

# Panel for Historical Engineering Works Newsletter

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Editor's Note

## Iron Bridges at Croome Court, Worcestershire

by Peter Cross-Rudkin and Roger Cragg

The National Trust, with grant aid from the Heritage Lottery Fund, bought the parkland surrounding Croome Court in 1996. The Trust is now well into a ten year programme to restore the grounds, which were landscaped originally by Capability Brown, and were opened to the public in 2003. Across an ornamental lake there are two wrought iron bridges, which are not mentioned in Pevsner. By courtesy of Carter Jonas, the Estate agents and Mrs Jill Tovey, their archivist, we were able to inspect some documents and two drawings of the larger bridge. Neither drawing is signed or shows the bridge exactly as built, and one was apparently produced for the client, the Earl of Coventry, to select some architectural details.

The larger bridge has a single 52ft 6in span and rises about 8ft 6in. The deck ribs are of flat plate 5in x 3/8in with stiffening pieces, 1 1/4in x 1 1/4in, top and bottom running along one side only. There is a 'main' arch rib, also 1 1/4in x 1 1/4in, with a single circle in the spandrel between the two. The ironwork was supplied and erected by John Mackell for £300, which he received in two stages in May 1795. The archives provide no firm evidence of the designer, but James Wyatt was the architect principally involved at Croome at the time, and the structure has affinities with his (three-span) bridge of 1790 at Syon Court, Isleworth (HEW 2376). It seems reasonable to suppose that he was responsible. Mackell was presumably the smith of Park Lane, London who is known to have worked with Wyatt elsewhere. The smaller bridge is similar, but spans 25ft.

These bridges have come to notice because the land has been opened to the public. With the Syon Park bridge they are the oldest wrought iron bridges known to remain in Britain, and they show how understanding of bridge design

in a new material was developing. It is not unrealistic to expect that there are more early iron structures still in private hands. Where appropriate, may we urge readers to make use of occasional openings, for instance under the National Gardens scheme, to look for them?



(the larger bridge) © Roger Cragg



© Roger Cragg

## Charles E Peterson

Readers will be sorry to learn that Charles E Peterson passed away on 17 August 2004 in the USA, shortly before his 98<sup>th</sup> birthday. He was greatly respected for his work over many years in the field of architectural and engineering history and conservation.

## One Email led to 3 Successful Events

by Paul Dunkerley

An email sent to Janice Parkinson, Regional Administrator of ICE North West at their office in the CUBE Buildings, Manchester by Jack Knight, a tunnel engineer, offering to give a paper on 'Victorian Brick-lined Railway Tunnels', led to more than he had bargained for. Janice realised that his offer would fill a gap left by the sudden cancellation of a speaker, so passed the offer on to Trevor Simm, ICE North West Development Officer, who accepted it on behalf of the

where vertical movement of goods took place, the tunnels were driven solely for that purpose. The Great Northern Warehouse has some similarities with the Cromford case but the unloading shafts were not contemporary with the cutting of the canal and by the time they were made the canal had become a dead end canal from the River Irwell.

It would appear from the above, that the arrangement on the Cromford Canal whereby goods were loaded and unloaded at an underground wharf *in a through tunnel which formed part of the main line of the canal* was possibly unique, or extremely rare, and hence the recommendation of the Sub-Panel was that it had a high historical value.

The initial planning application for the development was rejected by the local Planning Authority but the applicant appealed and an Enquiry was held recently. The Sub-Panel's recommendations were submitted to the Enquiry by the Friends of the Cromford Canal as part of their evidence. In his report the Inspector, in allowing the appeal, laid down a number of conditions which would safeguard the line of the tunnel and commented that "... the canal tunnel, with its former loading/unloading facilities connecting the Butterley factory with the barges below, appears to be a unique example of that practice and of more than passing historical interest."

## Scottish Activity

by Roland Paxton

Scottish Regions, Summer Visits, 2004



Denis Naulty at Linlathen Bridge © Author

Highlights of the ICE 2004 Scottish Regions Summer Weekend Visit on 3/4 July, organised by the Scottish Group of the Panel, began at Linlathen East iron bridge where the party was welcomed by Lieutenant-Colonel (rtd) Denis Naulty, Vice-Chairman of Dundee Civic Trust. For some time PHEW has been encouraging refurbishment of this unique iron bridge which is in poor state and thought to be Scotland's oldest surviving example dating from c1804. The party was delighted to know that the Trust and Dundee ICE Branch engineers led by their present chairman Alasdair McLeod were taking an active interest in saving it.



Arbroath, Bell Rock LH shore station © Author

Then northwards to Arbroath where we visited Robert Stevenson's impressive Bell Rock Lighthouse shore station, 1813 (now a museum), the harbour and boat slip, and admired the machicolated splendour of Keptie water tower 1885. At Montrose, the party looked at Owen Williams's soon-to-be-dismantled 1931 reinforced concrete bridge, the harbour and the museum where plans of the bridge showing its steel reinforcement were specially laid out. We returned to Dundee via Stevens' neo-classically embellished Bridge of Dun (built 1785–1787).

