

BRADLEY'S RAILWAY GUIDE



Also by Simon Bradley

The Railways: Nation, Network and People

St Pancras Station

BRADLEY'S RAILWAY GUIDE



A JOURNEY THROUGH TWO CENTURIES
OF BRITISH RAILWAY HISTORY 1825–2025

SIMON BRADLEY



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For Clara

CONTENTS

Introduction	10	1840 Outlines of a Network	42
1825 Stockton & Darlington	12	1841 An Early Model	44
1826 Track Topics	14	1842 Minding the Gaps	46
1827 Birth of the Railway Station	16	1843 Telegraphy	47
1828 Competition	17	1844 Royalty By Rail	49
1829 Rocket	19	1845 The Railway Mania and the Railway King	51
1830 The Liverpool & Manchester, 1: Grandeur and Achievement	20	1846 The Photographic Record	53
1831 The Liverpool & Manchester, 2: Commerce and Goods	23	1847 Viaducts	55
1832 Cuttings	24	1848 Brunel's Atmospheric Railway	57
1833 The Liverpool & Manchester, 3: Classes of Travel	27	1849 Choosing a Timetable	60
1834 Suburban Dawn: The Dublin & Kingstown Railway	29	1850 Waiting for the Train	61
1835 The Great Western: Brunel's New Model	31	1851 Great Exhibition	63
1836 London's First Railway	34	1852 Railway Time	64
1837 Civil Engineering: The London & Birmingham Railway	36	1853 Geology	66
1838 Mail By Rail	37	1854 Paddington Station, Mark 2	68
1839 Tickets	40	1855 Second-class Travel	70
		1856 Brought to Account	72
		1857 An Industrial Townscape	75
		1858 Standardisation	78
		1859 Excursions	79

1860 Horse Sense	81	1889 Armagh: Disaster and Reform	137
1861 Fatal Outcomes	83	1890 The Greatest Bridge	139
1862 Coal	85	1891 Cliff Railways	142
1863 The Narrow Gauge Steps Up	87	1892 Farewell to the Broad Gauge	143
1864 A Pneumatic Adventure	90	1893 Locomotive Aesthetics	147
1865 Staying the Night	92	1894 Coal For Export	148
1866 Dickens	94	1895 An Enquiry into Advertising	150
1867 Timber	95	1896 Travel De Luxe	152
1868 St Pancras: The Greatest Victorian Station	97	1897 Terror and Vulnerability	154
1869 Overreach in Morayshire	100	1898 Railway Letters	155
1870 Going Underground	101	1899 Great Central	157
1871 Murder on the Railway	103	1900 Deeper Underground	159
1872 The Refreshment Room	105	1901 A Light Railway	162
1873 At the Junction	107	1902 Suburban Connections	164
1874 Levelling Up	109	1903 On Clydeside	166
1875 Commemoration	111	1904 Tyneside Electrics	167
1876 Over the Fells	113	1905 Rail Motoring	169
1877 Seeing Clearly	114	1906 An Underground System	171
1878 Crossing the Tay	116	1907 Marshalling Yards	173
1879 Dangerous Work	118	1908 Industrial Unrest	175
1880 Bank Holiday	120	1909 Holiday Arrangements	178
1881 Collecting Dogs	122	1910 Religion and the Railways	180
1882 Secondary Lines, Smaller Stations	123	1911 The Pleasures of Miniaturism	182
1883 Going Electric	125	1912 Joint Lines	184
1884 A Railway Knight	127	1913 Fare Dodging	185
1885 Footbridges	129	1914 War	187
1886 The Greatest Tunnel Yet	131	1915 Ambulance Trains	191
1887 Goods in Transit	133	1916 Railwaywomen	193
1888 Transporting the Dead	135	1917 Trains Under Strain	195
		1918 A Wartime Port	196
		1919 In Memoriam	199

1920 Enter Hornby	201	1951 Festival	264
1921 Internal Combustion	203	1952 Rural Decline	266
1922 The Eve of Amalgamation	205	1953 Floods	268
1923 Grouping	207	1954 Diesel Dawn	269
1924 Posters	209	1955 A Plan For Modernisation	271
1925 The Railway Centenary	210	1956 At Waterloo	274
1926 General Strike	214	1957 Styling	275
1927 Smoking	216	1958 Staying With Steam	278
1928 Containers	218	1959 New Stations	280
1929 Titled Trains, Modern Design	220	1960 Seaside Specials	281
1930 The Modern Steam Locomotive	222	1961 Trainspotting	283
1931 Track Recording	224	1962 Preservation	285
1932 Colour-Light Signals	226	1963 Dr Beeching's Report	288
1933 Electricity in Control	228	1964 New Logo, New Name	291
1934 Coaling Towers	230	1965 Decrepitude and Survival	293
1935 Streamlining	232	1966 Race and the Railways	295
1936 Sleepers For All	233	1967 A New Approach to Photography	298
1937 The Last Great Railway Hotel	235	1968 Farewell to Steam	300
1938 Back to School	237	1969 News From Underground	302
1939 Evacuation	239	1970 The Railway Children	304
1940 Under Attack	242	1971 Freightliners	305
1941 Salvage	244	1972 Early Obsolescence	308
1942 Design For Austerity	246	1973 Motorail	310
1943 Wagons in Wartime	248	1974 Electrification to Scotland	312
1944 Blackout	250	1975 Rail 150	314
1945 Brief Encounter	252	1976 High Speed Trains	316
1946 A Hard Winter	254	1977 Industrial Steam	318
1947 Slipping	256	1978 Heritage Revalued	320
1948 Public Ownership	258	1979 Equal Opportunities	322
1949 On Film	260	1980 Urban Renewal	324
1950 Carriage Configurations	262	1981 Merry-Go-Round	326

1982	Sectors	328	2008	Semaphores and Their Successors	383
1983	Changing Brakes	330	2009	Tornado	386
1984	Railcards	332	2010	London Overground	388
1985	Pacers and Sprinters	334	2011	Railways on British Stamps	390
1986	Network Southeast	336	2012	Change At King's Cross	392
1987	Docklands	338	2013	Bus Replacement	394
1988	The Clapham Disaster	341	2014	Changing Climate	396
1989	The Settle and Carlisle Reprieved	343	2015	Reopening	398
1990	Narrow-gauge Novelties	345	2016	Are You Sitting Comfortably?	400
1991	East Coast Electrics	347	2017	Slam Doors and Grandfather Rights	402
1992	New Tickets, New Fares	349	2018	Sources of Power	404
1993	British Rail and Royal Mail	351	2019	Scottish Sleepers, Overseas Suppliers	406
1994	Eurostar	353	2020	Pandemic	408
1995	Authenticity?	357	2021	A Guiding Mind?	410
1996	Going Private	359	2022	Crossrail	412
1997	Vintage Revival	360	2023	HS2	414
1998	Franchises	362	2024	Delays on the Line	416
1999	Open Access	364	2025	Bicentenary	419
2000	Broken Rails	366		<i>Acknowledgements</i>	420
2001	Mountain Railways	368		<i>Sources</i>	420
2002	Enter Network Rail	370		<i>List of Illustrations</i>	423
2003	Pendolinos	372		<i>Index</i>	426
2004	Flying Scotsman	374			
2005	What's in a Name?	376			
2006	Going Nuclear	379			
2007	Change At St Pancras	381			

INTRODUCTION

Britain has a special relationship with its railways. The key elements of the new technology – steam locomotives, track, signalling, and more – were British inventions, and home-grown innovations were influential as railways spread rapidly abroad (not to mention the Irish contribution to the railway history of these islands). Yet the self-contained British network also fostered traditions that have remained locally distinctive, such as an extreme concern with locomotive aesthetics, or the diverse popular movement that is railway preservation. Many of the great monuments of the British network – station buildings, bridges and viaducts, tunnels – remain in everyday use, thanks to a combination of historic under-investment, happenstance and deliberate protection. So the twenty-first century railway traveller moves through time as well as space, following routes that may be up to two hundred years old. Even the celebrations to mark the bicentenary of the Stockton & Darlington Railway in 2025 will follow in the footsteps of earlier commemorations – in 1875, 1925 and 1975 – as the industry developed its own historical consciousness and collective pride.

