

## **A brief history of Britain's railways – early times to the 21<sup>st</sup> century**

### **Early Times**



Ancient civilisations realised that wheeled vehicles ran more efficiently and needed less maintenance if they were guided using grooves cut into the stone blocks of roads.

Evidence of these first 'rail lines' used to guide chariots and wagons of the Greek and Roman Empires can be seen today at ancient sites in Greece and Italy.

As far as is known the first railway as such first appeared in the 15th century in the mountains of Slovakia. Iron miners made a track of sorts with slender, straight tree trunks over which they ran wagons with broad grooved timber wheels. In the Slovakian cathedral of Rosvana an altar painting dating from 1513 includes miners pushing such wagons.

References can be found to the fact that in the early 16th century iron wheels had appeared running on trimmed timber tracks. Eventually the wheel flange was adopted to hold a pair of wheels on a track and the use of man or horse-hauled rail wagons in mines spread across Europe.

### **17<sup>th</sup> and 18<sup>th</sup> centuries**

The earliest use in Britain of this type of railway, known as a 'wagonway' came in the 17th century. A 3.2 km (2 mile) line was built by Huntingdon Beaumont at Wollaton near Nottingham between October 1603 and October 1604 to carry coal from pits at Strelley. Britain was to become the world leader in railway development and many of the railway pioneers were to become household names.

In the 18th century horses were used to take coal and ore to the nearest waterway and by this time iron was used for the tracks for the first time.

In 1727, the Ravensworth Wagonway in County Durham built the world's first railway viaduct. Known as the Causey Arch, it carried a line across Tanfield Moor and remarkably it still stands today!

In 1758, the Middleton Railway, a private colliery line near Leeds, became the world's first railway line to be authorised by an Act of Parliament. One of the conditions of extending the line beyond the boundary of the colliery was that adequate fencing to protect the public had to be erected.

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### The Age of the Train

At the start of the 19th century Britain had 2400km (1500 miles) of industrial railway - the next 50 years were to see a massive expansion of the railways that revolutionised transport in Britain and across the world.

The world's first public goods railway authorised by Act of Parliament, the Surrey Iron Railway, was opened in 1803. Iron rails replaced the unstable wooden rails and William Jessop designed a system of square rails with wagon wheels having flanges on their inside edge. However, the only power to pull the wagons remained the horse. - a situation that was soon to change.

Building on the stationary steam engine pioneering work of Thomas Newcomen and James Watt, a Cornishman called Richard Trevithick built the world's first steam locomotive in 1803. His second locomotive, called 'New Castle', was the first to be put to practical use when it began hauling iron a year later at the Peny-darren Iron Works in South Wales. In 1807, South Wales also saw the operation of the Oystermouth Railway - the world's first railway to carry fare-paying passengers- although the wagons were still hauled by horses! By 1808, Trevithick had perfected his design, incorporating his innovation of a chimney to remove the exhaust gases, and exhibited his engine Catch Me Who Can to the high society of London.



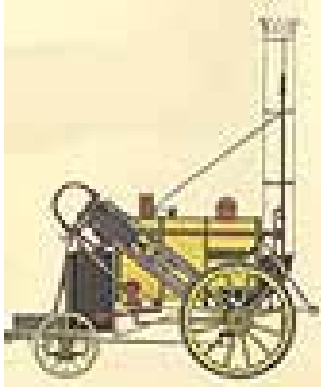
World's first commercially successful steam locomotive. Middleton Railway, Nr Leeds, 1812, Copyright, Science Museum

The world's first commercial use of steam locomotives occurred on the Middleton Railway, where in 1812 Matthew Murray's locomotive, Salamanca, came into operation using a rack and pinion method of traction (used later for mountain railways) devised by John Blenkinsop.

One of the many visitors to Leeds who came to see the rail operation was a young man called George Stephenson, an engine -wright at Killingworth colliery near Newcastle-upon Tyne.

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### Steam becomes king



George Stephenson started building engines and his first called Blucher took to the rails in 1814 at Killingworth Colliery. At nearby Wylam colliery, William Hedley also built engines, the first of which named Grasshopper made an appearance a year earlier.

George Stephenson eventually became engineer of the Stockton & Darlington Railway that came into being in 1821. In 1823 he opened the world's first railway locomotive construction company run by his son, Robert, to build a locomotive for the railway.

On 27 September 1825 on the Stockton to Darlington line, the engine Locomotion driven by George Stephenson became the world's first steam locomotive to haul passengers on a public railway. 500 passengers were carried mostly in open goods wagons, although a lucky few sat in a purpose built passenger coach called the Experiment. The train was led by a man on horseback carrying a flag and it reached a speed of 24kph (15 mph).

