Thoughts on refurbishing Linlathen East Bridge, Dundee – Scotland's oldest surviving iron bridge?

By **Professor Roland Paxton,** *Engineering historian and conservationist**

Presented to Dundee Civic Trust at Abertay University 29th January 2004

ICE lecture by Roland Paxton 13.2.2013

PHEW Mission *'to identify, record and promote knowledge of civil engineering heritage and to encourage excellence in conservation of its finest examples'*

Backing for restoration of bridge

PROFESSOR ROLAND Paxton was in Dundee last night to fire up enthusiasm for the restoration of the Linlathen East bridge, describing similar projects with which he has been involved.

At a public meeting organised by Dundee Civic Trust at Abertay University, Professor Paxton, honorary professor of civil and offshore engineering at Heriot-Watt University, and a member of the Royal Commission on the Ancient and Historical Monuments of Scotland, warmed to his topic immediately reminding the audience that the bridge over the Dighty was Category A listed—"the same category as Holyrood Palace."

The bridge's importance lies in its status as the oldest surviving cast iron bridge in Scotland.

Dating from around 1804 it has great importance in the development of metal bridges, and as such the Institution of Civil Engineers (East of Scotland) were encouraging its restoration as an example of excellence.

Professor Paxton stressed that it was not going to be an easy job but that it was possible. The bridge had been grossly altered and crudely converted into a three-pin arch. It had been adapted for farm use, with timbers added to the arch.

The bridge embodied Dundee technology of 1804, and displayed features he had not seen elsewhere and this was part of its charm.

The meeting heard that Dundee City Council is supportive of the project.

Councillor Rod Wallace, whose ward takes in the bridge, said that the area was to undergo massive changes with housing development and it would be important to make the bridge user friendly and part of the community.

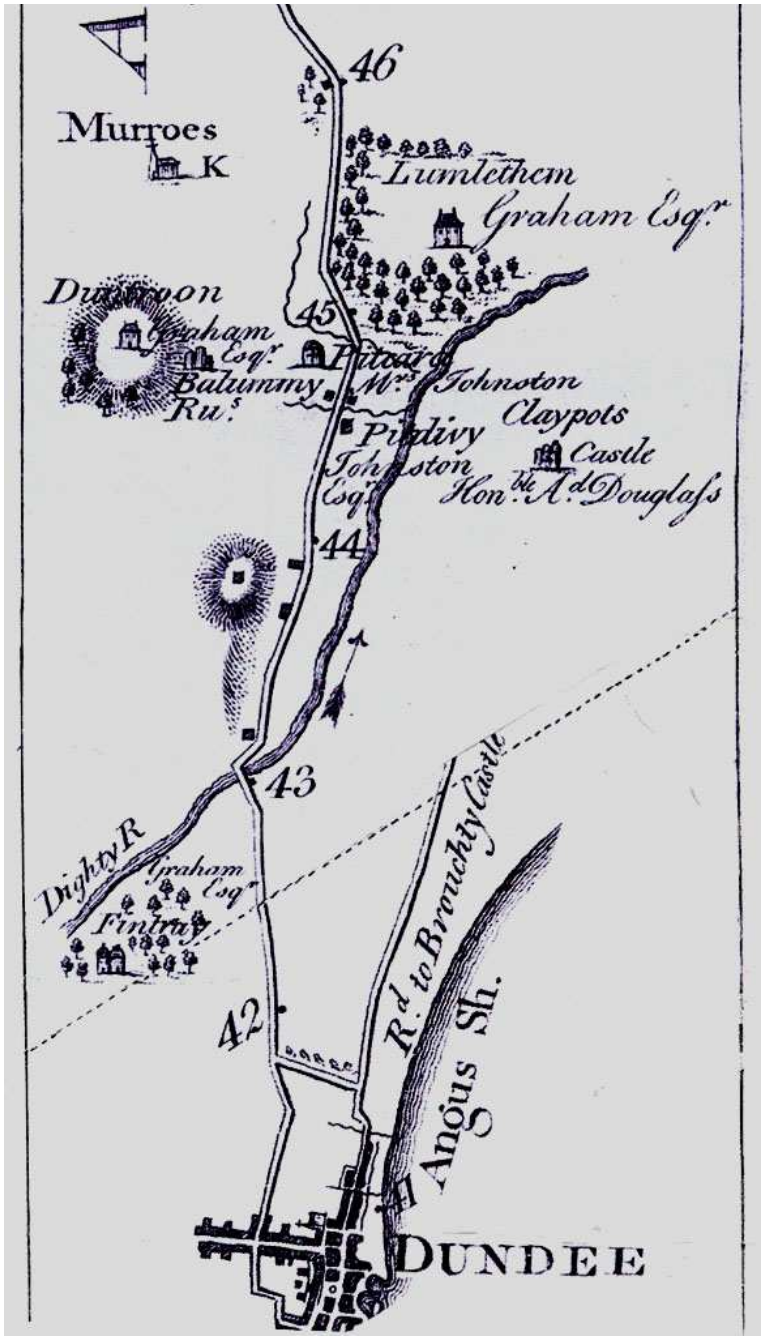
Access was an important issue since there would be no point in restoring it if people could not get to it.

The professor described the range of people involved in trusts and limited liability companies who were invaluable in making such projects worked.

