies on board, who forcibly removed the obstruction. But by the time this was effected a force of opponents had arrived and, though the South Western train was already on the crossing, a fight did not seem worth while, and the South Western

contingent returned with their goods to Guildford. The Brighton Company attempted to obtain an injunction against the South Western running trains into Portsmouth but was defeated, and the line was opened for traffic on January 24th. As with so many railway wars, the final agreement was a compromise, both railways using the line into Portsmouth jointly, with the London to Portsmouth traffic receipts pooled on the basis of 66 per cent. to the London and South Western Railway and 33 per cent. to the London, Brighton and South Coast.

The title of the London, Brighton and South Coast Railway dated from 1846, when the London and Brighton absorbed the London and Croydon, which had, presumably, been financially weakened by its expensive flirtation with the atmospheric system on the Forest Hill section. By an extension through Lewes the Brighton company had extended its network to St. Leonards in 1846 and two years later had completed its route to Portsmouth Town through Chichester and Havant, the very same year that the London and South Western Railway reached Portsmouth via Cosham, by a branch from its Southampton line. The same year also witnessed the Brighton's entry into Horsham from Three Bridges, but it was many years before the main line, passing through that Sussex market town, was completed to Portsmouth from London. By agreement with the South Eastern Railway the Brighton company's trains commenced running into Hastings in 1852, but three years previously the line had been finished to Newhaven, to which the steamer services to France had been diverted from Brighton. The line to Uckfield was opened in 1858, and railway facilities were given to Leatherhead and Petworth the following year, but the stand-by of the Company so far as receipts were concerned continued to be the London and Brighton main line, on which greatly improved train services had been introduced since the early 'forties.

The book of Bye-laws, Rules and Regulations to be observed by The Officers and Servants of the London, Brighton and South Coast Railway Company, dated January 1857, contains many rules and regulations which would be anathema to the passengers as well as to the railway employees of to-day, and one or two examples may be quoted, which can be regarded as typical of many railways in the period now under review.

"No servant is allowed to receive any gratuity from the public, on pain of dismissal."

"No intoxicated person must be allowed to travel by any train, and care must be taken not to book any persons in liquor."

"The Drivers of Trains or Engines running on Lines side by side, as between Norwood and London, are strictly forbidden to race one against the other."

"On Sunday, Christmas Day, and Good Friday, no Train or Engine is allowed to pass upon the Lines between London and the Bricklayers' Arms junction, between the hours of 11 a.m. and 1 p.m."

"In all cases of detention or stoppage, it is the duty of the Guards to explain to passengers the cause thereof, and if there is no danger to them, to satisfy them of that fact, and endeavour to pacify those that may be annoyed."

"Dogs are not allowed to travel in the compartments of the Carriages appropriated to the Public, but they must be placed in the Dog Boxes or other places provided for them."

The Brighton's easterly neighbour, the South Eastern, had extended its Ashford to Canterbury branch to Margate and Ramsgate by the end of 1846, and by 1851 also a southerly extension had been completed from Ashford to Rye and Hastings; thus the station at Ashford, still an important market town, handled all the rail traffic from the Kent coast to London until 1861, when the London, Chatham and Dover's competing line to Dover through Faversham was

opened. In 1847 the South Eastern Railway had set up its works there, having previously shared repair-shops with the London and Croydon at New Cross, though the first new engine was not turned out at Ashford until 1853. Sixty years later the London, Chatham and Dover Railway's workshops at Longhedge, near Battersea, were finally closed and the work concentrated at Ashford, whilst in recent years the repairs to the Brighton Railway's engines—now the Central Section of the Southern Railway—have also been largely concentrated at Ashford.

The South Eastern had obtained a lease of the little Canterbury and Whitstable in 1844, and absorbed it completely in 1853, while in 1845 it took over by lease the London and Greenwich, two years later undertaking the working of the Gravesend and Rochester. In order to connect this latter line with its main system it commenced the construction of the so-called North Kent line from Woolwich to Gravesend; this connection was completed just before 1850, and a through route established via Strood, Maidstone and the early branch from Paddock Wood to Ashford and Dover in 1856. Meanwhile, the direct route to Hastings from Tonbridge had been finished in 1852, the same year in which the Company had absorbed the Reading, Guildford and Reigate Railway, which cut right across the London and Brighton territory, bringing the South Eastern into direct communication with the London and South Western Railway at Guildford. In 1853, just at the moment when the South Eastern Railway was apparently about to establish a monopoly of rail traffic in Kent, the East Kent, between Faversham and Strood, was completed. This comparatively insignificant rival, which later became the London, Chatham and Dover, energetically pushed its extensions along the northern coast of Kent, finally reaching Dover in the early 'sixties, but the story of the cut-throat competition between these two railways properly belongs to the decades which

follow the one under review in this chapter. It is, however, appropriate to mention here that the famous Doctor Samuel Smiles, who wrote "The Life of George Stephenson", was secretary of the South Eastern Railway during the 'fifties; the writing of his various books does not seem to have prevented him from giving his full attention to the work which the rapid development of his company must have thrown upon him.

North of the Thames estuary the railway system of East Anglia was being steadily built up during the 'fifties, the Eastern Counties having absorbed several lines in Norfolk in 1852 and taken over the working of the Eastern Union in 1854. Just before 1860 the completion of the East Suffolk line through Woodbridge to Yarmouth had opened up a very extensive agricultural area to rail traffic, but the formation of the Great Eastern Railway, which combined the various lines in East Anglia into one monopoly, did not take place until the early 'sixties.

Since 1858, by agreement with the Great Northern Railway and due, doubtless, to some extent to the departure of Hudson from railway politics and diplomacy, the Midland trains had obtained an entry into London from Hitchin, the link consisting of a line from Leicester via Kettering and Bedford. To-day the erstwhile main line between Bedford and Hitchin is a comparatively unimportant branch. In the south-west the Midland had finally succeeded in getting its standard-gauge trains into Bristol in 1854, and two years earlier it had attained Morecambe Bay from Skipton, by an agreement with the "Little" North Western, thus making possible the later activities of the Midland on the Irish Sea and in Ulster. The scheme of amalgamation between the Midland Railway and the London and North Western which was mooted at this time fell through completely, public opinion by this time having crystallized quite definitely in favour of preserving competition, and the Midland, thus

cheated of its hope of attaining access to London by means of the London and North Western, had to turn elsewhere; this led, automatically, as the only alternative, to its agreement with the Great Northern. For a short time there seemed to be some chance of complete amalgamation with the Great Northern, but the same difficulty of public opinion, as expressed in Parliament, completely blocked any such proposal; this aspect of railway regulation is more extensively surveyed later in this chapter. To the north of Derby the Midland was beginning to experience competition from the Manchester, Sheffield and Lincolnshire, which at this period extended from Manchester to the East Coast at Grimsby, making connection with the Great Northern at Retford. In 1858 these last two companies signed the "Fifty Years Agreement", of which one result was the formation of the Cheshire Lines, jointly owned by both companies, the Midland becoming associated as a 33 per cent. partner nine years later. Thus the Great Northern and the Manchester, Sheffield and Lincolnshire Railways had obtained a footing on Merseyside by 1860. Manchester, which had long been regarded with envious eyes by the Midland, thus became a cockpit of railway competition, just as it had witnessed cut-throat competition in the coaching days. Whenever the Midland interests proposed to build a line of their own into Manchester they were met with offers of running-powers over existing lines, and for many years their only entry was the Manchester, Sheffield and Lincolnshire line from New Mills, a line which still carries London and North Eastern and London Midland and Scottish trains.

In addition to the Manchester, Sheffield and Lincolnshire, the London and North Western and the Great Northern, which reached Manchester over the Manchester, Sheffield and Lincolnshire Railway's lines, Manchester was also the headquarters of the Lancashire and Yorkshire Railway which had been incorporated in 1847, the successor through

amalgamation of the Manchester and Leeds of 1836. The Lancashire and Yorkshire possessed by 1850 a system which somewhat resembled a spider's web, and the spider, pivoting on Manchester, lost no opportunity of swallowing stray small lines which remained on the outskirts of the web. Thus, the East Lancashire was combined with the Lancashire and Yorkshire in 1859, which enabled the latter to reach Colne and Burnley, and with the steady growth of the cotton trade in South Lancashire the Lancashire and Yorkshire was able to build up a very important and lucrative traffic on its extensions which served the majority of the cotton centres. This amalgamation of the East Lancashire and the Lancashire and Yorkshire was, like many others of this period, very strongly opposed, though it was admitted in the "Railway Times" of the period that "neither the mischief which the London and North-Western has inflicted nor the loss that the Great Western is suffering, can be repeated by the amalgamation of the Lancashire and Yorkshire and the East Lancashire". The Great Western instance referred to that company's agreement with the railways known as the Shrewsburys. In spite of opposition the Lancashire and Yorkshire extended its activities, and later stretched from the Mersey to the Humber; from its earliest days as the Manchester and Leeds it had been in close touch with the York and North Midland and the Leeds Northern.

Amalgamated with the York, Newcastle and Berwick in 1854 to form the North Eastern Railway, the two last-mentioned companies had already had a comparatively long history. It will be remembered that the York and North Midland had provided the connecting link between York and the south and had been opened in 1840, thanks very largely to the energetic backing the proposal had received from Hudson. During the 'forties it had extended its influence by absorbing the Leeds and Selby and the Hull and Selby as well as the early Whitby and Pickering; at the

same time it had been constructing extensions of its own to Bridlington, Leeds and Harrogate. Thus by the early 'fifties the York and North Midland from a small and unpretentious beginning had blossomed out into a very important entity. The Leeds Northern, hitherto known as the Leeds and Thirsk, was of minor importance, while the progress of the York, Newcastle and Berwick has been outlined already in a previous chapter: the amalgamation of these three lines virtually placed the whole area between Newcastle, Hull and Leeds in the hands of a single company, though the rounding-off of the system by the acquisition of the Newcastle and Carlisle and the early Stockton and Darlington Railway was not completed until 1862 and 1863 respectively. The alternative route to London from Berwick via Normanton and Derby had been duly recognized in the so-called pool of English and Scottish traffic in 1856, but, in practice, very little London traffic still followed this comparatively circuitous route by 1860, a year in which the East Coast partners, the Great Northern, the North Eastern and the North British Railways, arranged to provide a special stock of carriages for the through expresses between King's Cross and Scotland. The North British at this time, however, consisted only of the line from Berwick to Edinburgh, and it was not until the next decade that, by a series of amalgamations, it became sufficiently powerful to challenge its rapidly growing rival, the Caledonian, which had most of its activities centred on Glasgow, while the North British was naturally interested mainly in the Edinburgh district, where it had absorbed the aged Edinburgh and Dalkeith.

Having surveyed in brief the physical growth of the British railway system during the ten-year period 1850-1859, it is time to study the repercussion of the rapid spread of railway construction and the various proposals for amalgamation upon public opinion, presumably reflected with reasonable accuracy by Parliament. Though the London

and North Western and the Midland were unable to bring about their own amalgamation in 1852, it is clear from the formation of the North Eastern Railway two years later that the House of Commons was not wholly against amalgamations as such. It may have been that the scene of action in the latter instance was further from London or that the companies concerned were not considered sufficiently powerful to give any real cause for fear, but a close study of London and North Western and Midland politics in the early 'fifties suggests the conclusion that the more probable cause of failure to bring about amalgamation was primarily of an internal and not an external nature. The same applies to the London, Brighton and South Coast and the London and South Western Railways, which at the same period were reported to be considering amalgamation. The Brighton company at that time possessed a very able chairman, by name Samuel Laing, who in 1853, in evidence before a Select Committee, made some very remarkable statements with regard to the inefficacy of early control, or rather lack of control, by Parliament of railway construction. Mr. Laing had previously been an officer of the Railway Department of the Board of Trade, and in 1841 had signed a report stating that "it is indispensable that the department entrusted with the supervision of railways should have the means of obtaining full information on all points connected with the working of the railway system". Hence it cannot be claimed that his views had changed materially in the intervening twelve years.

The fourth report of this Committee, known as Cardwell's Committee, was issued in April, 1853, and definitely regarded continued amalgamation as undesirable, though probably inevitable, since competition could only result over a long period in some sort of close working agreement, if consolidation of interests was not permitted. However it appears that the Committee, which was a very strong one,

would have preferred the former to the latter alternative. The immediate result of the Cardwell Report was the passage in 1854 of the Railway and Canal Traffic Act, probably the most outstanding piece of railway legislation since the Railway Clauses Act of 1845. Indeed this Act is a very notable landmark in British railway legislation, since it laid down the two important principles that railways must offer reasonable facilities and also that they must not show undue preference as between one trader and another. Introduced by Cardwell, and, consequently, sometimes referred to as the Cardwell Act, this Act bore little resemblance to the recommendations of the Committee's report of the previous year. The two main principles embodied in the Railway and Canal Traffic Act of 1854 set up a standard of regulation of rail-transport which in due course was followed at varying intervals of time in all important countries abroad. An Act of 1858 amending the law relating to cheap trains and an Act of 1859 permitting the railways to settle their differences with other companies by arbitration were the only other items of important railway legislation during the remainder of this decade; it was not until 1863 that one finds an Act reaching the Statute Book amending the Railway Clauses Act of 1845.

The Postmaster-General's third annual report, covering the year 1856, shows how useful railway extensions were proving as a means of providing better postal services. Thus during that year one more town each week was given day mail service with the Metropolis, though conditions were by no means perfect; for it appears that, although the mails from Wick, Thurso and Northern Scotland were supposed to arrive earlier in London, the benefit had been considerably impaired by irregularities on the railway, owing to the excessive length of the trains in the crowded seasons. The parcel-post service on the Great Northern was the object of particular commendation, and a similar arrangement, though

on a small scale, for conveying mail-bags at parcel rates had been made with the Brighton, the South Eastern and the North Eastern Railways. Punctuality was, nevertheless, far from good, and the Postmaster-General makes considerable complaint of this feature of the service, though the North British appears to have been blameless in this respect, due in part to the comparatively low speed of its mail trains —twenty-five and a half miles an hour including stops—and in part to the system of extra pay for regularity, which all the other railways had refused to adopt. The extended use of travelling post offices had materially improved the speed of the mail services, the extent of which covered 61,000 miles daily, an increase of 2,600 over the previous year; of this total mileage for the United Kingdom, 28,692 was by rail, at an average cost of 9¾d. per mile, and 32,721 miles by coach, omnibus or mail-cart, at an average cost of 10¼d. per mile. In the following year, 1857, the Government introduced a Bill to make further provision for the carriage of mails by railway, concerning which a notice was sent by Thomas Coates, of Parliament Street, to the secretaries of the various railways, closing with the following two paragraphs: —

"I have given you a very imperfect outline of this bill, which, from the extraordinary confusion of its language, I do not pretend fully to understand; but I hope I have said enough to convince your company of the necessity of acting promptly in the matter.

"As usual with all these bills affecting the interests of railway companies, it is introduced at the end of the session, when the vigilance of the members is lulled, and their continued attendance necessarily insecure". The railways opposed this Bill strongly, and Mr. Love, Chairman of the Eastern Counties, addressed an appeal to every member of the House of Commons to prevent its second reading. His case rested on the enormous capital of

the railways, namely £300,000,000, which might be seriously affected, as one of the clauses laid down a scale of mail payments of only ¾d. per mile for every 112 pounds, and on the damage likely to ensue to the travelling public " and the large interests connected with sundry articles of food (fish, etc.) which are of a perishable character ". Apparently there were many abuses within the Post Office at this time which might have been made the subject of legislation. One very serious complaint made by the railways was that the Post Office entered into contracts with them for fair and moderate charges, which it then promptly repudiated, the charges being made the subject of arbitration. The " Railway Times " of November, 1857, goes so far as to say: " By this discreditable course of conduct the payments for conveyance of mails are withheld. Companies are kept out of their income, while the Post Office issues its balance-sheet, showing that an immense increase of business is conducted at a lower rate of cost each succeeding year ". It is not, therefore, surprising that the railways strongly opposed the Bill of 1857, which did nothing to remedy this state of affairs. They were successful in preventing its passage, but a new regulation was made in 1857 which provided that a " book-packet " which did not contain anything in the nature of a letter might consist of any number of either printed or written sheets; the packet was not to be more than two feet in any direction, but might " consist of books, manuscripts, maps, prints with rollers, or any literary or artistic matter ".

Another proposal of the Postmaster-General's that the packets of the English and French Governments should divide the Calais and Boulogne " stations " equally between them also came to nothing, as the French Government refused to remove any of its steamers from Calais. Since it was not considered desirable for the British boats to continue to undertake the whole of the service between Dover and Boulogne, the evening mail from London and Paris,

which was the heaviest, was transferred to the Dover-Calais route, in spite of the longer distance by sixty miles. Apparently the whole of the passenger traffic had passed to the Boulogne route at this time, and the French Government desired that Calais should retain some share in the cross-channel traffic. At that time much of the capital of the Boulogne and Amiens Railway was held in England, and, since that company only received seventy-five centimes per kilometre for the mail trains, international relations entered deeply into this matter, for the mails, if sent by Calais, were taken to Paris by the Nord Railway via Lille and St. Quentin.

Though a period of great railway development, the ten years 1850 to 1859 saw little development in road or inland water transport other than their gradual replacement by the rapidly extending railways. Hence this chapter is of necessity almost entirely devoted to the study of railway growth and expansion, and it was not until the close of the next decade that there were important signs of road revival, with the coming of the bicycle. By the year 1860 the importance of the railway system, as measured by traffic receipts, had virtually trebled, as compared with the figures which are given in the statistical returns issued by the Railway Commission and covering the railways of Great Britain and Ireland for the years ending June 30th, 1846, and June 30th, 1847. These returns must be amongst the earliest statistical returns covering the British railways published officially by Government order, since the Commissioners were only appointed by an Act of 1846. A few figures may be reproduced from them as a useful record. During the twelve months ended June 30th, 1847, the railways had carried 51,352,163 passengers, their receipts from passenger traffic amounted to £5,148,002 5s. 0½d., and from goods, cattle, carriages, parcels, mails, etc., to £3,362,883 19s. 6¾d., or a grand total of £8,510,886 4s. 7¼d. Figures for 1860,

which are probably not comparable on a strictly statistical basis, are, nevertheless, sufficiently illuminating as showing the enormous growth of the railways during those thirteen years. Gross receipts in 1860 exceeded £27,000,000, and the number of passengers totalled over 160,000,000—a three-fold growth; the net receipts amounted to more than £14,000,000 on a paid-up capital of well over £300,000,000. When it is realised that nearly 90,000,000 tons of merchandise and minerals were conveyed by rail in the United Kingdom during 1860, it will be acknowledged that the railways must have built up their own traffic rather than filched it from their competitors by the roads and canals, who could not even in their golden age have attempted to handle traffic of such proportions.

CHAPTER V

1860—1869

RAILWAYS, TELEGRAPHS AND OMNIBUSES

If the 'thirties and 'forties may be regarded pre-eminently as the era of railway construction, the 'fifties and the 'sixties might equally be called the age of amalgamation, and, consequently, of increased financial stability for the railways. Amalgamation of several railways into one large group spreads the incidence of trade depression in any individual industry over a wider territory; it may be compared with the theoretical conception and principles of insurance. This method of spreading trade risks has been of equal, if not of even greater, advantage during the ten years since 1923 than the actual economies of physical amalgamation; but any discussion of that problem belongs to a review of transport in the twentieth century rather than to the story of the smaller scale amalgamations of the 'sixties. Nevertheless, the spread of risks and the economies of consolidation even in that era were by no means negligible factors, and the lack of such a policy, which was notable by its absence in the case of the Kentish lines, became patently obvious towards the end of the nineteenth century, when the force of circumstances finally drove the competing South Eastern and the London, Chatham and Dover Railways into the very closest working agreement short of complete amalgamation.

There is plenty of evidence that public opinion in Kent, during the period to which this chapter relates, was as much in favour of competition as those responsible for the management of the two railways concerned, and few better examples

exist to demonstrate the economic truth that, whilst over a short period the service offered to the public might improve as a consequence of competition, over a long period the public stood to lose very seriously, and the longer the day of reckoning is delayed the more painful will be the process of rehabilitation. One can only express admiration for the masterly way in which the Southern Railway of to-day has grappled with the problem of duplicate facilities and routes in Kent, welding into one coherent whole a mass of redundant way and works, thus succeeding in making many such lines comparatively profitable, either by electrification or by the construction of loops to divert trains from lines overburdened with traffic to lines which had previously been scarcely a paying proposition. "Punch" is believed to have remarked in connection with this agreement between the South Eastern and the London, Chatham and Dover that "two wrongs do not make a right"; nevertheless, their fusion laid the true foundation of improvement.

The London, Chatham and Dover had commenced life as the East Kent Railway, the more familiar title dating from 1859, and had reached Canterbury and Sheerness in 1860 and Dover in 1861, to which it ran trains in connection with the boats which competed with its rival's connecting service from Folkestone to Boulogne. Entry into London was effected by a nine hundred and ninety-nine years lease of the Mid Kent Railway, and then over the West End and Crystal Palace Railway to Battersea, whence the Victoria Station and Pimlico Railway was used to reach a temporary station at Victoria. To compete satisfactorily with the South Eastern, which had completed Charing Cross Station in 1864, the Chatham opened its city station at Ludgate Hill in the same year, to which scheme the South Eastern replied with an even better situated terminus at Cannon Street in 1866, and in order to cut down the times of its trains to Dover, constructed the much shorter route between Tunbridge—later

changed to Tonbridge—and New Cross, which materially shortened the circuitous route via Redhill; the new line, which was heavily graded and involved certain long tunnels, was opened throughout in 1868. The battle between these two comparatively small companies had begun in earnest and was destined to continue for another thirty years. Virtually all the towns in northern Kent could be reached by either line, since the Kent Coast Railway, amalgamated with the London, Chatham and Dover in 1871, attained Whitstable in 1860, Margate and Ramsgate in 1863, Maidstone in 1874 and Ashford, the holy of holies of the South Eastern Railway, in 1884. How different the later railway history of the country south of the Thames would have been if the policy adopted in East Anglia had been followed by the powers that guided Kentish railway managements during the 'sixties!

Whatever dreams the Eastern Counties may have possessed in the days of Hudson of some day becoming the southern section of the East Coast route to Scotland they had vanished spectre-like by 1860, at which date King's Cross had become the recognized starting-point for the Humber, the Tyne and the Tweed. Even in recent years carriages labelled "York" have traversed the line of the old Northern and Eastern via Cambridge, Ely, March and Lincoln, but the "Cathedral Route" to the North is but the ghost of plans that went astray, and the more normal route can at least claim Peterborough. The Eastern Counties, therefore, which had leased the Northern and Eastern in 1844, deprived of its aspirations, determined to form a monopoly for itself in East Anglia, which it started to accomplish in no uncertain manner by amalgamation with the Eastern Union, serving Ipswich and Colchester, the East Anglian, serving the Ely district, the East Suffolk, stretching along the coast to Yarmouth, and the Norfolk Railway, which linked Brandon to Lowestoft and Yarmouth. The title taken by this combination of lines was the Great Eastern, and this com-

pany virtually possessed monopolistic powers so far as rail transport was concerned in East Anglia as early as 1863. The chairman of the Great Eastern was the Horatio Love, of the Eastern Counties, who had offered such strong opposition to the Government Mails Bill a few years previously. As the country it served was agricultural, it is not surprising to find that practically 50 per cent. of its receipts in 1862 were derived from passenger-train traffic.

In the meanwhile the Great Northern, under Mr. Denison, who seems to have played a leading part in the railway politics of this period, had been turning a deaf ear to the suggestion that, jointly with the London and North Western Railway, it should take over the Manchester, Sheffield and Lincolnshire, at that time under the astute direction of Mr. Watkin. The terms of the fusion had actually been discussed in 1860, and a final agreement was at last reached, but Mr. Denison, who received the news whilst in bed with gout at Doncaster, succeeded in reversing the decision of his board, and in January, 1861, the Manchester, Sheffield and Lincolnshire was advised that the Great Northern could not agree to discuss the matter further. Mr. Watkin, much chagrined at the result of the negotiations, almost immediately obtained a lease of the South Yorkshire, and this proved a serious blow to the Great Northern, all the more so as strong competition for passenger traffic had developed with the Midland. Congestion at King's Cross, partly due to the heavy traffic for the exhibition of that year, led the Great Northern to give the Midland notice to quit its coal depot, built beside the King's Cross terminus, by 1862, and this somewhat hasty action fanned the flame which later resulted in the Midland's obtaining powers to build its own line from Bedford to a terminus in London, famous to-day as St. Pancras. At this period Mr. Allport was directing Midland policy and it was unlikely that such a veteran, who had been trained by Hudson, would be turned from his determination

to obtain an entry for his line into the Metropolis. The Great Northern and the Midland interests had also clashed in the South Yorkshire coal district; indeed the former company by its rapid extensions during the early 'sixties—for example into Cheshire to tap the salt traffic through its share in the Cheshire Lines; by a proposal to reach Norwich through the acquisition of the Norwich and Spalding, later dropped; and by through-booking to the Victoria Docks in London—had brought itself into conflict with practically all its neighbours. After a long fight Great Eastern aspirations to obtain an entry into the South Yorkshire coalfield and a direct connection with the Lancashire and Yorkshire resulted in the construction of a Great Northern and Great Eastern joint line from March north to Lincoln, which enabled traffic to be tapped from the Manchester, Sheffield and Lincolnshire via Retford and from York and the North Eastern Railway via Doncaster.

The North Eastern had finally taken over the Newcastle and Carlisle in 1862 and the Stockton and Darlington in 1863, but its northern neighbour, the North British, had much more important amalgamations to effect during the 'sixties, the chief being the absorption of the Edinburgh and Glasgow in 1865. Meanwhile the North British had reached the border city of Carlisle three years previously, as a result of the completion of the Waverley route, or Border Union Railway, southwards from Hawick. The same year it had amalgamated with the Edinburgh, Perth and Dundee, so that by 1865 the North British consisted of a 723-mile system. To the north of Aberdeen the early sections of the Great North of Scotland had been constructed on a fan-shaped scheme designed to tap the fishing traffic of the various ports along the coast line from Inverness to Aberdeen. Many small lines had been consolidated to form a coherent whole in 1866, and an unusual feature of this, the most northerly Scottish railway of the period, was that it provided no second-class accommo-

dation even at the time of its first opening in September, 1854, between Kittybrewster and Huntly. The year 1861 had witnessed the amalgamation of two lines centred on Nairn, one from Inverness, opened in 1855, and one from Keith, opened in 1858, which were destined to form the nucleus of the Highland Railway. The amalgamated company, which took the title of the Inverness and Aberdeen Junction Railway, absorbed the Perth and Dunkeld, which had been opened in 1863, and in the same year the line was completed from Forres to Dunkeld. Finally, in 1865 the Company changed its name to that of the Highland Railway, which at Perth connected with the Dundee and Perth, absorbed by the Caledonian in 1863.

The Caledonian during the 'sixties, like its neighbours to the north and east, was rapidly extending its sphere of influence, mainly by absorption or amalgamation. The Scottish Central's line from Falkirk had a northern terminus at Perth, thus providing a link between the Caledonian and the Dundee and Perth and the Scottish North Eastern, which last-named had reached Aberdeen as the Scottish Midland during the 'fifties. The Caledonian absorbed the Scottish Central in 1865 and the Scottish North Eastern, thus consolidating its system between Carlisle, Glasgow, Perth, Dundee and Aberdeen. South of Glasgow, the Glasgow, Paisley, Kilmarnock and Ayr, which had blossomed out into the Glasgow and South Western in 1850, amalgamated in the same year with the Dumfries and Carlisle Railway. The opening of this southern extension provided an alternative route from Glasgow to London via Carlisle, and later acted as an added inducement to the Midland to construct its own line into Carlisle. By amalgamation in 1865 it reached Castle Douglas and Girvan, as well as Kirkcudbright, whilst by the close of the 'sixties it had established itself in a strong position on the south bank of the Clyde, where the shipbuilding industry was growing rapidly.

Thus the policy of amalgamation which had reached its height in the Midlands and north-west of England during the 'forties and in the east and north-east during the 'fifties came to fruition in East Anglia and throughout Scotland during the 'sixties. Indeed, by 1870 the railway map approximated to the outline which has been so familiar to students of transport during the last twenty years, and the names of the vast majority of amalgamated companies of 1870 remained virtually unchanged until 1923, when traditions, nomenclatures, colours and a whole régime were swept away in the flood of post-war enthusiasm as exemplified by the Railways Act of 1921. Naturally, many extensions were being opened during the 'sixties throughout the country, and small lines opened as independent companies were gradually absorbed. For example, the London and North Western Railway, which had finally taken over the Chester and Holyhead in 1858, during the 'sixties followed the same policy in regard to the Bangor and Caernarvon, the Vale of Clwyd and the Conway and Llanwrst, whilst it had worked the Central Wales line from its opening and absorbed it before 1870. By the same year it had engulfed the Brynmawr and Blaenavon in South Wales, and was about to take over the Caernarvonshire Railway, a successor to the Nantlle, a contemporary of the Stockton and Darlington Railway, and the Caernarvon and Llanberis. In the Midlands, the South Staffordshire and the South Leicestershire had become part of the London and North Western in 1867, as well as the Birmingham, Wolverhampton and Stour Valley, while the Cannock Mineral line had been taken over in 1865 and the Cromford and High Peak three years previously. The same progressive policy was applied to the Lancashire area, where the St. Helens, as successor to the St. Helens and Runcorn Gap, was absorbed in 1864, and the Stockport, Disley and Whaley Bridge two years later. In the north similar signs of expansion were evident in the Cockermouth and Working-

ton being taken over in 1866, while the much more important Lancaster and Carlisle Railway, which gave the London and North Western entry to the Border city, had been leased for 999 years from 1859.

It was in 1859 that Brunel died, and during the 'sixties the Great Western was steadily rounding off its system, though spending considerable energy in endeavours to solve its own particular problem created by its two running-gauges. Hereford had been reached from Malvern in 1861, a year which saw the leasing of the West Midland, and in the following year the Shrewsbury and Hereford, from the first of standard gauge, was leased jointly by the Great Western and the London and North Western Railways. The Shrewsbury and Welshpool was taken over jointly three years later. In Cornwall, Falmouth had been reached in 1865, Brunel's famous trestle viaducts carrying the Cornwall Railway and its extensions on from the Royal Albert Bridge at Saltash. As these lines are being penned the last of these famous timber structures is about to disappear, but his Saltash Bridge will remain for many years, as will the Great Western speeds which his foresight made possible. In 1868 the Great Western absorbed the Bristol and South Western Union Railway, which brought into its hands the ferry-service across the Bristol Channel, and paved the way for the construction of the Severn Tunnel in the 'eighties. By 1870 considerable sections of the Great Western had been converted to the standard gauge, for instance, the lines from Aylesbury to Princes Risborough, from Basingstoke to the junction near Reading, and from Hereford to Grange Court near Gloucester. Naturally, those branches which connected with neighbouring standard gauge systems were the first to be converted and the complete conversion of the main line from Paddington to Penzance must be recorded in a later chapter; but the death of Brunel approximately synchronized with the doom of the broad gauge in England, incidentally the widest

running-gauge which has ever been seriously tried for railway purposes. Such conversion greatly simplified through-running with the London and North Western Railway and also with the Midland, which had opened its line to London, St. Pancras, in October, 1868, the same year that trains entered Moorgate Street over the Metropolitan. In 1867, the Midland had effected an entry into Manchester, this connection enabling it also to tap the Liverpool traffic over the Cheshire Lines Committee. By 1870 it had penetrated into Wales as far as Brecon and during the 'sixties had promoted several Bills aiming at the construction of an independent line to Carlisle.

The Midland's expansion to Scotland, to Heysham en route for Northern Irish conquests, to Wales, where Brecon was to prove merely a stepping-stone to Swansea, to Bath en route for Bournemouth and the English Channel over the Somerset and Dorset, a railway jointly owned with the London and South Western Railway, to Norwich en route for the North Sea at Yarmouth was due to the policy of Sir James Allport, who, as Mr. Allport, has been frequently mentioned in earlier chapters. The 'seventies witnessed the flowering of this growing tree, but the fruit did not materialize, at any rate so far as Northern Ireland was concerned, until a considerably later date. By its joint ownership of the Somerset and Dorset the Midland could offer a through-route from Yorkshire and Lancashire to the English Channel at Poole, and this route proved highly competitive with the alternative Great Western service and the London and North Western route via Willesden, whence trains passed on to the London and South Western Railway proper at Clapham Junction, reached over the West London and West London Extension Railways, which were jointly owned. The original title of the West London had been the Birmingham, Bristol and Thames Junction. The London and South Western had reached Exeter via Salisbury in 1860, but beyond the Devon

county town the gauge question again obtruded itself in the case of the Exeter and Crediton and the Crediton and Barnstaple, both of which were originally broad-gauge lines; the South Western, pushing westwards, leased the former in 1862 and the latter in July of that year, laying a mixed gauge so that its trains could reach Barnstaple. Exeter, St. David's, station is almost unique, as the Great Western and the London and South Western trains from London pass each other moving in opposite directions, though there is a similar example on the same line at Plymouth, North Road. The South Western came to Bournemouth from Ringwood in 1870, though Christchurch, at that time the more important town, had been reached early in the 'sixties. Little need be said of the Brighton Railway extensions of this period, except the opening of Victoria Station in 1860, and the opening of the Dorking to Portsmouth line by 1868. After this brief survey of railway construction and amalgamation throughout Great Britain during these ten years, attention must be turned towards the growth of rail facilities in the Metropolis.

On January 10th, 1863, the Great Western Railway's broad-gauge rolling-stock began working over the newly-completed section of the Metropolitan Railway from Bishop's Road, Paddington, to Farringdon Street, which station had been opened with the name of Victoria Street. Originally known as the North Metropolitan Railway in 1853, the Company had been re-incorporated in August, 1854, as the Metropolitan Railway, a name that was to last until June 30th, 1933. The gauge problem once more obtruded itself, this time in the London area, and within the short space of six months the Great Western and the Metropolitan found themselves at loggerheads. The Great Western gave the Metropolitan a mere ten days notice that they would cease to provide rolling-stock for the Metropolitan service, thinking, no doubt, that on such short notice the Metropolitan would be unable to make any arrangements for other

rolling-stock, especially as the Great Western at that time alone possessed broad-gauge carriages, and that consequently the smaller line would have to come to terms. But the Metropolitan, which, as a small company surrounded by more powerful neighbours, has always had to do battle with Goliaths, found allies in the Great Northern and the London and North Western Railways, which supplied sufficient coaches to work the service until the Metropolitan's own rolling-stock had been delivered. These coaches were, of course, of standard gauge, but the railway had originally been constructed as a mixed-gauge line, and great was the chagrin and surprise of the Great Western to find on the morning of August 10th, 1863, a full service of standard-gauge trains working between Bishop's Road and what is now Farringdon Street. The locomotive problem, however, proved the most crucial point, because the Great Northern engines were not equipped for smoke-condensing, as were the Great Western ones so summarily withdrawn; but by good fortune, the Great Northern, under the direction of Mr. Sturrock, its mechanical engineer, had fitted a few of its locomotives with condensing apparatus for working the King's Cross to Farringdon Street service, due to be opened on September 1st, 1863, and these, with additional engines rapidly equipped with a pipe and flexible tube which led from the exhaust pipe to the tender, were now placed in service on the Bishop's Road line. A further difficulty arose for a short time, owing to the defective laying of the third or standard-gauge rail, but after some weeks this was overcome, and on October 1st, 1863, the Great Northern's suburban and City service was begun, trains running through to Farringdon Street from the Great Northern main line, by the connecting link at King's Cross. The similar Midland Railway service was not commenced until July, 1868, a few months before the opening of St. Pancras Station. In celebration of the first through-journey from the Great Northern main line, the passengers

launched a frontal attack on the refreshment-room at Farringdon Street, and in a short time had consumed all its contents. The broad-gauge rail remained in position until 1869, when it was removed, but by that time the Metropolitan standard-gauge metals had spread extensively, the western section of the "Inner Circle" from Praed Street to South Kensington being opened just before Christmas, 1868, and the Hammersmith and City line, owned jointly by the Great Western and the Metropolitan, had penetrated to Latimer Road in the same month.

Eastwards from Farringdon Street the line was completed to Aldgate in 1876, whilst the northerly extension from Baker Street reached Swiss Cottage in 1868, the same year that witnessed the opening of the Aylesbury and Buckingham Railway, which was amalgamated with the Metropolitan in 1891 and forms part of the latter's long extension into Buckinghamshire. The southern section of the "Inner Circle" from Aldgate to the Mansion House, which is jointly owned with the Metropolitan District Railway, was not opened until the 'eighties. The "District" Railway, as it is commonly called, had been incorporated in July, 1864, and the first section was opened from Kensington to Westminster on December 24th, 1868, though traffic could not be carried to the Mansion House until July, 1871.

Another important station to be opened in London in the 'sixties was Broad Street, the terminus of the North London's line from Kingsland, at the end of October, 1865, previous to which date the trains of the North London, originally known in 1846 as the East and West India Docks and Birmingham Junction Railway, had used Fenchurch Street Station. The London and North Western Railway owned a half share of Broad Street Station and always worked in close liaison with the North London, finding it a most useful link between Willesden and the London Docks. In 1908 the London and North Western took over the working and

management of this interesting little railway with its fourteen route miles, and its rolling-stock works at Bow, whence issued a long series of remarkably efficient and, for their day, powerful eight-wheeled, leading-bogie passenger tank engines, which were such a familiar sight in North and East London for more than half a century; the last of this long and honoured line was reported as withdrawn during the summer of 1933. Another interesting feature of the North London's history was that it provided only first- and second-class passenger carriages until 1875.

There were many curious examples of passenger-train service in the London area during the 'sixties and 'seventies; thus one finds London, Brighton and South Coast trains running into Cannon Street on the South Eastern in 1867, as did also trains of the London and North Western. It is possible that these excessively circuitous workings were due to the comparative lack of adequate omnibus services; the rail route, however roundabout, was better than the rumbling omnibus. That the railways at that time were far ahead of the roads in the technique of traffic working may be gathered from the cold reception accorded in 1868 to the suggestion of Mr. J. P. Knight, the Traffic Superintendent of the South Eastern Railway, that mechanical signals should be employed to control road traffic. It is true that the then Commissioner of Police was directed by the Secretary of State to inquire into the possibilities of the idea, and one signal was finally erected at the junction of Parliament Street and Bridge Street, in time for the opening of the parliamentary session in December, 1868. The patentees of this semaphore-type signal were Saxby and Farmer, well-known engineers of that time. The standard was about twenty-three feet high and had three arms for use in daylight which were raised or lowered by means of a handle. When they were raised all traffic came to a stop to allow foot passengers, more particularly Members of Parliament, to cross the road,

and when lowered traffic might proceed, but with caution; a lantern at the top of the mast was lighted at night by gas and displayed a red light for " Stop " and a green light for " Caution ". Apparently this first effort at a traffic-signal for roads was unpopular with the police, largely on account of the expense of gas-lighting, and the standard was allowed to fall into disuse, in spite of the fact that an improved design was brought out by Mr. Knight in 1871.

Just as England was the birthplace of the steam-locomotive, it had also been the birthplace of the railway signal, for as early as 1844, Tyer, a name still honoured in the railway signal world—indeed a firm of this name still, in 1933, manufactures signal apparatus—had introduced experimentally on a line in North Kent electric railway signals, by which the train itself signalled the line clear and signals could be transmitted between stations. Apparently the Great Western and the London and Birmingham Railways, after an early trial, temporarily discarded the telegraph system of Wheatstone and Cooke, but it was not many years before the telegraph came into its own again, and telegraph communication was provided by private companies who came to agreements with the railways to use their rights of way, on which to set up their lines of poles. In 1868, however, by the so-called Telegraph Act of that year, the Postmaster-General obtained powers to purchase and take over the telegraph facilities. This Act embodied due compensation to the railways for the loss they sustained by this action of the State; it was further provided that the railways should take over free of charge all apparatus, such as posts, wires and instruments, on their own lines and canals, in order that the railways might be able to maintain their own telegraph system: to-day they possess on their own right of way a vast network of telegraphs and telephones nearly equal to that of the Post Office itself.

In the early days of the Liverpool and Manchester the

only available signalling system consisted of flags by day and lamps by night, which were held by the pointsmen, sometimes called policemen. They were provided with huts and wore the customary tall hats of the period and long-tailed coats, but by 1835 these human arms had been replaced by wooden posts, a method still further improved upon by the London and Birmingham, which adopted discs and lamps on twelve-foot poles, constructed to turn through ninety degrees so as to face an approaching train by day and to exhibit a red light at night. The " line clear " indication was given with the disc edgeways to the train, a position which permitted the driver to pick up a white light by night; it is of interest that this edgeways disc indication, though hinged horizontally, is still in use for distant signals on the German railway, but in France the vertical hinge is still retained. The operation was effected by means of a lever at the base of the post. The disc design gave way to the semaphore—universally employed in Great Britain until the modern colour-light signal—during the early 'forties, a period which marked the beginning of interlocking, namely the centralization of control of the signals in one cabin with mechanical means to ensure that two signals for opposing routes could not be lowered at the same time. The famous Bricklayers' Arms installation of 1856, the invention of Mr. Saxby, is reported to have been the first instance of point and signal interlocking, which was designed to make certain that the route shown as " clear " by the signal aspects was the same as that for which the points had been set. Three years later the first interlocking frame was installed at Willesden Junction, and so great was the improvement achieved by this method that by 1873 it is on record that no less than 13,000 interlocked levers were in use on the London and North Western Railway alone. During the 'sixties the technique of interlocking had been greatly improved, largely through the excellent work of the famous firm, Messrs. Saxby and

Farmer, whose business later became part of the Westinghouse Brake and Saxby Signal Company of to-day.

It was only by the improvement of the signalling system that the speed of trains could be increased, and, because competition with the coaches had by this time become virtually negligible, one of the chief incentives to faster rail movement was the pressure exercised upon the railway managements by the Postmaster-General. Considerable criticism had been voiced concerning the Anglo-Irish postal service, and to improve matters a special service was inaugurated on October 1st, 1860, from Euston Square Station to Holyhead, which ran in conjunction with special high-speed mail steamers. Thus the regular night and day mail service began. Two years later considerable attention was attracted to the American mail service via Queenstown, when in January news which might possibly mean peace or war was hourly expected from the United States. The "Europa" arrived off Queenstown at 9 p.m. one evening with the important despatches, which were conveyed over the 515 miles from Queenstown pier to Euston Square in three minutes over fifteen hours, the sea-passage being performed by the mail packet "Ulster" and the 130½ miles from Holyhead to Stafford run in 145 minutes, equivalent to 54 m.p.h. Incidentally this run, which was accomplished without any stops, brought to public notice the water pick-up apparatus in the form of troughs, a system still used to-day, which had been invented by Ramsbottom, the London and North Western Railway's Northern District locomotive superintendent.

During the early 'sixties there had been important developments in the Post Office, amongst which was the Act passed during the 1860-1861 session which provided for the establishment of Post Office Savings Banks. A year later the fee for registered letters was reduced from sixpence to fourpence per letter, while the same year witnessed the opening

of a branch of the Pneumatic Conveyance Company at Euston which permitted the transit of mail bags by this means between the station and the North-Western District Office. The postage charge for a British inland letter was, of course, one penny at this time, but mails for foreign countries had to bear much higher charges, and the efforts to better the existing facilities in regard to international postage services led to the holding in Paris, in 1863, of the first Postal Congress for "the improvement of postal communication between the principal countries of the world" at which even Ecuador was represented. By 1864 the British Post Office employed nearly 26,000 officers, of whom about one hundred were domiciled abroad, and of the remainder about 3,500 were in London. The Post Office gross revenue in that year amounted to over £4,000,000, and at that time the Postmaster-General was invariably a Peer of the Realm. Virtually all the mail contracts were absorbed by the railways during the twenty years 1846-1865, and on the London and North Western main line there were eight up mail trains daily, with a similar number of down trains, each, of course, carrying its post office sorting-carriage and its post office sorting-staff; the Scottish mail covered the 451 miles to Perth in eleven and a half hours. The final delivery from the country station, or local post office, was very slow, however; for the rural letter-carrier, the name "postman" was not common at that time if used at all, frequently had to trudge thirteen miles a day, including Sundays, on his long circuit for 10s. 6d. per week. In the words of one of them, Edward Capern; reproduced from Lewin's "Her Majesty's Mails":

"O! the postman's is as blessed a life
As any one's I trow,
If leaping the stile o'er many a mile
Can blessedness bestow.

" If sweating big drops 'neath a burning sun,
And shiv'ring 'mid sleet and snow;
If drenched to the skin with rain, be fun,
And can a joy bestow!

" If hearing the bells ring Sabbath chimes,
To bid us all repair
To church (as in the olden times)
And bend the knee in prayer;

" If in these bells he hears a voice
' To thy delivery!'
God says to every soul ' rejoice ',
But, postman, not to thee ".

