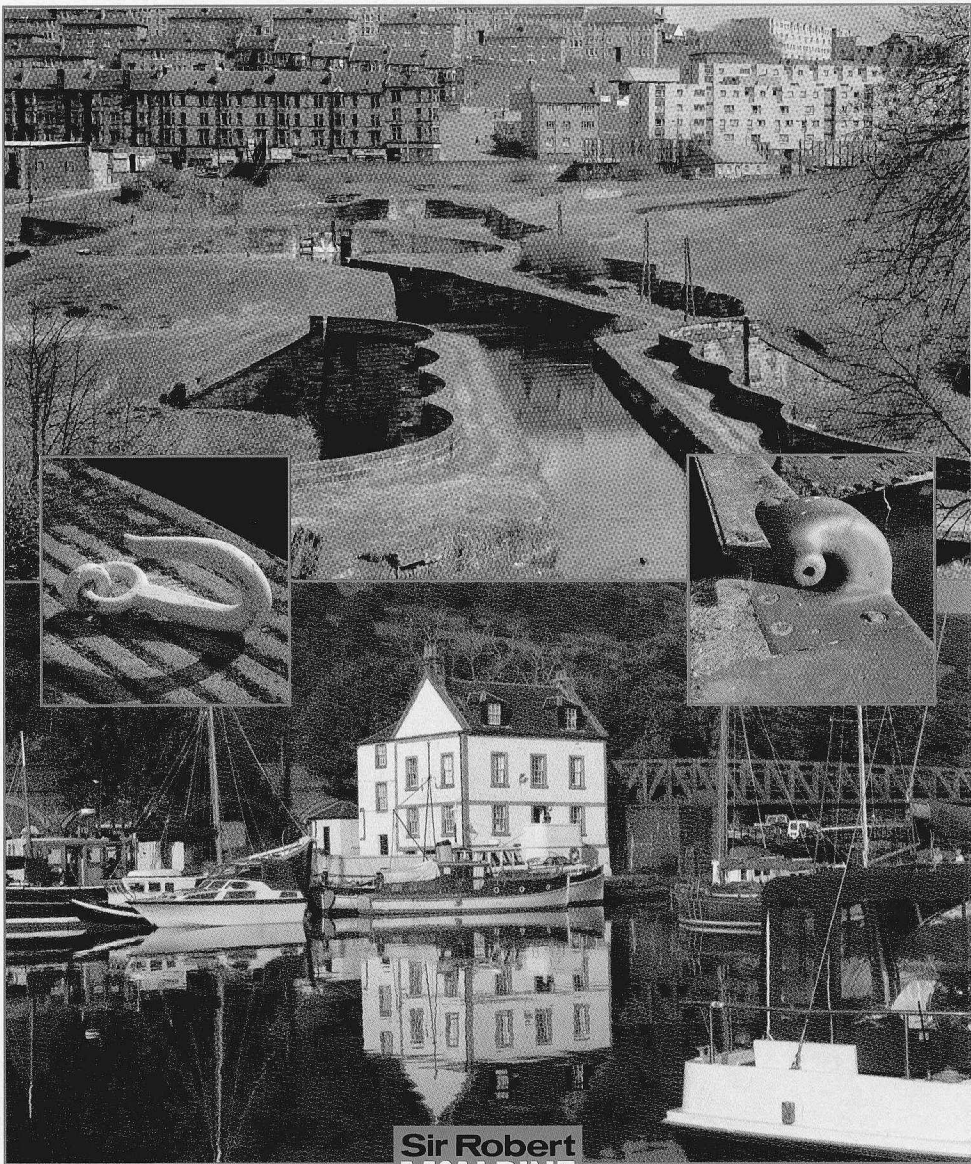


The Forth and Clyde Canal



Sir Robert McALPINE

Began in 1768 but not fully opened until 1790, the Forth and Clyde, known as 'the Great Canal', is Scotland's oldest and longest major canal.

The idea of a Forth-Clyde waterway, linking the east and west coasts of Scotland and replacing long and hazardous northabout sea voyages, was first mooted in the reign of Charles II (1660-85). Surveys were carried out in 1726 and 1762, and again in 1763-4 by the celebrated Yorkshire engineer of Scottish descent, John Smeaton. In his report Smeaton offered two possible routes, one from the River Carron through to the Clyde at Yoker, the other, a more expensive option which was never seriously pursued, cut across from above Stirling to Loch Lomond and thence down the Leven Valley to the Clyde at Dumbarton.

In a second report in 1767, Smeaton presented only one route, from Carron to Dalmuir with a branch to Glasgow. This scheme, with later modifications near the eastern entry and in the line west from Glasgow and eventually to Bowling, was broadly the canal that was authorised by Act of Parliament in 1768 at an estimated cost of £150,000. Under the direction of Smeaton, assisted by Robert Mackell, co-author of the 1762 survey, construction work began in 1768 at the eastern end. By 1775 the canal had reached Stockingfield, near Glasgow, but financial difficulties first slowed and then stopped progress. By 1777, when Mackell took over as chief engineer, the Glasgow branch had reached Hamiltonhill Basin but then, like the main cut, it came to a standstill.

Government aid in the form of a loan of £50,000 from the sale of forfeited Jacobite estates enabled work to be resumed in 1785 when Robert Whitworth, an experienced canal engineer who had worked in England under James Brindley, was appointed to replace Mackell who had died in 1779. Whitworth paid close attention to the design and construction of the Kelvin Aqueduct, the major engineering work west of Stockingfield, and by July 1790 the canal was finally open to navigation from sea to sea. In the following year the Glasgow branch was extended to Port Dundas and to a junction with the Monkland Canal, a separate enterprise begun in 1770 which was seeking to exploit the collieries of north Lanarkshire.