This book offers a guide through the nation's railway story for those who want to know more, with fresh looks at many themes and some angles that may be less familiar to readers who already have an informed interest in the subject. Its 201 entries span the two centuries between the Stockton & Darlington's opening and our own time, with an illustration and a short chapter for each year. These can be read in sequence, dipped into, or explored by following cross-references between the yearly entries. Some entries cover key events (1889, 1923, 1948, 1996); others offer snapshots of long-term developments (1885, 1938, 1984, 2008), or instances that cast light on larger stories (1847, 1869, 1936, 1969). The illustrations draw on the rich visual record of the railways, including fine art and topography (1832, 1857, 1873, 1946), outstanding industrial and commercial design (1893, 1929, 1964, 1976), and photography of every kind, from 1840s pioneers through twentieth-century film to the digital imagery of our own time.

The railway story is also intertwined with wider social and economic change. Mail and communications were transformed (1838, 1843, 1898).

Commuting offered new ways of life to those able to afford it (1834, 1902), while excursion trains, Bank Holiday trips and seaside holidays opened up fresh worlds to millions (1859, 1880, 1909, 1960). Trade and industry – coal, iron and minerals especially – flourished thanks to railway access (1831, 1863, 1894, 1981). The rise of road transport in the twentieth century prompted new responses from the railway companies, with varying degrees of success (1921, 1928, 1971). The two world wars brought very different challenges, to which the railways responded with courage, endurance and imagination. The individual stories of David Cadman, Asquith Xavier and Karen Harrison illuminate different twentieth-century struggles, for employment rights and equality of treatment on the railways (1908, 1966, 1979) – counterparts to the big names, from Brunel to Beeching, who loom large in the railway story.

Trains themselves likewise have their own fascination. No single account can cover more than a fraction of this richness and diversity, but a selection of locomotives, carriages and wagons feature in the pages that follow. Another recurrent theme is the debt owed by Britain's railways to technology from abroad, especially after the nineteenth century had passed (1904, 1931, 2003). Yet there are outstanding innovations too, such as the advances made in underground railways and tunnelling (1900, 1906, 1969, 1994), and the unjustly neglected story of British Rail's computerised tickets (1992).

Britain's railways enter their third century in an uncertain state. Recent grand projects – HS2, and the proposed reorganisation dubbed Great British Railways – have been curtailed or delayed (2021, 2023), and a question mark currently hangs over the operational model introduced with privatisation (1996). When new trains arrive, their software is often so complex that years may pass before they are passed for service (2024). Climate change and the imperative to decarbonise meanwhile present their own urgent challenges (2014, 2018). Yet the railways are now firmly recognised as essential to national life, and there seems little prospect of a return to the cutbacks of the 1980s or the lethal misjudgements of the early privatisation years (1988, 2000). Lovers of the railways may prefer to gaze into the past with fondness or fascination, but the future looks hopeful too.

Simon Bradley
June 2024

1825

STOCKTON & DARLINGTON

Public railways of the steam age began in 1825. In that year a twenty-six-mile line opened in south County Durham, running between collieries in the western coalfields, via Darlington, to the river port at Stockton. Intended chiefly for the conveyance of coal, the Stockton & Darlington Railway was built under the direction of the engineer George Stephenson (1781–1848). From modest beginnings, Stephenson had achieved pre-eminence as engineer to many of the colliery railways of the North East, and with his young son Robert (1803–59) had already established a locomotive-building firm based in Newcastle upon Tyne.

Railways in 1825 were far from new, having been used in various forms for over two centuries, chiefly for the local transport of coal and other minerals (see 1826). Recent advances in the design of iron rails were one precondition of the success of the Stockton & Darlington project. As the line was longer and more heavily engineered than all its predecessors, the promoters also depended on local networks of investment to pay for its construction. The key figures came from a group of inter-related Quaker families, with Edward Pease (1767–1858) at the forefront (see 1875). An Act of Parliament secured the company's legal standing, including the rights to buy up land to form the route.

As first conceived, the line depended more on haulage by horses than by steam. It was also open to private operators to provide and run their own trains in return for an access fee, on the principle of contemporary turnpike roads. Passenger services were initially operated by subcontractors, and were entirely horse-drawn. Station buildings soon followed (see 1827), but were not part of the original concept.

The new railway attracted much attention at home and abroad, but visual records of its earliest years are quite scanty. Terence Cuneo's painting of 1949 draws on descriptions of the S&DR's inaugural train on 27 September 1825, when George Stephenson drove one of his own company's locomotives from Shildon to Stockton. Its train was chiefly composed of chaldron wagons – the regional type used for carrying coal – pressed into use as improvised carriages; some had already been loaded, and their passengers balanced on top of the coals. At one point



Stephenson took the train up to 15 mph, outpacing the horses that were racing alongside.

Cuneo's canvas shows *Locomotion No. 1* at the head of the train. This famous engine survives in preservation (see 1875 and 1925), but recent examination of its fabric has revealed complex origins. The oldest part is the boiler, built in 1827 and later transferred from another early Stephenson engine. Even the number '1' was not bestowed until 1827, the name *Locomotion* following in 1833; the original appellation was the much less definitive-sounding *Active*. Later restorations excepted, the other parts owe their origins to three subsequent rebuildings, the last of which (1856–7) returned the locomotive to a form closer to its first appearance. So, in mildly deceptive form, *Locomotion No. 1* was set up for its enduring role as a totem and icon of the birth of the railways.

Terence Cuneo, *The Opening of the Stockton & Darlington Railway*. Painting, 1949

1826

TRACK TOPICS

Early railways, wagonways and tramways were very diverse in terms of their track. This engraving from the mid 1820s shows some of the varieties.