How different was his successor's lot in the days of the bicycle! It was in the last years of the 'sixties that the velocipede, as many of the early bicycles were called, came into use on the British highway. Charles Spencer, who claimed to have introduced the bicycle into Great Britain in 1868, wrote a most excellent and entertaining little book about " The Bicycle, its Use and Action " in 1870. Apparently earlier velocipedes had evoked the derision and irreverent remarks of street-boys, but by 1870 the bicycle passed along the streets without undue attention and one reads that " an accomplished velocipedist careering swiftly and gracefully along at a speed of twelve to fourteen miles an hour, excites a feeling of respectful admiration, not totally exempt, perhaps, from a slight tinge of envy ". The bicycle was the only two-wheeled velocipede of note, and Mr. John Mayall, jun., on a Wednesday in February, 1869, so " The Times " records, accomplished the journey to Brighton, with his friends Mr. Spencer and Mr. Turner, all mounted on two-wheeled velocipedes, in time to enjoy dinner by the sea, and the second part of a concert at the Grand Hall after the dinner. The three friends started off at 8 m.p.h. from

Trafalgar Square, where a preliminary run was made round the Square, and in spite of a heavy head-wind made good progress, but after Crawley, Mr. Mayall drew ahead of his friends, and between Clayton and Brighton covered one mile in four minutes. Mr. Spencer, who threaded his way between the City and Harrow-on-the-Hill every day, amongst omnibuses, cabs and drays, claimed that he put extra steam on when the less congested roads were reached, but the "Hill" at Harrow had to be negotiated carefully in wet, foggy or damp weather. The expert of the wheel recommended wheels of hickory with steel tyres and framing of the best scrap-iron, and one must admit that, having covered 2,830 miles in a year, he ought to have known something about bicycles, the prices for which were £12 if required for long journeys or hard wear, and £10 for ordinary use and racing. Mr. Spencer gives strict instructions as to the "graceful" use of the velocipede; one should vault on to the saddle, but dismount by passing the right leg over the handle-bars; it was also permissible to ride side-saddle, to rest the legs by stretching them straight in front, or to fold the arms and steer with the legs only. Suitable clothing was also essential and the following items are particularly mentioned as being "*de rigueur*": —

	£	s.	d.
Thick flannel guernsey of dark colour, from		8	0
Short flannel drawers . . .		10	0
Blue serge trousers to fit tight below the knee and loose above, double seated		15	0
Half Wellington boots with Bordeaux uppers and very strong soles, from .	1	0	0
Stout jacket of blue serge, short, with large pockets inside, none out, and to button close up to the neck . .		15	0

Many bicycles of the later 'sixties were constructed by the Veloce Company, whose catalogue claimed that the velocipede really originated at Lyons, where some celebrated manufacturers of the Celerifere of the 'fifties applied to the front wheel a pair of winches working on axles, and in 1863 a gentleman of Paris practised on their new "velocipede" in the Place de la Concorde and the Quai d'Orsay, accompanied by a friend mounted on wheeled skates. Parisians were puzzled by these apparitions, but the fashion rapidly spread, though Lyons, Grenoble and Chamberry led the way in regard to their use. Veloce front wheels varied from 25 to 40 inches in diameter, as presumably did those of Mr. Charles Spencer, and their control cannot have been easy in the crowded London streets.

Though the "Tilbury" had more or less disappeared by 1850, the dog-carts were in use at this time; they were built to such heights that in the form of a very high tandem gig they became known as "The Suicides". London had also its full complement of Hansom Patent Safety cabs, invented in 1834 by Mr. Hansom, to whose designs the Birmingham Town Hall had been constructed. Lord Beaconsfield once described these vehicles as the "Gondola on Wheels", but the national carriage of the mid-Victorian period was the "Brougham", named after the Lord Chancellor, first built in the year Victoria became Queen, and greatly improved by Hooper in 1845. These elegant four-wheeled vehicles were fitted with bent glasses at the front corners and could seat two or four persons. There were also the "Wagonette", the first one having been built for the Prince Consort in 1842, and the various types of "Landau", which came into popularity in 1842, prices ranging as high as £120 with extra embellishments amounting to £40. During the 'sixties there appeared the first traction-engine, one of these curious objects being exhibited at the Agricultural Show in 1860, under "miscellaneous

articles "! But a few years later the Society offered a prize for the best engine, which was won by Messrs. Aveling and Porter Ltd., who had built the first steam road-roller in 1867. In 1870 the Prince of Wales had brought a cab-phaeton to London from Paris, and these soon become known as " Victorias ", and met with considerable patronage, but the London transport vehicle of the day was the horse-omnibus, greatly improved since the days of Hancock and Shillibeer.

An outside seat was fixed to one of the London omnibuses in 1849, and the passengers on the roof sat back-to-back, this design being known as the " knife-board " pattern; the extra carrying-capacity, though strictly against the law, proved very welcome in 1851 when the Great Exhibition was held in Hyde Park. A fine harvest of receipts was reaped by the bus-owners in that year, but the fares were reduced in 1852, and before 1853 passengers were being carried on buses for one penny. The important landmark of the decade was the formation in 1855 of the Compagnie Génerale des Omnibus de Londres, with offices in Paris and London. The foreign relationship of the Company undoubtedly delayed its progress in London and there were many manifestations of considerable opposition, but, in spite of these difficulties, evolution was rapid and the policy of the Company consisted in taking over large numbers of the small operators and owners; incidentally a policy which its successor, the London General Omnibus Company, has continued for nearly eighty years, until there has now been granted complete monopoly in the London metropolitan area. With only twenty-seven vehicles in operation during the first week of 1856, the Company, which had a French and British directorate, had extended its fleet to over six hundred vehicles by the summer of 1856, and two years later was registered as an English concern under the name of the London General Omnibus Company. In all, there were about eight hundred omnibuses on the streets of London in 1858.

While the 'fifties had witnessed the growth of this large horse-omnibus organization in London, the first horse-trams made their appearance there in the early 'sixties. The first line was opened by Train from the Marble Arch to Notting Hill Gate in 1861, but the rail flanges, which projected above the road-surface, were regarded as a source of danger and a cause of accidents, and, consequently, the line did not last long and was taken up. The 'seventies, however, were to see further experiments with tram services in London, as a result of the passing of the Tramways Act of 1870. The London General Omnibus Company has earned the deep gratitude of Londoners since its formation in 1858, and it is probably this forward policy which was responsible for London's remaining to this day primarily a bus-city rather than a tram-city, as well as making the Company for many years past the largest omnibus-operating concern in the world.

After taking over the many independent proprietors and larger lines such as Messrs. Wilson's Holloway "Favourites", the General company was able to make important improvements in the buses themselves, as well as in the degree of courtesy shown to the passengers by the coachmen and conductors; ex-soldiers back from the Crimean War were employed in large numbers, and for operating purposes the whole Metropolitan area was divided into six districts, some of the proprietors whose interests had been bought up being employed to operate the districts they had previously served. In cases where the independent operators had not been bought up associations were set up in which the Company had an allotment of omnibuses and from which it obtained a share of the profits, an example of such an association being the Atlas and Waterloo. The so-called "pirate" buses of the period 1923 to 1933, more politely termed independents, had their counterpart in the decade 1857 to 1866, and then, as in recent years, their

activities were mainly concentrated on the more profitable routes. Many of the early General bus routes were quite long, and stretched to what are even now regarded as the outer suburbs, but their speed was slow and as the train services steadily improved the number of through passengers grew smaller. Beyond gradual expansion there is little to chronicle in London bus-development between the middle 'sixties and the 'eighties, when the first garden-seat bus made its appearance on the London streets.

There was little interference, either by Parliament or by any local-government body, with passenger transport by road during this mid-Victorian period, but legislation governing the railways was extending materially and, because rail transport had by this time gained almost a monopoly of inland passenger and freight traffic, the general tendency at Westminster was towards control of charges and stricter regulations to ensure the safety of passengers. The inter-railway competition of the 'fifties had very materially brought down fares, or at any rate been the cause of many cheap facilities being offered. Thus a brilliant study, published in 1855, pointed out that an 8s. return ordinary fare on the Edinburgh and Glasgow, covering a distance of 46 miles, had actually been brought down to 1s. for a reduced-fare return-ticket. In spite of their virtual monopoly, many of the railways were far from prosperous at this time, and the London, Brighton and South Coast, which had little competition on its main source of revenue, the line to Brighton, passed through such a difficult financial period in the later 'sixties that a Committee of Investigation was appointed which published its financial report in 1867. On the other hand, in that year, its near neighbour, the London and South Western had declared half-yearly dividends at the rate of $3\frac{3}{4}$ per cent. and $5\frac{1}{4}$ per cent. on its ordinary stock.

During 1863 the Railway Clauses Act of 1845 was amended by the passing of a new Act which paid specific

attention to the problem of working agreements between two or more railways, and after its passage such agreements were only permissible when approval had been obtained from the Board of Trade and the shareholders had given their sanction. The following year witnessed the passage of the Railway Companies Powers Act and the Railway Construction Facilities Act. The latter was destined to be amended in 1870, but, as it aimed at reducing the cost of railway construction by authorizing the Board of Trade to issue the necessary certificate, thus avoiding the need for obtaining the permission of Parliament by an Act, it is reasonable to suppose that feeling at Westminster was not strongly hostile to railways in 1864. The same attitude may be read into the report of the Royal Commission appointed in 1865 to make an investigation into the charges made by the railways; for the Report, published in 1867, though containing a mass of valuable data, recommended no important legislative changes in regard to the railways. Actually the recommendations of the majority report, there being minority reports signed by Sir Rowland Hill and one other member, were negative and suggested that the railways should continue to be permitted to charge what sums they thought best, within the structure of the maximum rates. In other words, competition, in spite of the many amalgamations, seems to have been playing its true part, doubtless assisted by the then growing realization that the prosperity of a railway must depend upon inducing the maximum of passenger and freight movement at the minimum of charges. The scientific principle of railway commercial policy is to design the structure of charges in such a way as to keep to the marginal line which, on the one hand, brings the maximum of prosperity to the community and territory served by the railway system and, on the other, yields the maximum net revenue to the railway administration. Over a short period the two may possibly be in conflict, but over a long

period they are in harmony; the greatest difficulty lies in the fact that this imaginary line is for ever vibrating, and to retain the delicate balance adjustments must be in course of preparation to offset changes in the ebb and flow of trade, commerce and fashion, each of them dynamic and kaleidoscopic in nature. The majority of the Commission frowned upon the suggestion of Government purchase of the railways, but more strict control of railway practice and procedure was regarded as a desirable improvement. The Regulation of the Railways Act of 1868 carried this suggestion into practice, since it called for the submission of more detailed semi-annual statistics and accounts by the railways, and the general form in which they were to be presented to the Board of Trade, as required by this Act, remained without material alteration until amended, or rather, wholly changed, by an Act of 1911, to be mentioned later.

The next important piece of legislation was the Act of 1871, also entitled Regulation of the Railways. Primarily concerned with the problem of safety, it provided for the inspection of all new facilities, such as extensions of lines or stations, by the representatives of the Board of Trade, in other words, the inspecting officers, whose duties were closely defined. Perhaps the most important clauses were those relating to accidents, the reporting of which, whenever a passenger-train was involved, was now made compulsory, as was also the case of any accident likely to have caused loss of life or personal injury. If in their estimation deemed desirable, the Board of Trade could then hold an investigation and call for the production of all relevant books and papers. The recommendations resulting from these accident investigations have been of very material assistance in bringing about that high degree of safety which has long been a proud record of the British railways. Though the Board of Trade had no power to enforce the adoption of the recommendations embodied in its accident reports, in practice many

of them were adopted voluntarily, not only by the line on which the accident had occurred but on many other railways as well.

It must not be supposed that accident inquiries had been of small importance in the earlier years. Very excellent and detailed reports of railway accidents had been published covering the year 1847—they are to be found in the Report of the Commissioners of Railways for 1848—which carried on the general statistical design of the tables previously used by the Railways Department of the Board of Trade. Even at that early date attention is drawn to the difference between train movement accidents and other accidents happening to occur on railway premises, for instance, a missed foothold when descending from a stationary vehicle. At the beginning of 1847 there had been 3,036 miles of railway open for traffic, a figure which had increased to 3,496 by the end of the year, and, although the number of passengers conveyed had increased by 37 per cent. as between the first six months and the second six months of the year, namely to 31,734,607, yet the number of passengers killed or injured through causes beyond their own control fell by 29 per cent. Though the total number of persons killed was 211, only 30 passengers were killed, and only 19 from causes beyond their control; the most serious cases were those at Wolverton, where a train ran into a siding and collided with a coal train killing seven passengers, and on the Shrewsbury and Chester when a bridge over the Dee gave way, with the result that part of the train was precipitated into the river and five passengers were killed.

An interesting book could be written on the various railway accidents which have occurred during the intervening years, many of a unique nature and caused by a curious combination of unfortunate circumstances, but the subject has been so admirably dealt with on its statistical and legislative side by H. Raynar Wilson in his "Railway Accidents

Legislation and Statistics 1825-1924" that there is little which need be included in this chapter. The figures of passengers killed in train accidents vary widely from year to year, but for the ten years 1850-1859 they numbered 147, and during the next decade totalled 237, a serious rise, though it has to be remembered that the volume of traffic handled, both passenger and freight, was rising rapidly at this time. Closely connected with the problem of accidents is that of the claims arising therefrom; many of a most fantastic nature were unfortunately allowed in courts of law, for instance, a case on the Eastern Counties, in which a large claim had been made in connection with an accident at Stratford, though it was proved that the claimant had walked home to Wandsworth Road without help after he was supposed to have been rendered insensible. Boiler-explosions were fairly frequent in the early days of railways, and the unfortunate driver and fireman were usually killed, as in a case at Basingstoke in 1857, when the engine-driver and fireman, who were performing their duties on an engine at the time when its boiler exploded, were thrown, the former forty yards behind the engine and the latter fifty-five yards in front of it. Fortunately no other casualities occurred, but it was nearly half an hour before the bodies could be found. On the Bristol and Exeter in October of the same year an accident was caused by workmen employed in repairing the tunnel at Bourton, who left two trucks loaded with stone on the line. The driver of a passenger-train approaching the tunnel, owing to a sharp curve in the line, did not see the obstruction in time to avoid a collision; happily, though the engine and tender were thrown off the line, no passengers were killed. A curious accident occurred on the Great Western at about the same time: a passenger discovered that one of the seats in his compartment was on fire. While he endeavoured to smother the fire with coats and rugs, the only other passenger in that compartment, a lady, leaned out of

the window and screamed for assistance. It was not before the train had run for some miles that she succeeded in attracting attention, whereupon the carriage was taken off and left to burn out, the passengers escaping unhurt. A disastrous accident occurred at Kentish Town in 1861, when a London and North Western ballast train was run into by a North London excursion, with a resultant loss of sixteen passengers killed and no less that 317 injured. The legislation passed in 1871 no doubt reflected the increasing alarm at the number of fatalities arising from railway accidents, but the peak seems to have been reached during the first five years of the 'seventies, when 213 persons were killed. So disturbed was public opinion on this matter that Queen Victoria in a letter dated October 3rd, 1873, to Mr. Gladstone, then Prime Minister, urged that the Government should take strong measures in regard to this matter, and even went so far as to suggest separate lines for freight-trains, and that a railway director should be forced to go with the trains, which would soon result in a different state of things. A vast improvement had, however, been brought about by the 'eighties.

Practically no mention has been made in this chapter of inland waterways, and, indeed, there is little to record during the period from 1860 to 1869; the railways were pre-eminent, and evidence given before a Joint Select Committee of 1872, which was investigating railway and canal amalgamations, leads one to believe that the railways were then being heavily criticized for their alleged sabotage of canal transport. It was claimed that through railway purchase of essential links in the country's canal system all efforts to improve inland water transport facilities had been stultified. The same criticism is not unknown to-day, and has lasted through the intervening sixty years, but the obverse of this picture is to be found in the evidence given by Mr. Grierson, General Manager of the Great Western Railway, before a

Committee of Parliament in 1881, when he pointed out that in the majority of cases the railways were forced to purchase their canal interests, and that in the case of his own company Parliament itself had made the purchase of several canals the price of the Act to construct the railway. Probably both assertions are equally correct, but the real reason for loss of traffic by the canals was without question the slow speed of movement as compared with the railways, a disadvantage which was by no means offset by their slightly lower charges.

CHAPTER VI

1870—1879

RAILWAYS, ROLLING-STOCK AND LEGISLATION—TRAMWAYS

As compared with 10,433 route miles of railway open for traffic in 1860, 15,537 miles had been completed by 1870, though the latter should not be regarded as statistically accurate, because for the following year, 1871, the returns showed a decrease of no less than 161 miles. Presumably this discrepancy is accounted for by the fact that the returns for 1871 were furnished by the railway companies on forms specifically provided for that purpose by the Board of Trade, whereas the figures for 1870 had been collected from the individual half-yearly statements rendered by the companies to the shareholders. During the ten years above mentioned the number of passengers carried, exclusive of season-ticket holders, had increased from about 163,500,000 in 1860 to approximately 336,500,000 in 1870, and the net receipts of the British railways had risen over the same period from roughly £14,500,000 to over £23,000,000. The traffic density per route mile had, therefore, increased to an important degree, and the network of lines had been rounded off by the addition of many branch lines, more direct routes and the improvement of terminal facilities. Similarly the larger companies had been steadily absorbing the smaller independent lines, and, not content with absorption, had brought about important working agreements amongst themselves.

A specific instance was that of the London and North Western and the Lancashire and Yorkshire in 1862,

whereby much needless competition between the two lines in the Lancashire district had been eliminated, but an even closer union was considered desirable, and, as from the beginning of 1872, it was proposed to set up a united board; so strong however, was the opposition shown to the proposal to set up a virtual rail-transport monopoly in Lancashire and West Yorkshire, both by the commercial and the industrial interests, as well as by the other railway companies, that the Amalgamation Bill resulted in the setting up of a Select Parliamentary Committee to inquire into the whole question of railway amalgamations. With other important proposed consolidation schemes pending, notably those of the Midland and the Glasgow and South Western, and the Caledonian and North British, the Select Committee reported against large-scale amalgamation as a policy, and the first London and North Western and Lancashire and Yorkshire Amalgamation Bill was withdrawn, only to be reintroduced in the following session and to meet with still greater opposition which finally resulted in its being thrown out. It is interesting to note in retrospect that exactly fifty years after the London and North Western and Lancashire and Yorkshire Railways' scheme was first proposed the two companies were amalgamated into one large concern, just prior to the complete grouping of the lines forming the London Midland and Scottish Railway in 1923, the year which marked the inclusion in the same railway system of the Midland and the Glasgow and South Western Railways; this later policy was designed by Parliament itself, and formed part of the provisions of the Railways Act of 1921. In short, railway policy of the 'seventies was half a century ahead of public opinion and political thought, and other cases might be quoted of this unexpected anomaly. What enormous and unnecessary expense might have been saved to the traders, the travelling public and the shareholders if Parliament had not been so slow in visualizing the trend of economic pro-

gress and evolution is a thought as useless as it is melancholy, but it might at least be pointed out that the present London Midland and Scottish Railway would have been able to withstand the post-war years of depression far more adequately, and charges could doubtless have been lower than they have to be to-day in order to keep the financial status of the Company healthy.

In 1871 the London and North Western was extremely prosperous, paying 7¾ per cent. on its ordinary shares, the highest figure touched since 1847; but the demands for new expenditure were everlasting and the enlargement of Euston Station had become imperative, though the scheme was not completed until 1874. Lime Street Station at Liverpool and the Citadel Station at Carlisle were also improved during the 'seventies. In the Midland counties this railway was extending its lines and its influence and with the help of its old rival the Great Northern obtained running-powers into Nottingham and Newark, while the latter line in exchange could penetrate to Northampton and run trains from Market Harborough to Peterborough. To extend its Irish connections the London and North Western opened the Holyhead and Greenore route and took over the working of the Dundalk and Greenore, a line of 5ft. 3in. Irish gauge, in 1873. In the same year through-carriages were run from Euston over the East and West Junction Railway to Stratford-on-Avon, whilst in the Chester, Swansea and Nuneaton districts the North Western improved its position by constructing new lines or taking over existing ones. A few years later the same policy was continued by the absorption of the very ancient Sirhowy, and the, at that time, newly-opened Anglesea Central; by 1877 the Company had acquired the Whitehaven, Cleator and Egremont, from which the line to Sellafield was jointly owned with the Furness Railway.

The Furness, based on Barrow-in-Furness, had been opened in August, 1846, for mineral traffic only, passenger

services being commenced in December of that year and increased with the subsequent opening of branches to the Lakes : in later years the main line of the Furness, starting at a junction with the London and North Western Railway at Carnforth, and passing Furness Abbey, near Barrow, terminated at Whitehaven. From Maryport, in Cumberland, ran the Maryport and Carlisle, originally incorporated in 1837, which, like its southern neighbour, the Furness, gained most of its revenue from mineral traffic. George Stephenson had been engineer for the Maryport and Carlisle, and in 1873 it paid a dividend of 13 per cent., a fact which may have assisted in inducing the London and North Western and other lines to permit its trains to use the new Citadel Station at Carlisle. Always a wealthy line, the £100 stock of the Furness Railway was quoted as high as £160 in 1878, and it never reached a lower level than £120 that year.

Later on in the 'seventies, through co-operation with the Rhymney Railway, the London and North Western succeeded in entering Cardiff, and actually constructed a short line of its own near that city. By 1879 the London and North Western system had practically taken the shape that it retained in 1921, and in the intervening period construction work mainly centred on the improvement of facilities, and the widening of lines where increasing traffic made congestion and delays unbearable.

In many areas it was in strong competition with the Midland, which had completed its own line into Carlisle in 1876, thus forming a third route from London to Scotland. The Midland had expanded greatly during the 'sixties, either by means of running-powers over adjoining railways, by absorption, or by the construction of branch lines, and this policy was continued during the 'seventies, especially in the Liverpool, Manchester and Birmingham districts, as well as in the West of England; thus the Company was enabled to tap

the fruit-growing areas around Malvern, Tewkesbury and Hereford. In Staffordshire the independent North Staffordshire Railway, dating back to 1846, acted as a buffer between the Midland and the London and North Western interests. This small company, now part of the London Midland and Scottish Railway system, spread from Stoke westwards to Crewe and Market Drayton, northwards to Congleton and Macclesfield and eastwards to Uttoxeter; thence by using Midland metals it reached Derby. It was primarily of local importance, one of its most profitable routes being that from Hanley to Kidsgrove, opened at the end of 1875, and although amalgamation with one of its larger neighbours was mooted in 1874 the scheme fell through, and actually it remained independent until 1923. Midland absorptions came thick and fast through its Act of August, 1876, involving the Wolverhampton and Walsall section and the Swansea Vale line amongst others; the latter was reached over the Hereford, Hay and Brecon, leased by the Midland in 1874. But perhaps the most far-reaching development of the Midland in the mid-'seventies was its joint lease with the London and South Western Railway, in November, 1875, of the Somerset and Dorset line, itself an amalgamation of the Somerset Central and the Dorset Central. The connecting-link at Bath, authorized in 1871, permitted Midland trains to run through to the South Coast. The steadily growing power of the Midland caused considerable alarm to the Great Northern, which concentrated on developing its own territory in Hertfordshire and Lincolnshire, though its incursion into Lancashire and Cheshire as a third partner in the Cheshire Lines Committee, which had required a Great Northern contribution of about £1,000,000, ought not to be forgotten.

In Yorkshire the Great Northern also had commitments with the Lancashire and Yorkshire in connection with its entry into Keighley, but the largest piece of construction was

probably that of the Bourne and Sleaford, authorized in 1865. In 1869 the Great Northern had been assailed with the cry " King's Cross roof is tumbling down " and had been forced to spend £13,000 out of revenue on the renewal of the eastern, or arrival, side of the station. During the early 'seventies the Great Northern consolidated its position in the Bradford area, and succeeded in reaching Cambridge via Shepreth. Dewsbury, Derby and the Nottingham district also witnessed Great Northern activities, whilst jointly with the Manchester, Sheffield and Lincolnshire it had taken over the West Riding and Grimsby, which in addition to strengthening its position south of the Humber enabled it to cut twenty minutes off its express-train schedules between London and Leeds.

The Sheffield line, as it was then commonly called, shared with the Lancashire and Yorkshire and the North Eastern the distinction of being the most important provincial railway in England, and, still under the leadership of Sir Edward Watkin, it had profited by the eternal fights between the Great Northern, the Midland and the London and North Western Railways to strengthen its position in the Manchester, Sheffield and Lincolnshire areas. Having paid no dividend at all between 1848 and 1854, its dividend rates averaged about 1 per cent. during the 'seventies, but it was dependent on the London trunk lines for its southerly connections, and this unfortunate position in the end drove it into constructing a southerly extension to the Metropolis. In October, 1877, a proposal was made to transfer the whole undertaking to the Great Northern and the Midland, but the negotiations fell through, and the Sheffield company was forced once again to rely on its own resources and build up traffic largely on lines jointly owned with its more powerful neighbours, as, for instance, the Cheshire Lines Committee.

The most important development on the North Eastern

Railway during the early 'seventies was the completion of the connecting-line with the Great Northern at Doncaster and Selby, thus shortening materially the East Coast route to York and Scotland. The later years of this decade saw the construction of new lines in the coal-mining regions of Durham and Northumberland, as also at the Hartlepools, in addition to enlargements at the New Station at Leeds, jointly used with the London and North Western Railway. By an Act of August, 1874, the Blyth and Tyne Railway was amalgamated with the North Eastern, and two years earlier the latter company had completed the purchase of the Hull and Selby, originally incorporated in 1836.

To the north of the Border, the North Eastern's partner, the North British, by its Act of 1870, obtained powers to construct the Tay Bridge, and, though it was originally a separate undertaking, the capital of the Tay Bridge Company was taken over by the North British in 1878, the bridge being opened for traffic in June of that year. Various small Scottish lines became vested in the North British in 1877, but in spite of its steady expansion, or perhaps because of it, the company was far from being a profitable concern, and between 1866 and 1872 paid no dividends on its ordinary stock; after a further lapse in 1874, its fortunes improved somewhat during the later 'seventies. Its southern neighbour, the North Eastern, had been a consistent dividend earner, and never paid less than a rate of 3 per cent. between 1870 and 1879 on its consolidated stock.

The Caledonian, the great rival of the North British, was also fairly profitable, and never failed to pay a dividend from 1852 to 1879; during the later 'seventies it frequently paid 3 per cent. or even more. Caledonian expansion during this period was mainly confined to small connecting-lines and branches, but the development of Grangemouth as a port deserves specific mention, since it formed what was virtually the eastern terminus of the Forth and Clyde Canal,

which had become vested in the Caledonian by virtue of an Act of 1867. Indeed, the Caledonian Railway had attained by 1880 the form which it preserved, except for comparatively minor extensions and improvements, notably the Oban line, until the organization of the London Midland and Scottish Railway.

There is little to be recorded in regard to Highland Railway progress at this epoch, but as regards the Glasgow and South Western mention should be made of the absorption of the Ayr and Maybole line in 1871, and the taking-over in 1869 of the Glasgow, Paisley and Johnstone Canal. Numerous small lines were added to this system during the 'seventies, but of far greater importance as a landmark in Scottish railway history was the incorporation of the Forth Bridge Company in August, 1873. By an Act of 1878 provision was made for the commencement of the works by August 1st, 1879, and their completion by August 5th, 1881. The foundation of the bridge was actually laid on September 30th, 1878, and it was provided that the North British, the Midland, the North Eastern and the Great Northern Railways, all of which had running-powers, should guarantee any deficiency in net revenue. The opening of the great bridge falls to be recorded in the next chapter, as do its widespread effects upon traffic-working.

Meanwhile in East Anglia the Great Eastern was steadily extending its network of lines serving Norfolk and Suffolk, the Forncett and Wymondham being among the lines authorized in 1876, together with the absorption of the Ely and Newmarket and the conversion of Bishopsgate into a freight station. In 1865 the Blackwall had been leased to the Great Eastern, though the London and North Western, the Midland and the Great Northern retained their running-powers over this important entry to the London docks. The Bury St. Edmunds and Thetford, the Ramsey and the Saffron Walden were all small lines absorbed during the 'seventies,

but of greater import, though it did not come to fruition, was the proposal of 1877 to merge the Great Eastern with the Great Northern; in practice the scheme resulted in the joint line in the Spalding and Lincoln area. The outstanding landmark in Great Eastern Railway history of this period was the opening in the City of London itself of the new passenger terminus at Liverpool Street, which is reputed to have cost over £2,000,000. Suburban trains were transferred there from Bishopsgate in 1874, and the whole station completed in 1875. Situated admirably from a passenger's point of view it has not been without its disadvantages from a railway viewpoint, since the ever-growing traffic during the peak business hours forced the Great Eastern to construct new facilities and widen lines which could not possibly prove remunerative, in view of the very low level of fares which had to be charged under the terms by which the land for the construction of the great terminus had been obtained. Financially the Great Eastern had never been profitable, and on only three occasions between 1865 and 1879 could it afford to pay a dividend rate exceeding 1 per cent. The opening of Liverpool Street failed to improve matters, but it laid the foundation for a steadily-developing traffic in the twentieth century, and since the war period the station has been handling nearly 250,000 passengers each weekday, a figure only exceeded in very recent years by St. Lazare at Paris. The Great Eastern had already become interested in Anglo-Continental traffic via Harwich, thanks to Parliamentary powers obtained in 1863 with reference to the steamer services to Flushing, Rotterdam and Antwerp. It was not, however, until the 'eighties that this international traffic attained great importance, twin-screw steamers being first put into service in 1883.

South of the Thames cut-throat competition between the South Eastern and the London, Chatham and Dover Railways had not yet prevented the former company from being

a consistent dividend-earner, and the rates throughout the 'seventies had averaged over 2 per cent. though care has to be exercised in that the dividends, as in the other instances previously quoted, were considerably higher for the second six months of each year than for the first six months, when traffic returns are always much leaner. An Act of July, 1871, had authorized the amalgamation of the Kent Coast Railway, incorporated in 1857, with the London, Chatham and Dover, and the latter in its enlarged form had paid much attention to the development of London suburban traffic. Its Holborn Viaduct Station had been completed in 1874, and the adjoining "new and magnificent hotel, leased to Messrs. Spiers and Ponds, was opened on November 17th, 1877". During the year 1878 the London, Chatham and Dover was running eighty trains per day to and from Moorgate Street, paying the Metropolitan for the use of their railway a mileage-proportion of such fares as might be fixed by the Chatham and for the use of the station at Moorgate Street a rental based upon the traffic actually carried. In spite of its financial situation the Chatham proprietors, at a meeting held in February, 1878, refused to countenance the terms of fusion with the South Eastern Railway proposed in a Bill to be submitted to Parliament. Under the proposed agreement the net profits were to be divided as follows: —

	To the London, Chatham and Dover	To the South Eastern
1st year of fusion	31 per cent.	69 per cent.
2nd " " "	31½ "	68½ "
3rd " " "	32 "	68 "
4th " " "	32½ "	67½ "
5th and following years of fusion	33 "	67 "

The South Eastern had been able to record considerable progress during the 'seventies. Having taken over the Reading, Guildford and Reigate line, as well as the Canterbury and Whitstable Railway and the Continental Steam

Packets during the 'fifties, it had obtained further powers with respect to steam vessels during the 'sixties, while the same decade had witnessed the widening and extension of the North Kent to Chislehurst, Sevenoaks and Tunbridge, the last-named being reached in May, 1868, while the Mid-Kent line had been amalgamated with the South Eastern in 1864. Various branches were completed during the early 'seventies and the railway took over the Lord Warden Hotel at Dover and the Pavilion at Folkestone. To reduce competition with the London, Brighton and South Coast an agreement for the division of competitive traffic had been sanctioned by Parliament at the close of the 'sixties, and in February, 1879, this important agreement was renewed for a further ten years. Meanwhile the London, Brighton and South Coast Railway had obtained powers in 1868 to raise its fares, differentiating between those charged on express and on ordinary trains, the two sets of figures being: —

By express train	First . .	$2\frac{3}{4}$ pence per mile
	Second .	2 " " "
By ordinary train	First . .	$2\frac{1}{4}$ " " "
	Second .	$1\frac{3}{4}$ " " "
	Third .	1 " " "

It will be noted that these powers were obtained just prior to the agreement with the South Eastern Railway.

There was comparatively little physical extension of the Brighton Railway's network during the 'seventies, though in 1878 the construction was authorized of certain lines in the Oxted and East Grinstead area, some of which were to be jointly owned with the South Eastern. The same year the Brighton Railway purchased the little Hayling Bridge and Causeway line for £3,000, though they subsequently had to spend £30,000 in improving it; this small line from Havant still remains one of the most interesting branches of

the Southern Railway. By an Act of 1872 the Brighton, through its connection with the Newhaven Harbour, was empowered to accept contributions or subsidies from the Government of France and to enter into agreements for the improvement of Dieppe port. At Portsmouth the Harbour Line had been opened in October, 1876, and the next year, jointly with the London and South Western, authorization was received to construct the Isle of Wight and Ryde Pier Railway, so that the Isle of Wight Railway trains could run to the end of Ryde pier, where passengers were landed from the London companies' boats, which crossed Spithead from Portsmouth Harbour. In the London area closer contact had also been established between the Brighton and the South Western, and, incidentally, the northern companies, by means of the West London Extension Railway, the capital for which had been provided by the Brighton, the London and North Western, the Great Western and the London and South Western Railways, while by a later Great Western Act of 1875 these four companies were given power to assume the mortgage debt of the Extension company. It is often forgotten that when Victoria Station was opened in 1860, the Brighton only owned half of it, the other portion being rented by the London, Chatham and Dover and the Great Western Railways, while the London and North Western Railway ran trains into the Brighton's section under a toll arrangement. Another link between the London, Brighton and South Coast and the London and South Western was the former's lease, dating from 1856, of the little Wimbledon and Croydon line, which in part follows the route of the Surrey Iron Railway. Taken over absolutely by the Brighton in 1866, it formed an important exchange traffic-route from the South Western and the west to South and East London.

Steadily expanding towards the west, the South Western absorbed the Andover and Redbridge in 1863; and powers

had been obtained in 1865 to amalgamate the Salisbury and Yeovil and the Exeter and Exmouth; powers to lease the Devon and Cornwall followed the next year, and extensions were authorized both in the London area and to link the Southampton and Dorchester district with that of Poole and Bournemouth. The Salisbury and Yeovil and the Dorset Junction Railways were leased in 1867, while 1868 witnessed the completion of the Kensington to Richmond line. Various improvements were effected during the early 'seventies, including the purchase of the Ringwood, Christchurch and Bournemouth line in 1874, and during 1876 came the purchase of the Exeter and Crediton and the removal of the broad gauge from that and other neighbouring lines. The little Barnstaple and Ilfracombe, opened in 1874, was leased to the South Western before 1879, and by 1880 this company had established an alternative route to the Isle of Wight by taking over the Lymington line. The year 1878 marked the absorption of the Staines and Wokingham and the holding of the last meeting of the Salisbury and Yeovil as a separate entity. At the close of 1878 the London and South Western Railway owned 552 miles, excluding jointly-owned, leased or rented miles, and had been paying annual dividends at the rate of about 4½ per cent. on its ordinary stocks for ten years. Indeed at this period the London and South Western was a much more profitable concern than its larger neighbour the Great Western, whose annual dividend rates on its consolidated ordinary stock scarcely touched two per cent. during the later 'seventies. The stock quotations of the two railways during 1878 accurately reflect their comparative prosperity: London and South Western stock never dropped below 129 during the year, whereas Great Western stock had fallen below 92; during the same year it is interesting to note that South Eastern ordinary stock never fell below £123½.

The Great Western was, in truth, still struggling with its

internal problem of the gauges, though from 1870 onwards it had begun to put its house in order very energetically. Its various ordinary stocks had been consolidated that same year, and in July of the following year it embarked on overseas expansion by an Act covering steamship services to the Channel Islands, Cherbourg and St. Malo, as well as from Milford Haven to Waterford and Cork, and many extensions and absorptions were authorized in the succeeding years. The Severn Valley, Wales and Cornwall were the scene of most of these activities, but the Great Western aspirations were unbounded by counties, countries and seas, and one finds amongst the long list of purchases and expansions an agreement with the Dublin and Wicklow at Waterford. It is not possible to mention specially all the small railways vested in the Great Western during these years, and there would be little object in recording them, since in many instances they had always worked in close liaison with Paddington interests and the inevitability of their final absorption had long been prophesied. A typical example, and by far the most important in point of size, was the final amalgamation of the Great Western and the Bristol and Exeter as from August 1st, 1876; the Bristol and Exeter, it will be recalled, had from its inception been virtually a section of the Great Western, forming the latter's link between Bristol and the South Devon, Cornwall and West Cornwall Railways. The South Devon which had been leased to the Great Western in 1849 and long worked by it, was finally amalgamated with it on August 1st, 1878, the same date on which the West Cornwall was taken over, though the intervening Cornwall Railway, stretching from Plymouth to Falmouth, was not absorbed until 1889; negotiations to this end had been set on foot before 1880, but had fallen through owing to the feeling that the Great Western's offer of £5 of stock for every £20 of Cornwall stock was insufficient. Since the associated companies, namely the Great Western,

the Bristol and Exeter and the South Devon, had to make up deficiencies in 1877 and 1878, it was presumably their wish to take the Cornwall Railway over at the earliest possible moment.

If one includes lines leased, rented or partly owned, the Great Western mileage as early as 1878 reached the respectable total of 2,140, nearly 500 miles longer than the London and North Western and 700 miles longer than the Midland, its two nearest rivals in point of size. How rapid had been the expansion of the Great Western may be realised when it is pointed out that this company in 1879 possessed practically the same route mileage as the Southern Railway of to-day, though, of course, its traffic was not nearly so dense. It is probable that such rapid extension was partly responsible for its financial weakness at the period under review, but the strain on its revenue arising from the necessity for gauge conversion must have been the main cause of its comparatively poor showing in regard to net receipts. It had always been noted for its expansionist policy, and the 'seventies are not devoid of examples of this which might be quoted; three instances will suffice to show how the seed was being sown from which important developments have grown in later years. Firstly, the Great Western had been authorized in 1865 to take over the little Great Western and Brentford Railway, and seven years later the line became actually vested in the Great Western. Of comparatively slight importance, this purchase has permitted the development of a Great Western port on the Thames, whence goods can be shipped by barge for transfer to ocean vessels in the London docks. Modern coastal vessels from Strasbourg, Paris or Amsterdam can to-day reach Brentford, also served by the Grand Union Canal, and engage in international trade therefrom. The second instance was the opening of the jointly-owned Woodside Station at Birkenhead in 1878, at that time said to be one of the most spacious and

convenient erections of the kind in the Kingdom. The Great Western thereby opened a worthy portal on Merseyside, and from Woodside Station ferry-steamers bring the passenger direct to the embarkation gangway of ships bound for all the more important ports of the world, especially the United States and Canada. By this means the Great Western tapped transatlantic traffic and, perhaps even more profitably, holiday travel to the Isle of Man. The third instance was the planning of the great Severn Tunnel scheme, and though powers had to be sought in 1877 for the extension of terms for its completion and the tunnel was not finished until the next decade, nevertheless the necessary preparations were largely the work of the later 'seventies.

Considerable space could be devoted to the growth of the various railways in South Wales which now form a part of the enlarged Great Western system, but of more importance was the steady growth of the Lancashire and Yorkshire railway, of which mention has been made earlier in this chapter in connection with the proposal for its amalgamation with the London and North Western Railway. The later 'sixties had witnessed the opening of many branches by the enterprising Mancunian concern, each tapping some new industrial centre, and in many cases requiring to be widened owing to traffic increase within a few years of their opening. The Halifax, Burnley and Blackburn lines of the later 'sixties were typical instances, while the Bury, Bacup, Oldham and Hellifield extensions were amongst the more important during the 'seventies. A financial interest in the Hull docks was acquired in 1872, and two years previously, in conjunction with the London and North Western Railway, powers were obtained in connection with the Fleetwood and Belfast steamer services; in the same year the Preston Station of the old North Union was enlarged to cope with the increased traffic. The North Union had become vested in the Lancashire and Yorkshire and the London and North Western

Railways in January, 1864, both companies participating in the lease of the Preston and Wyre, which was amalgamated with the Blackpool and Lytham in 1871, thus laying the foundation for the development of Blackpool as a holiday resort. Indeed it was largely in view of the additional traffic envisaged on the Preston and Blackpool line that Preston Station had to be enlarged. During the twentieth century this holiday traffic to Blackpool has taxed the railway facilities to their utmost, and its safe movement redounds greatly to the credit of the London Midland and Scottish Railway and its predecessors the Lancashire and Yorkshire and the London and North Western Railways. In recent years this traffic is shared with long-distance motor-coaches, but even so the figures of passengers carried to Blackpool are astounding to those not familiar with them, and in spite of serious trade depression the movement has shown a remarkable degree of stability. To-day the accommodation offered to the passenger to Blackpool is very different from that of the 'seventies, though the Lancashire and Yorkshire carriages of the mid-Victorian era were in many ways superior to those of the London lines and embodied many new ideas.

For this progressive policy the Lancashire and Yorkshire was indebted primarily to the superintendent of their carriage-making department at Miles Platting, Mr. Charles Fay, who, it is believed, had been engaged, as a young man, on building some of the first carriages for the Liverpool and Manchester Railway. The loose-chain couplings of the old Liverpool and Manchester carriages had given place to the screw coupling before 1840, and the adoption of spring-buffers added very materially to the comfort of passengers. The Manchester and Leeds, the ancestor of the Lancashire and Yorkshire Railway, like the majority of the early lines, used a three-compartment carriage for first- and second-class passengers, the former being fitted up very comfortably and

having glass sashes, while the latter were open at the sides, though equipped with sliding wooden shutters; this railway was more generous than most to its third-class passengers in that it provided a roof, though not seats, to its third-class carriages, which were known as "Stanhopes"; on nearly all other railways of this period the third-class carriages were merely open wagons. Divided into four compartments by a wooden bar down the middle and another across, these carriages were 17 feet in length and weighed rather over two tons. A contemporary account states that there were four entrances, and the number of passengers the vehicle would contain depended upon the bulk of "the respective stanhopers". The Company's servants were strictly ordered not to porter for wagon passengers. This company seems to have been one of the first to experiment seriously with improved braking-apparatus in place of the handbrake operated from each coach by a brakesman, presumably owing to the heavy gradients on the line; but it was not until 1857 that Mr. Fay, of Miles Platting, brought out his new brake patent, by which several carriages could be braked simultaneously. This appears to be one of the earliest attempts to design an automatic brake, and is, therefore, worthy of some attention. The appliance was first fitted to two large new carriages, 33 feet long, built of East India teak, one having six compartments and a luggage van and the other, which accommodated seventy-two passengers, having three first- and four second-class compartments. Very lofty and free from oscillation, they were long four-wheelers, and Mr. Fay's patent brake consisted of a horizontal bar running under the centre of the carriages; the bar was revolved by a vertical shaft, by operating which brakes could be applied to all eight wheels simultaneously, and so powerfully that the train "could be brought to a stand, in spite of the engine's power".

Improvement in the early third-class carriage design was

partly, if not mainly, due to the provisions of the Regulation of Railways Act of 1844, which stipulated that all such carriages or wagons should be covered, and this naturally led to the fitting of sides as well.

The beautiful workmanship of British railway coaching-stock is exemplified by the fact that a carriage shown at the 1851 Exhibition, and later used as a Royal Saloon on the London and South Western Railway, was once in use between Callington and Bere Alston, and later was sold to the Rother Valley Railway, now known as the Kent and East Sussex, where as late as 1928 it was still in use as the manager's saloon. With a coupé at each end, it was mounted on four wheels and possessed a first-class compartment in the centre; it is probably still in being and is worthy of preservation.

At the close of the 'forties the first carriages of the Great Northern, built by McWilliams, of Goswell Road, London, were the subject of much comment and praise, especially in regard to the third-class compartments, which were described as equal to second-class on most railways at that time. The seconds of the Great Northern were fitted with good glass windows and cushions on the seats, while the first-class were as convenient " as any man of the nicest taste " could wish. The Great Western had turned out an eight-wheeled carriage for Queen Victoria, with a disc and crossbar on the roof to signal the Queen's instructions to the look-out on the tender, in 1848, but it was not until 1852 that eight-wheeled carriage-frames were built at Swindon for general public service. They were subsequently employed on the Metropolitan Railway fitted with gas lighting and were finally broken up during the 'seventies. The Great Western used papier-mâché for the panels of its first and second class carriages in the 'fifties, and the Company adopted the composite type of vehicle as standard, consisting of two first-class, two second-class compartments and a compartment for

luggage; it is rather surprising to find that the broad-gauge second-class compartments only seated five a side after 1854, thus showing no advantage over standard-gauge coaches so far as seating capacity was concerned. Cushioned seats began to be provided on this line in 1859, about the time that luggage ceased to be carried on the roofs of the carriages, a practice which seems to have disappeared from the Great Western Railway at a comparatively early date on its broad-gauge lines, though it continued on some lines until about 1870.