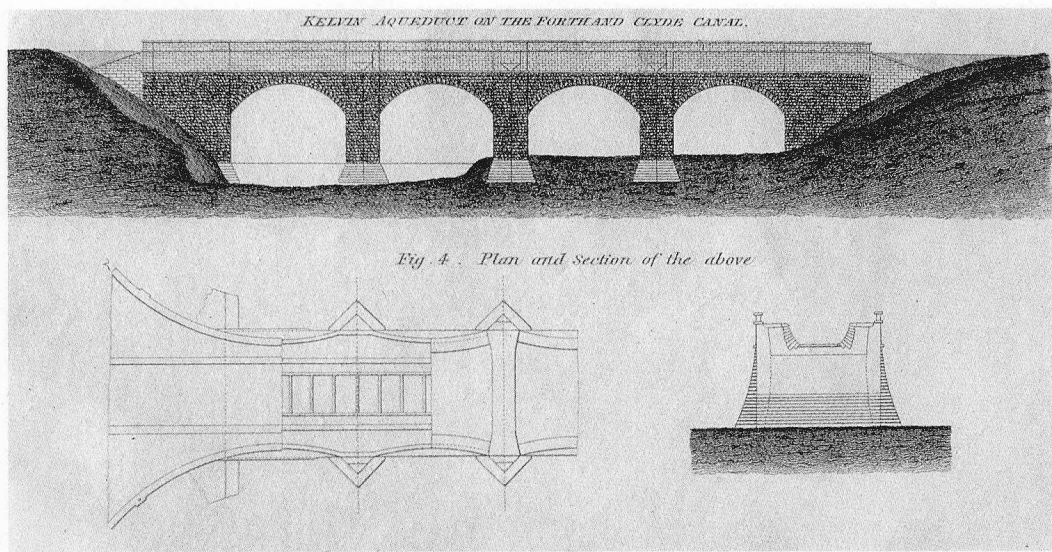
Between what grew up as Grangemouth on the Forth and the western terminal basin at Bowling on the Clyde, the waterway has a total length of 38 3/4 miles (62.5km), including a three-mile (4.8km) branch into central Glasgow. It climbs to an 18-mile (29km) long summit pound some 156 feet (47.5m) above sea-level through a series of 20 locks on the

eastern side and 19 on the west (where the entry point is higher), each lock having a standard rise of eight feet (2.4m). Water was fed into the summit level from two main sources, Townhead Reservoir near Kilsyth, which was itself the recipient of a sophisticated feeder canal system, and ultimately, further west, via the Monkland Canal.

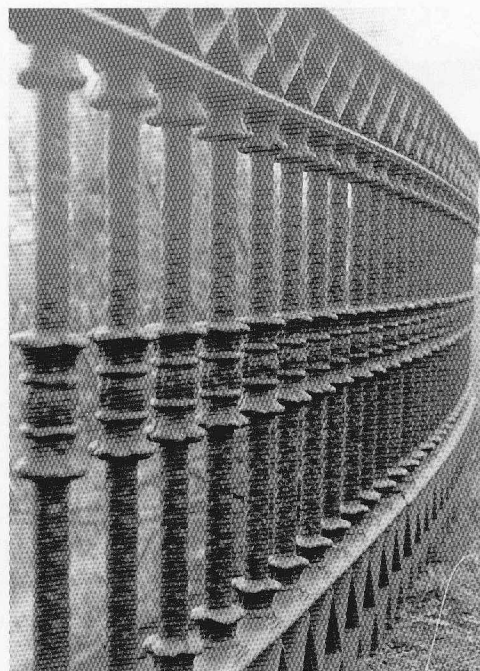
Intended for broad-beamed, sea-going vessels, the canal was cut to a depth of seven feet (2.1m; increased to eight feet (2.4m) in 1788), with an average breadth of about 63 feet (19.2m) and 30 feet (9.1m) at the surface and bottom respectively. In order to allow for the masts of the sailing ships, all the canal overbridges were designed to be opened. Originally these structures were mainly of a two-leaf, wooden-armed lifting drawbridge type, similar to those over Dutch canals, but the original drawings also included provision for horizontally-turning bridges. Their 19th-century successors were timber and cast-iron bascule (or see-saw) bridges, whose decks, split in the middle and pivoted at each end, were lifted by hand-operated gearing. Unusually, at Camelon, the main Falkirk-Glasgow road was originally led beneath a canal aqueduct, the partial remains of which were revealed during the course of recent restoration works.

Of the two principal aqueducts on the canal the one over the Luggie Water at Kirkintilloch is an elegant single-arched structure with curved abutments. It was designed and built by Smeaton in 1772 and in 1858 was adapted by the Campsie Railway to carry their railway tracks through the arch on a low masonry platform bridge between the canal and the river. The four-arched Kelvin Aqueduct, Whitworth's masterpiece, was at the time of its construction in 1787-9 the largest engineering work of its kind in Britain. Carrying the canal some 70 feet (21.3m) over the waters of the Kelvin below the flight of five locks at Maryhill, it undoubtedly remains the canal's most impressive single piece of engineering, even though its visual qualities may not be readily apparent.