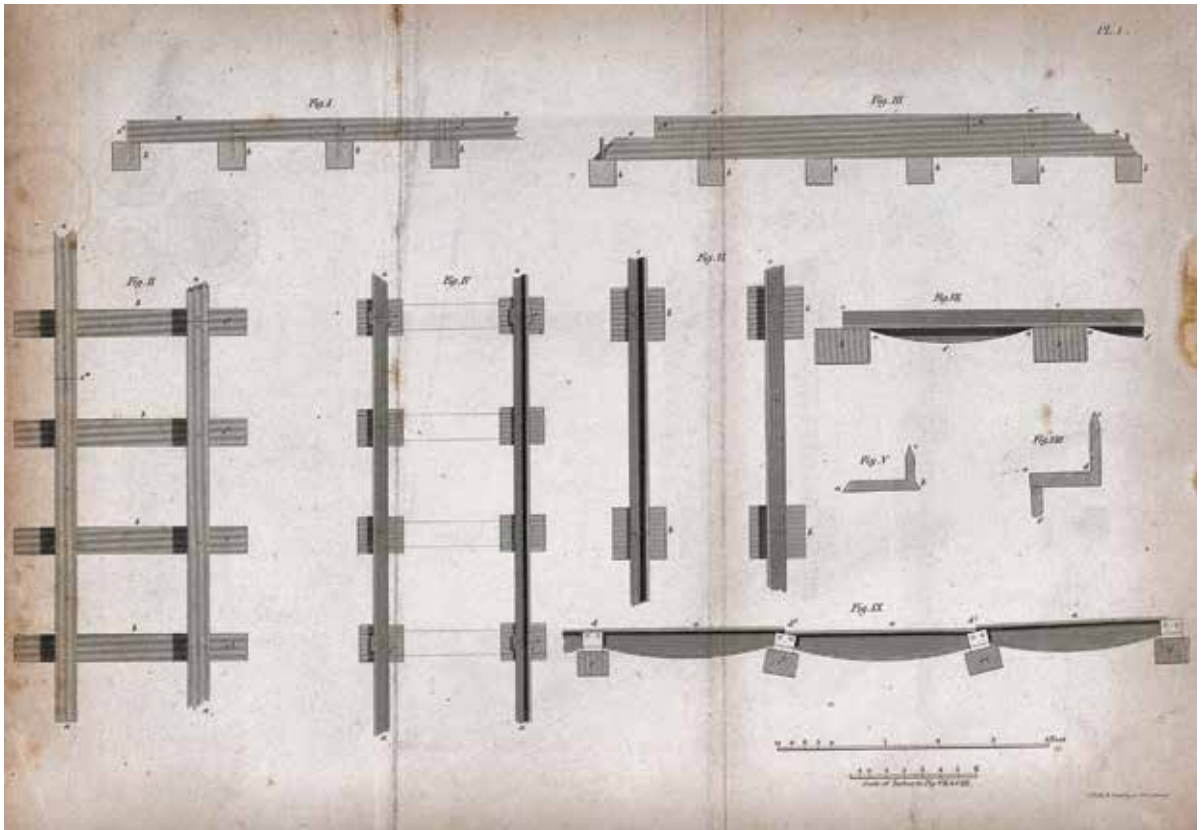
Railways made entirely of wood (Figs I–III) were already passing out of use in the early nineteenth century. Oak was the preferred material for the rails, which were joined together by wooden sleepers. The rails might last only a year in use, so it made sense to lay them in double depth so that the assembly would keep its shape when the upper rails were replaced. To save wear, thin wrought-iron strips were attached to the rails on some lines from the early eighteenth century, and iron tyres and cast-iron wheels for the wagons also appeared.

The next step was to make entire rails of cast iron, for greater durability and strength (although cast iron was prone to cracking). Rails of this kind were generally laid on stone blocks rather than wooden sleepers. Those shown here are of the wagonway or plateway type, of L-shaped section with a vertical flange projecting upwards (Figs IV–VI and VIII). The flanges might be on either the inner or the outer face of the rail, and the wagons ran on flangeless wheels, kept in line by friction against the flanges.

Edge rails, designed for use with flanged wheels, allowed wagons to be moved using less energy. These became the favoured type in North East England after 1800, while other regions stayed loyal to the plateway. Both kinds came to be cast with a curved lower profile, the so-called fish-belly type (Fig. VII), to strengthen the rail at its weakest point, midway between the supports.

On horse-drawn lines the greatest stresses were imposed by loaded wagons, but steam locomotives were much heavier still and required stronger rails to work successfully. One early response to the challenge was developed by the partnership of George Stephenson and the Tyneside chemical manufacturer William Losh (1770–1861), who patented a type of cast-iron rail in 1816 with the ends tapered to make an overlapping joint.

Some of the Stockton & Darlington's route was laid with rails of Losh's type, but most of the line used a newer, wrought-iron version lately



patented by John Birkinshaw (1777–1842). Wrought iron, being strong in tension as well as compression, was much less prone to fracture, though it was also more expensive and complex to produce. Birkinshaw's rails were T-shaped in section with a broad cross-head. They measured fully 18 feet long rather than the 3 feet or so of the cast-iron type, but retained the fish-bellied lower profile, which was used in multiple on each rail, for strength between the sleepers. Longer rails also reduced the friction and wear on the wheels by reducing the number of rail joints, and were less prone to shift out of alignment than the shorter version, a weakness illustrated here by Fig. IX. They were an essential precondition of the success of the steam-hauled passenger railway.

Mid-1820s engraving of track types, by Neele and Stockley

1827

BIRTH OF THE RAILWAY STATION

The Stockton & Darlington's wider significance grew as the line became a testing ground for how a public railway should operate. When trains began running there were as yet no purpose-built stations, and passengers were directed to book their tickets at inns near the line. One of the crossings along the route was at Aycliffe Lane, where the future *Locomotion No. 1* had been delivered by road, assembled, and first put on the rails (see 1825). In 1826–7 the railway erected a building here, which later took the name of Heighington station, after the nearest village (pronounced as in 'High').

Heighington was not yet quite a railway station as later generations would understand the term. No high platform was provided, only a small paved area from which to climb up into the carriage – a horse-drawn vehicle until the 1830s, locomotives at first being restricted to the haulage

Heighington station
(formerly Stockton &
Darlington Railway),
Co. Durham, c.1950–5



of coal and goods. The stone-built, hip-roofed structure alongside provided an office for the railway's coal depot and was also intended to serve as an inn, as at the larger buildings that the S&DR had put in hand at both Stockton and Darlington. But a licence was required to open an inn, and the local magistrate at first refused to grant one for Heighington. Instead, the building began to be used as a waiting place for passengers and a depot for the collection and delivery of goods and parcels. By 1840 the company was referring to the building – which had lately been joined by two workers' cottages – as a 'station'.

The line runs across a slope at this point, so the builder made use of the different levels to provide a two-storey structure with its upper floor alongside the railway. Whether the storeys were originally linked inside appears doubtful as no staircase was provided at first, so the ground floor was probably meant for exclusive use by the intended hostelry. Yet the building proved adaptable to the needs of a station of the more familiar kind, and trains still stop here. The photograph, taken in the early years of British Railways (see 1948) about a century after the line opened, also gives a glimpse of one of the standard features developed for Victorian railways: track with rails of 'bullhead' section, secured to timber sleepers (no more stone blocks) by cast-iron chairs, and held in place by ballast composed of sharp-edged stones.

1828

COMPETITION

The origins of competition between railway companies can be traced as far back as 1828, when the Clarence Railway Act received royal assent. Its intended traffic was coal, much of it drawn from the Auckland district in western County Durham, which was already served by the Stockton & Darlington. By taking a shorter route to Stockton, and offering better facilities for onward shipment from there, the Clarence Railway – named for the royal duke, later King William IV – aimed to draw off traffic from the senior company's line, with which it made a junction at Simpasture, near Heighington (see 1827).

The share certificate shown belonged to an individual investor, the distinguished mathematician the Revd George Peacock (1791–1858), a Fellow of Trinity College, Cambridge. The government also invested, to the tune of £110,000 subscribed by the Exchequer Loan Commission, which had been established in 1817 to promote employment by lending to public works. Some other early lines also received such loans, including the Liverpool & Manchester (£100,000; see 1830) and the Newcastle & Carlisle (£160,000; see 1832). Fresh loans to British lines ceased once it became clear that railway building would pay for itself, although some Irish companies received support into the 1840s.

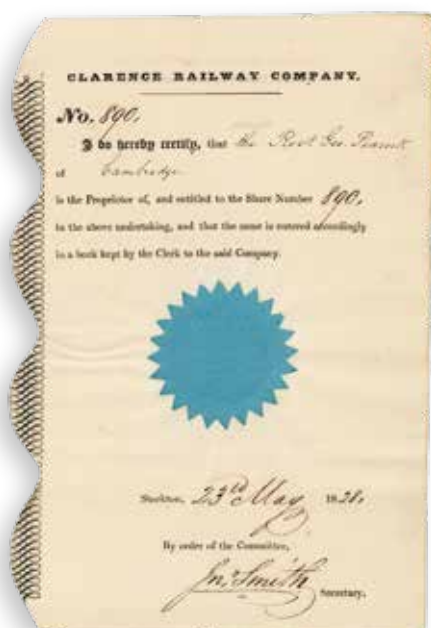
The wisdom of competition proved less clear once the Clarence Railway opened in 1833. It won plenty of coal traffic, cutting the Stockton & Darlington's tonnage from 26,762 to a mere 9,482. However, the S&D struck back by placing heavier tolls on freight that continued its journey by the newer route. With its line now running at a loss, the Clarence company surrendered management to the Loan Commissioners, who pressed on with finishing the remaining works. The Commissioners had to step in again in 1842, after an interruption in traffic from a feeder route again placed a question mark over the Clarence Railway's future. This time they took full possession, and put the line up for auction. Other shareholders raced to the rescue, securing funds to cover the stricken

line's debts by means of 6 per cent preference shares, which paid out at a better rate than existing stock.