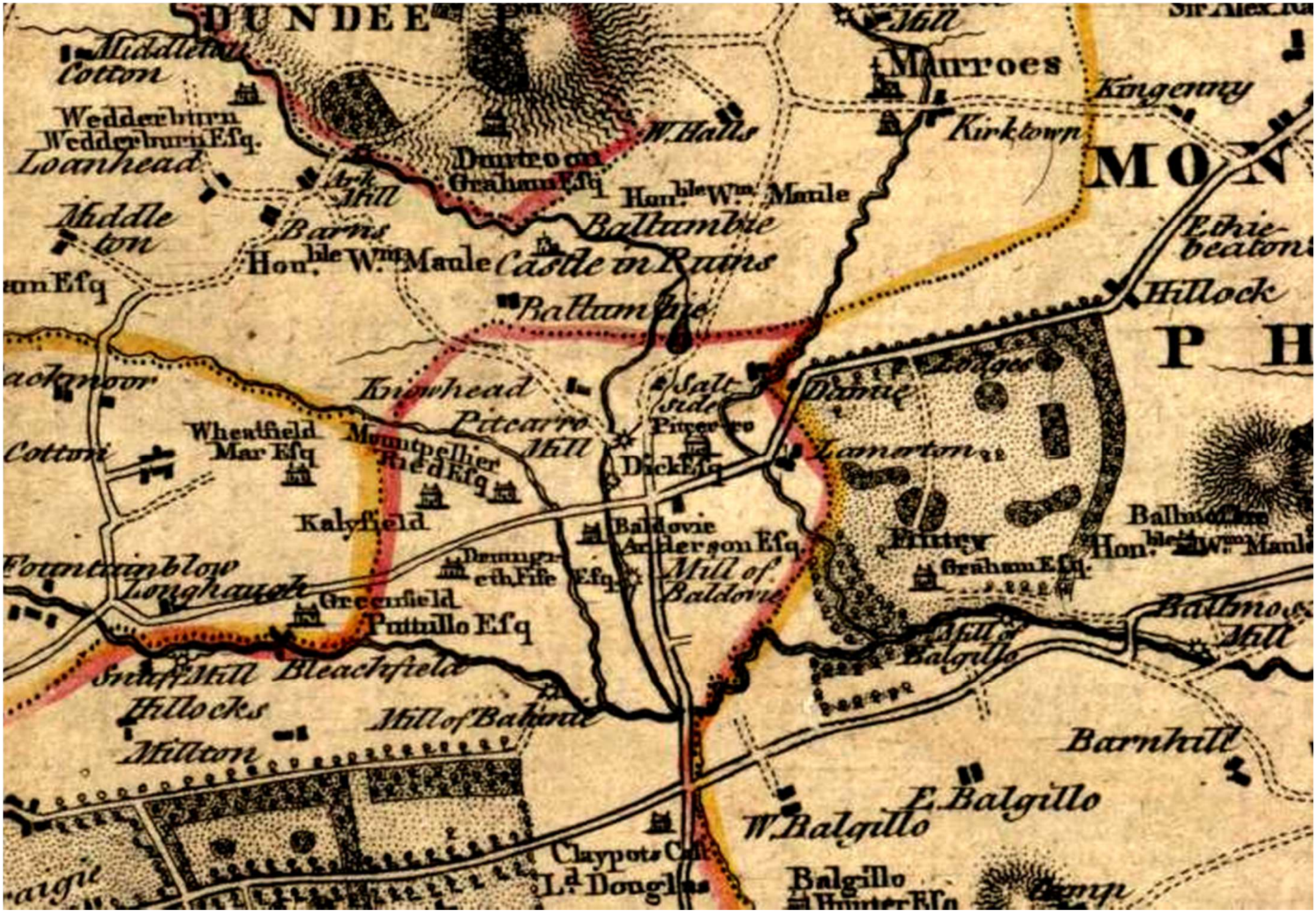
It would be a highly skilled job to restore the bridge but it could be done.

His "ball park" figure based on previous similar work was £300,000.

The Courier
Dundee
Jan 30th 2004 -
Coverage of
Dundee Civic
Trust's initiative
in inviting me
to lecture in
support of
conserving
the bridge

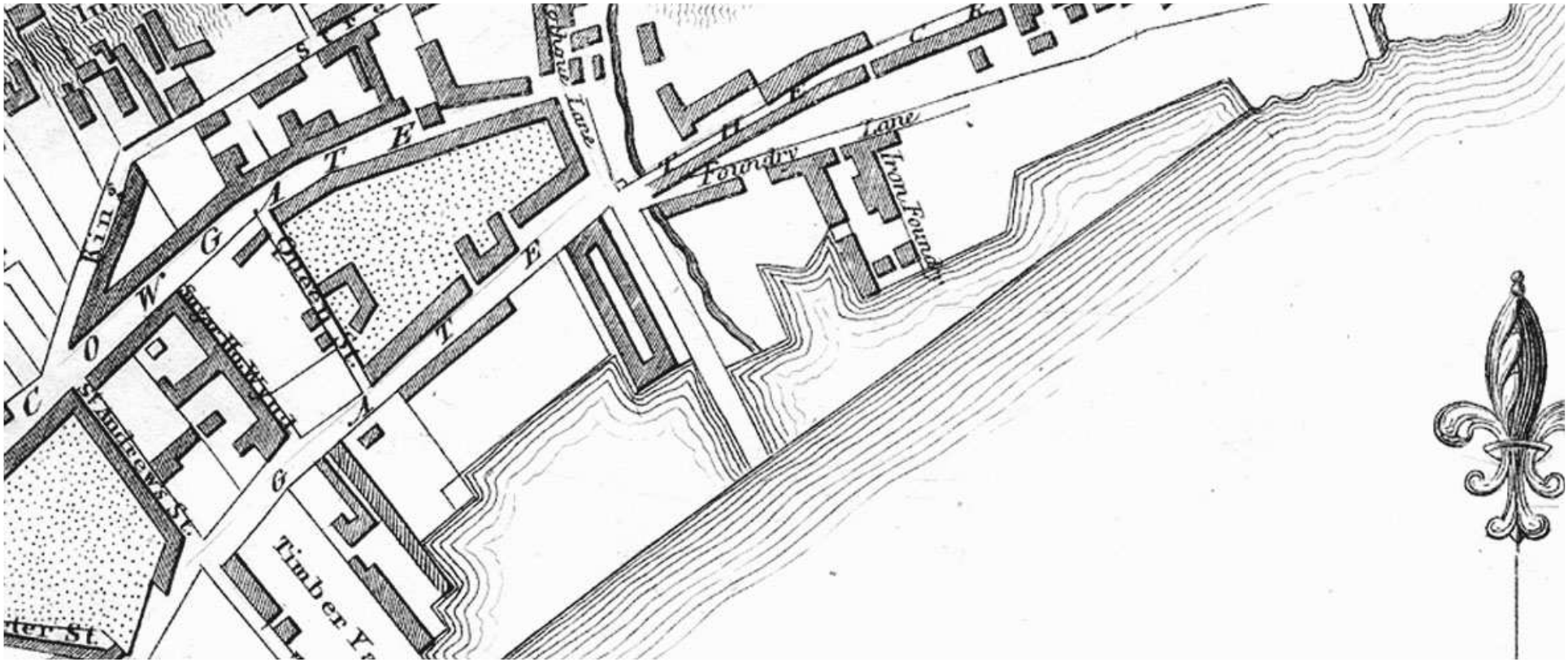


Taylor & Skinner's Roads Survey 1775, when the main Access to the Lumlethen [Linlathen] Estate of 'Graham Esqr.' 4 miles East of Dundee was from the main Dundee to Arbroath Road from the North

