INDUSTRIAL ARCHAEOLOGY NEWS

129
SUMMER
2004

THE BULLETIN OF THE ASSOCIATION FOR INDUSTRIAL ARCHAEOLOGY

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ASSOCIATION FOR INDUSTRIAL ARCHAEOLOGY

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Liaison Officer
Simon Thomas
AIA Office, School of Archaeological Studies, University of Leicester, Leicester LE1 7RH
☎ 0116 252 5337, Fax: 0116 252 5005
e-mail: AIA@le.ac.uk
Website:
www.industrial-archaeology.org.uk

COVER PICTURE

John Brown's Shipyard on the Clyde, now mostly demolished, with the exception of the Giant Cantilever Titan crane built by Sir William Arrol & Company in 1907 (see regional report on Scotland, page 12)
Photo: Crown Copyright: RCAHMS

Timely rescue of Brunel's canal bridge

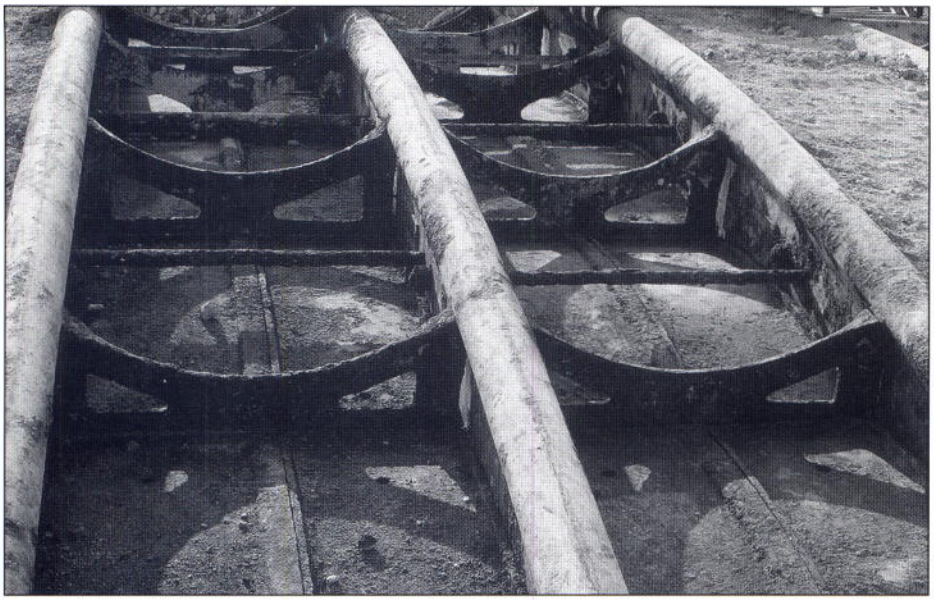
A newly discovered I.K. Brunel iron bridge of 1838, which carried Bishop's Bridge Road across the Grand Union (formerly Grand Junction) Canal at Paddington (TQ 26488159) in west London, will have been completely removed by early May for a major road widening scheme. Its carefully dismantled cast ironwork and facing bricks will have been put into temporary storage, for re-erection when a suitable place for that can be confirmed and funds raised. It is hoped it may not be far from the original site. Meanwhile the structure has been carefully recorded by measurement and photography.

