

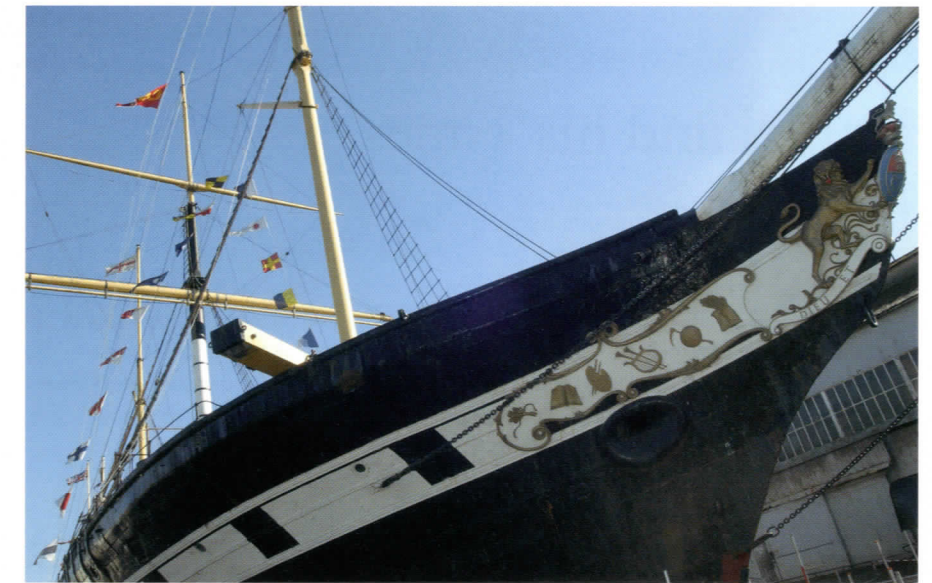


Isambard Kingdom Brunel

A Man of Genius

Brunel would be revered as an engineering genius on the basis of a just a handful of his achievements. His first great ship, the *Great Western*, was the first steamship to engage in transatlantic service. His second, the *Great Britain*, was the world's first iron-hulled, screw propeller-driven, steam-powered passenger liner. The third and last, the *Great Eastern*, was by far the biggest ship ever built up to that time and went on to lay the transatlantic cables that formed the first telecommunications link between Europe and the USA.

On the Great Western Railway (which incidentally carried the world's first postal train), the Box Tunnel was the longest railway tunnel of the age. The Clifton Suspension Bridge was the longest single-span road bridge in the world. The brick arches on Maidenhead Bridge were so wide and flat that many expected them to collapse as soon as the supports were removed. Needless to say, they didn't, and still carry intercity trains from London to Bristol. But the superlatives keep coming. We can add to these engineering feats his ground-breaking work on prefabricated buildings and drainage systems that transformed medical conditions in the Crimea. Then there are architectural



projects as diverse as the traditional elegance of Temple Meads in Bristol, the innovative iron and glass structure of Paddington in London and a magnificent wrought iron bridge at Saltash that still looks modern today.

One of Brunel's greatest gifts, however, lay in his ability to sell his ideas, raise funding, inspire his workers and maintain the high standards that ensured the success of his projects. Of his performance at hearings in the House of Lords, it was said '... rapid in thought, clear in his language, and never said too much, or lost his presence of mind.'

He stayed fully involved with all aspects of his projects from first drawings to finished article, and was as passionate about the aesthetics of a design as about the calculations. In writing to his brother-in-law about the Clifton Bridge, he said: '...of all the wonderful feats I have performed..... I think yesterday I performed the most wonderful. I produced unanimity among 15 men who were all quarrelling about that most ticklish subject – taste.'

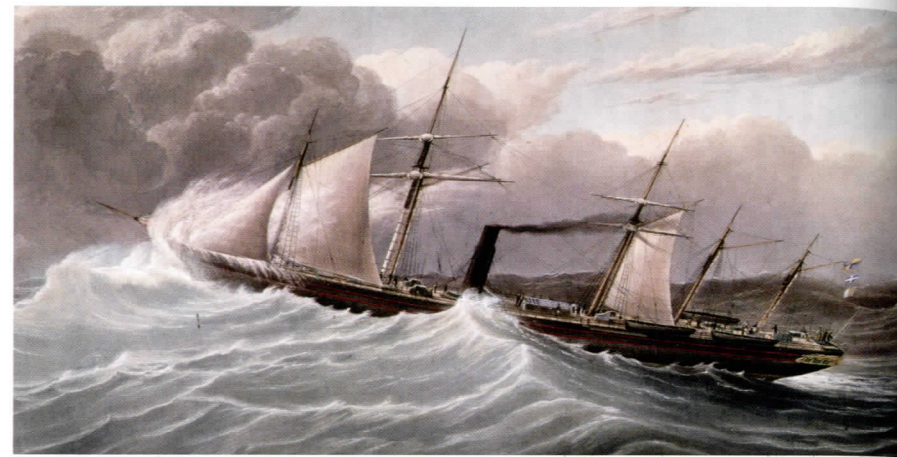
If you add to all these qualities his ability to cross-fertilise methods of construction and uses of materials, it is not surprising that he is regarded as one of the greatest Britons of all time.

Opposite: GWR locomotive *City of Truro* crossing Saltash Bridge. Photo credit: Chris Milner/The Railway Magazine

Above: The *Great Britain*



The triple 'bow and string' construction bridge carrying the branch line from Slough to Windsor.



Brunel and his Times

1806 Brunel born in Portsmouth, the son of a distinguished French engineer, Sir Marc Brunel, who had come to England at the time of the French Revolution. Unlike most engineers of the time, Isambard Brunel received a sound education and practical training – partly in France – before entering his father's office at the age of 16.