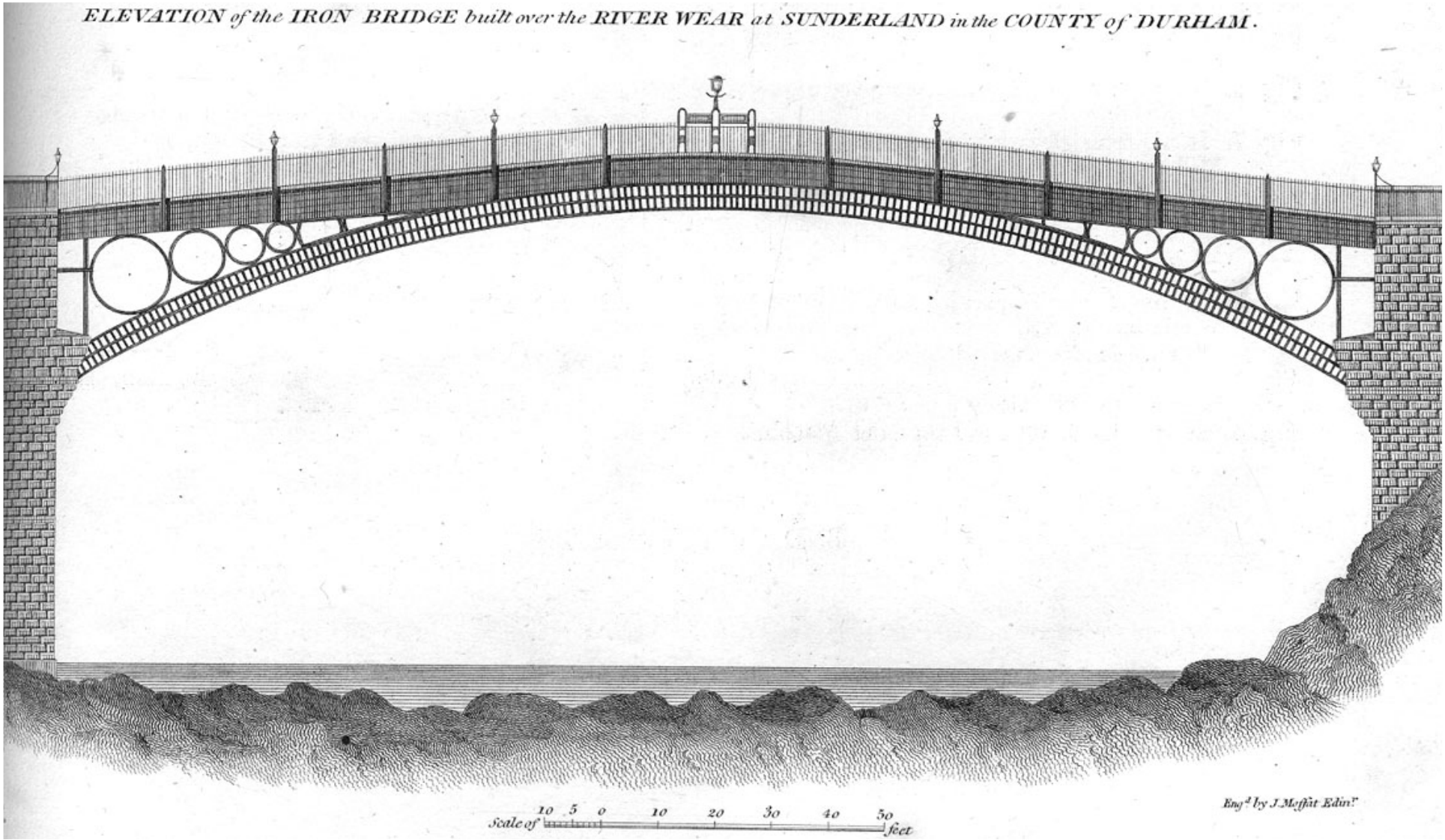


Ainslie’s survey - Angus-shire (pt) 1794 – no estate bridge shown

Thomson's redrawing of Ainslie's Angus-shire c.1825 – no estate bridge shown, but one does feature on an estate plan of 1827

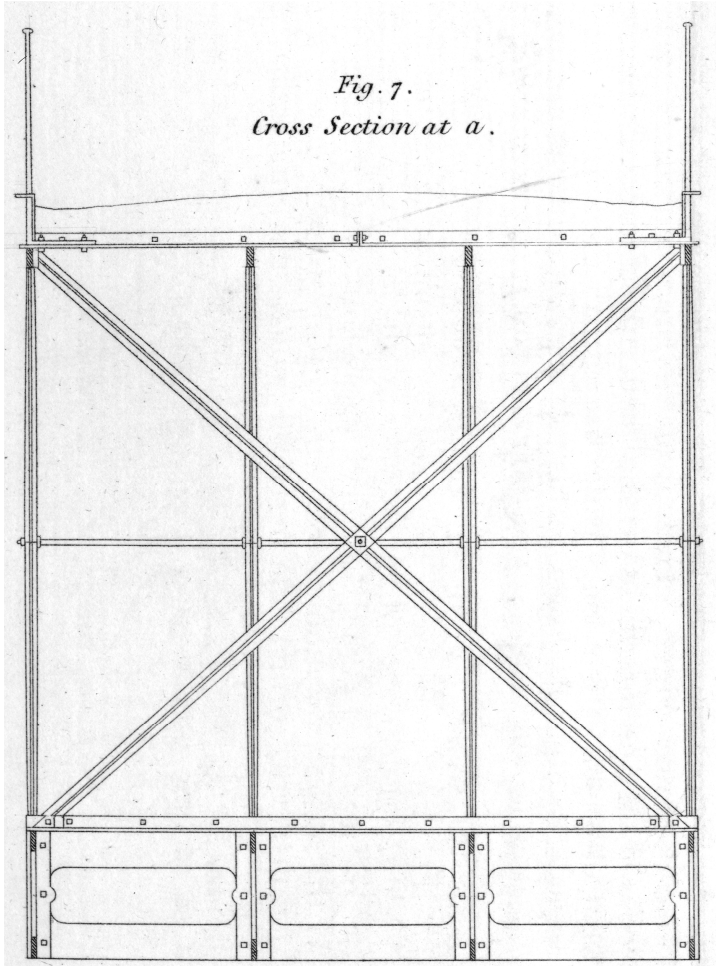


Part of J. Wood's plan of Dundee in the 1821 showing the East Iron Foundry extant c.1804 where the bridge might have been made, but the author has not managed to find any conclusive evidence of the bridge's provenance or date of manufacture



