



Bridging the World

BENJAMIN BAKER, ONE OF THE MOST IMPORTANT 19TH CENTURY CIVIL ENGINEERS, WAS BORN IN FROME, SAYS CATHRYN SPENCE.

Should you ever reflect on the Forth Bridge, London's underground system, the Hudson tunnel into New York or, indeed, Cleopatra's Needle, your thoughts are unlikely to turn to Keyford, Frome – but that is where the civil engineer responsible for these projects, Benjamin Baker, was born in 1840.

A new exhibition at Rook Lane Chapel, Frome, is celebrating the achievements of this local, yet global visionary. "An engineer of the highest originality and distinction... his connection with the Forth Bridge and the Aswan Dam alone are sufficient to mark him out."

It is thought that Baker's father (also Benjamin) moved from the ironworks at Tondy, Glamorgan to work as a manager at the Butts Hill Iron Works. In 1820, William Cobbett (1763-1835) described Frome as "a sort of little Manchester", due to its weaving industry and many iron foundries – the most famous and enduring being Cockey's and Fussells.

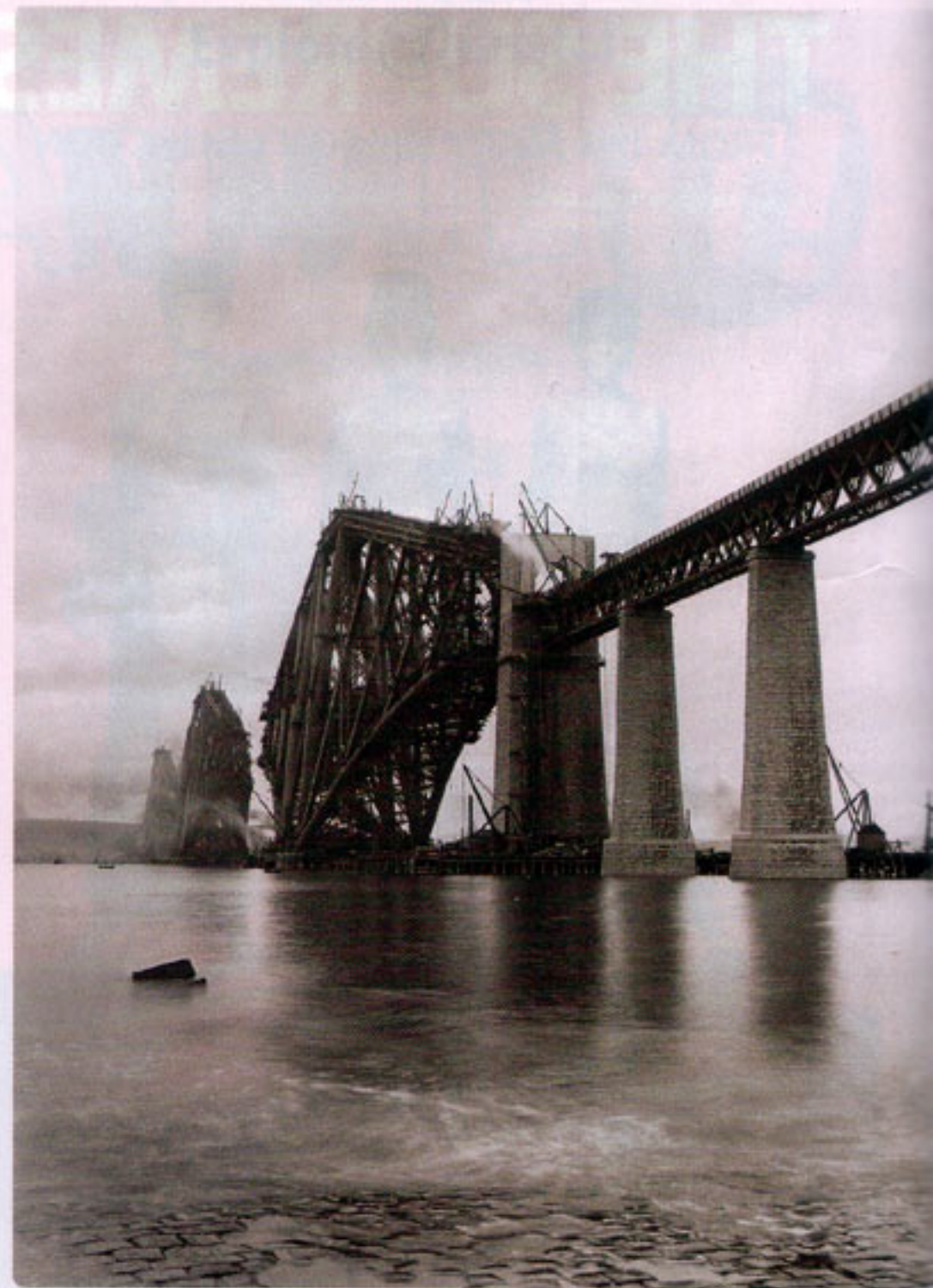
By 1851 however, Baker Snr had died, and his widow moved to Cheltenham, where Baker and his sister, Fanny Maria, were being educated at Cheltenham Grammar School. In 1856, Baker was apprenticed to Price and Fox's Neath Abbey Iron Works (until 1860). He then moved to London to join William Wilson's company, and it was there that Baker assisted in the erection of the Pimlico railway and Victoria Bridge and station.