Such twists and turns in County Durham's railway story fill many pages of W. W. Tomlinson's official history of the North Eastern Railway (1915), which was the name adopted when a number of regional lines merged in 1854. The Stockton & Darlington was in turn absorbed in 1862, followed in 1865 by the company into which the ill-starred Clarence Railway had already been folded. With other annexations, the North Eastern thus secured an effective monopoly across the region, as well as inheriting the S&D's claim to seniority in the genesis of the railways (see 1875).

One quirk of the Clarence line's early operations concerned the payment of locomotive crews. Drivers were not paid a regular wage, but received three-sixteenths of a penny for each ton of coal carried.

Clarence Railway share certificate, 1828



In turn, each driver had to pay his own fireman, and provide locomotive coal, oil, lamps and other running expenses. The company looked after locomotive repairs, but private owners supplied the wagons, which were of the chaldron type widely used in the North East (see 1825).

1829

ROCKET

Ahead of the opening of the as yet incomplete Liverpool & Manchester Railway, an ‘ordeal’ was held in October 1829 in order to settle on the best type of locomotive for the line. Staged at Rainhill near St Helens, the trials featured five machines (including the horse-operated *Cycloped*), of which only George and Robert Stephenson’s *Rocket* completed the five-day proceedings. Permissible weights, loads and minimum speeds were specified, and consumption of fuel and water were measured. The engines were required to make ten trips, of a total length equivalent to one return journey between the cities at each end of the line.

Since the opening of the Stockton & Darlington four years before (see 1825), locomotive design and materials had been thoroughly rethought by the Stephensons and their circle. *Rocket* therefore entered the lists with many advantages. These included a firebox of copper plate, a newly developed form of boiler with multiple flue tubes passing through the water chamber, and the use of angled cylinders driving directly onto the wheels. The Stephensons’ locomotive was also stylishly presented, in a version of the yellow and black livery used by fast stagecoaches, and with its chimney painted an impractical white, as if to imply cleanliness. These features no longer appear on the surviving engine in the Science Museum’s collection, which was heavily reconstructed a few years later and now has the blackish hue of unpainted cast- and wrought iron.

The familiar image of the canary-yellow engine owes much to the existence of multiple replicas. The best known of these is probably the much-travelled working locomotive built in 1979 for the ‘Rocket 150’ celebrations of the following year. This incorporates a few parts saved from the very first replica, built in 1881, as well as a new boiler, frames and

Rocket, Airfix model
package artwork, c.1963



rear wheels from a drastic reconstruction in 2009. An older replica, made for the Science Museum in 1935 and now displayed at the National Railway Museum in York, is a static exhibit featuring cutaway sections. At least six other full-size versions are known to have existed, two of which are now in museums in the US (the one in Chicago has its chimney improperly painted yellow). Of the lost examples, the unlikeliest was built to feature in Buster Keaton's silent film comedy *Our Hospitality* (1923). And there are plentiful models of all scales and types, including a 1:72 scale plastic kit introduced by the Rosebud firm in the 1950s and subsequently taken over by Airfix, which sold 'in the tens of thousands' for twenty years or more.

1830

THE LIVERPOOL & MANCHESTER

1: GRANDEUR AND ACHIEVEMENT

The new form of public transport reached its early maturity in 1830 with the opening of the Liverpool & Manchester Railway. From the outset, the line was conceived to meet the needs of a whole region, rather than conveying a specific mineral traffic with passenger services as a useful extra, like the Stockton & Darlington. All the services on its

double-tracked line were locomotive-hauled, and the company itself operated the trains and owned the carriages. Other factors behind the success of the venture included plentiful mercantile capital, powerful legal expertise in securing the necessary legislation, and an advanced management structure, under a board of directors who met weekly.

The railway was largely constructed under the control of George Stephenson, who was also one of the many contractors involved in building it. An eminently practical man, Stephenson took a back seat when it came to the creation of the L&MR's public image, which included some of the most strikingly aestheticised features on any railway ever built – as if to impress on the world the seriousness and significance of the new technology. The most extraordinary of these was at Edge Hill on

The Moorish Arch at Edge Hill at the opening of the Liverpool & Manchester Railway, 15 September 1830. Drawing by Isaac Shaw



the approach to central Liverpool, depicted here by Isaac Shaw on the opening day.

The mighty cutting in the rock at Edge Hill marked the limit of locomotive haulage to and from Manchester. The onward journey into the heart of Liverpool was managed by two steeply graded tunnels worked by rope haulage: one to Wapping by the docks for goods traffic, the other to a short-lived passenger terminus at Crown Street. Edge Hill's twin winding engines were housed in powerful towers, finished off with castellated top storeys after the railway's opening day, which were linked by a 'Moorish' horseshoe arch in a composition apparently derived from the Grand Gate of Cairo. The suggestions of far-flung trade, appropriate for an ocean port, were underscored by the chimneys for the engines, which stood behind the artist's viewpoint. Fashioned like giant Doric columns, these echoed the legendary 'Pillars of Hercules' at the Straits of Gibraltar, marking the limits of the Mediterranean world in antiquity. Both designs are credited to the railway's architect, John Foster of Liverpool (c.1787–1846), whose education included seven years of foreign travel and the excavation of ancient sites in Greece, then under Ottoman occupation. The rope-worked inclines were necessary because early locomotives were still unequal to heavy haulage on steeper gradients. The same combination of forms of traction appeared elsewhere in the 1830s on railways built on similar principles, and inclines likewise featured on the Stockton & Darlington's colliery branches (see 1825).

To underscore the sense that history was being made, the L&MR shrewdly invested in some specially fancy carriages, shown to the left, for the opening ceremonies. Guest of honour was the prime minister, the Duke of Wellington: military hero, Tory, and general opponent of the Reform party, in whose ranks most of the railway's leading figures firmly stood. Among them was the Liverpool MP William Huskisson, whose misfortune it was to be famously and fatally run over by *Rocket* when the MP crossed the line to talk to Wellington in his fancy carriage at a later stop along the line.

The cutting at Edge Hill was widened in the 1860s, destroying the exotic arch and its engine houses, but some of the adjacent steps and rock-cut chambers remain, now protected by listing.

1831

THE LIVERPOOL & MANCHESTER

2: COMMERCE AND GOODS

The Liverpool & Manchester's directors understood the value of publicity and the power of images. Guidebooks to the line were published straight away, and superior illustrations were also made available. For these, the company sought out the leading London print-makers Ackermann & Co., who sent the young architect and engraver Thomas Talbot Bury (1809–77) to do the job. The aquatints comprising Ackermann's *Coloured Views on the Liverpool & Manchester Railway* duly appeared in 1831. Coloured drawings made by Isaac Shaw in 1830 were also worked up and issued as engravings.

Bury's viewpoint here is beneath the warehouses at the Wapping end of the line, next to Liverpool's docks. The warehouses were raised well above the tracks on slim cast-iron columns, the rails running between. Trap doors in the warehouse floors – a device imitated from warehouses

Warehouses at Wapping (Liverpool), Liverpool & Manchester Railway. Aquatint engraving by Ackermann & Co. after T. T. Bury, 1831



built over canal basins – allowed goods to be raised and lowered into the wagons below, which could be transferred between the different tracks by means of small turntables. This was a task within the capacity of human muscle power, as long as the loaded wagons did not become too heavy. It must have helped that much of the railway's cargo consisted of bales of raw American cotton, destined for the textile mills of Manchester.