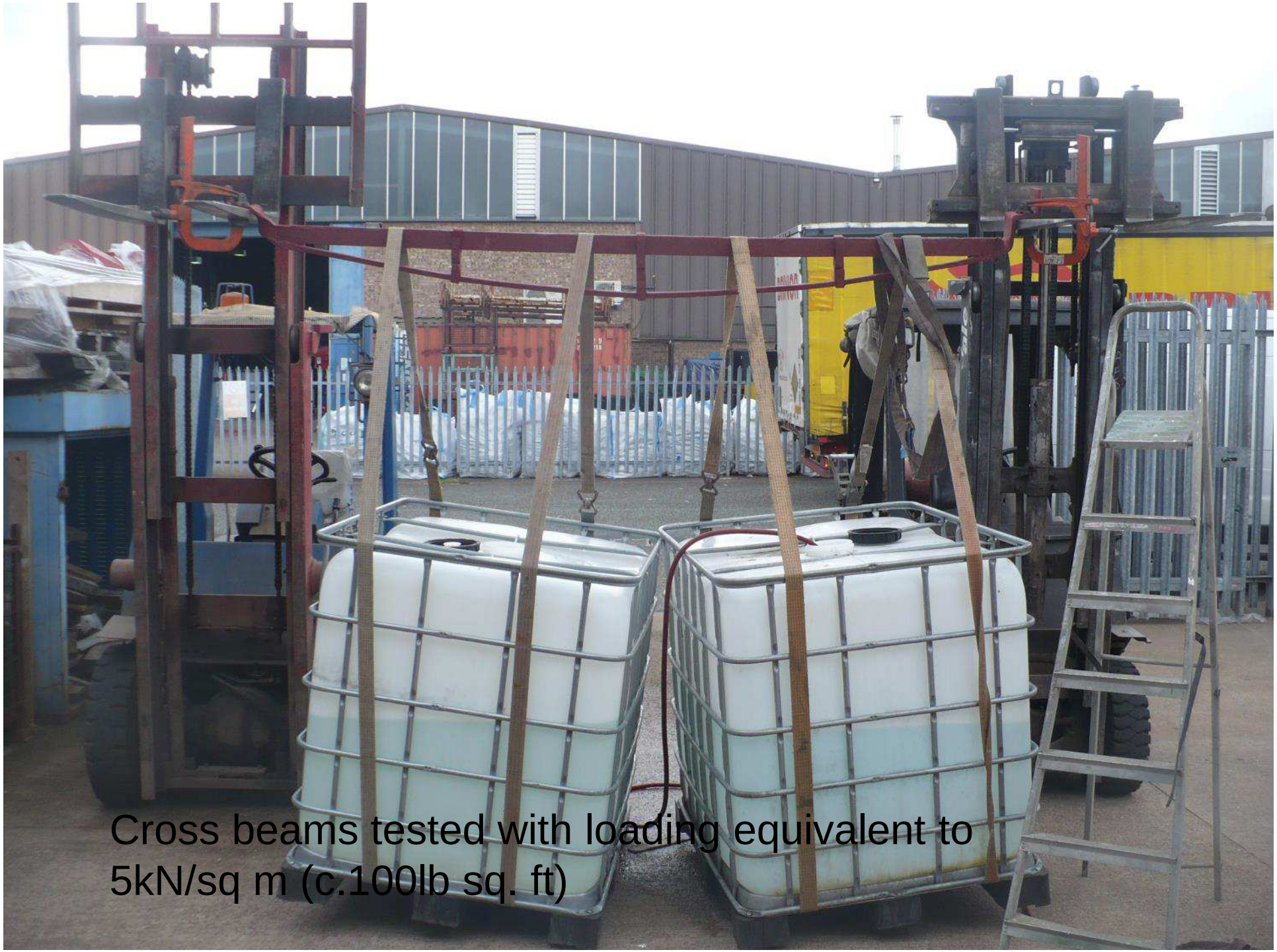
Sunderland Bridge 1796 – Thos Wilson – First UK cast iron bridge with diminishing diameter circles in spandrels — widely known and influential – Linlathen Iron Bridge most unlikely to have been earlier

Stratfield Saye Bridge, Hants 1802 – T Wilson 13½ ft wide 40 ft span, conserved in 1998 winning an ICE HB&I Award



Bonar Bridge 1812 – Telford/Hazledine – cast iron with lattice spandrels – a state-of-the-art development – widely influential.
Linlathen ironwork quite different, but both arches radially supported at the abutments

Linlathen Bridge interior looking north in 2003 – ribs, trusses ties


Cross beams tested with loading equivalent to
5kN/sq m (c.100lb sq. ft)

Linlathen East Iron Bridge
when re-opened 27 June 2012

A

PRACTICAL ESSAY

ON THE

STRENGTH OF CAST IRON,

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1822.

TO

THOMAS TELFORD, Esq.

CIVIL ENGINEER,"

FELLOW OF THE ROYAL SOCIETY OF EDINBURGH,

PRESIDENT OF THE INSTITUTION OF CIVIL ENGINEERS,

MEMBER OF THE GEOLOGICAL AND

ASTRONOMICAL SOCIETY, AND OF THE ACADEMY OF

SCIENCES OF STOCKHOLM, &c.

