Panel for Historical Engineering Works Newsletter

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International Historic Civil Engineering Landmark Status for the Great Western Railway

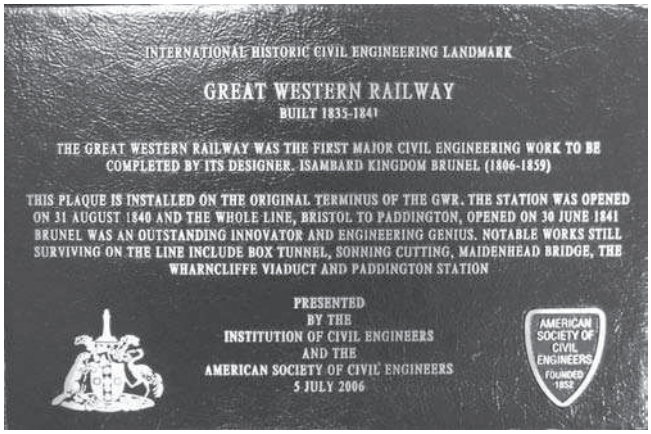
by David Greenfield

One of the major attractions and publicity events during the recent Brunel bicentenary celebrations was a steam-hauled train journey from London (Paddington) to Bristol (Temple Meads) on 5 July 2006. Among those wining and dining in style in a train of Pullman coaches, drawn by GWR King Class loco 6024 'King Edward I', was a party of ASCE and ICE members and staff. These included Emory Kemp, Jerry Rogers and other ASCE and History & Heritage Committee members well-known to PHEW members, on their way to a plaque dedication ceremony.

On their arrival at Bristol, in a torrential storm of almost tropical proportions, they were met in the GWR Board Room of the old Temple Meads station by Bristol's Deputy Lord Mayor, Lord Lieutenant and High Sheriff, all wearing their ceremonial robes of office and no doubt suffering for it due to the high humidity.

The Deputy Lord Mayor of Bristol, a noted local historian, opened the dedication ceremony by greeting the party in 'Krek Bristle' (= 'correct Bristol', i.e., Bristol dialect), before reflecting on the strong historical links between Bristol and America, and how those links were reinforced by Brunel's work in what became his adopted city.

Dennis Martenson and Gordon Masterton responded, in their roles as Presidents of the ASCE and ICE respectively, before jointly unveiling a plaque which acknowledges the GWR as an International Historic Civil Engineering Landmark. The plaque will be mounted alongside other accolades in the foyer of the British Empire & Commonwealth Museum which is housed in the old station buildings.



GWR Plaque text

© David Greenfield

The party then took a guided tour of the building, taking a particular interest both in the vaults beneath the old station (where the ash-disposal holes can still be seen), and of course in the magnificent roof over the former train shed which now serves as a conference and function hall.

Party boarding Pullman coaches at Paddington

© Mike Chrimes

The Brunel Bicentenary Conference and Engineering History Activities

by Jerry R Rogers, ASCE History Committee (HHC)

After Brunel *SS Great Eastern* photographs and exhibits at the London Science Museum, and with Brunel educational panels and brochures at Paddington Station, the Brunel Bicentenary Steam Train Special left 5 July with many engineering friends for Bristol Temple Meads Station.

Following the 'plaque' ceremony concerning the GWR as an International Landmark (see previous article). The

A Remarkable Ritson Remembered

by Roland Paxton

Few civil engineering professionals lose their lives in the course of their duty but James Ritson, a 30-year-old protégé of the eminent Robert Stevenson (1772–1850), did. A review of his brilliant but short career indicates that he was destined for greater things had he lived longer!

Ritson was born in Lamplugh, Cumberland on 26 December 1806 and became apprenticed in c.1822 to G D Rome of Heathfield, near Annan, a land and road surveyor and civil engineer who acted as resident engineer to Stevenson for building Annan Bridge from 1824–1827. It was here working for Rome where Ritson met Alan Stevenson (1807–1865), of similar age, later to become famous as the designer and erector of arguably the world's most finely proportioned and elegant rock lighthouse at Skerryvore Reef some 12 miles southwest of Tiree.