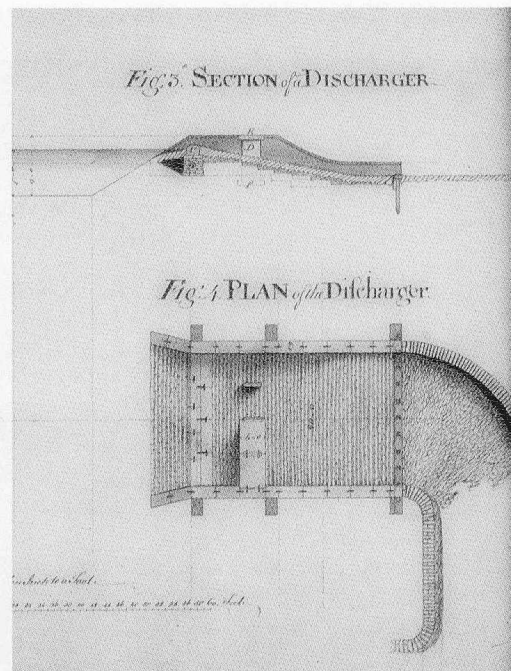
Dullatur Bog, the principal engineering challenge posed by the line of the canal, retains no such spectacular structural monument. There, a solid protective bank of earth and stones buried more than 50 feet (15.2m) deep into the towpath side of the canal is a hidden reminder of the fact that during the initial phase of construction this notorious quagmire engulfed the canal works, even to the extent of swallowing a newly-built stable-block. That is why the derelict shell of its replacement stable stands on solid ground a prudent distance north of the canal at Craigmarloch.



Glasgow, Kelvin Aqueduct; elevation, plan and section (from Thomas Telford, Edinburgh Encyclopaedia, xv (1830), plate 414).



Kirkintilloch, Luggie Aqueduct; detail of original railings (since replaced). (SC678649)



Discharger or overflow, 1768; drawing by John Smeaton (© The Royal Society).



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Further information about the Forth and Clyde Canal and about the sites illustrated in this broadsheet is available from the NMRS at the address given above. The NMRS is open Monday to Thursday 9.30 - 16.30 and Friday 9.30 - 16.00.

RCAHMS is grateful to The Royal Society, London, for permission to reproduce the Smeaton drawings in its collections. A microfilm copy of some 65 drawings and maps from the Smeaton collection relating to the Forth and Clyde Canal is available for reference in the NMRS.

In the preparation of background material for this broadsheet RCAHMS acknowledges the assistance of Professor Roland Paxton of Heriot-Watt University, RCAHMS Commissioner and Chairman of the The Institution of Civil Engineers' Panel for Historic Engineering Works (PHEW), and Mrs Sandra Purves, Secretary of the Scottish Group of PHEW.

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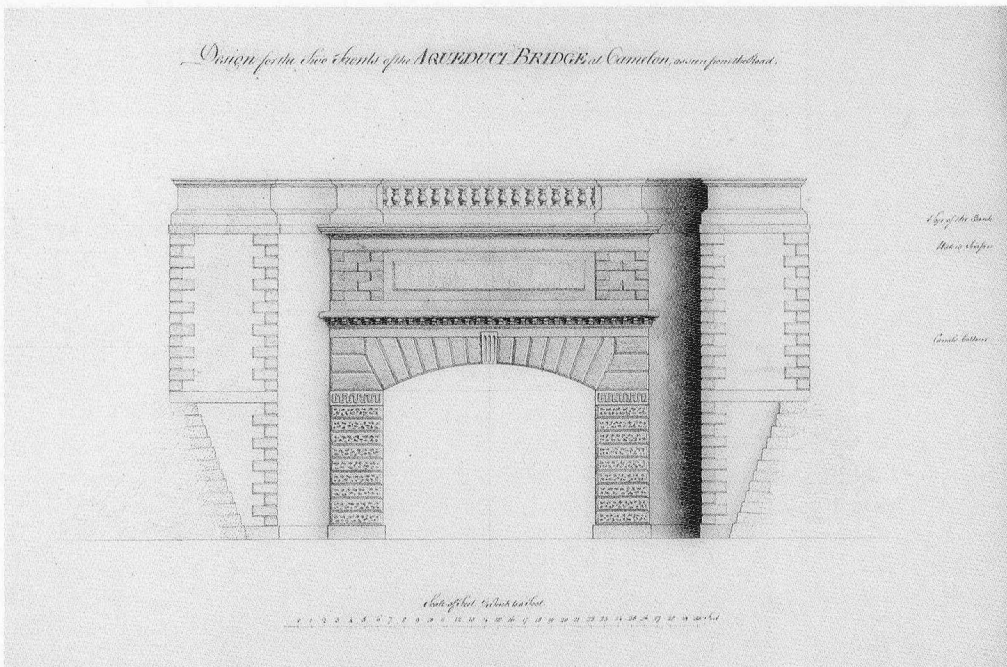
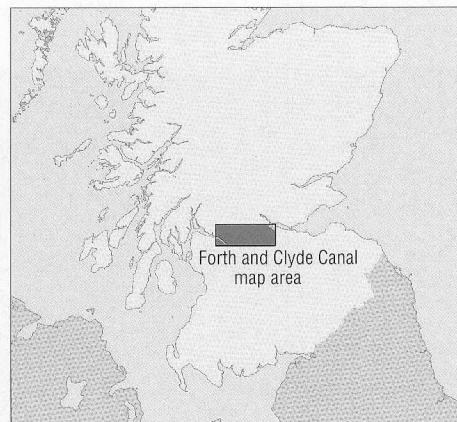
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Front cover:
Glasgow, Kelvin Aqueduct and Maryhill Locks from west.
Bowling Basin and Custom House from south-west and (inset) typical mooring hooks.