One telling inaccuracy, repeated by Bury in some other views, concerns the apparent distance between the rails. Any purchaser of the prints who was inspired to visit the railway would have been surprised to find that the rails were placed just 4 ft 8½ in. apart. This represented the standard gauge of the established colliery railways of the North East, plus an extra half-inch to allow for the newly invented 'coned' wheels of tapered profile, which ran on inwardly angled rails. This was a much smoother and more stable arrangement than the old right-angled wheels and rails, on which the wheel flanges wore heavily against the rail sides.

Commanding the centre of the picture is the mouth of the tunnel, which extended for over a mile and a quarter through the sandstone up to Edge Hill with its winding engines (see 1830). Exceptionally, in the first months after its completion the tunnel walls and arch were whitewashed and the whole length was piped for gas lighting, to allow spectators to explore the new marvel. This encouraged Ackermann & Co. to include a view of the tunnel interior, one of very few such engravings ever made. The first issued version was embarrassingly misleading, however: instead of the visually unexciting cables employed to convey the wagons up and down, it showed a (prohibited) locomotive steaming down the tunnel.

1832

CUTTINGS

The cutting through the Cowran Hills in Cumberland, on the route of the Newcastle & Carlisle Railway, provided a foretaste of the unprecedented movements of earth and spoil required as the network took shape. As conceived when the railway was enacted in 1829, the route was to pass through the summit of the hills by means of a tunnel some



300 yards long. However, advance workings encountered an unstable combination of clay and sandy soils with springs running through, so the line's founding engineer Francis Giles decided in 1832 that a mighty single cutting should be made throughout.

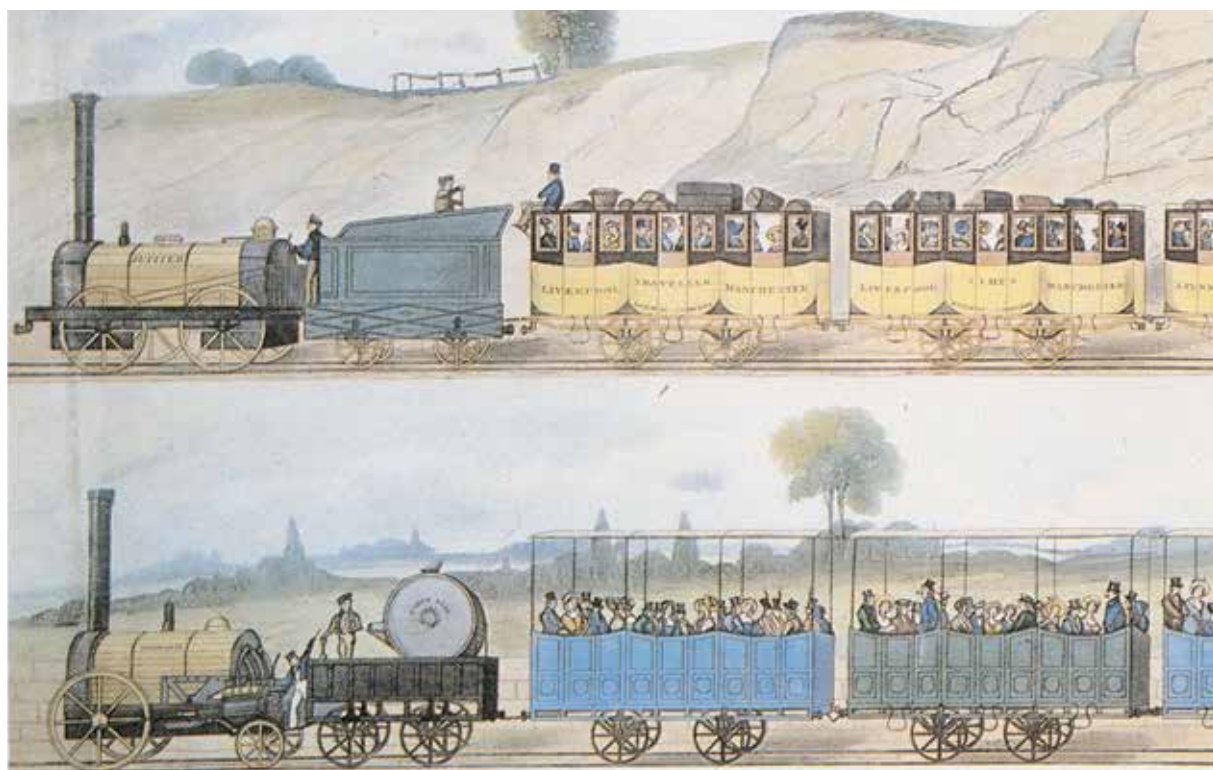
Cowran cutting, Newcastle & Carlisle Railway. Drawing by J. W. Carmichael, 1835

This was the largest such excavation yet attempted in Britain, nearly a mile long and up to 110 ft deep, and requiring the extraction of a million cubic yards of spoil. The sides were angled at a slope of 1:1.5, and at the bottom a broad trench was made between retaining walls 700 ft long and 14 ft high. The trench and walls reduced the amount of excavation needed to achieve the required depth for the line to run through, yet the finished cutting was still 301 ft across at its widest point. Completion of the diggings took some years, even with men working in shifts with naphtha lamps for illumination in the darker hours, and trains did not begin running through it until a year after John Wilson Carmichael drew the workings in 1835. Decorations on the opening day of the line's western section on 15 July 1836 included a double row of flags suspended from ropes, stretched across the void between two of the highest points.

Chopping through the natural landscape so drastically also required provision for drainage and water management to protect the trackbed from waterlogging. Here the rainwater from the sides of the cutting was directed into open drains along the tops of the retaining walls. The water

was then carried down vertically into a main drain constructed beneath the tracks, where it was joined by the flow from the springs, running westwards into the nearest beck. The excavations caused other nearby springs to fail, and the company had to divert a supply to the neighbouring village of Wetheral in compensation.

Another essential question was how to handle the spoil created by earthworks. As far as possible, railway builders tried to create a balance between material excavated from cuttings and the deposits needed to form embankments and raise ground levels elsewhere. Civil engineers' calculations of such quantities in the period were often presented with unreal exactitude: George Rennie, defending the second survey for the proposed Liverpool & Manchester Railway before a parliamentary committee in 1828, stated that its cuttings would require the extraction of 2,329,206 cubic yards, while 2,171,595 cubic yards would go into its embankments. At Cowran the change of plan from tunnel to cutting appears to have upset the intended equilibrium, and it was noted in 1842 that much of the surplus from the line's earthworks had been 'thrown out to spoil'.



