THE INSTITUTION OF CIVIL ENGINEERS

PHEW NEWSLETTER

Panel for Historical Engineering Works

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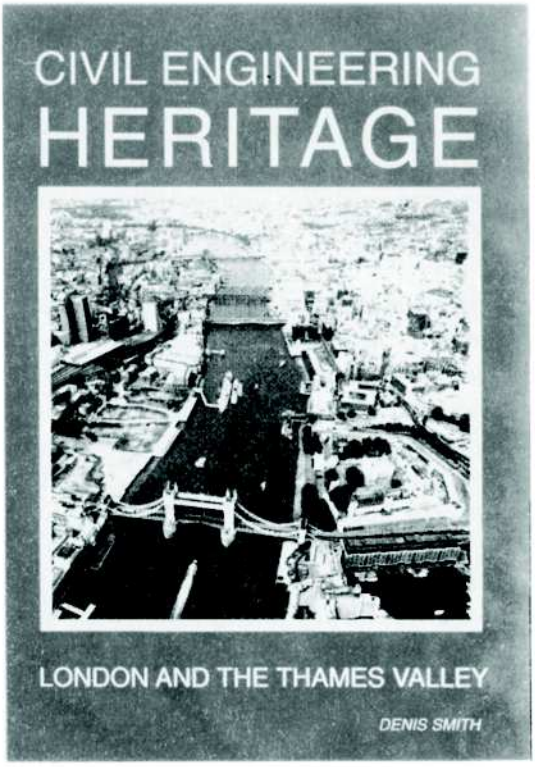
CIVIL ENGINEERING HERITAGE: LONDON AND THE THAMES VALLEY

by The Editor

December 2000 saw the publication of the Panel's sixth volume in its *Civil Engineering Heritage* series, which covers London and the Thames Valley and completes the coverage of England and Wales. Denis Smith, Panel member for London, edited the volume and there was important input to its production from Brian Powell, member for the Chilterns and the Thames Valley, Malcolm Tucker and Peter Stephens, the Panel's Technical Secretary.

Given the fact that the volume mainly covers the metropolis, it has generally adopted a thematic approach to the presentation of the works it describes and in this respect differs from the geographical approach adopted by the other volumes in the series, although Chapter 9 considers all selected work in the Thames Valley. Two whole chapters are concerned with the Port of London and engineering associated with the River Thames and other chapter topics include Rivers and Canals, Public Health Engineering, Railways and Notable Buildings. Some two hundred works are described – many are illustrated by photographs or drawings. Denis Smith has contributed a substantial number of photographs, but has also enclosed a significant number by Wendy Teppett who undertook a major photographic survey for the book. Each chapter is introduced by clear location maps of the works described and a relatively brief, but informative, introduction to the chapter contents.



Available from TTL Bookshop (tel: 020 7665 2019)
Price £19.95

The works described have been selected because of their technical interest, innovation, durability, aesthetic qualities and sometime because of their association with eminent engineers. The text is designed to provide a better understanding of the contribution made by Civil Engineers to the economic and social development of London and the Thames Valley. Examples of the work of Sir Marc and Isambard Brunel, the Rennies, Robert Stephenson, William Cubitt, Sir Joseph Bazalgette and many others are included.

The 'index' section at the rear of the volume has a helpful listing of London Memorials to Civil Engineers. As with other books in the series the volume is presented in an attractive cover illustrated by an aerial view of part of the River Thames with Tower Bridge in the foreground.

The London and the Thames Valley volume is the penultimate in the series designed to cover Great Britain and the whole of Ireland. Work is continuing steadily on the one remaining volume, which is planned to encompass the whole of Scotland.

LIFFEY BRIDGE RESTORATION
by Ron Cox

Dublin's famous landmark, the Liffey (or Ha'Penny) Bridge (HEW 3032), has received a £1.5 million refurbishment and was re-opened on 21 December 2001. This single 138ft span cast iron footbridge was erected over the river in 1816, the castings being supplied from a Coalbrookdale foundry. Following a structural assessment by Mott MacDonald EPO Limited, the main contractor, Irishenco Construction, part of the Mowlem Group, supervised the work of refurbishment over a period of nine months. Overall management and funding were provided by the Roads and Streets Division of Dublin City Council.

Subcontractor Gabriel Hughes Contracts undertook the task of cleaning the superstructure and railings. This entailed the removal of all existing paint by hydro-blasting, followed by dry blasting to remove rust scale and prepare the surfaces for re-painting. The superstructure was carefully examined and cracks in all components repaired by Metalock UK, using micro-stitching techniques. Eight new cruciform bracing members were installed to replace broken bracings. New masonry flanking walls to match the existing quay walls were provided.

The railings, which were in a particularly poor condition, and would have failed modern safety standards by a factor of six, were dismantled and dispatched to Harland & Wolff in Belfast, who were able to salvage around ninety-eight per cent of the ironwork.

The off-white colour of the restored bridge is as close to the original as possible, and corresponds with a decree by George III that the new iron bridges in his Kingdom should be painted white to assist riverine navigation. Around ten million pedestrians per annum use the bridge.