Carriages mounted on three axles instead of two were rare at this period, though the Great Western had experimented with them, and on the Oxford, Worcester and Wolverhampton section trials had been made with Fay's brake, as well as with one designed by a Mr. Newall. During the 'sixties various types of brakes were the subject of trial, but it was not until about 1876 that the Great Western met with any real degree of success, when the Sanders Automatic Vacuum Brake was tested. It was late in the 'fifties that the first experiments were made with gas lighting for carriage purposes and with foot-warmers for heating. The foot-warmers used on the London and North Western Railway were oblong tins filled with water hermetically sealed and placed in a boiler until the water was thoroughly heated, when they were ready for use; but a patent foot-warmer was later brought into use on nearly all the main lines in which the water was replaced by acetate of soda. The early 'sixties witnessed the fitting of destination-boards on the carriages and trials were made with rolled-steel beams, in place of wood, for the frames of the carriages; but at this time and for many years afterwards teak was the favourite material for the bodies themselves, and so excellent was the workmanship that many of these bodies could have lasted much longer than they actually did had not their design, which involved such disadvantages as a narrow

seat, low roof and inadequate lighting, rendered them obsolete.

Further experiments were carried out by the Great Western with long eight-wheeled coaches on the Metropolitan line, but the vast majority of carriages were four-wheeled, though by 1870, six-wheelers were slowly coming into favour. While the London and North Western Railway coaches had for many years been constructed at Wolverton, the Great Western acquired most of theirs from outside builders, but some had been built at Paddington and others, in 1868, at the West Midland shops at Worcester; carriage-building only started at Swindon in 1869. For some years the Great Western was primarily engaged in constructing six-wheeled standard-gauge stock, about twenty-five to thirty feet long, but later in the 'seventies it was found necessary to build a considerable number of broad-gauge carriages, of six- or eight-wheeled design; the latter were very fine vehicles for their time, with clerestory roofs and a width of ten feet—probably the widest coaches ever built for service in Great Britain. Like many early North Western coaches, they were not of bogie design. The first Great Western eight-wheeled bogie-carriages appeared in 1874, thus improving the comfort and ease of running at high speeds, especially on curves, but a curious reversion to six-wheelers took place three years later, when the first sleeping-cars were put into service between London and Plymouth. It was not until 1878 that eight-wheeled carriages were used for the standard-gauge sections; third-class carriages began to be upholstered in the same year. The Great Western coaches since 1864 had been coloured in the Company's present livery—chocolate lowers and cream uppers—and except for a brief lapse to brown all over from 1909 to 1912 and then crimson lake until 1923 the coach livery has remained the same for almost eighty years; to some extent the popularity of the Great Western as

a passenger line may be ascribed to its retention of the chocolate-and-cream.

Open-spoke wheels were normal until about 1870, when the Mansel wheel with a wooden centre came into use, a design which has only recently died out. Consequent upon legislation passed in 1868, which required the fitting of some means of communication between the passengers and the guard, trials were made with a variety of types of apparatus to ensure this result, including a communication system of electrical type on certain lines south of London. In 1869 the Great Western was using a cord along the eaves of the coaches as a means of communication, a practice which was still used by some Continental European railways only a few years ago. During 1868, also thanks to legislation, certain compartments on each train were made available for those who wished to smoke.

Two other railways with progressive ideas of carriage construction were the Midland and the London and North Western, the latter for many years having standardized on their famous colours of chocolate lowers and white uppers, which were destined to last until after the grouping of 1923. Even in 1933 the last few examples of carriages painted in these colours could be seen in use, carrying workmen from Bletchley to the Wolverton carriage-shops. The standard London and North Western carriage of 1872 for third-class was thirty feet long, weighed ten tons, and seated fifty passengers. The Midland, which possessed some of the finest vehicles running in the country at that time, announced that as from April 1st, 1872, it would make third-class accommodation available on every train, at the Parliamentary fare of one penny per mile. This revolutionary step caused great consternation to the other companies, since previously all express trains had carried first- and second-class passengers only. The only retort of the lines competing with the Midland was to open certain of their trains to the third-class

passenger, but the Great Eastern, which did not compete with the Midland adopted the latter's policy in its entirety. The Midland sprang several further surprises in 1875, for they began in that year to build long clerestory-type bogie-coaches, to work on trains which carried the Pullman sleeping-cars which the Company had acquired from the United States in 1874; this clerestory, or Pullman, type of roof remained a mark of Midland carriage-design until it was decided to adopt the elliptical type during the war period. As from the beginning of 1875, this enterprising company ceased to carry second-class passengers; it also ceased to offer any reduction on return-tickets. The first may be regarded as a highly desirable step, since it simplified the operating-problems connected with train-formation, and led to a great improvement in third-class accommodation; but the latter step was retrogade, and has led in recent years to loss of revenue. Both policies were in due course followed by all other railways, except for a few services, such as the Continental boat-trains, but an interesting feature of the Midland's elimination of second-class was the provision for the first time of third-class accommodation on the North London Railway, a section of the London Midland and Scottish Railway which still provides second-class compartments. It may here be pertinent to quote from "The Appropriation of the Railways by the State", written by A. J. Williams in 1870, the following lines: "One obvious cause of waste", says Sir Rowland Hill, "is found in the distinction of classes"; and there can be no doubt that he is right in saying that "a great reduction in fares would warrant a reduction in the number of classes to two".

The Pullman sleeping-cars on the Midland had been preceded by six-wheeled sleeping-cars on the West Coast route to Scotland in 1873. Just before 1880 the Great Northern seized the initiative in the improvement of passenger-train travel by the inauguration of dining-cars on the

trains between London and Leeds, though this practice did not become regular until February, 1880. Gas as a method of carriage lighting began to supersede the old oil lamps on the London and North Western Railway in 1879, the shale-oil gas being carried in two sixteen-foot cylinders under the carriage body; so successful did the innovation prove that as from 1880 the practice became standard for that company.

By far the most important problem of the 'sixties and 'seventies in regard to the coaching-stock of the railways was, however, the improvement of brakes and the design of some satisfactory continuous system. The Royal Commission set up in 1874, as a result of public nervousness referred to in the previous chapter, to inquire into the question of railway accidents, made its report in 1877, and consequent upon its recommendations the Railway Returns (Continuous Brakes) Act was passed in 1878. During 1875, at the instigation of the Commission, trials with various systems of continuous brakes had been made on the Midland near Newark. Among the eight competitors there were three Midland trains, one fitted with the Westinghouse brake, one with Barker's hydraulic brake, and the third with Clarke's hydraulic brake; the London and North Western train had Clarke and Webb's chain brake, the Great Northern Smith's vacuum, and the Caledonian used Steel's air brake, while the Lancashire and Yorkshire submitted Fay's patent brake and the London, Brighton and South Coast train had the Westinghouse vacuum pattern. The Westinghouse air brake on the Midland train seems to have been the most successful. One of the great advantages of the continuous brake was that, if the train parted, the two portions would be brought to a standstill without a collision. Curious as it may seem, the deliberations of the Commission, tardy as they were, actually seem to have put off the equipment of rolling-stock with continuous brakes, for no company could embark on their provision for fear that some other standard

would be adopted for the whole country. Meanwhile, in August, 1877, the Board of Trade strongly urged the companies to agree to a standard amongst themselves, and the Act of 1878, above mentioned, forced the provision of continuous brakes, but failed to fix any uniform type as standard. Consequently, for a time, most of the companies adhered to the design previously used, as, for instance, the Clarke and Webb brake on the London and North Western. During the following decade, however, this company changed to the simple vacuum, only to change again in 1886, when it adopted the much-improved automatic vacuum, which basically is the same brake as that employed throughout the country to-day. Gradually the competition between the brake systems narrowed down to two of them, the Vacuum and the Westinghouse, and these two brakes remained standard until 1923, when all the four railways standardized on the Vacuum for steam traction, though some Westinghouse-fitted rolling-stock still remains, especially in Scotland. The Westinghouse might now be regarded as standard for electrified lines.

In the realm of railway legislation the most far-reaching event to be recorded during the 'seventies was the provision for the appointment of a Railway and Canal Commission, contained in the Railway and Canal Traffic Act of 1873. This Act amended the previous legislation of 1854, and transferred the hearing of complaints touching railway and canal charges from courts of law to the sittings of the three Railway and Canal Commissioners. One commissioner had to be versed in the law and another experienced in railway business, and the same principles were followed in making appointments to the Railway Rates Tribunal set up by the Railways Act of 1921. Since 1922 this tribunal has taken over the bulk of the railway work from the Railway and Canal Commission, but the latter still hears complaints concerning service and facilities. An important function of the

Commission from its birth in 1873 was its work of settling inter-railway disputes. Amongst the remaining provisions of the Act which set up the Commission was the requirement that the railways should make their schedules of rates and fares available to the public.

The "Regulations of the Railway Clearing House" by the mid-'seventies had become a volume of considerable size, the issue of 1874 running to well over two hundred pages; therein can be found regulations governing the movement by rail of every kind of commodity. For instance, tramway cars were to be conveyed by passenger trains; steam fire-engines were to be charged sixpence per mile, though fire-engines worked by manual power, if not exceeding two and a half tons each, were to be charged the same as a four-wheel carriage. One had to pay threepence per dog for any distance up to ten miles, and the dogs could be conveyed in cases, crates or hampers, or simply with chain and collar. Bands of musicians accompanying excursion trains were conveyed at half the excursion charges, but brass bands were charged single fare for the double journey, as were military bands, though the double journey had to be completed within four days, Sunday being considered a *dies non.* What happened if a military band claimed to be a band of musicians is not related. Explicit instructions are given in regard to railway ropes, which had to be not less than twenty-five yards long and to be made of hemp, each rope to be numbered on a metallic ferrule, and each railway had its own distinguishing colour; thus South Eastern Railway ropes had one yellow, one green and one white thread, whilst its rival, the London, Chatham and Dover Railway, had a red and yellow thread in two strands and a blue thread in one strand.

"The Railway Clearing House General Classification of Goods by Merchandise Trains on Railways" had also become a book of over one hundred pages by 1876. At

that period all freight traffic was divided for charging purposes into seven classes, the mineral class being marked M; traffic falling into this latter division was loaded and unloaded by owners, conveyed at their risk and carried in quantities of not less than four tons per truck; then there was a Special Class marked S, which applied to station-to-station traffic only, and was carried in quantities of not less than two tons per truck; then followed five classes—first, second, third, fourth and fifth. Within Class 1 were to be found wagon-axles, boilers not exceeding 30ft., garden rollers, and boats belonging to the Royal National Lifeboat Institution. Class 2 may be exemplified by beef in casks, herrings, ginger-beer and new ropes at owner's risk. In Class 3 were to be found shirts, shoe-horns and ship's sails; Class 4 included velocipedes, sausages and steam-gauges, while Class 5 charges applied to ivory, papier-mâché goods and plaster figures (packed). Additions to the classification in the following year included beer in bottles, to be charged first-class, and bloater paste, to be charged third-class, while the allowance off those rates, which included collection and delivery, when the public performed the collection and delivery service in country districts amounted to 1s. per ton for first, second and third class articles; 1s. 6d. per ton for fourth and fifth class articles, and one penny each for parcels handled under the " smalls " classification.

A glance at such books as these helps one to form a picture of commercial England at this mid-Victorian period, when the railway system was virtually complete and when the basic foundations of its relations with the State had been firmly laid, at the end of the first half-century of railway development. The 'eighties were to see vast improvements in the speed and comfort of trains, but already in 1879 the British railways were in the forefront of the world in many respects in spite of the contemporary remarks of an American visitor, which appeared in the " New York Tribune " on his return:

"In America travelling is a luxury of which the Scotch have not the most remote idea. The first-class cars will not bear comparison with those of America, and the third-class have been designed with a view of applying a crucial test to the endurance of the unfortunate. It is to be noticed, however, that, as a rule, the shareholders receive good dividends, and the roads are probably made to pay by sacrificing the passenger's comfort. Or, to put the matter in a light more favourable and more just to the directors and management, by a close calculation of expense, a definite conclusion can be arrived at both upon the rates for carrying freight and upon the amount of comfort that can be given the passengers in return for their money. As to the speed at which the cars run, it has been greatly overestimated. An exaggerated idea has been formed of it by its having been very generously assumed that the exceptions are the rule. On the longer route—that, for example, between London and Edinburgh—the rate is certainly sometimes terrific, but on the shorter routes the rule is reversed. . . . I have travelled in England and Scotland both faster and slower than I ever did in America, but I am not, for that reason, sure that any of the 'flying' English trains can beat the fastest trains between New York and Philadelphia. . . ."

Though railways had been born in Great Britain, foreign countries had also pushed ahead with railway construction; and, for instance, in 1877 the present State Railway of France, whose lines were at that time owned by several different administrations, mainly the Ouest, spread out from Paris to Angers, Redon, Brest, Granville, Cherbourg, Le Havre and Dieppe. Going farther afield in Europe by 1879 there were railways at St. Petersburg, Bucharest, Lemberg and Seville, though the most remarkable line must have been the Metropolitan of Constantinople, a short underground railway with an average gradient of one in ten. In Asia there was the Smyrna to Aidin line, and the Woosung Rail-

way at Shanghai, while in India the two largest companies were the East Indian and the Great Indian Peninsula Railways. In Australia the Victoria Government Railways already totalled 600 miles and in Canada the Grand Trunk was all but 1,400 miles long, though far from profitable even in the later 'seventies. The Pennsylvania Railway, at that time, was a line of 1,670 miles, and the total American mileage in 1877 was virtually 80,000 miles. In Argentina the Buenos Ayres Great Southern and the Central Argentine, both incorporated in 1862, had become large and powerful companies in 1877, and the capital of the San Paulo of Brazil even at that time totalled £2,750,000.

Returning to London, the Metropolitan Railway had spread eastwards to Bishopsgate, now known as Liverpool Street, by July, 1875, and to Aldgate in November of the following year, though the jointly-owned section of the Metropolitan and Metropolitan District Railways between Aldgate and Mansion House was not completed until the middle of the 'eighties. The north-westerly extension beyond Swiss Cottage did not reach West Hampstead until the middle of 1879, but once it had got beyond the tunnel section construction progressed more rapidly and traffic was carried to and from Harrow before the end of 1880. On the southern section of the "Inner Circle", constructed by the Metropolitan District Company, the line eastwards as far as Mansion House had been completed by 1871, as mentioned in the previous chapter, and February of the following year witnessed the completion of a most important connection with the London and North Western Railway, thus permitting through trains to travel from the North London terminus at Broad Street via Willesden and Addison Road to South Kensington and the Mansion House, where they reversed and the run concluded within a mile of the starting point. On the electrification of the "Inner Circle" this so-called "Outer Circle" service was

withdrawn, but the London and North Western continued to run trains between Broad Street and Earl's Court, this service later being still further shortened to one between Willesden and Earl's Court. There was also a " Middle Circle " run by the Great Western between Moorgate and the Mansion House via Addison Road, some of the trains having District coaches, but all being hauled by Great Western engines. Started in 1872, this service continued until the beginning of the twentieth century when the trains stopped at Earl's Court; finally, a few years later, Great Western trains only ran between Moorgate Street and Addison Road.

The 'sixties and 'seventies were decades of rapid railway extension and growth, and as railways grew in strength and influence other forms of inland transport became relatively less important. In Great Britain there was little progress during the period 1870-1879 in the realm of canals or, indeed, road transport other than development of the various tramway systems in the larger towns. So far as street transport was concerned the decade of the 'seventies saw no great change in regard to omnibus design, but it did witness new trials with tramcars, which, it will be recalled, had been tested on the Bayswater to Marble Arch route for a short period from March 23rd, 1861. Though New York City had been using horse-drawn trams for many years, the first route having been opened to Harlem in 1832, it was not until 1860 that the first passenger tram was put into service in Great Britain by G. F. Train in Birkenhead, where the first rails were of the step design. The Cincinnati Street Railways are reported to have been the first to experiment with a steam tram in 1859, but several other American cities began to employ them during the following year. It was an Act of 1870, designed to facilitate the construction and to regulate the working of tramways, which really laid the basis of tramway construction and extension in Great Britain, though Birkenhead in the previous year had made

trials with the flat-grooved rail, an event of no small significance which paved the way for important developments. The year which saw the passing of this Act also witnessed the opening, on May 2nd, of the Metropolitan Street Tramways Company's line between Brixton Station and Kennington Gate, while during the same month a service began to be operated between the Churches of Whitechapel and Bow, under the name of the North Metropolitan Tramway Company.

Since London has always been a city of buses rather than trams, the importance of its tramway service is apt to be forgotten, but very large mileages are operated both north and south of the Thames, though rails have never been laid in some of the main thoroughfares. Tramways, which offer a very cheap service to the city worker, should not be overlooked, and as they were extended during the later years due tribute will be paid to the social benefits resulting therefrom. The larger provincial cities have been the main stronghold of tramway services in Great Britain; thus there was a Liverpool Tramway Company in the early 'sixties, as successor to an experimental line laid by Train between Sheil Road and Old Swan. The original company did not last long, however, but upon its demise another undertaking was formed only to succumb in its turn, and in 1874, owing to the bad state of the tramway tracks, the city ordered all rails to be removed. The company immediately set about repairing its lines, but this led to such financial difficulties that they were finally turned over to the municipality and rented to the company which operated horse-cars over them. An amalgamation of the tramways company with the Liverpool Omnibus Company resulted in the formation of the Liverpool United Tramways and Omnibus Company, and the system in later years was taken over by the municipality and for nearly forty years has been known as the Liverpool Corporation Tramways. This example is quoted

at some length as being typical of the vicissitudes attending the birth of the tramways in several provincial cities, Bolton Corporation, for instance, embarked on tramways in 1878, having previously relied on horse-buses, and horse-drawn cars began to operate in 1879; some of the very early Bolton trams were remarkable in being double-deck vehicles.

The Hull Street Tramways were even earlier, since the first horse-drawn trams were inaugurated in that city in 1873, while the Glasgow Tramway and Omnibus Company Limited began operations in August, 1872, the city having constructed the lines and leased the track to the Company for a twenty-three years' period commencing in July, 1871. At the opposite end of the country, Plymouth had laid its first horse-tramway line in 1872. The Leeds tramway system, one of the most progressive in the country, can claim a history dating back to 1870, when a private company was formed to which the corporation granted a lease of its highways for twenty-one years. The citizens of Leeds had to be introduced to this new system of road transport by means of free rides on the horse-drawn cars on an experimental track in Cookridge Street. Free travel seems to have appealed to the populace, and such enthusiasm was evinced that in September of the following year the first tram route was opened to Headingley; in this case, however, travel was not free. The company, nevertheless, did not prosper, and the corporation, in spite of the Government's dislike of municipal undertakings, decided to take it over. A question then arose as to the method of traction, and in October, 1877, a steam-driven tram was tried on the Hunslet to Kirkstall route, and this method was generally substituted for horse-drawn trams two years later.

The Tramways Act of 1870 provided for a comparatively inexpensive and uniform mode of procedure in regard to obtaining authority for tramway construction, and authorized local authorities to acquire them compulsorily after a fixed

period. However, with horse-tramways in mind, the concessions were limited in time, a fact which proved of serious import when electrification took place at a later period, involving as it did heavy capital expenditure per mile. On several lines experiments were made with steam trams during the 'seventies, but the noise, smoke and steam, which frightened horses, made such mechanization undesirable and the majority of lines returned to horse traction before the era of electrification. Though the genesis of tramways in Great Britain must be ascribed to the 'sixties, little progress on a commercial scale had been effected until the following decade; compared with railway extensions and improvements tramway progress was comparatively unimportant, whether measured by the capital involved or the number of passengers carried; indeed, the omnibus was virtually supreme for local street transport in 1879.

Before turning to the developments of the 'eighties brief mention should be made of the Blackburn motor-car of 1878, designed by a resident of Tunbridge Wells. It was driven by the combustion of benzoline and the steam which was generated passed into cylinders, the driving-shaft being connected with the driving-wheels by means of an endless band. Of dog-cart design and mounted on three wheels, it came under the provisions of the Highways and Locomotives (Amendment) Act of 1878, since the Blackburn autocar seems to have been regarded as a road locomotive and, consequently, treated as a traction-engine. The 1878 Act amended the earlier 1861 Locomotive Act, which dealt with the regulation of road locomotives passing over bridges, and made necessary the carrying of a red flag in front of the locomotive.

CHAPTER VII

1880—1889

PASSENGER-TRAIN SERVICES, PERMANENT WAY, AND BICYCLES

By 1880 the length of the railways of the United Kingdom had practically attained 18,000 route miles, 2,400 miles having been added since 1870. A further 2,000 miles were destined to be added during the 'eighties, but this increase in mileage cannot be taken as a fair and accurate measure of the effect of railway progress on the social and commercial life of the nation, since the total number of passengers carried per annum, exclusive of season-ticket holders, had risen from about 336,500,000 in 1870 to almost 604,000,000 by 1880, though the total paid-up capital of the railway industry, including nominal additions, had only increased from £530,000,000 to rather over £728,000,000. The net receipts in 1880 totalled nearly £32,000,000 as compared with the approximately £23,400,000 of ten years earlier, so that it cannot be claimed that, even in this mid-Victorian period, the railways were very profitable, taken as a whole. With a freight tonnage of over 235,000,000 in 1880 it is clear that the prosperity of the country at that time was largely dependent upon the efficiency of the railway system; in short, the 'seventies and 'eighties witnessed a period of intensive growth in railway traffic, and, with the importance of construction growing less almost yearly, the internal improvements on the railways already constructed warrant closer attention.

Before embarking on a survey of the passenger-train service of this period, mention must be made of the completion

of certain major construction-projects which took place during the early 'eighties. Developments south of London call for little notice. In the London area itself the South Eastern trains commenced to run into Liverpool Street Station in 1880, via the East London Railway, an eight-mile line incorporated in 1865 to link the railways north and south of the Thames. Opened in December, 1869, from New Cross to Wapping, this line used the tunnel under the Thames constructed by the Brunels, father and son, and the Brighton Railway provided the rolling-stock. The connection between Wapping and the Great Eastern Railway was completed in 1876, so that the East London trains could run right into the great City terminus. The Brighton was to take 53 per cent. of the gross receipts for operating the East London, but the latter was dissatisfied with the working arrangements and obtained redress in 1876 by appealing to the Railway Commissioners. In 1884 the East London line was connected at Whitechapel with the District and Metropolitan lines, and for many years was leased to six railways, the South Eastern, the London, Chatham and Dover and the Brighton south of the river and the Great Eastern, the Metropolitan and the District north of the river. Now part of the Southern Railway, the East London passenger service has for twenty years been worked by Metropolitan Railway multiple-unit electric trains on the route from Hammersmith to New Cross (South Eastern and Chatham Railway) and New Cross Gate (London, Brighton and South Coast Railway) via Liverpool Street (Metropolitan Railway), while the freight trains have been usually hauled by Great Eastern locomotives between Shoreditch and New Cross. The South Eastern Railway completed its Port Victoria line in 1882, a further excursion into the Continental services, and the same year saw the reconstruction of Brighton Station by the London, Brighton and South Coast Railway. The Croydon and Oxted joint line of these two railways was opened the

following year. The London, Chatham and Dover extended its line to Sheerness in 1883 and reached Ashford from Maidstone in 1884, St. Paul's Station also being available for traffic that year; two years later the Chatham completed its Gravesend branch and in 1888 its Greenwich branch. Westwards the Metropolitan District had reached Putney Bridge in 1880, the year in which Harrow had been reached by the Metropolitan; the former railway pushed on to Hounslow in 1883, while 1884 saw the completion of the "Inner Circle" between Mansion House and Aldgate. By 1887 the Metropolitan had reached the country at Pinner and in 1889 had penetrated to Chesham.

To the east of London, along the north bank of the Thames, stretched the London, Tilbury and Southend Railway, opened to Shoeburyness in 1884. Historically this line could claim a separate existence since 1862, though originally promoted jointly by the Eastern Counties and the Blackwall companies; it had been opened in 1854 and was leased for operation to Peto, Brassey and Betts, the contractors, for twenty-one years. Since 1875 the Company had worked the line itself, using the Fenchurch Street Station of the Great Eastern Railway as its London terminus, and running trains to Southend via Tilbury, with a ferry service to Gravesend; and in 1888 the direct route from Barking to Pitsea, avoiding Tilbury, was opened. And looking back, it seems extraordinary that the Great Eastern should not have acquired this line, which was absorbed during the twentieth century by the Midland, which thereby acquired control of the enormously-valuable railway traffic of the Tilbury Docks of the Port of London Authority. The Great Eastern line to Clacton had been completed in 1882, and the following year witnessed the opening of the line to Yarmouth via Acle, to-day a popular centre on the Broads. A private line, later to be taken over by this company, was completed to Felixstowe in 1886.

So great was the increase of passenger traffic into London from the south that the South Eastern had been forced to widen Charing Cross bridge in 1887; two years earlier the London and South Western Railway had enlarged its Waterloo Station. This latter company reached Swanage in 1885, but of greater importance was the opening of the Bournemouth direct line in 1888; the following year saw the completion of the Wimbledon and Putney loop, as well as the establishment of the rolling-stock works at Eastleigh, once Bishopstoke, to-day the most important locomotive construction shops on the Southern Railway. The shorter route to Guildford had been completed in 1885, and in 1887 the London and South Western absorbed the Bodmin and Wadebridge, although it was at that time unconnected with the South Western metals, since the westerly extension to Wadebridge was not finished until 1895. In 1890 South Western trains, through the Company's taking over the working of the Plymouth, Devonport and South Western Junction Railway, entered Plymouth; as at Exeter, Great Western and London and South Western trains bound for London leave Plymouth, North Road, travelling in opposite directions. In the Isle of Wight several railways were amalgamated to form the Isle of Wight Central in 1887, though the Isle of Wight Railway was not included in this island imitation of mainland railway policy. Northwards, by its joint ownership with the Midland of the Somerset and Dorset, the London and South Western had reached Bath in 1875, while from Andover to Cheltenham there was being built up the Midland and South Western Junction Railway, an independent line formed by the amalgamation in 1884 of the Swindon, Marlborough and Andover of 1873 and the Swindon and Cheltenham Extension Railway of 1881. This alternative through link between the London and South Western and the Midland Railways, since the line terminated with the Midland at Cheltenham by means of running-powers over the

Great Western from Andoversford Junction, was not completed throughout until 1898, and as a result of the grouping provisions of the 1921 Act fell into the hands of the Great Western Railway, thus leaving the Southern Railway of to-day with only one link with the Midland Railway, now the London Midland and Scottish, apart from the London area.

The Great Western Railway in the 'eighties, as a partial reply to the construction of the Midland and South Western line, gained control of the Didcot, Newbury and Southampton, thereby enabling its trains to reach Southampton, previously a close preserve of the London and South Western, though at a later date Midland and South Western Junction trains reached Southampton Town Station via Andover and Romsey over London and South Western metals. By far the most important Great Western event of this decade was, however, the construction of the great Severn Tunnel, which was completed in 1886. Work on the Tunnel had been started in 1873 under the supervision of Charles Richardson, with Sir John Hawkshaw as consulting engineer, but the latter became engineer in charge in 1879. One of the main difficulties in the construction of this $4\frac{1}{2}$-mile tunnel, of which rather more than half is actually under the river, was the fact that the tides of the Severn are the highest in Europe, and the pumps first used in the work were found to be quite inadequate to cope with the volume of water which poured into the shaft in 1879. Larger pumps were ordered, but it took the better part of a year to clear the works of the water from the Great Spring, as it was called; work then proceeded steadily until October, 1883, when the Great Spring again burst and, to add to the engineer's troubles, a tidal wave on the Monmouthshire side poured into one of the shafts, nearly causing the loss of eighty-three men, who had to be rescued by boat. Eventually it was found necessary to sink a further shaft at one side of the tunnel, six large pumps being used to control the Great Spring. A coal train

used the Tunnel in January, 1886, but it was not until December of that year that passenger trains began to operate through the Tunnel. Besides providing a much shortened route to South Wales from London, the Tunnel also enabled a faster service to be offered from Devon and Cornwall to the north via Hereford, Shrewsbury and Crewe. Various Great Western branches were completed during these years, notably to Bodmin and Helston in 1887. The Company was, meanwhile, steadily progressing with the conversion of its line from broad to standard gauge, though the last broad-gauge train did not leave Paddington until 1892, three years after the death of Daniel Gooch, the intimate friend and colleague of Brunel and for many years designer of the Great Western's broad-gauge locomotives.

On the west to north route, the Midland was becoming highly competitive with the Great Western, and with its network of lines stretching from Bristol through Birmingham to Carlisle, York, Lincoln, Manchester and Liverpool it was able to offer an excellent cross-country service, and even to compete for traffic from Bristol to London. The Midland was mainly concerned with internal improvements or the widening of existing lines at this period, so that there is little to be recorded in the way of new construction or absorption of other lines by the Midland, though preparations were being made for acquiring the Tilbury line, as well as the Northern Counties in Ulster, and for the construction of Heysham Harbour. Though the development of the Heysham route was highly competitive with the Lancashire and Yorkshire route to Belfast via Fleetwood, on the Anglo-Scottish services the two companies were working hand-in-glove, and the opening of the Lancashire and Yorkshire line to join the Midland main line at Hellifield enabled good services to be offered from Manchester and Liverpool to Carlisle where connections were made with the Glasgow and South Western for the Glasgow route and the North

British for the Waverley route to Edinburgh. The opening of the Exchange Station at Liverpool by the Lancashire and Yorkshire in the later 'eighties added greatly to the attraction of this service between Liverpool and Scotland as an alternative to that offered by the London and North Western and its Scottish partner the Caledonian.

The London and North Western Railway was already a very well knit system by 1880, but that summer witnessed the opening of important new works at Holyhead by the Prince of Wales. These works cost three-quarters of a million, and a few months later new paddle-boats attaining speeds of nineteen knots were put into service on the Holyhead-North Wall route to Dublin. The Company, in 1880, was mainly engaged in widening its main lines, notably the line from Bletchley to Roade, while the new loop from Roade via Northampton virtually gave it four tracks between London and Rugby. Lines were also being widened in the Birmingham, Warrington and Manchester areas; at Manchester the construction of the Exchange Station was a leading feature. Improvements at Liverpool during this period included branches direct from Edge Hill to the Docks and the opening out of the tunnel to Lime Street. The next few years saw the completion of many of these improvements, while the taking over of the Watford and Rickmansworth foreshadowed the later development of the London outer suburban area; considerable attention was also being devoted to hotel facilities at Euston, Birmingham and Preston, a new hotel being opened at the last-named in 1882. The Lancaster Canal Company had been taken over in 1885, and that year also witnessed the penetration of the London and North Western beyond the Border, since the Portpatrick and Wigtownshire Railway passed into the control of the London and North Western, the Midland, the Caledonian and the Glasgow and South Western Railways. This Scottish line, which had been assisted financially by the Lancaster and

Carlisle and other companies twenty years previously, had been opened to Stranraer during the 'sixties, though the cross-channel service originally run between Portpatrick and Donaghadee, but not being successful, was subsequently transferred to the Stranraer-Larne route in the early 'seventies. The London and North Western had previously subscribed to the Callander and Oban Railway, in reality a subsidiary of its partner, the Caledonian, and this line was opened on July 1st, 1880, thereby ensuring that the West Highland tourist traffic started from Euston.

The Caledonian had opened Glasgow Central Station the previous year and was, before the end of this decade, to play a leading part in that famous event in British railway history, the Races to Scotland. In 1876 St. Enoch Station at Glasgow had been opened by the Glasgow and South Western, and three years later this line completed the fine hotel adjoining this station. In 1887 the through-route was opened from Ayr to Stranraer, which joined the Portpatrick line at Dunragit and greatly improved the route from Glasgow to Belfast by the short sea crossing.

The 'eighties were an important decade for the North British Railway. The long bridge across the Tay had been opened in July, 1878, but on the night of December 28th, 1879, a great storm swept the bridge away and a train fell into the river below, causing very heavy loss of life, no less than seventy-three persons being drowned. This terrible disaster, by far the worst in the first fifty years of British railway history, was an exceedingly heavy blow for the North British, but steps were immediately taken to rebuild the bridge and the second Tay Bridge, one of the longest in Western Europe, was opened in 1887; the first set of Races to Scotland, as they were called, took place almost immediately after the opening of the new bridge, in July and August, 1888. Meanwhile work on the great Forth Bridge was being pushed forward, but this latter was not

opened until 1890, and in its turn presaged the second series of Races to Scotland in 1893-1895. The North British in 1880 jointly with the Caledonian had absorbed the ancient Dundee and Arbroath, and in the southern part of its territory had completed new suburban lines in the Edinburgh district, and in England opened the Silloth dock in 1885.

Its southern partner on the East Coast route, namely, the North Eastern, was busily occupied in building up its coal and heavy traffic in the Tyneside area and in Yorkshire during this decade; having achieved a virtual rail monopoly in its area it was able to turn its attention to internal matters rather than new construction. The one exception as regards competition was the development of the Hull, Barnsley and West Riding Junction Railway, whose later title was the Hull and Barnsley. The first section of this line, which represented an effort on the part of Hull interests to free themselves from complete reliance on the North Eastern, was opened in 1885; the line finally terminated in a junction with the Midland Railway at Cudworth, north of Sheffield. Essentially a freight line, it owned the Alexandra Dock at Hull, and also connected with the Manchester, Sheffield and Lincolnshire at Wath and the Lancashire and Yorkshire near Knottingley. The construction of this line was a good example of the needless duplication of existing facilities, on the initiative of a municipality, backed by public feeling in a legislature. It is such examples which to-day, when public opinion is against inter-railway competition, make much-needed economies so difficult to effect and give rise to the charge of overcapitalization.

Coming south of the Humber, the history of the Great Northern in this decade was one of great activity. Besides helping guarantee the Forth Bridge Company, whose new Bill had been passed by Parliament in 1882, the Great Northern in the same year obtained powers to take over the

Louth and Lincoln; and considerable attention was paid to the development of tourist traffic in that neighbourhood, at Skegness and Mablethorpe, with the result that 20,000 passengers were carried to Skegness on August Bank Holiday, and that over a single line. The next year passenger trains were run into Leicester, and on the East Coast the Great Northern worked in league with the Eastern and Midlands Railway, a combination dating from 1883 of small lines between Peterborough and Yarmouth. The Great Northern penetrated into the Great Eastern's territory, just as the Midland and South Western Junction line did into the Great Western's, when the Eastern and Midlands became the joint property of the Great Northern and the Midland Railways in 1893. Consequently it still remains in the joint ownership of the London Midland and Scottish and London and North Eastern Railways as successors to the parent companies of 1893; it has served for many years to give the Midland an entry into the Yarmouth fishing trade and the holiday traffic from the towns in the Midlands to the Norfolk coast. Various small branches, some of considerable, others of minor importance, were opened by the Great Northern during this period, but in spite of extensions and a progressive policy it was finding it very difficult to compete with the Midland for coal traffic and even for passenger traffic. The huge cost of widenings, especially in the area just north of London, proved a heavy drain on the Company's finances, and with the sudden death of Mr. Denison, who had so long guarded its fortunes, in 1883 and the liabilities incurred for the Cheshire Lines Committee in connection with the latter's extension to Southport, opened in 1885, the Great Northern found itself in a far from happy position in the mid-'eighties. Facing these difficulties with determination, it proceeded to copy the Midland and on May 1st, 1885, abolished second-class accommodation on certain sections. In attempting to concentrate on the development of the

lucrative long-distance traffic to Scotland it found itself involved in the Races to Scotland of 1888.

The accounts of these Races, which make absorbing reading and have often been described, lead us directly to a survey of passenger-train service in Great Britain at this time. One of the first reliable studies of express-train speeds in Great Britain was that which formed the basis of a paper read before the Statistical Society by H. B. Willock in 1884 relating to the services offered by the railways in 1871. The same society had published in its journal in 1883 a paper by E. Foxwell, but the classical study on this subject was the book by Foxwell and Farrer published in 1889, to whom later generations have owed a debt of gratitude for their valuable records of the later 'eighties. Doubtless the stirring races in 1888 had drawn public attention to the high speed of passenger travel by rail, and though many fast runs had been made in the earlier decades few of them were duly authenticated. For instance, there was a popular tradition on the Great Western that on May 11th, 1848, the Bristol express covered the supposed 53¼ miles to Didcot at 66.7 miles per hour, start to stop, and a card purporting to commemorate this broad-gauge event was actually printed and gives the engine as the " Great Britain ", the train as the 9.15 from Paddington, the load as four carriages and a van, and the names of the driver and fireman. Thanks to the researches of the Reverend R. B. Fellows, an acknowledged expert on the railway history of this period, it has now been proved that the mileage quoted on this card is quite inaccurate, since the present Paddington Station was not opened until 1854; further, in 1848, there was no Bristol or Didcot express timed to leave Paddington at 9.15, and such authorities as Charles Rous-Marten and E. L. Ahrons doubted the authenticity of this record run, while the Great Western itself in 1931 was unable to give any official confirmation of it. Since a serious accident to an up-express had occurred at Shrivenham, near Didcot, the pre-

vious day, causing the loss of six lives and since at the beginning of May Great Western drivers had been warned not to run at excessive speed the story of this run seems somewhat improbable. Nevertheless, such lack of official records did not prevent an account of it appearing in the Final Report of the Royal Commission on Transport, published in 1931, and intended to show how little progress had been made in railway speed during the intervening eighty years. In practice the researches of the Reverend R. B. Fellows into the time-table schedules of the 'forties have shown that the average of the best trains at that period was about 40 miles per hour, whereas in recent years they have averaged very nearly 60 miles per hour. The fastest train of the earlier period appears to have been run on Saturday, March 18th, 1848. It left Paddington terminus at 10.54 a.m. and arrived at Didcot at 11.45, a start-to-stop speed of 61.5 miles per hour; as the train was booked to leave Paddington at 9.45 it would appear to have been over an hour late!

Doubtless, very fast runs were occasionally made in the early Victorian era, but the trains were very light and devoid of other than hand-brakes. The most important difference lay in the number of trains operated over any given mileage of line. Thus, the number of passenger trains from London to Brighton in 1842 passing through Wivelsfield numbered five; to-day over the same pair of metals there are about one hundred and forty trains in the twenty-four hours, and a much higher number at holiday periods. Provided that a line could be kept free for several minutes before each train, start-to-stop speeds of 70 miles per hour or over could be obtained regularly, with trains of three hundred tons or more, with modern steam locomotives, assuming the absence of sharp curves and an almost level line. In the 'forties the rails were made of iron and comparatively soft, and if very high speeds were attained they must have been attended with a very serious degree of danger. It was the steady progress

made with permanent-way construction and locomotive design and maintenance, the better construction of the coaches, but above all the adoption of the continuous automatic brake which made the high speeds of the 'eighties compatible with safety; it was the absence of powerful brakes which rendered the advance in speed so slow between the 'forties and the 'eighties.

Taking these points in turn, one may well devote some attention to the progress that had been made in track construction. The Liverpool and Manchester in 1840 had been using no less than five different sections of rails, varying in weight from 75 pounds to 60 pounds per yard, while in addition there were also some fish-bellied rails, so called from the fact that their vertical section was deeper in the rail centre than at the ends. At first the rails were laid in many places on sandstone blocks, but by 1840 larchwood sleepers 8½ feet long were replacing the stone blocks, the rails, as nowadays in Great Britain, being held in position in chairs by means of oak keys, compressed by a hydrostatic process after being dipped in palm-oil. Somewhat heavier chairs were used at the joint than those employed along the rest of the rail, these weighing 26 pounds each. The neighbouring Manchester and Leeds, like many other contemporary lines such as the Blackwall and the North Midland, used 15-ft. rails of parallel form —that is to say, not of fish-bellied design—and secured them in the chairs by means of a ball and key arrangement, the ball of cast-iron fitting into a socket in one side of the stem of the rail. On embankments " kyanized " larch sleepers were employed, but on the rest of the line stone blocks of four cubic feet were placed diagonally and broken or burnt stone was used for the ballast. A curious feature of this line was the use of stone-flag Lancashire fencing on the Manchester division, and the replacement at quite an early date of wooden fencing by stone walls. The term " kyanized " was derived from Kyan's patent, being a method for the seasoning

and preservation of timber. Trials with the process had been made in 1832 by the Board of Ordnance, and several of the early lines adopted the method for their sleepers and timber for buildings.

Brunel's permanent-way on his 7-ft. gauge line was almost unique and consisted of bridge-form rails weighing up to 62 pounds per yard. Beech piles 10 inches in diameter and 12 feet in length were driven into the ground in pairs at intervals of five yards, every alternate pair having two cross-ties of American white pine which were let into a groove cut out near the top of each pile, to which they were bolted very firmly. The top of the pile was level with the surface of the gravel ballast, and on the top of the transverse ties were laid longitudinal sleepers covered with Swedish tar on which lay elm planking $1\frac{1}{2}$ inches thick and 8 inches wide. The rails were then fastened to this wooden planking by means of screw-bolts which passed through perforations in the rail flanges; in order to ensure smooth travelling a layer of felt was inserted between the rail and the elm planking. This very complicated but ingenious system proved to be excessively costly and had to be given up, but to Brunel, whatever his faults, must be credited the honour of being one of the first railway engineers to realize the great necessity for good drainage; his complete line from London to Bristol was, considering the times, exceedingly well drained. Bridge-rails laid on longitudinal timbers were also in use on a short stretch of the London and Greenwich line. The Grand Junction, whose line was ballasted with sand and gravel to a greater depth than was normal, namely two feet, was one of the earliest lines to use the double-parallel form of rail, apparently with the idea of using the lower section as the running-edge after the top had become too far worn for further use. Since many of these rails were set in chairs on stone blocks, which possessed little spring, indentations were caused on the lower surface,

which made reversal at a later date undesirable, and the idea was not followed up.

The British railways since their earliest epoch have, in general, always adhered to the so-called bull-headed rail, while foreign railways have for the most part, since their first construction, used the flat-bottomed rail, sometimes known as the Vignoles rail, after the famous engineer. There have been many exceptions, notably the Great Western, where Brunel's bridge-rails were later superseded by flat-bottomed rails, which remained in use until the 'nineties; flat-bottomed rails were used by the Eastern and Midlands, the Midland and South Western Junction and certain Irish Railways, and some of them may still be seen to-day; but, apart from the Great Western, the flat-bottomed rail has only been used where speeds were low. It is cheaper to fix, since neither chair nor key is required, but for equal axle loads this type seems to call for a heavier rail than the bull-headed design, and, in spite of the popular conception that the flat-bottomed rail is cheaper to maintain, the bull-headed rail has many advantages, such as rapidity of handling when renewals are in progress, and yielding a longer sleeper life, which may quite easily more than offset the supposed advantages of the flat-bottomed design. With the latter, unless very expensive and specialized machinery is employed, the fixing of the rail to the sleeper has to be carried out by means of spikes or coach-screws on the spot, while with the bull-headed rail a line can be re-sleepered and re-railed at two separate times. Any advantage in expense derived from the elimination of the chair has been practically offset by the almost universal employment of a tie-plate between the flat-bottomed rail and the sleeper, except, for instance, on the Nord Railway of France, where sleepers of hardwood are exclusively used. The employment of a chair permits the use of a cheap, softwood sleeper, whereas with the Vignoles rail on main lines carrying fast and heavy

traffic a hardwood sleeper is far more desirable if wood is used at all.

The maximum weight of wrought-iron rails did not increase greatly until the 'sixties, when they reached 82 pounds per yard on certain lines in the North of England, but a very important change had occurred in 1847 when, in place of the rail ends being left to rest in joint-chairs, a suspended joint was designed, the rails being held in position by fish-plates. The credit for this improvement belongs to Bridges Adams, and many British railways adopted this rail-joint as a standard during the succeeding years, notably the London and North Western in 1853. Another event of perhaps even greater significance was the replacement of iron by steel as a material for rails at the beginning of the 'seventies, thanks to the invention by Henry Bessemer of his process of steel manufacture. A steel rail is reputed to have been under test at Chalk Farm on the London and North Western with very satisfactory results as early as 1862. Besides being much stronger than the malleable iron previously used, it was found to wear more uniformly, and for a given weight its ability to withstand abrasion proved very advantageous. The stronger rail in turn permitted the use of a harder wheel-tyre; in spite of heavier axle-loads, greater speeds and harder tyres, the life of the rail during the nineteenth century was steadily increasing until it reached about twenty years, so far as well-maintained main-lines were concerned. Many of the early locomotives had cast-iron tyres which were slipped on without shrinkage. Though the weight of rails had increased steadily, the length remained comparatively short, and even in 1890 there were few railways utilizing rails more than 30 feet in length, though the weight per yard on some lines by that year had reached 90 pounds.