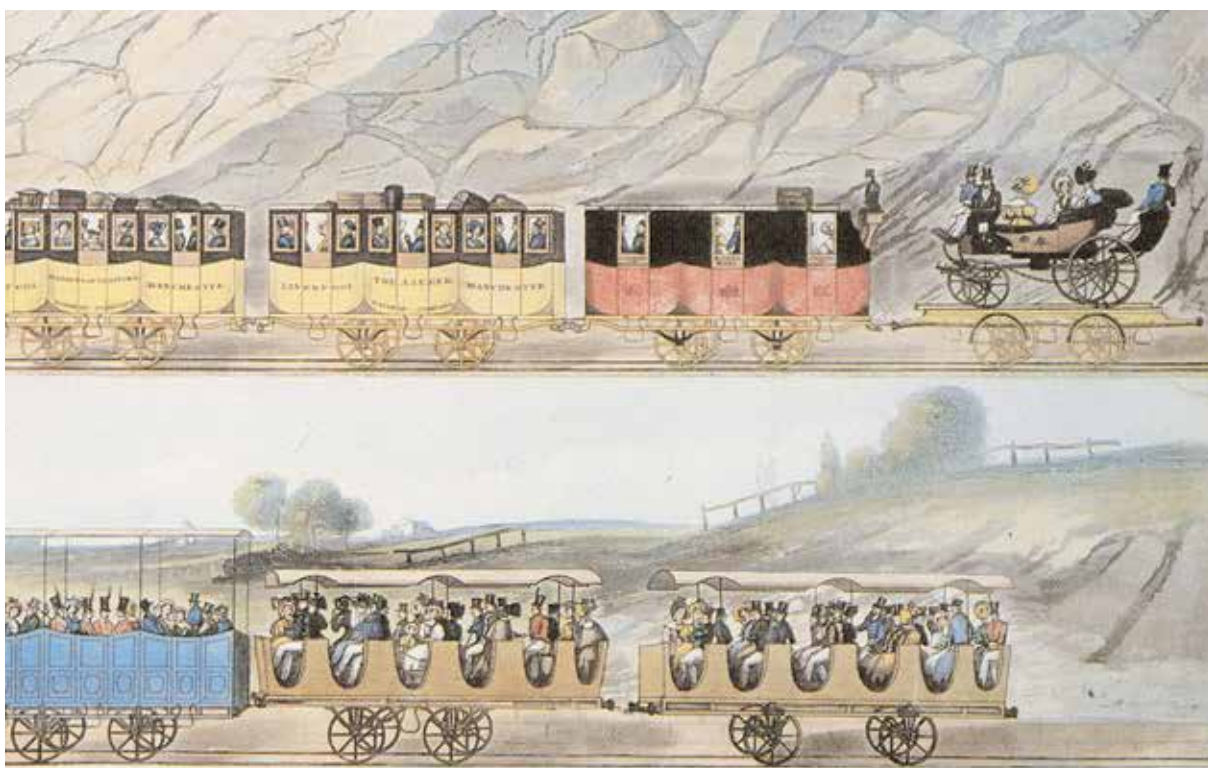
1833

THE LIVERPOOL & MANCHESTER

3: CLASSES OF TRAVEL

Widespread fascination with the railway phenomenon ensured a ready market for views of the Liverpool & Manchester (see 1831), including this updated depiction of its passenger trains, issued by Ackermann & Co. in 1833. The lower image was reworked from Isaac Shaw's first version of 1831, adding canopies over the second-class carriages, which were originally open to the sky. There was no need to adjust the depiction of first-class travel, for which the L&MR set a standard that was widely followed. Its first-class carriages were composed of three six-seat compartments, each clearly derived from the contemporary stagecoach body, even down to the two-dimensional imitation of the upswept lower

First- and second-class trains, Liverpool & Manchester Railway. Aquatint engraving by Ackermann & Co. after Isaac Shaw, 1833



outlines. Also taken over from stagecoach conventions was the use of names – *Traveller*, *Times*, *Marquess of Stafford* and *Treasurer* are shown here – which served to help passengers identify the carriage in which their seats were booked. In the line's early years, first- and second-class trains ran separately.

The fifth vehicle of the first-class train is a mail coach. The Post Office had been quick to spot the potential of railway transport, and so the mails between Liverpool and Manchester followed the passengers of the stagecoach routes on to the rails. Another innovation was the conveyance of private road carriages on flat wagons (carriage trucks, in railway terminology), their occupants commonly remaining in their seats throughout the journey. These were likely to include some of the wealthier passengers on each train, although they may have envied the passengers inside the enclosed carriages when the rains came, or showers of cinders from the locomotive. The engraving shows two different designs of these, *North Star* (above) and *Jupiter*. The former is a more advanced design, having a larger firebox and a tender with an iron water tank rather than the *Rocket*-type wooden barrel shown with *North Star*.

Another engraving in the series depicts two goods trains, one carrying livestock, the other general merchandise. Third-class carriages were not illustrated on any early views of the L&MR, for the company did not yet possess any. There were still none in 1842 when Francis Whishaw issued his compendium *The Railways of Great Britain and Ireland*, one of the best reference sources for early public railways. It took the intervention of government, in the form of W. E. Gladstone's Railway Regulation Act of 1844, to change matters. The Act stipulated that future railways with a substantial passenger service had to provide at least one train a day with fares at a maximum rate of a penny a mile, using carriages that had seats and some protection from the weather – neither of which could then be guaranteed in existing third-class stock. Established lines were not compelled to follow suit, but as an incentive Gladstone exempted the new cheap trains from the 5 per cent duty that the Treasury levied on passenger receipts. So the older companies fell into line, and some form of third-class travel became a normal and expected facility across Britain's railways – though not yet on every train.

1834

SUBURBAN DAWN

THE DUBLIN & KINGSTOWN RAILWAY

By 1834 steam-hauled passenger railways were operating in the United States and France as well as in Britain. Ireland joined the club in the same year, when a railway opened between Westland Row in Dublin and the harbour at Kingstown, today known once again by its Irish name of Dún Laoghaire (Dunleary). The route was important because Kingstown harbour had lately been expanded to serve as the chief port for Anglo-Irish traffic, including the mail boats sailing from Holyhead.

Unlike its British predecessors, the Dublin & Kingstown Railway was not equipped to haul goods trains. Its route of about five and half miles, much of it built expensively along the shore of Dublin Bay, had great potential as a source of suburban traffic and pleasure trips, and plenty of intermediate stations were soon provided. The result has been called the first commuter railway, though with the caveat that the D&KR carried unaccompanied parcels too, a term that was generously defined to allow for items up to five hundredweight (0.254 tonnes). These were fitted under the carriage seats or placed on the roofs. It could almost be said that the line was also the first to serve a capital city, except that Dublin had lost that status when the United Kingdom was formed in 1801.

As at the Liverpool & Manchester Railway (see 1833), the classes and types of carriage were distinguished by colour. Whishaw's *Railways of Great Britain and Ireland* (1842) records these as 'purple lake' for first class, yellow for enclosed seconds, green for open-sided seconds, and blue for thirds, which were also open. Another feature shared with the L&MR was the adoption of the Stephenson's gauge of 4 ft 8½ in. The engineer and surveyor for the Dublin line represented a further link: he was C. B. Vignoles (1793–1875), who in the mid 1820s had joined John and George Rennie in rescuing the Liverpool & Manchester project by means of a new survey (see 1832), after George Stephenson's original proposals had been dismissed by Parliament.

The common British gauge had only a short life in Ireland, for which the Board of Trade stipulated a wider standard of 5 ft 3 in. for all new lines in 1843. The Dublin & Kingstown was converted to this gauge in



The Dublin & Kingstown Railway, from the Martello Tower Bridge at Seapoint, looking towards Kingstown. Aquatint engraving after Andrew Nichol, 1834

the 1850s. Before then, in the ten years up to 1853, it had staked another claim in railway history by operating its new extension to Dalkey on the 'atmospheric' principle – that is, the trains were moved by suction, acting on a piston that slid within a large iron tube fixed between the rails. A stationary pumping engine drew the air out of the tube from the uphill end, and the whole extension was built on a moderate gradient, so that returning trains could run back by gravity. Clean and quiet, the atmospheric system worked perfectly well on this local line of one and three-quarter miles. A subsequent attempt by Isambard Kingdom Brunel to scale up the technology for the South Devon Railway was a costly failure (see 1848), leaving the steam locomotive to reign supreme for generations.

