



THE INSTITUTION OF
CIVIL ENGINEERS

Panel for Historical Engineering Works

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CONTENTS

- *International Civil Engineering Landmark - The Dublin-Belfast Rail Link*
- *The Chairman's Column*
- *ICE Marks the Restoration of Homersfield Bridge*
- *New Use for an Old Bridge*
- *Correspondence ...*
 - Torksey Railway Bridge*
 - Crofton Chimney Rebuilding Appeal*
 - Mass Concrete in Buildings*
 - The Thames and Severn Canal*
- *The Mouchel Centenary Conference*
- *Proposed New Book Series from Variorum*
- *HEWs in the News*
- *Editor's Note*
- *Record Form Update*

INTERNATIONAL CIVIL ENGINEERING LANDMARK - THE DUBLIN-BELFAST RAIL LINK

by R C Cox

The President of the American Society of Civil Engineers, Charles Parthum, has presented International Civil Engineering Landmark plaques to Iarnród Éireann (Irish Rail) and Northern Ireland Railways. These are to commemorate the civil engineering achievement of linking Dublin and Belfast by rail, in particular the opening, in 1855, of the Boyne Bridge and Viaduct (HEW 3013), spanning the River Boyne at Drogheda, about thirty miles north of Dublin.

In the early 1840s, there were many lattice girder bridges in America, and a few in England, but all these were of timber. James Barton, in a paper to the ICE in 1855, wrote that 'Sir John Macneill was the first to use wrought-iron lattices in the construction of railway bridges'. In 1843, having already erected and



Pictured at the presentation of a commemorative plaque to Iarnród Éireann (Irish Rail) at Connolly Station, Dublin on 19 June 1996.

Left to right: Professor Alan Prasuhn (ACE History and Heritage Committee), Ron Cox (PHEW Panel Member), Charles Parthum (President ASCE), David Waters (Chief Executive, Irish Rail), and Philip Callery (President IEI)

tested a wrought-iron latticed girder road bridge of 83ft 6in span at Killester, Macneill carried the Dublin & Drogheda Railway (D&DR) over the Royal Canal with a single span of 144ft. The novelty and boldness of Macneill's structure was highly thought of at the time.

When it came to build the railway connecting the D&DR at Drogheda to the Ulster Railway at Portadown, the crossing of the River Boyne at Drogheda presented a considerable challenge. As far as the Boyne Bridge is concerned, it is generally accepted that the conceptual design was Macneill's, but that the detailed working drawings were prepared by Barton, who was Engineer to the Dublin & Belfast Junction Railway. Barton was one of the first two graduates in civil engineering from the engineering

school at Trinity College Dublin, which had been founded in 1841.

The plaques carry a reference to the Boyne Bridge, rather than Boyne Viaduct. This is because the world civil engineering landmark value of the crossing of the Boyne at Drogheda lies in the fact that it was here, for the first time, that iron latticed girders were used in a bridge on such a large scale. The girders formed the bridge over the waterway and connected two masonry approach viaducts. Macneill and Barton pushed structural engineering technology to new limits at the Boyne with a span of 549ft. continuous over two supports, the central span being 267ft.

The Boyne Bridge is also considered to have been the first to have been designed in accordance with calculated stresses and provides us with an early example of rational engineering design. The results of tests to destruction on a number of wrought iron columns and struts at the site were published by Barton and his assistant Bindon Blood Stoney and provided invaluable information for structural designers.

The plaque ceremonies took place on 19 June in Dublin and Belfast. A small group from the Institution of Civil Engineers (NI Local Association) travelled to Dublin on the 0800 service and joined representatives of the American Society of Civil Engineers and the Institution of Engineers of Ireland for the presentation of the Dublin plaque to the Chief Executive of Irish Rail (the plaque is to be mounted at Connolly Station). Most of the guests then travelled to Belfast on the 1300 service on which lunch was served. The Belfast plaque was presented to the Managing Director of Northern Ireland Railways at a ceremony at Central Station, where the plaque will be mounted. The group from Dublin then returned on the 1800 service from Belfast and were provided with an excellent dinner en-route.

The IEI and the ICE (NI LA) acknowledge with gratitude the excellent arrangements made by both railway companies, which ensured that a most enjoyable day was had by all who participated in this commemoration of a significant civil engineering achievement. The American Society of Civil Engineers is to be congratulated on their historical and heritage activities, in particular the International Civil Engineering Landmark scheme.

THE CHAIRMAN'S COLUMN by Roland Paxton

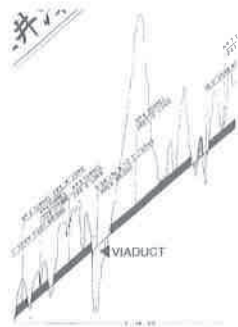
The Panel's connection with English Heritage continues to develop and has taken a significant step forward with the appointment of Mike Chrimes to their Industrial Archaeological Advisory Panel and with our submission to them of a list of 120 HEW's as candidates for listing with a view to safeguarding more of the best of our engineering heritage and obviating another Thames Tunnel debacle. Gareth Gardner's coverage of our efforts in *New Civil Engineer* 1/8 August is much appreciated.