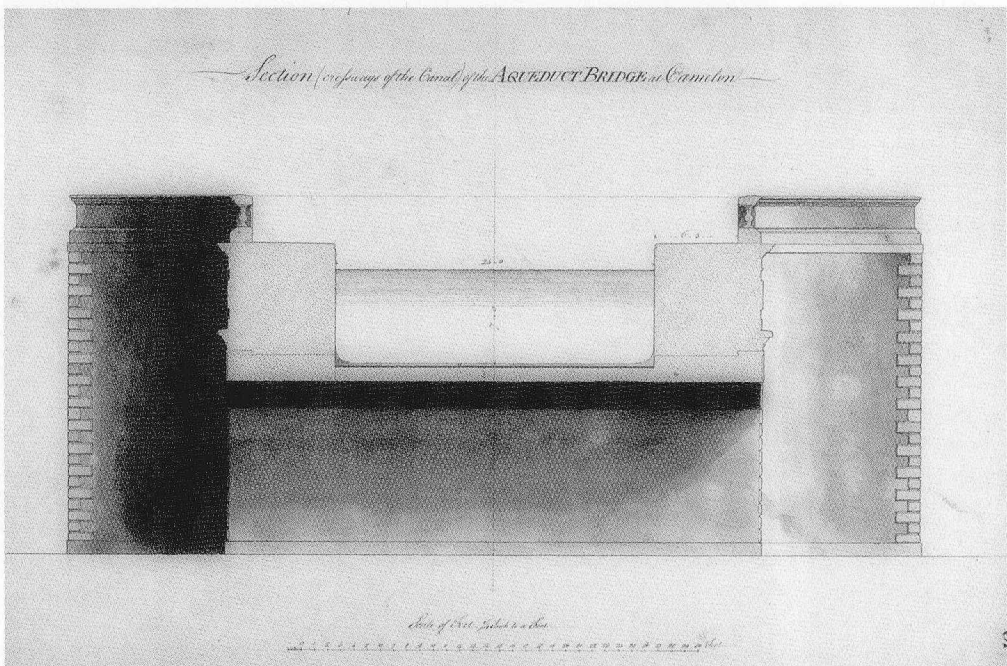
The Forth and Clyde Canal was closed in 1963 by Act of Parliament and road construction soon limited the navigable lengths of canal. In partnership with Scottish Enterprise and seven canalside local authorities, British Waterways Scotland successfully bid for funding from the Millennium Commission and the European Union to undertake Britain's largest canal restoration project, The Millennium Link. This £84.5m project restored navigation to the Union and Forth and Clyde Canals in 2002, thereby allowing boats to travel once again between Edinburgh and Glasgow, and between the North Sea and the Atlantic Ocean. The regenerative effect of this restoration is already showing along its 110km length.

The Falkirk Wheel, the world's first rotating boatlift, was constructed to re-join the two canals. Created to replace a flight of 11 locks which linked the two canals at Camelon, this magnificent structure stands 115 feet (35 metres) high and each of its two giant caissons can carry four boats at a time in a 15-minute lifting and lowering operation. It was opened by Her Majesty The Queen on 24 May, 2002.

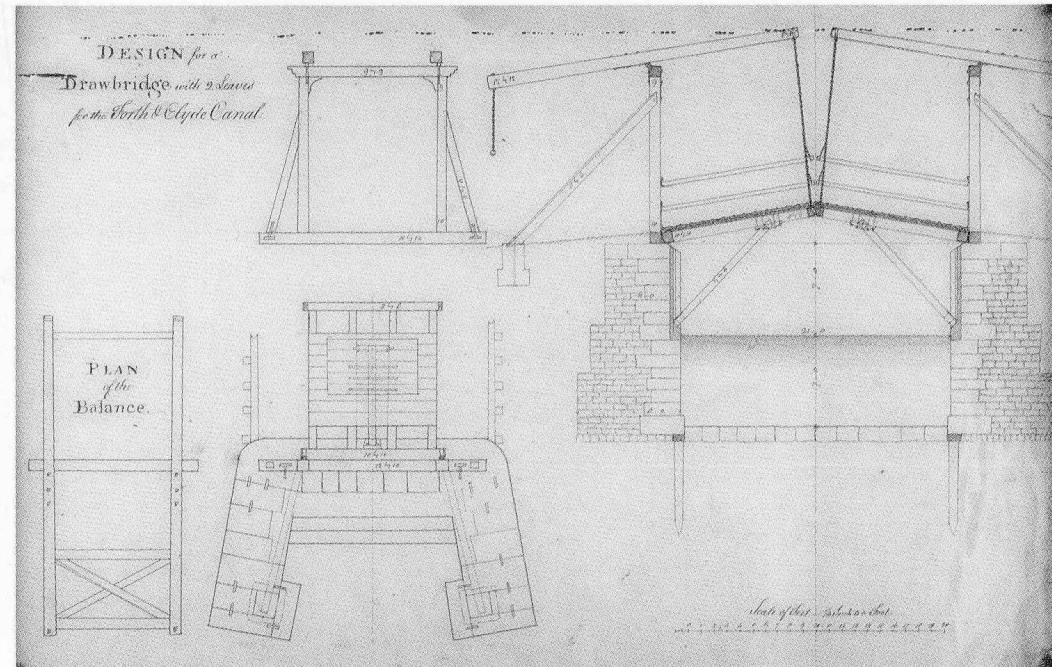
The Falkirk Wheel Visitor Centre is open every day 09.00-18.30 (last entry 18.00) and admission is free. For further information telephone 01324-619888, and for details and bookings for a boat trip experience telephone 08700-500208.