The first railway line to be built between two cities was constructed from Liverpool to Manchester a distance of 48km (30 miles). The building of the line involved significant engineering expertise to cross Chat Moss bog, the Sankey Valley and cut through solid rock at Olive Mount.

The term navvies (named after the navigators who had cut out the canals) was applied for the first time to the hundreds of travelling workmen, many from Ireland, who achieved this feat using little more than spades and pickaxes!

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### **The Rainhill Trials**

Before the line was opened, the owners decided to hold locomotive trials to see which engine they would choose for their new railway. The famous Rainhill Trials were held in September 1829 over a distance of 4km (2 1/2 miles) before crowds of upto 15,000! There were five entrants - Sans Pareil built by Timothy Hackworth from Shildon, Novelty entered by John Braithwaite, Timothy Burstall's Perseverance, Cyclopede ( a treadmill worked by two horses!) and the legendary Rocket built by George and Robert Stephenson.

The winner was the Rocket and in September 1830 the Liverpool to Manchester line was opened with George Stephenson at the controls of Northumbrian. As a result of the trials the Stephensons went on to construct eight locomotives for the railway. Four months earlier a small local line between Canterbury and Whitstable had opened mainly carrying freight. However the Liverpool-Manchester line was the world's first true railway carrying passengers and freight over some distance on a double track line of metal rails.

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### **Railway Mania**

Between 1830 and 1850 some 9,650km (6,000 miles) of public railway were built in Britain - this period became known as the age of Railway Mania. In 1837, the first long distance line, the Grand Junction Railway, built by another railway pioneer Joseph Locke, was opened between Birmingham and the Liverpool-Manchester Railway.

A year later Robert Stephenson completed the first section of the London to Birmingham Railway between the newly constructed Euston Station (where the first railway hotel was opened in 1839) and Boxmoor in Hertfordshire. Now there were the beginnings of the world's first true railway system.

Railway safety became an obvious issue - George Stephenson designed the world's first locomotive whistle for the engine Samson following its collision with a horse and cart on the Leicester to Swannington line. The first laws for the safety of the railways were enacted under the Regulation of Railways Act 1840 to be followed by a succession of Acts covering passenger safety and comfort.

There was a massive growth in passenger traffic with many people travelling just for fun. The first excursion train ran in July 1840 from Nottingham to Leicester and in the same year Midland Counties Railway ran an excursion train for 2,400 passengers!

Control of the rail system developed with introduction of the first semaphore signals at New Cross on the London & Croydon Railway in 1841. The same year saw the first use of the electric telegraph to send simple messages from one signalman to another at Chesterfield on the North Midland Railway.

Railway tracks had originally been laid on stone blocks, but the use of wooden sleepers placed at right angles to the track became widespread. With the expansion of the railway system there were obvious advantages in having all tracks the same width or gauge.

Following the Stephensons' example most used the 1,435 mm (4' 8 1/2") gauge, which became the standard gauge for all but one line in 1844. The exception was the Great Western railway line from Paddington to Penzance, built by the outstanding engineer Isambard Kingdom Brunel, that remained at a gauge of 2,140 mm (7' 0 1/4") until 1892.

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### Railway Mania



Railway Mania reached its peak between 1846 and 1850 with the opening of some 6,500km (4,000 miles) of railway lines but amalgamations of small lines had already begun.

George Hudson from York became known as the 'Railway King' as he bought up many small railway companies in the North East. By 1850, the railways of Britain had over 2,500 steam locomotives with the top speed record of 78mph held by Brunel's locomotive Great Britain.

Improvements to passenger carriages, especially for first class travellers, were made with the introduction of the first luxurious Pullman parlour cars imported from America on the Midland Railway between London and Bradford in 1874.

The first dining car called Prince of Wales was introduced by the Great Northern Railway on the Leeds to London route five years later. The first all-Pullman train ran between the capital and Brighton in 1881 and it also became the first train to be electrically lit throughout.

From 1860, coal took the place of coke as the fuel for locomotives which themselves developed rapidly in the next 50 years.

Although the railways were almost all steam operated, Britain's first all-electric railway built by Magnus Volk was opened on the sea front at Brighton in 1883.

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### 20<sup>th</sup> century

The first electrified suburban railway line was opened between Newcastle and Benton in 1904. Steel rails gradually replaced iron and the track lengths of around 20m (60') were bolted together by iron sections called fishplates.