1825 Brunel began directing work on his father's Thames Tunnel which ran between Rotherhithe and Wapping. It was opened in 1843.

1830 Wins the second Clifton Bridge competition, and construction began the following year. However, by 1843 when the money ran out only the piers had been built. The bridge was eventually completed by members of the Institution of Civil Engineers after Brunel's death and opened in 1864. The now famous suspension bridge was designed as the longest single-span road bridge – almost 215 metres – in the world at that time.

1832 Begins professional association with the Bristol Docks Company. Brunel was responsible for the redesign and construction of many of Britain's major docks, including Bristol, Cardiff and Milford Haven.

1833 At the age of 26, he was appointed engineer to the newly-formed Great Western Railway. The London-Bristol line opened in 1841 and most of the great civil engineering works on the line – viaducts, tunnels, bridges – are still used by today's high-speed trains. He eventually engineered over 1,200 miles of railway, including lines in Ireland, Italy and Bengal.

1837 Launch of the Great Western, designed for the GWR Company to operate the Bristol-New York route, becoming the first steamship in regular transatlantic service. She crossed the Atlantic, propelled by paddle wheels driven by a two-cylinder steam engine, in 15 days, half that of a sailing ship.

1843 Launch of the Great Britain (pictured above), which probably carried more passengers between England and Australia than any other ship in the 19th century. She was the largest ship in the world at the time and the first propeller-driven, steam-powered iron ship to cross the Atlantic. She served as a troopship during the Crimean War and the Indian Mutiny but, in contrast, she also carried the first ever English cricket side to tour Australia.

1852 Brunel's bridge over the Wye at Chepstow lacked the elegance of many of Brunel's other work, constrained as it was by a site that had a 37-metre cliff on one side and a low-lying alluvial plain on the other. Brunel also had to accommodate over 15 metres of headroom at high tide (the second highest tidal range in the world). His asymmetrical bridge – one of the first open-web girder bridges in Europe – comprised one half with three 30-metre plate girder spans, and the other half with a 100-metre span of quite different design. The bridge was dismantled in 1962, but the University has an original girder section displayed on a plinth alongside the cutting from the Uxbridge branch line of the GWR which bisects the Uxbridge Campus.

1855 Between the request by the War Office in February to the end of the same year, Brunel's unique prefabricated hospital for Scutari in the Crimea was designed, shipped out, assembled on site and had a full quota of 1,000 beds. Prior to its erection, Florence Nightingale reported that three men were dying from disease for every man dying in battle. The structure of self-contained wards and trunk drainage ensured that only 50 out of 1,500 sick and wounded died at the new hospital.

1858 When the Great Eastern, or Leviathan, was launched, she remained the largest ship for another 50 years. She had both paddle and screw propulsion and was designed to carry 4,000 passengers. After a short transatlantic career, she was converted to a cable-laying ship, beginning a 100 years of transatlantic communication by cable.

1859 Opening of the Royal Albert Bridge at Saltash. Brunel's design consisted of two wrought iron trusses each spanning over 140 metres and weighing 1,000 tons with a clear headway for river traffic of 30 metres. The underwater portion of the central pier was a cylinder over 10 metres in diameter, and the base is nearly 25 metres below high water. It still carries all the rail traffic to Penzance.

1859 Brunel died on 15 September. At the time of his death he was vice-president of the Institution of Civil Engineers, and left one son and wife Mary.

The Brunel website includes articles on I K Brunel taken from the University archives: www.brunel.ac.uk/about/history/ikb/



A special set of stamps to mark IKB's bicentenary was introduced in February 2006 (reproduced by kind permission of Royal Mail Group plc). A limited edition First Day Cover with an illustration of the University is also in production.

Highlights of the Great Western Railway

- **Paddington Station**, completed in 1854, comprised a three-span iron and glass structure of 213 metres by over 70 metres, with a 31-metre centre span, all supported by 189 wrought-iron arched ribs and 69 cast iron columns.



The 275-metre long Wharcliffe Viaduct still carries London-Bristol trains at an elevation of almost 20 metres across the Brent Valley in West London.

- **Maidenhead Bridge**, opened in 1839, had to meet the clearances specified by the Thames Commissioners. Brunel's design comprised two brickwork arches each of 39 metres span and a rise of only 7.3 metres – the widest and flattest brick arches in the world.

- **Box Tunnel**, begun in 1836 and the last part of the Bristol-London line to be completed in 1841, runs a completely straight course of nearly 3 kilometres through the Cotswolds. Using nearly 34 tons of stone and 30 million bricks, there was just a 5cm error in alignment when the two ends were joined.

- **Temple Meads Station**, completed 1841, still survives as the British and Commonwealth Museum in Bristol.

- **Broad Gauge** Although other lines around the county were being constructed on tracks the same width as those for coal trucks (just under 1.5 metres), Brunel built his railway with a gauge of just over 2 metres. This gave superior ride and stability

and allowed higher speeds and passenger capacity, but the greater quantity of track already existing in narrower gauge meant that the government eventually had to adopt it as the standard, and broad gauge track was converted. The first broad gauge locomotive took to the rails just one mile from the Uxbridge Campus at West Drayton station in 1838, and broad gauge trains passed through the cutting between Cleveland Road and the main University carpark.

First Brunel Lecture – January 1958

L T C Rolt, famous for his definitive biography of I K Brunel, spoke, appropriately, on the great man. A reprint of his lecture was subsequently available to purchase for 1 shilling, but is now reproduced on the Brunel University website.