



John Rennie's improvement of Scotland's infrastructure 1779-1821

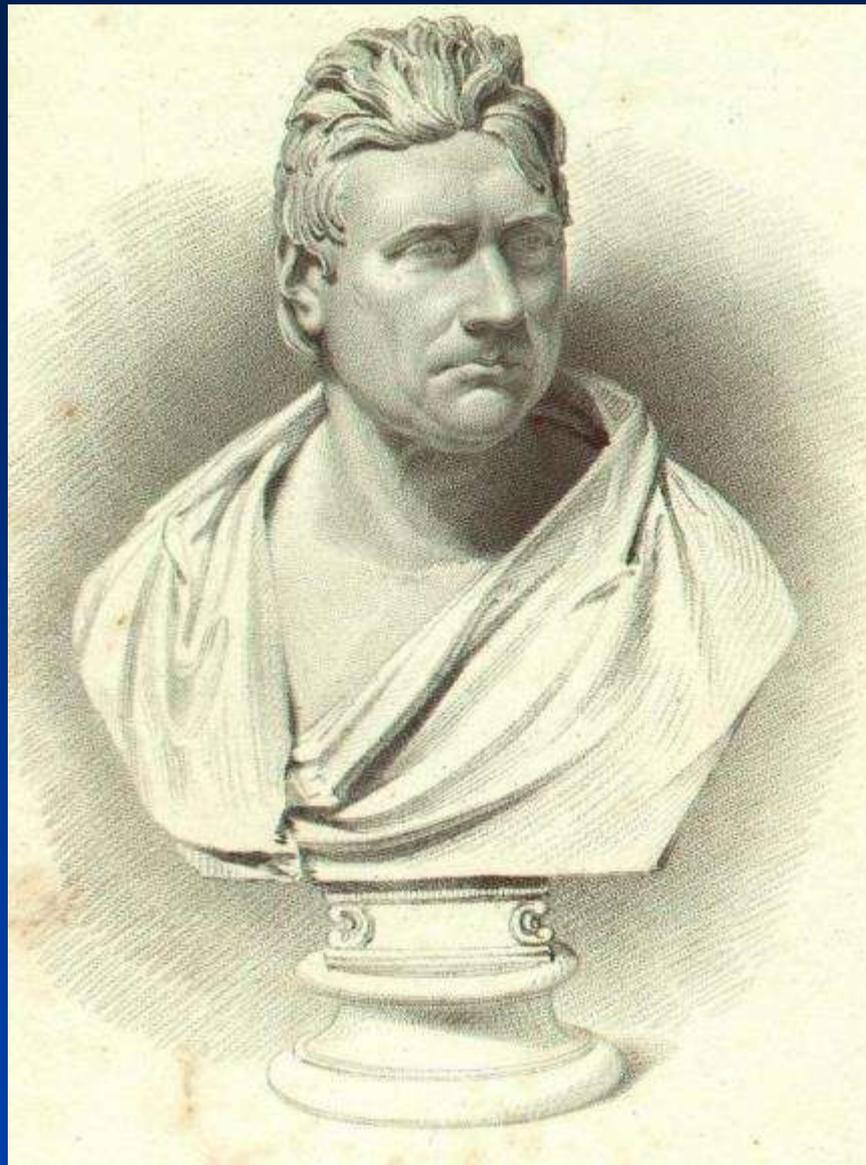
By Professor Roland Paxton MBE FICE FRSE

School of the Built Environment, Heriot-Watt University

Vice-Chairman Institution of Civil Engineers' Panel for Historical Engineering Works

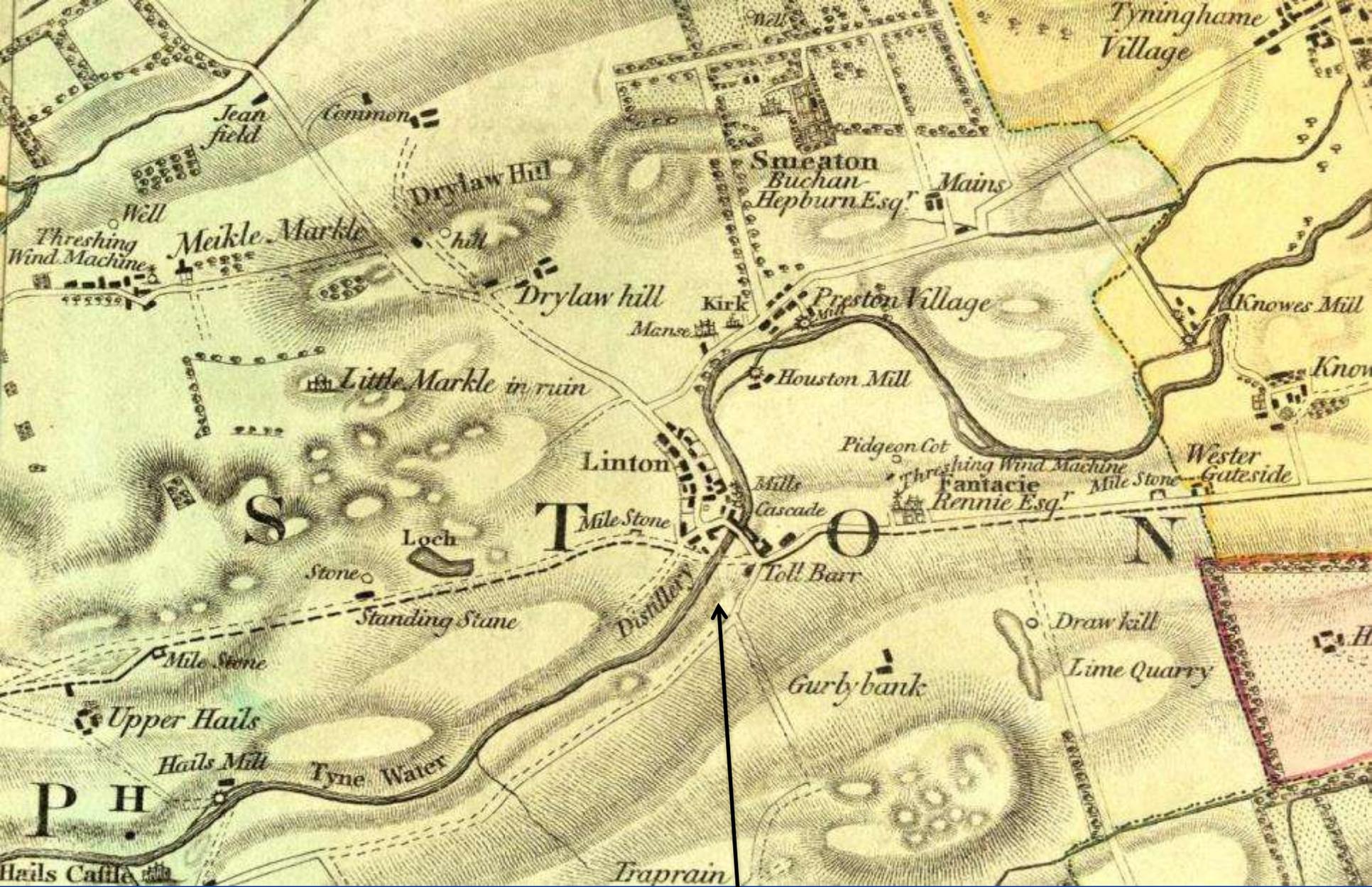
From *THE TIMES* 17 10 1821 – Funeral arrangements at St. Paul Cathedral extremely well devised. The funeral coaches and private carriages formed a line nearly a mile long. The coffin which was of gigantic proportions, covered with black velvet and ornamented with gold, was carried by eight bearers. The *cortege* consisting of a hearse with six horses, 16 mourning coaches and 19 private carriages moved slowly from Rennie's house at Stamford St. A few minutes before one o'clock the body was carried into St. Paul's followed by 60 mourners.

Among the vast number of distinguished persons who followed Mr. Rennie to the grave we noticed Sir Joseph Yorke, Sir Humphrey Davy, Sir J. Seppings, Sir George Cockburn, Mr Hamilton Under Secretary of State, Mr. Chantry R.A., &c. &c. Mr G. Rennie, eldest son was chief mourner. Some confusion arose from the efforts of the crowd to force themselves with the procession into the church, but no serious accident occurred.

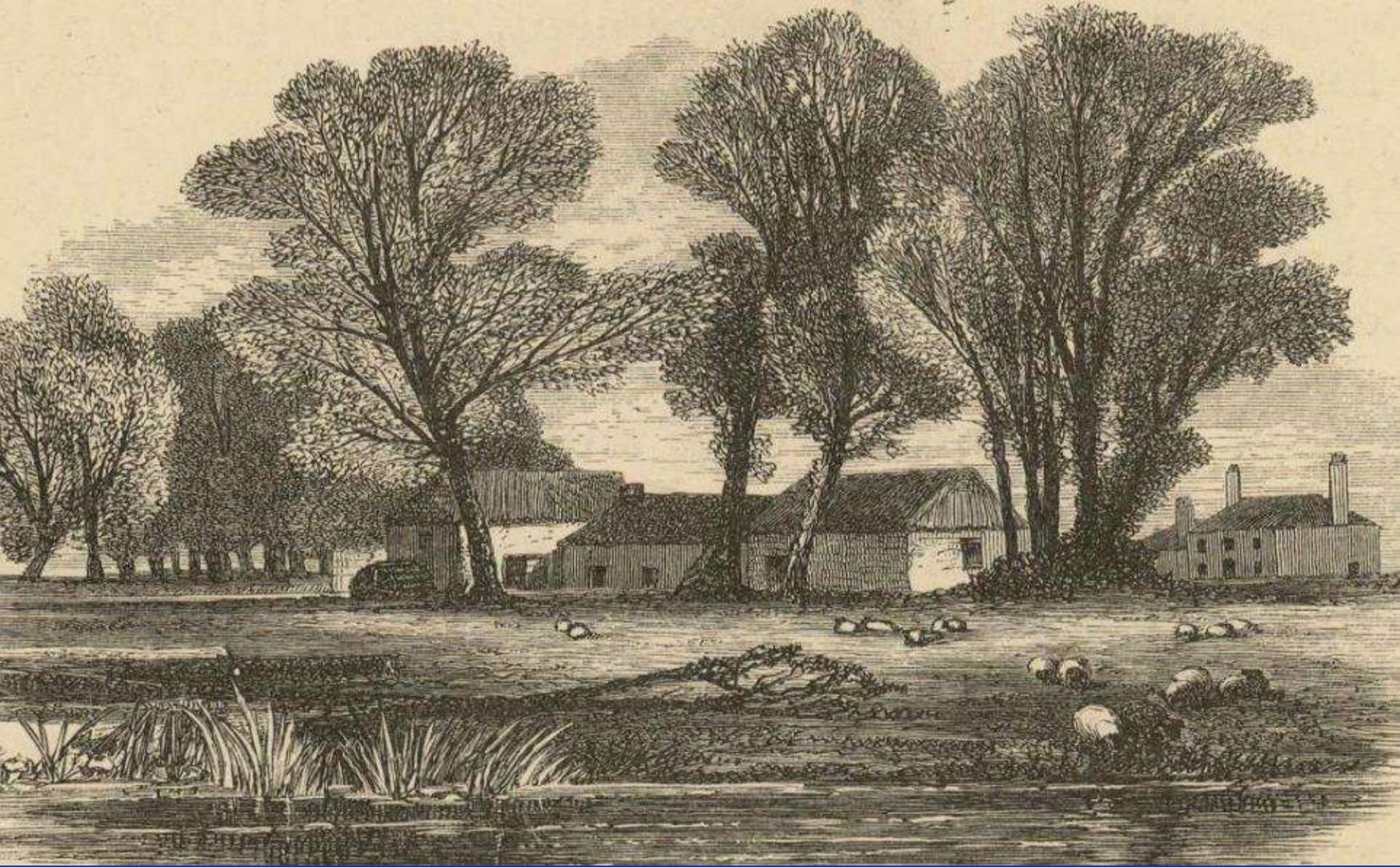


Here lie the mortal remains of
JOHN RENNIE
CIVIL ENGINEER
F.R.S. F.A.S.
Born at Phantassie in East Lothian
7th July 1761
Deceased in London 4th Octr. 1821
THIS STONE
is dedicated to his private virtue
and records
the affection and the respect of
his family and his friends
but
the many splendid and useful works
by which
under his superintending genius
England, Scotland and Ireland
have been adorned and improved
are
THE TRUE MONUMENTS
OF
HIS PUBLIC MERIT
Waterloo—Southwark—Bridges
Plymouth Breakwater
Sheerness Docks &c. &c. &c.

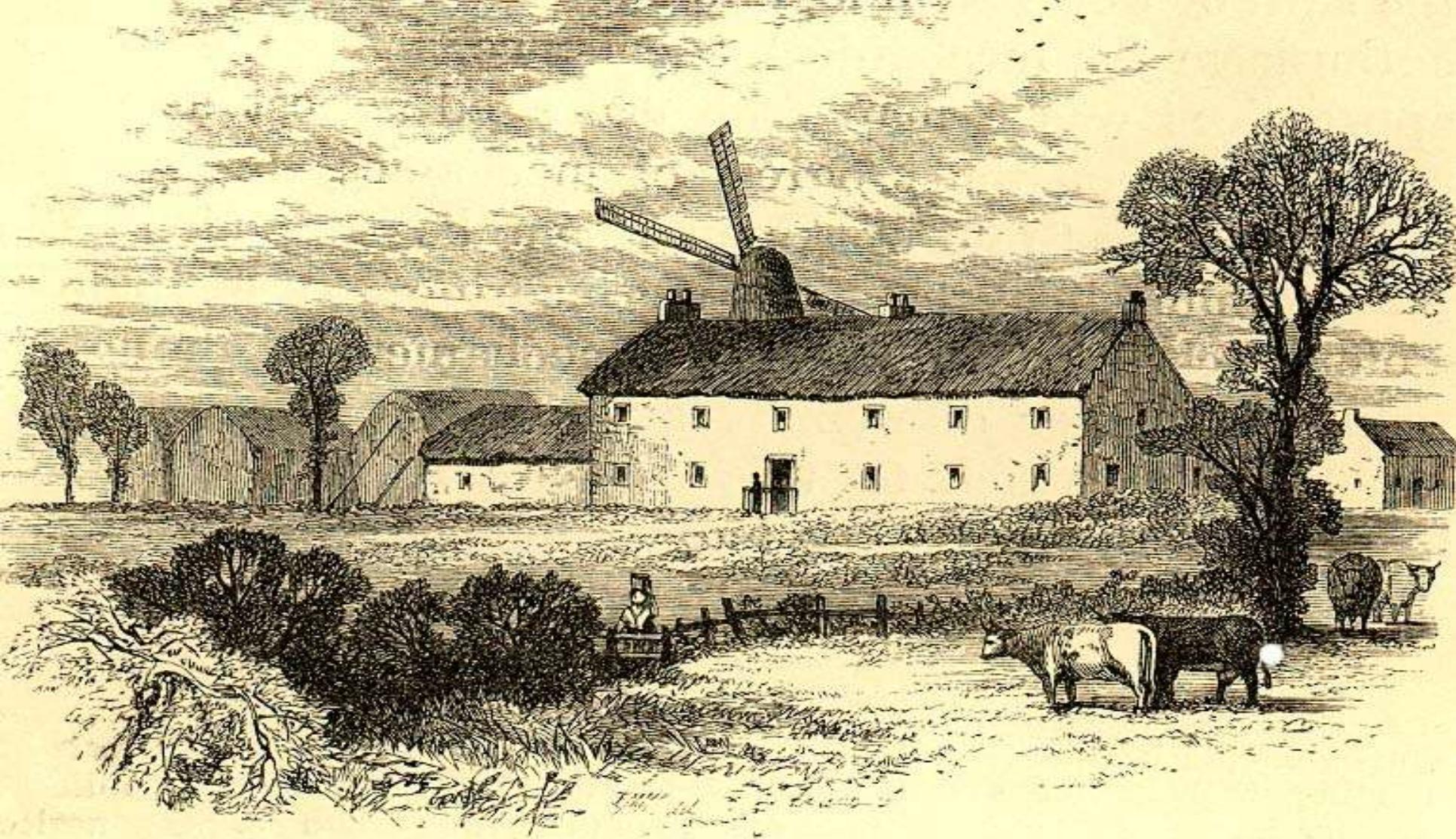
Rennie bust and grave inscription in St Paul's Cathedral
His date of birth was actually 7 June 1761



Rennie's birthplace, Fantacie (Phantassie), East Linton – note Knowes Mill which reputedly he worked on c.1779



Houston Mill, East Linton - home of Andrew Meikle
Millwright, from whom Rennie learnt his trade from c.1773



RENNIE'S BIRTHPLACE, PHANTASSIE.

[By E. M. Wimperis, after a Drawing by J. S. Smiles.]