By 1914, there were 130 individual railway companies in Great Britain each with their own distinctive livery. The rail network had grown to 32,265km (20,053 miles) and it was estimated that no village in England was more than 32km (20 miles) from the nearest station.

The railways possessed some 23,000 locomotives, nearly 73,000 carriages and 1.4 million goods wagons. This size of network was to serve Britain well moving troops around the country to the various embarkation points for the war on the mainland of Europe. Working the railways under a central Government committee during the war revealed how wasteful cut-throat competition between over 100 companies had been.



Midland Railway, 1914

The years after the First World War were therefore to see a massive change in the way the railways in Britain were organised. In August 1921, an Act of Parliament was passed to merge the 123 existing companies into just four. The four great railways that came into being on 1st January 1923 were the Great Western Railway (GWR), the Southern Railway (SR), the London, Midland & Scottish Railway (LMSR) and the London & North Eastern Railway (LNER).

The big four companies continued building steam locomotives because coal was cheap and plentiful. There was a degree of rivalry between the companies through the 1920's as to who could build the biggest and most powerful locomotives. GWR had their 'Castle' and 'King' Class locos, LNER under Nigel Gresley developed the 'Pacific' Class locos, LMSR introduced their famous 'Royal Scot' Class locos and SR its 'King Arthur' Class.

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### **Diversification and record breaking**

Facing increasing competition from other forms of transport, the railway companies diversified into operating road vehicles, internal airlines and shipping services. The first train ferry services began in 1924 on the Harwich to Zeebrugge route.

The speed of trains became the new rail battleground, an intense rivalry that began in 1928 when LMSR beat LNER to the record for the then world's longest non-stop railway journey between London and Scotland.

The 1930's saw deliberate efforts to beat the world speed record on Britain's railways. GWR began the race with its claim for 'the world's fastest daily train' known as the 'Cheltenham Flyer'.

The Treganna Castle then claimed a world record of 92 mph for the journey between Swindon and Paddington in 1932. The first steam locomotive to reach 100mph was LNER's Pacific Class Flying Scotsman designed by Nigel Gresley.

In September 1935, Gresley introduced Britain's first purpose-built high-speed train, the Silver Jubilee, between London and Newcastle. On a demonstration run the streamlined A4 Class locomotive Silver Link hauled the train at a world record speed of 112 1/2 mph.

During 1937 intense rivalry developed between LNER's Coronation, a streamlined loco operating on the London to Edinburgh route and LMSR's Coronation Scot, a streamlined Pacific class loco designed by William Stanier, operating from London to Glasgow.

Nigel Gresley decided to go for a record that would not be beaten, even by the Germans who had achieved 124 1/2 mph in 1936. He chose his newest A4 Mallard which in a special trial on 3rd July 1938 along a stretch of track north of Grantham touched 126mph - a world speed record for steam that would never be broken.

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### World War 2 and nationalisation



With the outbreak of the Second World War in 1939, racing on the railways stopped and the industry turned its mind to far more serious matters. Two massive rail movements took place in the early war years. During a weekend in September 1939 over 1,300,000 children in over 3,000 special trains were evacuated from the cities to the countryside. Following the evacuation at Dunkirk over 600 special trains transported over 319,000 troops from Dover to camps and hospitals throughout Britain.

The railways played a vital part in the war effort and were targeted by German bombers. Thousands of items of rolling stock were damaged or destroyed and sadly, 395 railway staff were killed and over 2,400 injured on duty. One old loco named Victoria was credited with downing an enemy aircraft as its boiler exploded during the attack and caused the plane to crash!

Yet again, a World War resulted in a major reorganisation of the railway industry in Britain. A Railway Executive Committee controlled the operations of the big four companies during the war years and this situation continued until nationalisation.

The Act of Parliament was passed in August 1947, a year that also saw the significant introduction, days before nationalisation, of Britain's first main line diesel electric locomotive by LMSR. On 1st January 1948 British Railways came into existence and took responsibility for operating the country's railway system.

British Railways or BR was divided into six regions for operational purposes and had to face all the problems of running a system damaged during the war. Shortages of raw materials and coal added to its problems. In addition much of the rolling stock BR inherited was poor - the steam locomotives included nearly 450 different types some of which were 70 years old!

Rebuilding was a slow and costly business, but as far as the engines were concerned the future was still based on steam. A new type of standard class locomotive named Britannia was brought into operation and in 1954 a more powerful prototype named Duke of Gloucester was developed - it was to be the end of the line for new steam locomotives in Britain.

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### End of the age of steam and rationalisation



Electrification increased, passenger coaches replaced, and in 1955 over a £1 billion was earmarked for modernising BR over a 20 year period.