THIS ESSAY

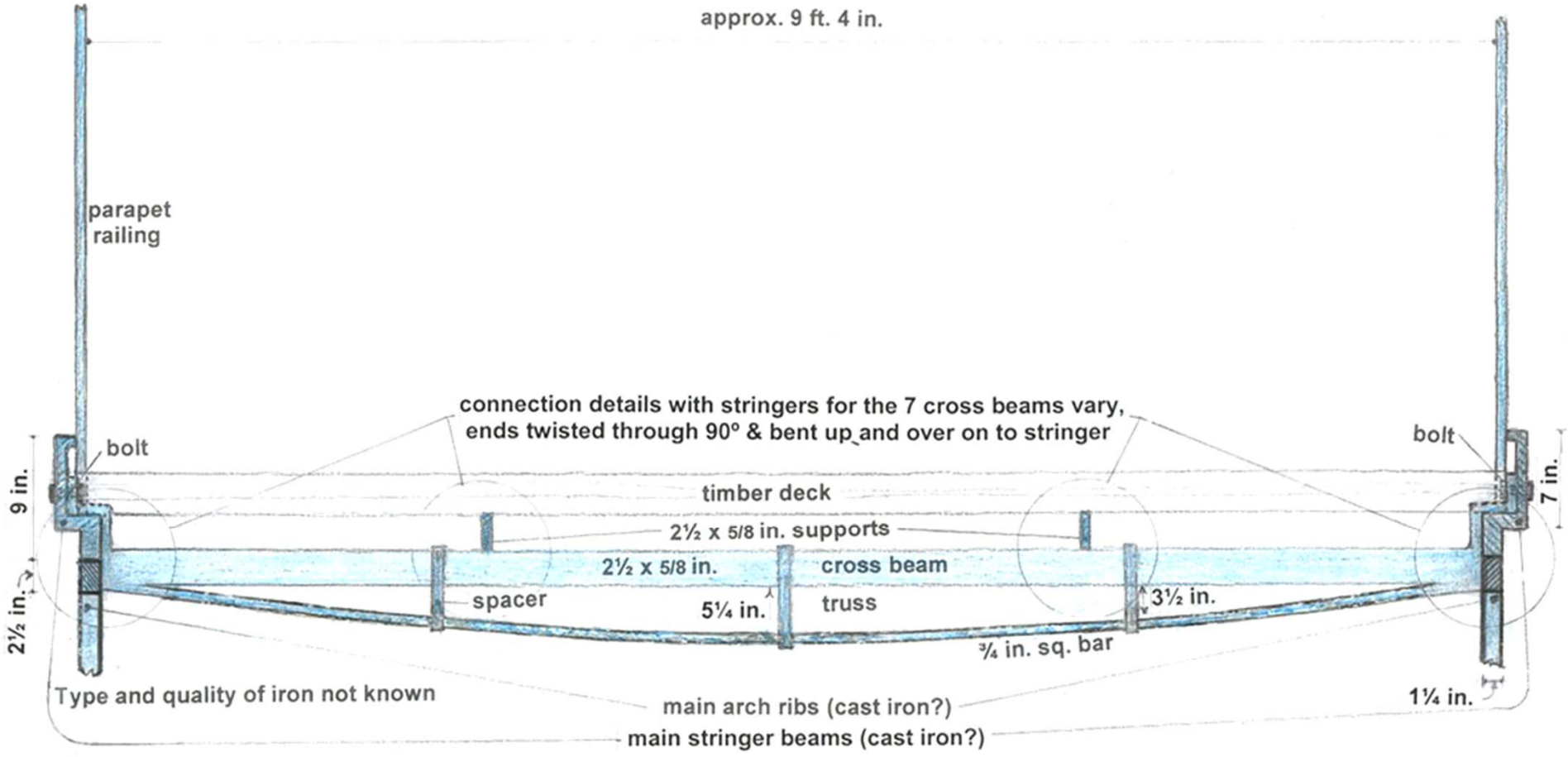
ON THE

STRENGTH OF CAST IRON

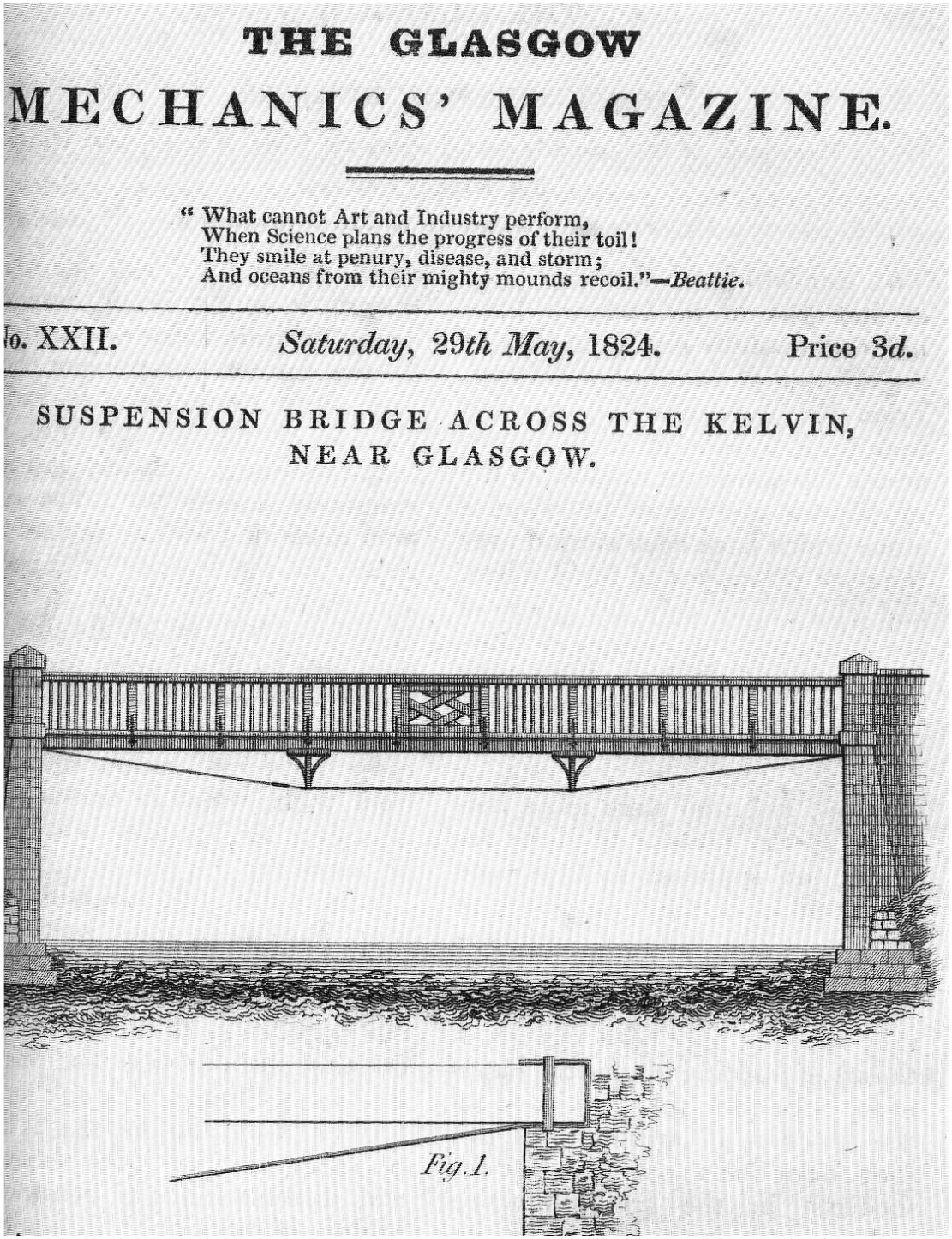
IS INSCRIBED BY

THE AUTHOR.

The first text book solely devoted to the **strength** and use of cast iron in structures– Tredgold 1822. Unlikely to have been used at Linlathen



Linlathen Bridge's construction – probably unique in the world. Author's notional sketch in 2003 of probable original cross-section at mid-span. An additional centre rib was obviated by means of light wrought-iron trusses of the form shown of the under-spanned suspension bridge type



THE GLASGOW

MECHANICS' MAGAZINE.