Rennie's birthplace, Phantassie, East Linton



Knowes Mill 1779 – undershot wheel

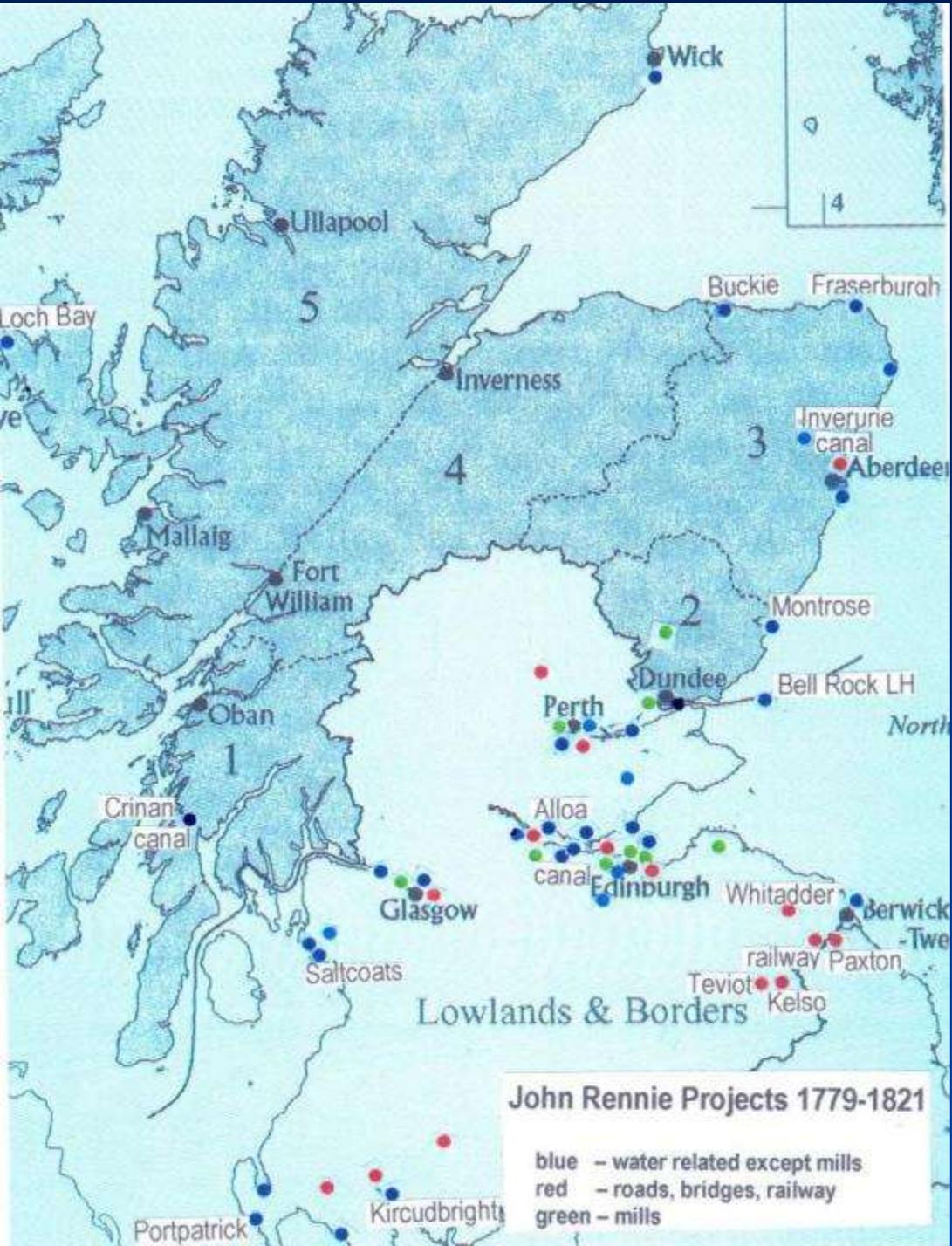
[reputed to be the first mill on which Rennie worked]

man of the name of Rennie. He was intended for a mill-wright, and was breeding to that business under the famous Mr Mackell at Linton, East Lothian. He had not then attended Mr Gibson for the Mathematics, &c. much more than six months; but on his examination, he discovered such amazing powers of genius, that one would have imagined him a second Newton. No problem was too hard for him to demonstrate. With a clear head, a decent address, and a distinct delivery, his master could not propose a question either in natural or experimental philosophy, to which he gave not a clear and ready solution, and also the reasons of the connection between causes and effects, the power of gravitation, &c. in a masterly and convincing manner; so that every person present admired such an uncommon stock of knowledge amassed at his time of life. If this young man is spared, and continues to prosecute his studies, he will do great honour to his country.

David Loch's
school
examiner's
report on
Rennie at
Dunbar High
School in 1778.
Rennie was at
Edinburgh
University 1780-
83 – studied
part-time under
Professors
Robison and
Black

Rennie's Scottish Projects 1779 – 1821

His early work included mills, canals, and harbours

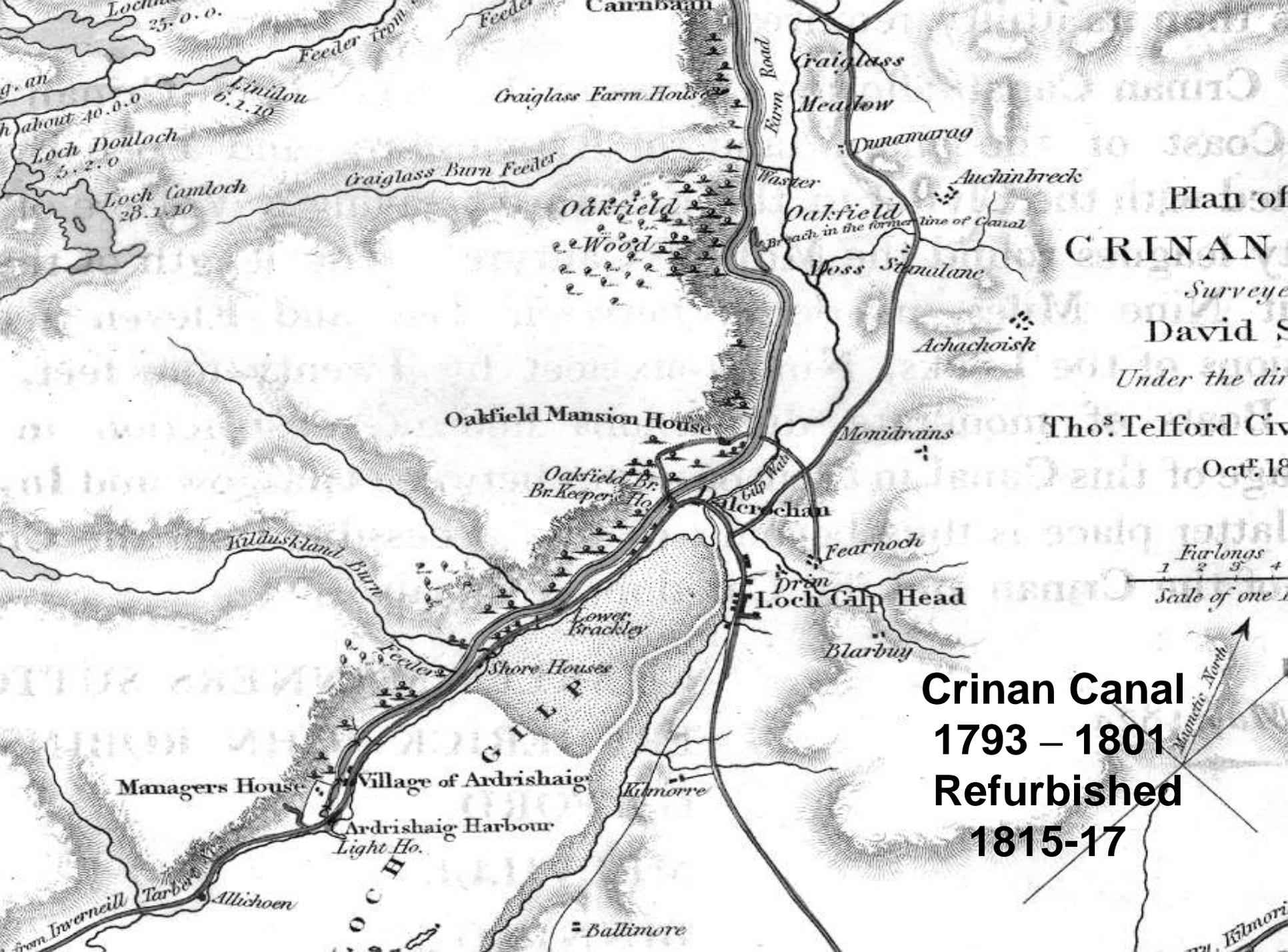


to Rochdale - I am now on my way to Inverary
to survey ~~the~~ Loch Crinan to Loch Gilp two
arms of the sea for vessels of large Burthen - I shall
be at Inverary for a fortnight to come. Where any
letter addressed to the Post Office will find me -
from Inverary I go by the Ports of Tobermory in
the Isle of Mull to Ullapool & then to Wick in
Caithness to survey the different Harbours at that
place & about the beginning of August next

Rennie letter to Shuttleworth re. Rochdale Canal in July 1792. Note his busy life – Crinan Canal survey – Inverary, Tobermory, Ullapool, Wick and Inverness Harbours



Aberdeenshire Canal 1796-1805. GNS Railway in 1854



Plan of
CRINAN
Surveyed
David S
Under the direction
Tho^s. Telford Civ
Engin^r.
Oct^r. 18

Crinan Canal
1793 – 1801
Refurbished
1815-17



© RCAHMS

9-mile long Crinan Canal at Crinan

that score, and I hope your Lordship & the Magistrates
for stating the cost according to the best of my Judge-

I have the honor to be

My Lord Provost & Gent^l

Your most humble Serv^t

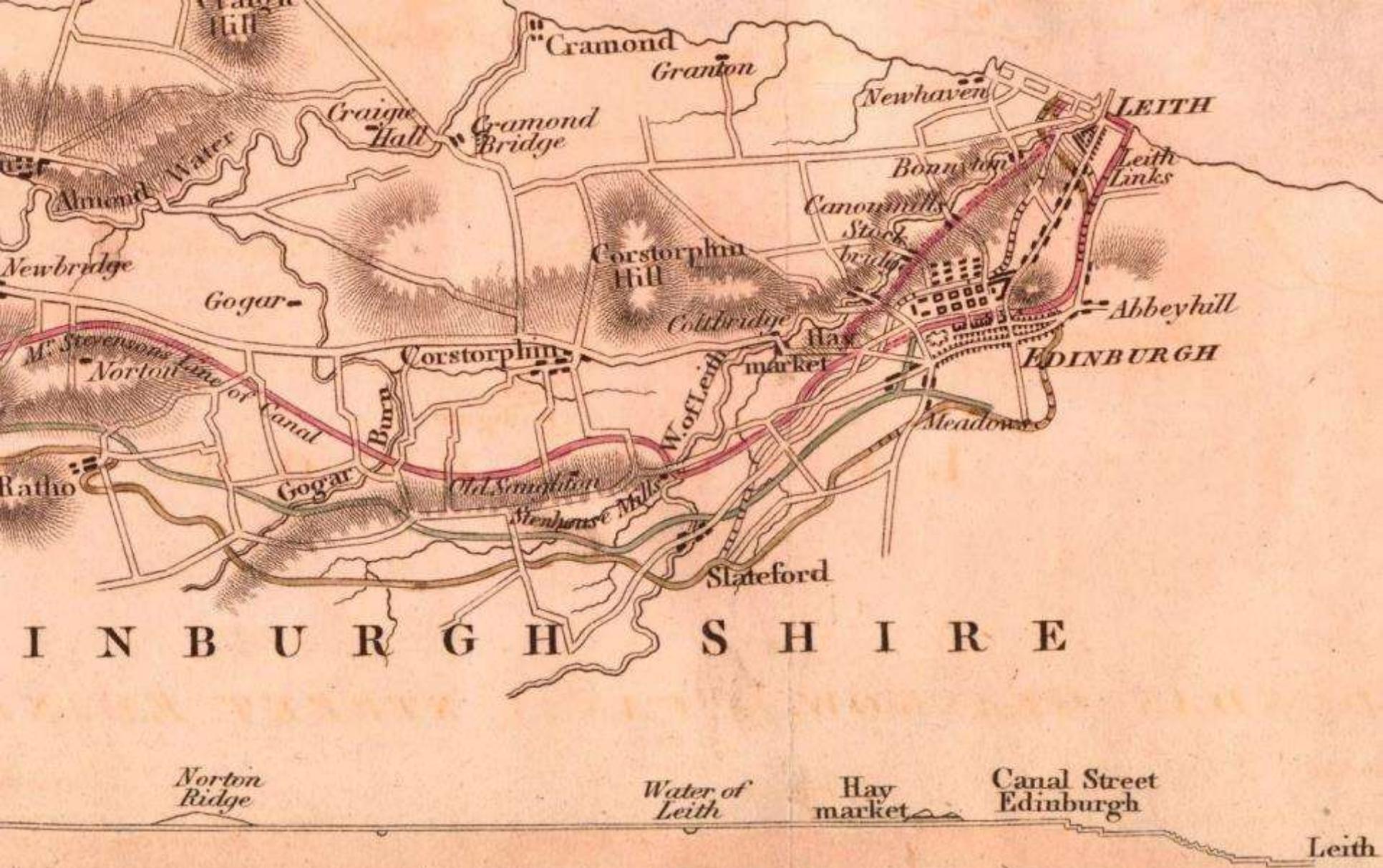
Wm Rennie

ble the
and
Edin^m

£390,081

ESTIMATE - HIGH LEVEL UNION CANAL
LOCKING DOWN THROUGH EDINBURGH TO GLASGOW

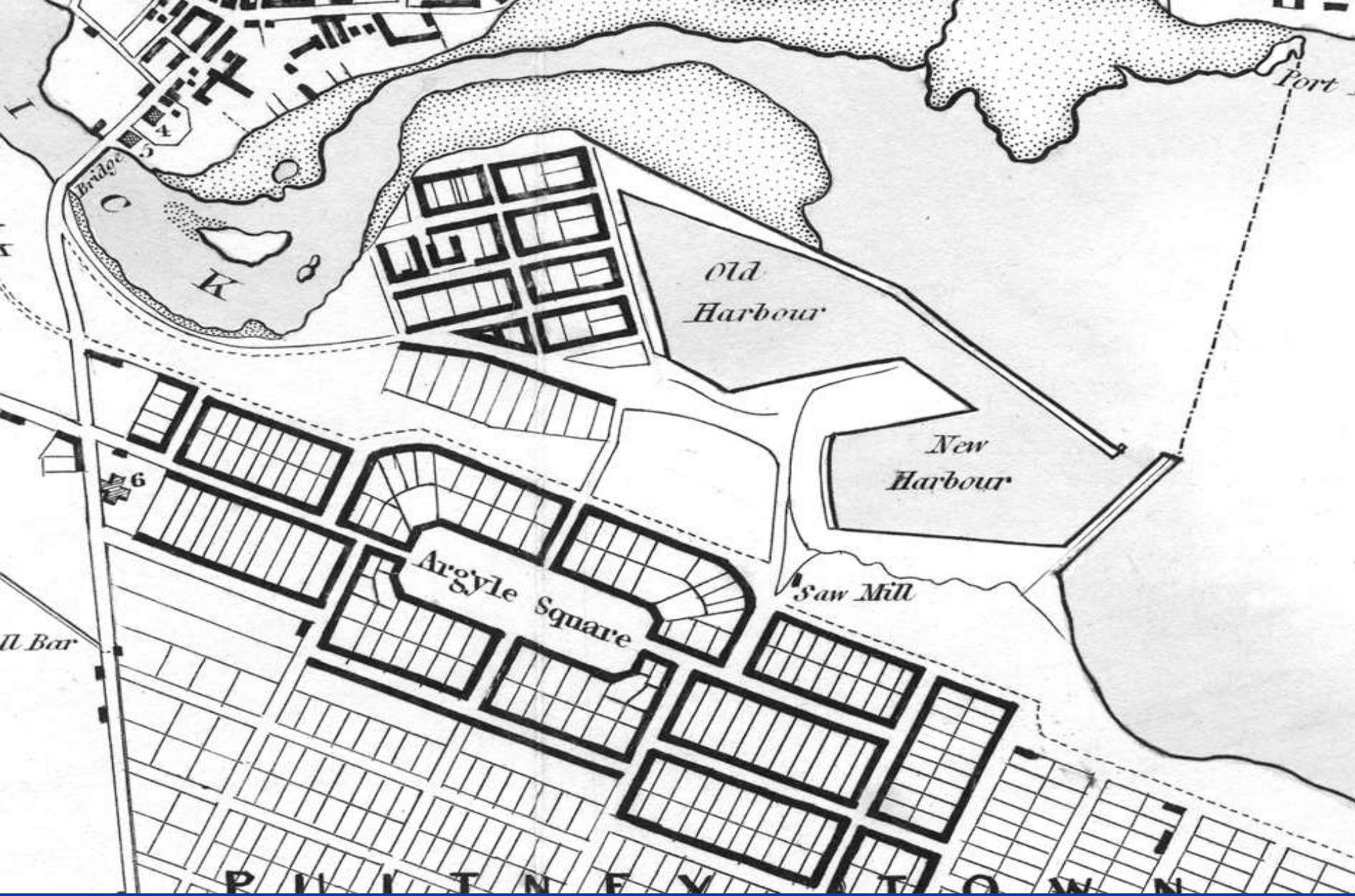
Edinburgh to Glasgow Canal – Rennie’s involvement 1797-1816.
He favoured a line in this 1815 report 40 ft higher than Union Canal



Edinburgh and Glasgow Canal project – Rennie's line (brown) connecting Leith harbour. Baird's line (green) begun 1817



Edinburgh to Glasgow Union Canal project – Rennie's line (brown)



Rennie worked on Wick harbour and mills in 1790s
but Telford's harbours (above) were executed

Great as the importance of this communication has always been reckoned, the ideas entertained of it have fallen very short of the reality. It appears from an account kept by the superintendant, that during the year ending 15th May 1811 there crossed at the Queen's-ferry TWO HUNDRED AND TWENTY-EIGHT persons every day throughout the year. And on some days so many as FOUR HUNDRED AND FORTY-SEVEN were ferried over. There passed during the same year

Carriages	-	-	-	-	1515
Carts	-	-	-	-	4254
Horses	-	-	-	-	13,154
Cattle	-	-	-	-	18,057
Sheep	-	-	-	-	25,151
Barrell Bulk	-	-	-	-	5,520
Dogs	-	-	-	-	2,615

by far the greater part of which travelled along the Great North Road. The value of the goods