In 1861, he passed into the office of John (later Sir) Fowler, where his talents were quickly appreciated and within ten

years was given the responsibility for the construction of the Metropolitan and District railways. Baker pointed out the uneconomic use of power associated with travelling between stations only half-a-mile apart – the majority of the journey was actually spent accelerating and then braking. On the Central London Railway he was able to realise his ideal urban railway, which he said should undulate with stations placed at the summit of the undulations. By this means, gravity could assist both the acceleration away from a station and the braking on approach. By so doing, Baker improved efficiency in fuel consumption and speed by 50%. Baker was to later be largely concerned with the introduction of electricity to the London underground, and thus the tube system as we know it today.

During these years Baker studied and published articles on structural theory and the strength of building materials, his particular interest was long span bridges; he also advocated the use of steel over any other material. His investigations were extremely influential, and concluded that, "by a system of cantilevers, supporting an independent girder, an opening might be bridged which could not be spanned by any of the systems previously" known. His theories were, of course, spectacularly proved with the construction of the Forth Bridge.

In association with Sir John Fowler and William Arrol, Baker designed and built the world-famous Forth Railway Bridge, using the principle of the cantilever. Built from steel, Baker took



Top left: Portrait of Benjamin Baker by his assistant Evelyn George Carey, December 1885.

The Forth Bridge, from Hawes Pier, 15 April, 1889.

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"Baker designed and built the world-famous Forth Railway Bridge, using the principle of the cantilever. Built from steel, Baker took into account the effect of wind on exposed bridges, a lesson learned from the Tay Bridge disaster of 1879."

into account the effect of wind on exposed bridges, a lesson learned from the Tay Bridge disaster of 1879. The construction created a continuous railway connection between Edinburgh and Aberdeen. Once work was well underway, Baker gave a lecture to the Royal Institution in May 1887, where he attempted "to convey... some notion of the magnitude of the proportions and difficulties of construction of what is generally admitted to be one of the most important engineering works yet undertaken".

It is testament to Baker (who received a knighthood for this project) that, over a hundred years later, the Forth Railway Bridge is still an internationally recognised landmark and is being considered by UNESCO as a possible World Heritage Site.

Throughout his career, Baker was involved with a number of projects in Egypt advising the Khedive Ismail Pasha on how best to develop the country's resources. Irrigation from the Nile, and maintaining water levels during the summer months, in an almost rainless country, had occupied Egyptians since antiquity. In 1898, Baker was appointed consulting engineer to the Egyptian Government on the Aswan dam and reservoir project, which was completed ahead of time in 1902.

Previously, in 1878, Baker devised a method to bring Cleopatra's Needle to London; one of three ancient obelisks given as a sign of friendship to Paris, London and New York. Muhammad Ali gave the London Needle in 1819 as a

commemoration of Lord Nelson's victories at the Battle of the Nile. However, the British Government was not keen to finance its transportation. (The French had taken seven years to transport and erect their Luxor Obelisk to Paris.) The London obelisk remained in Alexandria until 1877, when Sir William J. E. Wilson donated £10,000 to the scheme. Baker designed a cylindrical vessel – called the Cleopatra, over 28m long and almost 5m in diameter, in which the obelisk was encased and towed, by sea, to England. Again, it is testimony to Baker's incredible skill that the time taken from excavation to erection on Victoria Embankment was only 18 months.

It would be naïve to think that these incredible engineering feats were achieved without disaster or loss of life. Six crew from the rescue boat the Olga, were lost when the Cleopatra broke free in a storm in the Bay of Biscay. They are commemorated with a plaque on the needle's pedestal stone. Whilst 98 lost their lives during the construction of the Forth Railway Bridge, and another 450 were injured. Not to say, 'life was cheap', but more that progress of this magnitude sadly demanded sacrifice.

Until 24 July 2009, Benjamin Baker is being celebrated in the town of his birth – Frome. The first ever exhibition

exploring his work has been made possible due to support from the Heritage Lottery, the Happold Trust and the Institutions of Civil & Structural Engineers, among others.

Hosted by Rook Lane Chapel, a gallery space and architects' practise, the exhibition will include little known photographs of the mile long Forth Rail Bridge under construction, taken by Baker's assistant Evelyn Carey, and printed from the original glass negatives held in the National Archives of Scotland. These images will be displayed alongside rarely seen vintage prints, on loan from Getty Images, of two of Baker's other remarkable projects, the transportation of Cleopatra's Needle and the construction of the Aswan Dam. ■

'Benjamin Baker of Frome: Bridging the World' will be on display at the Rook



Cleopatra's Needle in Alexandria, Egypt, 1877 – showing the beginning's of Baker's cylinder being built around the obelisk. This cylinder would enable it to be transported by sea to London. Photograph courtesy Getty Images.

Lane Chapel, Bath Street, Frome, until 24 July. Open Monday – Saturday, 10am – 4pm; and at Frome Museum, North Parade, Frome, until 24 July. Open Tuesday – Saturday, 10am – 2pm. In addition to the exhibition there will be a Victorian Reading Room at Frome Museum, family workshops, lectures, performances and more. For full details visit: www.rooklanearts.org.uk

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