During the 'nineties the length of rail increased more rapidly than the weight, and even to-day the weight for main lines in Great Britain does not exceed 95 pounds; for

secondary lines an 85 pound per yard rail has been found sufficient. In the first decade of the twentieth century heavy rails were tried by several companies, notably the Midland, which used those weighing 100 pounds per yard, and the Great Western, which adopted 97½ pounds as a standard; but in 1905 the British Standard Section Steel Rail weighing 95 pounds per yard was agreed upon. Foreign railways, more especially in the United States and Canada, which use exclusively flat-bottomed rails, have long put into their tracks rails of much greater weight than those standard at a contemporary period in Great Britain, and to-day the Pennsylvania Railroad is using rails weighing 152 pounds per yard; but axle-loads are much heavier abroad and the flat-bottomed design calls for a greater weight per yard than the bull-headed rail. In France, where the Etat and the Paris-Orléans Railways still have large mileages of bull-headed rails in their main lines, the standard weight of a rail is 92¾ pounds per yard; the Midi still standardizes on the bull-headed rail, though this policy is likely to disappear on the now imminent fusion of the Paris-Orléans and Midi Railways. If the weight of rail was lower as regards England than abroad, the British railways long led the van in length, with all its attendant advantages of fewer fish-plates and joints, and the London and North Western Railway deserves credit for this, since it adopted a 60-ft. length in 1894. It is frequently pointed out that the railways have owed nearly all their great landmarks in progress to outside manufacturers; here seems to be an instance where the ownership of a rail-mill by the Company, at Crewe, alone made the early use of a really long rail possible. The rail-mill at Crewe, a proud possession of the London and North Western, was finally closed by the London Midland and Scottish Railway in 1932, and, though it was presumably out of date when closed, its record of achievement in regard to output of long rails will remain an honoured memory in railway annals for

many decades. On the British railways many experiments have been made with metal sleepers in place of timber ones, but in every case extensive trials have resulted in a reversion to wood; a railway in Yorkshire was using metal cross-ties before 1840. One of the most far-reaching of such experiments was made by the London and North Western during the 'eighties, both steel and iron sleepers being the subject of trial. Some of the sleepers lasted quite a number of years, but others cracked and failed in a very short period, and their unevenness of life and consequent unreliability resulted in the abandonment of metal and a reversion to timber. In recent years, when suitable Baltic timber has been difficult to obtain or excessively dear, many experiments have been made with various designs of steel sleepers by the British railways, notably the Great Western, but in several instances they had to be removed after a short time; it is, however, still too soon to state whether the expected life will be obtained from these modern designs. Whilst it is frequently stated that metal lasts longer than timber, it may be pointed out that when it has been well seasoned timber may last over many centuries, as for instance the piling on which Venice and Amsterdam are largely built, or the church roofs in England. It is only the ravages of boring insects which have made renewal necessary after several hundred years. An added complication has arisen in connection with the use of steel sleepers through the steadily extending track-circuits, which necessitate the employment of a non-conducting material as a cross-tie, and no satisfactory method of overcoming this difficulty has yet been evolved; this problem is primarily one of signalling and calls for mention when modern signalling methods are discussed.

In recent years the type of ballast utilized on British railways has nearly always been crushed granite or slag; although on branch and secondary lines cinders or gravel have been employed, though there are disadvantages due to

the dust therefrom affecting adversely journals and bearings on the rolling-stock, and adequate drainage is more difficult to obtain. In British railway practice the rails are canted inward at the slight angle of 1 in 20, and with sleepers impregnated with several gallons of creosote each, under pressure, the life of a main-line track using steam traction, and well maintained with good drainage, averages about two decades, after which much of the material can be used on secondary lines. Considerable attention has been given to the chemical content of rails, with a view to increasing their length of life, and much valuable research has been done on this subject in recent years; crossings made of manganese steel, the sorbitic process of treatment, trials with chromium steel, to mention but a few, are amongst the results of scientific research. The extra strength of the rail has permitted the growth in axle-load; indeed, it was the coming of the steel rail in the 'seventies that enabled the locomotive engineers to design locomotives with much greater adhesion, and thus made possible the remarkable records of train-running of the later 'eighties, especially on the Anglo-Scottish lines.

It is not possible—nor would it be appropriate here, since it is a technical subject—to follow up the evolution of the steam-locomotive from the four-wheeled Bury-type engine No. 1 of the London and Birmingham with its single driving-axle to the express-locomotive types of the 'eighties. But brief mention may be made of a few outstanding developments. The design of a bogie, mentioned previously in connection with carriage-construction, is of special importance with locomotives since it allows of easy travelling around curves, particularly on poorly constructed lines. A bogie may be defined as a four-wheeled truck so constructed as to turn on a central pivot and usually placed under the front part of a locomotive, thus enabling it to take curves of small radius. The locomotive construction firm of Robert Stephenson & Co. exported two bogie-engines for the Saratoga and

Schenectady Railroad in 1833, and, as if in reciprocity, six years later eight engines containing this feature were exported by Mr. Norris, of Philadelphia, for the Birmingham and Gloucester Railway. These locomotives, which worked at a pressure of 62 pounds per square inch, cost £1,550 each; a heavy Import Duty of 20 per cent. had to be paid on their arrival. Four of them were honoured with names, including that of "England". In spite of the success of the Norris engines, the British designers did not adopt the four-wheeled bogie extensively until the 'seventies and 'eighties. Nevertheless, speed, and the desire for it, was steadily growing, and, as compared with the 39 m.p.h. of the "North Star" in 1839, by 1853 an engine of the Bristol and Exeter is reported as having reached 81 m.p.h., though there are no details of the run and it must have been a somewhat dangerous procedure. The "North Star", one of the most famous of the early locomotives, had been built by Robert Stephenson & Co. for a Russian 6ft.-gauge line possibly the Tsarkoe-Tselo line, which was opened before the Great Western itself, and, of course, the locomotive had to be altered to run on the 7ft. gauge.

For fast passenger trains the "singles", some with 8ft. driving-wheels, were supreme on several lines, and Gooch's "Great Britain", completed in thirteen weeks, touched 62 m.p.h. in the experiments conducted for the Gauge Commissioners in 1846. For goods trains the standard British design was the six-wheeled coupled, the 0-6-0, which is still numerically the largest family of locomotives in Great Britain, if classified by wheel design. Another famous Great Western locomotive was "Lord of the Isles", which, exhibited at the 1851 Exhibition, was only withdrawn in December, 1881, and, sad to relate, afterwards scrapped. Engines of this time were remarkably efficient, running up to 800,000 miles before being reboilered and only consuming 30 pounds of coal per mile.

Increasing weight of trains brought about the use of two coupled axles, especially on lines where gradients were heavy, and 1861 brought a further advance when a four-coupled engine with a leading four-wheeled bogie was working on the Great North of Scotland. Other four-coupled types were built with a leading carrying-axle only, making them in railway nomenclature 2-4-0's instead of 4-4-0's, but the fast trains of the 'eighties were still being run largely by single-wheelers (2-2-2), notably Stirling's design on the Great Northern and Ramsbottom's "Problem" class on the London and North Western. This line had painted its locomotives green up to 1873, but after that year the standard colour was black. It is of interest that during the previous year, 1872, Crewe locomotive-works had turned out no less than 146 locomotives.

Even in Scotland there were many singles, one of which, the last single in service in Great Britain, was of bogie design by Neilson and still runs between Perth and Dundee. This engine was exhibited at the International Exhibition of Industry, Science and Art at Edinburgh in 1886, was then taken over by the Caledonian Railway and later used to haul the West Coast express during the races to Edinburgh in 1888. Bogie singles (4-2-2) were built as late as the first years of the twentieth century, but corridor and restaurant cars were getting too heavy for them by then and they found difficulty in starting with the limited adhesion on their one driving-axle. Few classes of engines were more popular with the travelling public than the Stroudley singles of the Brighton line or, in later years, the Johnson bogie singles of the Midland.

Fast and powerful locomotives running on a well laid and well maintained permanent way were of little commercial use for high-speed work without adequate brakes, the more so as services were becoming more frequent, trains heavier and train density greater. Thus it was the improvement in

brakes, largely the outcome of the brake trials of 1875, together with the steady improvement in signalling methods that made the speeds of the 'eighties possible without sacrifice of safety. The 1874 Royal Commission on Railway Accidents recommended the use of the absolute block system, the general principle of which was to ensure that not more than one train could be in any given block section at the same time. In retrospect it is hard to understand the opposition to this system by the then chief engineer of the North Eastern, who was the railway representative on the Royal Commission and signed a minority report in which he claimed that the theory of absolute safety from the adoption of this system "has undoubtedly created a new source of danger". Coupled with the working of the block telegraph apparatus, which was applied from 1879 onwards to the working of trains through busy station yards, absolute block working certainly made possible, with due regard to safety, the excellent express services run by the railways in 1888. A rule book of 1876 describes the absolute block system as follows: "On those portions of the line worked on the Absolute Block System, a second train or engine must not be allowed to enter a section until the preceding train or engine has been signalled as having passed out of the section, except under the circumstances specified in Rules 100 and 101, to meet cases of train or telegraph failure". This, of course, did not apply to lines worked by train staff or ticket where "A Train Staff or Train Staff Ticket must be carried with each train or engine, and without this Staff or Ticket no train or engine must be allowed on the Line". Single lines could also be worked by a pilot guard wearing a special dress or badge, no train being permitted on the line unless accompanied by the pilot guard or started by him. A third method of working a single line was to have only one engine in steam on that line, except in case of accident or failure.

As showing the vast improvement in express train speeds

between 1870 and 1890 by the London and North Western, the best train at the former date covered the 113 miles from Euston to Birmingham in 3¼ hours, the almost 189 miles to Manchester in 5 hours, and the 201¾ miles to Liverpool in 5¼ hours, but the other trains of that year were much slower. By October, 1888, when the first general accelerations of the British railways took place, the times had been reduced to 2 hours 40 minutes to Birmingham, 4 hours 15 minutes to Manchester and 4 hours 25 minutes to Liverpool. A feature of the London and North Western activities in South Lancashire had been the inauguration of fixed interval services between 9 a.m. and 8 p.m. between Liverpool and Manchester. On other railways there were similar accelerations; thus, the 86 minutes to Cambridge from Liverpool Street in September, 1877, including a three-minute stop at Bishop's Stortford to collect tickets, had been brought down to a 75-minute run by October, 1888. The Midland and the Great Northern Railways in 1888 equalled the time of the London and North Western to Manchester with runs of 4 hours 15 minutes, though the fastest run to Brighton took 65 minutes, which does not show such rapid progress as in the North, and is the more remarkable in that the Northern expresses were having to handle heavier coaches, such as sleeping- and dining-cars. The London and North Western had introduced a sleeping-saloon on its London to Glasgow run in 1873, while the following year sleeping-saloons were also placed on the London to Holyhead and London to Liverpool routes. This line's corridor sleeping-cars of 1882 ran on eight wheels and were no less that 42 feet in length, being the first owned by that company to exceed 33 feet; between 1872 and 1889 the tare weight of the standard London and North Western carriage had increased by 80 per cent., namely from 10 to 18 tons, whereas the seating capacity had only risen by 40 per cent. First-class carriages in the latter year possessed lavatory accommodation, which enabled station

stops to be cut out. The trains of this company to Scotland in the 'eighties also carried heavy mail-sorting vans, which picked up and dropped mail-bags at high speed.

In 1872 the 10 a.m. from Euston took 11½ hours to reach Glasgow and 11 hours 10 minutes to reach Edinburgh, but in 1888 the "Railway Races to Edinburgh" between the East and West Coast routes rapidly reduced this time. For many years previous to the race the West Coast route had carried the lion's share of the Glasgow traffic, but the London to Edinburgh traffic was almost entirely the preserve of the East Coast partners. Just prior to 1888 the fastest East Coast train to Edinburgh, carrying no third-class passengers, took nine hours, whereas its West Coast rival required ten hours to Edinburgh, Glasgow being also reached in the same time from Euston; since the East Coast train, which had to pass through Edinburgh, did not reach Glasgow, Queen Street, under the twelve hours, there was virtually no competition from the East Coast for the London to Glasgow traffic. The West Coast 10 o'clock to Edinburgh, however, carried third-class passengers, and the races of 1888 were primarily brought about by the East Coast partners providing third-class accommodation on the 10 o'clock—the "Flying Scotsman"—from King's Cross as from November, 1887. In June, 1888, the London and North Western and Caledonian Railways replied by cutting the London to Edinburgh and Glasgow schedules of the 10 a.m. from Euston by one hour, thus equalling the time to the Scottish capital by the East Coast route. The East Coast replied by knocking a further thirty minutes off the journey time on July 1st, 1888. The West Coast train was cut down by a similar thirty minutes on August 1st, thus again bringing both trains level as to time. This move, only announced on July 27th, was countered by the East Coast's reducing their time by a further half an hour, as from August 1st, thereby bringing the two capitals within eight hours of each other for the

first time. Euston announced on August 3rd that as from August 6th their 10 o'clock would arrive at Edinburgh by 6 p.m. also, and this time was actually bettered on the initial run, though the train was admittedly a light one of about 80 tons. Except for a locomotive failure at Shap on the 9th, the West Coast trains kept good time, being usually handled by "Problem" 7ft. 6in. singles to Crewe and the 2-4-0 "Precedents" between Crewe and Carlisle. The East Coast trains, hauled over the Great Northern section by Stirling's 8ft. singles, were heavier, with tare weights of over 100 tons, but the gradients were easier and the mileage somewhat shorter; on the other hand the fact that the service was run by three partners in place of two made strategic moves more difficult. Nevertheless, on August 12th, after the peak movement for the "Twelfth" was over, they cut a further fifteen minutes off the run reducing it to $7\frac{3}{4}$ hours, but the rival West Coast train arrived in Prince's Street Station, Edinburgh, that evening at 5.42 p.m. Both public opinion and the railway managements by this time were seriously concerned at the possible dangers of such fast running, and for the rest of August schedules were stabilized at $7\frac{3}{4}$ hours for the East Coast and 8 hours for the West Coast route; the following month a reversion was made to $8\frac{1}{2}$ hours.

The brilliant performance of the engines and their drivers has been described in detail many times and there is little need to repeat it, but in recent years there has been much misinterpretation of the event in railway history. Without question, the rivalry of the two routes attracted public attention at home and abroad to the potentiality of railway speeds, and, consequently, the advertising value to the railway industry was by no means small. Equally it proved that Edinburgh and Glasgow could be reached under the best weather conditions easily in $7\frac{1}{2}$ hours, if the lines were kept clear, rolling-stock kept at concert-pitch and every one

keyed up, including the organization; it also showed the possible effect of the opening, then imminent, of the great Forth Bridge; but it proved quite conclusively that railway races were not a commercial proposition, and the delays caused thereby to other traffic did not warrant their continuance. To compare the railway race of 1888 with the regular running day-in and day-out of the "Royal Scot" or the "Flying Scotsman" of the present time, as has so frequently been done, is to compare special high-speed air flights with the regular commercial service of Imperial Airways, where safety is quite rightly a first consideration, and the balancing of expenditure by receipts of great importance.

The railways, at any rate north and west of London, were at this period wide awake to the value of speed, and the comfort and facilities on the trains were steadily extending, six-wheeled dining-cars being put into service on the London to Liverpool and the London to Manchester routes by the London and North Western in 1889. The spur towards speed and comfort must have come entirely from inter-railway competition, since for passenger traffic, at any rate, the railway was supreme, although with the improvements made in road surfaces, due to the coming of the cycling era, the few remaining coaches were putting up record journeys. For instance, Selby's "Old Times" coach to Brighton on July 13th, 1888, accomplished the round trip of over one hundred miles in 7 hours 50 minutes, the outward journey taking just over four hours. Throughout the season of 1888 this coach did the journey to the "Old Ship" at Brighton in times varying from 5½ to 6 hours, while another Brighton coach, the "Comet", made a journey in 6 hours 10 minutes by a somewhat longer route. One cannot say whether the railway races to the North were a desire to emulate Mr. Selby's "Old Times", but the cyclists regarded the latter as a challenge, and after many unsuccessful attempts had been made four famous cyclists riding in relays on August

10th, 1889, beat the round-trip record of the "Old Times" by riding from the White Horse Cellars (Hatchett's) to the "Old Ship" at Brighton and back, 108 miles, in 7 hours, 36 minutes, 19 2-5 seconds. It was indeed the age of speed.

Bicycles had been considerably improved during the 'seventies, thanks largely to H. J. Lawson, of Coventry, who is reputed to have invented the safety-bicycle in 1876, and by 1880 they had reached a form which changed comparatively little until the twentieth century. Lawson also patented in September, 1880, the design for a motor-car to be driven by compressed gas, and was, therefore, practically the first designer of a motor-car proper as distinguished from a "Steamotor Car"; the fact that Lawson was a Coventry man explains the rise of that town as one of the great bicycle and motor-car building centres of the world.

In London this decade witnessed the formation of the London and District Omnibus Company, in 1880, the forefather of the London Road Car Company, of 1883, which became the great rival of the London General Omnibus Company. It was the new rival which was responsible for the introduction to the Londoner of the "garden-seat" bus of 1881, which gradually ousted the older knife-board design. It is curious that this improvement in seating accommodation on the upper-deck did not reach London earlier, because the so-called garden-seat had been in use in Continental Europe for many years. Horse-bus and -tram designs, however, changed more slowly than railways and even in 1913-1914 some of the last of the horse-trams to run in the country, at Oxford, still provided seating accommodation back-to-back on the top-deck, as had the Brussels horse-trams forty years previously. Even during the last few years electric trams at Southampton have been in use employing this very primitive and uncomfortable form of seating on their open-tops.

In 1889 the tramway system of the county of London con-

sisted of 106½ miles and carried about 169,000,000 passengers annually. Its ownership was split amongst fourteen different companies, all of which employed horse traction, though there were two short stretches of cable-operated line, one on Highgate Hill and the other on the Streatham and Kennington route. Operation of tramway systems by municipalities had been very rare until 1882, the usual practice being for any system, even if built or subsequently acquired by a municipality, to be leased out for operation to a private company. Nevertheless, in 1882, Huddersfield was unable to find anyone to whom it could lease its lines on a satisfactory basis, and Parliament permitted the operation of the system by the Huddersfield Corporation itself, the Board of Trade granting a licence for this purpose.

The 'eighties, which had witnessed such a vast improvement in facilities for passenger-movement by rail, also saw considerable advance in the movement of merchandize, and by 1880 it had become the rule for goods dispatched from London to be delivered in Lancashire, Yorkshire and the Midlands within 12 hours. In part this was made possible through the increase of traffic which permitted the loading of through wagons, but due credit must be accorded to better railway organization and to the construction of marshalling-yards, the most important of which was the unique lay-out at Edge Hill, Liverpool, on the grid-system and worked by gravity. This yard, designed by Mr. Footner, had been completed during the 'seventies, but it was by no means the first yard to employ gravity for shunting, since this had been used for many years by the North Eastern Railway. The close co-ordination between the railways and the various cartage firms, like Pickfords and Carter Paterson, resulted in a well organized system of collection and delivery for lighter merchandize, and ensured the correlation of rail and road services, the latter, of course, being limited in sphere through the use of horse-drawn carts. Carter Paterson & Co. had been

appointed to handle the delivery of railway parcels in the London and suburban area for many years by the Great Western, the Great Eastern, the Midland and the companies now forming the Southern Railway. An interesting old bill of this firm, issued in 1865, quotes charges of fourpence to 1s. 2d. for packages varying from 7 to 112 pounds, carried within a radius of three miles, and between fourpence and 1s. 6d. for packages ranging from one pound to 112 pounds for distances exceeding that radius. In each case hat boxes were charged at the rate of sixpence each.

The handling of small packages and parcels by the carrying firms and by the railways had been materially affected by the Post Office (Parcels) Act of 1882, and the first Government parcel-post service came into being the following year. The negotiations with the railways had been long drawn out, but it was finally agreed that the weight of a parcel should not exceed seven pounds, and that the scale of charges was to vary from threepence to 1s. according to weight. The Post Office agreed to pay to the railway companies 55 per cent. of the postage received on the parcels conveyed by rail, the payment being made in a block sum to the Railway Clearing House, and the latter organization distributing it amongst the different lines. By this means the nation was provided with a flat-rate of postage on parcels throughout the country, similar to the principle of postage charges in regard to letters; later this system was extended to the Colonies as well. The economic significance of this uniform postage-charge was by no means unimportant, as it gave considerable advantage to the shops and commerce of the cities, over the local village shops. People who lived in the country, even in the early 'eighties, were very circumscribed in their activities; visitors from only twenty miles away, unless they were near a railway station, had of necessity to stay the night and rest the horses. Dinners, dances, tennis and shooting parties required long preparation by written correspondence.

In short, the activities of life were home-made, and a visit to London from, let us say, rural Suffolk or Norfolk was an adventure to be undertaken but once or twice a year.

At a time when crops of grain or hay were mown by hand, when milkmen carried their pails on yokes, when threshing was done by the flail, seed broadcast by hand and when oxen rather than horses brought the shocks to the downland stacks in Sussex, London seemed far indeed from the countryside. Yet many of these signs of mid-Victorian England continued well into the twentieth century, though they have all but disappeared to-day. If London seemed far away in 1880, what of Paris? Yet Paris, the fare to which, including several days sight-seeing, was £5 return, as regards transport differed less from London than it does to-day. Though London hansoms were represented in Paris by victorias, there the traveller would find double-deck omnibuses, as well as the double-deck suburban carriages at St. Lazare and the Gare de l'Est; at the latter many may still be seen in use, though in a much improved form. Paris had no Eiffel Tower until 1889, and the construction of its " Metro " was only under discussion in 1880, while many of the London-Paris services were dependent on the tides; transport in France as in Great Britain had registered remarkable progress in the 'eighties and the end of that decade may be regarded as marking a turning-point in transport history. Transport developments are evolutionary, but, if lines of demarcation, however blurred, have to be made, 1889 may well be regarded as the conclusion of the old and the beginning of the new; it marks the complete monopoly of the railway for fast land travel. Early in the 'nineties came the first sign of the re-awakening of the roads through the progress made with motor-cars.

CHAPTER VIII

1890—1899

THE TRAMWAY AND THE INTERNAL COMBUSTION ENGINE AND THE RACES TO ABERDEEN

During the 'eighties approximately 2,050 route miles had been added to the railway system of the United Kingdom, and during the succeeding decade rather less than 1,800 were to be added. This last figure appears higher than might be expected, but it mainly represents comparatively unimportant extensions. Small railways in Ireland, light railways and local lines, such as the Easingwold and the East and West Yorkshire Union Railways, were responsible for a certain percentage of the total. In 1890 the number of passengers, exclusive of season-ticket holders, carried exceeded 817 million and the tonnage of minerals and merchandize had risen to over 303 million. On a total paid-up capital, including nominal additions, of almost £900 million, the net receipts in 1890 amounted to £36,760,000, or about 40 per cent. of the gross receipts. The era of large scale railway construction had, nevertheless, been passed long before 1890, and legislation during the last ten years of the nineteenth century centred mainly on the control of charges made by the railways, then holding a virtual monopoly of inland transport, except for the heavy traffic still carried on the canals in horse-drawn barges.

During the 'eighties, besides the Post Office (Parcels) Act of 1882, an Act called the "Cheap Trains Act" had been passed in 1883, which abolished the duty levied under the Railway Passenger Duty Act of 1842, in so far

as it applied to fares of one penny per mile. In general it may be said that after 1883, passenger duty had only to be paid on first- and second-class tickets. In return for this concession the railways were required to provide a service of trains at very low fares for workmen. Tramways were equally under the statutory duty of providing cars for workmen at suitable times in the early morning; as a result of the shortening of the working day to eight hours, and the consequent later start in the morning by labourers, artisans and so forth, virtually anyone arriving at his destination before 8 a.m. can obtain a workman's ticket at a very cheap fare, in any district where workmen's tickets are available.

The most far-reaching legislation of the 'eighties had been, however, the Railway and Canal Traffic Act of 1888. Owing to continuous disputes between the traders and the railways over the powers exercizable by the latter in the matter of charges, a Select Committee of the House of Commons had been appointed in 1881, and this Committee had made a very complete investigation into the powers of the railways, said to be contained in not less than 900 Acts of Parliament. The Railway and Canal Traffic Act was the final result of this very extensive study of a highly intricate problem, touching virtually every industrial and trading concern in the country, and it provided for the revision of the charges of all railways and the fixing of their maximum rates. The new scales of charges were to be submitted to the Board of Trade within six months of the passing of the Act; these were duly deposited with the Board of Trade in February, 1889. More than 1,500 objections were made by traders and bodies representative of trading interests to these new schedules of charges; consequently it became necessary for conferences to be arranged between representatives of the traders and those of the railway companies. These conferences, at some of which Lord Balfour of Burleigh presided, continued until the late spring of 1890. Finally, the

Board of Trade succeeded in producing a report containing the schedules of charges, and a revised classification for merchandize and minerals, which made the classification uniform for all British railways, and fixed almost uniform charges for nearly all of them; admittedly there were certain exceptions, notably in regard to Class A traffic. Nevertheless, opposition by the traders still continued sufficiently strong to warrant a further inquiry by a Joint Committee of both the Houses of Parliament, and this resulted in further amendments; but the fundamental proposals of the Board of Trade Report were left much as they had been, so far as the classification and schedules of rates were concerned. These finally came into use as from the beginning of 1893, as a result of the passage of the Railway Rates and Charges Order Confirmation Acts of 1891 and 1892.

Perhaps the most notable principle involved was the adoption of a tapering rate-scale, and the abolition of the addition of so much per mile for every mile after the sixth. The tapering scale provided for a certain rate per mile up to twenty miles, a somewhat lower rate for the following thirty miles, and a still lower rate for the succeeding fifty miles: this, in practice, means that the rate per ton mile grows less as the length of haul increases. Such a principle is almost universal to-day for railway charges and is economically sound, since it bears some relation to the operating cost of haulage on the railway itself; at the same time its adoption met with much criticism and opposition. The new classification divided all freight into eight classes, the uniformity in charges applying also to the charges for station terminals, which consist of loading and unloading and covering and uncovering of wagons, where such work is done by the railway company. Though originally covering the work of the Select Committee of the early 'eighties, this highly important Act has been dealt with in this chapter of the 'nineties because its final results became evident in 1893, and from its passage

in 1888, through the seven years until 1895, there is a continuous sequence of Parliamentary investigations.

It will be recalled that the Railway and Canal Traffic Act, 1873, had authorized the appointment of Railway Commissioners to carry into effect the provisions of the Railway and Canal Traffic Act of 1854, as well as the increased powers conferred by the Act of 1873. The Railway and Canal Traffic Act of 1888 provided for the reconstitution of this tribunal, known as the Railway and Canal Commission, which was to consist of two Commissioners to be appointed by the Board of Trade, as well as three *ex-officio* members who were to be judges representative of England and Wales, Scotland and Ireland. During the last twenty years various changes have been made in this Commission and the two members are appointed on the recommendation of the Home Secretary. Much of the railway work of the Commission was transferred to the Railway Rates Tribunal, as a result of the Railways Act of 1921, but in 1933 the Commission still exercised jurisdiction in matters concerning alleged undue preference and the adequacy of facilities and service offered by the railways. A Bill was deposited in 1933, however, to abolish this Railway and Canal Commission altogether and distribute its functions elsewhere, so far as the railways were concerned, mainly to the Railway Rates Tribunal.

The alterations in charges, which embraced millions of different rates and were the result of several years of detailed study and analysis came into operation, as already stated, on January 1st, 1893, the Government being unwilling to delay the operation of the Act beyond that date; as insufficient time had been available for the examination of many exceptional rates, that is to say, those special rates granted to traders which were lower than the standard scales, the railway charged the full statutory rates in such cases. This raised a storm of opposition from the traders who had to pay higher

rates than they had been accustomed to, whereas those who were benefiting by reductions in rates remained discreetly silent. So strong was the agitation that the Government was pressed into passing another Railway and Canal Traffic Act in 1894, the main provision of which was that, where any rate had been raised as from January 1st, 1893, the responsibility for justifying the amount of the increase fell upon the railway company. Such justification was very difficult to prove since the railway had to show that there had been a change in the circumstances under which the traffic was handled; hence the actual rates charged were often far below the level to which the railways had the power to raise them.

Other than these Railway and Canal Traffic Acts and a Light Railways Act of 1896, which resulted in the construction of several small lines in country districts, such as the Basingstoke and Alton Light Railway, the most important legislation of this period, 1888 to 1900, consisted of a Regulation of the Railways Act of 1889, which required that all trains carrying passengers must be fitted with the automatic continuous brake. In practice all the chief companies had so equipped their passenger trains prior to the passing of this Act, but the provision ensured that no risks would be taken on the smaller lines, and on unimportant branches, where accidents, if measured by loss of life, can be just as serious as on main lines carrying fast and heavy traffic. Another provision of this Act of 1889 related to the block system of working, and also defined the requirements in regard to the locking of points and signals. Another aspect of railway safety was covered by the Regulation of Railways Act of 1893, which was concerned with the hours of duty of the railway staff; moreover, four years later the railwayman received further attention by being included in the Workmen's Compensation Act. With the increasing weight of trains and the increased density of traffic during the 'nineties,

conditions of work were doubtless becoming considerably harder, whilst congestion outside many of the larger freight stations and yards held up trains for long periods.

The British railways have always suffered through being pioneers, in that roughly 50 per cent. of the wagon stock has been owned by coal mines and merchants, trading concerns, quarries and so forth. While many of these privately-owned wagons are fine examples of the wagon-builder's craft and are well maintained, others are aged and decrepit, falling far below the standard of railway owned wagons, and of far greater age—many privately owned wagons of the 'eighties are still running. In 1881 the Midland Railway bought up virtually the whole stock of privately owned wagons running on its system, but the net result appears to have been that the railway came into possession of thousands of semi-antique wagons, whilst their previous owners were in a position to order new wagons to replace them. The problem is still outstanding to-day; Government after Government has failed to find any solution of this important question which must have cost the country millions of pounds in empty wagon shunting and haulage, since nearly all privately owned wagons have to be returned empty, there being no return load. It is not claimed that return loads for more than 10 per cent. could be found if the wagons were railway owned, since coal, which is the load most of these wagons carry, obviously flows in one direction only, but the greater elasticity of operation resulting from common ownership, whether under a railway aegis or not, would effect enormous savings; the capital expenditure on marshalling-yards constructed purely to sort out such empty coal-wagons for return to their respective collieries is unfortunately beyond recall. Traders who cry out that the level of British railway rates is too high should remember their own continuous opposition to the adoption of a system which has always been the practice on railways abroad.

Probably the most important railway event of 1890 was the opening of the Forth Bridge, which gave the East Coast partners the shortest route to the Scottish cities north of Edinburgh, namely, Perth, Dundee and Aberdeen. Opened for passenger traffic on June 1st, 1890, this great structure across the Firth of Forth forged the last link in the chain of railway facilities stretching from Dover and Penzance through Aberdeen and Inverness to Wick and Thurso and led directly to the Anglo-Scottish races of the 'nineties. Aberdeen was the objective this time, not Edinburgh, and the races were all the more thrilling as the East Coast trains had to reach Aberdeen over the metals of the Caledonian Railway from Kinnaber Junction, just north of Montrose and thirty-eight miles south of Aberdeen. Certain sections of the East Coast route north of the Forth consisted of single track only, where trains were liable to delays unless great care was exercised. Using corridor-coaches for the Anglo-Scottish services and providing third-class travellers with dining-car accommodation, to the rivalry in comfort rivalry in speed was soon added. After the completion of the Forth Bridge the East Coast trains reached Aberdeen in 12 hours 15 minutes, a time which had been reduced to 11 hours 35 minutes by 1894, when the West Coast trains were taking 11 hours 50 minutes for the journey. The timing of the night express to Aberdeen from Euston was cut the following July to 11 hours 40 minutes, to which the East Coast partners replied by timing the rival 8 p.m. from King's Cross to reach Aberdeen in 11 hours 20 minutes; this accentuated the rivalry, as the train had to reach Edinburgh in under the 8½ hours agreed upon after the races of the 'eighties. The London and North Western and Caledonian Railways replied to this alleged breach of faith by running the 8 p.m. from Euston to Aberdeen, in mid-July, 1895, in 10 hours 46 minutes and 10 hours 21 minutes on two successive nights; the Great Northern, North

Eastern and North British Railways responded a week later by announcing a timing of 10 hours 45 minutes, or 15 minutes faster than the official schedule of their West Coast rivals. The official schedule of the Euston train proved quite unimportant, however, as it arrived at Aberdeen anything up to 40 minutes ahead of the booked arrival, and, of course, before its rival from King's Cross; but at the end of July the East Coast timing was cut by a further 20 minutes and the train arrived at Aberdeen in 10 hours 20 minutes from London, only to find the West Coast train had been 15 minutes ahead of it from Kinnaber Junction, virtually one hour ahead of schedule.

During the first half of August the West Coast night train continued to arrive at Aberdeen before its East Coast rival, but on the 19th both trains were "given on" to the Kinnaber Junction signalman at approximately the same time, and the Caledonian signalman accepted the "foreign" line train; the West Coast express had to follow its rival, which steamed into Aberdeen at 6.17 a.m. The following mornings witnessed still earlier arrivals; the white-and-chocolate coaches from Euston one morning reached Aberdeen before 5 a.m., but the night East Coast express of August 21st, replied with an arrival at 4.40 a.m., beating the West Coast express by a quarter of an hour. On the night of the 22nd, the London and North Western and the Caledonian Railways staged a special run with a very light train of seventy tons, and covered the 540 miles throughout to Aberdeen in 512 minutes, at a speed of over 63 miles per hour, thus reaching the goal at 4.32 a.m. It was, however, realised that such racing could not continue indefinitely, and an agreement was reached by which the East Coast route was to be allowed a thirty-five minutes' advantage, since its somewhat easier route was sixteen miles shorter. Nevertheless, the racing had once again opened the eyes of the public to the capabilities of the steam-locomotive and the capacity of the railway

managements for organization. It is satisfactory to record that Sir Josiah Stamp, chairman and president of the London Midland and Scottish Railway, and Sir Harold Hartley, his vice-president, have agreed to preserve the famous locomotive "Hardwicke", which hauled the racing train of August 22nd on the 141 miles from Crewe to Carlisle at an average speed of more than 67 miles per hour, in spite of a route over the heavy Grayrigg and Shap gradients. This is in strong contrast to the earlier Great Western policy which permitted such famous locomotives as the "North Star" and the "Lord of the Isles" to disappear without a thought for future generations, for the reason that space was too valuable in the paint-shop at Swindon.

Though the spirit which animated the five railways engaged in these races of 1895 must be an object of admiration, and was then, and still is, regarded as evidence of sportsmanship and progressive endeavour, yet, like the earlier races of 1888, these have been wholly misinterpreted by present-day critics of railway operation. The trains became steadily lighter as the speeds rose, though the East Coast trains were somewhat heavier throughout that famous July and August. At the end of July the weight of the East Coast train was 179 tons, and consisted of eleven vehicles, but by August 16th this had been reduced to one bogie sleeping-car and five six-wheel coaches, in all 105 tons. Patrick Stirling, whose famous bogie-singles of the Great Northern hauled this train night after night, had maintained that a three-hour timing from King's Cross to York was possible, and on the night of August 21st this claim was actually beaten by one minute; half a century earlier, in 1845, the best timing had been 7 hours 40 minutes, though Mr. Hudson's "special" of the previous year had accomplished the run to York from Euston in 5 hours 38 minutes, the Great Northern Railway not then being in existence. In the summer of 1933 the "Scarborough Flier" was booked

to cover the 188 miles to York in 3¼ hours, but on its opening run cut the time to 190 minutes; the weight of modern trains is sometimes four times that of the night sleeper of 1895, and the Gresley 4-6-2 "Pacifics" of to-day are only twice as heavy, the respective weights being 45 tons and 92½ tons. The greatest difference, however, lies in the occupation of the track, since the number of trains per day on the main line is practically double that of the 'nineties. Similarly with the West Coast route, to haul a load of 70 tons at a mile a minute to Carlisle is a vastly different matter from hauling a train of 500 tons night after night, with due allowance for any special delays, such as permanent-way restrictions for relaying, unexpected signal checks or exceptionally bad weather. Yet such is the task set the new London Midland and Scottish Railway's four-cylinder Pacific (4-6-2) "Princess Royal", and if the public timing is a little slower than the racing trip of "Hardwicke" in 1895 it ill becomes the critic to maintain that no progress has been achieved in the last forty years. Day-to-day operation must be a commercial proposition and due regard must be paid to fuel consumption and the cost of locomotive maintenance and repairs. The races of 1895 were magnificent, but they were short-lived and could not at that date have been made permanent features of railway operation without inflicting grievous financial loss.

In 1933 the locomotives of the East Coast route, now all embraced in the London and North Eastern Railway, must be capable of handling 550 tons on the fast Anglo-Scottish services, and able to make up time if required; and there is every reason to believe that Mr. Stanier's new London Midland and Scottish "Pacifics" will be able to accomplish like feats on the West Coast route. Only by adroit combination of progressive locomotive design, coupled with detailed attention to economical operation, can the railway systems of to-day hope to win through to that dawn of renewed

prosperity which has suffered gradual eclipse through the rise of the road motor vehicle and the incidence of a trade depression, national and international, unparalleled since the opening of the Liverpool and Manchester Railway a century ago.

That the speeds attained during the 'nineties involved considerable risk can be seen from a serious increase in the number of accidents. The year 1890 had witnessed a bad collision at Norton Fitzwarren on the Great Western Railway, when ten people were killed, and the London and North Western and Midland Railways suffered a bad accident near Birmingham in May, 1892. Two months later a London and North Western train was derailed when running at high speed near Melton Mowbray, and during the following years there was another derailment due to high speed on the Blackpool line, involving loss of life; thirteen people were killed the same year in a derailment at Llantrissant. In 1894 a collision involving the Manchester express occurred at Chelford, near Crewe, fourteen people being killed and eighty injured. The Great Northern suffered a serious derailment in 1895 at St. Neots, when two people lost their lives, and again at Little Bytham in May, 1896, when three people were killed. It is not intended to infer that high speed was wholly to blame in these cases; indeed, deaths in railway accidents during the 'nineties were not more numerous than during the succeeding decade; but it is incontrovertible that the higher the speed and the greater the desire to make up for lost time the more difficult it is to pick up signal indications, especially in bad weather. Accidents almost invariably occur through a combination of unfortunate circumstances—for instance, trouble with a locomotive, which is perhaps steaming badly, coupled with worry at home, or, perhaps, a signal not working well with the lamp not showing clearly, and the natural desire to avoid delay to a series of important trains. Contemporary records

seem to show that after the Aberdeen races the railway managements preferred on the whole to compete in the realms of comfort and service rather than in that of speed, a policy which has continued almost to the present day. Probably their decision was wise, whether judged from the point of view of finance or of safety, though it has been the subject of considerable and, sometimes, virulent criticism, especially during the post-war decade.

The 'nineties had opened auspiciously in regard to comfort, with the Great Western's providing third-class accommodation on all its trains in 1890; moreover, the Great Northern had abolished second-class travel, except in the London area, the following year, and the Great Western in 1892 led the way with complete corridor trains, that is to say, vestibuled from end to end, though, incidentally, the connections between the coaches were at the side and not in the centre as with modern coaches. The West and East Coast rivals were not long in following suit, and in the summer of 1893 went one step further than the Great Western by marshalling within their vestibuled train formation dining-cars with accommodation for two classes. The West Coast Joint Stock train, built at Wolverton, was the first in the country to have centrally-positioned gangways between the carriages, and had very handsome fittings, of ornate and Victorian design. The East Coast Joint Stock train, built to North Eastern Railway design, also started a new fashion by including a separate kitchen-car, a policy which is now adopted extensively by the London and North Eastern and London Midland and Scottish Railways, and to some extent by the Great Western Railway. Curiously enough, the kitchen-car possessed no through-passage, so that it virtually cut the train into two halves. The Great Northern later built some very fine third-class dining-cars for this train which in their day were regarded as even superior to the first-class cars; from photographs of their interiors one may

assume that their superiority lay in even more extensive doses of Victorian ornamentation, such as green velveteen head-rests and cut-glass mirrors; of greater importance was their equipment with automatic couplings, and they were thus forerunners of the excellent "buckeye" coupling now standard for corridor trains on the London and North Eastern and Southern Railways. Weighing 36 tons each and mounted on six-wheeled bogies, these fine vehicles were nine feet wide and all but sixty-four feet long. They shared with the West Coast Joint Stock the honour of setting a new standard for railway-carriage construction in Great Britain. At the time of their construction electric lighting was only in an experimental stage, and they were naturally lighted by incandescent gas, but in 1896 the London and North Western Railway began tests with Stone's system of electric lighting, by means of a dynamo driven from the axle, and Wolverton, which was then repairing over 8,000 carriages annually, was fitting some of its Watford bogie suburban sets, then being turned out, with similar lighting in 1897. Mr. Park, at that time the Carriage Superintendent of the London and North Western Railway, had migrated from the North Eastern at York, and the standard of Wolverton design and workmanship was very high : corridor coaches were built on steel frames and fitted with automatic vacuum brakes, though vehicles running into Scotland were equipped also with the Westinghouse brake, since that was the standard brake of the Caledonian; they were also provided with steam heating apparatus.

With the exception of the Outer Circle trains working in the London tunnels, which were of varnished teak, the London and North Western carriages were painted in the famous white and chocolate; in all sixteen coats of paint were applied to the carriages before they left the shops. Modern opinion will possibly consider such a policy unduly expensive, but the well-known colouring, which lasted extra-

ordinarily well, was probably the cheapest advertising ever undertaken by a railway company; incidentally, it raised the *esprit de corps* and morale of the staff. In 1897 the Midland, always noted for its comfortable and spotlessly clean coaching-stock, turned out some excellent dining-car trains for its North and West service between Bradford and Bristol. The design of these fine twelve-wheel bogie vehicles included an oak and steel frame and much india-rubber in the springs to minimize vibration. Unduly decorative according to present-day opinion, they evoked much praise at the time, and the comfort of the seats was especially singled out for comment. The Great Western with the inclusion of dining-cars on their corridor trains were able at last to cut out the Swindon luncheon and dinner stop from several of their express trains in October, 1894, and, thanks to the steadily extending use of corridor stock on all the largest railways, the comfort of passenger travel had made enormous strides by 1900. Many of these early corridor coaches are still in service; today they seem somewhat narrow and over-ornate in their interiors, but they heralded a new era and will have lasted all but forty years by the time they disappear, which says much for the carriage builder's art.

South of London the rate of progress had been slower; the South Eastern had put into service some American or chair cars in March, 1892, the forerunners of the present Pullmans, and six years later, in October, 1898, the London, Brighton and South Coast Railway inaugurated the sixty-minute "Pullman Limited" to Brighton on Sundays, the ancestor of the present-day "Southern Belle". At the beginning of 1893 the Great Eastern Railway followed the example of the Great Western by abolishing second-class accommodation on its trains, though it retained the second-class, as had the Great Northern, in the London suburban area, where it still existed in 1933. The most important

event in London and South Western Railway history of the 'nineties was the absorption of the Southampton Docks, an event which has ultimately led to the huge development of the estate and which is still proceeding; the world's largest graving dock was opened there by the King in July, 1933. The ownership of such a dock by the Southern Railway proves how strongly the function of a transport concern, as opposed to a purely railway concern, has always been to the fore in British railway management.

The year 1892 witnessed the complete conversion of the Great Western to standard gauge. The last broad-gauge passenger train to Penzance was the 10.15 a.m., though the very last passenger train to leave Paddington on the broad gauge was the 5 p.m. to Plymouth, the night mail on that day, May 20th, being for the first time run on the narrow gauge and using the South Western Railway's lines from Exeter to Plymouth. The Great Western then accomplished the extraordinary feat of converting 177 miles of broad gauge to standard gauge in two days, the night mail leaving Paddington on Sunday, May 22nd, being able to proceed as far as Penzance on Monday morning: the change-over was a triumph of organization. The passing away of the dreams of Brunel and Gooch was doubtless a source of sorrow to many, but from the ashes of that funeral pyre has arisen a better and greater Great Western, which to-day can claim an uninterrupted lineage without change of name for almost a century; few railways in the world have a finer financial record, or consist of a better-maintained property in spite of the chaotic time through which the railways of this and other countries have passed during the last twenty years.

During June, 1893, there was started the celebrated service to the Hook of Holland from Harwich, later transferred to Parkeston Quay, and now legitimately regarded as the English gateway to North-Eastern Europe. Other cross-

channel services were being greatly improved, including the inauguration of a daylight service to the Channel Islands, and the first twin-screw steamer, the "Seine", was placed in service on the Dieppe to Newhaven route on May 7th, 1891, though the South Eastern's Folkestone-Boulogne service relied on paddle-wheelers till a much later date, the "Duchess of York" and the "Princess of Wales", of this type, being added in 1897 and 1898. In 1895 over 100,000 passengers had crossed the Channel by this last-named route, and the time between London and Paris via Folkestone had been reduced from 12½ hours in 1845 to 7½ hours in 1890.