Ferry patronage at Queensferry in
1811 from Rennie's report



Hawes Pier Queensferry in 2008

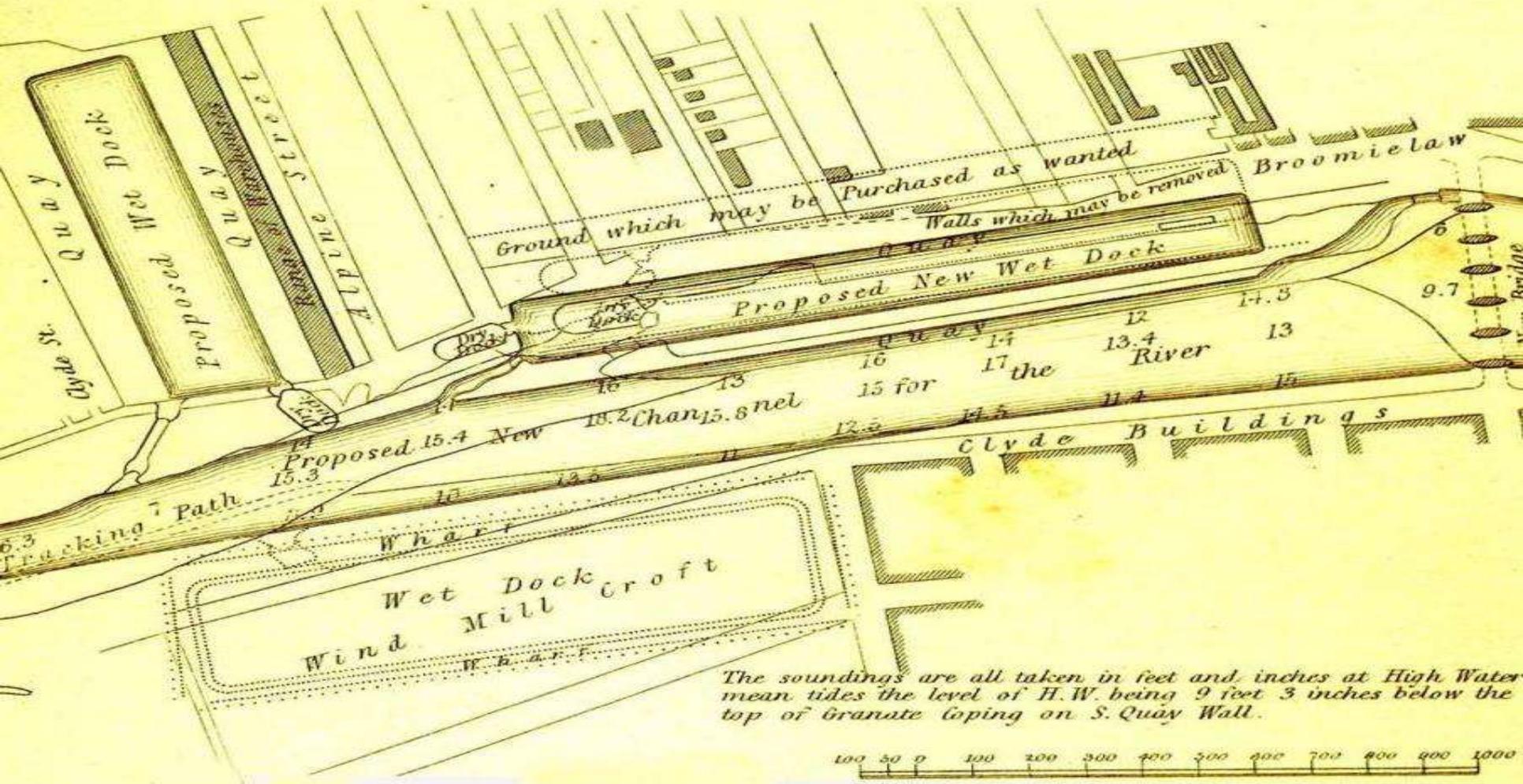


Queen Margaret ferry-boat at Hawes Pier Queensferry in 1963

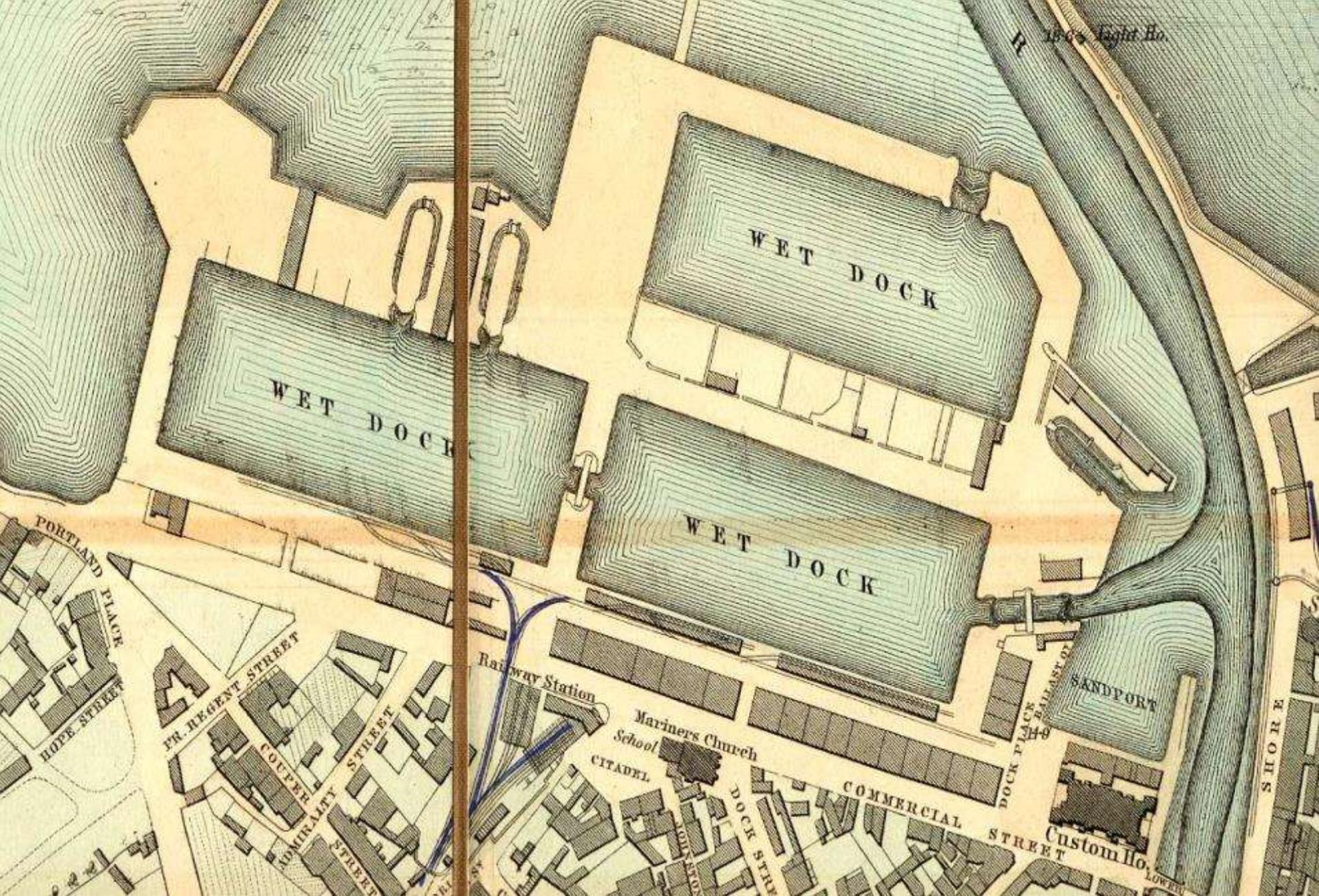
Plan of the
RIVER CLYDE
At the City of Glasgow
 WITH THE PROPOSED DOCKS ON THE
BROOMIELAW.

by the late M. Rennie.

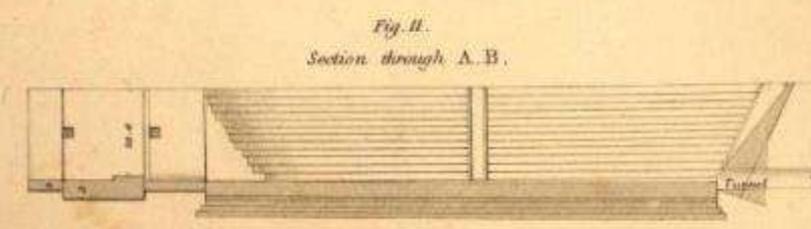
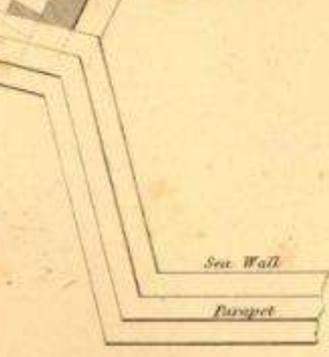
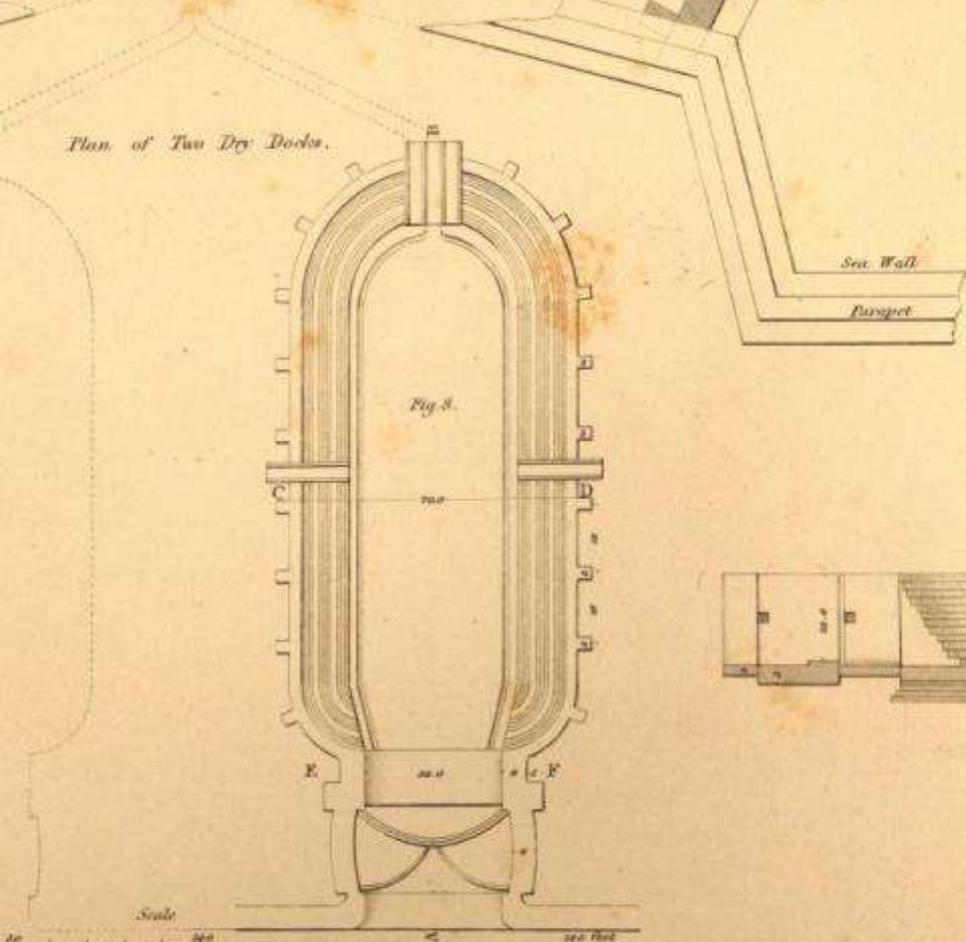
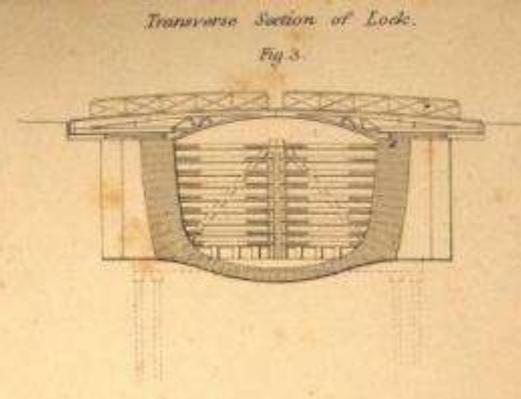
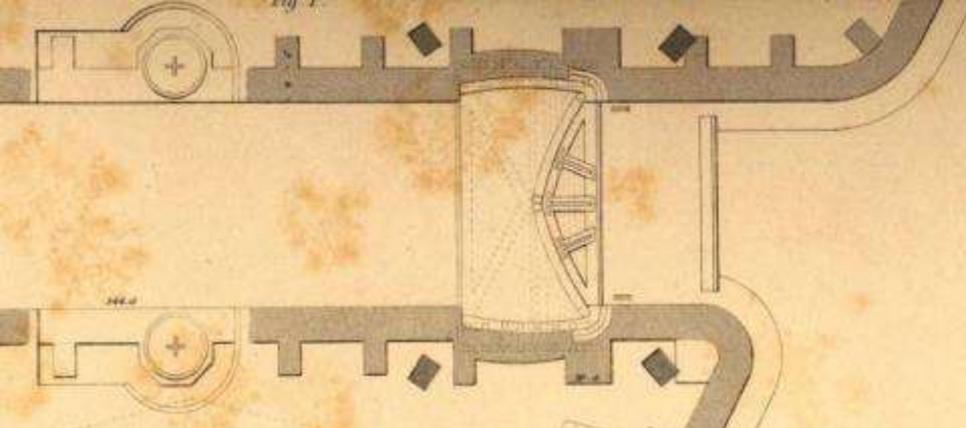
Fig. 1.



Glasgow Docks, Clyde Navigation improvement 1799-1800



Leith - Rennie docks and warehouses executed 1804-17



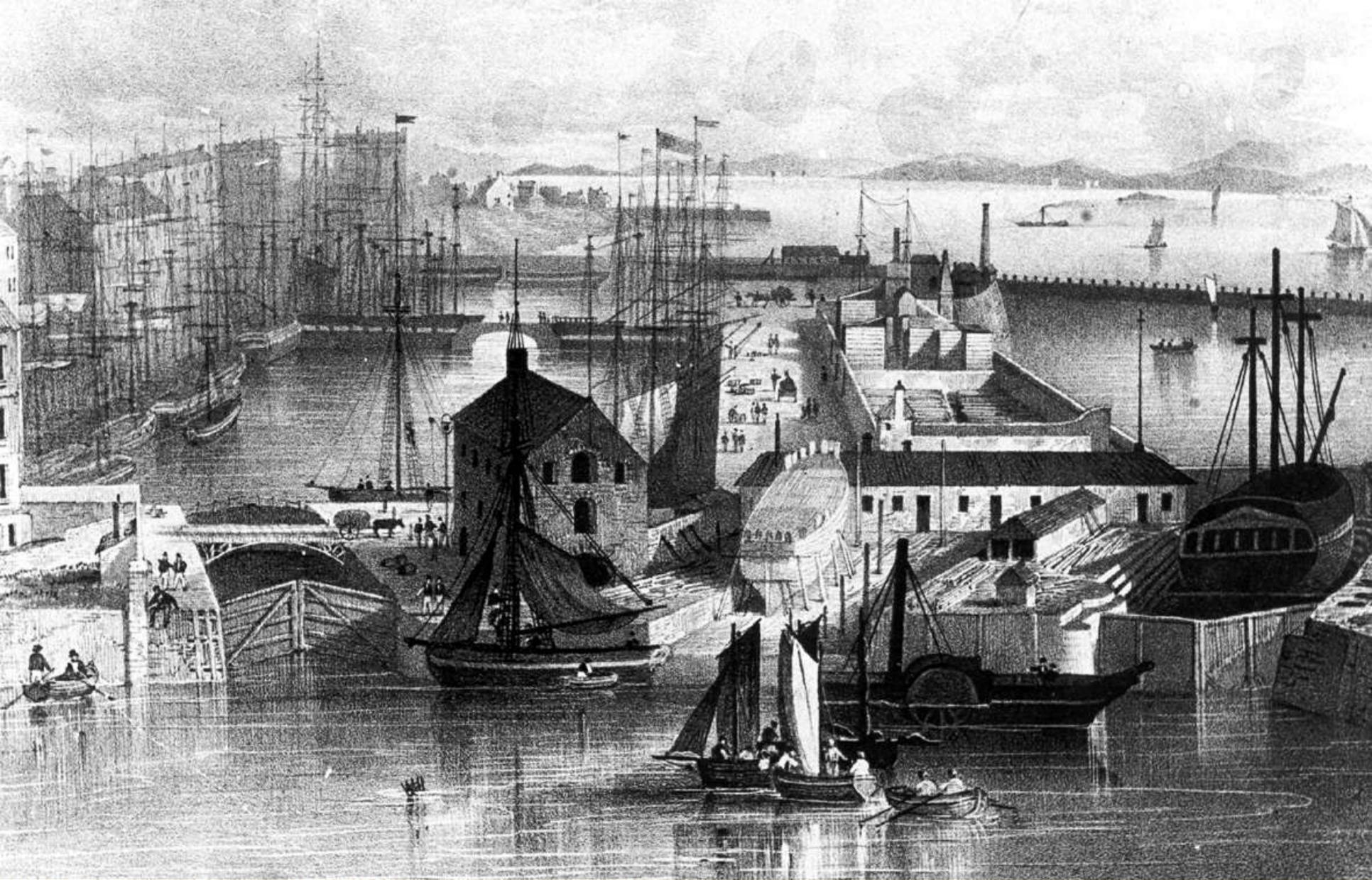
Leith
Docks
1806 -
Entrance
lock,
swing-
bridge,
dry
dock.
Rennie's
drawing



Leith docks entrance lock 1806 as in 1980



Leith docks entrance lock as preserved in 2010



Leith docks in 1838 – note Rennie's entrance lock and docks (left) and dry dock (right)

Fig: 1.