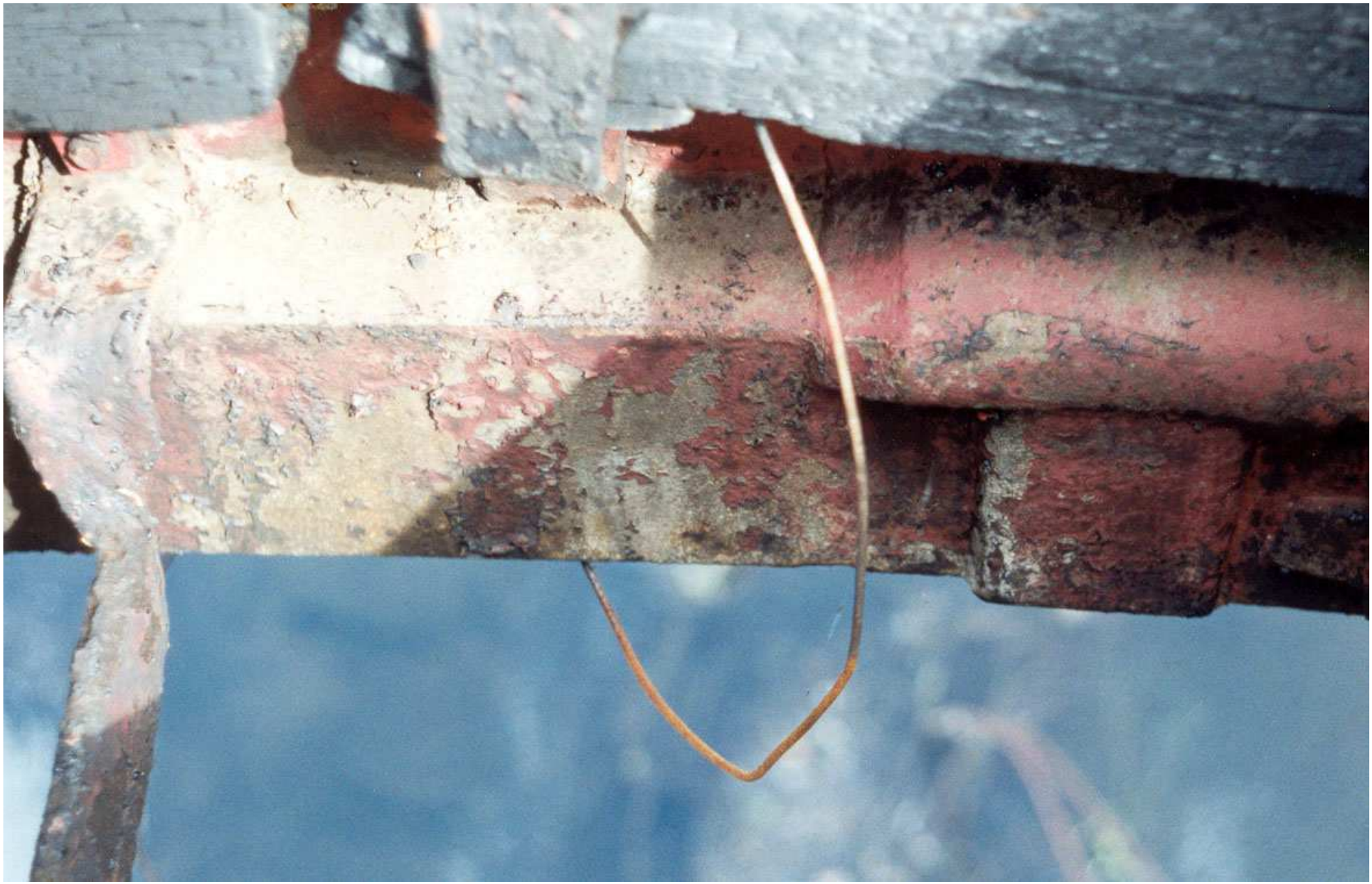
"What cannot Art and Industry perform,
When Science plans the progress of their toil!
They smile at penury, disease, and storm;
And oceans from their mighty mounds recoil."—*Beattie.*

No. XXII. *Saturday, 29th May,* 1824. Price 3*d.*

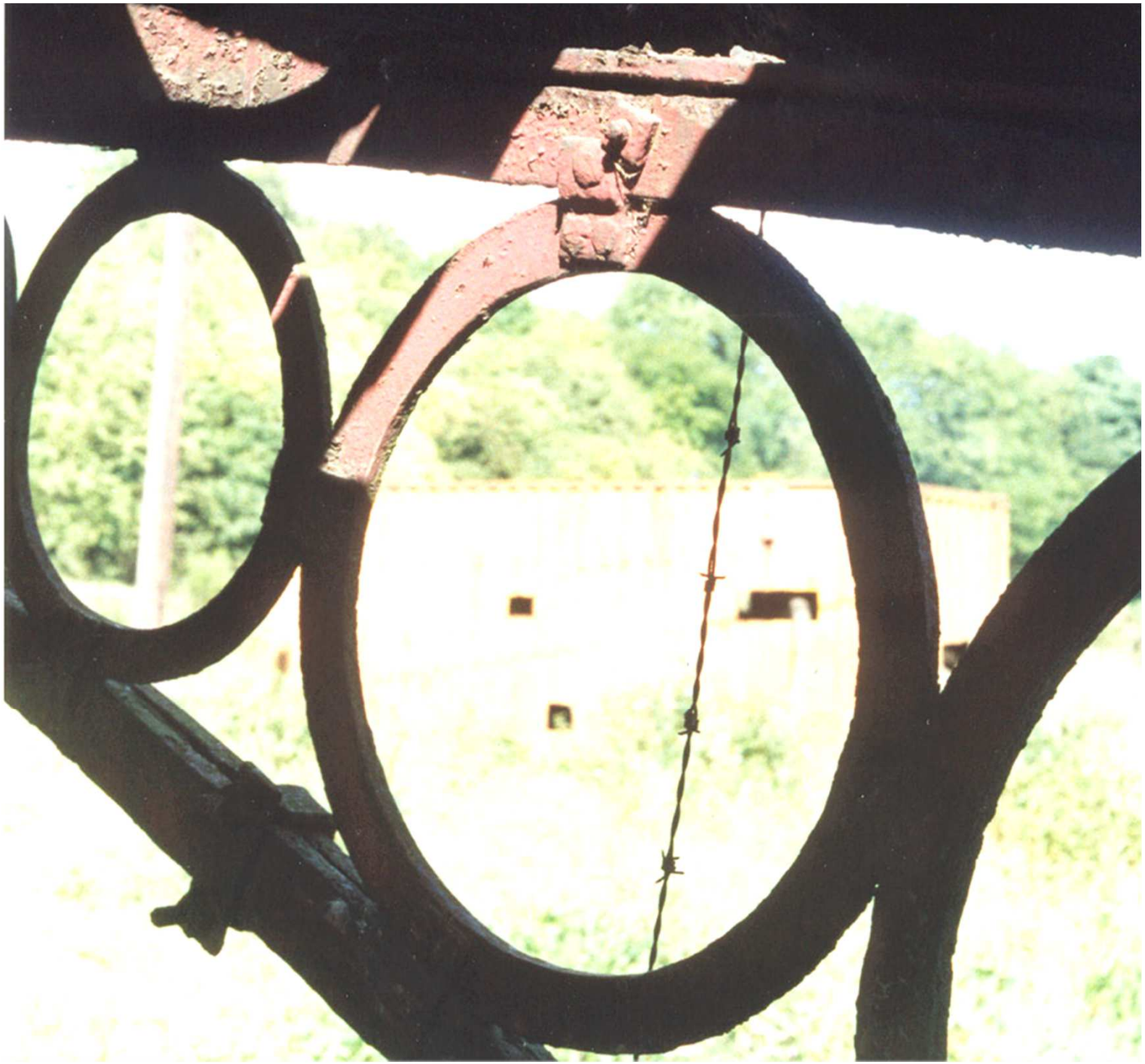
SUSPENSION BRIDGE ACROSS THE KELVIN, NEAR GLASGOW.