Liffey Bridge
© Author

THE CHAIRMAN'S COLUMN
by Professor Roland Paxton

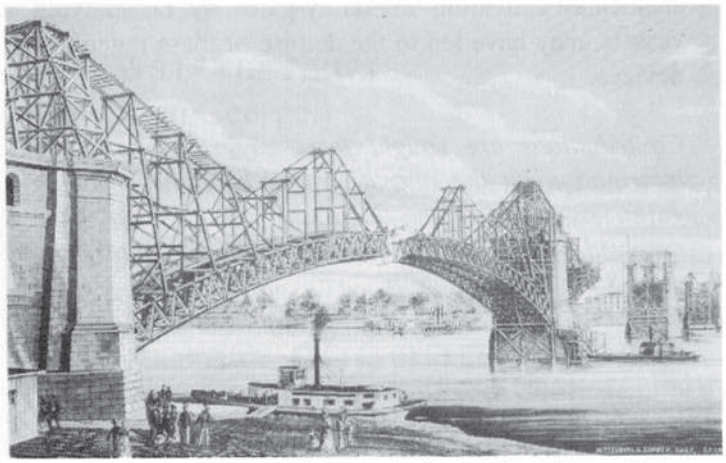
The Panel welcomes and has actively contributed to two recent initiatives both commissioned by Historic Scotland. The first is a draft of *Scotland's Iron Structures T(echnical) A(dvice) N(ote)* under preparation by Tom Swailes of UMIST. This much-needed manual, profusely illustrated with examples, will undoubtedly assist the authentic preservation of historic iron structures. It includes sections on the principles and philosophy of conservation, iron making, the structural use of iron, structural elements and their appraisal, materials and properties and conservation and repair. With its wide coverage this advice note also constitutes a valuable account of the historical development of structural ironwork in Scotland, particularly in the nineteenth century. Publication is expected in the near future.

The other initiative is a *Proposed Professional Accreditation Scheme in Conservation* document being prepared by Heriot-Watt University and the Edinburgh College of Art's School of Architecture. It consists of a rational educational framework for the accreditation process drawn up from an architectural standpoint. However, Historic Scotland, English Heritage, and also PHEW, have for a long time felt the need for engineers involved in the preservation of the nation's engineering heritage to have the requisite aptitude and knowledge, including state-of-the-art techniques. I am currently in discussion with the document's co-author Dr Stewart Stirling with a view to PHEW being included as an organisation to be consulted on historical engineering works. The Panel would provide information from its records, an assessment of the work's significance and make preservation suggestions based on its national competition adjudications and other experience. Although supportive of the proposal, the Panel does not have the resources to take a lead in managing the accreditation of individuals or firms.

The Imada family on the 100th birthday of their mother (Kaichi Watanabe's daughter)
© The Imada family

A memorable experience of my historical engineering visit to Japan in 1996 was being hospitably entertained by the Imada family at the Ginza in Tokyo and talking to their remarkable 95-year-old mother. She wished to visit the Forth Bridge that she had heard so much about from her father, Kaichi Watanabe. He was the graduate engineer on Sir Benjamin Baker's staff commemorated for posterity in the historic photograph of Baker's human cantilever model illustrating the structural principle of the Forth Bridge – tubes in compression, struts in tension! [see http://www.forthbridges.org.uk] Watanabe gained valuable experience under Baker and on his return to Japan became a successful and influential railway engineer. Recently the Imada family sent me a photograph taken on their mother's 100th birthday which I feel sure they will be delighted to share with readers. Congratulations to the Imada family. This subject is still of interest as exemplified in a recent visit by first year civil engineering students and staff of Heriot-Watt University to the model at the Forth Bridges Visitor Centre. Here, Professor Garry Pender braved the Watanabe seat after rain and the human cantilever experience was re-lived yet again to the delight of all.

Professor Pender, and Heriot-Watt University students 'humanising' a Forth Bridge model
© Dr Scott Arthur



Closing the east arch of the St Louis Bridge. *Scientific American*, 15 November 1873
© Linda Hall Library

On the ASCE front, provisional discussions are now taking place between myself and Vice President Dr Jerry Rogers for a 5-day tour from 24-28 June 2003, commencing with a joint one-day Stephenson symposium in London followed by visits to sites in North Wales for possible joint International Landmark plaque ceremonies. Then on to north-west England and Central Scotland. Our visitors are expected to include ASCE President Tom Jackson, Dr Rogers, Professor Petroski and other Heritage Committee members. The Panel is looking forward to a considerable involvement. Dr Rogers has also mentioned an outstanding historical exhibition at Linda Hall Library of Science, Engineering and Technology, Kansas City, until 31 July in honour of ASCE's 150th anniversary. Since 1995 the Library has acted as ASCE's library and all their publications are deposited there. The exhibition focuses on the accomplishments of American and European engineers ranging from Leonardo's 1497 canal lock to nineteenth century bridges, with UK engineers much in evidence. An illustrated catalogue is available from Linda Hall Library, 5109 Cherry St, Kansas City, Missouri 64110-2498, USA.