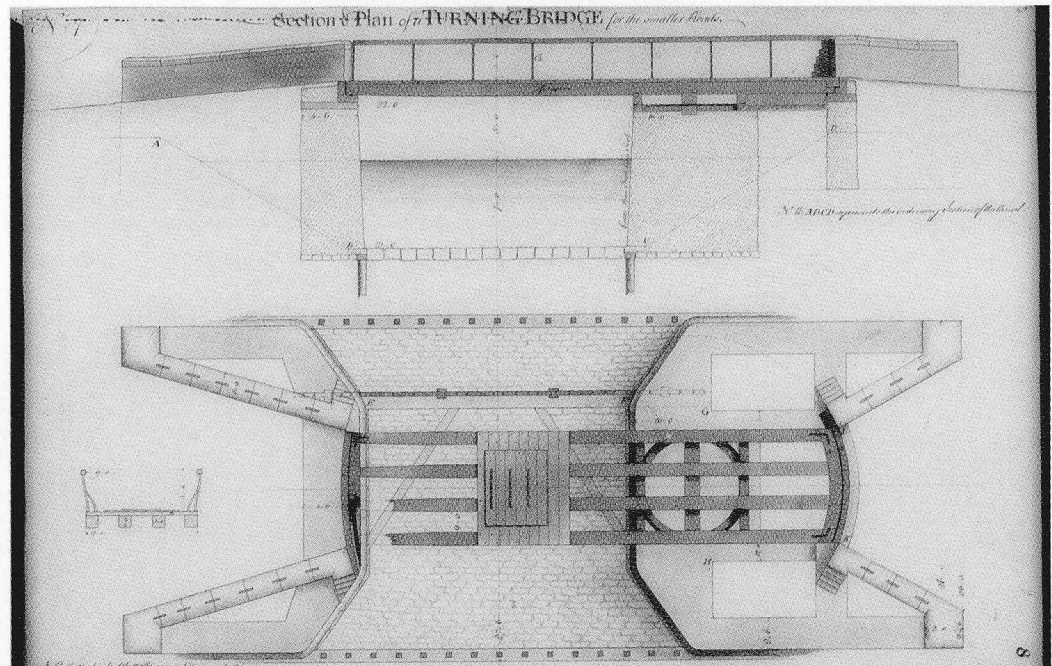
Falkirk, Camelon Aqueduct, 1770; elevation by John Smeaton (© The Royal Society).



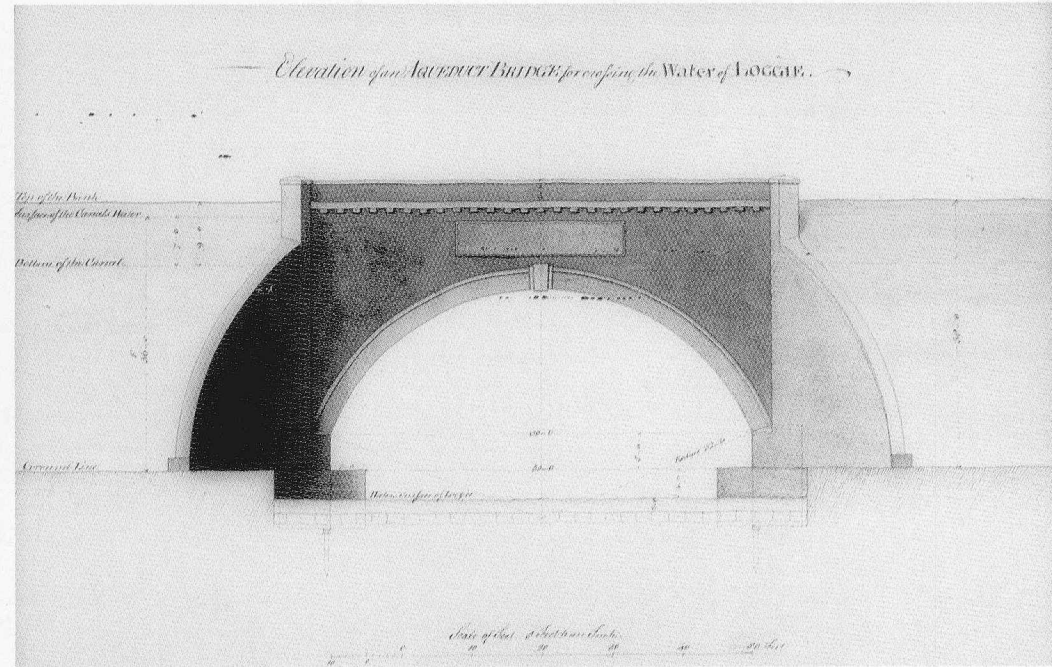
Falkirk, Camelon Aqueduct, 1770; section by John Smeaton (© The Royal Society).