Fig. 1.

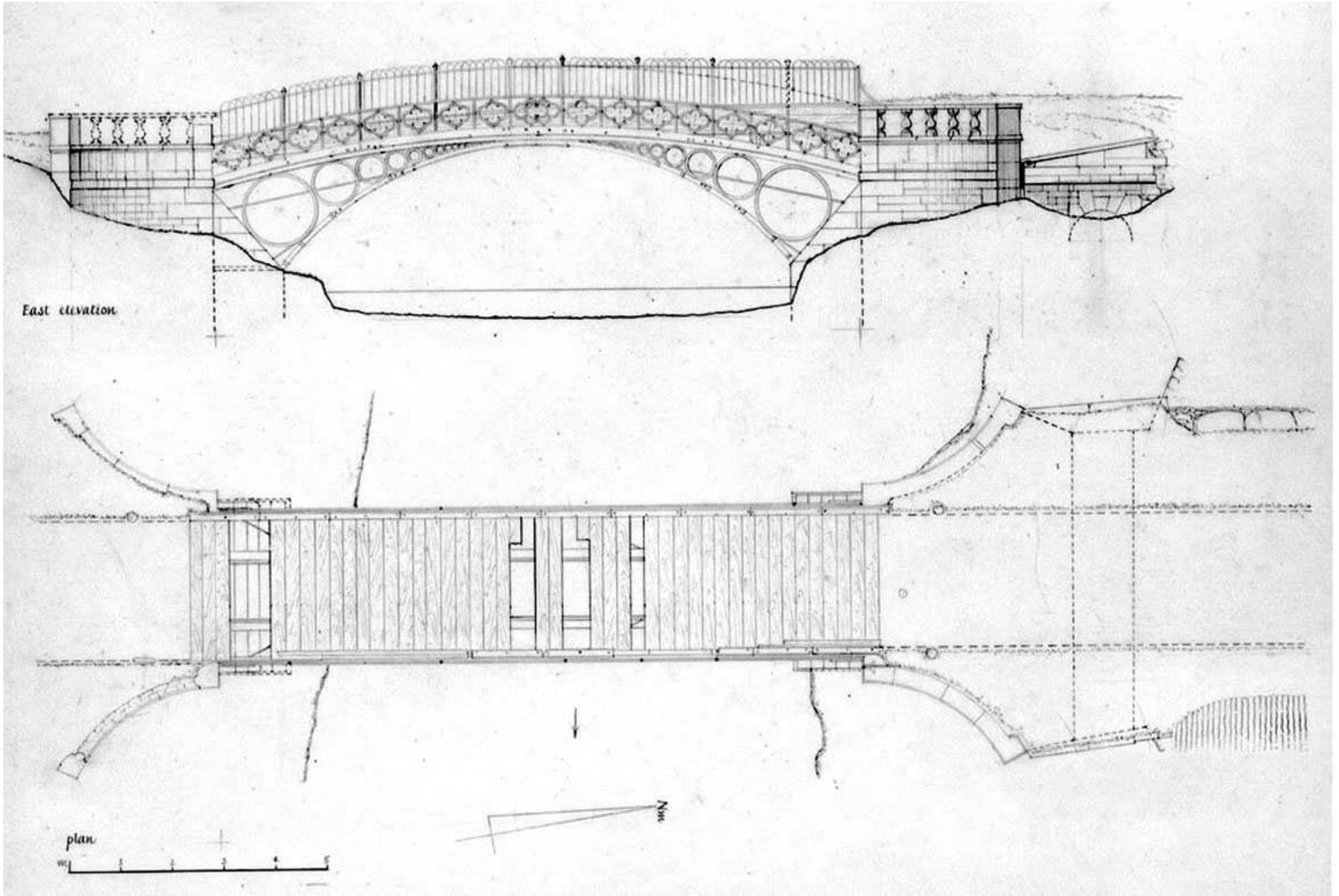
The Linlathen cross-truss concept [based on earlier practice in industrial buildings for trussing timber beams]
was developed and used for estate bridges near Glasgow and elsewhere from 1822-1850.
Had Linlathen Bridge been designed as late as 1824 it would probably have taken this, or a more robust cast iron arch form



Linlathen Bridge – end of simply supported cross-truss on rib top



Mode of ring connection by means of straps – note square nuts on screw-bolts



The RCAHMS *Threatened Building Survey* drawing 2003 provides a valuable record of the bridge's pre-conservation state

Linlathen Bridge's distorted 20th century timber deck in 2003

Cinlathen Bridge 2003 – note main rib central casting, cross-truss and sway stays. Dating from 1810 ± 14 years, possibly c.1804. It didn't influence iron bridge development nationally, but it is of great interest as probably Scotland's earliest surviving locally-made iron bridge and for its cross trusses and other unique details.