A pleasing development in Scotland is the re-launch of the Forth Bridge Visitor Centre in permanent premises at the Queensferry Lodge Hotel, North Queensferry. The Centre's Trust chaired by Douglas McBeth, and on which I represent the Panel's interest, now receives an annual rent from Regal Hotels plc which will enable us to continue to develop and manage the content of the exhibition. The location affords superb views of both bridges, admission is free and visitors are most welcome.

My 13-day visit to Japan in June at the invitation of JSCE's Committee on Historical Studies was excellently organised by Hiroshi Isohata and Shigeru Onoda and proved to be stimulating and most worthwhile. It included attendance at the Committee's annual national conference at Akita University in Northern Japan, at which I read a paper relating to the conservation of historic railway structures with particular reference to the Laigh Milton Viaduct project. Some measure of the activity of their Committee can be gauged from the fact that 81 other refereed papers were also published and read simultaneously at three venues. It was interesting to note that each author had contributed up to £400 towards publication costs! After my lecture, which was most ably interpreted by Dr Isohata to an audience of about 200, I attended several other presentations including one by Professor Konishi relating to the present state of disused structures on the Usui Mountain Railway which I visited two days later. This 1 in 15 gradient rack railway connecting the east and west of the country, on one of Japan's most historic and scenic lines rising to over 1,000m above sea level, was constructed in 1891-1892 under the direction of Charles Pownall CE (see *Min.Proc.ICE.* cxx, 43-53).

Because of the mountainous terrain much of the Usui Railway was in tunnel, emerging frequently to cross steep-sided gullies. Its principal bridge structure, the Usui Viaduct, has four brick arches,

three of which were originally of 60ft span, and is about 112ft high. By c.1910, to safeguard against earthquake effects, the piers had been widened and extra arches provided which reduced the clear spans to just over 54ft. All the disused structures have now been examined and reported on by JSCE members to assess the extent of any repairs needed and a feasibility study is now in hand for the conservation of some structures including the Usui Viaduct which JSCE's Committee on Historical Studies is recommending for preservation. However, obtaining the necessary finance will not be easy. We wish them well in this most worthwhile objective under their new Chairman Professor Yoshio Hanzawa who, amongst many kindnesses, introduced me to the delights of sushi! More about Japan anon.



Disused Usui Railway section including viaduct



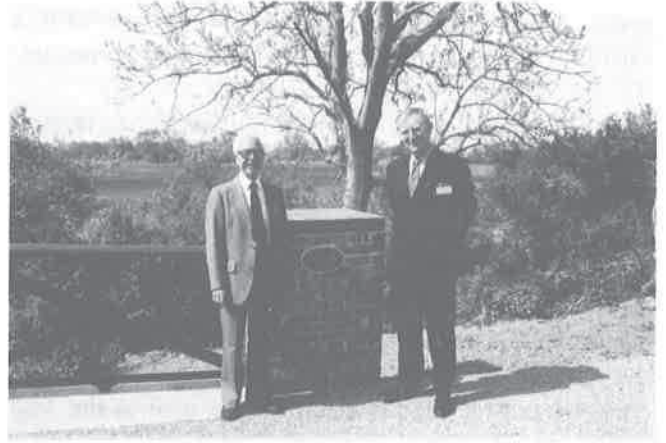
On Usui Viaduct trace-bed with Professor Kubota
courtesy Shigeru Onoda



At Usui Viaduct with Professor Konishi
courtesy Shigeru Onoda

ICE MARKS THE RESTORATION OF HOMERSFIELD BRIDGE

by Ted Labrum



Homersfield Bridge
(photograph courtesy of Mrs Ridley)

On 31 May 1996 the President, Professor Tony M Ridley, unveiled a plaque on Homersfield Bridge, the oldest concrete bridge in Britain, to commemorate its restoration. The ceremony was attended by representatives of the Norfolk Historic Buildings Trust, English Heritage, various local authorities and the East Anglian Local Association (Chairman, Steve Read) who hosted the event. This public road bridge was built in 1870 as a private venture by Sir Shafto Adair and the President was pleased to welcome at the ceremony Lady Darell, a descendant of Sir Shafto.

The above picture shows the President (right) after unveiling the plaque, accompanied by Panel member Ted Labrum.

NEW USE FOR AN OLD BRIDGE

by Ted Labrum

It is not easy to find an appropriate alternative use for redundant girders from an old bridge but Norwich found a novel solution.

Dukes Palace Bridge, carrying Duke Street over the River Wensum near the heart of Norwich, is one of a very distinctive array of river bridges in the city. The earlier cast iron arch of 60ft span was built in 1822 to a design by the engineer Henry Lock but the narrow road width over the bridge eventually