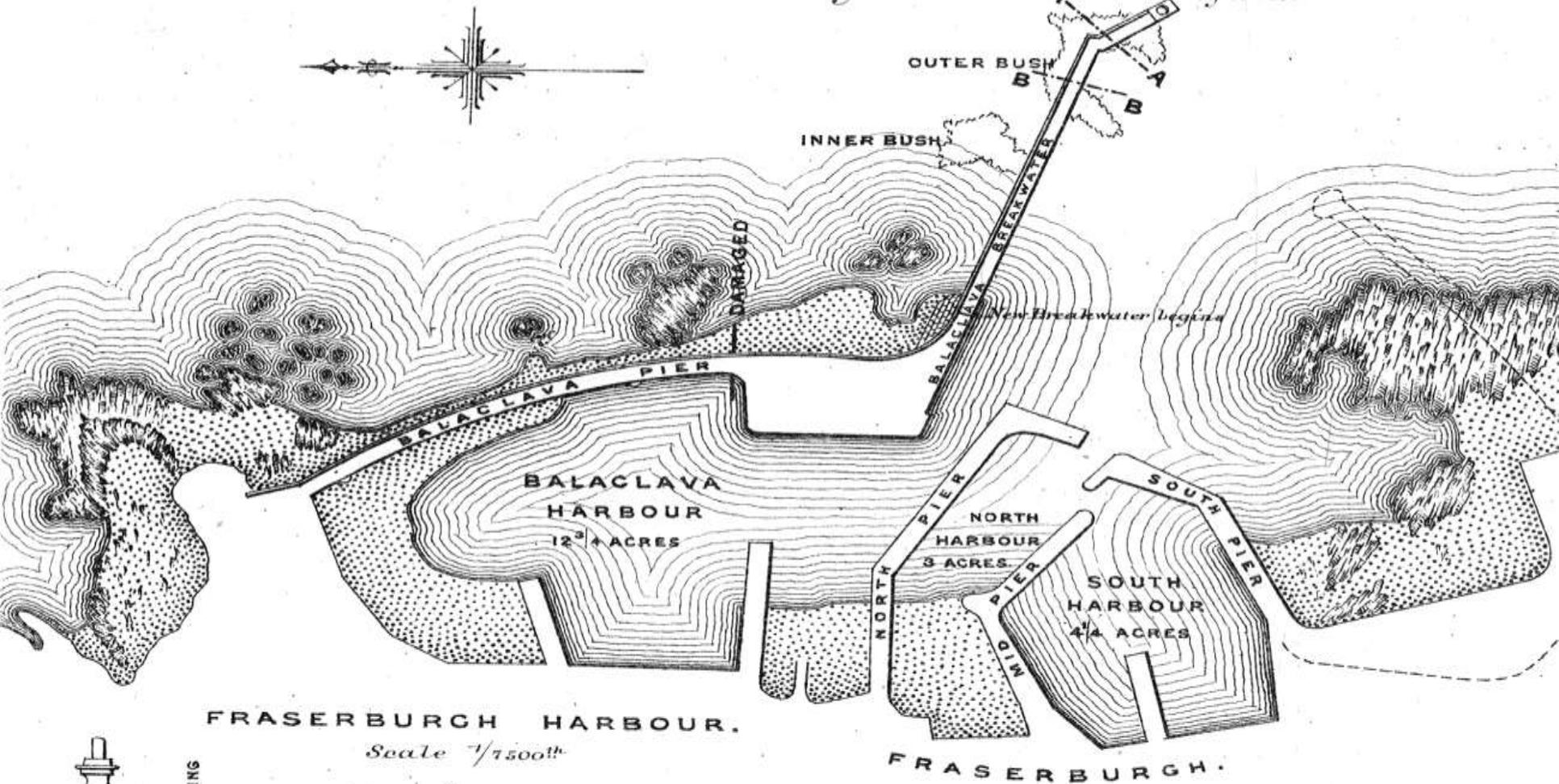
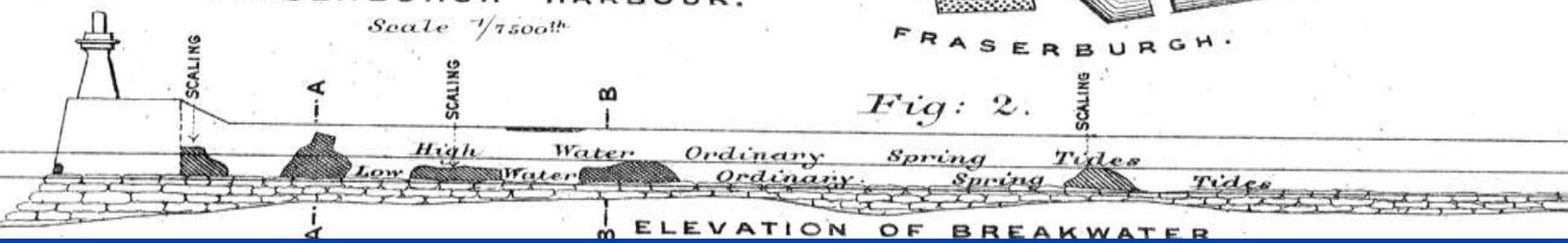
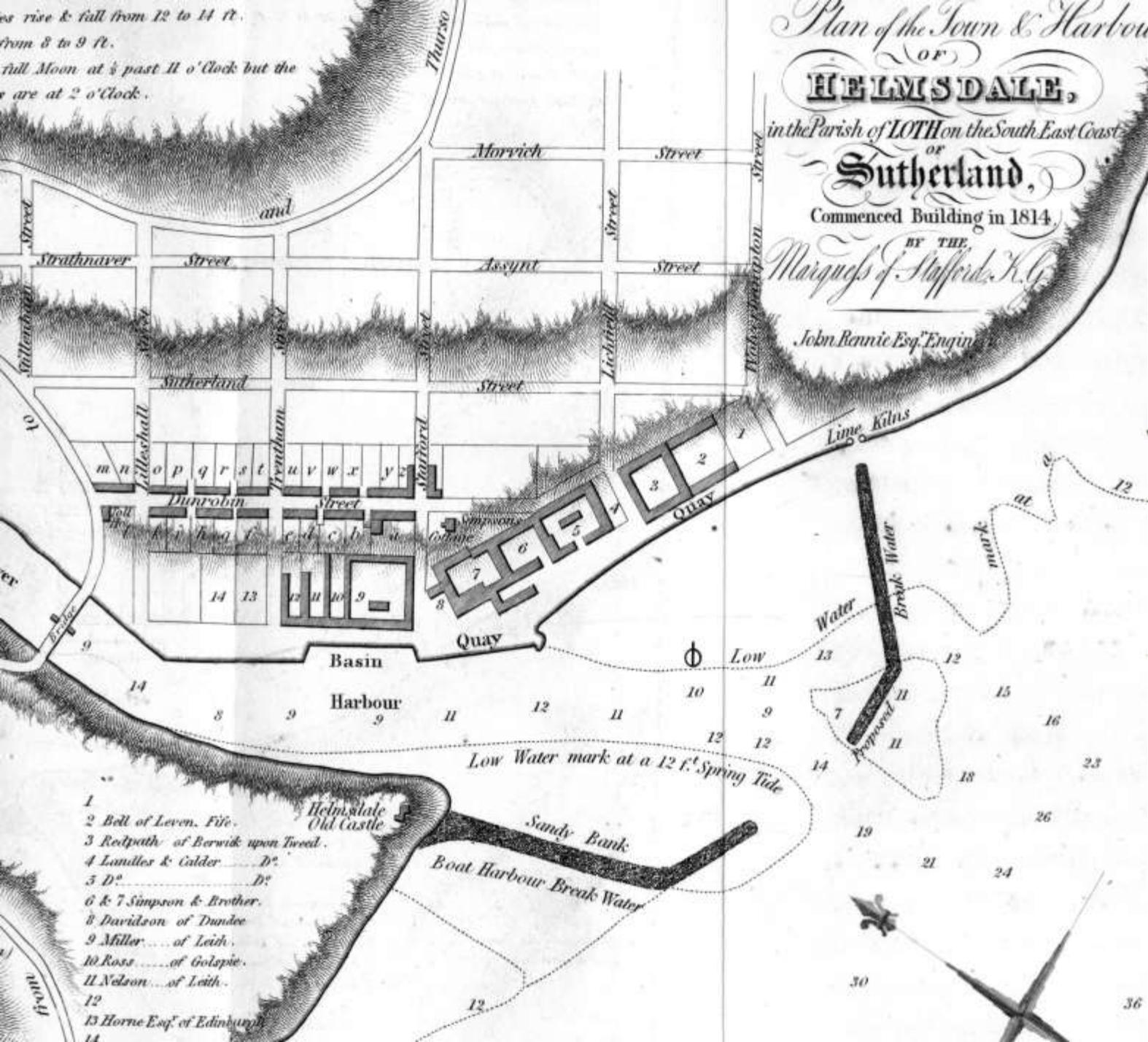


Fig: 2.



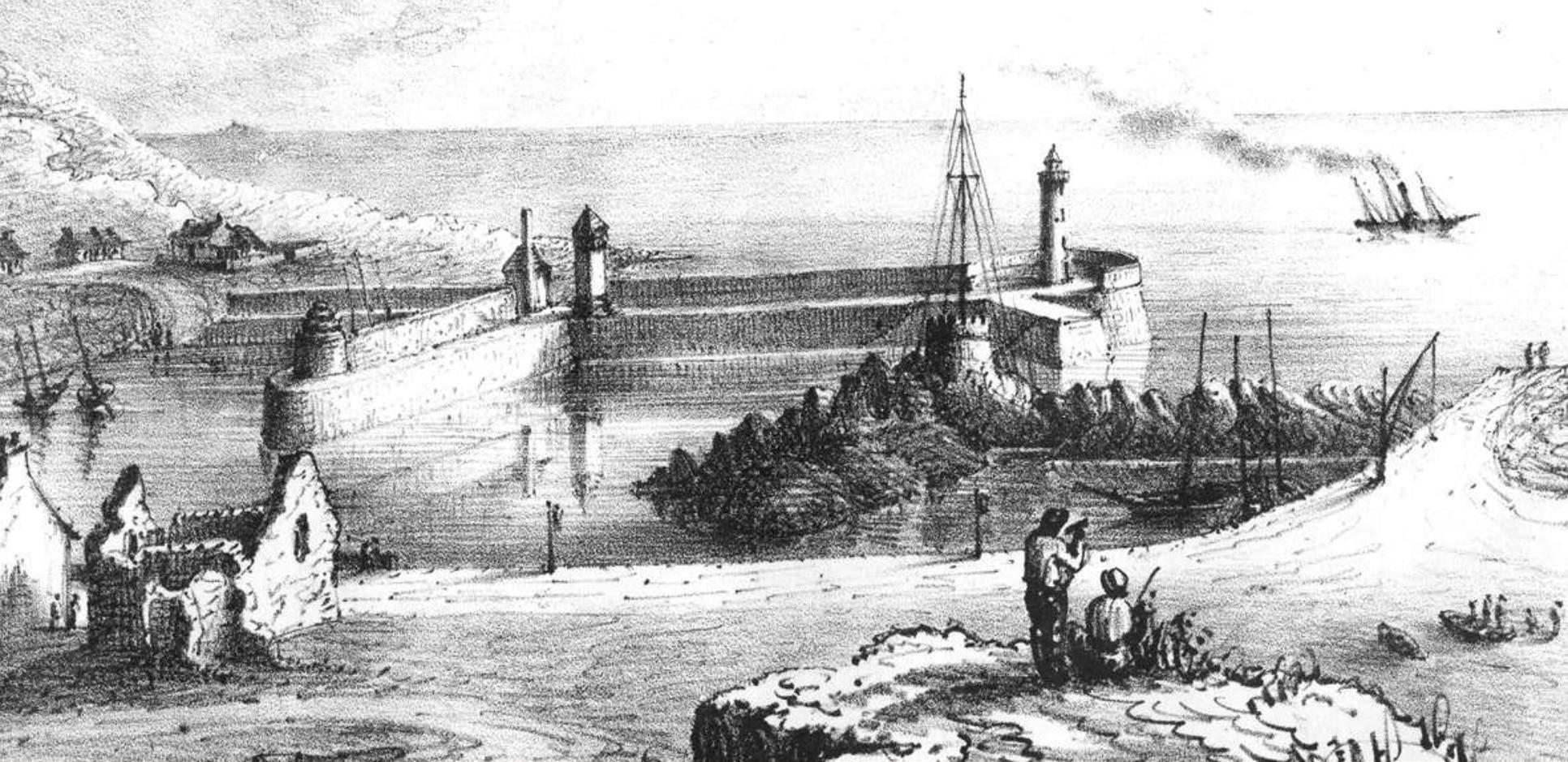
Fraserburgh Harbour 1806. Rennie's work incorporated in North Pier



Helmsdale
Harbour
1814-19

Rennie
Engineer

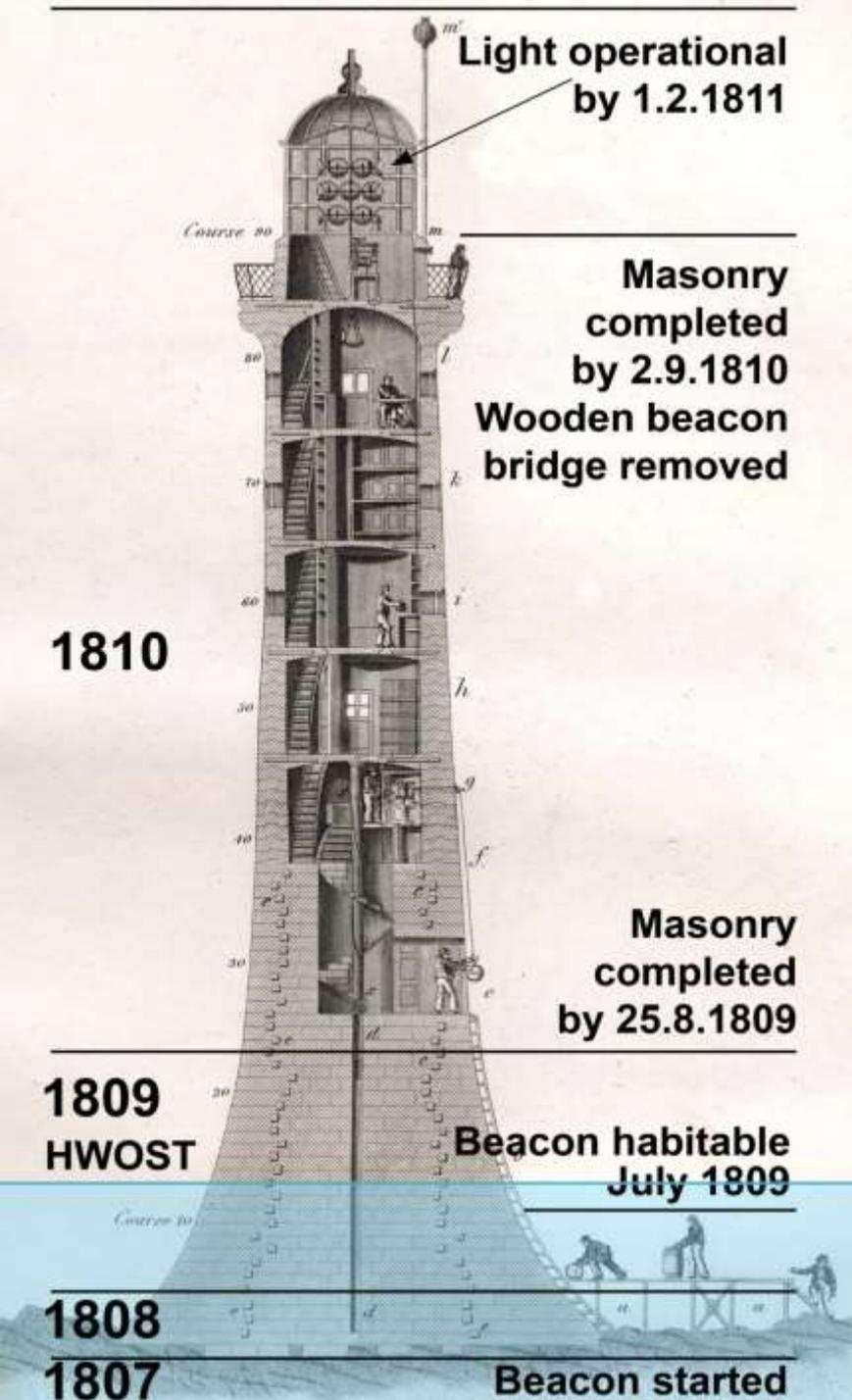
Proposed
Break-
water not
built?



Portpatrick Harbour – Rennie 1818 – 2 piers and lighthouse – c. £170,000. Work began 1820 – ‘700-800 labourers digging, quarrying, trundling barrows and working by night and day in the light of blazing coals ... din of ocean stilled by the clang of hammers, suction of pumps, hissing boilers and bellows roar. £14.000 storm damage in 1839. Above view c.1850



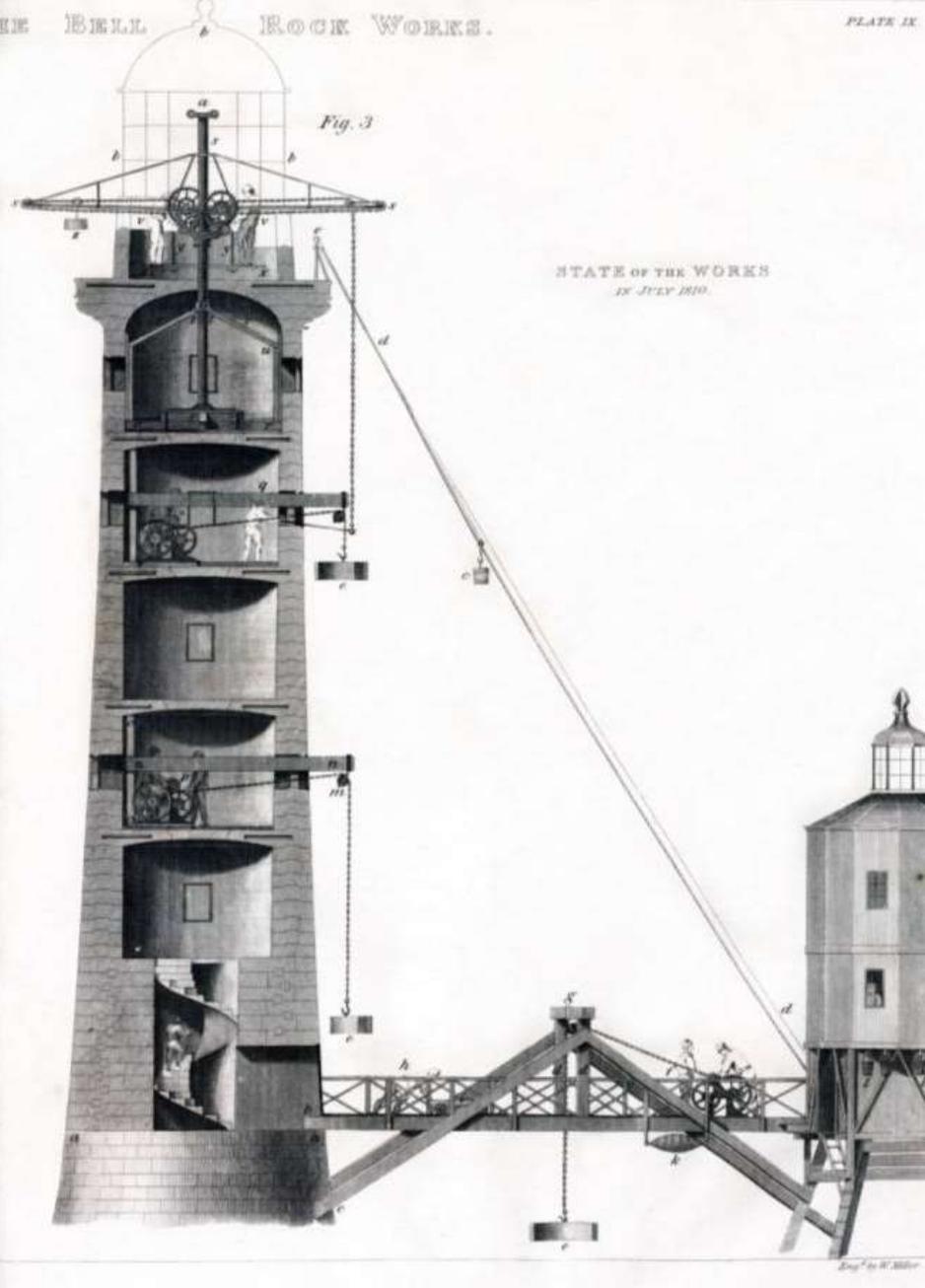
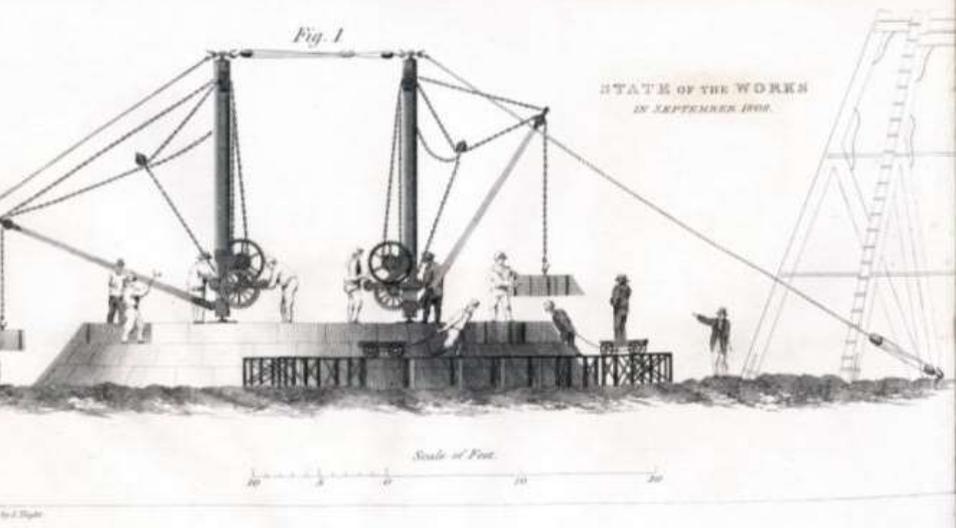
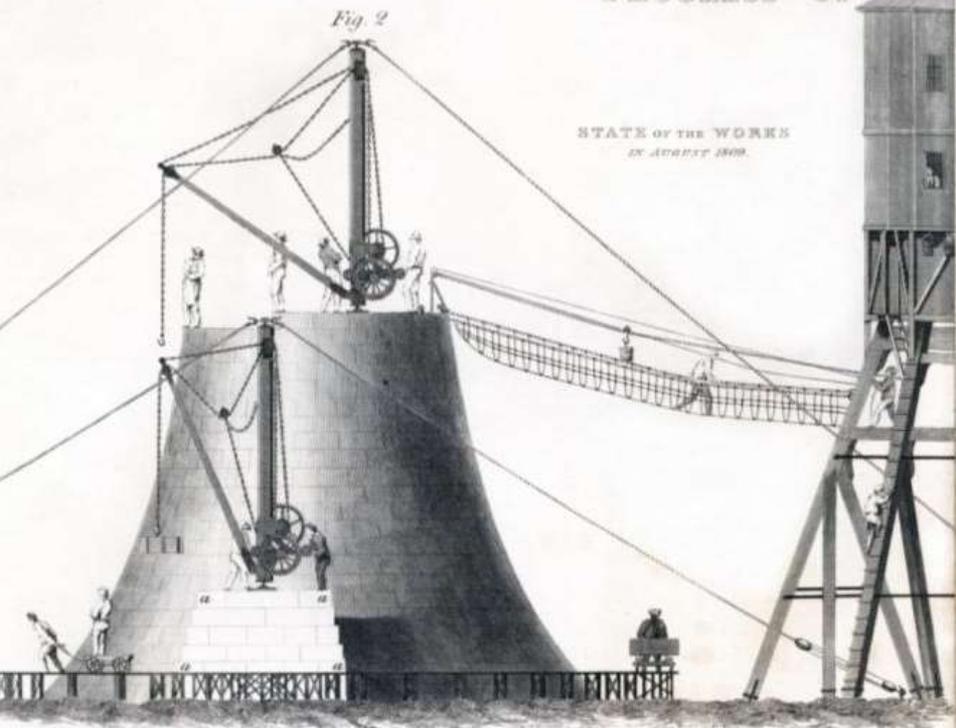
Rennie's Berwick Pier and
Lighthouse 1808-24. Pier
about 30 ft wide and 2000 ft
long. Cost £63,000 – still used