1835

THE GREAT WESTERN

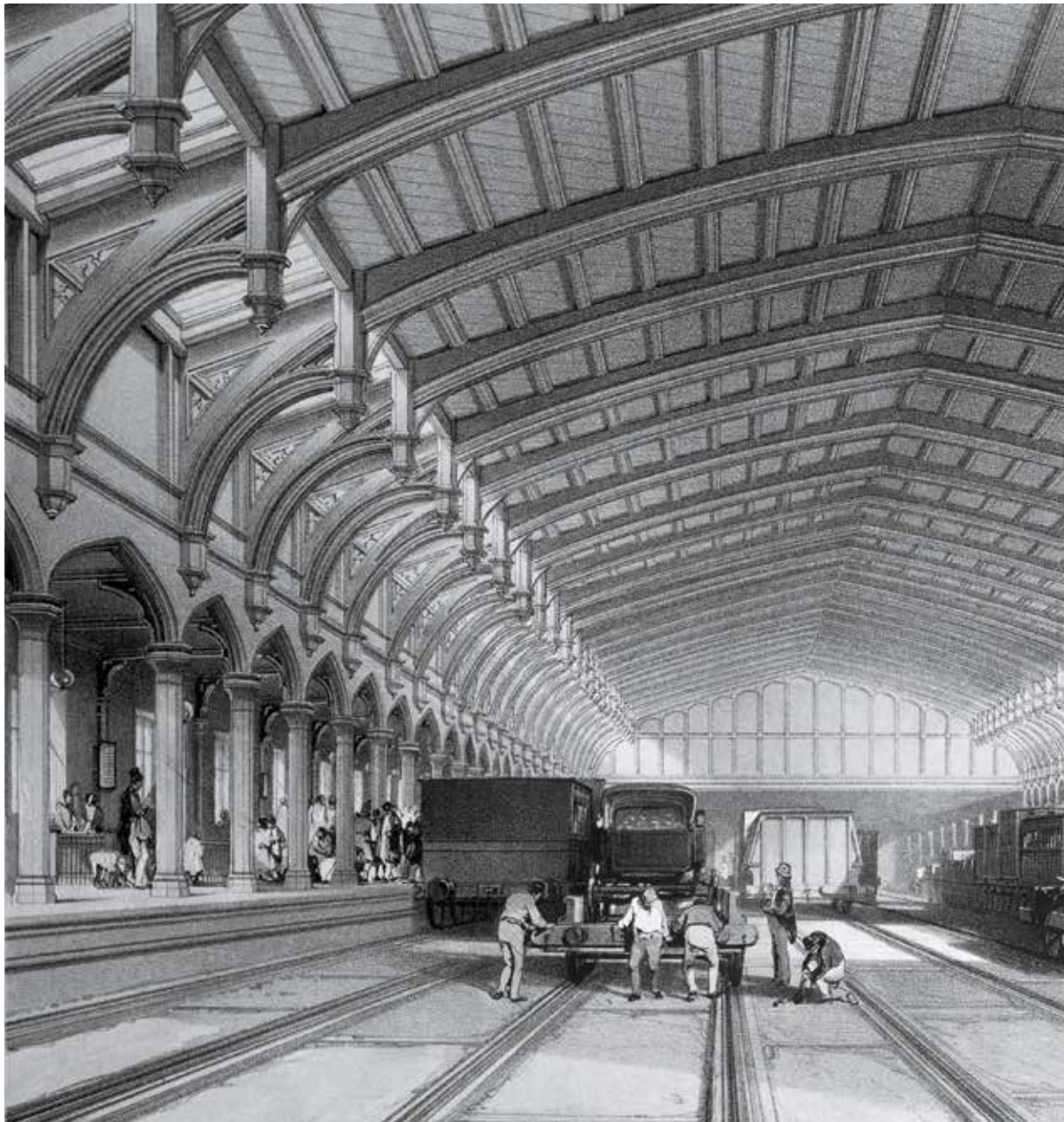
BRUNEL'S NEW MODEL

The beginnings of the Stockton & Darlington and the Liverpool & Manchester are traditionally dated from their years of opening, in 1825 and 1830 respectively. The Great Western Railway, the most radical departure from the Stephenson's railway concept in these early years, liked to calculate its beginnings from 1835, when the necessary Act was passed. This tradition appears to have originated in the twentieth century, when the grouping of the companies (see 1923) left the Great Western as the only survivor from the pioneer years still with its original name. The GWR was never short of ancestral pride, and the earlier date was more resonant than 1838, when its first trains actually ran. Activities to mark the company's nominal first century in 1935 included naming its latest carriages 'Centenary stock'.

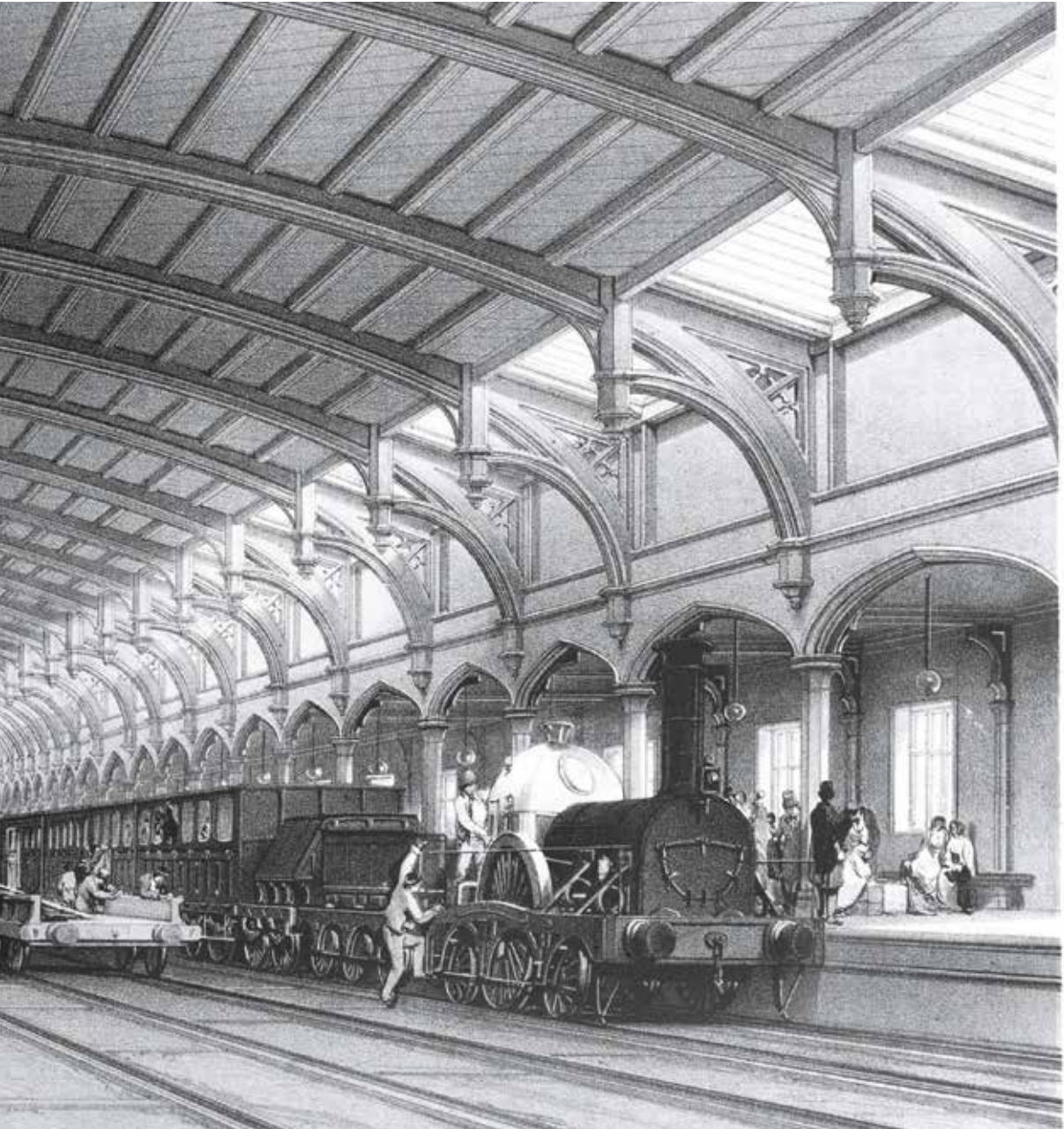
The GWR's main line from London to Bristol was completed in 1841. The best visual record of its original form is the survey by John Cooke Bourne, published in 1846 as a huge elephant-folio volume of lithographs with descriptive text. Bourne captured the scale and ambition of the railway, as conceived by its famously brilliant and versatile engineer Isambard Kingdom Brunel (1806–59). Brunel's chief innovation was to adopt a track gauge of 7 ft $\frac{1}{4}$ in., exactly half as wide again as the Stephenson standard (see 1831). The track was of a different design too, composed of rails with horizontal lower flanges which were screwed directly to wooden sleepers supporting the rails along their full length. Brunel argued that his broad gauge would allow larger and more capacious trains, which was certainly true, as well as favouring faster and more stable running, which turned out to be incorrect owing to the many incremental improvements which the standard gauge achieved over the years ahead. Worse, the existence of two incompatible main-line gauges within one country fatally prevented through running. Within two years of Brunel's death, mixed-gauge track was installed at the GWR's Paddington terminus to allow trains of both types to operate, although it was another thirty-one years before the very last broad-gauge train steamed out of Paddington (see 1892).