So far as railway construction goes, the Dore and Chinley section of the Midland between Manchester and Sheffield had been opened in 1893, and the West Highland line from Helensburgh to Fort William in August of the following year. In 1895 the Bodmin and Wadebridge had at last been connected with the London and South Western Railway, and in 1898 the latter penetrated to Bude; this line finally reached Padstow, its present Cornish terminus, in 1899. In Scotland the Highland Railway completed its direct line to Inverness from Aviemore just prior to 1900, while its Skye line had been extended to Kyle of Lochalsh in 1897. Many small lines were being opened to traffic in all sections of the country; for example, in the Yorkshire coalfield the South Yorkshire joint line, and in South Wales the Cardiff Railway and the Port Talbot Railway, both in 1897. The enthusiasm for railway construction even included the conquest of Snowdon by rail, and in North Devon the narrow-gauge Lynton and Barnstaple was opened in May, 1897. Seaside resorts were not forgotten; the Lee-on-the-Solent Light Railway was completed in 1894 and the line from North Walsham to Mundesley in 1898, while Selsey Bill was opened up to the tourist by the Hundred of Manhood and Selsey Railway of 1897. Agricultural development was the object of the Weston, Clevedon and

Portishead Railway of 1897 and the Rother Valley line from Robertsbridge of 1900; the last three of these remain independent railways even to this day.

The greatest scheme of railway construction, however, was the entry into London of the Manchester, Sheffield and Lincolnshire, which, making use of the Metropolitan's extension to Aylesbury opened in September, 1892, constructed a terminus for itself at Marylebone, into which it began to run trains on March 15th, 1899. In anticipation of this elevation to fame its name had been changed to the Great Central Railway in 1897, and during the previous years it had steadily been improving its position in the North, opening a line to Annesley in January, 1893, and completing a line between Ellesmere and Wrexham in 1895. The following year had seen the opening of the first section of the Lancashire, Derbyshire and East Coast, which was later destined to be absorbed by the Great Central Railway. The extension of the Great Central southwards to the Metropolis, as may be supposed, had met with the strongest opposition from all the other existing trunk lines, and to avoid the opposition of the Great Northern there had been a proposal that the latter should join in the construction of the line, but Sir Henry Oakley, of the Great Northern, refused to spend capital upon a scheme which could only be successful if it drew traffic from his own line, and the fight was continued. Sir Henry reminded the Great Central that Mr. Denison had said "We picked the Sheffield up out of the dirt"; presumably Sir Henry did not think that they had shown themselves grateful. After a long political battle the Great Central scheme was authorized, thanks largely to the tactics used by Sir Edward Watkin, and the last great main line to be built in Great Britain was steadily extended southwards from Annesley to Nottingham, then on through Loughborough and Leicester to Brackley and over the Metropolitan's Aylesbury extension, finally terminating in

the station at Marylebone. Thus an alternative route was opened up to London from Liverpool, Manchester, Wakefield, Grimsby, Sheffield, Nottingham and Leicester. The trains built for this new service embodied several unusual features; besides being fitted with Gould vestibules and automatic couplers, like the earlier Great Northern dining-cars, the Great Central dining- and kitchen-cars were electrically lighted and all carriages were provided with portable tables, a practice now common but at that time very rare. Moreover, buffet-cars were included in certain trains, a policy which for some reason suffered complete eclipse until revived by the London and North Eastern and London Midland and Scottish Railways a year or two ago.

The growth of passenger traffic had necessitated the enlargement of many of the country's largest passenger stations. At Manchester, the Central Station, whence the Cheshire Lines Committee trains departed for Liverpool, had been opened in 1877; Great Northern trains began to work into it in 1899. The facilities at the Lancashire and Yorkshire Railway's Manchester station, known at Victoria, had become hopelessly inadequate and this station was much enlarged in 1898. At Glasgow the Caledonian's Central station had to be extended in 1890 and again in 1894, three years before the opening of the famous Subway Line in that city, which was worked by cable traction. In the London area the Cannon Street Station bridge of the South Eastern Railway had been widened two years previously; Euston had been considerably extended in 1894, and extensions were made at Liverpool Street by the Great Eastern Railway the same year, in part to cope with the increase of Edmonton traffic, while in 1897 this railway inaugurated an " all night " service of trains from its great City terminus. The Tottenham and Forest Gate Railway, connecting the Midland with the London, Tilbury and Southend, had been opened in July, 1894, while the Tilbury company had completed its

Grays to Upminster line in 1892 and its Upminster to Romford branch the succeeding year. Increasing train services heralded a demand for more adequate signalling facilities, and at Waterloo the famous "A" box had been brought into service in 1892.

The most outstanding landmark in London travel at this epoch was the genesis of the "tube" railway and the coming of electric traction. Thanks to the invention of the Greathead shield, by which circular tunnels could be constructed comparatively easily beneath London, the City and South London Electric Railway was constructed and opened from the Monument to Stockwell just prior to Christmas, 1890, and in August, 1898, the Waterloo and City Railway, terminating at the Bank, was opened. From the first this latter line was closely allied with the London and South Western and, taken over by it in 1907, is now part of the Southern Railway. Both these tube lines, together with the Central London of 1900, or "Twopenny Tube" as it was called, were the precursors of underground electric traction in Great Britain, though electric traction for surface or overhead lines dated back to Traill's electrification of the Giant's Causeway Line in Northern Ireland in 1883, and the first section of the Liverpool Overhead Railway had been completed in March, 1893. Mr. J. H. Greathead's shield for underground tunnel construction offers a strong contrast to the primitive design of timber shield, with a square cutting face, used by Sir Marc Brunel, father of Isambard Kingdom Brunel, when he was constructing the Thames Tunnel of the 'thirties. Started in 1824, this tunnel was not finished until 1843, being later purchased, as mentioned previously, by the East London Railway in 1866 and converted for use as a railway, the first train passing through it in December, 1869.

The City and South London Tube line was from the first worked with electric locomotives, though in 1880, when the

scheme was first mooted, cable traction, as used later at Glasgow, had been envisaged. The line was extended southwards to Clapham Common and northwards to Moorgate, the old Monument station being closed, in 1900; power was picked up by the locomotives from a conductor, or third, rail carrying direct current at 500 volts. The Central London was a much longer line, since it stretched from the Bank to Shepherd's Bush; it was opened by King Edward VII, then Prince of Wales, in June, 1900, and first used for public traffic the following month. Since a uniform fare of twopence was charged, regardless of distance, the line quickly earned for itself the title of the "Twopenny Tube"; like the City and South London it originally employed electric locomotives, but these were later to disappear, as did the uniform fare. It was the success of this electric line which led to the question of electrification of the Metropolitan and Metropolitan District Railways, at any rate in the tunnel sections, but that boon to the London traveller did not come about until some years after the opening of the twentieth century.

The population of Greater London, which had more than doubled itself between 1851 and 1891, by 1901 exceeded 6,500,000 souls, and the increasing demand for travel facilities taxed the suburban services of the main line railways, the Metropolitan and the Metropolitan District, as well as the omnibuses and tramways, to their limit. In 1901 the extent of travel in the Greater London area had been placed at 848 million passenger journeys, of which 270 millions were carried by omnibus, 341 millions by tram, and the balance by the local railways; in addition, of course, there were the millions carried annually in the suburban trains of the main line railways. Just before the close of the nineteenth century several efforts were made to develop a motor omnibus, and an experimental electric bus was tested for a short period during the Diamond Jubilee year. This vehicle, the first

motor-bus to be licensed by Scotland Yard, used to run between Charing Cross and Victoria, and its frequent failures in service led to many unkind comments from the staff of passing horse-buses. An oil-engined bus was placed on the Victoria and Kennington route by the Motor Traction Company in 1899, the route being changed to Kennington and Oxford Street, but little success was achieved with it, and it was ingloriously withdrawn in 1900; in fact, the new century opened with no real motor-omnibus service in London. There was considerable competition between the horse-buses of the "General" and other concerns and the Metropolitan and Metropolitan District Railways for very short distance traffic; at a somewhat earlier period the Metropolitan had actually run three-horse buses of its own, between Portland Road Station and Piccadilly, complete with an umbrella, and providing accommodation for two classes of passengers, but the service did not last very long. In fact the London buses, with their garden seats, in 1899 remained very much like their predecessors of the middle 'eighties; there had, however, been a considerable development in 1893 with the introduction of the bell-punch for tickets, which solved a very acute problem; in 1891 there had been a serious strike, since the conductors, drivers and other employees realised that a well-organized ticket system would reduce those additions to their official pay which from early coaching days had always been regarded as part of the normal earnings from work of this nature.

Though omnibus progress had been slow and the London horse-buses still held their monopoly, a new era was dawning, and within the following twenty years the horse-bus was destined to disappear entirely. To the provisions of the Locomotive Act of 1865, sections of which were repealed by the Highways and Locomotive (Amendment) Act of 1878, must be ascribed the failure of the motor-bus to assert itself during the nineteenth century. The amending Act

substituted certain new provisions in place of the earlier ones it repealed, amongst them being the requirement that a man should walk twenty yards in front of the locomotive on the highway. Motor-buses were regarded as locomotives for the purposes of this legislation, and it was not until after the passage of the Locomotives on Highways Act of 1896, which repealed the earlier legislation, that much progress could be made in the practical use of the motor-bus, at that period a very unreliable vehicle. This Act greatly eased the position and 1896 witnessed the first motor parade to Brighton, in which fifty-four vehicles took part, the motive power being either electricity, steam or the petrol engine. The London to Brighton road was throughout the century a racing ground for coaches, cyclists and, later, motor-vehicles, and it will be recalled that the four cyclists of 1889, riding in relays, had lowered the time for the 108 miles out and home to 7 hours 36 minutes 19 2-5 seconds; in April, 1890, another team of four cyclists reduced the record to 7 hours 25 minutes 15 seconds, a record still bettered two months later by a single rider who, using a pneumatic-tyred "Facile" safety cycle, brought the time down to 7 hours 19 minutes. The famous rider, S. F. Edge, on a cushion-tyred safety cycle on July 23rd, 1890, put up a record of 7 hours 2 minutes 50 seconds, and beat Selby's homeward coach record journey, mentioned in the last chapter, by eighteen minutes, doing it in 3 hours 18 minutes 25 seconds. Further records were made in later years; indeed the Brighton races in one sphere became almost as exciting as the London-Aberdeen races in another; one may conclude mention of them by recording the exploit of E. P. Moorhouse on the last day of September, 1890, who accomplished the round trip in 8 hours 9 minutes 24 seconds on a tricycle.

If omnibus progress had been slow during the 'nineties, tramways had progressed rapidly thanks to the coming of electric traction. In London the London County Council

availed itself of its powers to purchase the earliest of the London tramway systems, the London Street Tramways Company in 1891. But its acquisition proved by no means easy, and eventually the litigation over the price reached the House of Lords, which delivered judgment in favour of the Council in July, 1894. Meanwhile, in 1892 the London County Council had determined to purchase the lines of the North Metropolitan Tramways Company, but it had no intention of operating them, and leased the two systems it had taken over to the North Metropolitan Tramways Company for operation for fourteen years beginning with 1896. This same year, however, the London County Council obtained the requisite powers to operate the tramways they purchased; they exercised this power in the case of the system south of the Thames, the London Tramways Company, which was taken over at the beginning of 1899. The same policy was adopted with undertakings acquired in later years. Powers to electrify their tramway systems were not obtained by the London County Council until 1900, consequently electric trams were not run by the Council until the early years of the twentieth century. Nevertheless, tramway electrification had progressed more rapidly in the provinces, especially in the North, and had engaged attention at Leeds in 1891; the first line in England with overhead trolleys commenced working to Roundhay soon afterwards. So satisfactory did this experiment prove, that in 1896 the policy of electrification on this pattern was adopted and the original line extended to Kirkstall; the last horse-tram in Leeds disappeared from the streets in 1901, and the last steam-tram in 1902.

One of the earliest tramway systems in England was that at Bristol, where electric cars were running in 1895. The Hull Street Tramways Company was taken over by the Corporation of that city in 1896, under the terms of the Tramways Act, and the first track for the operation of electric

tramways was laid in June, 1898. At Plymouth the Corporation had purchased the tramway system in 1892, and, as a consequence of the passing of the Light Railways Act of 1896, the system of electrification was studied; in 1899 the first electrified section was put into operation. The Bolton Corporation had been authorized to operate its own tramway system in 1893, and by the beginning of 1900 all its routes were being run electrically by means of the overhead trolley system. The first electric tram in Glasgow was run on the Springburn route by the Glasgow Corporation in October, 1898, and early in the following year the Corporation determined to convert the whole of its horse-drawn tram routes to electric traction, a policy which required the construction of a generating station and five sub-stations; by 1901, at the time of the International Exhibition in Glasgow, electric trams were running on all routes, and Glasgow for many years has had one of the most successful and extensive tramway systems in Great Britain. At Liverpool, which has also been primarily a tram as opposed to a bus city for nearly half a century, the Corporation obtained powers to purchase and operate the tramways themselves in 1897, and exercised them the same year, running horse-drawn trams and omnibuses from September 1st that year. No time was lost in electrifying, and on November 16th, 1898, the first electric tram route was opened between South Castle Street and the Dingle; by June, 1901, virtually all the routes had been electrified.

From this brief glimpse it will be realised that London had fallen behind in regard to tramway electrification. However, the appointment of Sir Clifton Robinson, who had been associated with George Francis Train in the earliest experiments at Birkenhead in 1860 and had much transatlantic experience, to be managing director of the London United Tramways Company, formed in 1894, augured well for the early electrification of that Company's network of

lines, which early in the twentieth century comprised over fifty-five route miles. By 1901 the London United Tramways had electrified sixteen track miles, and authorization had been obtained for a further conversion of forty-two miles, including the routes between Isleworth and Hampton Wick and to Kingston and Hampton Court.

Rapid as tramway electrification was, at any rate in the North, towards the end of the 'nineties, the decade can only be regarded as pre-eminently a railway decade. It was true that the evolution of the motor vehicle had commenced, the steam tricycle of Sir Thomas Parkyn, sometimes known as a Motorvelo, was on exhibition at the Horse and Horseless Carriage Exhibition at the Crystal Palace in May, 1896; but it was also true that Sir Thomas Parkyn had been summoned under five counts at the Greenwich Police Court for the use of this machine some years earlier. Abroad progress had been more rapid and the "Petit Parisien" had organized a motor-car race from Paris to Bordeaux and back in July, 1894; there had been forty-six entries, and a Daimler motor carriage had won the first prize. Peugeot, Panhard and Levassor, as well as the Count de Dion et Bouton, were all designing motor vehicles by the middle of the 'nineties, and motor-cycles could be bought for £64. But in England progress was slow, though Sir David Salomons, the Mayor of Tunbridge Wells, had imported one of the most perfect Daimler motors money could buy. It was he who organized the first motor exhibition in 1895, where none but horseless vehicles were on show. It was he also who took the chair at a public meeting in Cannon Street Hotel, a railway building, in the same year and led a deputation the following February to the Local Government Board to plead for easier legislation for the "self-propelled" vehicles. The same month the Prince of Wales went for several rides in a Daimler motor-car, and finally one must record the change by one of the cycling papers of its title to that of "The

Wheelman and Motor Car Weekly"; shortly afterwards came the production of the "Autocar".

Yet, for all these triumphs, the century closed with railways pre-eminent for inland transport; they had been changing rapidly since 1889, and many of the great figures of mid-Victorian railway development had passed away. In 1891 Sir Richard Moon resigned from the chairmanship of the London and North Western Railway, having been on the board since 1847 and having for thirty years acted as its chairman; early in 1893 the same company lost by death its General Manager, Sir George Findlay, the author of an excellent text-book on railway operation, who was born at Rainhill, the scene of the railway trials of 1829, when his father was working on the construction of the Liverpool and Manchester. In 1895 the London and North Western lost by retirement its Superintendent of the Line, G. P. Neele, who had served thirty-three years in that position. Other lines were losing their great men too, and internally organization and financial policy were changing rapidly; with the passing of years such matters as pension schemes became important, and Findlay, in the fifth edition of his book, published posthumously in 1894, gives a detailed outline of the setting up of the London and North Western Pension Fund in 1883 and its subsequent progress and strength; a sure sign that the industry had far outrun its coming of age and was practically celebrating its diamond jubilee.

Railway competition had been a powerful incentive to efficiency, increased comfort and improved service during the decade; while small companies had been absorbed, as, for instance, the little Harrow and Stanmore, the biggest lines had waxed stronger and stronger, and the added strength derived from commercial prosperity led to greater power to compete with their neighbours. Yet in some directions cut-throat competition had proved so disastrous that co-operative measures had to be adopted to heal the financial

wounds, and the century did not close before the long-expected working agreement between the South Eastern and the London, Chatham and Dover Railways had become an accomplished fact. One wonders if the meeting at Cannon Street Hotel in connection with self-propelled road vehicles may have given the two railways a glimpse of future competition and urged them towards co-operation. However that may be, this agreement, briefly expressed, provided for a working union of the two former competitors, the capital of each company remaining separate and any new capital being provided in the same proportion as the division of the respective shares of the net traffic receipts, the South Eastern percentage being placed at 59. By means of a joint committee, known as the South Eastern and Chatham Managing Committee, the two railways were worked as one unit, and endeavours were made to reduce, so far as circumstances would allow, the enormous train mileage built up in the days of competition.

Whatever may have been its faults the nineteenth century had witnessed progress in inland communications far exceeding all previous centuries. Carried forward on the high tide of commercial prosperity, the railway network had penetrated into every corner of the island, and few foresaw the problems which would arise within the next twenty-five years, through the waging of war on a scale hitherto undreamt of. The rise of rail transport in the nineteenth century is an epic story, and during the early twentieth century the development of the internal combustion engine for road and air travel forms the background for a story scarcely less remarkable, and possibly even more far-reaching in its incidence on the social prosperity and welfare of mankind.

CHAPTER IX

1900—1909

RAILWAY ELECTRIFICATION, DEVELOPMENT OF THE MOTOR OMNIBUS

In the year which marked the opening of the twentieth century the mileage of railway open for traffic totalled 21,855 route miles, and by 1910 a further 1,530 miles had been added to this network. A certain proportion of this new mileage is accounted for by the construction of tube railways in the London area and a few new light railways, and the balance by the new cut-offs and connecting lines of the main-line railways. The Great Western Railway is particularly in evidence during this period of ten years, for it materially shortened the rail distance on several of its most important arteries during the first fifteen years of the new century. Excluding season-ticket holders, the number of passengers carried increased from over 1,142,000,000 in 1900 to nearly 1,307,000,000 in 1910, while the tonnage of freight carried increased over the same period from about 425,000,000 tons to more than 514,000,000 tons. Total paid-up capital rose from £1,176,000,000 in 1900 to over £1,318,000,000 in 1910 and the net receipts were in excess of £47,000,000 in the later year, a rise of £7,300,000 on 1900. As measured by net receipts the year 1901 was probably the least satisfactory of these ten years and the only one when net receipts for the railways taken as a whole did not reach the £40,000,000 level. These few figures will serve to show that, though there was not much new construction as measured by route mileage, traffic and receipts

were steadily growing; in short, the period was one of intense internal evolution, as was indeed the case with the country itself at this period. Though trade and industrial production fluctuated year by year within each industry, and as between one industry and another, yet the virtually steady rate of progression of railway receipts, at that period a good enough index of trade activity, demonstrates that there was no major set-back affecting the whole kingdom; although gross receipts in 1908 and 1909 fell somewhat short of the good results of 1907, those of 1910 were far in excess of the 1907 financial results. Indeed one of the problems of the period was that of finding means to carry added traffic over the existing lines, already scheduled to carry, in many cases, as much as the signalling equipment and the speeds of the trains would permit with due regard for safety.

Inevitably many important main lines had to be widened, a typical example being the section of the Brighton line between Purley and Earlswood, just south of Redhill. It will be remembered that the South Eastern and the London, Brighton and South Coast Railways both ran trains over this section northwards from Redhill to Croydon and New Cross, and the bottle-neck on the southern section of this line, especially at Merstham Tunnel, finally induced the London, Brighton and South Coast to construct a separate route of its own, avoiding the Merstham Tunnel and Redhill Station. This new line, including a long tunnel at Quarry, was opened to traffic in 1900; later the widening was extended southwards through Three Bridges to Balcombe Tunnel. The London and North Western, which had been quadrupling much of its mileage during the 'nineties, near Wigan being one example, had launched out on a big scheme of widening between Euston and Willesden in 1898, and in 1902 further powers were obtained to widen sections of the Trent Valley line between Nuneaton and Rugeley; it is of interest that there exist even to-day a few miles of main line near

Nuneaton which still possess only two tracks, but as a result of amalgamation much of the traffic can be routed alternatively if there is any likelihood of congestion. The potential carrying-capacity of a railway is usually regulated by the capacity of the terminals and marshalling-yards, and at the nodal points of the great railways, such as Crewe, the companies had to embark on large-scale improvements. The London and North Western adopted an almost unique plan at Crewe by tunnelling underneath the station, and running through these subways the freight trains to and from the Northern main line and the Liverpool and Manchester lines and the great marshalling-yard south of the passenger station, which last was greatly enlarged. This far-reaching scheme improved the traffic working throughout the whole system, since Crewe was the nerve centre, and must have paid for itself many times over during the last quarter of a century. In 1901 the Company had inaugurated a transhipment shed at Crewe by means of which merchandize dispatched in small quantities could be re-sorted at Crewe, being sent there in wagon-loads of small consignments for innumerable destinations. On the passenger side Euston had again to be enlarged in 1904, and Glasgow Central on the Caledonian Railway was similarly dealt with in the succeeding year; the London, Brighton and South Coast opened the first portion of its new Victoria Station in June, 1906. These few brief instances, typical of a progressive movement throughout the railways at that time, will suffice to show the problem involved in expanding existing facilities.

The London and South Western Railway adopted a different method for increasing capacity; in April, 1902, one of the first automatic signalling installations in the country was put into operation on a section of its line. Though the station movements when required were controlled by signalmen, the through movements on the main line operated their own signals automatically by means of track circuits, the rails

being bonded and the current passing through the wheels and axles from one rail to the other, thereby making a circuit and operating relays which in turn operated the signals. The North Eastern Railway about the same time determined to install Hall-type automatic signals on its line between York and Northallerton, as a means of avoiding the capital cost of widened lines. It was only in 1933 that this widening was completed and the old automatic signals on this section replaced by modern colour-light automatics. The newly-installed light-signals are of the approach-lighted type, that is to say, the approaching train, by means of the track circuits, itself illuminates the electric lamps of the signals, which display a red aspect, the danger indication, if the track ahead of the train is occupied and a green aspect if the line is clear; if the second section in advance is occupied a yellow aspect, or caution indication, is shown. It is frequently supposed that making a train operate the signals it is approaching is a comparatively new idea; but this is not the case, for the original automatic signal installation of 1903, between Thirsk and Alne, used track circuits by which the train lowered the semaphore arms on the signals it approached, provided, of course, that the section in advance was unoccupied by another train. The advent of this system is important, as the whole of modern signalling practice is based on the use of the track circuit.

The Great Western solved its problem of congestion largely by the construction of new cut-offs to its main lines, incidentally shortening very materially the distance by rail between Paddington and Plymouth, Paddington and South Wales and, at a later date, Paddington and Birmingham and Birmingham and Bristol. By 1901 the first cut-off on the new route to Taunton had been opened from Stert to Westbury, about thirteen miles, but the second fifteen-mile section between Castle Cary and Langport was not opened until July 1st, 1906; this reduced the mileage to Plymouth from

246 to 225¾ miles. In 1933 further improvements were made to this route of the "Cornish Riviera Limited" with the completion of the new cut-offs at Frome and Westbury, together with the new fly-over junction at Cogload, which reduced the mileage slightly and the time to Plymouth to less than four hours. For many years from July 1st, 1904, this London to Plymouth run was the longest non-stop run in the world, its original routing being over 240 miles. On July 1st, 1903, the Great Western's new 33½-mile cut-off line to South Wales was opened for traffic; leaving the original Bristol line at Wootton Bassett the new line rejoins the old at Patchway just east of the Severn Tunnel. Incidentally, this new line provided an alternative route to Bristol, cutting out the tunnel at Box and the city of Bath. A new nine-mile line in Pembrokeshire improved the West Wales route and paved the way for the inauguration of the Fishguard-Rosslare express route to Ireland on August 30th, 1906, three fine boats named after the patron saints of England, Wales and Ireland being put on to run this service. The Cunard Company's steamers first began to call at Fishguard on August 30th, 1909.

Paddington had long envisaged a more direct route to Birmingham, but its fruition required much capital expenditure and considerable mileage construction. The first stage in the programme was the building of a new 23-mile line from Acton to High Wycombe, opened in 1906, the Great Central Railway having constructed a short connecting section from Neasden to Northolt; northwards from Princes Risborough, the Great Central rejoined its old route north of Aylesbury, thereby obtaining an alternative line into London free from the Metropolitan's suburban trains. This Great Western alliance with the Great Central was good statesmanship from the point of view of both sides; the social results were excellent, since the new line opened up for residential purposes a section of the country comparatively near

London yet hitherto little developed. The final Great Western plans were brought to fruition on April 4th, 1910, when the Ashendon-Aynho section, between Princes Risborough and Banbury, was opened for traffic and permitted the running of London to Birmingham expresses over the 110½ miles on a two-hour timing. The Birmingham-West of England route of the Great Western was materially improved on July 1st, 1908, by the opening of the 20-mile section from Honeybourne to Cheltenham; thus the route of the fast trains would be via Stratford. This traffic was highly competitive with the Midland, as the London to Exeter traffic was with the London and South Western, and the London and Birmingham traffic with the London and North Western; one cannot study these moves in retrospect without a feeling of admiration for their planning and strategy, as also for the rapidity with which this series of improvements was completed.

Midland developments at this period centred largely on Belfast, for on July 1st, 1903, it absorbed the Belfast and Northern Counties Railway; this move was quickly followed by the inauguration on September 1st, 1904, of an express cross-channel passenger service from the port of Heysham, developed by the Company, to Belfast. Four years later the Midland converted to electric traction its line between Heysham and Morecambe, a few months later extended to Lancaster. This railway was also undertaking various schemes of widening, as for instance, between Leeds and Bradford. With Mr. (later Sir George) Gibb as its general manager, the North Eastern Railway during this period was in the van of railway progress and several important trials were made with policies which were common in the United States but unusual in Great Britain at that time, automatic signalling being a typical example. It was felt that trials should be made with higher capacity wagons, thereby reducing the proportion of the weight of the wagon to the load it carried.

This was excellent in theory, and provided that traders were willing to send sufficiently large consignments the scheme would probably have proved successful. Many high-capacity wagons were constructed and did good service, but the British rate-structure was not designed to encourage the use of such wagons for more than a limited number of traffics and routes. For shipment coal such wagons have proved excellent in every respect and are still employed at Blyth, but the majority of coal-mines can only deal with wagons not exceeding twenty tons capacity under their screens and on their sidings, many of which are sharply curved. Nevertheless, the tradition of higher wagon-capacity still remains in the North Eastern area of the London and North Eastern Railway, and the coal traffic in Durham and Northumberland is mainly handled in wagons exceeding twelve tons, which is the standard wagon size of Great Britain to-day.

The problem of electrification was studied in great detail at the North Eastern headquarters at York, and the electrification on the 600 D.C. system of the Newcastle suburban services, completed in February, 1904, was one of the earliest conversion schemes outside London, if one excludes the special case of the Mersey Railway, almost completely a tunnel-line, on which electric traction was introduced in April, 1903. The North Eastern was the only line to use electric traction for freight traffic, having at an early date electrified its branch to Newcastle Quay, and later, in 1916, converted the Newport-Shildon eighteen-mile section on the overhead system. With the opening of the Durham coast line in 1903, the completion of the great bridge over the Tyne at Newcastle, opened by King Edward VII on July 10th, 1906, and the scheduling of a train from Darlington to York which covered the 44¼ miles in 43 minutes, as from July 1st, 1902, at that time the fastest train in the British Empire, the North Eastern could claim great achievements during the first decade of the twentieth century. Less

spectacular, but of great importance, was the policy adopted by Sir George Gibb of recruiting staff destined to ascend to higher positions in the service from the Universities, and other sources. Sir George was also a pioneer in promoting education for railwaymen, and the results of the policy which he started on the North Eastern have proved valuable in wider spheres during the recent chaotic years. The North Eastern was also greatly to the fore in the development of statistical analysis, and for many years before the official use of the ton-mile in Government statistics, utilized this unit of measurement for its own internal benefit. The work of the late Sir William Acworth in advocating the use of the ton-mile in railway statistics called for by the Board of Trade should not be forgotten, and if it had been adopted earlier, it would have been possible, in recent years, to compare more adequately the level of rates charged by the railways after the war period with those levied on the trade of the country during the immediate pre-war years.

Exulting in its arrival in London, the Great Central Railway, as might be expected, did everything possible to develop traffic over its new route, its policies being designed by Mr. (later Sir) Sam Fay. The Great Central provided connections with practically all the largest railways in England, and perhaps the most interesting feature of its services was the number of through-train workings, for which the Great Central tracks provided the essential link. Thus in July, 1902, a through-train began to run between Newcastle and Bournemouth via Oxford; in October, 1903, a new through-service was started between Manchester and Dover via Banbury and Oxford; in May, 1906, a through-service began between Newcastle and Cardiff, also via Banbury; in addition to which, there was the older through-service via Retford between Liverpool (Cheshire Lines Committee) and Parkeston Quay for the Great Eastern's continental steamers. Ever extending its lines by absorption, the Great Central took

over the Wrexham, Mold and Connah's Quay Railway at the beginning of 1905, and in the same year moved its headquarters from Manchester to London. In 1906 its new line from Neasden to South Harrow permitted the routing of its fast trains from Marylebone over the Great Western joint-line through HighWycombe; at the beginning of 1907 it absorbed the Lancashire, Derbyshire and East Coast Railway, and in 1909 made a stronger bid for the continental traffic by placing turbine steamers on the Grimsby to Rotterdam route; in 1908 it had brought into use the great marshalling-yard for coal traffic at Wath.

Great Central competition led to a material improvement in the passenger services between London and the towns and cities of the Midlands; a typical instance was the Great Northern's non-stop express over the 175¾ miles from Wakefield to London in July, 1903. Indeed the number of non-stop runs of over 100 miles in length in Great Britain provides a remarkable record, considering the density of population and the comparatively short mileages of the railways. There were 152 such runs in the summer time-tables of 1906, and the total reached 157 during the summer of the succeeding year, of which the London and North Western provided 50, the Great Western 33, the Great Northern 25, and the Midland 14, the longest run being that of the "Cornish Riviera" via Westbury, 225¾ miles, and the fastest that of the two-hour Great Western expresses once daily each way between Paddington and Bristol via Bath, 118¾ miles, started on August 4th, 1903. The Great Eastern, the North Eastern, the Caledonian, the Great Central, and the London and South Western Railways were also represented in this total of 157 runs, though all 12 North Eastern trains travelled over North British metals north of Berwick.

In Scotland at this period there were several new lines being opened, notably the West Highland Railway, worked

by the North British Company, to Mallaig in 1901, the Dornoch Light Railway in 1902, and the Ballachulish extension of the Callender and Oban line and the Leith Central branch of the North British the following year, as well as the Wick and Lybster Light Railway. It is interesting to observe in 1933 how much of the railway construction of the later 'nineties and early twentieth century has proved unremunerative; thus the Bankfoot and the Campbeltown and Machrihanish Light Railways in Scotland, both opened in 1906, now cease to carry passengers; the Welshpool and Llanfair Light Railway of 1903 in Wales, as well as the Alton and Basingstoke of 1901 and the Axholme Joint line of 1903, and the Leek and Manifold Light Railway of 1904 in England, have all suffered in a similar way in recent years, the Alton and Basingstoke being almost completely abandoned, while the Bideford, Westward Ho! and Appledore of 1901 lasted as a railway less than twenty years. Other small lines constructed at this period have never carried much traffic, such as the Rother Valley of 1900, now the Kent and East Sussex Light Railway and still independent in ownership, the Yarmouth and Lowestoft direct line of July, 1903, the Kelvedon, Tiptree and Tollesbury Light Railway of 1904, the Mid-Suffolk Light Railway of the same year and the Nidd Valley line of 1907. The list could be considerably extended, but the above-mentioned are typical examples and it looks as if the passage of the Light Railways Act, under which many of these small branches were constructed, must have resulted in severe losses to the railway investor; doubtless its provisions were more successful when applied to the electrification or extension of tramway systems. With the vast railway progress of the later nineteenth century it was only natural that there should have been some over-eagerness in regard to railway construction, and it is perhaps easy to be critical when looking back at a period when the meteoric rise of the motor-omnibus and motor-car could

hardly have been envisaged accurately by the best prophets of the time.

Yet the point should not be overstressed, as certain lines constructed in the early 1900's have proved quite useful extensions, as for instance, the Woodford-Ilford loop of the Great Eastern Railway, opened in 1903, the same company's Cromer and Mundesley line of 1907, owned jointly with the Midland & Great Northern, the Bexhill-Crowhurst branch of the South Eastern and Chatham of 1902 and the more important Bickley-Orpington connecting loops of the same railway, brought into use in September of that year, which connected the erstwhile South Eastern and London, Chatham and Dover main lines and permitted trains to and from the coast to arrive at or depart from any one of the various London termini; this link proved exceptionally useful when the roof of Charing Cross Station collapsed on December 5th, 1905, and the station could not be re-opened until the following March. Other successful lines of the period were the Lyme Regis branch from Axminster and the South Harrow line of the Metropolitan District Railway, both dating from 1903, while the same year witnessed the completion of the Blackpool-Kirkham direct line of the Lancashire and Yorkshire. This railway, like the North Eastern, had been experimenting with a large number of high-capacity wagons, having at that period much bulk traffic to deal with on its dense traffic lines, varying from coal to cotton and wool, but in spite of the close clustering of the many towns in South Lancashire and the West Riding of Yorkshire it was found very difficult in practice to obtain sufficient loads of general merchandize to keep these wagons actively in circulation, and with the gradual transfer of much of the cotton and wool traffic to road transport, they have gradually been replaced by standard twelve-ton wagons. However, the trials should be recorded, as it is often assumed that the British railways in pre-war years never

experimented on any important scale with the use of high-capacity wagons.

The Lancashire and Yorkshire, which had put on a very fast forty-minute Liverpool to Manchester service in October, 1902, was one of the pioneers of electric traction for suburban passenger services, the first section to be converted being that between Liverpool, Southport and Crossens, opened in April, 1904, on the 600 volt D. C. system, the current being collected from a third rail. Two years later the neighbouring Liverpool-Aintree services were converted, and finally the whole route to Ormskirk; in 1905 a spur was constructed so that the Liverpool Overhead Railway trains could work through to Southport if required. This, like the Newcastle suburban electrification of the same year, was one of the most notable of the earlier conversion schemes, and it seemed that electrification would sweep all before it at that period; it is, indeed, rather difficult to understand why more rapid progress did not ensue during the following six years. Naturally the War prevented the fruition of the various plans that had been mooted, and it cannot be denied that electrification calls for very heavy capital cost per mile, but the Liverpool-Southport line, with its non-stop expresses, was an unqualified success and a great improvement over the steam service which it replaced. The motor-cars and trailers, the former possessing four motors of 150 horse-power each, were of the American type, being open centre-vestibule cars with reversible seats, and embodying straight sides and clerestory roofs; sixty feet long, the cars built for these multiple-unit trains were no less than ten feet wide, a figure scarcely exceeded by any railway coach in Great Britain; they ride extremely smoothly and are very popular still with the local residents. As with many of the early electric lines, especially in London, a fourth, or negative rail was provided in the four-foot way, to ensure a reliable return circuit.

If electrification progressed rapidly on the suburban routes

of the main-line railways in the North, it was also making some headway in the London area, and naturally the first conversions were in the tunnel section of the Metropolitan and Metropolitan District Railways. It was in September, 1905, that the Inner Circle trains began to operate by electric traction, and before the end of that month the last steam-train on this service was withdrawn. This conversion may be said without exaggeration to have started a new epoch in London transport, and it was destined to herald the conversion before many years had passed of the whole of the District Railway and the inner suburban services of the Metropolitan Railway. The District Railway had recently brought into use two new extensions, namely the Whitechapel and Bow line in the east, and a short section of line in the west at Acton Town in 1905. The Metropolitan had also been active, opening its Uxbridge extension in July, 1904, and the whole Baker Street-Uxbridge line was operated electrically from the beginning of 1905. Meanwhile the Metropolitan's Buckinghamshire extension beyond Harrow as far as Verney Junction became a joint line with the Great Central in 1906.

Electrification brought many intricate problems in its train, of which perhaps those of signalling were of paramount importance. Electrification means frequency of service if interest is to be earned on the heavy capital expenditure involved, and, though the Circle trains ran at low speed, when compared with main-line expresses, the problem was how to schedule with safety forty trains per hour over the same section of line, which meant, of course, very short headway between trains. At junctions such as South Kensington, Aldgate and Earl's Court, the margins between trains over the various cross-overs must be merely a matter of seconds. Accidents are bad in the open, but in tunnels the liability to panic is much greater, and with electric lines there is bound to be a conductor rail carrying a high voltage. The District Railway determined to install automatic signalling throughout

between Mansion House and South Kensington, and it says much for the administration of this very efficient line, carrying more trains per hour than almost any railway in the world, and also for the signalling apparatus that there has never been a serious accident between these two stations. The northern section of the Circle also had its special problems, and the Midland Junction box, situated in the middle of a tunnel, which controlled the connection between the Metropolitan Railway at King's Cross and the Midland and the Great Northern lines, was handling in 1907 no less than 580 trains every 24 hours; it will be realized that these trains of the main-line railways were worked by steam, and still continue to be to-day, on their way to and from Moorgate. As showing the enormous growth of passenger travel on the Metropolitan during its first forty-two years of existence, it may be mentioned that in one week of January, 1905, more than 357,000 passengers used King's Cross (Metropolitan) as compared with less than 33,000 in the similar week of 1863. Braking-power was another problem to be solved with these high-density train services, but multiple-unit electric trains are especially well equipped for rapid deceleration.

Towards the end of 1906 the Metropolitan service between Hammersmith and Aldgate was being run by electric trains along the northern section of the Circle, but the intensity of the service and the undesirability of mixing steam and electric trains brought about the abandonment of many long-standing London through passenger services. Thus the Hammersmith-New Cross trains ceased to run at the end of 1906, and from the end of the year a like fate attended the Richmond-Aldgate service; on the other hand 1907 witnessed the revival of through trains from beyond Swiss Cottage on the extension line to Aldgate, but the Great Northern service through to the South Eastern via Ludgate Hill was withdrawn in the spring of that year, and later the same year the Great Northern service to Victoria; the corresponding Mid-

land trains via Ludgate Hill ceased running in the following year. Naturally the electric trains could not work through the East London line tunnel, so that a further link between north and south of the Thames was broken, though an alternative steam service temporarily took its place until the East London line was electrified early in 1913, when Metropolitan electric trains commenced running through to New Cross. In 1909 the Metropolitan started to run fast through-trains from Aylesbury to Aldgate, electric locomotives hauling the trains, some of which in 1910 began to carry Pullman cars in their formation, between Aldgate and the end of the electrified section. The Metropolitan for many years has possessed a great reputation for signalling progress, thanks largely to the excellent work of its chief engineer at that time, Mr. Willox, and was one of the earliest lines to install automatic signals; this was between Praed Street and South Kensington. The Metropolitan District had employed the electro-pneumatic type of automatic signalling on its section of the Circle, but the Metropolitan adopted the all-electric apparatus between Praed Street and Aldgate at a slightly later date, so that by 1909 the whole of the Circle line train operation was protected by automatic signals. The Metropolitan as early as 1910 commenced to use semaphore signals moving in the upper quadrant rather than in the lower, as had always been the standard British practice until about 1930. The Metropolitan is believed to have been the first British line to adopt the upper quadrant system extensively.

During this first decade of the twentieth century tube extensions were opened for traffic with bewildering frequency; during 1901 the City and South London line reached the Angel, though it did not arrive at Euston until 1907. Early in 1904 the Great Northern and City line had been opened from Moorgate to Finsbury Park, unique among the tube lines as its tunnels were constructed on a scale to

handle the trains of main-line railways. This line was taken over by the Metropolitan Railway in 1913, and it is one of the mysteries of London transport why more use has not been made of this valuable link in the facilities between the City and the northern suburbs. The next tube-line to be opened was the Baker Street and Waterloo, more commonly known as the Bakerloo line, in 1906, between Baker Street and Elephant and Castle. In 1907 it was extended to Edgware Road, and in December, 1906, the Great Northern, Piccadilly and Brompton, more usually called the Piccadilly line, was completed and opened for traffic between Finsbury Park and Hammersmith. In June, 1907, came the opening of the Charing Cross, Euston and Hampstead Railway of Y formation with its base on Charing Cross and one apex in the open air at Golders Green, the other at Highgate in a tunnel. These last three lines were known as the London Electric Railways, the Central London and the City and South London lines being separate entities; though later co-ordinated through the formation of a common pool, the two latter lines remained distinct companies until 1933, when, like all other London lines, they were taken over by the London Passenger Transport Board. The Central London in 1909 gave up its twopenny standard fare, and began to offer tickets, like other tube-lines, rising from the minimum of one penny, doubtless due to the growing competition from motor-buses which catered attractively for the short-distance passenger along the main east-to-west artery of London.

It must not be thought that all the London buses by this time had been mechanized; of the 2,951 licences for omnibuses issued by the Commissioners of Police for the Metropolis in 1909 the majority, to be exact 1,771, were for animal-drawn stage-carriages. Nevertheless, the change-over to motor-buses had been rapid since 1903, in which year the licences for mechanical stage-carriages numbered only 13 out of a total of 3,636. In 1902 a Thornycroft steam-car had

been put into service on the Oxford Circus-Hammersmith run by the London Road Car Company, but had been taken off again after only a few months; it was not until 1904 that the London General Omnibus Company was granted a licence to run a service by mechanical traction, although the "General" had made some trials with a petrol-electric bus during the previous year. A Clarkson steam single-decker vehicle was run by the "General" between Piccadilly Circus and Kensington in 1904, and the same year witnessed this company's first essay in regular motor-bus operation. The succeeding year saw the formation of the London Motor Omnibus Company, a new-comer and the first exclusively motor-omnibus organization in London; by 1907 there were over 1,200 mechanical stage-carriages licensed for use in the Metropolitan area. The General Company, feeling acutely the competition from the various other bus undertakings, absorbed the "Vanguard" and "London Road Car" concerns in 1908, an important landmark, since it may be regarded as one of the first attempts at unification of the various surface passenger-carrying organizations other than tramways. The "Vanguard" double-deck buses provided the basic design for the famous General "B" type motor-bus, seating 34 passengers, which did not, however, make its appearance on the London streets until 1910. Great variety was shown in the nomenclature of the early motor-buses, and one finds "Pilot", "Standard", "Great Eastern", "Metropolitan", "Arrow" and "Union Jack" amongst a lengthy list. The coming of the motor-buses had enabled the various operators to lengthen the individual routes very considerably, and this added convenience should not be overlooked; some of the old horse-bus routes were very short, one, starting from Knightsbridge and terminating at Sloane Square, being less than three-quarters of a mile, but the average length of route in the late 'nineties was about four miles, and some routes exceeded eight miles. The speeds worked out at approximately

5½ m.p.h. Owing to traffic congestion the average throughout speed of the motor-omnibus routes did not greatly exceed that of the horse-drawn vehicles, and for 1909 comparative figures appear to be 7 m.p.h. and 6 m.p.h. respectively. Unlike the tramways, the bus services offered no workmen's fares, but in spite of the lack of this influence towards a lower receipt per mile, the average fare per passenger mile at the beginning of the century was well under one penny for most of the important companies, though in a few cases the figure fell to less than three farthings, and, at the other end of the scale, rose to over one-penny-farthing.

Parallel with the growth of motor-bus services and the rapid extension of the underground electric lines came the conversion of the various tramway systems to electric traction; in 1901 to ensure standardization of equipment, so as to make the through running of the cars possible, the separate tramway undertakings within the County of London were welded into a single system, owned and operated by the London County Council. Heavy capital cost per mile is a feature of all electrification schemes involving its use for traction purposes, and there were large scale economies to be obtained if the whole tramway system could be regarded as one unit, with the power supply taken from one generating station and with the longest possible through routes. The London County Council, therefore, very wisely adopted the policy of purchasing all tramway undertakings, and in view of the extent of the systems in 1903, namely 189 miles in Greater London, the programme was by no means a small one, though a certain percentage of this mileage had already been acquired. For æsthetic reasons the Council had adopted the conduit system of power-feed rather than the overhead trolley-wire almost universal in Great Britain, though the conduit system has always been extensively used in foreign cities, notably Paris, Berlin and New York.