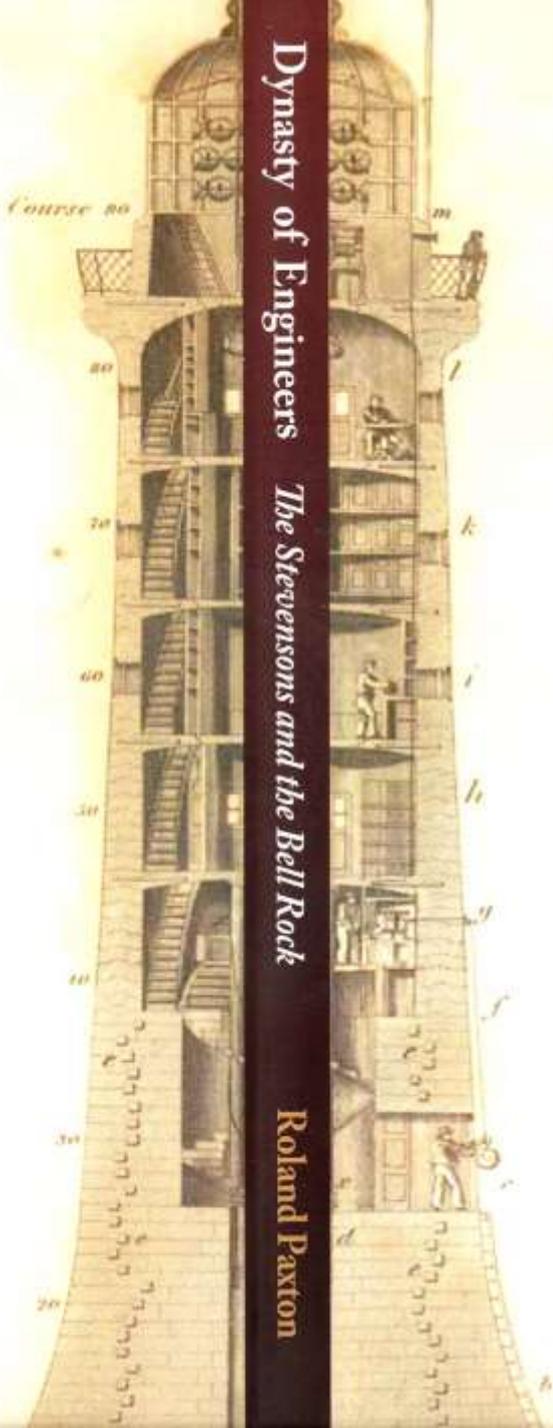
Bell Rock Lighthouse as erected 1807-11

John Rennie, Chief Engineer
Robert Stevenson, Resident Engineer

Slow progress until the beacon was built alongside, then completion of masonry in 13 months



Bellrock Lighthouse progress 1808-10



Dynasty of Engineers

The Stevensons and the Bell Rock

Roland Paxton



*Dynasty of
Engineers*

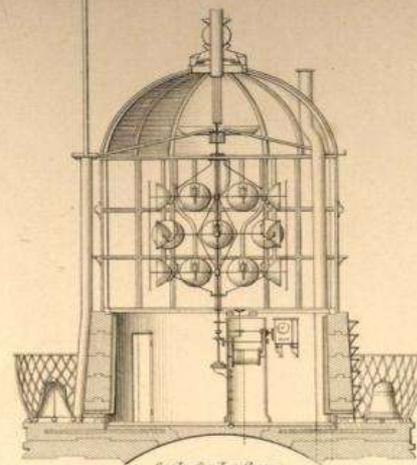
*The Stevensons and
the Bell Rock*

ELEVATION AND TRANSVERSE SECTION

DESIGN AS EXECUTED.

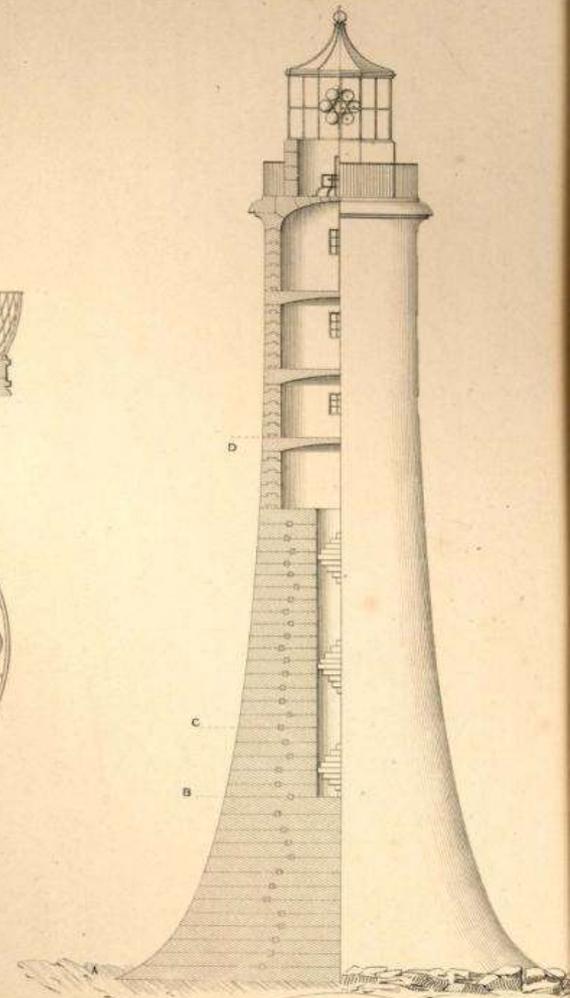


SECTION OF LANTHORN

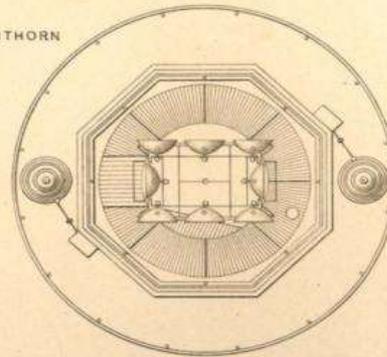


ELEVATION AND TRANSVERSE SECTION

ORIGINAL DESIGN.



PLAN OF LANTHORN



Scale for Elevations and Plans

PLAN AT E

PLAN AT A

PLAN OF LIGHTHOUSE
TAKEN BELOW THE DOOR WAY

PLAN AT B

Bellrock Lighthouse - Sir John Rennie's drawing 1854



Bellrock Lighthouse kitchen – note floor dovetailing

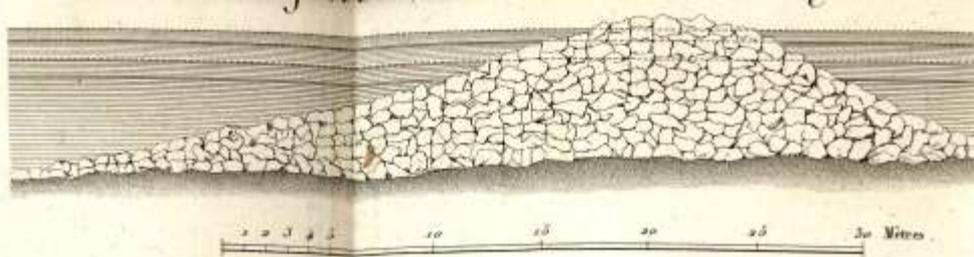
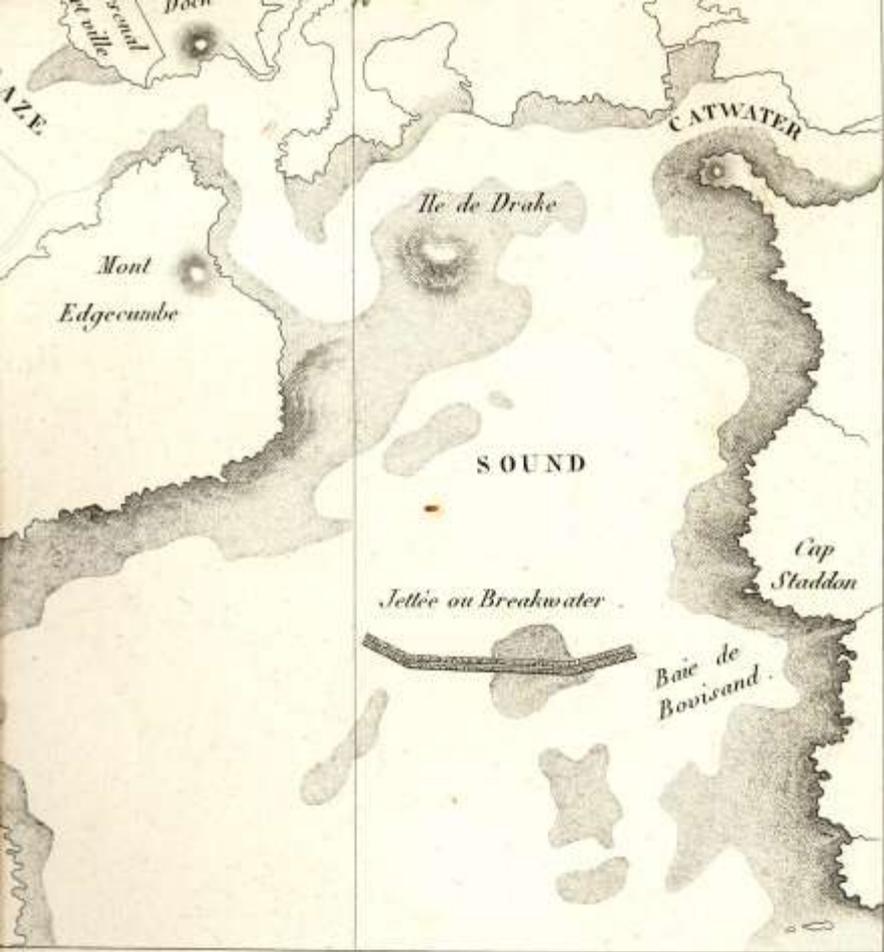
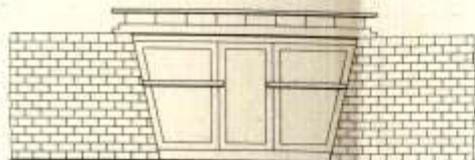


Fig. 7.



Fermetures à panneaux des formes de construc^{on}.

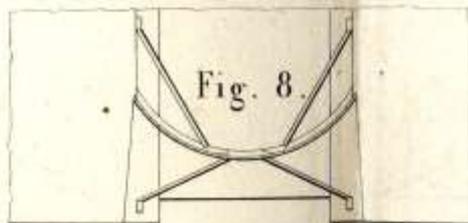
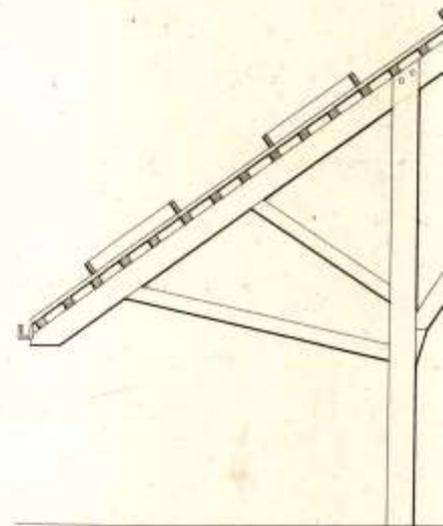


Fig. 8.



Plymouth Breakwater 1812-47

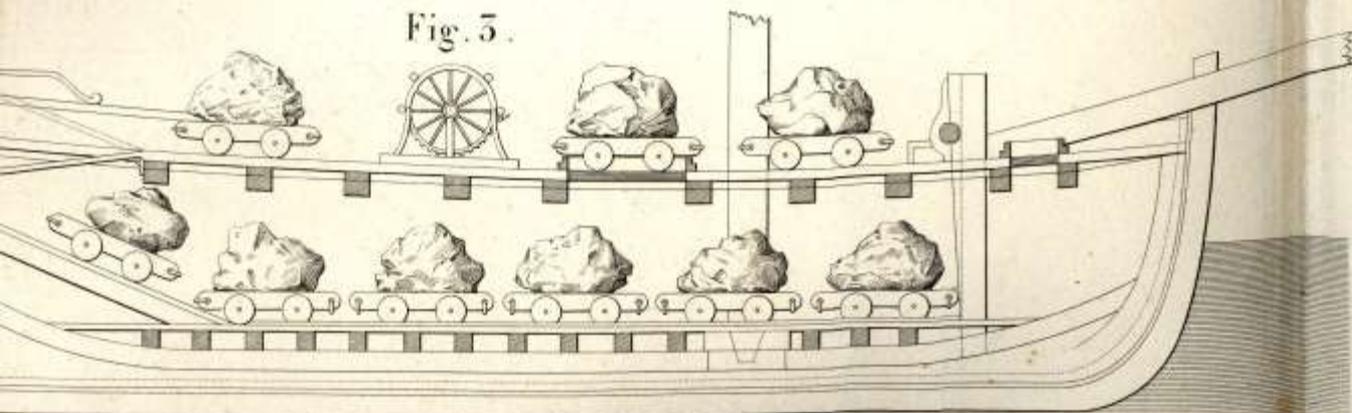
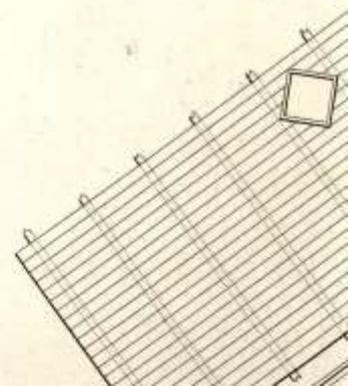


Fig. 5.





Glencorse dam

Edinburgh water supply

Crawley

Spring

Glencorse Reservoir

1820-25



Fig. 2

Section across the Valley of Glencorse Burn or Longitudinal Section of the Head.



Fig. 3

Cross Section of the Head in the Line AB of the Longitudinal Section.

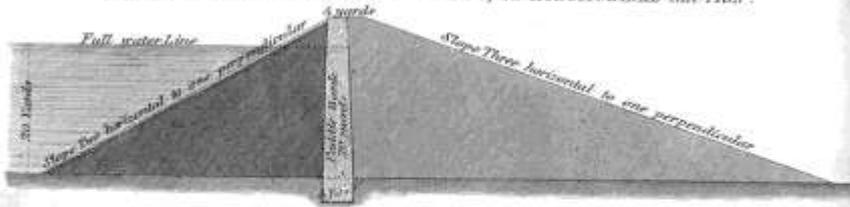
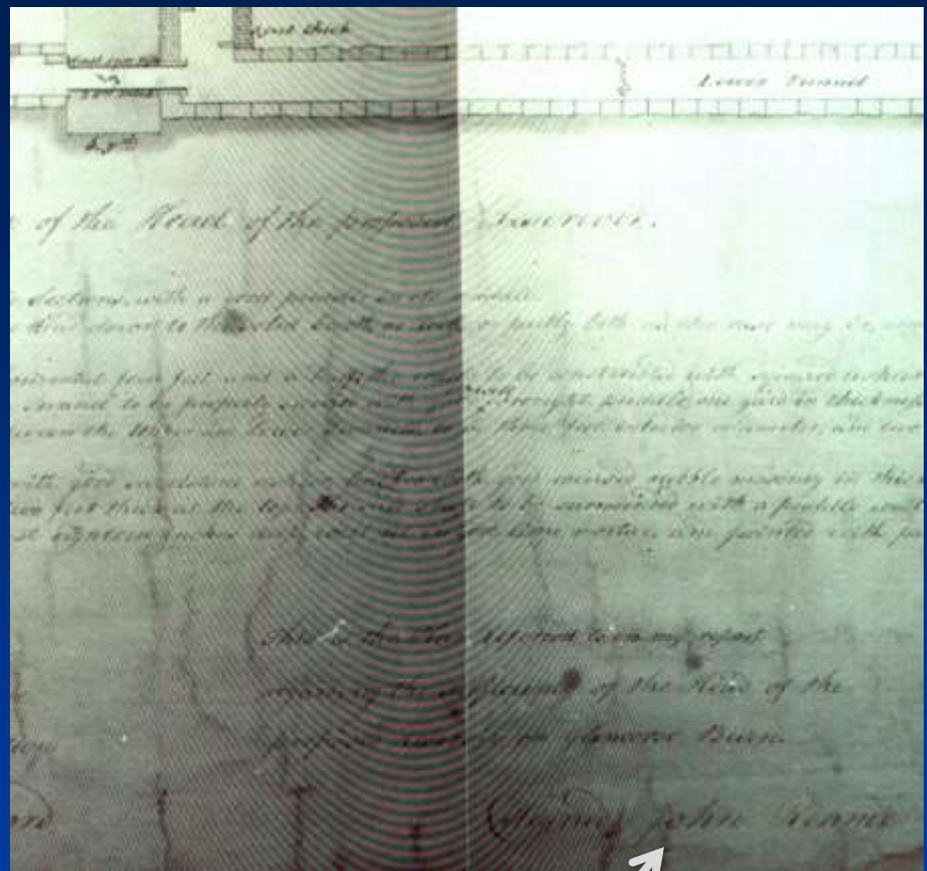


Fig. 4

Cross Section of the Head in the Line CD of the Longitudinal Section.