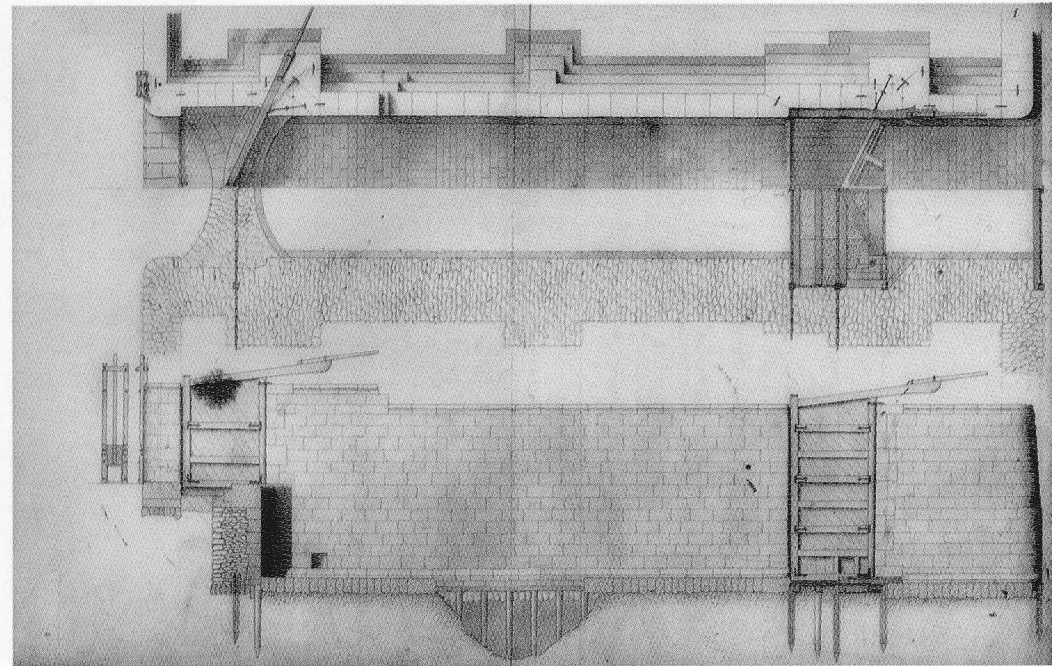
Two-leaf wooden drawbridge, 1768; drawing by John Smeaton (© The Royal Society).



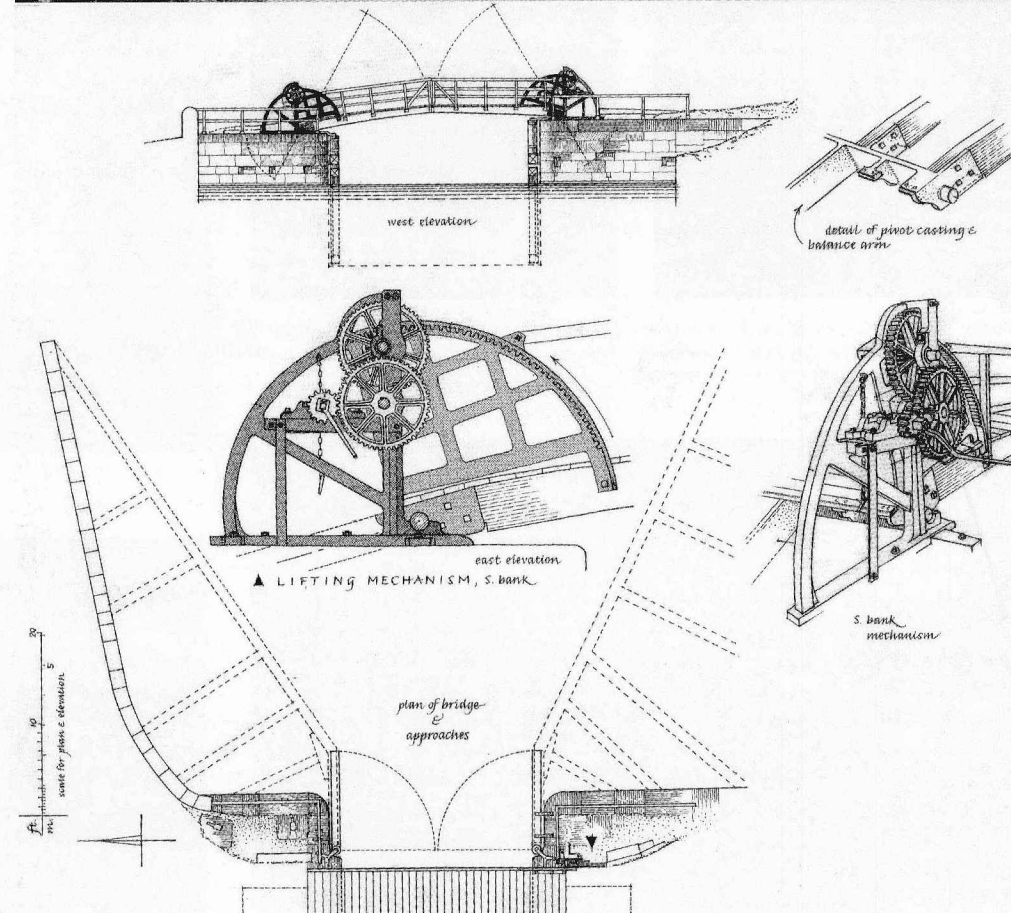
Turning bridge for minor roads, 1768; drawing by John Smeaton (© The Royal Society).




Kirkintilloch, Luggie Aqueduct, 1772; drawing by John Smeaton (© The Royal Society).



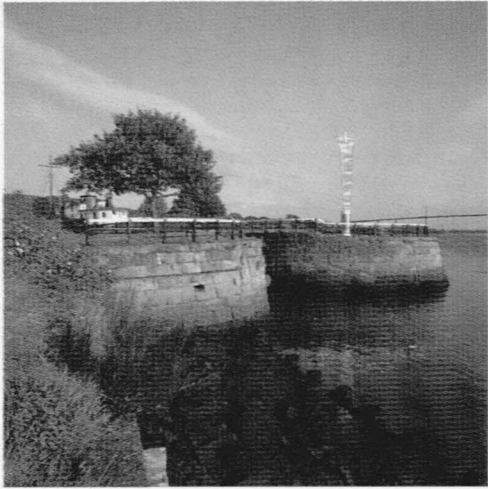
A common lock chamber, 1768; drawing by John Smeaton (© The Royal Society).