The 4 July visits began at Naughton Estate, Balmerino, where owner James Crawford kindly allowed us to inspect and load test his previously unrecorded iron bridge cast at the Durie Foundry, Leven, in 1818.

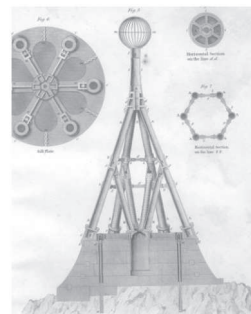


Naughton Estate iron bridge, 1818 © N Butcher



Guard Bridge and St Andrews' railway line © Author

Then onwards, via Guard Bridge c1440, with its differing cutwater details at almost every pier, and the remains of the St. Andrews Branch Railway viaduct, to the site of Robert Stevenson's Carr Rock Beacon work yard (1813–1821) at Fife Ness, where an interpretive board elucidated the working operations. As it was low tide and fine, we saw the long-lasting cast iron unlit beacon erected by Stevenson in 1821 on the bottom courses of his 40ft stone tower destroyed by the sea in 1817.

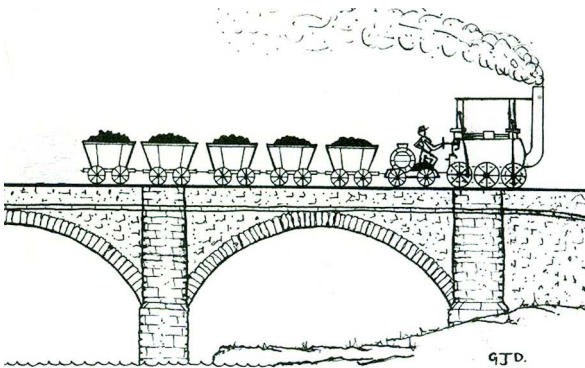


Carr Beacon. Stevenson's *Account*, 1824

The visit ended at Crail harbour with its vertically coursed stones and timber wedged open-jointed facing masonry and nearby Anstruther harbour where, at the Fishery Museum, original Stevenson drawings had been specially laid out.

**Hunting the ‘Ghostly Duke’**

Hunting for the ghostly ‘Duke’ [of Portland] – a fascinating steam locomotive quest which seems to have fallen to my lot! Panel Members who last September visited the ICE initiated conservation of Laigh Milton Viaduct 1811 on the former *Kilmarnock & Troon* may recall my keen interest in the fate of the first steam locomotive in Scotland after having deduced ‘The Duke’s’ 1816 date of operation from foundry records of broken rail replacements.



‘The Duke’ at Laigh Milton Viaduct, 1816 © Author

Imagine my delight a fortnight later, when visiting Broomhall, with the USA National Park Service *Senior Scholar for Historic Engineering* Dr Robert and Perry Kapsch, to learn from Lord Elgin that the 7<sup>th</sup> Earl (of ‘Marbles’ fame) had purchased a ‘Travelling Engine’ from the Duke of Portland for £70 on 5<sup>th</sup> November 1824, presumably on the advice of his engineer Charles Landale. A landmark step forward in the quest but, what had happened to ‘The Duke’ next? Perhaps he served on the Elgin Railway in some capacity? Or, was he converted into a steam pump and used to keep the estate’s ‘Glen Hole’ limestone quarry dry?

From his extensive archive, Lord Elgin knew of an old boiler which had been moved from the quarry in 1874 to serve as a water cistern that was still in existence. Could it provide the answer? Interestingly enough, after some excavation, it turned out to be an early 19<sup>th</sup> century wrought iron riveted boiler 3ft 3in diameter with 0.375in thick plates. But, at 16ft in length excluding its inappropriate bull noses it was, alas, also too long to meet my perception of ‘The Duke’s boiler’!



Old boiler at Broomhall © Author

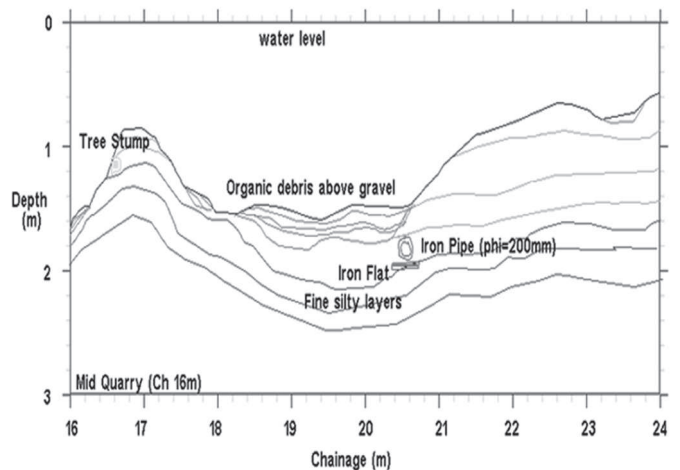
Another tack seemed worth a try, although a long shot. Lord Elgin was able to confirm that the quarry had ceased to operate in 1890, after which it flooded. But, had the opportunity to realise scrap iron value been overlooked? A joint exercise was initiated with myself representing PHEW and Heriot-Watt University, Dr Colin and Gordon Stove of *Radar World* and a 3-man RAF Diving Team headed by Chief Technician Al Goodwin, all of whom enjoyed contributing their services gratis for the good of this cause.