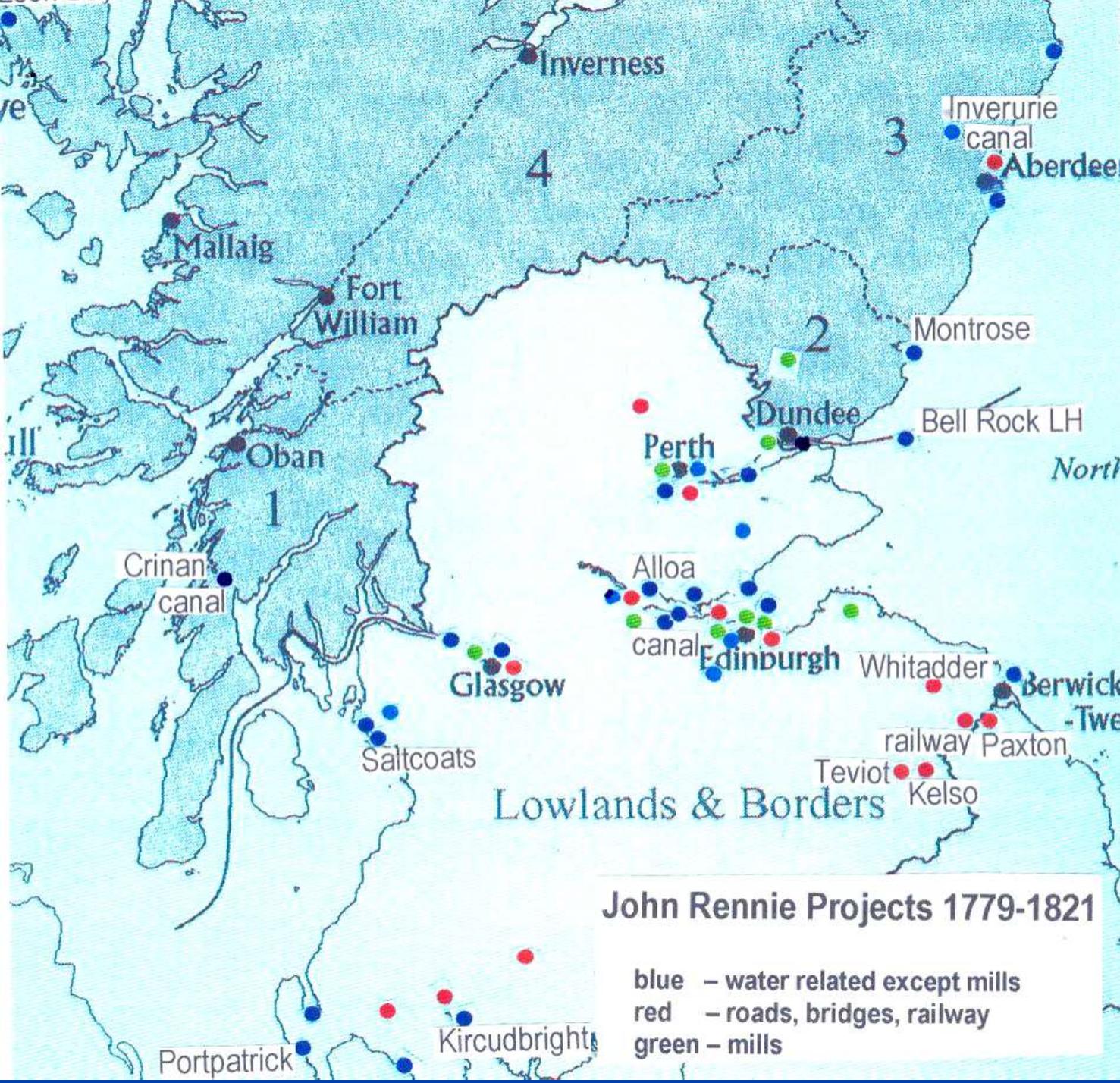
John Rennie's signature
on original specification

Glencorse Reservoir 1825 – Engineer James Jardine



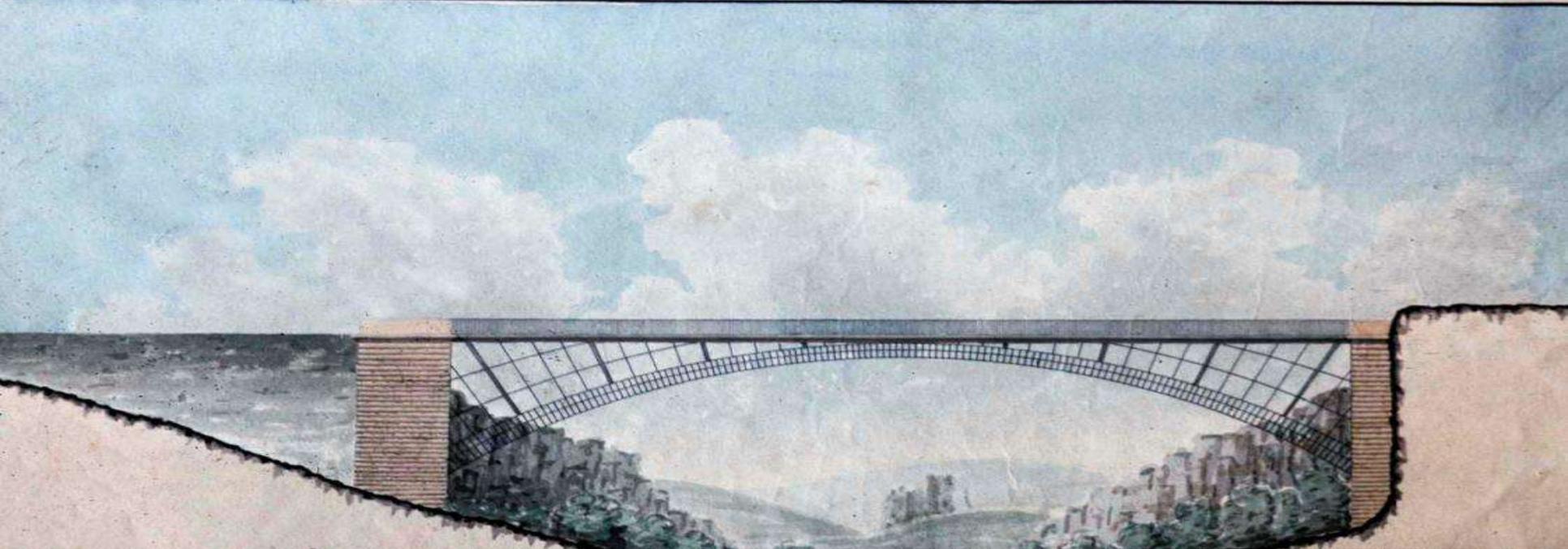
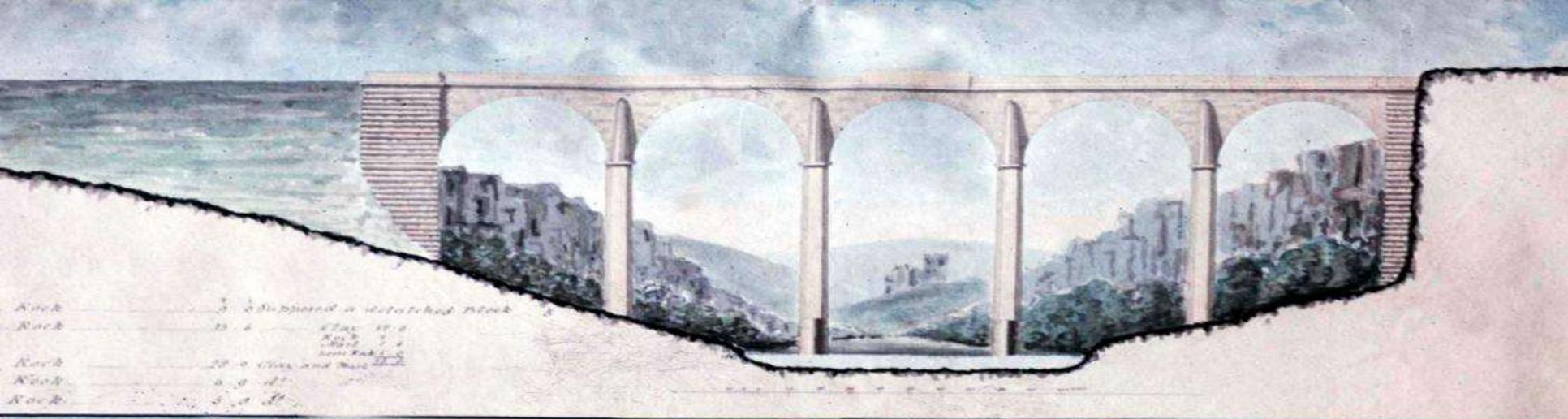
Loch Leven proposed drainage in 1810 to reclaim 500+ acres and improve water supply to River Leven mills. Done 1830. Rennie's drainage of English East & West Fens was on much larger scale

Rennie bridges roads and railway (all shown red)





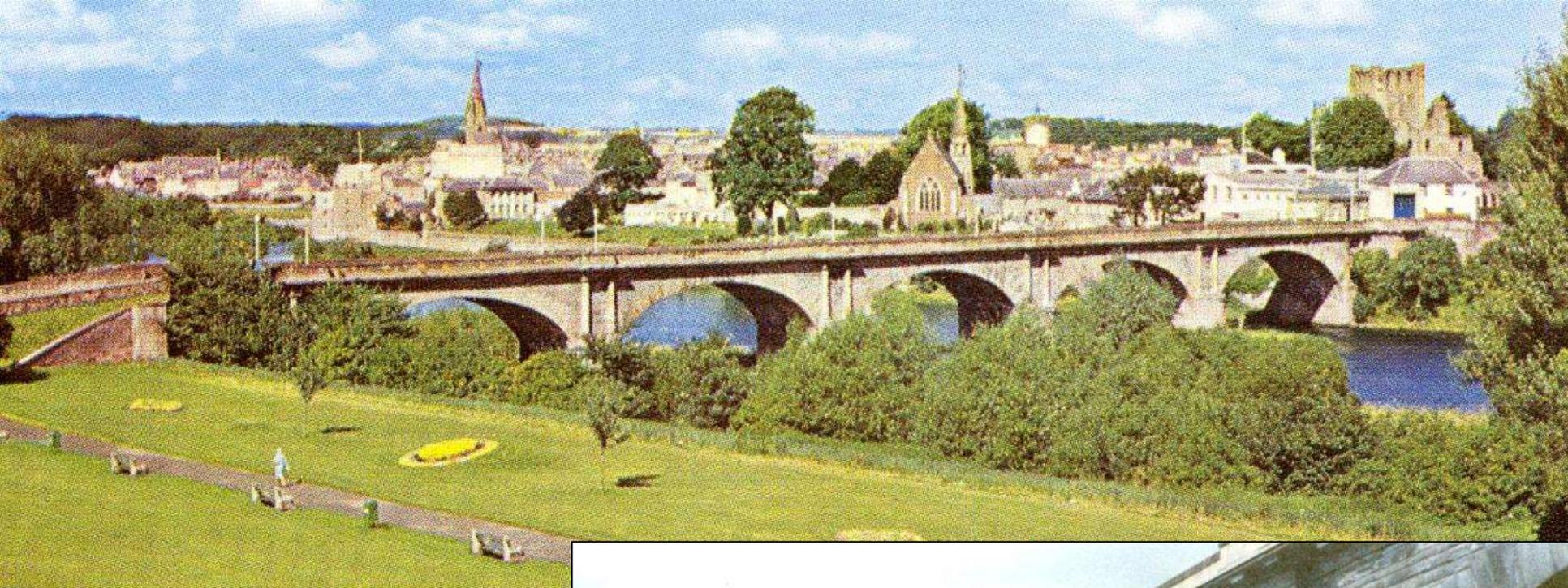
Stenhouse Bridge over Water of Leith, Edinburgh 1784 – Rennie's role unconfirmed. Bridge replaced c.1925



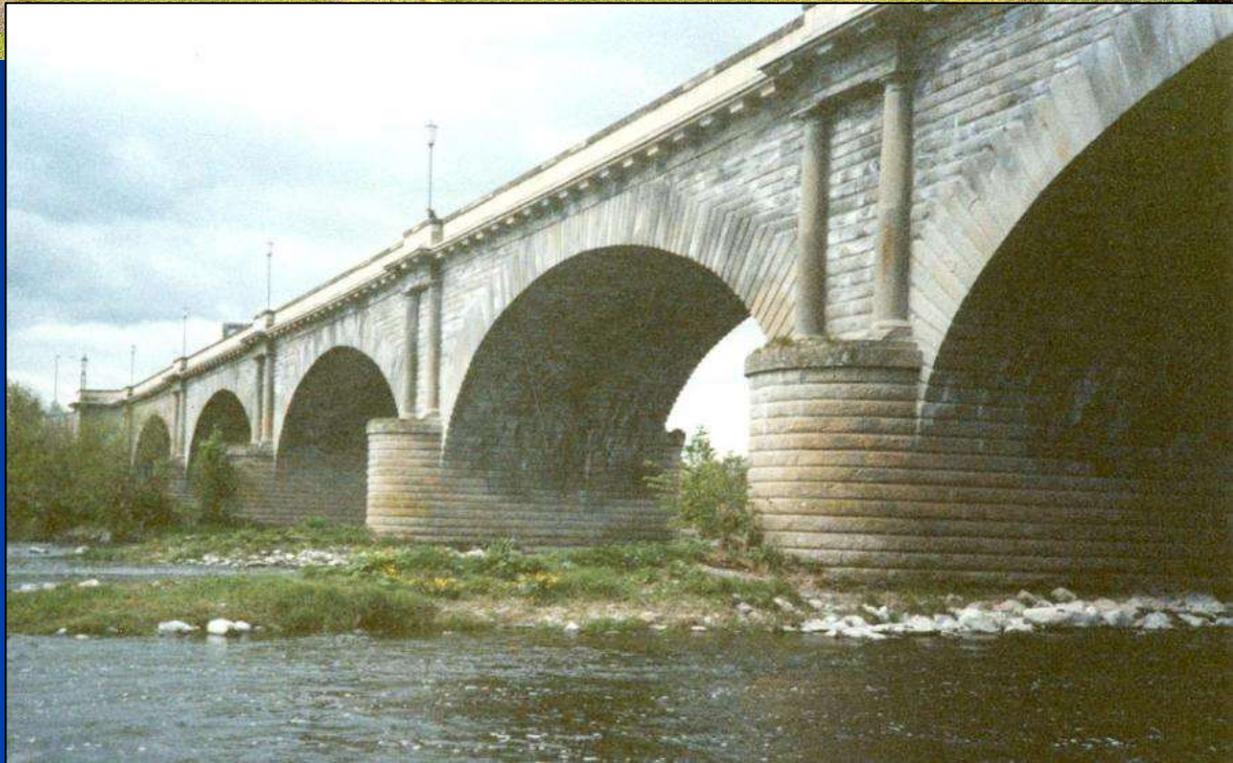
Whiteadder Bridge, Berwickshire - Proposals 1800. Rennie changed his spandrel load transference mode from radial to vertical at Boston in 1804



A stone bridge at Kelso was built 1755-6, fell 1757, rebuilt c.1760, fell in 1797 when, according to Rennie, “during one great ice flood it had four of its six arches very much choked with ice and the current running between its narrow starlings and the other two arches, dug out the bottom and swept the whole away.”