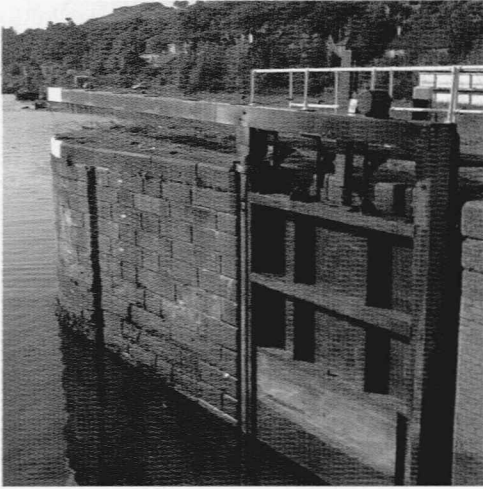
Craigmarloch Bridge; later type of geared bascule bridge (since replaced) from west, and survey drawing by Geoffrey Hay. (SC554891) and (SC367495)



The Forth and Clyde Canal



Bowling Basin: old entry (now overflow) from north-west. (SC681720)



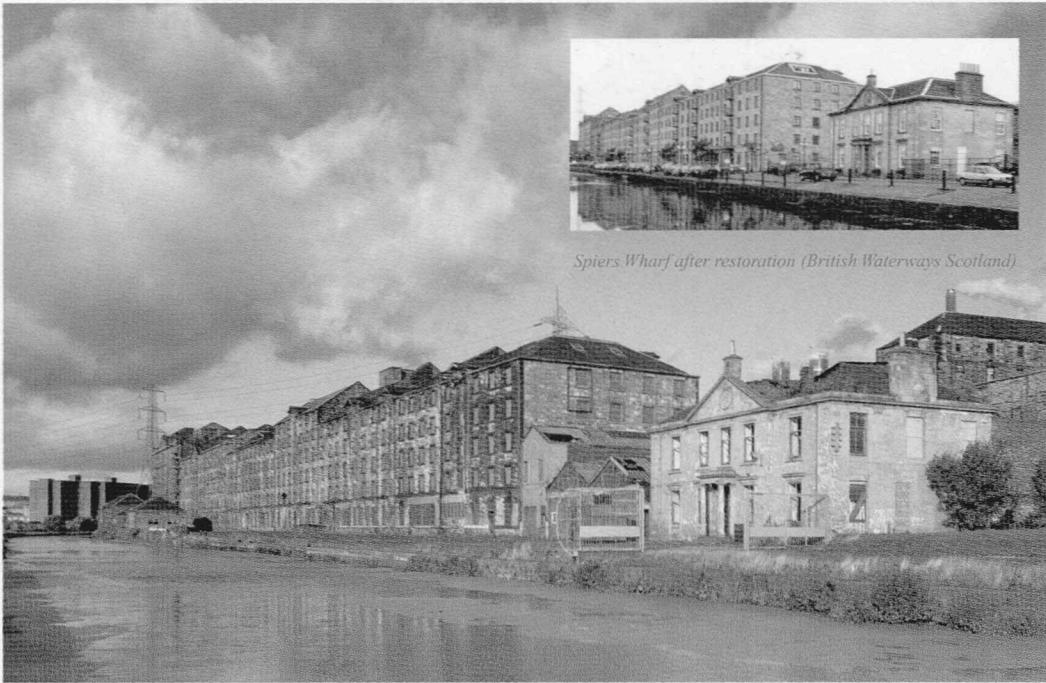
Bowling Basin: sea lock, north outer gate. (SC681722)



Bowling Basin: Custom House from south-west. (SC681715)



Glasgow, Kelvin Aqueduct and Maryhill Locks from west. (SC361954)



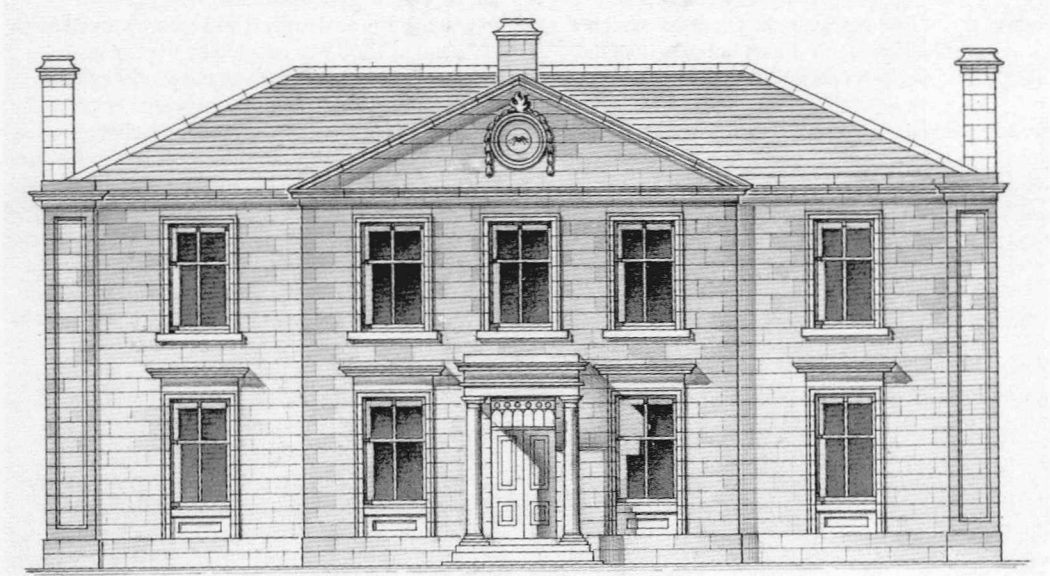
Glasgow, Spiers Wharf, Port Dundas; Forth and Clyde Canal Company Offices and Warehouses from south-west, 1986. (SC702969)