Dr Stove in boat starting radar survey © Author



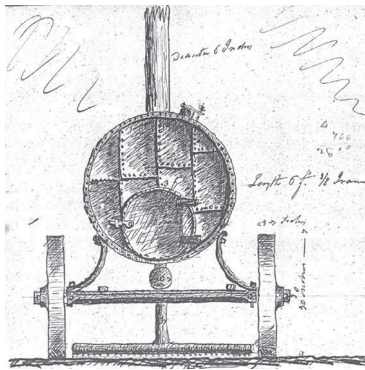
‘Glen Hole’, Broomhall – RAF divers 19.06.2004 © Author



Section at west end of ‘Glen Hole’, Broomhall. Interpreted radar scan showing ironwork © Radar World Ltd

Our findings which resulted from radar scanning from the RAF dingy the whole of the submerged area of the 'Glen Hole', about 14,000 sq m in half a day, indicated an uneven quarry floor submerged to a depth of up to 11m with many tree stumps and about 1m of soft organic silt overall (very smelly when disturbed by the divers!) But, all we discovered by way of iron was a pipe and plate just under the silt at the west end, in line with the entrance ravine.

The quest continues in Lord Elgin's archive in which an intriguing 1820s sketch by the ingenious Landale incorporating a 3ft dia boiler has just turned up. Possibly a tar spreading trailer he had noted in Northern England. Anyway, its boiler is too small to have been the Duke's!



Landale's commonplace book © Elgin Archives

### American Visitors

In August I was delighted to take former ASCE H&HC Chairman (1990–1997) Alan, and Mona, Prasuhn on the 'Antonine' through the Falkirk Wheel, and also, to see Alan inspect our joint ASCE/ICE plaque designating the regenerated Forth and Clyde Canal an International Historic Civil Engineering Landmark. More than a million people have now boated through 'The Wheel' since it was opened just over two years ago!



Professor Prasuhn at plaque near the 'Falkirk Wheel'

© Author

## A Personal Account of Nineteenth Century Tunnelling

### Information supplied by James Child

*James Child's great-grandfather, James Carstairs, was only 24 years of age when he started work on the Calton Tunnel in the 1840s. The following is his account:*

Six years after my time was served and I applied to the contractors for the Western portion of the North British Railway to give me employment, being anxious to learn the

practical part of Railway work. The contractors' names were Lorimer & Somerville. It was the former who lost his life at the burning of the Edinburgh theatre, which gave him both a memorial window and a marble statue and a public funeral.

He was very kind to me and I commenced my duties with great earnestness, the principal one being the construction of the Calton Tunnel and laying off the bridges through the Cannongate as far as Portobello, or rather Fisherrow.

The Resident Engineer, Mr Bell, was a mason and at that time had no knowledge of instruments, so that the whole burden of laying out and levelling fell upon me. Mr Bell was a very hard working man; became in the course of years highly esteemed by the Railway Company, and upon his retirement a few years ago the whole of the Railway officials and other friends, with Sir James Falshaw the Lord Provost of Edinburgh in the chair, gave him (Mr Bell) a public banquet, but to return.

The Tunnel was nearly all through solid rock.

The line was laid over the surface when I went, but the whole of the underground lining [alignment (ed)] was done by myself and the tunnel was to be carried on and built full size without any preliminary heading being made.

I set my theodolite upon the Tower over the centre shaft so as to fix a portion of straight line at each end, also across the centre shaft, but I could not get it to work with the needle, it being attracted by the massy iron railing around the High School. I had therefore to abandon the use of the needle below, from it and the large quantity of rails about and around.

I then upon the centre line took two back objects in the distance upon the produced line. On the west end I fixed a batten upon the parapet of the North Bridge and one of the turrets upon the Castle Rock happened to be fair on the line. This turret I always look at when I happen to be in Edinburgh, for it stood me in good stead at a time when I was in great perplexity. The East End was carried on far distant objects in the same way.

The next difficulty was how to get the centre line and direction: at the horizontal drifts. I tried to measure the distance, with rods upon the surface over the cliffs to the mouth of the drifts, and then measure inwards below, but that failed to give the direction of the centre line.

A happy thought occurred: "the four interior angles of a quadrilateral figure are equal to four right angles".

Fixing a flag at the outer end of each drift, I formed a quadrilateral figure, and the difference between the three angles and four right angles was the measure of the angle of direction of the centre line of the tunnel, the distance being carefully measured, with wooden rods plumbed over the cliffs from the centre line which passed close to Burns' Monument.

Upon these lines and that principle, therefore, the Tunnel was carried on, full size, from eight different points.

It has been my lot, almost all the way through life, to have much anxiety, but the anxiety about the correctness of these lines stands out very prominently.

The inside of the tunnel was all built in brick and cement and it would have been very dreadful had anything been wrong. To make a long and anxious period terminate in a few words after all the junctions were made the lamps