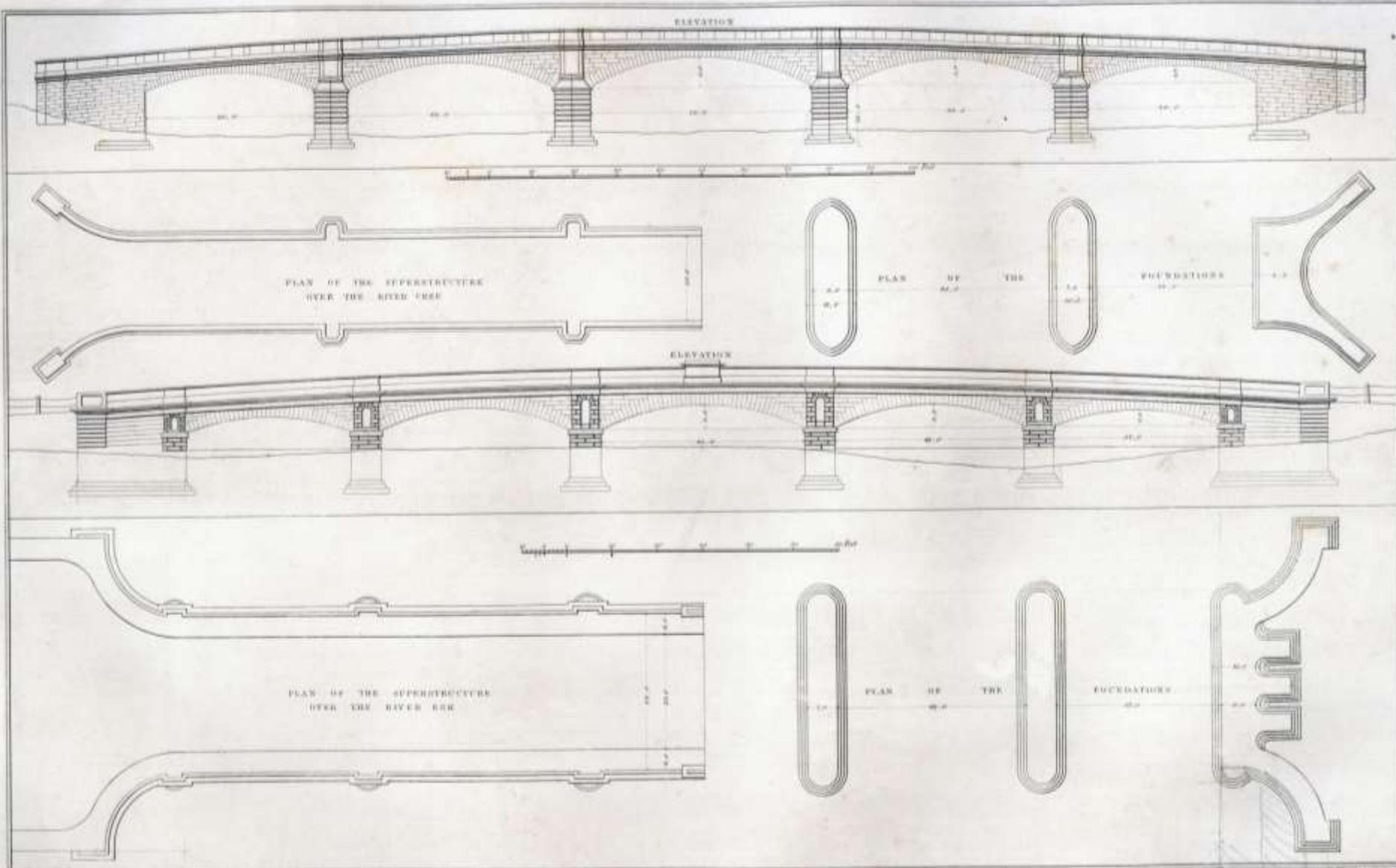
Kelso Bridge 1801-04
72 ft spans (elliptical)





*I am ever
affectionately
yours
W Lambton*

“When living in Kelso in 1803 I got employment at the New Bridge ... a more chaste and beautiful structure with the exception of Waterloo and London Bridges does not exist [but]...to which I took a great dislike ... I met with an accident which nearly crippled me for life ... [when carrying a stone] beyond my strength I sank under the load and the stone fell on my right leg ... near 3 months confinement ... effectively barring a mason’s clerkship”



BRIDGES ERRECTED OVER THE RIVER CREE AT NEWTON STEWART AND OVER THE ESK AT MUSSELBURGH.

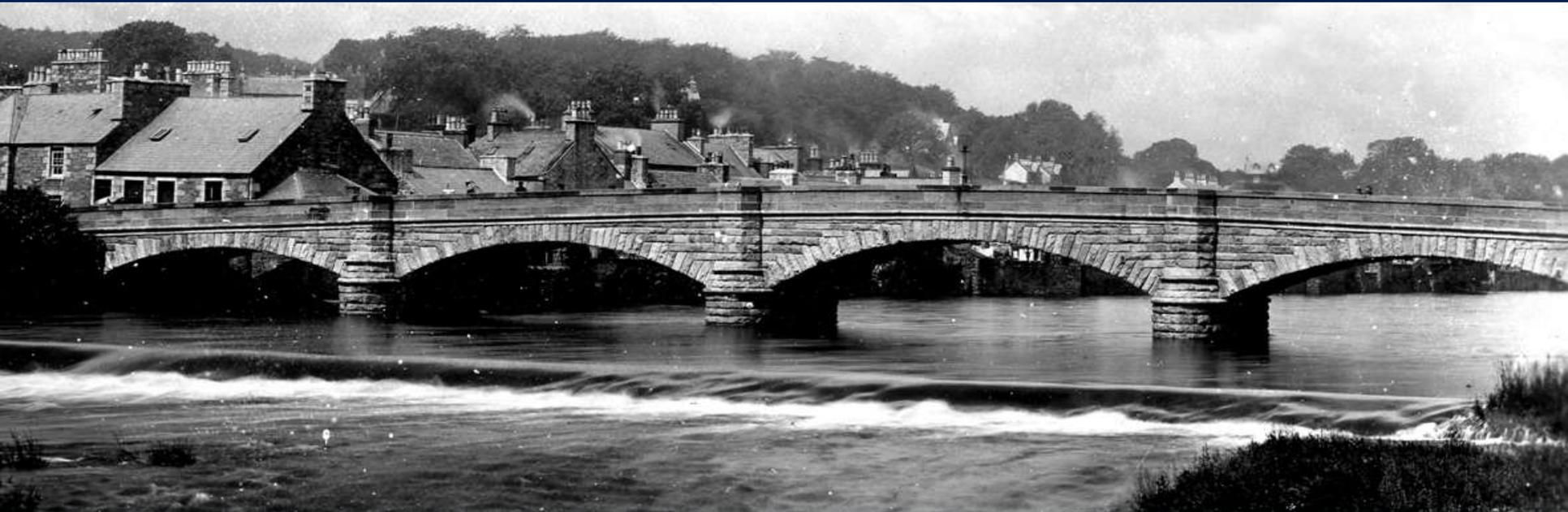
Rennie drawings of Musselburgh (46 ft max) and Newton Stewart (50ft max) Bridges



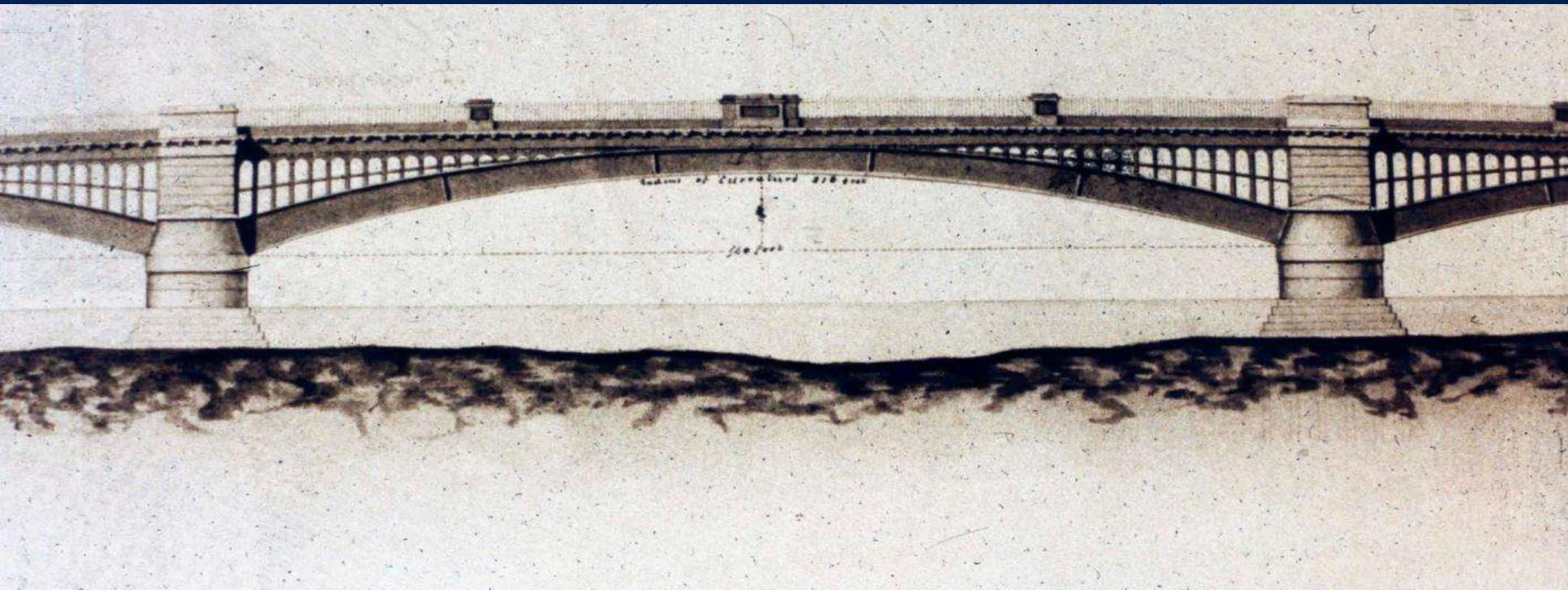
Musselburgh Bridge 1806-8 widened in 1925 on downstream side by Blyth & Blyth, Edinburgh



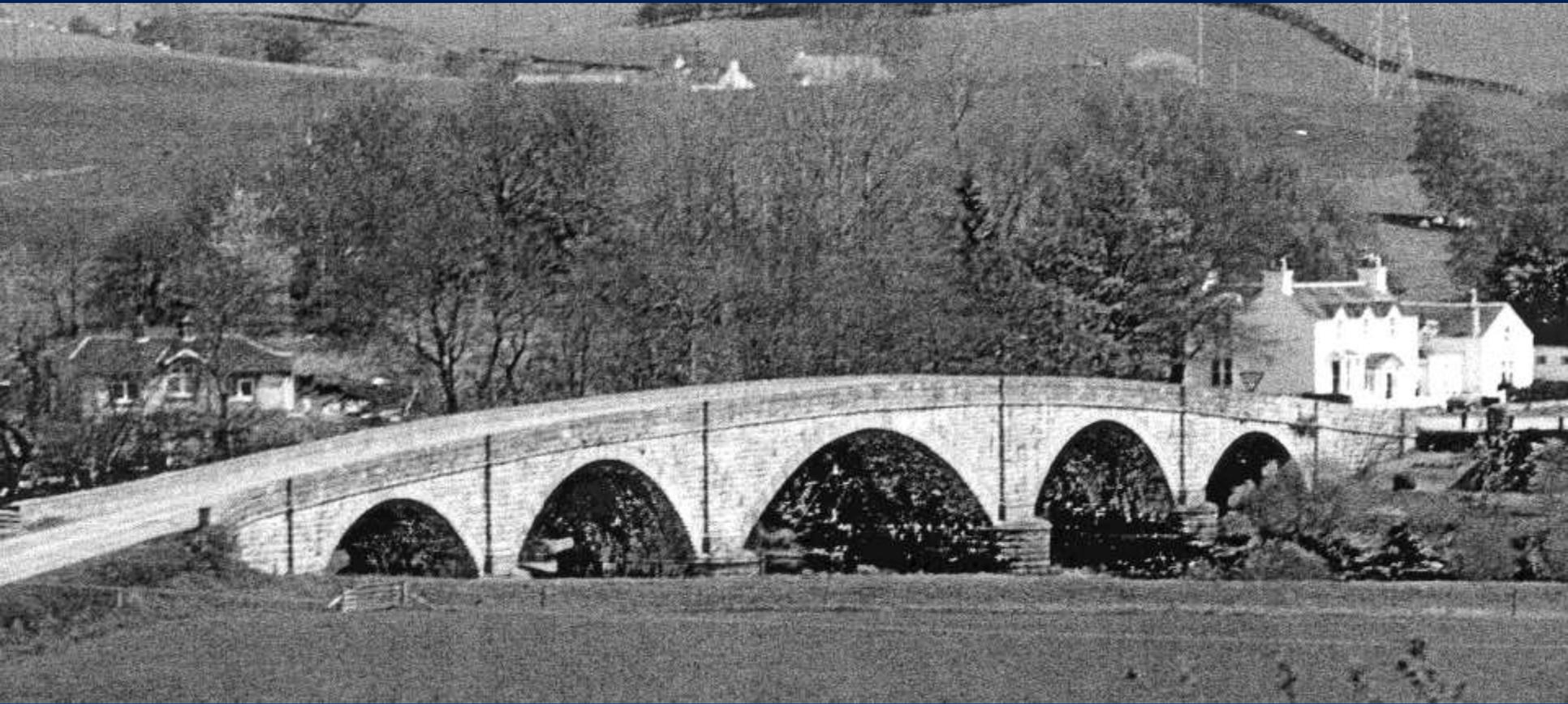
Musselburgh Bridge 1806-8 in 2010



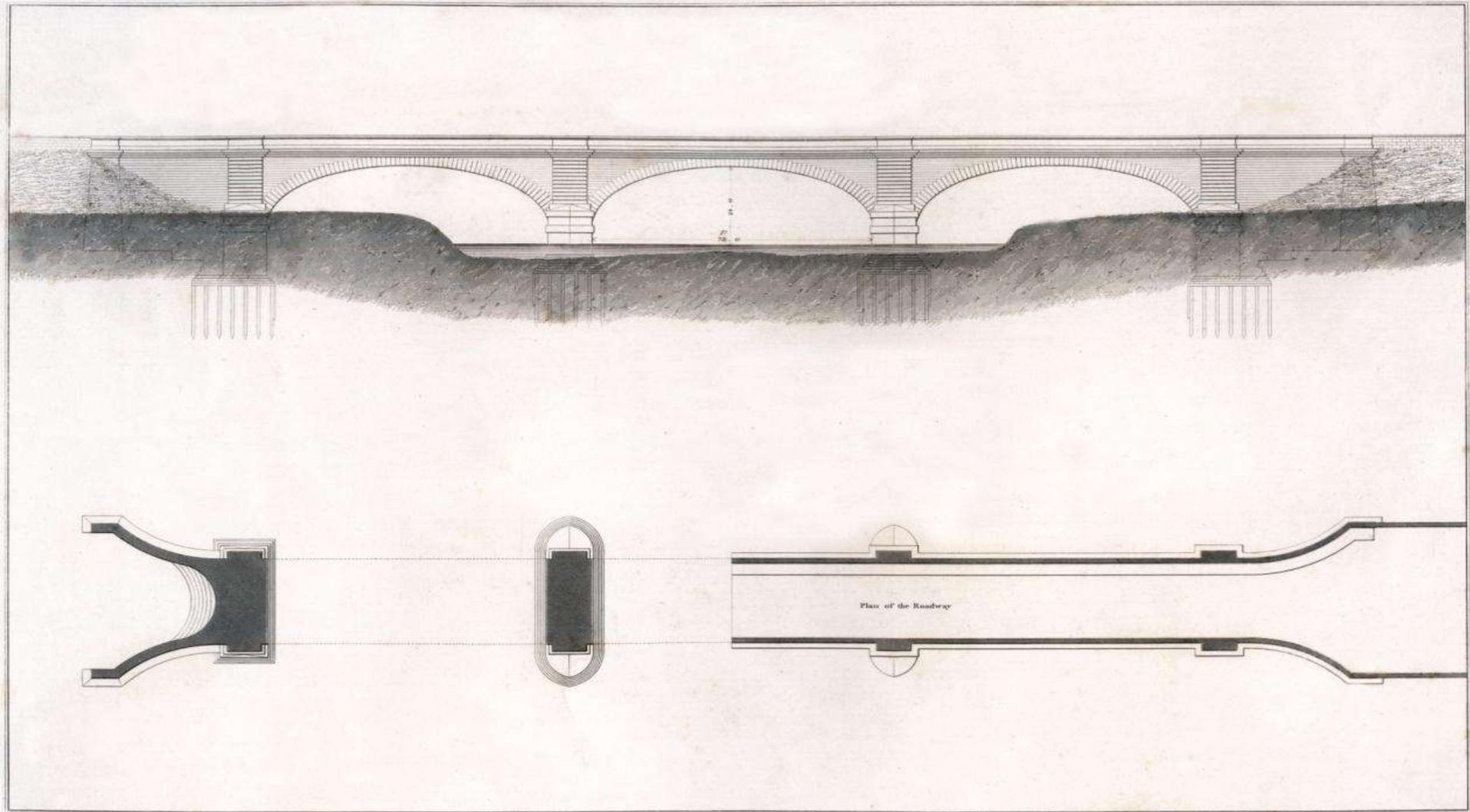
Cree Bridge, Newton Stewart 1812-14 – cost £8234



Glasgow, R. Clyde, Hutcheson Bridge Proposal 1815
(120 ft – 140 ft- 120 ft spans: ribs 48-66 ins deep)



Ken Bridge, New Galloway (90ft. max) 1820-24. Extensive water - way as earlier bridges destroyed by floods in 1806 and 1815



John Rennie, C.E.F.R.S. &c. &c. Const.

G. Blodwin Sc.

BRIDGE OVER THE EARN, SCOTLAND.

John Williams, Librarian of Science & Art, 406, G. Russell Street, near the Museum.

Rennie drawing of Bridge of Earn (72 ft spans) – built 1819. Widened in 1925 by F.A. Macdonald & Prtnrs

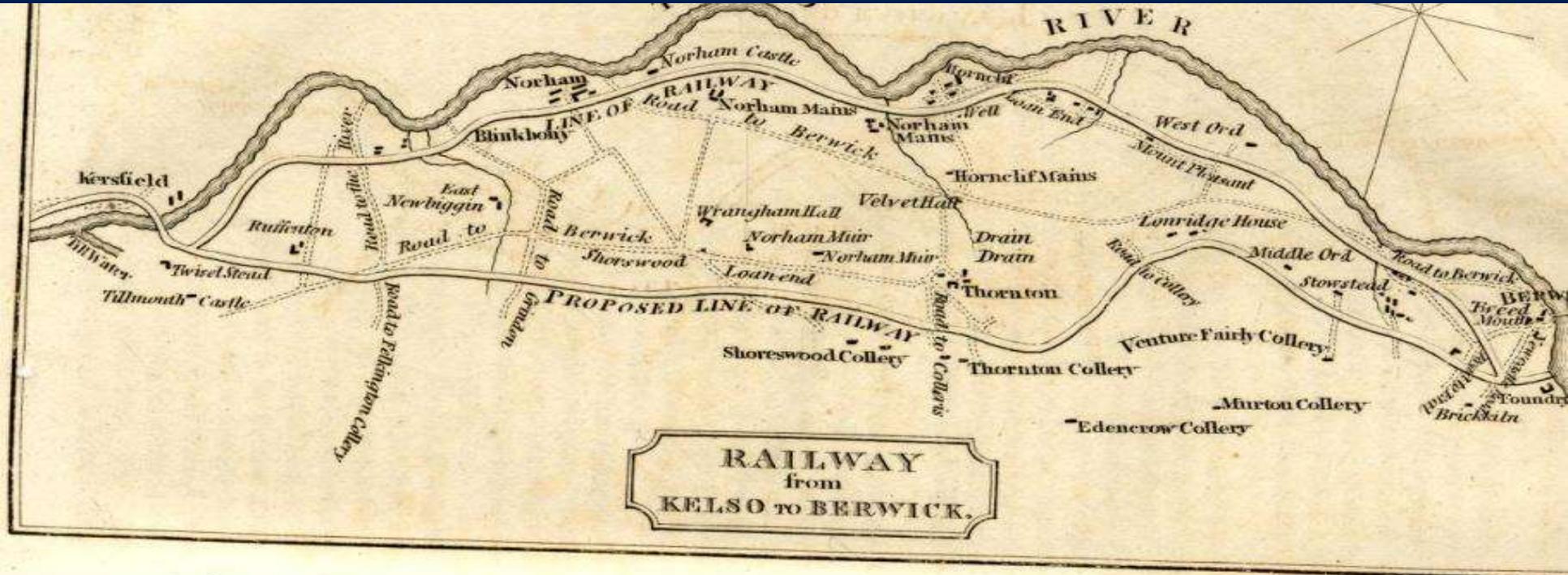


Rennie's Bridge of Earn 1819
as widened with concrete in
1925 retaining the elliptical
shape of the original arches
visible under the bridge