03/08/2011 09:51

Linlathen East Iron Bridge c.1804
View at re-opening 27 June 2012

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Broughty Ferry

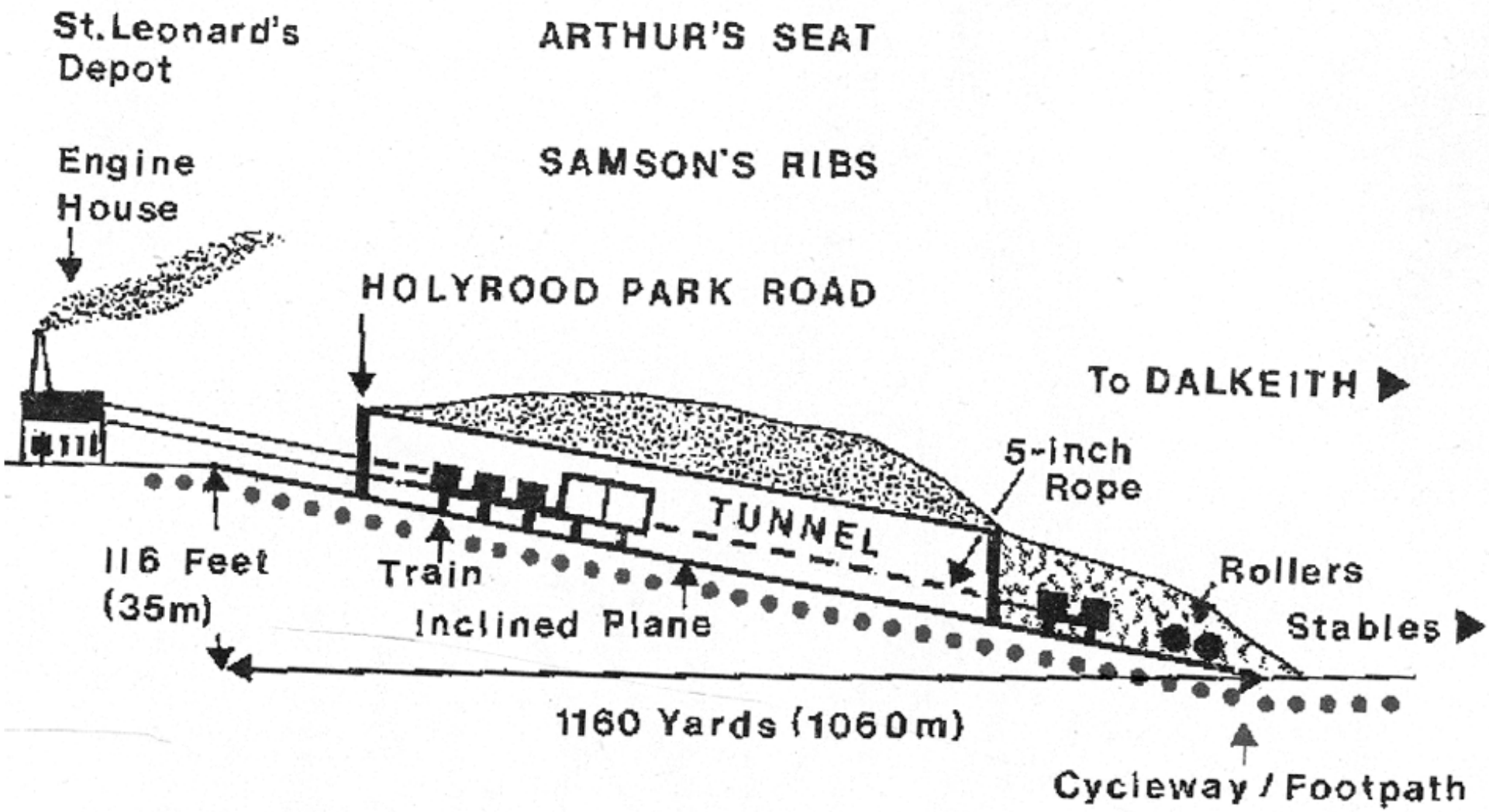
- Dismantling the existing iron parapets and bridge elements for off-site conservation.
- Off-site conservation of the existing ironwork, including new crown castings where the originals were not repairable.
- Conservation of the existing stone abutments, including matched stonework for balustrade elements previously lost through vandalism.
- Re-assembly of the iron bridge and parapets.

Union Bridge, Paxton R. Tweed 1820 437 ft span

Union Bridge, Paxton R. Tweed 1820 437 ft span

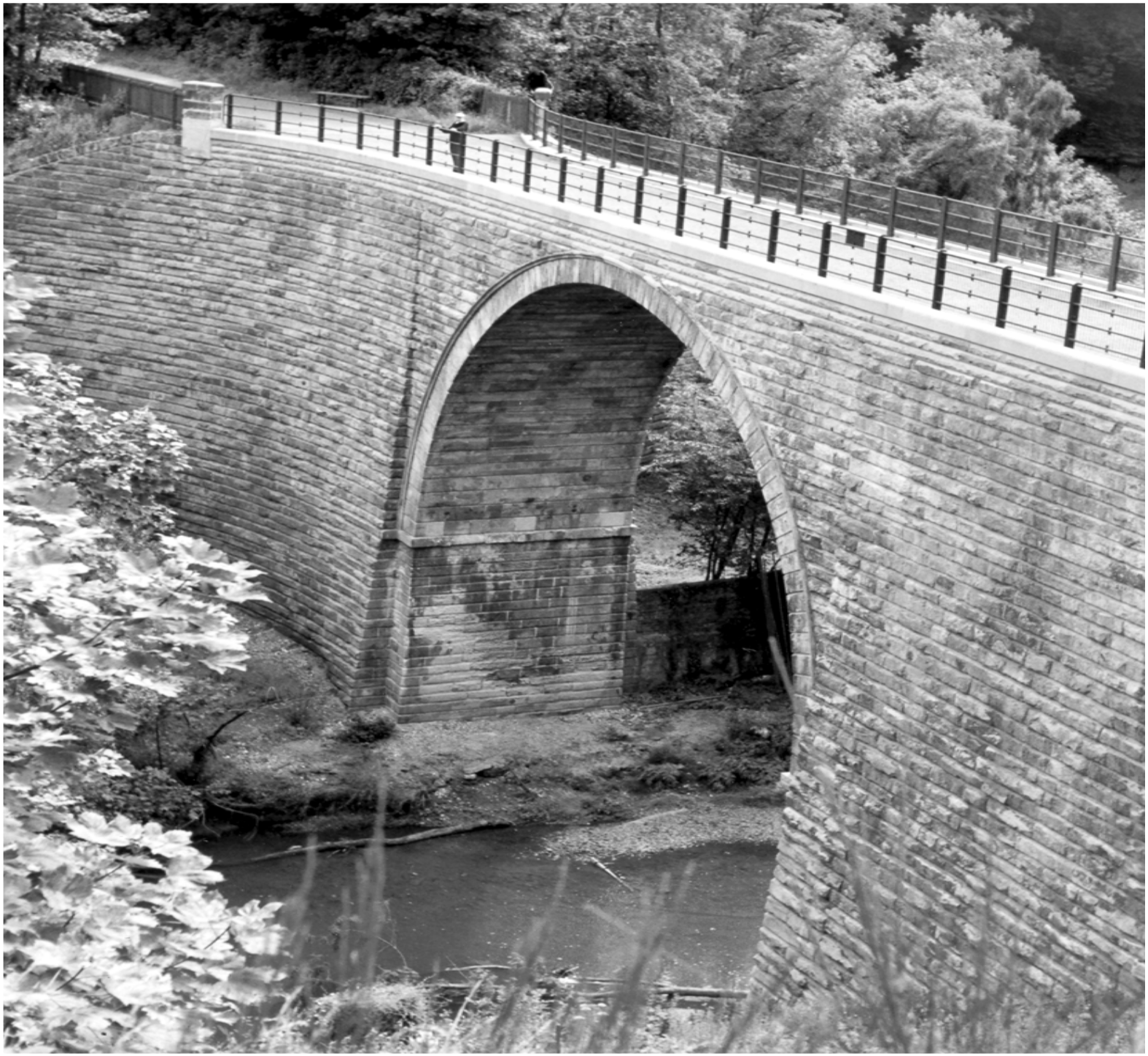
Union Bridge Jan 2013

Union Bridge
replacement
hanger as in
January 2013



EDINBURGH AND DALKEITH RAILWAY

Inclined Plane (1831) — Vertical Profile



Glenesk
Viaduct
1829-31
Closed
1965
Refurbished
1993
To be
reopened
for trains
2015

Craigellachie Bridge
1814
Refurbishment and IHCEL plaque
2007

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Dedicated: August 20, 2013