Together with electrification, the first section to be con-

verted being the Westminster-Tooting route in May, 1903, went the extension of the tramway system itself, the crossing of Vauxhall and Westminster Bridges and the line along the Victoria Embankment being completed in 1906, though it was not until 1909 that the circle embracing Blackfriars Bridge became a closed one; moreover, in 1908, the Kingsway Subway had been opened, providing a link between the northern and southern tramway systems, although it was only during the fourth decade of the twentieth century that this subway was reconstructed in order to permit of the passage of the standard double-deck closed cars. Excellent as open-top tramcars proved from the fresh-air point of view, electric trams became of considerably greater social value when enclosed tops were fitted to many of the cars in London and the provinces, a policy which dates in many cases from about 1906; the tramway possessed this great advantage over fifteen years before the motor-omnibus became generally fitted with an enclosed top deck. To obtain the longest through running possible, the London County Council entered into various working agreements with the neighbouring tramway administrations, amongst which was the London United Tramways Company, which by 1907 possessed 340 cars and had a network of 55 route miles, the majority double-tracked, reaching to Wimbledon, Kingston-on-Thames and Hampton Court. So cheap were the fares that one could travel 3½ miles for one penny on the London United system, and it appeared at that time that tramways for city and suburban passenger transport would carry all before them. In Liverpool, which possessed a very complete corporation-owned and operated system with about 500 cars in 1910, over 125,000,000 passengers were carried in that year, the fares being exceedingly cheap; a unique feature was the trial made about that time with first-class cars on certain routes. At Hull, on a system embracing only fifteen route miles, over 35,000,000 passengers were carried in

1910, the working expenses being less than sixpence per car-mile. The social benefit arising from the low fares on the tramway systems is hard to exaggerate; for the financial year 1908-1909 the London County Council tramways carried over 32,000,000 people in workmen's cars, and their long routes, especially south of the Thames, at length roused the London, Brighton and South Coast Railway to drastic action; it determined to electrify the South London line between Victoria and London Bridge; indeed, 1907 may be said to mark the beginning of the electrification of the main-line railways' suburban routes around London.

To gain some impression of the division of traffic between the various forms of London passenger-travel prior to the electrification of the tramway system, it may be pointed out that in 1902 the main-line railways carried 188,000,000 passengers, the underground railways 277,000,000, the tramways 361,000,000 and the omnibuses 280,000,000. On the Brighton's South London line there had been a drop in passengers carried to about 3,000,000 in 1908, though at one time 8,000,000 had travelled annually over it, but in December, 1909, it was converted to electric traction and soon afterwards was carrying 10,000,000 passengers on its $8\frac{1}{2}$-mile length, which incidentally involved one of the only examples of "reversible working" over one set of metals, between London Bridge and South Bermondsey. That the railways were not backward in realizing the potentialities of the motor-bus may be seen from the fact that in 1903 the Great Western had started a service of motor-omnibuses, and by 1906 was operating nearly twenty services in districts ranging from Penzance to Marlborough, Windsor, Stroud and Stourbridge. Costing about £900 apiece, these 20 horse-power single-deck vehicles were some of the earliest to run in rural England, and carried about 25 passengers; some were known as Wagonette Road Motor Cars, one of which ran to the Lizard. The North Eastern Railway had motor-

omnibuses by 1906, running between Beverley and Driffield and Ripon and Thirsk—in summer for variety the latter service visited Fountains Abbey—while the Great Eastern Railway, so a contemporary writer tells us, possessed fifteen "splendid" double-deck omnibuses at this date, seating 36 passengers and working on twelve different services, one of which ran from Chelmsford to Great Baddow. The London and North Western started a motor-omnibus route between Watford and Croxley in April, 1906, providing thirteen services each way daily. In addition the Great Western and North Eastern Railways were using motor and steam lorries for local cartage services, even embracing farm deliveries.

On the railways themselves many of the companies had developed light steam units, consisting of one carriage and a small locomotive, sometimes actually enclosed within the body of the vehicle itself. The Great Central had one such car in 1906, painted in its standard colour, with cream upper panels; the South Eastern and Chatham operated the Sheppey Light Railway with an articulated steam rail-motor; the London, Brighton and South Coast Railway used its famous little Stroudley "terriers", displaced from the South London line, coupled to a large bogie open-vestibuled coach, fitted for reversible working; this company's colours were also chocolate lowers and cream uppers in 1906. The Great Western had in use a large number of these reversible rail motors throughout their system; they cost £1,750 each, were fitted with a vertical boiler and carried one ton of coal and 450 gallons of water. The Great Northern, the London and South Western, the Lancashire and Yorkshire, the Glasgow and South Western and later the London and North Western all adopted this type of light steam unit, of which there were many varieties, for their light traffic lines, and the total number in use was very extensive in 1909. Present-day students of railway operation might gain the impression that the light steam unit has only been used on the British railways in

recent years, but such an impression would be entirely fallacious, and it is of interest that in first cost these light units of nearly thirty years ago compare very favourably with the modern ones, though the latter are probably considerably cheaper to operate.

Meanwhile there had been no lack of progress in regard to main-line locomotives, the call for increased power being both pressing and continuous from 1899 to 1909. Locomotives of the types which had taken part in the races to Scotland in 1895 proved quite inadequate to haul the fast corridor restaurant-car trains of 1905, which were beginning to exceed 300 tons in weight behind the tender. Even on the smaller lines, where speed was not so high, the inauguration of such trains as the Great Eastern's "Norfolk Coast Express" in July, 1907, and the all-Pullman "Southern Belle" to Brighton which did the journey in one hour in November, 1908, demanded modern and efficient locomotives. It was essential to have sufficient reserve of power to make up time if such trains were delayed by permanent-way speed restrictions or by signal checks. A particularly heavy train put into service in July, 1907, was the London and North Western's "American Boat Special", to carry passengers between Euston and Riverside Station at Liverpool. Fortunately the famous locomotive designers of the day—Mr. Ivatt, of Doncaster (Great Northern Railway), Mr. George Whale, of Crewe (London and North Western), Mr. Deeley, of Derby (Midland), Mr. McIntosh, of St. Rollox (Caledonian), Mr. Reid, of Cowlairs (North British), Mr. Robinson, of Gorton (Great Central), Sir J. A. F. Aspinall, of Horwich (Lancashire and Yorkshire), Mr. Holden, of Stratford (Great Eastern), and notably, Mr. Churchward, of Swindon (Great Western), to mention some of the more notable figures of the period—all developed designs of considerable power. But the race between the heavier loading of the fast trains and the development of locomotive power

was a continuous contest, as indeed it has always been. The British permanent-way was strong and excellently maintained, but in certain cases limits to axle-loads, especially on bridges, prevented the adoption of really big boilers during the early years of this period. The limitations imposed by the British loading-gauge were perhaps the most difficult to overcome. There were periods when the locomotive power on some of the railways became temporarily overwhelmed by the train-loading, notably on the London and North Western at the time of Mr. Webb's retirement in 1903. He had turned out from Crewe many three- and four-cylinder compound engines during his more than 30 years as locomotive superintendent, but they proved wayward machines, often slipping badly when they had to start a heavy train, though occasionally putting up very fast timings. His successor, Mr. Whale, faced the problem with great determination, turning out in a few years 130 four-coupled "Precursor" type two-cylinder express engines for the more level sections of the line, and 105 six-coupled "Experiment" class engines for the more heavily-graded sections of the line, as for instance that between Preston and Carlisle. Nevertheless, the use of two engines for the handling of one heavy train never completely died out on the London and North Western, because trains by 1909 had become too heavy for the "Precursors" and "Experiments"; Mr. Bowen-Cooke, Mr. Whale's successor, therefore in his turn developed and built more powerful locomotives of the same general design, fitted with super-heaters, and known as the "King George V" and "Prince of Wales" classes respectively.

Other railways, however, managed to keep abreast of requirements, and though it is impossible to mention more than a selection of the famous locomotive designs of the period, reference should be made to the first 4-4-2 type engine used in this country, designed by Mr. H. A. Ivatt for the Great Northern in 1898. This wheel-arrangement,

known as the "Atlantic" type, because it was reputed to be first used on the line to Atlantic City, became very popular both for tender and tank locomotives in the succeeding years; a fine type of "Atlantic" emerged from Horwich to Sir J. Aspinall's design for the Lancashire and Yorkshire in 1899, and the Great Central, North Eastern, North British, Great Western, and London, Brighton and South Coast Railways by 1908 all possessed several, and some many, engines of this type. In 1903 the Great Western brought over for trial from France one of the famous Nord type four-cylinder "Atlantics", and named it appropriately "La France"; it was later followed by two similar but larger engines as used on the Paris-Orléans. These famous machines, of four-cylinder compound design, were responsible for certain modifications in Great Western express locomotive design, which has gradually been evolved from the "North Star", the fourth Great Western engine to bear this honoured name, to its considerably higher powered grandson, the "King George V" class of 1927. Incorporating the use of four-cylinders for his new engine in 1906, Mr. Churchward did not follow French practice in adopting compounding, nor did he follow the 4-4-2 wheel arrangement, but favoured the 4-6-0 type, which yielded greater weight for adhesion purposes on the driving axles; in due course all the existing Great Western two-cylinder "Atlantics" were converted to 4-6-0's and became, with additions, the famous "Saint" class of that railway. The Midland was the only company to produce a really satisfactory compound express class locomotive of 4-4-0 type, new engines being built to this same design as late as 1932 for the London Midland and Scottish Railway. All the companies in 1910 were adhering in general to 4-4-0, 4-4-2 or 4-6-0 designs, with two outside or inside positioned cylinders, and the steam pressure tending to rise somewhat, while superheaters were being fitted to all new locomotives for main line work.

For freight-train working, especially where mineral traffic predominated, eight-coupled engines were steadily superseding the earlier six-coupled ones, thereby obtaining greater adhesion; amongst the companies to adopt this wheel arrangement were the London and North Western, the Great Northern, the Lancashire and Yorkshire, the Great Central, the North Eastern, the Caledonian and the Great Western Railways. The problem of speeding-up freight-train movement, both on the line and at the terminals and yards, had become a matter of supreme importance, if heavy expense through congestion was to be avoided, and the only hope lay in increasing the length of the trains and improving their speed. The two aims were diametrically opposed, but increasing locomotive power assisted towards a solution and Great Western trains of 80 loaded wagons, or 100 empties, could be seen travelling to and from the London area before 1909. Like the North Eastern and the Lancashire and Yorkshire, the Great Western had experimented with large wagons before 1890, but even between London and Birmingham or Bristol it had not been found possible to get a sufficiently good load regularly for the 25-ton capacity double-bogie wagons which had been the subject of trial; the average load on 204 journeys amounted to less than seven and a half tons. The Great Western, however, found that 20-ton wagons could be used satisfactorily for locomotive coal in 1897, but the ten-ton wagon remained standard on most railways until after 1909, and has been succeeded by the existing 12-ton standard.

Though competition was still extremely strong, there were signs that a greater degree of co-operation was being sought between companies that might be regarded as natural allies. The London and North Western, which in July, 1901, had terminated its ancient agreement with Pickfords for the collection and delivery of goods by road vehicle, four years later came to an agreement with the Lancashire and Yorkshire,

which had always worked very closely with it, especially in the Blackpool and Preston area, and followed this up in August, 1908, with an even more far-reaching agreement with the Midland Railway. One of the aims of this agreement was the achievement of closer working at many places where the two systems impinged on one another. Earlier in the same year the Court of Appeal had upheld the opinion of the Railway Commissioners that the proposed working agreement between the Great Northern and the Great Central Railways was " ultra vires " according to the provisions of an Act of the 1850's. Nevertheless, economies were still being effected by the taking over of small lines; the Great Western began to work the Port Talbot Railway in 1908, and the London and North Western took over the management and working of the North London Railway at the beginning of 1909, whilst, in a somewhat different category, the Stratford-upon-Avon and Midland Junction Railway was formed from several small lines in 1909.

In the matter of railway legislation the decade was comparatively barren, in contrast to its immediate predecessor, but it could claim considerable progress as regards the bettering of conditions of work for railway employees and increased protection for human life. Parliament had shown its interest in this aspect of railway matters by passing the Railway Employment (Prevention of Accidents) Act of 1900, which gave power to the Board of Trade to make such rules as it thought fit to increase the degree of safety afforded to railwaymen. The passage of this Act of 1900 led, in the succeeding years, to considerable improvements in yard-lighting, shunting methods and practice, and the provision of brakes on wagons; it led indirectly to the safety movement by the railways themselves, notably the Great Western, and it is probably true to say that the railways were ahead of nearly all other industries in this work, with their safety bulletins and well-organized ambulance-

classes, which dated back many years. Danger cannot be wholly eliminated from railway operation, but the British railways were early in adopting methods calculated to reduce it to a minimum.

The rise of trade unionism amongst railwaymen is witnessed by the famous action brought in December, 1902, by the Taff Vale Railway against the Amalgamated Society of Railway Servants, and it was largely the feeling aroused by the judgment in this case that led in 1906 to the return of a compact Labour Party of 29 members to the House of Commons. The Amalgamated Society of Railway Servants came into prominence again in 1908 when Mr. W. V. Osborne, secretary of one of the branches of the union, opposed the right of his union to levy its members or contribute funds to the Labour Party. Indirectly these two famous law cases have their bearing on inland transport and the conditions of work of railwaymen, but the subject is not one which can be dealt with adequately in this brief outline.

The first decade of the twentieth century had been one of steady progress on the railways and the coming of a new dawn on the roads, though few then visualized all that the new road era was to involve during the coming 20 years. It had also witnessed the first long-distance flights by air, and of the various divisions of transport canals alone had registered no material progress. Both competition and co-operation between the railways were strong and virile, and the period which marked the diamond jubilee of the Railway Clearing House also witnessed the attainment of a railway speed of over 100 m.p.h.

CHAPTER X

1910—1919

PRE-WAR PROSPERITY—RAILWAY EFFICIENCY—THE WAR PERIOD

THE second decade of the twentieth century so far as inland transport in Great Britain is concerned falls naturally into two clearly-defined periods. The first five years, prior to the outbreak of the European War in August, 1914, are the object of envious backward glances by those old enough to remember the prosperity of the country in those years—to-day considered peaceful but at the time regarded as chaotic, owing to industrial strife, especially in 1911, the problem of Home Rule for Ireland and the agitation for universal suffrage. On the railways the progress of the preceding ten years continued the even tenor of its way until August, 1914, and it is customary, since the annual statistics for 1914 were materially affected by the war, to regard 1913 as the standard pre-war year. Many of the railway plans for 1914 failed to materialize, and 1913 must be taken as the statistical unit of railway achievement and efficiency; little was it realised then that 1913 would be regarded as the standard for measurement twenty years later.

Less than 400 route miles had been added to the railway network of the United Kingdom between 1910 and the beginning of 1914, when the figure stood at 23,718, a total scarcely exceeded by 1934, though the figures are not comparable since the returns for Ireland are now separated from the returns for Great Britain. If route mileage had increased but little, the number of passengers carried, exclu-

sive of season-ticket holders, had risen to nearly 1,455 million in 1913, an advance of over 150 million in the brief space of three years. The tonnage of freight had also increased by virtually 54 million to over 568 million in 1913, and the net receipts reached the unprecedented level of £52 million in that same year. Post-war results are often compared adversely with the results for the last complete pre-war year, but it should in justice be pointed out that for the railways, as for other British industries, 1913 was a particularly prosperous year; comparisons with the 1912 figures would yield a somewhat different picture.

Reference may be made to certain outstanding events in British railway history during these four and a half progressive years; they begin with the first day of 1910, when the Cunard mail-steamers from New York, notably the *Mauretania* and *Lusitania*, began to call regularly at Fishguard. The East Coast railway ports, not to be eclipsed, replied by the opening of the Great Central's new line from Grimsby to Immingham, thereby paving the way for the opening by the King and Queen of the great dock at the latter place on July 22nd two years later. In 1913 the North British Railway opened Methil docks and the King George V Dock at Hull was opened by the King and Queen in June, 1914. The London and South Western Railway in July, 1910, inaugurated a daylight cross-channel service from Southampton to Havre, later run as a night service, with the turbine steamers *Normannia* and *Hantonia*, and in the following December Pullman cars were included in the South Eastern and Chatham Railway's rival Continental expresses on the day route via Folkestone, where the railway harbour six months later welcomed to its bosom the night ships of the Zealand line from Flushing, which had previously used Queenborough as its English terminus. Perhaps it was the lure of Pullman cars on the connecting night trains which induced this move to the Channel port,

or possibly the introduction of a new train by the Great Eastern in the previous May to connect with the competing night boat from Parkeston Quay and the acceleration of the service via the Hook of Holland.

Improvement of express-train services was the main feature of 1910, including a fast run by the Great Eastern to Clacton and the inauguration in July of two-hour trains to Birmingham by the Great Western over the Bicester cut-off, opened for freight traffic in April. As a means of meeting this long-expected competition the London and North Western Railway had offered since February a daily "City to City" express, from Birmingham, New Street, to Broad Street, London, the first British train to carry a typists' office. The Great Western replied by running a through-train from Wolverhampton to Victoria (South Eastern and Chatham Railway), but both experiments were short-lived. Competition also resulted in the introduction of fast London-Birmingham services on Sundays, and even the Scottish railways were waking up to the necessity of travel on the Sabbath, the Caledonian Railway having introduced Sunday rail and steamer services the previous summer. The Great Western abolished second-class accommodation on its trains in October, 1910, and the London, Brighton and South Coast followed suit in regard to its suburban services the following year; this latter company abolished second-class on all its lines in 1912, as did the London and North Western, except between London and Harrow, in 1911: the Lancashire and Yorkshire, the Cambrian, the North Staffordshire and the Maryport and Carlisle had done so the same year. Fruits of the London and North Western and Midland Railways' agreement may be seen in the diversion of certain of the latter's trains to the former's main line between Low Gill and Carlisle in July, 1910, during which year an important working agreement was arranged between the Great Western and the London and South Western Railways. Cross-

country journeys also benefited by the inauguration of new or faster services; a typical instance of the former may be mentioned in the Manchester and Birkenhead to Bournemouth trains of the Great Western, and of the latter in the competing Midland trains via Derby, Cheltenham and Bath over the Somerset and Dorset Joint line.

The year 1911 witnessed the introduction of many new restaurant-car trains by the Great Eastern, notably to Southend and Hunstanton, and by the London and South Western of two-hour trains to Bournemouth from Waterloo, a service only recently restored, because in the intervening years Southampton has trebled in importance. It was the age of increasing comfort and restaurant-car development, with tea-cars on the London to Liverpool and Manchester services and dining-cars on the Liverpool to Newcastle route. The lack, felt keenly in previous years, of sufficient corridor rolling-stock had prevented the development of these facilities at an earlier date. The most important absorption of this period was the taking over of the London, Tilbury and Southend by the Midland Railway in August, 1912, and amongst the new lines completed only a few merit reference. The Great Northern had long planned an alternative route to the North via Cuffley and Hertford, joining their old line north of the fine Welwyn viaduct and adjoining tunnel, which was an acute bottle-neck and too costly to widen. The southern section of this alternative loop from Enfield to Cuffley was completed in 1910, but the northern section was not finished until many years later and is used almost exclusively to-day for freight traffic, including the heavy mineral trains from the Nottingham and South Yorkshire coalfields. In 1911 the North Eastern Railway had opened the Selby and Goole line for passenger traffic. The development of Avonmouth Docks, owned by the City of Bristol, was considerably assisted by some new lines of the Great Western in that area, and Avonmouth,

together with the London and North Western port of Garston on the Mersey, throughout this period were the chief landing-points of the bananas brought from Central America by the famous banana-boats of Elders and Fyffes. A similarly short but highly important traffic-link, was the South Yorkshire Joint Committee's line at Doncaster, also opened in 1910 to ease the congestion of coal traffic in the rapidly developing South Yorkshire coalfield; no less than five large railways combined in the construction of this line. In another category, several small independent lines were reopened, such as the Shropshire and Montgomeryshire in April and the Mawddwy Railway in July of 1911, while the East Kent Railway was opened to assist the development of the Kent coalfield lying between Canterbury and Dover; near York the little Derwent Valley Light Railway followed suit the next year. Like many of these light railways, it still survives as an independent concern, though hardly blessed with the great prosperity foreshadowed for it; in East Anglia a similar little line serving Thaxted, also dating from 1912, later became part of the Great Eastern and then London and North Eastern.

In the London area electrification of the suburban services of some of the main-line railways was proceeding steadily, and in 1912 the Brighton Railway's electric services were extended to Tulse Hill; the same year saw the completion of six tracks for the London and North Western's line to Watford from Willesden, and the new service made possible started early in the following spring, though electric traction was not introduced until some years later. London and North Western electric trains began running into Earl's Court from Willesden in May, 1914. Early in 1910, the electric trains of the District started to work into Uxbridge over the Metropolitan, and three years later, on the completion of the electrification of the East London, Metropolitan electrics traversed Brunel's famous tunnel, replacing the Great

Eastern steam trains which had run up to 1911 between Liverpool Street and Croydon. Another north to south link was temporarily tried in that same year in the form of a service from King's Cross to the South Eastern and Chatham Railway, and in July, 1913, the latter's " Granville " express worked from and to King's Cross.

By far the most important item of progress in rail travel in the Metropolitan area was the extension of the various tube lines, and the installation of the first escalator at Earl's Court in October, 1911, caused continuous excitement to the Londoner, and equal consternation to the rural visitor. In December, 1913, the Bakerloo tube was completed to Paddington, while the much needed Central London extension to Liverpool Street had been opened the preceding year. The completion of a loop on the Hampstead tube to Charing Cross early in 1914 eliminated the necessity of reversing the tube trains at that station, thus materially assisting the traffic problem in peak hours. An event which was to have far-reaching consequences was the close association brought about in 1912 between the Underground Electric Railways Company embracing the three tube lines of the London Electric Railways, and the Metropolitan District, and the Central London, and the City and South London Tube Railways. This paved the way for the formation of a Common Fund or pool of receipts, which was finally achieved in 1915, covering not only all the Underground electric lines, except the Metropolitan, but also the London General Omnibus Company. The latter company had placed on the London streets an enormous fleet of its " B " type thirty-four seater double-deck omnibuses since 1910, when the first one was put into service, and by 1913 had achieved a virtual monopoly on the majority of routes. The last " General " horse-bus left London Bridge for Moorgate on October 25th, 1911, and in 1912 control of the company passed into the hands of the Underground Electric Railways Company of London.

In 1913, out of 3,664 stage-carriages licensed by the Commissioners of Police for the metropolis only 142 used animal traction, amongst the last to survive being the "Royal Blue", though a horse-bus service still operated between Somerset House and Waterloo as late as 1916. The London General Omnibus Company's conversion to motor vehicles had been rapid; in September, 1910, it still had over 4,500 horses and 343 horse-buses in service, which gives an impression of the number of horses required to operate one horse-bus or tram. In summer many of the horses were hired out to the Army for manœuvres, and the profit from this source had contributed to their retention. The greater reliability of the 1913 motor-buses may be seen from the fact that there was in operation that year a nineteen-mile route between Reigate and Stockwell. The fares remained low and that same year worked out at rather over ½d. per mile, a figure never attained during the post-war years.

Several tramway extensions were carried out during this period, but they were mostly of local importance only and applied to outer suburban sections, such as Norbury and Tooting. By March, 1913, the London County Council had effected working agreements to permit through-running of cars with certain authorities outside the County boundary, an important example being that made with the West Ham and East Ham Corporations, whereby a through service was run from Aldgate to Ilford Broadway; a somewhat similar agreement was made with the Leyton Urban District Council; thus the London County Council cars could reach the edge of Epping Forest. The number of people carried on London County Council workmen's cars had increased by over 100 per cent. between 1909 and 1914, reaching the vast total of 77,000,000 in 1913-1914. Some degree of co-ordination between the tramways and the underground electric lines had been achieved through the acquisition by the Underground Company of a considerable interest in the Lon-

don United Tramways, whose lines provided road transport extensions to the District and other electric railways.

In the great provincial cities of Liverpool, Manchester and Birmingham the tramway systems had spread steadily, both in mileage and even more in the number of passengers carried. In a comparatively small city such as Bolton over 32,000,000 passengers had been carried in the year 1913-1914 by the Corporation tramways system, which then owned 112 cars. Besides paying off considerable portions of their debt, many municipally-owned systems were earning sufficient surpluses to relieve the rates, and the policy of absorption by the various Corporations was continuing. In Edinburgh, the Corporation had acquired the lines within the city from the Edinburgh Street Tramways Company in 1893 and succeeding years, and had been authorized in that same year to convert the horse-tramways to cable traction, but having no authorization to operate the system, a twenty-one years' lease was agreed to with Dick Kerr & Company, later extended for a further five years; the cable system of traction was completed in 1901. At a later date operation was entrusted to the Edinburgh and District Tramway Company, and the twelve cables required to operate the whole system were nearly 50 miles in length. It was not until 1919 that the Corporation took over the operation of this cable system, which was one of the most extensive in the world. In 1915 the Plymouth Corporation took over the neighbouring Devonport and District Tramways system, but the two sections could not be united physically until after 1919. The cost of tramway operation rose steeply during the succeeding war years, as also did the number of passengers carried; at Hull, for instance, whereas less than 50,000,000 people had used the trams in 1913, by 1919 the total was little less than 70,000,000; over the same period working expenses per car mile rose from 6½d. to 11½d.

The Corporation Tramways at Liverpool in 1910 had

carried 125,500,000 passengers, the fares always being very low, and for a twopenny fare on certain routes one could travel up to seven miles. Liverpool, which had lagged far behind its neighbour Birkenhead, across the Mersey, in regard to the use of bogie cars, claimed to be the first British tramway system to adopt roller bearings for its cars, but this was in the post-war period. It was also one of the earlier systems to build its outer extensions on enclosed tracks, so that higher speeds could be attained. The Manchester Corporation Tramways date back to 1901, when the first electric tram was put into service, and by 1904 all the principal routes had been electrified; extensions outside the city boundary were made in 1903, when the municipality bought out the carriage company. A feature of the Manchester system was the carriage of parcels, which was started in 1906, a service which has brought in quite a large revenue in recent years. Birmingham Corporation Tramways date back to 1904, when the municipality took over and electrified a company-operated system using steam cars. By 1911 all the tramway routes in the city had become part of the municipally-operated network, and Birmingham, like Manchester and the London County Council, was comparatively early in adopting the eight-wheel, or bogie, design of car, which ensured smooth riding and incidentally offered greater seating capacity. The very complete tramway systems of the large northern cities had certainly built up an intra-city "wanderlust", and so efficient were they that, except in London, the business man and the clerk were normally able to return home for lunch, an impossibility in the days when horse traction or walking were the only alternatives. Yet per head of population the number of journeys per annum did not rise to the enormous figures reached in London, which, being a capital city and the nerve-centre of a great Empire, always drew like a magnet visitors from overseas and home-coming Englishmen on leave. It has been esti-

mated that in 1913 the passenger journeys in Greater London per head of the population, whether by bus, tram, underground or main-line railways, for the first time exceeded 300 per annum, and by 1920 they topped the 400 figure. · Tramways in Greater London in 1913 carried 812,000,000, buses 736,000,000, underground railways 417,000,000, and the main-line railways 250,000,000. An interesting table is to be found in " London Statistics ", which is published annually by the London County Council, showing the number of train arrivals on an ordinary weekday at each of the great London termini. Liverpool Street in 1913 came first with 470, of which all but 42 were classed as suburban, that is to say originating within a radius of 20 miles. Victoria, then partly electrified, came second with 451, of which 388 were suburban trains. Between 7 a.m. and 10 a.m. there arrived at Liverpool Street no less than 64,000 passengers, more than 21,000 per inward track, and over 20,000 per hour, or more than five per second; such a record in travel facilities was no mean achievement, and in its sphere was quite unexcelled by any railway or terminus abroad.

Indeed, the immediate pre-war years can be regarded as a period of steady all-round progress on the railways, though there had been signs of serious industrial discontent during those years. The festivities celebrating the coronation of King George V towards the end of June, 1911, had scarcely been concluded before a railway strike commenced in the middle of August. Train services were seriously interrupted and some lines went so far as to introduce special time-tables of reduced facilities. Short-lived as the strike was, since it was quickly terminated by the appointment of a Special Railway Commission, it gave the country its first taste of the problems that would have to be faced if ever a national railway strike were to be declared, or rather to become effective. Equally it showed the potentiality of the motor-car, and, as

it came in the middle of the holiday-season, for the first time many people started for their holidays by car, or by the few motor-buses and charabancs then in service. A coal strike followed in March, 1912, and the railways again suffered grievously, being forced to operate reduced services; a few sections of line were closed altogether. The Great Eastern was the only large company to maintain its passenger-train service virtually intact, thanks in part to the possession of oil-burning equipment for some of its locomotives. Even after the strike had been terminated in April, it required many weeks before the railways were able to establish normal working conditions, but, unlike the event of 1911, the trouble had not come at a peak period for travel.

A feature of passenger-train operation which has always been almost unique to Great Britain reached the zenith of its popularity in 1913, namely, the use of slip-carriages, by means of which coaches could be dropped en route while the train was travelling at speed, without stopping the main train itself. It is believed that, in its modern form, this system originated with the 1869 working of the Bristol and Exeter's "Flying Dutchman", from which carriages were slipped at Bridgwater off the "down" train; further slips were made from the "down" train at a later date at Yatton and from the "up" train at Tiverton. About the same time the westward "Dutchman" began to slip a coach at Chippenham and on the eastward journey at Reading. The system became extensively used by the Great Western and by several other lines during the succeeding years, and by 1914 no less than 170 slips, including eight in Ireland, of which the Great Western had 70, appeared in the public time-tables; in some cases on the London and North Western passengers in the "slip" could have their meals in the dining-cars before the point of "slipping" was reached, but on the Great Western and other lines the carriages concerned were not vestibuled through to the main train. The actual slipping

is controlled by the additional guard carried in the slip, who, by operating a lever, releases a pin and the coupling drops, the brake pipe being automatically disconnected, having been previously sealed to preserve the vacuum. All slips were temporarily abolished on the Great Western in January, 1917, but some trains had been carrying no less than three separate slips, each consisting of one or more coaches, the "Riviera Limited" itself carrying two slips, one for Westbury and the Weymouth line and the other for Exeter. The Great Western main line to Cornwall was ideally suited to the operation of slips, because a very heavy train from Paddington could gradually reduce its weight as it approached the heavy gradients west of Taunton, and between Exeter and Plymouth.

Express passenger-train operation had achieved a very high degree of efficiency by 1913, and taking the Great Western as an example, though it was an exceptional case owing to the construction of the various cut-offs, one finds the time between Paddington and the principal cities and towns served by the line very materially improved since the beginning of the century, if one takes as one's measure the time of the fastest train. Thus 35 minutes had been knocked off the schedules to Chester, 25 minutes to Birmingham, 60 minutes to Plymouth, 27 minutes to Cardiff, and practically two hours to Penzance. The Great Western was fortunate in possessing the "City" class of 4-4-0 locomotives, one of which, the "City of Truro", holds the steam-locomotive speed record of the world; this locomotive is preserved in the Railway Museum at York. In touching 102.3 miles per hour for a quarter of a mile when running down the Wellington bank in Somerset on May 9th, 1904, with a light train of 148 tons conveying the American mails, carried by the *Kronprinz Wilhelm*, from Plymouth, this locomotive reached a speed which has not been excelled by any other authoritatively timed locomotive in normal public service;

the 128½ miles from Plymouth, Millbay, to Pylle Hill, Bristol, were covered, in spite of the very steep gradients in Devon, in 123 minutes 9 seconds. Sisters of the same class also put up fine performances; on July 1st, 1903, the "City of Bath" with 230 tons behind the tender on the 10.45 a.m. from Paddington passed Bath in 105 minutes 11 seconds for the 106 miles 70 chains. Another locomotive brought the 12.0 p.m. from Bristol to London via Badminton, 117½ miles, in 115 minutes 18 seconds; the "City of Bath" on July 14th, with a special weighing 130 tons, conveying the then Prince and Princess of Wales, passed Bath from London in 92 minutes 2 seconds, Bristol East (117 miles) in 101 minutes 52 seconds, and Exeter (193¾ miles) in 172 minutes 34 seconds, arriving at Plymouth (245¾ miles) in 233 minutes 35 seconds, or 36 minutes before scheduled time. On August 7th of the same year the "City of Gloucester" on an "up" train, with a more adverse gradient, ran the almost 83 miles from Wootton Bassett to Paddington in 72 minutes 38 seconds. Such runs are worthy of comparison with the astonishing record of to-day held by the same company's "Cheltenham Flyer" over the same racecourse.

Great feats were being accomplished on other lines, notably the special run of "Holyrood", a four-coupled bogie Brighton engine then just out of the shops, on July 26th, 1903, when, with a load of five Pullmans weighing 130 tons, the 51 miles to Brighton from Victoria were covered in 48 minutes 41 seconds, in spite of a greasy rail after heavy rain. On the same evening the return journey, in spite of a strong side wind, occupied only 50 minutes 21 seconds. It is of interest that even in 1933 the electric trains drawing power from an outside source have not bettered "Holyrood's" time by more than a minute as yet. These famous runs of the pre-war decade had shown what British locomotives could accomplish in the realm of speed, but trains had grown vastly heavier by 1913, making the

running more difficult from the locomotive point of view, albeit less spectacular from that of the public.

On August 4th, 1914, a memorable date in the history of Britain, all progress temporarily ceased, and the energies of the railways, as of all other industries, turned to other channels. The Government, realising that the railways were destined to play a leading part in the success or failure of the war, took the whole system over, by means of an Order in Council, under the provisions of the Regulation of the Forces Act of 1871, but wisely left their management in the hands of those best qualified to obtain the maximum results. The control of the railways was vested in the Railway Executive Committee as from August 5th, 1914, the Committee consisting of 13 general managers of the largest railways. The official chairman was the President of the Board of Trade, but Sir Herbert Walker, General Manager of the London and South Western Railway, was appointed acting-chairman, and Mr. G. S. Szlumper, also of the London and South Western, railway secretary. The nation owes a deep debt of gratitude to the acting-chairman, now General Manager of the Southern Railway, for the admirable manner in which the railway system performed its function with expedition and efficiency at a time when so much depended upon it. The way in which thousands of troops were passed through Southampton, when the story was unfolded at a much later date, evoked the highest praise, not in military quarters alone but from the transport experts of other countries as well.

The original terms of remuneration to be paid by the Government to the railways were made public by the Board of Trade, in a notice dated September 14th, 1914, but early in 1915 the terms were somewhat amended; whereas under the first agreement the sum to be paid in compensation to the railways concerned was to be the sum by which their net receipts for the period during which the Government was in possession

of them fell short of the aggregate net receipts for the corresponding period of 1913, subject to certain provisions; under the 1915 agreement 25 per cent. of the war bonus granted to railway employees who came within the Railway Conciliation Scheme was to be borne by the railways and not by the Government. In practice, however, the point is mainly of academic interest, as conditions changed rapidly during those war years, and, as the Government did not relinquish control until 1921, the question of compensation was in reality dealt with under the provisions of the Act of 1921. The Railway Conciliation Scheme mentioned above had come into being as a result of the railway strike of 1911, which had been called by the four great railway trade unions of that date, the Amalgamated Society of Railway Servants, the General Railway Workers' Union, the United Pointsmen and Signalmen's Society and the Associated Society of Locomotive Engineers and Firemen. It is true that there had been a conciliation scheme in being as early as 1907, when a strike had been threatened by the Amalgamated Society of Railway Servants, in consequence of which the Board of Trade had intervened, and in November, 1907, a scheme of conciliation and arbitration had been organized. Based on a series of sectional conciliation boards to deal with the conditions of work and wages, there was superimposed a central board for each railway, to which any outstanding problem could be submitted, with a provision for final reference to an independent arbitrator. The short-lived, but serious, strike of 1911 led to the setting up of a Special Commission of Inquiry to look into and recommend improvements in the existing conciliation scheme of 1907, and the resulting report of this Commission brought about a wide extension of the scheme. Excluding questions of management and discipline, the activities of the sectional conciliation boards were to cover all matters appertaining to wages, hours and conditions of service, and the greatly widened scheme was introduced just

prior to 1912, when the conciliation boards were reconstituted. The trade unions, however, were not by any means satisfied, and in November, 1913, gave a year's notice of their wish to terminate the plan; negotiations were in progress between the railways on the one side and the Associated Society of Locomotive Engineers and Firemen and the National Union of Railwaymen, a combination of several unions, on the other, when the outbreak of war temporarily put a stop to them; in October, 1914, it was agreed by both sides that the 1911 Conciliation Scheme should continue. During the war period railway wage rates were for the first time placed on a national basis; it could hardly have been otherwise, as the Executive Committee was acting on behalf of, and as an agent of, the Government, and wage increases were granted in the form of a war bonus.

It is not the function of this book to relate the military activities of the railways at home or abroad during the war period. Large numbers of railwaymen had been called to the colours, first as combatants but later to form the Railway Traffic Establishment and the Railway Operating Division, detachments of which served in Italy, Salonika and Egypt, to mention a few theatres of war other than the Western Front. Many others served in the Royal Engineers, under the Docks Directorate or with the Inland Water Transport organization. Over 500 British locomotives were loaned for service overseas, some of which finally reached Salonika, Palestine and Baghdad. Thousands of wagons were also sent overseas, together with coaches for ambulance-trains, rails, points, cranes and all the equipment which goes to make railway operation possible and efficient even under war conditions. Many of the railway shops at home were turned over completely to the production of war stores and munitions. The story is an epic one, and has been well told, so far as the London and North Western Railway is concerned, in "Deeds of a Great Railway", by G. R. S. Darroch.

During these war years the London and North Western fitted out at Crewe an armoured train, several ambulance trains for use in Great Britain and in France, and also manufactured artificial limbs, paravanes for mine-sweeping, fuses for shells, cartridge-cases, and tractors, to mention but a few of the war stores, while it loaned for service overseas about 110 locomotives, many of which finished their days at El Kantara long after peace had been signed.

At home ordinary passenger services had to take second place to troop movements, the carriage of coal for the Fleet, and the production, assembly and dispatch of war stores. Much traffic that had previously gone by coastwise vessels had to be diverted to the railways, owing to the submarine menace, whilst shortage of men and materials prevented the normal repairs from being effected and operating efficiency became exceedingly difficult to achieve. To add to the difficulties, the chalk cliffs between Dover and Folkestone had fallen on to the line along the coast between these two nerve-centres of the war organization, and it was not until 1919 that this section of line could be reopened. Restaurant cars were withdrawn on many lines to lighten the trains and make room for more seating accommodation, since economy of coal forbade the running of unnecessary duplicate portions; sleeping-car traffic was discouraged by higher fares for the same reason. The railways first experienced the application of summer time on May 21st, 1916, in order to reduce the nation's lighting bill and fuel consumption. Excursion fares and cheap ticket facilities, carefully built up over many years, disappeared completely and ordinary passenger traffic was discouraged by the rise in fares, in order that the lines might be kept clear for the essential freight traffic to pass. To ease the problem of wagon supply, the Great Northern, Great Central and Great Eastern Railways arranged to pool most of their standard wagons, an arrangement which proved to be the forerunner of the existing system of "common

user " wagons. Under the " common user " system a wagon owned by, say, the North British Railway, could be loaded and dispatched to a station on, say, the Great Western Railway, when to all intents and purposes it became a Great Western wagon, and could be reloaded and dispatched to, perhaps, the Great Eastern, which company in turn took it over and reloaded it, thus saving much empty back haulage. This system does not, of course, apply to any but standard wagons. Early in 1916 the London and North Western, Great Western, Midland, Lancashire and Yorkshire and North Eastern Railways adopted a similar " common user " arrangement in regard to their wagons of normal design, and the three larger Scottish companies followed suit in June of that year. By May, 1918, the wagon position had become so serious that the Board of Trade was given statutory powers to take possession of privately-owned wagons, though some savings had been effected at the end of the previous year by the Railway Executive Committee announcing that certain traffic could only be accepted for transit on certain selected railway routes.

Some works which had been under construction in August, 1914, were continued under growing difficulties, and were finally completed in 1915, for instance, a few miles of new line in South Wales on the Great Western, and the extension of the Bakerloo tube to Queen's Park on the London and North Western, whence the electric trains could continue on the widened lines to Willesden. On the London and South Western electric traction was inaugurated on the Waterloo-Wimbledon route by the end of 1915, whilst the London, Brighton and South Coast was brave enough to place third-class Pullmans in service in the autumn of the same year; on the other hand the London and South Western finally abolished second-class accommodation in 1918. In one respect continued progress was registered, namely, suburban electrification, as shown in the north by the opening

of the Manchester-Bury route of the Lancashire and Yorkshire in April, 1916, and in the London area by the Bakerloo trains from Willesden to Watford in April, 1917, a trial run having been made the previous January, and the inauguration by the London and North Western of electric multiple-unit trains between Broad Street and Kew and Richmond. The London and South Western's electrification scheme was by far the largest and was brought to fruition by a series of conversions during 1916—the Kingston "roundabout" in January, followed by the Hounslow loop in March, the Hampton Court branch in June and the Claygate section in November. This scheme released many steam locomotives urgently wanted elsewhere and it is important as forming the basis for the far flung network of electric lines of the present Southern Railway, extending from Gravesend in the east to Guildford in the west, with the semi-main line stretch of fifty miles to Brighton, opened in 1933; in short, it was the genesis of the world's largest suburban electrification scheme using the third rail for power-feed and the 660 volt D.C. system. It may be argued that the Brighton's South London and Crystal Palace electrification of an earlier date should, in reality, be regarded as the forerunner of the present network; but for the sake of uniformity, through running, ease of operation, co-ordination of services and the welding together of the various sections of the Southern Railway, this earlier system, for which the 6,600 A.C. single-phase system with overhead power line and catenary suspension had been chosen, has been entirely eliminated and replaced by the system which the London and South Western had chosen for its larger programme, and which proved highly satisfactory when the various conversion schemes based on Waterloo were progressively completed.

It would be a useless task to quote statistics of railway traffic during the war years; indeed passenger traffic was deliberately discouraged, certain stations and halts being

closed, and in January, 1917, ordinary fares were raised by 50 per cent. The war period was marred by the most disastrous accident in British railway history, when there was a double collision, involving a troop train, on the Caledonian Railway in 1915, near Quintinshill, and about 224 people were killed. The appalling total of 269 fatalities was reached in that year; in 1914 the total had been only six, and for 1916 again it was gratifyingly low, the figure being three. Apart from the railways themselves, the railway-owned steamers were almost entirely on war service, working with the various naval fleets, transporting troops or acting as ambulance or leave ships across the English Channel. With the railways, the railway-owned canals had passed into State control and the independent canals were taken possession of by the Board of Trade in February, 1917, by means of one of the regulations of the Defence of the Realm Act of 1914.

The canal system of the country still suffered through its divided ownership and the consequent difficulty in the quotation of through tolls, many of the canals being owners of their waterways but not operators of craft. The railways on the other hand, had been fortunate, thanks largely to the foresight of Mr. Carr Glyn, of the London and Birmingham, in the benefits they had derived through the early formation of the Railway Clearing House. In 1888 Parliament had given the canal companies power to establish a Clearing House on similar lines to that of the railways, but little progress had been made towards the fruition of any such scheme up to 1914. A Royal Commission which had been appointed in 1906 to inquire and report on the canals and inland navigations of the United Kingdom issued its fourth and final report at the close of 1909, and came to the conclusion that for the most part there had been little progress since the middle of the nineteenth century. There were, of course, some conspicuous exceptions, notably the

Manchester Ship Canal, opened in 1894, but which, however, has almost invariably been regarded as a canal for ocean steamers rather than an inland navigation. The Manchester Ship Canal is thirty-six miles long and in 1913 the tonnage carried through it amounted to 5,780,161 tons. Another exception was the Aire and Calder Canal, dating back to 1699, which handled a large tonnage of coal from the growing South Yorkshire coalfield to the Humber ports, and carried out its work both efficiently and profitably. But for the most part it must be admitted, with sadness, that progress had been painfully slow, and the majority of inland navigations were still small independent entities. The following figures of tonnage carried on canals in the United Kingdom show this clearly, when one remembers that the Manchester Ship Canal was not yet built in the earliest year mentioned:

1888	36,461,682	tons
1898	41,600,706	„
1905	43,161,926	„

In 1874 the Gloucester and Birmingham Canal had absorbed the Worcester and Birmingham, the Commission expressing itself favourably on this waterway, by which barges could proceed from Sharpness to Worcester. In fact the Commission based its famous X system to some extent on this waterway, and recommended that this south-westerly leg of the X should be adapted to take barges of 750 tons as far as Worcester. From Worcester to Birmingham, London to Birmingham and Leicester, the south-easterly leg, or the Grand Junction route, 100-ton barges were to be catered for, with 300-ton barges on the Trent and Mersey canal west of Nottingham, and 750-ton barges thence to the Humber, by the Trent navigation, or north-easterly arm of the X. Barges of 100-tons were recommended from Wolverhampton to Runcorn by the Weaver Navigation, or the

north-westerly arm. In spite of these far-sighted recommendations the high capital cost of the changes which they would necessitate prevented any important betterment schemes prior to 1914, and it was not until after 1919 that the question again became prominent, or even a practical proposition.