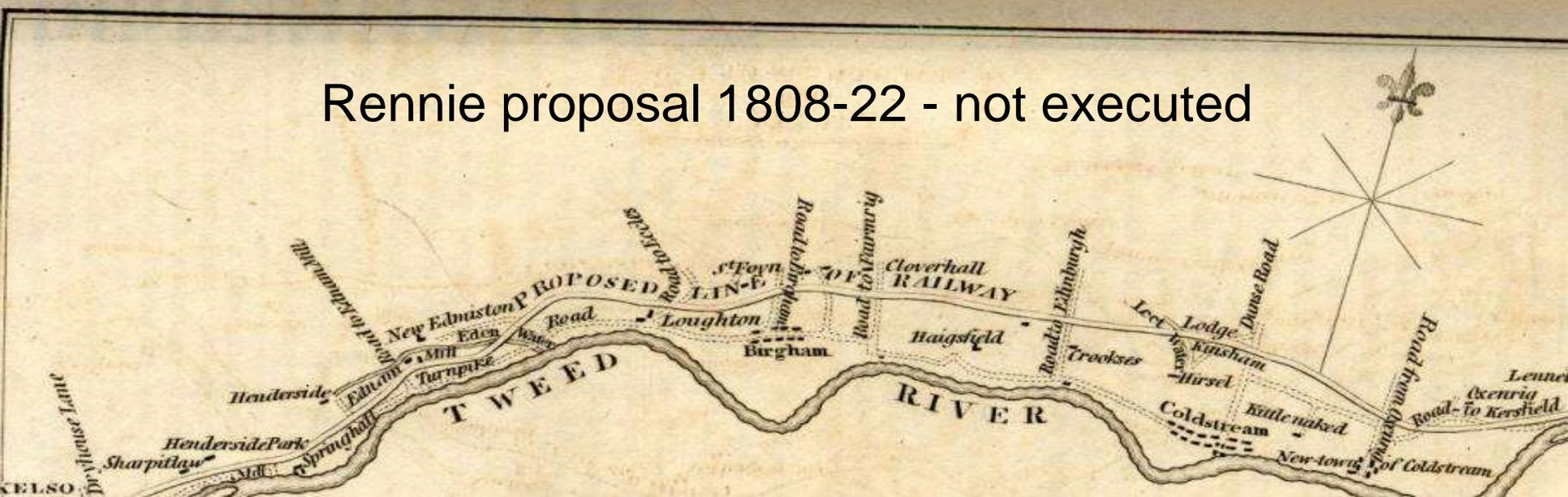




Rennie's
(8-arch)
Cramond
Bridge
1820-21
under
demolition
in 1963

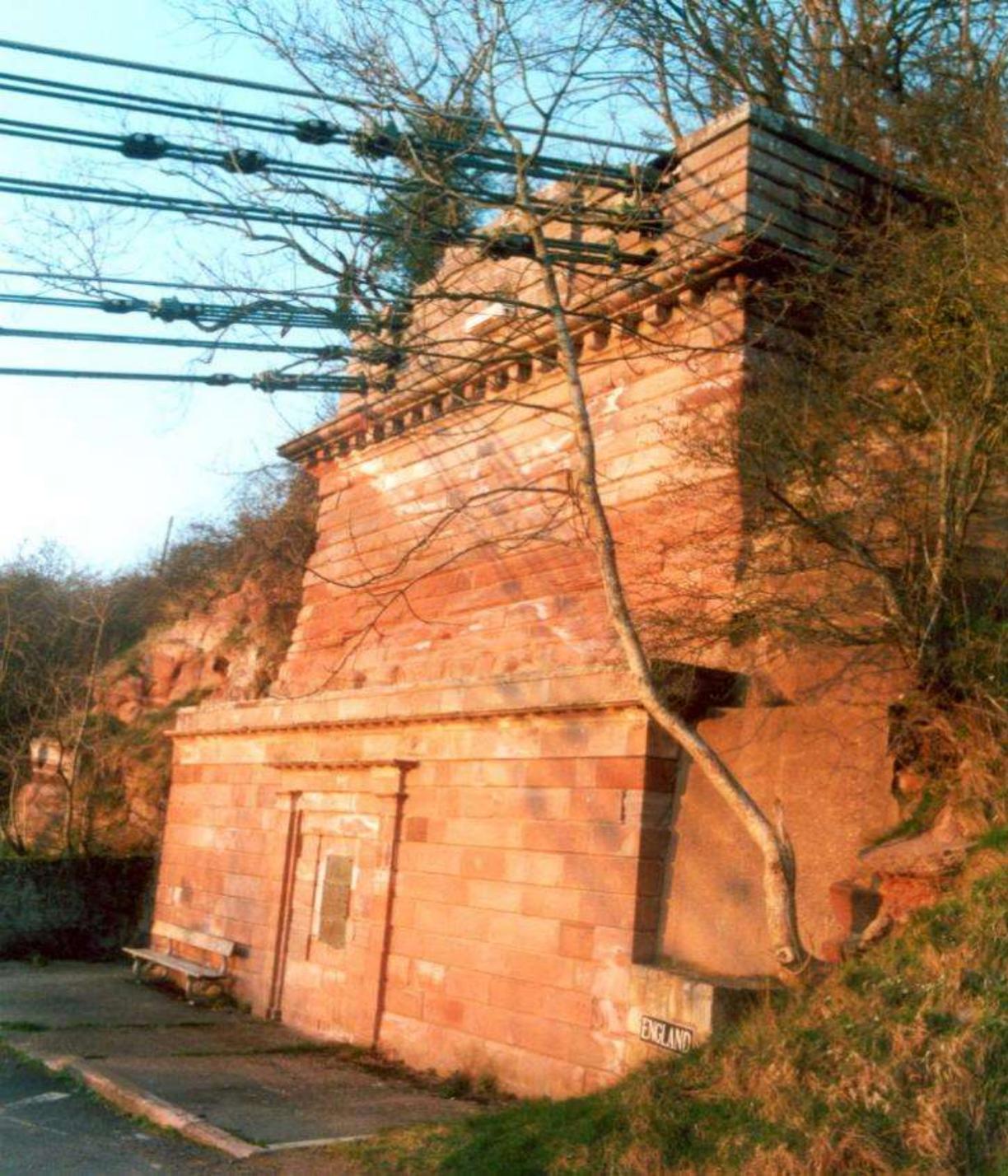


Rennie proposal 1808-22 - not executed





Union Bridge, Paxton, 1819-20. Rennie advised Capt. Samuel Brown RN on the strengthening of the tower and abutment, of what is now the world's oldest suspension bridge still carrying vehicular traffic



Union
Bridge
abutment
1820
Wrought
ironwork
by Capt.
Samuel
Brown.
Rennie
advised

Pont de Southwark à Londres.

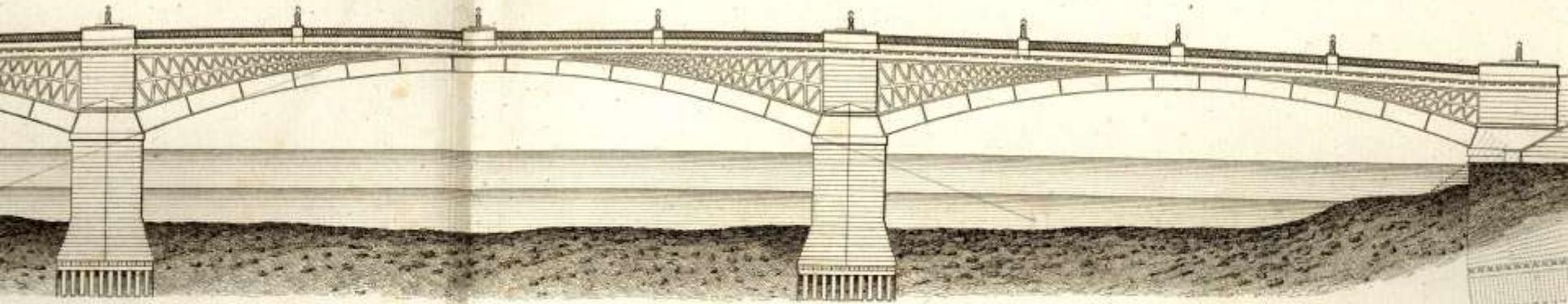


Fig. 2.

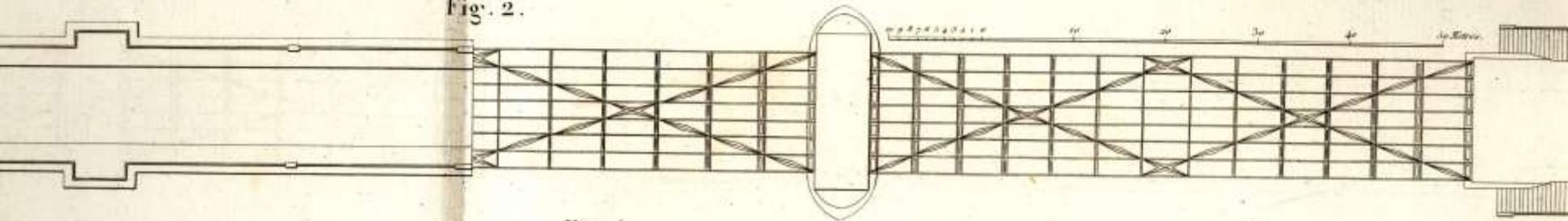


Fig. 4.

Fig. 5.

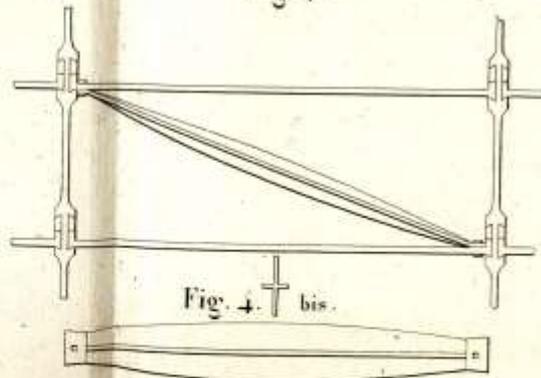
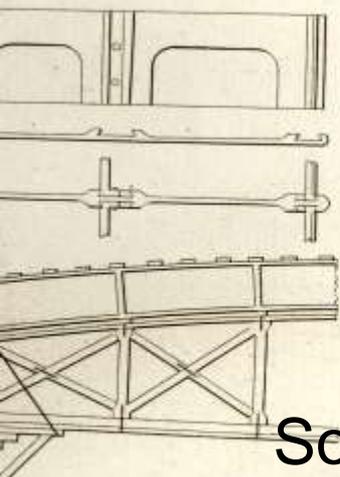


Fig. 4 bis.

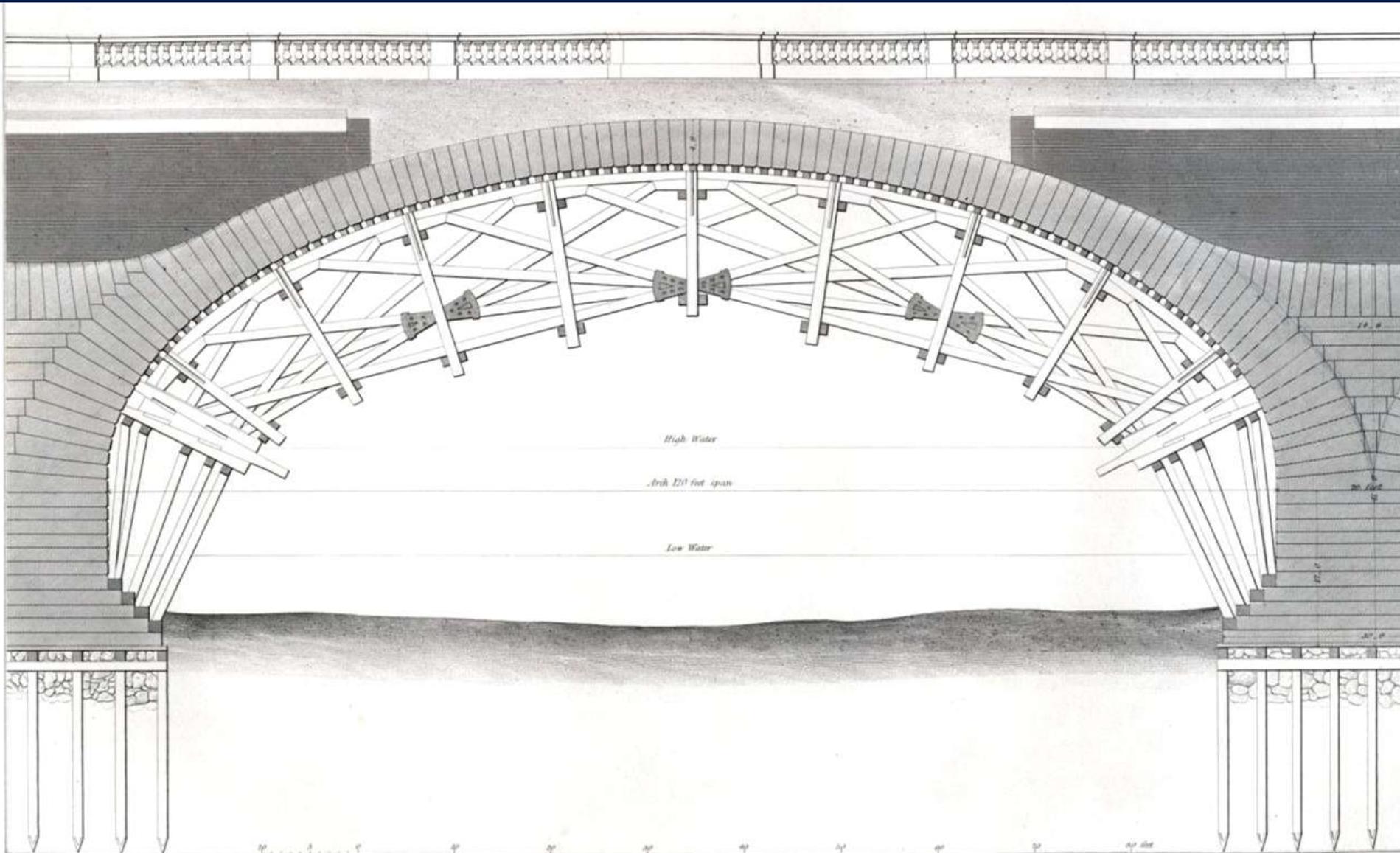
Fig. 7.

Fig. 7 bis.

Fig. 5. ter.

Fig. 5. bis.

Southwark Bridge 1814-19. Weight c. 5400 tons.
Cost £0.66m. Demolished 1920.



John Rennie C.E. Const.

WATERLOO BRIDGE, LONDON. CENTRES &c.

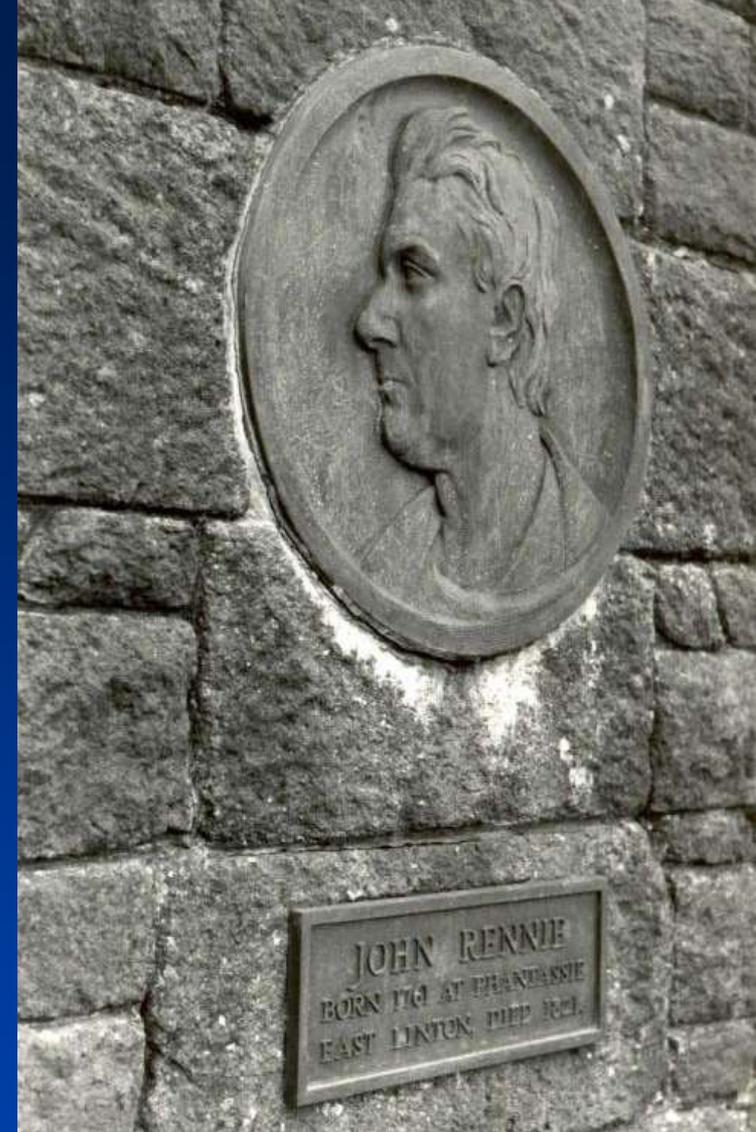
Rennie's Waterloo Bridge London with centering

Waterloo Bridge 1811-17 – 'the finest bridge in Europe', cost £1M. Under demolition from 1934. Note balusters and Arrol's temporary steel replacement bridges. Rennie also designed Southwark and London Bridges





London Bridge opened 1831 cost £2.5m. Sold in 1968 for \$2.5m.
Façades now part of a re-build at Lake Havasu, Arizona, USA



Rennie Memorial, East Linton, including Waterloo Bridge baluster (not seen) and James Rennie, at its relocation at Phantassie in 1981 (left). 1936 memorial on bypass (right)



Second Waterloo Bridge baluster in Phantassie grounds, with plaque from 1936 memorial at base. This was replaced by a larger plaque on its relocation at Phantassie in 1981.

FINIS

A postscript from my *John Rennie* monograph, 2011

Rennie as a bibliophile was a man after my own heart.

When his fine library was sold at auction in July 1829, it comprised more than two thousand titles ranging from the 15th to the 19th century. It included early printing, history, topography and travel with such gems as Daniell's *Ornamental Scenery* (1795) and *Voyages in Great Britain* (1814-25) and Hakluyt's *Navigations* (1805), works by Defoe, Euclid, Isaac Newton and Euler, and a first folio Shakespeare (1623)!