Kirkintilloch, Luggie Aqueduct; north face showing inserted level of later railway. (SC691359)



The Falkirk Wheel under construction; aerial view from south-west. (SC695564)



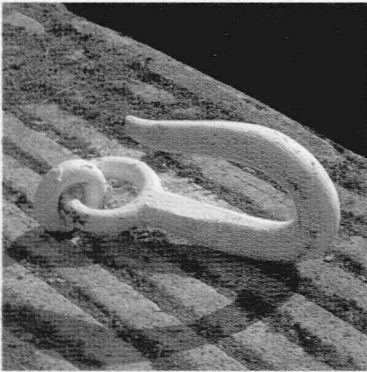
Glasgow, Spiers Wharf, Port Dundas; drawing of principal elevation of Forth and Clyde Canal Company Offices. (SC374109)



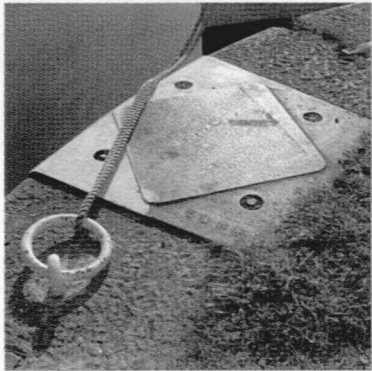
Falkirk, Camelon; the Union Inn from north. (SC700201)



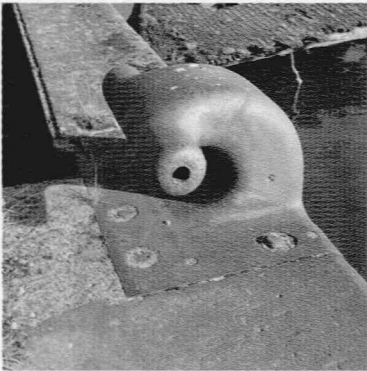
(SC681706)



(SC681707)



Bowling Basin: typical mooring rings. Lower view also shows a plate marked 'L & D Ry' (Lanarkshire & Dunbartonshire Railway) which crossed the canal on a swing bridge. (SC681710)



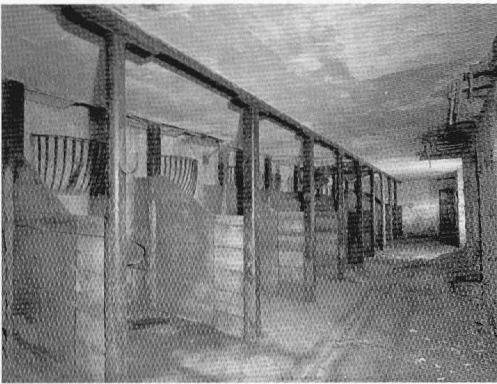
Bowling Basin: typical mooring hooks. (SC681710)



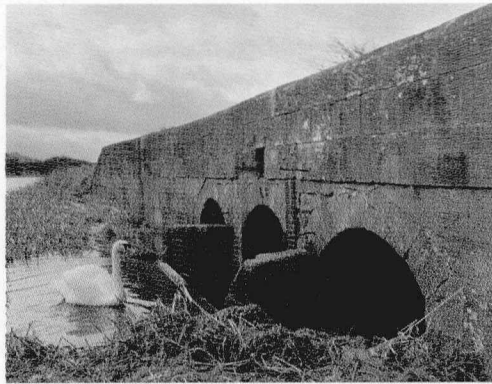
Bowling: inner basin and lock-keepers' residence from west. (SC681708)



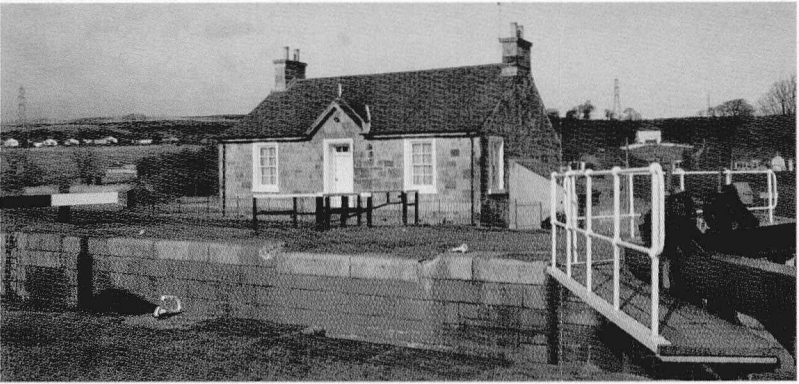
Kirkintilloch, Glasgow Road Bridge; frontage of stables-block (prior to restoration) from south. (SC361957)



Kirkintilloch, Glasgow Road Bridge; interior of stables-block (prior to restoration). (SC361956)



Wyndford; triple-arched overflow or spillway from east. (SC701774)



Wyndford Lock and lock-keeper's cottage from south-east. (SC700207)



Falkirk, Camelon; flight of locks (15-12) descending eastwards towards the former Rosebank Distillery. (SC700202)



Grangemouth, Old Harbour, 1955; lock entry from east. (SC554889)