In the immediate pre-war years of the decade under review there had been some important legislation which affected the railways, amongst which was the Railway Companies Accounts and Returns Act of 1911. Previous legislation dealing with the presentation of railway accounts and statistics mainly hinged on the Regulation of Railways Act of 1868, but the 1911 Act considerably improved the methods of compilation and presentation as well as standardizing the periods which accounts were to cover, so that they coincided with the twelve months calendar period. The suggested use of the ton-mile as a basic statistical unit, though advocated by several experts, did not form part of the new legislation, and it was not until the end of the decade that this feature became embodied in Government requirements. A Departmental Committee had been set up in 1909 to inquire into the question of inter-railway agreements and amalgamations; its report, made public in 1911, pronounced favourably upon the working arrangements agreed to about this time between the London and North Western, the Midland and the Lancashire and Yorkshire Railways, or Western group of lines, and the Great Northern, Great Eastern and Great Central Railways serving the eastern side of the country. It is probable that this community of interests led, at a much later date, to the conception of the two groups which ultimately became known as the London Midland and Scottish Railway and the London and North Eastern Railway, respectively. There was also a further agreement under discussion at this period between the Great Western and the London and South Western Railways. The third

important step in the relationship of Parliament to railway legislation was the passage in 1913 of yet another Railway and Canal Traffic Act, which amended the earlier Act of the same name in 1894, and authorized the railways to charge increased rates, provided that they could prove that the betterment in labour conditions offered to their staff had resulted in unavoidable extra expenditure. This amending Act was made necessary by the improved conditions which had been the outcome of the troublous summer of 1911, and in July, 1913, taking advantage of these new powers, the railways put into force a general increase of 4 per cent. on the existing rates on freight traffic.

Prior to the outbreak of war a Royal Commission had been appointed to study once again the relationship of the railways to the State, but its deliberations were cut short by the opening of hostilities in August, 1914; it was not until 1919 that this question came to the fore once more and policy had to be settled quite definitely. Even prior to the conclusion of the war a Select Committee had been set up in August, 1918, to consider what steps ought to be taken to improve the internal facilities for transport within the United Kingdom, especially with a view to the co-ordination of the various means of transport. The first and second reports of this Committee were published at the end of 1918, and in 1919 Parliament passed the Ministry of Transport Act, which transferred the Railway Department of the Board of Trade, together with certain sections of other departments, to a new Ministry of Transport. The last piece of railway legislation to be passed during the second decade of the twentieth century, it was hailed, like many other achievements of that early post-war period, as the dawn of a brighter and better age; time brought disillusionment, but any assessment of the true value of this new department of the State must be deferred.

The period 1910 to 1919 was a period of great contrasts,

of strong light and deep shade, but at its conclusion it witnessed the dawn of a new transport age, the epoch of revitalized transport by road. In 1910 the production of motor vehicles in the United Kingdom only totalled 14,000, and by 1913 it had reached but 34,000, a figure destined to be increased by over 100 per cent. for one of the early post-war years. Coupled with the extended production of new vehicles, thanks in part to the demands made by the War Office for supply to the armies in the field or on the various lines of communication, there were many War Department vehicles returned from the theatres of war and sold at very low prices for civil work on their return. Even the London General Omnibus Company, which had sent over hundreds of its "B" type buses to France, was forced to carry passengers in converted motor-lorries, temporarily equipped with seats and stairs, for a short period after the war. The roads, which had been comparatively free from traffic prior to 1914, except for bicycles and local horse-drawn carts and carriages, soon became great arteries of travel, and though their mileage remained practically constant at about 175,000 miles for England, Wales and Scotland, the expenditure on their betterment and maintenance rose rapidly from about £18,000,000 in 1913-1914 to over £43,000,000 in 1920-1921, though much of this was by way of overtaking the arrears due to under-maintenance during the war period.

It was just when the dawn of this new age was breaking that the Ministry of Transport and Parliament set about the formation of the new charter for the British railways, which took final shape in the provisions of the Railways Act of 1921. It will always remain a mystery for future generations why those responsible for shaping the new policy apparently never even visualized the growing importance of the motor vehicle and the internal combustion engine. It is all the more remarkable in view of the fact that the first Minister of Transport had himself, as Director-General of Military

Railways, witnessed the remarkable ability of the motor vehicle to handle troop-movements in the field and to feed whole divisions day in and day out without failure. Equally remarkable, in view of the outstanding achievements of the Royal Flying Corps and the Royal Air Force on active service, was the statement on aerial transport embodied in the second report of the Select Committee, made public in November, 1918, that "in view of the improbability of aerial transport being available upon any considerable scale for many years to come for the internal transport of passengers and goods the Committee has made no inquiries in regard to it". If such lack of foresight was typical of the spirit of those responsible for legislation in the transport sphere, it must be admitted that the Railways Act of 1921 was a much more satisfactory piece of legislation than might have been expected.

CHAPTER XI

1920—1929

POST-WAR RAILWAY RECONSTRUCTION AND THE RISE OF THE MOTOR VEHICLE

THE years 1919-1920 were a period of reconstruction and re-introduction of pre-war facilities as soon as circumstances permitted. The rate of progress achieved was, however, slow, owing in part to the high level of prices existing at that time and the uncertainty as to the future trend of costs, but in part also to the recurrence of industrial troubles. At the end of September, 1919, railway traffic was almost entirely suspended for two days, owing to a widespread strike of railwaymen, though after the third day, through the assistance of volunteers, traffic began to flow once more. In October, 1920, a serious strike paralysed the coalfields, and the railways suffered a further setback on this account. Nevertheless, difficult as conditions were, there was a steady return towards normality, and the Great Eastern Railway re-introduced day-trip excursion trains to Clacton and Southend in August, 1920, and later in that year put Pullman cars into service on its trains to these towns and to Cambridge, the last-named service being, however, short-lived. For the Christmas travel in 1920 period excursions were re-introduced, a sign of definite progress. But the level of freight rates and fares at this time was far out of line with the general level of prices and the costs which were incurred by the railways, both as regards labour and materials, and in January, 1920, the Government raised the level of rates, including demurrage charges; in August there followed an

increase in ordinary fares and in the season-ticket scales. During September there was a further rise in freight-rates, and the scales for workmen's tickets were increased at the same time. However necessary such a policy may have been to reduce the load on the taxpayer, who at that time was responsible for making up the difference between gross receipts and expenditure together with interest on the railway capital, the increases undoubtedly diverted considerable passenger and freight traffic to the rapidly extending services offered by the road motor vehicle.

The close of 1919 had witnessed the constitution of a Railway Advisory Committee, which included 12 railway general managers and four representatives of railway trade unions; it took over the functions of the Railway Executive Committee, which had served the country so well in its time of peril. Government control of the railways was actually regulated by the Ministry of Transport Act, and Sir Eric Geddes announced in the House on December 8th that it was also proposed to set up a Central Board, consisting of five general managers and five representatives of the railway trade unions, primarily to deal with disputes concerning wage-rates and conditions of service. After the termination of the war an agreement had been entered into between the Board of Trade and the railway unions which conceded an eight-hour day as from February 1st, 1919. Subsequent agreements of 1919 and 1920, which related to wages and conditions of service, had been negotiated by the Railway Executive Committee acting on behalf of the Government. As a consequence of the national railway strike in September, 1919, the National Union of Railwaymen had demanded nationalization of the railways and representation for the employees on the board of management. It was as a result of these demands that the Government put forward the scheme for Central and National Wages Boards, which were inaugurated in December, 1919.

With the future Government policy in regard to the railways as yet undecided, the early months of 1921 can only be regarded as an interregnum, and, as is always the case with such periods, programmes of reconstruction could only take indefinite shape, and no rapid revival of pre-war facilities could be expected. The publication in February of the Colwyn Committee's Report on the agreements made between the railways and the Government during the period of Government control was the first event to commence clearing the haze surrounding future policy, and in May the Government's intentions were made clear by the introduction into Parliament of the Railways Bill. This legislation, far-reaching as it was, reached the Statute Book after only a few weeks and received the Royal Assent on August 19th, just four days after the railway system of the country had become decontrolled. During the first six months of the year preparations had gradually been made towards this desired end; thus the allocation-scheme for freight traffic had come to an end in February, and the long-drawn-out coal strike from April until June, with a threatened railway and transport workers' strike at the same time, had doubtless assisted towards the rapidity with which the Government, pressed on all sides to further programmes of post-war reform, set about divesting itself of an industry which at that time seemed likely to prove a costly incubus rather than a profit-earning concern. The provisions of the Railways Act of 1921 laid down the path which should be followed in turning the great railway industry back into the hands of its shareholders. Like all such legislation, especially when it is desired to ensure a rapid passage through the two Houses, it was a compromise; it made no provision for nationalization; on the other hand, it created vast changes in the internal organization of the industry, and, not permitting the railways to put on their pre-war dress, by amalgamating them into four large groups laid a foundation upon which a

policy of nationalization could be built in future years. By many it was prophesied that the final step towards the formation of one single railway system would not be long delayed. In practice, such prophecies have been falsified, since a decade has passed after the coming into being of the four amalgamated companies.

The Railways Act of 1921 consisted of six parts, the fifth and sixth of which dealt with light railways and general matters respectively and need not be the subject of detailed examination. The first part of the Act amalgamated practically all the railways of the country, except for the Metropolitan and the other electric lines confined to the London area and a few light railways in country districts, into four large groups, named respectively Southern; Western; North Western, Midland and West Scottish; and North Eastern, Eastern and East Scottish. These four groups took the titles so familiar to-day of the Southern Railway, the Great Western Railway, the London Midland and Scottish Railway, and the London and North Eastern Railway. Within the first-named were the South Eastern and Chatham Railway, the London and South Western Railway and the London, Brighton and South Coast Railway as constituent companies, to which were added a series of subsidiary companies, such as the three railways of the Isle of Wight. To form the new Great Western Railway, the only large railway now to retain its title for nearly 100 years, there were added to the Great Western of 1921, as constituent companies, the Cambrian Railway in Central Wales, and the Barry, the Cardiff, the Rhymney, the Taff Vale and the Alexandra (Newport and South Wales) Railways while over a score of subsidiary companies, such as the Midland and South Western Junction Railway, were absorbed into the new organization. The third group consisted of eight constituent companies—the London and North Western, the Midland, the Lancashire and Yorkshire, the Furness, the North Staf-

fordshire, the Caledonian, the Glasgow and South Western and the Highland Railways—to which were added nearly 30 subsidiary companies, such as the aged Dundee and Newtyle, the North London and the Maryport and Carlisle. The fourth group was formed of seven constituent companies, namely, the North Eastern, the Great Central, the Great Eastern, the Great Northern, the North British, the Great North of Scotland and the Hull and Barnsley, and also embraced about 25 subsidiary companies, such as the Colne Valley and Halstead, the Mid-Suffolk Light Railway and the London and Blackwall.

It will be realized that in general the amalgamation was so designed as to preserve competition between London and many of the main industrial centres of population in the country, if not always for passenger traffic, at any rate for freight, which can be handled competitively over moderately circuitous routes, as between Avonmouth or Glasgow and London. Competition for passenger service was thus preserved between London and the cities of Exeter, Birmingham, Manchester, Birkenhead and Liverpool, Glasgow, and Edinburgh, as well as Leicester, Nottingham, Sheffield, Leeds, Bradford, and Huddersfield. Secondly, the amalgamation scheme preserved the close relationship already existing between many of the railways, as, for instance, the partners on the East Coast route to Scotland and also their rivals on the West Coast route. There were possibly some anomalies and no attempt was made to deal with the more important joint lines, such as the Cheshire Lines Committee, the Somerset and Dorset and the Midland and Great Northern, which still remain jointly owned to the present time; the comparative success of the design determined upon for welding the pre-war railways into four groups may be measured from the lack of serious disputes which came before the Amalgamation Tribunal, set up by the Act to deal with any problems arising therefrom. Only two cases were

outstanding when the provisions in regard to amalgamation came into force on January 1st, 1923. This part of the Act also provided for a payment of £60,000,000 to be made to the railways for compensation for extra wear and tear, damage and so forth, which had resulted during the period of Government control, and the £60,000,000 was duly divided up amongst the various companies, and used to overcome arrears of maintenance, replace worn out rolling-stock and in general to bring the properties to a pre-war standard of efficiency again. This sum was accepted in full discharge of all claims by the railway companies against the Government, as a result of their being taken over through the Act of 1871 at the outbreak of war in 1914. In practice the conversion of the capital of the pre-amalgamation companies into the four large railways reduced the nominal capital of the country's railway system by about £100,000,000, through the elimination of much capital that had never proved remunerative for many years, for example, only £2 8s. 6d. of new Great Western ordinary shares was given in exchange for £100 of Cambrian Railway ordinary stock. Alone of the four new companies did the London and North Eastern Railway yield any increase, and in January, 1923, the total capital of the four groups was under £1,000,000,000, as compared with almost £1,100,000,000 on January 1st, 1922.

The second part of the Act was short and dealt primarily with inter-railway working, notably pooling and schemes for "common user" rolling-stock, but the third part was of outstanding importance, because it set up a Railway Rates Tribunal of three members, whose duty would be to control the charging powers of the railways, thus taking over certain of the duties of the earlier Railway and Canal Commission, which, however, was still left to deal with questions of undue preference and the adequacy of facilities. The new tribunal was to supervise the design of a standard classification of merchandize and to institute a schedule of standard charges,

which finally came into operation at the beginning of 1928. The new schedules made special provision for the so-called disintegration of the various rates into conveyance and terminal charges. It was hoped that by means of the new classification of freight into no less than 21 classes, exclusive of coal, the thousands of hitherto existing exceptional rates could be abolished and the railway rate structure of the country considerably simplified. Such, however, was not to prove the case, thanks mainly to the steadily increasing force of competition by the motor vehicle, and it is probable that in 1933 the percentage of traffic carried at exceptional rates is higher than it has ever been in British railway history. The Act laid down that the charges for each amalgamated company were to be such as would, in the opinion of the Tribunal, yield, with efficient and economical working and management, an annual net revenue equivalent to the aggregate net revenue in the year 1913, in addition to allowances for capital expended since 1913, or not fully remunerative in that year. Hence it comes about that 1913 is still to be regarded as the measuring-stick of British railway prosperity, and each year the Railway Rates Tribunal undertakes an annual review to determine, first, whether the railways have been managed and worked with due economy and efficiency and, secondly, whether alterations should be made in the schedules of charges, namely rates and fares, so that the railway net receipts should approximate more nearly to the net receipts of 1913, which have become, in effect, the standard revenue. Thanks to trade depression and road competition the railways have never been able to earn the standard net revenue that their charges are supposed to be designed to yield. The Tribunal has in fact failed to carry out its instructions, but since the gap is as wide as it is, and the importance of the internal combustion engine was not visualized by those who framed the legislation of 1921, the fault lies neither with the Tribunal nor with the railways

but almost wholly with the law, the provisions of which are impossible of fulfilment. It may be of interest to quote the figures of standard revenue and actual net revenue for the last few years, to show how serious the situation has become; the loss has of necessity fallen primarily upon the holders of railway stocks and shares. Figures reproduced in the 1933 Review of Railway Charges by the Railway Rates Tribunal indicate that the net revenues earned in 1930, 1931 and 1932 ranged from £37,716,113 to £26,425,192, as compared with a standard revenue, plus allowances for additional capital, now computed at £50,935,475.

There is a provision in the law that if the standard revenue is exceeded the standard charges must be so amended as to return 80 per cent. of the excess to the trader and the travelling public in the form of lower rates and fares; hence in theory the trade of the country and the general public is in co-partnership with the railways. It is frequently remarked that the road vehicle has reduced the costs of transport. Undoubtedly it has accomplished this for many individual businesses, but, if a large percentage of the traffic now handled by road had been retained by the railways, there is little doubt but that, by the provisions of the 1921 Act, the level of railway charges would have been lower than it is to-day, since the standard revenue figures would have been exceeded and 80 per cent. of the surplus returned to the trading interests of the country. Thus there is, to some extent, a vicious circle of cause and effect; the loss of rail traffic to the road prevents the lowering of rail charges, and, while the individual gains, the traders as a whole, and chiefly the heavy industries whose traffic must be largely handled by rail, suffer and their ability to compete in the export markets is reduced. Some degree of Government guidance as to the methods by which traffic should be handled would seem to be the only key adequate to unlock the chain of cause and effect. In 1932 the level of charges borne by

the trader has been estimated as being about 40 per cent. to 50 per cent. above the pre-war level, but, owing to the lack of a ton-mile unit in 1913, such comparisons are mere estimates, and the average receipt per ton-mile varies widely as the proportion of low-grade and high-grade traffic fluctuates year by year, and this fluctuation is important over a period of 20 years; also the average receipt per ton-mile changes in accordance with variations in the average length of haul.

The fourth part of the 1921 Act, dealing with wages and conditions of service, provided for the establishment of Sectional Railway Councils, and reconstituted the Central Wages Board, already mentioned, and the National Wages Board, the latter consisting of six representatives each of the railway managements and of the railway trade unions, together with four representatives of the public, nominated by the Federation of British Industries, the Association of British Chambers of Commerce, the Co-operative Union and the Parliamentary Committee of the Trades Union Congress, with an independent chairman, nominated by the Minister of Labour. Such, in brief summary, are the main provisions of the Act of 1921, regarded by many at the time as the new charter for the British railways. Doubtless its provisions were not perfect, particularly as regards the principles of charging, but it is an easy matter to be wise after a period of 13 years, and taken all in all the Railways Act of 1921, considering the disastrous years which British industry has had to contend with since its passage, can be regarded in retrospect as a successful piece of legislation.

Although many of the early estimates of financial savings due to amalgamation were over-optimistic, the fact remains that railway expenditure exclusive of steamboats, hotels and other ancillary businesses in 1932 amounted to £121,300,000 as compared with £156,900,000 in 1923. To what extent a reduction could have been possible without

the formation of four large groups will never be known, because the conditions have not been static, and the state of *coeteris paribus* has never obtained. On the other hand it can be claimed with justice that many of the policies which have been most fruitful of economy—such as through locomotive running between London and Edinburgh, the standardization of rolling-stock construction and maintenance, and the centralization of control and avoidance of unnecessary correspondence—would hardly have been possible if there had still been in existence a large number of separate companies. Nevertheless, economies could not be achieved at once. The Railways Act provided for the compensation of those who lost their positions as a result of the amalgamation, and hence it was some considerable time before the full economies resulting from a reduction in personnel became operative. The problem of reorganization with concerns as large as the London Midland and Scottish, embracing a capital of over £400,000,000, required time, and in every case many months had to pass before new standards, the result of detailed trials and experiments, could be settled for rolling-stock, permanent-way, stationery and all the many points of detail which, though small in themselves, amount to enormous figures when translated into terms of great railway companies. However, by 1925 the four large railways were getting into their stride, and the years 1923-1924 may be regarded as having been occupied with the formation of definite policies for the future.

Not that the intervening years had been barren of achievement. In 1920 the Great Eastern Railway had introduced its famous "jazz" service of suburban trains into Liverpool Street, by means of which it achieved a record of train entries and departures per track for any large terminal station in the world, whether steam or electrically operated. During 1921, in spite of the serious coal strike already mentioned, many companies in July offered a much

improved and accelerated summer service, while later in that year experiments, though short-lived, were made by the South Eastern and Chatham Railway with through fruit-trains from the south of France, over the war-time Calais-Richborough train-ferry—a scheme likely to be revived in 1934 on the completion of the new Dover train-ferry, when fruit is to come direct to London from Valencia and flowers from the French Riviera. To assist the flow of traffic, rates on minerals and coal were reduced prior to 1922, and week-end tickets stimulated passenger travel, but certain railways took time by the forelock and amalgamated before the year 1923, notably the London and North Western and the Lancashire and Yorkshire Railways, the amalgamation being approved at the close of 1921 and brought into effect on January 1st, 1922. The North Eastern and the Hull and Barnsley Railways amalgamated in 1922, as did five of the constituent companies of the Great Western group. The same year witnessed the re-introduction of many facilities, such as the North Eastern's run between Darlington and York at over 60 m.p.h. and a through service from Liverpool and Manchester to the Kent Coast. Rates on merchandize traffic were further reduced, and electric trains introduced on the Euston and Watford service, while the reconstructed station of the London and South Western at Waterloo had been opened by the Queen on March 1st.

Following on the amalgamation services were further improved and the Great Western timed one of its Cheltenham to London expresses at 61.8 m.p.h. between Swindon and Paddington, while the Fishguard-Rosslare route to Ireland was reopened and a through service offered between Penzance and Aberdeen, practically the longest run possible in the island. The London Midland and Scottish Railway speeded up many of its main-line trains, and offered through carriages from Euston to stations on the erstwhile Wirral

Railway. The London and North Eastern started a Pullman car service from King's Cross to Leeds, Harrogate and Newcastle, reopened the Harwich to Zeebrugge route, placed articulated sleeping cars on its night trains and installed some of the earliest colour-light signals on its Marylebone-Wembley section, preparatory to the opening of the Wembley Exhibition. The Southern Railway reorganized the whole of its continental services from the Channel ports, and embarked upon an enormous scheme of suburban electrification on the lines of the late South Eastern and Chatham Railway. Being unsuccessful, owing to the opposition of a few local landowners and Members of Parliament, in obtaining powers to abandon the Basingstoke and Alton Light Railway, which had long been unremunerative and had been taken up for war purposes, it was forced to relay this branch, an important matter in regard to principle, since the branch in recent years has been abandoned almost completely. It is such cases as these which, through lack of foresight on the part of the regulatory authorities, cause unnecessary financial loss to the shareholders, tend to force up the level of rates and fares to unnecessary heights and lead to charges of overcapitalization. The very light traffic on that line could easily have been handled by road, as it is in fact to-day, and the criticism that the railways did not foresee the value of road transport is falsified by the application made by the London and North Western and Midland Railways for powers to operate road vehicles even prior to the formation of the London Midland and Scottish Railway in 1923. Opposition, however, proved too strong, and the application was abandoned, but it prevented the formation of a co-ordinated rail and road policy until about 1927, when all four railways asked for wide powers in regard to the ownership and operation of road transport for both passenger and freight traffic.

The next year, 1924, opened inauspiciously with a partial

strike of drivers and firemen, and was marked by few outstanding developments, though Prince George opened the Harwich-Zeebrugge train-ferry service, which, utilizing the ferries previously based on Richborough, created a regular rail link between the British and Continental European railways. In the intervening years an important traffic has been built up of imported fruit, vegetables, cheese, flowers and general merchandize, in through-wagons from points as far apart as Palermo, Vienna, Eastern Germany and even Scandinavia. Through the existence of this ferry, which now calls at Calais and caters for French traffic also, British firms have been able to quote successful tenders for special rolling stock, such as the Wagons-Lits Company's cars, and for electrical generating machinery, which would have been quite out of the question but for the availability of a train-ferry, which obviated the necessity of reassembly on the Continent. The present fiscal policy of the country, calculated to reduce international trade to a mere shadow of its former self, naturally reduces the incoming traffic, and thereby tends to increase the charges on export traffic. It would seem that political theorists, both at home and abroad, have not as yet mastered this elementary principle of transport economics, which applies to every transport concern, whether it owns ships, railway rolling-stock, road vehicles or aircraft.

The year 1925 marked the centenary of the opening of the Stockton and Darlington Railway, and during July suitable celebrations of this event were held near Darlington, including a parade of locomotives and trains representative of 100 years of railway progress. Though the line had actually been opened on September 27th, 1825, the celebrations were advanced by some weeks in order that the delegates attending the quinquennial meeting of the International Railway Congress Association held in London in that year, representing virtually all the world's countries which possessed important railway systems, might be present.

Meanwhile, steady progress was being registered by the four companies in making up war-time arrears of maintenance, speeding-up trains and restoring the pre-war standard of service. The Southern Railway was pushing ahead rapidly with its electrification scheme, and in April had converted to electric traction the Victoria to Sutton and Coulsdon lines of the Central, or Brighton, Section, a project put off for many years owing to the war. These were extensions of the 6,600 volt A.C. system, as used on the Crystal Palace lines, and were destined to be replaced about three years later by the third rail 660 volt D.C. multiple-unit system, which had been by then adopted as standard for the whole Southern Railway electrified system. On the Western, or London and South Western, Section of the line electrification was extended to Guildford and Dorking in July, 1925, and the same month electric multiple-unit trains began running to Orpington on the Eastern, or South Eastern and Chatham, Section; further routes embracing Hayes, Bromley, Addiscombe, Woolwich and Dartford were also converted to electric traction during the first half of 1926.

Just as the grouped railways were getting into their stride, with organizations determined, future policies settled, permanent-way and rolling-stock designs standardized and train services on the point of considerable improvement during the summer, came the outbreak of the general strike throughout the country in May, involving coalminers, railwaymen and many other transport and general workers. Future students of British economic history will probably regard this landmark as the most important, other than the war, in the history of this nation during the first 30 years of the twentieth century. Whatever may have been the cause of the disaster, it does not fall to be discussed in this outline of transport history, but its consequences upon the financial prosperity of the railway industry, including the shareholders and the railwaymen themselves, are impossible to exaggerate and it is

indeed as yet too early to attempt to measure them. The blow to the country's trade can never be truly assessed, but at a time when trade was beginning to revive satisfactorily it nipped the eagerly awaited revival in the bud, and dragged the whole nation into the depths of a trade depression from which to the end of 1933 it was still endeavouring to extract itself. The difference between what was and what might have been can only be guessed at from the more fortunate experience of those other countries whose railway receipts reached their highest level for all time during one of the years from 1926 to 1929—for instance, the United States, Canada, France, Germany and Belgium. It may, perhaps, be claimed that the railways in Great Britain were hit harder than any other industry, since, through their reliance on home-produced fuel, they were forced to reduce their train services to a mere skeleton of the intended programme, while their rivals on the road catered freely for the transport demands of the country, their fuel being imported and free from all restrictions as to use. What little coal was available had to be paid for at ruinous prices, 300 per cent. higher than the normal, and these supplies were exiguous and of poor quality, unsuitable for the British design of locomotive, being derived from Silesia, Pennsylvania and West Virginia, while the cost of unloading at British ports was high, since the normal equipment at these ports is designed to load and not unload coal. The railways emerged from this disaster with their finances severely strained, and with little chance of regaining the traffic which they had lost to the motor vehicle.

It was far into 1927 before there was any real return to normality, and the summer services of that year showed a spirit of energy which was refreshing in view of the convalescent state of the industry, for the London Midland and Scottish in July introduced a non-stop run from Euston to Carnforth, 236 miles, and the London and North Eastern an even longer run, from King's Cross to Newcastle, 268

miles; in September the London Midland and Scottish lengthened their non-stop run to Carlisle, 299 miles. The Great Western had launched out into feats of daring and reduced the time of the "Cornish Riviera" to exactly four hours to Plymouth, 225¾ miles, and of the "Torbay Limited" to five minutes under the three hours for the 173½ miles to Exeter from Paddington. During the following year the London and North Eastern inaugurated the non-stop run of the "Flying Scotsman" from King's Cross to Edinburgh, Waverley, a distance of 392.7 miles, a world's record for regular non-stop running, which has not yet been exceeded. To ensure this long non-stop run Mr. H. N. Gresley, chief mechanical engineer of the London and North Eastern, designed special corridor tenders for his three-cylinder "Pacifics" running on this service, by which the engine crew could be changed without stopping the train; this change-over is effected between York and Darlington after the train has been moving about three and a half hours. About seven tons of coal and 13,000 gallons of water are consumed on the journey, so that the latter has to be replenished en route; there are between King's Cross and Edinburgh five water troughs, which are each 800ft. long and six inches deep, and at 60 m.p.h. some 2,000 gallons are picked up in ten seconds, by a scoop nearly 12 inches wide which goes 1⅜ inches into the water. The same year saw the inauguration of third-class sleeping car accommodation for the first time in Great Britain on all railways but the Southern, whose journeys are not sufficiently long to warrant the provision of sleeping cars; during the succeeding years the popularity of this facility, which it must be admitted was somewhat tardy, has manifested itself strongly, especially in relation to Anglo-Scottish travel, though it has undoubtedly increased the weight of trains and withdrawn some patronage from the first-class sleepers.

Several further additions were made to the Southern Rail-

way's electrified network during 1928, but the most important event of the year was the grant by Parliament to the railways of powers to take a financial interest in road services, or to operate or own them. Previous to the passage of the Railway Road Powers Acts, which received the Royal Assent on August 3rd, 1928, the railways were not authorized to carry freight or passengers, except in certain isolated cases, throughout by road. The passage of these Acts, which, however, expressly excluded the London Metropolitan area from their provisions, opened a whole new vista of possibilities to those responsible for railway management. Within London itself there had been many improvements effected on the underground railways since 1920, amongst which may be mentioned specifically the complete reconstruction of the City and South London line, so that the normal type of multiple-unit tube trains might be used instead of the early electric locomotives hitherto employed. All the tunnels had to be increased in diameter and the line from Moorgate to Euston was closed from 1922 to 1924, the rest of the line being dealt with during the last-named year; it was not until December, 1924, that it was reopened throughout, together with the connecting tunnels at Euston whereby City trains could work through to Highgate and to Hendon and Edgware, an extension from Golders Green to Hendon being opened in November, 1923, and to Edgware in August, 1924. The Metropolitan jointly with the London and North Eastern had also been extending northwards, and opened an electrified branch to Watford from near Rickmansworth prior to the close of 1925; since the mileage of the Metropolitan outside the London area was jointly owned with the London and North Eastern it is amusing to speculate on the causes for the refusal of road powers to this company, since its joint partner was given them, and could obviously operate road vehicles on behalf of both, if necessary. Early in 1926 the Metropolitan completed the electrification of its so-called

widened lines between King's Cross and Moorgate, but the most important electric railway developments of the year were the opening of the City and South London's extension to Morden, in Surrey, and the completion of a branch between that line at Kennington and the Hampstead tube at Charing Cross, thus providing four tube tracks between Waterloo and Charing Cross under the river, and also offering alternative routes by Leicester Square and via the Bank between Kennington and Euston.

The number of passenger-journeys per head of population in Greater London reached 499, a figure not hitherto attained, in 1929; the underground railways handled no less than 616,000,000, the main-line railways' figure totalled 346,000,000, while the trams recorded a peak figure for all time of 1,076,000,000 and the buses more than doubled the 1920 total of 936,000,000 by reaching 1,912,000,000. During 1919 the London General Omnibus Company had put into service its "K" type of double-deck open-top design, seating 46 passengers, and over 1,000 "K's" were soon on the London streets, replacing the pre-war "B's", but omnibus design at this time was proceeding apace, and the "S" type of 1920, of the same general design, but seating 54 passengers, quickly superseded the "K's"; more than 1,000 of the "S" type were in circulation by 1923. In that same year the London General Omnibus Company turned out its "NS" type of bus, in which a successful effort was made to lower the body and eliminate one of the two steps, thereby permitting the fitting of a covered top at a somewhat later date. Over 2,300 "NS" buses were put into service, in fact, they became the standard London design. They seated 52 passengers and their covered tops materially eased the problem of handling the London peak-hour traffic. Though the "K" and "S" types have long disappeared, many of the "NS" class still remain in service and have been equipped with pneumatic tyres and in nearly all cases fitted

with covered tops. During the period 1922-1932 the "General", which before the war held a virtual monopoly of motor-bus traffic in London, was troubled with fleets of independent rivals, in addition to the large "Tilling" and "British" fleets, with which the "General" possessed a working agreement. Many of these independents, frequently operating only one or two buses, were bought out by the "General" after a limit had been placed on the number of buses running on any particular route, or along particular streets. In other cases it required some measure of control before a stage of stabilization could be reached; once it was reached ownership and single direction followed in many cases almost automatically. Undoubtedly, many of the independents started services before adequate control was exercised with the specific object of being bought out at high prices, a policy which applied also to many country bus and motor-coach services prior to the passing into law of the Road Traffic Act of 1930. The year 1929 witnessed the coming into service of two new "General" types, both built with covered tops and fitted with pneumatic tyres, one known as the "ST", of which about 1,000 have been constructed, and the other, a six-wheeler, the "LT", of which nearly 1,400 are now in service. During the period under review the average bus-fare per mile was slightly under one penny in London, if the few cheap midday and return fares are excluded from these calculations, and in general the scales are on a uniform level throughout the London area, except on routes where double-deck vehicles cannot be operated, and, consequently, a slightly higher fare scale is in force. The general principle governing the scales, which are regulated by the licensing authorities, was their equitability, but in practice there had to be considerable co-ordination of fares with the various underground electric-railway fare scales.

It has already been noted that the rapid growth of country bus services, centred on provincial towns, and of long-distance

motor coaches, not to mention the growing haulage of freight by road, not only by haulage contractors but also by trading concerns who owned fleets of lorries to handle their products as well as their raw materials, had stung the railways into energetic action in 1927, when they demanded road powers. These powers had been obtained after a long-drawn-out struggle, involving a lengthy public hearing in 1928, but by then the scale of road, passenger, and freight services had grown to huge dimensions. In every area of the country there had been built up an intricate network of passenger services, some local and some express, but roughly grouped into about 40 or 50 large and rapidly growing companies, loosely knit together in many cases by a centralized financial control, but operated as separate concerns with their own local managements. The names of many of these concerns had become as familiar to local residents as the names of the four railways themselves and in a few cases their origins went back to a few buses put into service during the pre-war or early war years. Most of them were of post-war origin, however, and had rapidly assembled huge fleets of vehicles, notably such companies as the "Ribble" in Lancashire, the "United" at Norwich and Newcastle, the "Eastern Counties" in East Anglia, the "Maidstone and District" in Kent, the "Southdown" centred on Brighton, the "Hants and Dorset" in the Southampton district, the "Devon General" at Torquay, and the "National", which spread from Penzance to Bedford, having in pre-war days a foothold in London itself. In Scotland there were the very efficient "Scottish Motor Traction" and "Alexander", to mention but two of the largest companies. The controlling force in many of these undertakings was Tillings and the British Automobile Traction Company, allied in turn with the British Electrical Federation, which dated back to the great tramway construction period.

It is not possible to trace in detail the history and rapid

development of these many concerns, though it would prove an inspiring story, and no doubt need be expressed as to the great benefits which such new services have conferred on villages which, far removed from any railway station, had had till then to rely on the slow and expensive carrier's cart and had been virtually cut off from the outside world. In a very interesting paper read before the Public Works, Roads and Transport Congress (1931) entitled "The Effects of Motor Transport on Village Economy" Mr. F. G. Richens gives many instances of the way in which outlying villages have benefited from the use of road vehicles, two prominent advantages being school buses for children, which has made it now possible for one secondary school to serve several villages, and the rapid distribution of newspapers, which had in the old days either to be posted or delivered by carrier's cart, in some cases not arriving until the day after publication. Local wants had to be provided for locally, and though one may regret the passing of such rural industries as the making of baskets and mats, "Dolly Varden" hats and chairs, "efficiency of motor delivery has brought to the average villager a far wider range of commodities and goods" at reduced prices. There is naturally an obverse to this medallion of social service and welfare, but on balance the country districts owe a great debt of gratitude to these local bus concerns which connect town activities to village life; they constitute, in short, an important step in the nation's progress.

A few examples may be quoted of the growth of this transport facility. Take, for instance, the Eastern Counties, formed in September, 1919, which by 1927 was operating over 557 route-miles, and carried in 1926 nearly 5,000,000 passengers in 78 buses, many of which were double-decked. United Automobile Services of York, covering 2,000 route-miles in 1929, had commenced operation in 1912, and its services stretched from Lowestoft to Bishop Auckland; its operations were managed divisionally. The Thames Valley Traction

Company, whose services dated from 1915, in 1927 carried over 9,000,000 passengers, and operated over 348 route-miles with its 141 vehicles; it had also developed an important express-parcels service. The Scottish Motor Traction commenced work in 1905 and by 1929 had spread its services throughout Scotland from the Border to north of Dundee. Its garage at Edinburgh could house 300 vehicles, and the total fleet consisted of 450 buses and coaches. Another concern, south of London, was the East Kent Road Car Company, incorporated in August, 1916, whose services ten years later covered 618 route-miles with 51 scheduled routes, over which there were in service some 300 motor-buses. Whilst much of the traffic handled was created by these companies, on the longer distances their express coaches, and those owned by independent concerns, undoubtedly attracted much traffic which had previously been handled by rail. An analysis in one area not 125 miles from London may be regarded as typical, and a few figures resulting from this study demonstrate the popularity of road travel to and from London. Competition in this case had not grown serious until 1927, and in winter during the succeeding years the traffic by road was light, but in summer heavy though unbalanced. With running expenses, the average cost per coach-mile worked out at rather over eightpence, to which nearly fourpence had to be added for overheads, such as advertising, payment of commission to agents and so forth. Though receipts per coach-mile were only fourpence in winter, in summer over two shillings was frequently earned, the through services to London producing £2,000 per week and on one day using 80 vehicles, many of which had to be hired. Apparently coach travel appealed most to the fair sex, who provided nearly all the passengers, about 90 per cent. of whom originated at the London end of the journey; few travelled for intermediate stages only. Though the coaches took twice as long as the competing express trains, the latter suffered losses

varying from 20 per cent. to 40 per cent. of their traffic during a two-year period, the greatest loss being occasioned at the London suburban stations, where rail travel involved a journey into the London terminus to start with. The long-distance coaches between that one area and London are estimated to have caused a loss to the railway of about £23,000 when 1927 is compared with 1929.

It is little wonder that the railways, empowered to operate road vehicles themselves in 1928, should not have hesitated long before obtaining a financial interest in such competing concerns, one of the first moves in this direction being the announcement in January, 1929, that the Great Western Railway had come to an agreement with the National Omnibus and Transport Company by which a new company was to be formed. Known as the Western National, this company had an authorized capital of £1,000,000, and the Great Western and the National were to have equal representation on the board, the Great Western turning over to the new company the operation of its omnibus services, including the Helston and Lizard service dating from August, 1903. Agreements followed thick and fast that year, but their virtual completion throughout the country could not be recorded for a further three years.

The railways were not the only transport concerns to suffer heavy losses of traffic through the rise of the motor-omnibus, and many tramway concerns were forced to replace their trams by the more mobile motor-bus, or to utilize motor-buses for their extensions into the surrounding country. A typical case was at Torquay, where the tramways company had inaugurated surface-contact services in 1907 and 1908, converting to the overhead-trolley system in 1911. Later the Company obtained a controlling interest in the Devon General, an omnibus company which had built up a fleet of 130 vehicles by 1927. For self-protection the Leeds City Tramways had assembled a fleet of 35 vehicles by 1927, while

as early as 1911 it had commenced the operation of trackless trolleys, which, while retaining electricity as the source of power, had proved more mobile, since they were independent of fixed rails, than the tramway car. Bradford also had trackless cars in 1911. The Potteries Electric Traction Company of 1898, in addition to its 115 single-deck trams was also operating about 100 motor-buses by 1928, and, as the rails required renewal on the tramways, the general policy tended towards a gradual replacement of trams by buses. The Mansfield and District Light Railway Company of 1901 had started an electric tram service in 1905, and the next year became the Mansfield and District Tramways; even before the war it had started omnibus operation in addition to the trams, and by 1928 it had 28 trams and 24 omnibuses at work.

Indeed, many of the small tramway systems of provincial towns had entirely abolished electric tram operation, especially where the streets were narrow, and had replaced the vehicles, when the tramway tracks required renewal on the various routes, by omnibus or trackless trolley vehicles. An example was Ipswich, where the corporation tramways started the conversion to single-deck trackless trolleys in 1925 and 1926; while at Darlington, where the tramway system had been opened in 1904, the conversion to trackless trolleys had begun in 1926 and was completed shortly afterwards; the tram-cars had wholly disappeared by 1929, and the new service increased passenger travel by over 1,000,000 during the first year. Motor-buses were operated in Edinburgh in 1919, and the cable system there began to be converted to electric traction early in the 1920's, the first portion being opened in 1922. These corporation tramways owned about 370 tram-cars, including eight salt cars, as well as 108 motor-buses and 21 motor-coaches. Wolverhampton was another city to pin its faith mainly on the trackless vehicle in place of the trams, and can claim the honour

of putting into service the first six-wheel covered-top trackless trolley vehicle, in 1926; as early as 1904 this Corporation had experimented with motor buses, the year in which Todmorden had also made extensive trials with motor buses.

The growth of motor-bus ownership during this decade may be seen from the fact that in 1920-1921 there were only 48 municipalities running 649 buses, which carried 74,000,000 passengers, whereas in 1929-1930 the number of municipalities had increased to 100, the number of buses to 4,737 and the passengers carried to 823,000,000. Nevertheless, the tramways and light railways open in Great Britain at the end of 1926 still had the large mileage of 2,554, representing a gross total of paid-up capital of over £100,000,000, and a net total of paid-up capital of nearly £58,000,000 The net receipts for the year exceeded £4,750,000, and the enormous total of more than 4,460,000,000 passengers had been carried. It will thus be seen that tramways were far from dead or even obsolete, and in London, as will be recalled, they achieved a record traffic figure in 1929. However, the increasing size of the motor-bus with its covered top—a type with 54 seats was used in Oldham as early as 1926, while Leeds had a six-wheeled bus seating 70 persons in 1929—was proving a serious competitor in carrying-capacity even to the largest bogie electric trams, in some of which no less than 78 per cent. of the load was carried on the driving wheels, thus ensuring rapid acceleration. In fact, the number of tram-cars in services operated by 86 local authorities had actually increased from 10,594 in 1920 to over 12,000 in 1928, and the mileage run had risen over the same period from 255,000,000 to 328,000,000. Nevertheless, the growth of the road motor vehicle, ranging from the motor cycle to the largest buses and motor lorries, was the outstanding feature of this decade, but the cost to the nation was heavy, since, according to statistics published by the Society of Motor Manufacturers and Traders, the

expenditure on roads, out of rates and out of loans, rose from over £43,000,000 in 1920-1921 to more than £65,750,000 in 1929-1930, though both totals included some expenditure incurred to relieve unemployment. Part of the heavy outlay was undoubtedly incurred to make good the arrears of maintenance which the war period had left as a legacy, but the rapid growth of road motor vehicles has called for better standards of road maintenance and repair, coupled with the construction of new by-pass roads and the easing of curves, corners and gradients. This remarkable growth, the evidence of a new era in transportation, may be seen from the following figures: —

	1922	1932
Licences current at the end of November (approximate) :—	No.	No.
Cars taxed on horse-power	293,740	1,014,026
Cycles	352,340	434,399
Goods vehicles *	158,856	360,195
Motor hackneys	72,263	72,390
All motor vehicles—		
Excluding tram-cars and trade licences	909,984	1,926,600
Including " " " "	933,308	1,957,251

* Not strictly comparable.

CHAPTER XII

1930—1933

THE CORRELATION OF TRANSPORT FACILITIES

THE remaining four years which terminate this chronicle of transport events have proved themselves of transcending importance. Throughout the hundred years of railway development no period even nearly approaches, nor bears comparison with, them in the wealth of difficulties to be surmounted and the vast changes which were occurring, destined to alter the whole relationship between railways and road transport. Internally, progress on the railways was continuing steadily, in spite of the plight of British industry, with its vast numbers of unemployed, during the period of uncertainty which ended in the departure of the country from the Gold Standard in 1931, to be succeeded in its turn by a still longer and more crucial epoch of uncertainty, both in regard to internal and international trade. Trade had shown some signs of improvement in 1929, and railway progress was beginning to gather momentum after its set-back resulting from the industrial strife of 1926. March, 1929, had witnessed further extensions of the Southern Railway's electrified system to Sutton and Epsom via Mitcham Junction, and two months later, to cater for the ever-extending Continental traffic, the Southern Railway put into service its "Golden Arrow", an all-Pullman train, to Dover, and the "Canterbury", a special de luxe boat. For the summer services the same progressive railway reinstated after many years a two-hour timing to Bournemouth, with its "Bournemouth Limited", and the Great Western curtailed to 70

minutes the time of its famous "Cheltenham Flyer" over the run of 77¼ miles from Swindon to London. In 1928 had come the inauguration of the Southern's colour-light signal installation at London Bridge, by which no less than eight signal-boxes had been eliminated, a triumph of engineering skill by the Westinghouse Company and a feather in the Southern's cap.