The move to diesel engines began and between 1955 and 1961 nearly 2,000 diesel engines were bought by BR. The diesel locomotives were less polluting and more economic, even if they required more careful maintenance - the first all diesel maintenance depot was built at Devons Road, East London.

Diesel locomotives were grouped in five different 'Types' according to their power output and one by one all the main routes began to switch to diesel power. Many suburban networks were electrified and where not, smaller linked diesel multiple-units (DMU's) came into operation.

In 1963 a major rationalisation of the rail network began following The Beeching Report - a plan in which lines and stations, losing money as a result of massive competition from cars, heavy lorries and internal airlines, were to be closed. Eventually over 10,000 km (6,000 miles) of track and 4,000 stations were shut down and the railway map of Britain in 1970 again looked like that of 1850.

Between 1961 and 1969 the 13,000 steam locomotives operated by BR disappeared to the scrap heap, preservation groups or museums. The locomotive, Black Five, hauled the last scheduled steam-hauled passenger train in Britain between Preston and Liverpool Exchange on 3rd August 1968.

The end of the Age of Steam also heralded a change in the name of British Railways to British Rail - a company with a new logo and new corporate identity. By this time, ordinary passengers on the East Coast Main Line were doing 100 mph on scheduled trains, They were hauled by powerful 3,300 hp (horse power) 'Deltic' diesel-electric locomotives that had been introduced for the first time in 1961.

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### **Modernisation**

In 1966 electrification of main line routes accelerated with the completion of the Euston to Crewe line. The West Coast Main Line saw a further extension of electric services to the Midlands the following year and eventually to Glasgow in 1974.

Modernisation of passenger coaches continued with The Mark 111 design in 1975 providing air conditioning, double glazing and sound insulation. Freight wagons were also improved with the introduction of high capacity, fully braked units and in 1965 the first Freightliner trains with box containers were introduced.

Safety systems were upgraded with the replacement of old manual signal boxes with power boxes controlling automatic signalling and Automatic Warning Systems (AWS) were introduced to drivers' cabs. Continuous welded rail (CWR) in lengths of up to 402 m (1,320 ft) replaced the old shorter rails and, combined with concrete sleepers replacing wooden ones, a smoother ride and easier maintained tracks resulted.

During development trials in 1973, prototype High Speed Trains (HST's) broke Mallard's record of the fastest train in Britain and the world speed record for a diesel. In October 1976 the first scheduled HST's carried passengers from Paddington to Bristol and they were introduced to many inter city routes. On the electrified West Coast Route Class 87 electric locomotives were fitted with new pantographs to allow top speeds of 177kph (110 mph)

The railway industry did not forget its heritage as it developed these high speed locomotives. On 27th September 1975, exactly 150 years after Locomotion began its historic journey, the National Railway Museum was opened in York by the Duke of Edinburgh.

Development work began on an Advanced Passenger Train (APT or 'tilting train') and during trials it became the fastest train ever to run in Britain when in December 1979 it reached 257.4 kph (160mph) – the train did not go into commercial operation.

In 1982 new powerful Class 58 freight locomotives were introduced to carry 1000 tonne loads at a maximum speed of 130 kph (80 mph). On 30th August 1984 a new HST broke the record for the fastest ever start-to-stop journey by a diesel train between two cities. During the journey of 621/2 minutes between Paddington and Bristol Temple Meads the locomotive, later named Top of the Pops by passenger Jimmy Saville, reached a top speed of 200kph (125 mph).

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### **Towards the 21<sup>st</sup> century**

During the 1980's, at the request of the government, BR sold all of its railway-linked operations to concentrate on running trains. These included Sealink, the railway-owned shipping service, and all the railway hotels.

In 1984 the go-ahead was given for the electrification of the 627 km (390 miles) long East Coast Main Line between King's Cross and Edinburgh, including the link from Leeds to Doncaster.

The electrification project was completed in July 1991. New electric Class 91 locomotives capable of speeds of 225 kph (140mph) were commissioned and the first Electra 225 to begin commercial operation travelled between London King's Cross and Leeds in March 1989.

On 1st April 1994 British Rail was privatised and a number of private companies took over its responsibilities. Railtrack became responsible for the rail infrastructure, 25 train operating companies (TOC's) were to run passenger services, originally seven freight operating companies (FOC's) were created and three rolling stock leasing companies (ROSCO's) were formed.

One of the world's great rail projects, the Channel Tunnel, was officially opened on 6th May 1994, the first time commercial rail travel was possible between the capitals of the United Kingdom and France without being interrupted by a sea journey.