Ritson's competence at Annan Bridge came to the notice of Robert Stevenson who employed him on completion of his apprenticeship c.1827. He remained with the Stevenson firm until his untimely death on 20 March 1837.

Annan Bridge © Roland Paxton

Notable projects on which Ritson worked, essentially as a maritime engineering surveyor included drawing a finely detailed chart of the Scottish coast at a scale of 8 miles to 1 inch showing lighthouses and harbours and many soundings. It was published in 1832 – an outstanding achievement. The chart was based on the firm's and his own work and earlier surveys, and included such detail as the temporary lighthouse at Gullane Hill for trials with illumination using lenses and the firm's level line proposal for the Edinburgh & Glasgow Union Canal.

In 1833 Ritson prepared a detailed survey of the River Tay from Perth seawards on which the firm's subsequently executed improvement of the Tay Navigation, involving the removal of fords, was based. In 1834 he surveyed the site for the proposed harbour at Perth which formed a basis for the harbour improvement eventually started by the mid-century.

Perth Harbour Survey 1834

The following year he surveyed the often inaccessible and storm-washed rock complex at Skerryvore Reef in preparation for building the lighthouse. His chart which also covered the sea to the south end of Tiree where the shore station was to be sited was published in 1834. An 1846 update, after construction of the lighthouse, was published in Alan Stevenson's classic account of the lighthouse in 1848.

Skerryvore – Lighthouse and Ritson's Gully 1846

Skerryvore Lighthouse © R R G Kinnear

In 1834 Ritson prepared a survey of the Firth of Forth coast from Granton to Leith extending inland to Edinburgh for the firm's Granton Harbour proposals for the Duke of Buccleugh. It was whilst the central pier of this project, which in 1850 incorporated

Part of Ritson's survey in Granton Harbour Report 1834

the terminus of the first 'floating railway' ferry, was being built under David Stevenson's direction in 1836–1837 that Ritson died. His diligence in finishing some work in wet weather resulted in his being 'thoroughly soaked' for hours without a change of clothes which led to a fever, pleurisy, and, some weeks later, his death.

Ritson was highly esteemed by the Stevensons and described by Alan as his friend. Alan referred to him in his Skerryvore Lighthouse book as the 'Principal Assistant Surveyor' for this project and recorded that it was due to

his ‘zeal and intelligence’ on this work that ‘so much of the accuracy can be attributed’. He named the deep gully crossing the rock from northeast to southwest ‘Ritson’s Gully’ as a memorial to his ‘activity and perseverance’, after one day Ritson had jumped the 12ft or so across it ‘while it was filled with a breaking wave.’

Soon after Ritson came to Edinburgh to work for Robert Stevenson he met and married Catherine Ruthven of 3 Salisbury Square, Edinburgh, by whom he had six children, three of whom died in infancy. The fourth child whom he named Robert Stevenson Ritson was adopted raised and educated by James’s elder brother Thomas (1802–1862) who was employed by the Northern Lighthouse Board. Alan Stevenson became Robert Stevenson Ritson’s godfather, a duty he clearly took seriously from morally instructive letters to his godson from 1847–1862.

By 1862 Robert Stevenson Ritson was at Nosshead and evidently a competent photographer as David Stevenson, then Engineer to the Northern Lighthouse Board, was much taken with his ‘excellent photographs’ of Nosshead Lighthouse (Alan Stevenson 1849) and used a wood engraving from one to illustrate ‘an ordinary first-class station’ in his article on lighthouses published in *‘Good Words’* in 1864.

Nosshead Lighthouse

PS. For the personal information in this article I am indebted to James Ritson’s great-great-grandson Simon Paterson of Thomas R Paterson and Sons, Salmon Fishers, Strathy Point, Thurso. This is based mainly on a private publication in c.1890 of ‘*Letters to Robert Stevenson Ritson’* dated 1847-1889, two from his uncle William, three from Alan Stevenson, and, one from David Stevenson.