Electrification of the Southern's suburban network was extended to the new line between Wimbledon and Sutton in January, 1930, and to Gravesend in the east and Windsor in the west, as well as on the Croydon-Wimbledon link in July. Before the end of the year, Pullmans, after a lapse of many years, were re-introduced on the Southampton boat-train services, while in July, 1931, an all-Pullman train, the "Bournemouth Belle" was introduced on the Waterloo-Bournemouth main line.

The two northern companies had each placed very luxurious rolling-stock on their competitive Anglo-Scottish expresses in 1930, and the previous December had witnessed the birth of what may be legitimately described as the most revolutionary steam locomotive design yet put into service in Great Britain, namely, the London and North Eastern's No. 10,000, a 4-6-4 four-cylinder compound, with 450 pounds pressure, designed by Mr. H. N. Gresley and fitted with a water-tube boiler in the design of which Mr. H. E. Yarrow had co-operated. It proved a fitting contribution to the celebration of the centenary of the Rainhill trials of 1829, in which Stephenson's "Rocket" had covered itself with glory. The opening of the Liverpool and Manchester Railway was also celebrated suitably at Liverpool on the date of the railway's hundredth birthday.

Three important events of this period were the publication of three Government Reports. Firstly, and most significant, there was the Weir Committee's Report on Main Line Electrification, published in April, 1931, in which the

enormous capital that would be required for conversion from steam traction was revealed to the public for the first time, namely, £261,000,000, upon which the estimated return was to be only 6.7 per cent. even upon calculations based on the comparatively prosperous year of 1929. Secondly, there was the Channel Tunnel Report, published in March, 1930, in which a strong and brilliant committee expressed a favourable opinion on the construction of this project by private enterprise, with one dissentient voice. Since 1931, however, Continental traffic has been reduced to a very low ebb, thanks to restrictions on imports imposed on both sides of the Channel, while in place of the tunnel there is likely to be inaugurated shortly a train-ferry service from Dover across the Channel. Thirdly, there was issued in December, 1930, the report of the Committee set up in 1927 to consider the benefits to be derived from automatic train control, by which the engine-crew are warned of the indication of the signals and, with certain apparatus, the brakes are automatically applied. The Great Western Railway is the only line in this country to have developed this system of signalling extensively, and in general the report favoured the Great Western apparatus as being suited for the British standard.

To relieve unemployment the Government had passed in 1929 a Development (Loan Guarantees and Grants) Act, by which the railways were enabled to obtain financial assistance in order that they might embark on capital works which would not otherwise be undertaken at a period of falling traffic, when it would be difficult for the railways to raise new capital themselves. Under this scheme, taken advantage of by all the railways to improve their systems, the Great Western, besides certain schemes for widening its lines in the neighbourhood of Bristol, Cardiff, Birmingham, Taunton and Swindon, determined to extend over all its main lines the system of automatic train control, a programme which

was to cover no less than 1,758 track-miles, and 2,000 locomotives, while deviations were to be constructed in the West of England main line at Frome and Westbury. Virtually all these schemes were completed by the close of 1933, together with the reconstruction of Paddington and Cardiff stations, and that at Bristol will be finished during 1934. The fruition of this large programme, coupled with the latest plan of utilizing Government financial assistance to construct over 5,000 twenty-ton coal wagons for the South Wales coal trade, and provision at all the Company's docks in South Wales of equipment to handle such wagons, will leave the Great Western one of the finest railway properties in the world. With its excellent, comparatively modern, and highly standardized locomotive stud, and its complete absence of deferred maintenance, it should emerge from the existing depression in an unrivalled position to take advantage of the revival of trade so long prayed for and so earnestly required to bring back prosperity once more to the railways and other of the country's industries. As a foretaste of what may come, the Great Western further reduced the timing of its "Cheltenham Flyer" to 67 minutes from Swindon in September, 1931, and on two occasions the run of 77¼ miles was accomplished in 58 minutes, or a speed of over 79 miles per hour; at about the same time the famous "City of Truro", the speed hero of 1904, was sent to York for preservation in the Railway Museum.

The London Midland and Scottish Railway, badly hit by trade depression, had been developing internally a system of detailed cost analysis, which has stood it in good stead in the recent years of chaos, and public attention was directed to its activities by the trials of a "Ro-Railer", equipped to travel on road or rail, at the beginning of 1931. Jointly with the London and North Eastern Railway, it had converted to electric traction in May the popular Manchester suburban route, known as the South Junction and Altrincham line,

and at the end of the year an important event occurred in regard to electric traction with the trials of a Drumm battery two-car train on the Dublin and Bray section of the Great Southern Railways of Ireland; earlier experiments with a single car had taken place the previous year.

That electric motors were not the only type of traction to record progress during these years may be seen from the trials made with a diesel electric rail-car at the close of 1931 on the London and North Eastern, and the development of several new locomotive types, notably the three-cylinder 2-6-0 "Moguls" of Mr. R. E. L. Maunsell's design on the Southern, and Mr. H. N. Gresley's three-cylinder 2-6-2 design of tank engines for suburban services on the London and North Eastern. Under the head of motive power, the chief work on the four companies consisted of improvements to existing types—reboilering, the elimination, especially on the London Midland and Scottish, of non-standard types, the programme of water-softening by which a greater mileage could be obtained from locomotive boilers between heavy overhauls at the shops, and the provision of automatic coaling and ash-handling plants at the locomotive sheds. It is only by such methods that the enormous economies effected have been made possible; on the London and North Eastern, to take a typical example, the mileage between general overhauls for passenger engines rose from 55,619 miles in 1923 to 98,219 miles in 1930. It is no exaggeration to say that complete reconstruction of the various railway workshops has taken place since 1923, largely due to the lead set by Mr. E. J. H. Lemon, now vice-president of the London Midland and Scottish, with a belt system of construction, and a mass-production method adapted to locomotive, carriage and wagon construction and repairs.

The vast schemes of resignalling have brought in their train enormous economies, coupled with a greater track-capacity

and more efficient operation. To the Metropolitan is due the credit for a considerable degree of the progress attained, notably in regard to the automatic signalling on the Uxbridge line and the installation, in 1932, of the first centralized traffic control system in Great Britain at Stanmore.

It may be claimed that the summer train services of 1931 for the first time excelled the best service of the summer of 1914. An interesting survey, which is published in the "Railway Magazine" each year, analysing the fastest train times between London and sixty-five provincial centres, showed that the sample of towns served by the Great Western Railway were over 2 per cent. better than in 1914, those on the Southern Railway 1.3 per cent. better, and those on the London Midland and Scottish and the London and North Eastern Railways fractionally worse, which was accounted for almost wholly by the elimination of fast trains on routes which had become secondary owing to the amalgamation, as, for instance, certain services from St. Pancras, and the slowing down of certain East Anglian services during the work of widening the main line near Romford, not yet completed. By the acceleration of the long-distance Anglo-Scottish trains in 1932, these times have been materially improved, and the speeding-up of Norwich trains has much bettered the East Anglian situation. In any comparison of present day and pre-war railway speeds the point is too frequently lost sight of that motor competition has forced the railways to insert more stops at provincial centres; thus the two-hour trains of the London and North Western Railway were originally run non-stop between Euston and Birmingham, at an average speed of 56.5 miles per hour. Gradually a Coventry stop was inserted for most trains, and by 1932 no non-stop trains were left on this route; many of the trains make two stops on the run, thus calling for a much finer locomotive effort, but also calling forth criticism on the ground that the trains

have not been accelerated during the last twenty years: incidentally, the service to the public is greatly improved. During the summer of 1931 there were 184 trains scheduled to run non-stop over 90 miles or more, as compared with 175 in 1914, and in the later year ten runs of over 200 miles.

Some indication of the improvement in facilities may be gathered from the fact that, in 1931, there were over 700 restaurant or Pullman buffet car runs operating daily, while there were 74 first-class and 66 third-class sleeping car runs, compared with 68 first-class only in 1914, and 429 restaurant cars in 1913; the number of slip-coaches had been reduced to 44 in 1931 from 170 in pre-war days; all these figures include the Irish Railways. The year 1932 witnessed many important accelerations, not only of main line trains but on cross-country journeys as well, and the winter services, 1932-1933, were further improved. On the London Midland and Scottish Railway alone the daily mileage covered by scheduled runs at over 55 miles per hour rose to 7,899 as compared with 5,081 during the summer services of 1932, two runs being made at over 62 miles per hour. Thus, in a few brief years, the previously accepted standard of 50 miles per hour for express trains had virtually been raised to 55 miles per hour. For the whole four railways the total daily mileage at 55 miles per hour or over increased from just over 14,000 miles in the summer of 1932 to nearly 19,000 miles in the winter months of that year, with the "Cheltenham Flyer" leading the speed-fleet at 71 miles per hour. Still further improvements have been effected during 1933, but probably the outstanding event was the inauguration of the electrified service to Brighton on January 1st, six months after electrification had been carried to Three Bridges. Though the speeds to Brighton have not been increased, the number of trains has been greatly augmented, and the added power derived from the use of multiple-unit electric trains confers a degree of ability to

make up lost time, which is of great importance over such a short distance. Elsewhere an event calling for note was the reduction in time of the "Cornish Riviera Limited" run to Plymouth to under four hours for the first time in railway history.

In another sphere, the appointment of Sir Harold Hartley F.R.S., as vice-president of the London Midland and Scottish Railway in February, 1930, brought to the fore the need for technical research into every phase of railway endeavour, and, though research is a slow-growing plant, its fruits are well matured when they ripen and the harvest is already being gathered.

Of transcendent importance throughout this period was the relationship of rail to road transport; competition had become of the keenest, and the railways, having nearly one hundred years of Government legislation to contend with, were finding it increasingly difficult, at a time of vanishing trade, to retain their accustomed traffic when assailed by the more elastic road motor vehicle, virtually free, until the passage of the Road Traffic Act of 1930, from any important restriction on its activities. By that year the railways' investments in road passenger concerns had grown to several million pounds, and the passage of that Act practically stabilized within a year the public passenger road services of the country. The problem of co-ordination, therefore, became comparatively easy on the passenger side, and by the end of 1932 the financial interest of the railways in road passenger services, excluding the Metropolitan area, had reached the high figure of almost £9,200,000, though a small part of this represented investment in companies carrying freight by road. It was the passing of the Road Traffic Act of 1930 providing for the establishment of thirteen areas, presided over by Commissioners responsible for the licensing and control of road passenger services which made possible the degree of stabilization necessary to achieve co-ordination

between the road passenger operating companies and the railways. It would not be true to claim that competition has been entirely eliminated even between the so-called allied companies and the railways, and possibly such complete correlation may not be desirable, but the more wasteful competition has been eliminated. Thanks to this, it has been found possible to close to passenger traffic over 700 miles of branch lines, on which the traffic was too light to warrant the continuation of passenger train facilities; allied companies' bus services now offer equal and in some cases better public service.

Unfortunately competition is still rife for the carriage of freight, and wordy warfare on the subject has occupied many columns of the Press during the past three years. The whole question is one of extraordinary complexity and has afflicted in like manner practically all large nations; in few cases can it be claimed that any final solution has yet been more than approached. So far as the railways are concerned, it is generally agreed that over half a century of rigid legislation, at a time when they held powers of virtual monopoly, has left them very little liberty as regards the quoting of rates and the classification of freight, which applies to all railways throughout the world and to most of the inland water carriers, as well as the problem of undue preference, which in practice prevents the lowering of any rate without a similar reduction to competitive traders.

The road vehicle is free from such bondage; its operator or owner can quote any rate he wishes, remunerative or unremunerative, and not being a common carrier like a railway he can refuse to accept merchandize for carriage; in short, his charges are elastic and he can pick and choose whatever he wishes to handle. His track is the public highway and there is no obligation upon him to continue his service for a day longer than he wishes. Thus, free of restraint, the road haulier is able to offer much lower rates than a competing

railway for high-grade goods which load well and can be easily handled; on the other hand he could not handle much of the traffic that a railway hauls cheaply and efficiently, such as export coal, minerals, meat in bulk from the docks, and so forth.

There is universal agreement that rail transport is an essential, at least in Great Britain, for trade and travelling purposes, and the crux of the problem lies in the difficulty of preserving a really efficient railway system if much of the more remunerative traffic is carried by alternative means. The situation is made even more complex by the problem of taxation. The nation has developed the road system of the country at great expense over two centuries at least; its capital value has been estimated at over £2,000,000,000. The road haulier, like the passenger bus, the private car, the bicyclist, the farmer, the pedestrian and his dog, all use the road system, while public utilities supplying gas, electricity and water, frequently use it as their right of way. Who shall assess the respective shares in interest on capital, sunk over centuries, and the maintenance charges of this publicly owned system? The road haulier claims that his motor vehicle pays its fair share for wear and tear of the road surface and its formation, but this again introduces a further complication; the taxation which he reckons as his quota includes, in addition to a licence duty, a petrol duty, which may be regarded either in the light of a toll for the use of the roads, or as an import duty levied on imported fuel which competes with home-produced fuel. Those who take the latter view point out that the aircraft which ply between, say, Birmingham and Torquay, and the housewife who uses petrol for cleaning clothes, equally pay this duty, as also does the railway which uses a petrol-engine to pump water into its troughs: hence this duty cannot be regarded as a tax levied for road maintenance. Others again maintain that it is a sumptuary tax.

It is not proposed to enter into this controversy here; the road-motor freight vehicle, whether it pays its fair share of the maintenance costs of the road system or not, undoubtedly fulfills a very useful function in the economic organization of the nation's trade, and undue restrictions upon its activities are neither socially desirable nor are they to be welcomed, from the strictly transport point of view. On the other hand, its ability by rapid transfer of activities to create chaotic conditions in the delicately balanced organization of markets, especially for food products, and the lack of regulation of conditions of service, create a position comparable with Gresham's law of money, in that an industry where the control of wages and conditions of service is remarkable by its absence will gradually drive out a competitor who offers reasonable wages and good labour conditions.

The Government attempted in 1932 to bring about an agreed policy between the two protagonists by the appointment of a conference presided over by Sir Arthur Salter, whose other members consisted of representatives of the railways and of the road freight operators. The Report of this conference was unanimous, but the road-carrying industry was practically unorganized and the report has been strongly assailed by many road operators since its publication. Some of its recommendations, tending towards a higher scale of taxation on heavy freight vehicles on the road, were followed up in part in the Finance Act of 1933, and the Government early in that year introduced a Road and Rail Traffic Bill, which has recently reached the Statute Book, and is likely to stabilize, by means of a licensing system, the road haulier's activity though it leaves the trader who desires to operate his own lorries virtually free of restraint.

On the other hand, the new Act definitely gives the railways more elastic powers to quote rates which may be the subject of agreement with individual traders, and 1934 is likely to see important developments in regard to the division

of freight traffic between the railways, which are ideally equipped to deal with bulk traffic over long distances, and the road hauliers, who are equally well fitted to handle small consignments over short distances.

It is claimed that railway freight rates are unduly high and out of line with present costs, but in practice the average receipt per ton-mile during 1932 was only 1.39 pence, and has been dropping steadily for at least six years. In order to reduce the burden of rail transport charges on certain heavily pressed industries the Government brought into force in 1928 a system of de-rating, by which 75 per cent. of the local rates paid by the railways was to be turned into a fund which was to be earmarked for the purpose of paying rebates on certain traffics, notably agricultural products, coal and coke for export or for iron and steel works, raw material for such works and mining timber. This scheme, which applies to canal transport also, is still in force, so that in practice the trader in certain favoured industries obtains a rebate on his rail freight charges, and consequently the average receipt per ton-mile in certain industries is not the exact measure of the burden of transport charges actually paid by the trader. With trade still failing to show any noticeable improvement, the immediate hopes of railway prosperity must lie, as they have done during the past five years, in the retention of economies already achieved and the continued search for elimination of existing waste, both internal as affecting the individual company and external, where the co-operation of other railway companies and perhaps of the Government is required.

A new avenue leading towards the abolition of wasteful competition has been opened with the approval by the Minister of Transport of the application of the London Midland and Scottish and London and North Eastern Railways, for permission to pool their receipts on all competitive traffic. Early in 1933 sanction was given to a similar agreement

between the London Midland and Scottish and Great Western, embracing the London and North Eastern where the latter was concerned in regard to competitive through services. It is too soon as yet to assess the financial value of these agreements as measured by potential economies; probably, like the fruits of amalgamation, they will ripen but slowly but will prove of notable benefit to shareholders and traders during the coming decade. The reduction in the number of circuitous routes, as also of competitive advertising, already practically a ghost of the past, together with the replacement of a competitive by a co-operative outlook augurs well for the future. On the other hand, it is to be hoped that future generations will not have cause to mourn the loss of the progressive spirit engendered by that inter-railway competition, which was so carefully fostered by the legislature throughout the first 70 years of railway history.

The admonitions recently addressed by Ministers of Transport to rail and road competitors consort ill with the fulminations against proposed railway amalgamations which Victorian England read at its luncheon table several decades ago; because in those days even the spur of competition had failed, owing to insufficient technical progress, to ensure that "The Times" should arrive in time for breakfast.

The Metropolis embarked in 1933 upon an experiment of complete co-ordination and absolute monopoly, which, if satisfactory, may provide a model for much wider spheres. The Underground group of companies together with the London County Council had put forward a scheme of co-ordination, discussed by Parliament during 1929, which, though admirably designed and carefully conceived, met with defeat owing to the preference of Parliament for political as opposed to economic considerations. The Labour Government, in its turn had perforce to replace the rejected scheme by an alternative more suited to its policy; but, when

a rival political party came into power, the Morrison Bill, so called from the Labour Government's energetic Minister of Transport, suffered eclipse, to emerge, however, in much altered form as the London Passenger Transport Bill, which, after considerable discussion and further amendment, finally passed through both Houses of Parliament during the spring of 1933.

This Act of April 13th, 1933, provided for the setting up, as from July 1st, 1933, of a complete monopoly of all passenger transport in the London area, with the exception of the main line railways, with which a system of pooling was to be arranged to cover all movements within the area served by the London Passenger Transport Board. This Board, which began to function on July 1st, 1933, consisted of a chairman and six other members appointed by a body known as " the appointing trustees ", namely, the Chairman of the London County Council, a representative of the Advisory Committee, the Chairman of the Committee of the London Clearing Banks, the President of the Law Society and the President of the Institute of Chartered Accountants in England and Wales. Equally the new Act reconstituted the London Traffic Advisory Committee, set up under the London Traffic Act of 1924.

It is gratifying to find Lord Ashfield, who has for so many years guided the policy of co-ordination of London traffic facilities, as Chairman of the new Board appointed by representative public men; thus the policy of previous years will be continued until the edifice, never quite complete, is built so firmly that it will withstand any shocks which future years may have in store. Into the new organization have been absorbed the various companies and administrations whose titles have for so long been household words, not only to the Londoner but to visitors from all countries, namely, the Metropolitan Railway, the various tube lines, the District Railway, the London County Council tramways, as well as

the London United and the North and South Metropolitan tramway systems. Into it also has come the London General Omnibus Company, which has become an integral part of London life, together with the many allied groups of buses, such as British, Tilling (London services) and the Overground, not to mention the many independents with their myriad names, from "Standard" to "Express", "Empress", "Premier", and even "Pickup", whilst the latest newcomer to London is the "Green Line", a younger sister of the L.G.O.C. and the "General" country services. It is not without a tinge of regret that Londoners will see these names slowly disappear, especially that of the Metropolitan Railway, and it is perhaps incongruous that the London Passenger Transport Board should find amongst its possessions the most important railway link for freight-traffic between the great railway systems north and south of the Thames.

The vast scale of the undertaking may be seen from the following figures, which apply to the period of its birth, and the reader will be under no delusion as to the great problem of organization to be faced in welding this mass of transport equipment and its directing forces into one coherent whole. The fleet owned by the Board consisted of 11,430 vehicles, of which 5,350 were omnibuses; 3,000 were railway-cars; 2,600 tram-cars; 420 coaches, and 60 trolley-buses, while the total staff numbered almost 72,000 and there were 226 stations on the system. The total passenger movement in 1932 on the facilities now operated by the Board reached the immense total of 3,463,000,000.

The Underground system and the L.G.O.C. continued to register expansion and improvement until its transfer to the new and all-embracing monopoly. Taking advantage of the Development (Loan Guarantees and Grants) Act of 1929, like the main-line railways, it embarked on a widespread programme of development northwards and westwards for its Piccadilly tube railway. Hitherto this line

had terminated at Hammersmith and Finsbury Park, but in 1930 the construction of a northern extension to Cockfosters, seven and a half miles, which cost about £5,000,000, was begun; the ultimate section of this northerly extension was not open for traffic until a few weeks after the formation of the London Passenger Transport Board, although the line had been opened to Enfield West in March, 1933. The westerly extension consisted of widened lines paralleling the District Railway from Hammersmith to Acton and Northfields, thus permitting a fast and a stopping service; the completion of this added facility in Western London dates from January, 1933.

During 1932 the latest type of L.G.O.C. bus appeared on the streets of London, known as the "STL" and mounted on a four-wheel chassis; it is, of course, of covered-top design and is fitted with pneumatic tyres. This type of bus seats 60, and the numbers in service are steadily increasing; in fact, already towards the end of 1933 they exceed 200; favourable comment should also be made on the new design of destination-indicator, which is embodied in the type. Progress in bus design, however, seems never-ending, a remark equally true of most rolling-stock, and already the designers of London's buses are experimenting with a "Q" type of double-deck vehicle with many radical changes from accepted bus design; thus the engine is placed on the off-side of the vehicle and the entrance is in the centre, thus permitting, if desired, the fitting of a life-saver in advance of the front axle, as has proved so efficacious with tram-cars.

The London County Council trams have been much improved also in recent years, and fitted with better seating accommodation on both decks; their relative freedom from advertisements outside gives them an aesthetic advantage over the buses, and possibly, owing to the semi-public nature of the new administration, the policy of eliminating such advertisements may find favour with the Board, though the

revenue from them is not to be lightly disregarded. London will then be relieved of a disfigurement which is the source of adverse comment by strangers from abroad and a source of surprise to visitors from provincial towns, whose municipalities have refused to permit advertising matter to appear on the exteriors of their public service vehicles, a policy also adopted by the London General Omnibus Company in regard to their Green Line subsidiary, perhaps with an eye to the powerful influences now at work to preserve the amenities of rural England.

London transport in 1933 has entered upon a new and far-reaching experiment in regard to transport facilities, the provision of which for a population of nearly 10,000,000 is a matter of very vital importance. In steering a course across a virtually uncharted sea, much depends for success upon the guiding hand on the tiller, and, to judge from past experience, London has little to be afraid of so long as the continuity of policy which has steadily built up the co-ordination of its transport facilities over a quarter of a century continues.

CHAPTER XIII

1830—1933

THE ENGLISH SCENE—A RETROSPECT

It is a century and ten years since John Loudon McAdam published in 1823 his "Remarks on the Present System of Road Making", in which he pointed out that the defective state of the roads round London was primarily due to the division of those roads into so many small Trusts, "which precludes the possibility of any extended plan of operations, for the benefit of the whole". An edition of "Paterson's Roads", published the preceding year, besides giving a clear picture of the network of mail-coach routes of that period, records that there were no less than three turnpikes to be met with on the Portsmouth road between London Bridge and Kingston, a distance of but 12 miles. Yet much progress had been made, for a letter in the 1792 Supplement of the "Gentleman's Magazine" stresses "the great improvements which, within the memory of man, have been made in the turnpike roads throughout this kingdom, would be incredible did not we actually perceive them; and when it is considered that Windsor, not long since, was a day's journey for a stage-coach, which stopped to dine on the road, one instance is as good as a thousand. I was led to this reflexion, Mr. Urban, by observing the beautiful toll-gate lately erected at Hyde Park Corner; which struck me so forcibly". Even at the end of 1932 there were still 80 toll-roads in existence in England and Wales, 24 of them being on roads nowadays placed in the Class I category, but in the

1840's there had been over 22,000 miles of road controlled by over 1,000 Turnpike Trusts, and the bridges over the Thames were toll-structures until the 'seventies.

Nevertheless, if progress on the roads had been slow during the nineteenth century, the coming of the railways wrought a revolution in speed and facility of movement, though mechanical engineering had existed long before the railway era. Hero of Alexandria, even in the third century, had described an apparatus to regulate the flow of water, utilizing the principle of the "penny-in-the-slot" machine of to-day, while Denys Papin carried out many experiments in the condensation of steam and foresaw the use of the safety-valve at least 100 years before Trevithick designed the first locomotive. But the rate of travel had scarcely advanced over the centuries since it depended upon the horse, and Boadicea rode in her chariot as fast as Wellington could ride to Dover. Of the surprisingly good speeds attained by the coaches this book has had something to say, but it was the power of steam on land and water which ushered in the century of speed development, destined to be eclipsed 100 years later towards the close of this chronicle by the progress of the internal combustion engine.

At the opening of the story steam-packets were carrying travellers across the Channel to Havre, and it was in 1836 that Francis Pettit Smith and John Ericsson took out patents for screw propellers within a few weeks of one another, an event destined to revolutionize ocean travel. However, a voyage on a steam vessel in 1833 was regarded as an event, and the papers of July 10th, that year record the round voyage of the *Soho* between Blackwall and Edinburgh, a distance of 1,350 miles covered in 133 hours. Vessels which plied at that time are still afloat, and the Thames barge which lay moored near the *Soho* was not materially different from its successor of to-day which sails past the *Strathnaver* home from Australia, the *Aurania* from Montreal

or the *Pacific President* back from Seattle, in the lower reaches of the Thames. It is over 100 years since the *Royal William*, the first vessel to cross the Atlantic wholly under steam-power, though the *Savannah* had crossed with the aid of steam in 1819, left Quebec, and nearly a century since Samuel Cunard's first steamer, the paddle-wheel *Britannia*, of 1,150 gross tons sailed from Liverpool for Boston on July 4th, 1840, The little paddle-wheeler *Premier*, built six years later on the Clyde, still plies from Weymouth and gives pleasure to excursionists, but Weymouth itself is very different from the Weymouth of 1850 when the *Premier* first visited that port.

Progress in ocean and coastal transport has been as marked as that in the railways, an industry but newly born in 1830; it was not until 1839 that "Bradshaw" first appeared, a landmark which showed that the industry had reached adolescence. The instructions given to the traveller at that time differ as widely from those given to the intending passenger to-day, as did the carriages which carried them from the luxury coaches, some with bucket seats, of 1933. Nearly a century has slipped by since third-class passengers were advised to fasten their hats by a ribbon to prevent them from being blown off. Few contrasts are greater than the first "Planet" locomotive, built by Stephenson for the Liverpool and Manchester in 1830*, and "The Princess Royal" built by the London Midland and Scottish Railway, the lineal descendent of the Liverpool and Manchester, at Crewe in 1933, which is designed to haul 500 tons at 60 m.p.h. between London and Crewe, and can accomplish a non-stop run from London to the Scottish border at the same average speed. A similar feat is being accomplished daily on the East Coast route by the three-cylinder "Pacifics", the

* A second "Planet" locomotive was built by Stephenson & Co. for the Liverpool and Manchester Railway in 1831, but this latter was a four-coupled engine for goods traffic.

" Flying Scotsman " and her sisters. In the summer of 1933 no less than 23 British express trains were scheduled to run daily at start to stop speeds of 60 m.p.h. or over, headed by the Great Western's " Cheltenham Flyer " at over 71 m.p.h. hauled by a Great Western four-cylinder " Castle ", while the slightly larger " King George V " engines perform equally meritorious feats on the heavier trains to the West Country.

The pace of progress on the railways has been faster and faster these last few years. Letters to the press mention the " new spirit " of the railways, and those who inveighed most vehemently against railway service in the past now admit that, in general, they have little cause for complaint. It is true that there have been many new adventures which have stirred the public imagination—mystery trains, railway air-services and cruise-trains, summer tickets at a penny a mile,* week-end sea cruises, collection and delivery at the farms, milk tank wagons and containers to the number of 7,000 for every type of traffic from bricks to grain and coal to meat. Credit is given to road competition as being the spur to such inventive genius, yet one may pause to wonder whether it is not in reality that the railways have used louder trumpets than was their earlier custom. It is frequently stated that the railways now sell service, whereas they used only to run trains, but after all the real function of a railway is to operate trains, and comfortable ones at that, and to run them punctually. Perhaps the railway operating departments were unduly bashful in the past, but it is certain that advertising is of little avail if the product to be sold is of poor quality, and many are sufficiently old-fashioned to believe that a good product advertises itself. Mr. Ford used to rely for his advertising on placing a notice on the American state highways " Count the Fords till the next corner ", but

* Average receipt per passenger-mile for all classes in 1932 was slightly less than three farthings.

no railway has as yet had courage enough to invite the intending passenger to " Come to our stations and watch the trains come in on time as the minute hand moves " or " We carry every inhabitant once a fortnight punctually and in safety ".

Many of the new railway inventions of to-day are but the culmination of years of experiment, costly trials and, sometimes, errors. The container system was in use in 1830, and for decades has been used for the Anglo-Continental and the Anglo-Irish traffic; if it did not develop internally with greater rapidity it was in part due to the difficulty of persuading the trader to try it. To speak of the " new spirit " of the railways does scant justice to the railway managements of pre-war years, equally it flatters too much the force of road competition. Progress is evolutionary and much remains to be done; gas lighting of carriages will not entirely disappear for some years, many more corridor trains are needed, 60-ft. rails will replace those of 45-ft., there are railway hotels yet to be modernized and locomotives of the 'nineties must be replaced by those of modern standardized designs. The struggle is ceaseless, and the fight to reduce maintenance costs through technical progress, as for instance by welding, goes on month by month and year by year. The high standard set by British express trains of 1933 may be seen from the fact that one in every fifty Americans visited the " Royal Scot " on its recent trip to America. It will be recalled that the first locomotive in the United States was the " Stourbridge Lion " of 1829, exported from Britain.

Whatever the future years may have in store, it is still the steam age so far as high-speed express running is concerned, and electrification, of which so much was expected 30 years ago, has not yet ousted the steam locomotive from its pre-eminence. As long ago as 1893 a well-known daily paper spoke of possible electric railway travelling at 1,000

m.p.h., but possibly it was a misprint for 100 m.p.h., though no electric locomotive has yet achieved the latter in everyday service, and even in 1933 there were virtually no electric trains timed at over a mile a minute. For tunnel sections, heavily-graded lines and in dense suburban areas probably electric traction is supreme, but the capital cost of electrification has proved a severe obstacle to its progress; to overcome this disadvantage electric traction for railways may in future develop more along the lines of an individual power-unit, either of battery design as with the Drumm system in Ireland, which has now progressed to the stage of a 200 ton five-car train, or along the lines of oil electric traction, which is at present being widely developed for light rail units and employed with considerable success in place of suburban electrification in Argentina. In each case the system overcomes the high capital cost of fixed electric equipment throughout the whole track-mileage to be electrified.

Already the internal combustion engine can claim the highest speed record on road, water, air or rail, but whatever the twentieth century may prove to be in matters of power and rail traction, the nineteenth century was for the railways exclusively an age of steam, and the present generation has seen fit to honour the locomotive development of the last 50 years by preserving examples of some of the outstanding designs of those days in the Railway Museum at York, while "Locomotion No. 1" of the Stockton and Darlington is to be found at Darlington and the "Rocket" at South Kensington.

It is a little over 50 years since the first electric line in England was opened at Brighton, the creation of Mr. Magnus Volk, and it is fitting that its jubilee should have been celebrated by the extension of the Southern Railway's electrification scheme to within a few hundred yards of the Aquarium whence the first English electric train departed in 1883. In the intervening period electrification has made

great strides on the roads in the form of tramways as well as on the railways, but tramways are themselves a species of railway though actually occupying the public highway, and their inability to manœuvre has led to their unpopularity in many centres; frequently they have been replaced by their more mobile successor the trolley-bus, or the even more elastic competitor the motor-omnibus. The lower cost of operation per vehicle-mile has alone kept them inviolate in many cities, but recent figures published in regard to Manchester, where trams on certain routes have been replaced by buses, seem to show that the increasing popularity of the bus ensures a higher net receipt per vehicle-mile with the latter, and in that city the cost of operation on certain routes is definitely lower with the bus than with the tram, being 14.3 pence and 16.5 pence respectively, though the latter figure excluded any provisions for the renewal of permanent way and rolling stock. Thirty years ago there were less than 400 electric trams in Manchester, but by 1932, though the trams had increased to 867, there were over 320 motor-buses at work too, the latter covering the same route-mileage as the trams and carrying almost 76,000,000 passengers. It has been stated that in 1931 over 4,600 motor-buses were being operated by municipalities, not to mention 425 trolley-buses. The coming of the heavy-oil engine in place of the petrol engine for omnibuses may prove to have dealt a death-blow to the electric tram, which until recently could claim a greater carrying capacity, but too frequently such calculations are based on the standing capacity rather than the seating capacity. It is, indeed, a curious feature of present-day transport progress that, where large peak travel movements have to be dealt with, the tendency is to offer standing space rather than seats in the heaviest traffic hours. The same tendency is witnessed in the design of many modern light rail-cars, which on a width of barely nine feet, attempt to seat five persons and provide a centre gangway. Such a

policy, though possibly to be defended on the grounds of economy, is in reality an admission of defeat, and it is incongruous that in an age which prides itself on transport progress the allocation of a seat to the city or urban worker suffering from the strain of modern life, should be regarded as a physical impossibility. On country branch lines where the rail-cars are designed to compete with road services employing buses with bucket seats, the practice is even less defensible.

Nevertheless, the tramway systems of large cities have a fine record of social service to look back upon, notably in London, where the great 167 mile network of the London County Council at the time of its absorption into the London Passenger Transport monopoly was carrying 700,000,000 passengers a year, at fares amongst the lowest in the country and with the low average cost per car-mile of 11.73 pence; very few city bus services using vehicles seating over 60 passengers could approach this low figure of operating cost. London also owes a debt of many years standing to the London General Omnibus Company, which dated back to 1855; the red of the " Generals " is the predominant colour in the Metropolis and is to remain so under the aegis of the publicly appointed London Passenger Transport Board. There are some who still sigh for the colour-schemes provided in recent years by the independents, and in earlier years by the even more variegated colouring of the horse-buses. The light green of the " Atlas " still haunts, ghostlike, St. John's Wood, and the dark green " Favourites " London Bridge; pale blue buses could be seen at Kilburn and yellow and red buses at Liverpool Street, while Camden Town is still not quite the same to many without its pale yellow buses and others even now remember the dark blue ones at Waterloo.

Another name long-cherished by the Londoner and shortly destined to disappear from the buses is that of " Tilling ", for Thomas Tilling, who founded the business, was born at

Hendon, in 1825, five years before the opening of this chronicle. Twelve years after his death the horses owned by the "Tilling" concern totalled no less than 7,000, but in the previous year trials had been made with a Daimler motor bus, and by 1905 over 20 Tilling motor-buses were at work in London; by 1912 the large London fleet mainly consisted of petrol electric buses, a type of traction which is still represented in Tillings large London fleet of to-day. In 1913 Tillings came to an agreement with the London General Omnibus Company and about the same time started motor-bus operations in certain South Coast towns. As early as 1905 they had run a motor service for the mails between London and Brighton, and have long been responsible for a large part of the public passenger transport service in that Sussex town. Tillings are one of the few transport concerns which can claim a history of virtually 100 years; during the last decade they have played a key part in the policy of co-ordination which has been effected between the various passenger road transport concerns throughout the country and the great railway systems.

The year 1933 witnessed the closer co-operation of the railways with the great freight-carrying companies of Pickfords and Carter Paterson. Each has an honourable history of over 100 years; Pickfords had early been associated with the Liverpool and Manchester and its successors, and the close of this review marks the renewal of that early and close association. Both these cartage firms are world renowned, and the correlation of their services with those of the railways registers one further step towards the elimination of wasteful transport competition.

Truly the progress of transport facilities and travel in London is a mirror of events throughout the country, and the Londoner of 1833 would believe himself in wonderland if he were faced with the ascent of one of the 137 escalators which are a feature of London's travel underground, and by

which one may descend to an electric tube-railway extending underground for the majority of its 25 miles. Similarly the Philadelphian of 1833, setting out to catch one of the three "lines" as trains were called in those days, on the Camden and Amboy Rail Road, which left that city at 6 a.m., 10 a.m. and 3 p.m., would find himself more than puzzled at setting foot in the underground Broad Street Station of the great Pennsylvania Railroad of 1933, successor to the Camden and Amboy. Again the Parisian of 1830, accustomed to his new type of cabriolet to seat three, would soon be lost in the "Metro" of 1933. Still there are on the roads, as well as on water, certain survivals of a quieter, but who shall say better, age; the hansom of 1834 was not vastly different from the hansom that one can hire even now in London or New York. To-day the motor-taxis are about 50 per cent. more costly than were the cabs whose fares were analysed with such thoroughness by Captain Shrapnel (late of 3rd Dragoon Guards) in 1851; at that time the General Post Office seems to have been the centre from which many of the cab fares were worked out.

Though the General Post Office did not deign to deal with parcels until 1883, the progress in its services has been as rapid as in other means of communication, and one learns with some surprise that as late as 1887 it revived a parcels mail-coach between London and Brighton which attracted considerable attention. The system was extended to many other places, such as to Guildford, Oxford, Reading and to Cambridge via Bedford, during the succeeding years; it was the original route that Tillings later took over with their early motor mail-vehicles. In recent years, partly due to the close co-operation with the railways and the very progressive administration of the Post Office itself, the parcels-post traffic has increased enormously, and the inauguration of the "Cash on Delivery" system has assisted its growth. At Christmas 1931 parcels posted in London alone exceeded

4,000,000, an increase of nearly 100 per cent. in six years, while letters showed an increase of 50 per cent. The Post Office, like many great public services and utilities, including the railways, suffers much criticism and is accorded but little praise. Yet its financial surplus reached £11,000,000 for 1932-1933, a remarkable result when the postal services of most countries are run at a loss. In 1912 the Government took over the National Telephone Company's service, and the use of telephones per head of the population is increasing rapidly. In this respect Great Britain has passed many nations which previously stood ahead of her in the use of the telephone, notably Germany, and to-day the average person takes off a telephone receiver every five days. London has become one of the telephone switchboards of the world, as well as being a nerve centre for cables and wireless traffic, the receipts of Imperial and International Communications reaching nearly £5,500,000 in 1930. To handle the postal traffic within Central London the Post Office owns and operates its own tube railway, where the trains run without a crew of any kind and keep themselves evenly spaced, perhaps the best example of a robot railway in the world.

Future generations will regard the year 1933 as one of revolution or evolution, so far as inland transport is concerned. Old shibboleths have been allowed to fade away and, as ten years previously, institutions and transport concerns of long standing with honoured names have disappeared, whether to be sacrificed on the high altar of a temporarily popular idol, known as co-ordination, or of a real and vital principle leading to complete monopoly none yet can tell. An existing Bill proposes to abolish the Railway and Canal Commission and transfer its functions as regards the railways to the Railway Rates Tribunal, by which an economy of £7,000 per annum is to be made. The London Passenger Transport Board, with its complete monopoly of passenger transport facilities, is emblematic of the worship

paid to complete co-operation. The policy of competition and rivalry between the railways is regarded as hopelessly out of fashion, in fact it seems that *laissez faire* has had its day, at any rate for transport. Some may mourn its loss. Stern necessity for economy has made inter-railway pooling the ruling passion of the year. Even the century-old rivalry betwen road and rail has been partially quenched, especially on the passenger side, a move which may be duplicated to some extent in regard to merchandize traffic through the negotiations between the railways and the cartage firms of Pickfords and Carter Paterson.

Nevertheless, the private car, regarded by many as the hallmark of social position, will remain a powerful competitor with the railways. Over 1,000,000 were licensed for use at the end of 1932, and more than 400,000 motor cycles. Many trading firms own and use their own motor vehicles, and it is unlikely that road transport will suffer from much diversion back to the rails. Great as the social benefits derived from road transport have been, the increasing speed of traffic on the road and the danger caused to the pedestrian is an offsetting disadvantage that should not be forgotten. In 1932 the death roll on the roads reached the alarming total of 6,600, while no fewer than 200,000 persons were injured. The increase of heavy traffic at night on main roads and the effect on ancient buildings, in "The High" at Oxford, for instance, must also be recorded as an anti-social result, but such disadvantages should be temporary and amenable to legislative control.

The problem of competition between transport facilities is not one facing this country alone; railways abroad are in even more desperate straits, and a decision of the Interstate Commerce Commission of the United States made public at the end of July, 1933, stresses the point that the "preservation of an adequate railroad transportation machine is more important to the country than lowered freight rates". This

concise statement brings out quite clearly that regulatory bodies in many countries have realized the vital nature of rail transport. In short, both rail and road transport facilities are necessary for the future welfare of the nation, and it is curious to find a statement, in a letter to "The Times" in August, 1933, that "Suffolk is a county that, although within easy reach of London, owing to its archaic train service, has fortunately escaped the hand of the speculative builder, and suffered but little from development". It appears that after all the road motor vehicle has not yet been able to do what the Eastern Counties Railway, almost the cheapest line in all England, failed to do. Such criticism is, of course, unjust; train service largely depends upon geographical distribution of population, and it is a curious commentary that among those areas of England in which rail traffics have held up the best in spite of trade depression and road competition East Anglia probably stands as high as any.

Inland transport of every kind has registered steady progress these last few years. Though this study does not attempt to embrace transport through the air, it would appear that internal air services within Great Britain were now entering upon a period when they can be regarded as commercially profitable. Considerable advance has been made during the last few years by certain of the inland waterways which form part of the "cross" scheme advocated by a Royal Commission about a quarter of a century ago. An amalgamation, now known as the Grand Union, controlling waterways between the London Docks and Birmingham, handled more than 2,000,000 tons in 1932, and with its £1,000,000 programme of improvements almost completed, one may claim that the south-eastern section of the "cross" has a big future part to play in the commerce of the country. Improvements to the Trent Navigation have given Nottingham excellent waterway communication with the Humber; thus the north-eastern arm of the "cross" has also been

materially bettered. The south-westerly arm can accommodate sea-going vessels as far as Gloucester and boats drawing nine feet of water as far as Worcester; the Worcester and Birmingham and the Staffordshire and Worcestershire canals only permit of boats with a draught of four feet six inches, and these will have to be improved before Birmingham can claim efficient waterway communication with the Severn estuary. This progressive spirit of the Grand Union and other waterways is to be welcomed heartily.

It is doubtful whether the modern economic organization of trade and commerce, with its reliance on small stocks-in-trade and the rapid movements of commodities to replenish these low stocks, can hold a great future for inland transport by water in a comparatively small country like England, where the canals are man-made rather than canalized rivers; nevertheless, there are many bulky products for which canals can cater quite admirably, for instance, bulk petrol and imported oils. The completion of the agreement between the Canal Association and the railways with reference to the provisions of Part 2 of the Road and Rail Traffic Act, increasing the elasticity of the railways' power to quote rates agreed with traders, is a sign that closer co-operation may eventuate between rail and water transport than has been the case for many years. In 1932 the Leeds and Liverpool Canal, a great trade route in 1830, its 60th birthday, carried a tonnage but little less than that of the Grand Junction and its important ally the Regent's Canal, the Londoner's pride at the opening of this story.

It would be fascinating to peep into the future, but prophecy is dangerous in transport affairs, and since transport policies are long in maturing, it is to be hoped that the years to come will be years of peaceful and steady endeavour, unperturbed by great cyclical trade fluctuations, warlike adventures or industrial strife. Progress does not consist of perpetual advance, it requires breathing spaces for

consolidating the achievements of the immediate past; such a breathing space is long overdue. In reality the supply of transport facilities appears to have overtaken the demand for their use, at least on a price-level which covers operating costs, and duplication of facilities itself raises the cost of offering transport service. In short, there is no call for the expenditure of capital to increase the nation's transport system at the present time; the agitation for large sums to be spent on new arterial roads should be discounted. Far better that existing facilities should be more adequately maintained and long-awaited improvements, such as the elimination of level-crossings and the replacement of weak bridges, which would add to the efficiency and prosperity of existing transport concerns.

Clouds of depression still shut out the glow of commercial and social prosperity, but there are gleams of light penetrating the gloom of the last few years, and care must be taken that the era of co-operation between the rival methods of transport just dawning should equally lighten the internal relationship of employers and employees, without which progress cannot be achieved. Exactly 100 years ago the first grant was given from the public purse for education, and the same month the Royal Assent was given to the Act of 1833 which laid the foundation of the factory inspectorate, a landmark in the betterment of social conditions in a great industrial country. Few will deny the benefits derived from those Factory Acts of the early nineteenth century which relieved the burdens on the factory-worker, but it was in part the coming of the railway which made those factories a possibility, and equally few will deny that the transport systems of to-day provide the solution to the problems they created. Transport is a social function, its objective the improvement of the standard of life of a population; it is to be hoped that the preceding pages of this book have sufficed to prove that the social obligation has not been forgotten, and

that rail, road and water have co-operatively served the nation well. It is the duty of the nation to lead them hand in hand, with no greater favour to one than to another, that they may continue to serve to the best of their joint abilities the common weal.

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