Malcolm Tucker

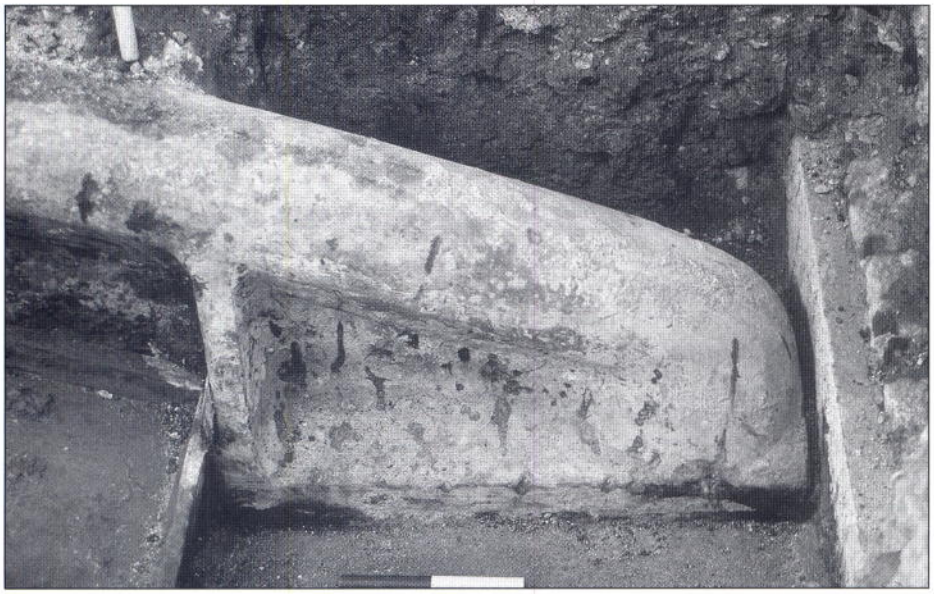
When, in 1837, the Great Western Railway Company finally decided on Paddington for their London terminus, the parish vestry required then to provide a public road access across the station site. At one end this had to climb abruptly from the Harrow Road to pass over the canal, which here paralleled the railway at a higher level. In order to achieve a gradient of 1 in 20 and maintain navigational headroom, Brunel (as the railway's chief engineer) was obliged to adopt cast-iron girders for the canal bridge to minimise its constructional depth. This seems to have been his first use of the material in a bridge. Brick or cast-iron arches would have risen too high and wrought-iron girders had not yet been developed. Brunel's reasoning on this is confirmed in his letter to the canal company.

To keep the girders to practical lengths he used two spans, one of 35 feet (10.67 m) clear width as the main navigational span, for two

Underside of the main span of the bridge *Photo: Malcolm Tucker*



Bulb-topped girders with cross-beams and tie rods, with concrete infill *Photo: Malcolm Tucker*



Distinctive bull-nosed end of main bridge girder *Photo: Malcolm Tucker*

General view of the main span of Brunel's Paddington bridge, with later brick parapet *Photo: Malcolm Tucker*

barges to pass each other alongside the towpath, the other of 16 feet (4.88 m) for barges using the busy wharves on the offside. This was evidently unsatisfactory to Brunel's architecturally sensitive eye and so, to maintain symmetry at least on paper, he designed a further span of 16 feet behind the towpath. This was faced to match the canal spans, although closed by recessed walls to hide a conventional brick barrel vault within. This was the start of the viaduct across the station site. Also for sake of appearance, he formed the undersides of the girders as shallow, segmented arcs and hid their side faces behind brickwork, with classical entablatures of frieze and cornice in Portland stone and smart, cast-iron parapets. The piers stood forward as pilasters between the spans and to close the ends. The bridge was 40 feet (12.2 m) wide between the parapets.

Thus the bridge remained until around 1909, when the open parapets were replaced by high walls of red brickwork and views of the canal were cut off from the road, Also, this part of the canal remained inaccessible to the general public after the other London towpaths were opened as footpaths in the 1970s. Thus concealed, the canal bridge's survival as a Brunel relic of interesting design went unrecognised by historians, although some railway enthusiasts claim his association with it as common knowledge.

The key identification was made by Steven Bridle of English Heritage. He had found a Brunel notebook in the Public Record Office with careful sketches and a tabulation of the proof load tests on the bridge's girders. On gaining access to the bridge in May 2003, he found Brunel's structure intact. But a major road contract that would sweep it away had already been signed. Fortunately, Westminster City Council has risen to the occasion, and has been able to fund the extra costs of dismantling rather than demolishing the bridge, within a tight construction programme.

The details of the bridge's ironwork have proved particularly interesting, and indicative of Brunel's unceasing originality. The girders have an unusual bulb section to the top boom. This has a greater cross-sectional area than the bottom flange, contrary to Hodgkinson's principle of making cast-iron bottom flanges considerably larger than the top (in proportion to the material's inferior strength in tension compared with compression). Did Brunel look upon the pronounced sickle shape of these girders as forming an arch, with the top boom taking an extra compression force? He did not provide end bearings for that, but incidental arching will have helped withstand heavy modern traffic. Curiously, the shape anticipated Brunel's 'balloon' flanges in wrought iron, despite the major differences of the two materials.

The plates in the soffit that supported the lime-concrete deck fill are also unusual. In the main span, they arched longitudinally between cross beams which stabilised the girders, while in the small span they arched laterally from girder to girder, like jack arches. I have had the privilege of recording all these features in detail on behalf of English Heritage.