Book Reviews

Battle for the North **by Charles McKean. Granta Books, 2-3 Hanover Yard, Noel Road, London N1 8BE. £20.00**

Review by T Martin and Iain MacLeod

This book is about the Tay and the Forth rail bridges – how they came to be constructed, why the first Tay Bridge collapsed. This review is only about reasons for the collapse of the bridge.

It seems that everyone who writes a book about the first Tay Bridge wants to have a new slant on what caused its demise. Charles McKean’s idea is that Bouch’s design was satisfactory and we need to look beyond wind loading for the cause. He supports the idea (based Bill Dow’s conjecture) that the main trigger for the collapse was that the end of the train became derailed due a kink in the rails. The derailed carriages then hit a main girder causing lateral force on the supporting piers. This caused one of the piers to collapse resulting in the collapse of most of the remaining main span piers and girders.

A main problem with McKean’s analysis of the situation is that he accepts old evidence about the adequacy of the bridge. Three commissioners were appointed for the Court of Enquiry for the disaster: Henry Rothery a Wreck Commissioner with a legal background, William Barlow, President of the Institution of Civil Engineers and William Yolland, Chief Inspector of Railways, also a civil engineer. Yolland and Barlow had both advised Bouch about the wind loading for the design of the bridge. For the final report of the Enquiry Barlow and Yolland effectively exonerated Bouch but Rothery put in a minority report saying that the design was bad and for this Bouch was entirely responsible. He also said that Bouch was partly responsible for bad construction and maintenance of the bridge. McKean writes that Rothery had a personal crusade against Bouch but there is good evidence to suggest that Rothery had it right. Barlow and Yolland as advisors to Bouch were not going to admit that the design was faulty. Admitting this could have compromised their own reputations. They were not independent assessors.

McKean’s conclusion that the wind was not the main agent in the collapse is based on: (a) technical reports presented at the enquiry that confirmed the design of the bridge was adequate in relation to wind loading and (b) the wind was not being particularly strong. Neither of these reasons stands up to scrutiny.

Bouch used 10lb/sq ft wind loading and made no allowance for the event that it might be too low a value. We would now use 50-60 lb/sq ft for the wind loading in such circumstances. The actual strength of the ties (24.1 Tons average from tests after the collapse) was less than their design strength (32.5 Tons). The main failure in relation to the ties was of the cast iron lugs by means of which they were attached to the columns. The specification for the bridge did not require that the holes in the lugs be drilled after casting to provide a uniform seating for the bolts. At the Court of Enquiry Bouch admitted that this was an unsatisfactory detail. That the applied loading was seriously underestimated and the strength of the ties was overestimated are therefore facts. Note that the logical and universally used strategy in structural design is to overestimate the loading and underestimate the strength. These errors do not however prove that the bridge would fail in the wind of 28 December 1879. But our analysis of these effects, using modern methods and reported in the *Proceedings* of the Institution of Civil Engineer in 1995, indicated that that the ties would be likely to fail at a wind force of Beaufort 10/11 (storm/violent storm).

McKean quotes Peter Burt (from his paper about the strength of the wind at the time or the disaster) that the storm was ‘not that severe’. Burt was not inferring that the wind was less than storm force. He was noting that it was not hurricane force for which condition it would be prudent to design the bridge i.e., if the bridge had not collapsed that night, a more severe wind could have come along later and done the job. Benjamin Baker, co-designer of the Forth Rail Bridge, on the basis of observation of lack of damage in the area, reported to the Court of Enquiry that he believed that the wind was not particularly high on the night of the collapse. But he was not there. Experienced mariners who were there, estimated the wind to be Beaufort 10/11. We recently found Meteorological Office records which support this view. Therefore the evidence that the wind could have caused the collapse is strong.

McKean’s book is the second to come out in recent years (the other was by Peter Lewis in 2004) that raises doubts about the blown down by the wind theory. We do not claim that our analysis establishes the truth of the situation. Our methods were by necessity approximate and there may be errors in our calculations. All we say is that our