The Great Western Railway's first station at Bristol Temple Meads. Lithograph by J. C. Bourne, 1846

Whatever the flaws of the broad gauge, Brunel's aesthetic gifts as a designer of structures were never in question. Bourne's view of the first station at Bristol Temple Meads shows how Brunel adapted fashionable architectural motifs derived from early Tudor England – the side arcades of shallow pointed arches, the trusses fashioned like those of



the hammer-beam roofs of great halls and churches – and fused them with functional essentials such as the rows of glazed panels placed to allow daylight to fall on the platforms. No other station was designed quite like this one, but then there was no other engineer with the restless brilliance of Brunel.



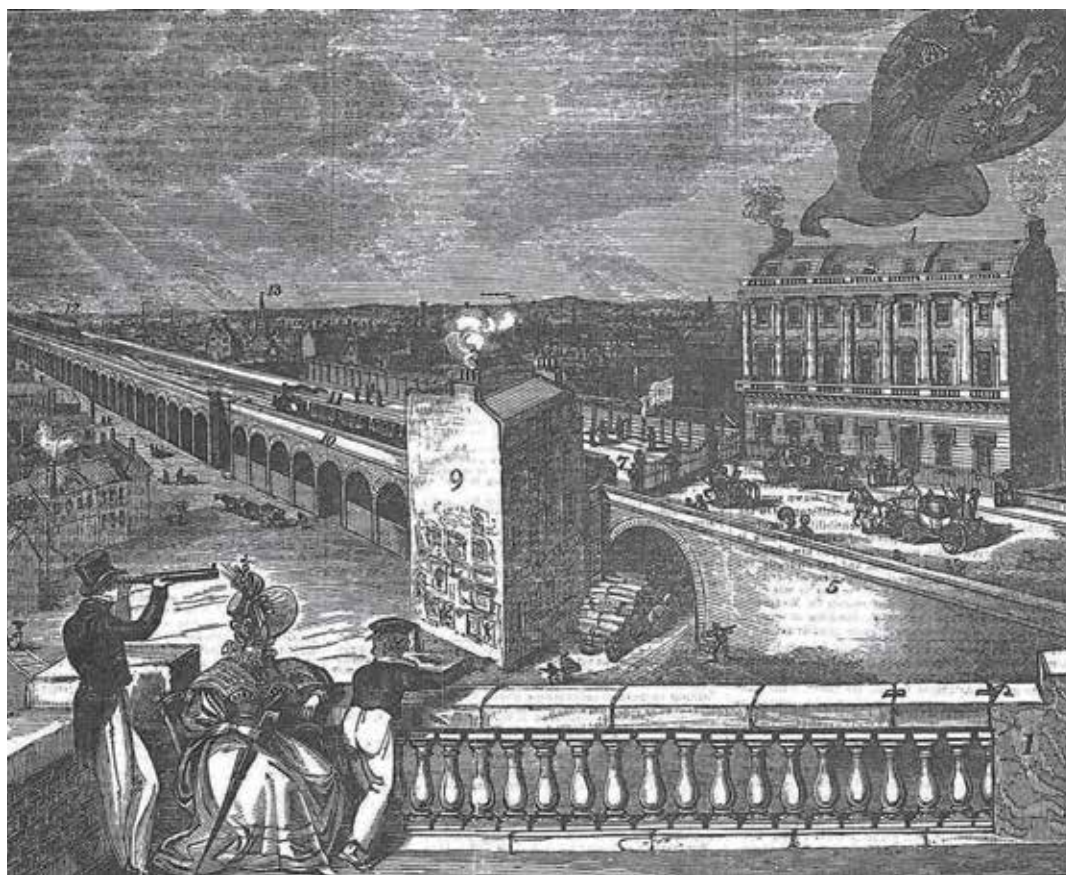
1836

LONDON'S FIRST RAILWAY

Britain's new transport technology arrived in the capital in the shape of the London & Greenwich Railway, the first stage of which opened in 1836 between London Bridge and Deptford. The terminus on the South Bank was so well placed that the companies of three later lines arranged to run their trains from it, and the early building was soon replaced by an expanded station. This engraving shows the first version shortly before services began, with the grandstand for spectators at the opening ceremony already in place on the far side of the line.

Like the Dublin & Kingstown Railway (see 1834), the London & Greenwich was conceived as a self-contained passenger route. What

The London & Greenwich Railway's terminus at London Bridge. Engraving from *The Observer*, 30 October 1836



singled it out among early lines was the new concept of an elevated route raised on a viaduct for its entire length, a distance of three and three-quarter miles. Some 60 million Kentish bricks were needed to build this unprecedented viaduct, which featured 878 arches. This apparently extravagant form was adopted in part to accommodate the many existing roads and streets, especially in the old suburbs of Southwark and Bermondsey. Access at the London end was by a road ramp, the upper part of which is shown to the right in the engraving. This was an essential feature for the traffic in road carriages, which the railway carried on flat wagons in the manner pioneered by the Liverpool & Manchester (see 1833).

Urban railway viaducts soon became commonplace, but in other respects the London & Greenwich was something of a freak. Its route originally included new toll roads and footpaths alongside the viaduct, and these also served as a means of access to the spaces beneath the arches. The company hoped to recoup some of its outlay by infilling these spaces to make houses for rent, a plan that foundered on the difficulty of keeping them free from rainwater coming through the structure from above. The prototype houses were gas-lit and even had gas stoves, because coal fires would have caused a nuisance to passengers on the trains overhead. Gas lamps also lined the tracks, to allow trains to run more safely in the hours of darkness in the years before fixed signals were developed (see 1850).

An awestruck impression of the line in its infancy, and of the new speeds attained by railway travel, can be had from the journal of Najaf Kuli Mirza, grandson of the Shah of Persia, who visited in England in 1836.

They [the English] have made roads of iron, and where it was necessary these roads are elevated on arches. The roads on which the coaches are placed and fixed are made of iron bars. The coach is so fixed that no air or wind can do it any harm, and twenty or thirty coaches may be fixed to the first in the train ... All that seems to draw these coaches is a box of iron, in which they put water to boil, as in a fireplace; underneath this iron box is like an urn, and from it rises the steam which gives the wonderful force ... We actually travelled in this coach, and we found it very agreeable, as it does not give more but even less motion than horses; whenever we came to the sight of a distant place, in a second we passed it.