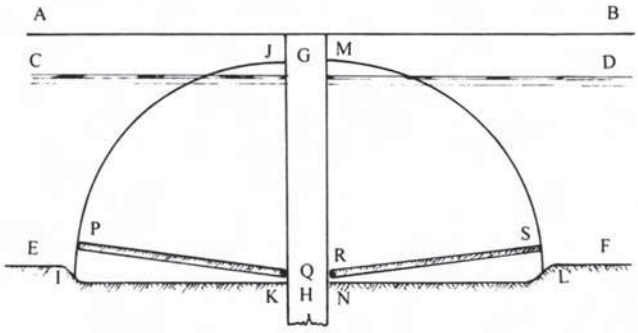
Dalingross Bridge, Comrie after refurbishment in 2001
© The Author

The 2001 conservation commendation awarded by the Saltire Society's Civil Engineering Award Committee on the Scottish Group of the Panel's recommendation was for Dalingross Bridge crossing the River Earn at Comrie. It is a riveted steel plate-girder arch bridge of three spans erected by Sir William Arrol in 1901, which has been strengthened by the seeding in of three new girders without spoiling its appearance. Congratulations to Charles Scott and Partners, Morrison Construction and Perth and Kinross Council.

Finally, well-earned congratulations to Denis Smith and his helpers on an excellent effort in producing an attractive-looking and authoritative sixth volume in

our *Civil Engineering Heritage* series – *London and the Thames Valley*. Also, congratulations to Keith Thomas, in co-operation with Roger Cragg and Paul Dunkerley for their valuable contributions in forming the all-Wales Group of the Panel. This reorganisation was necessitated by Local Association boundary changes following the creation of the Welsh Assembly. The Panel wishes the new Group a long and successful future under Keith Thomas's leadership.

BRINDLEY GATES
by R B Schofield



A Brindley Gate

Embankment failures are common enough on British canals and their effects are frequently devastating. A typical early reference states that in 1783, a sudden slip occurred in the banks of the Bridgewater Canal such that three barges were carried through the breach 'a great way out into the fields'. In more recent times, a similar great onrush of water followed a bank slip on the Shropshire Union Canal north of Market Drayton[1], wrecking property nearby and demolishing a road bridge, before flow was halted by *stop-planks* at Adderley and Audlem. In spite of these emergency measures, one mile of canal was emptied in 12 hours and the canal bed to the north was scoured to a depth of 5 feet.

Stop-planks are but one of three devices described by Rees[2] as used on the British canal system to minimise the damage resulting from bank failure. They were then regarded as 'not so expeditiously a provision for stopping a canal' and yet they are still widely used today; perhaps because no other method has been devised which has better stood the test of time. Vertical grooves are provided in the opposite walls underneath a bridge, or at places located at intervals on a long, level embankment so that whenever water flow has to be stopped (for repairs, or because of bank failure) a sufficient number of drop-planks can be lowered into the grooves.

Rees describes two, ostensibly more effective, methods of stopping flow by means of *safety-gates* and *stop-gates*. These devices seem to have been in common usage during the canal era and were probably preferred to stop-planks. An outline diagram of a *safety-gate* is shown. AB is the towpath level and CD the water level, EF being the canal bed. GH is a vertical stone pillar let into, and flush with, the masonry wall under a bridge, or in a narrow place, as earlier described. IJK and LMN are recesses cut about two inches deep into the walls. Similar provision is made in the opposite wall such that gates PQ and RS, which normally recline across the bed of the canal, can rotate into vertical positions on centres, or hollow quoins, at Q and R. Each gate is counterbalanced and any sudden, rapid flow of water following a breach would automatically lift one or other of the gates into the vertical position and thus arrest the flow. Rees stated that 'safety-gates should be placed at proper distances on every long level or pound of water, especially if the same is much embanked' and 'a single safety-gate ought to be placed at the end of every long embankment'.

Safety-gates are sometimes known as 'Brindley Gates' because their design is attributed to the engineer James Brindley (1716-1772) but there is no certainty that this is so, even though some appear to have been installed on Brindley's Droitwich Canal, once described as his *chef d'ouvre*[3]. The remains of such gates were found during recent restorations of the Kennet and Avon Canal; they are also believed to have been installed on the Cromford Canal[4].

Stop-gates are similar in construction to safety-gates except that they lie flat on the bed of the canal and are not counterbalanced; in the event of a breach the gate is lifted manually into the vertical position by a chain fixed to the gate.

It is likely that the difficulties of maintaining both types of gate, quite apart from the possibility of accidental activation of safety-gates by fast-moving vessels, may have led to the demise of these ingenious devices.

Contributions are sought from any readers having information on the operation and efficiency of such gates, as well as the locations of any that have survived. Please communicate with the editor, see page 8 for contact details.

References

1. *Waterways World*, Vol.30, No.3, March 2001, p29.