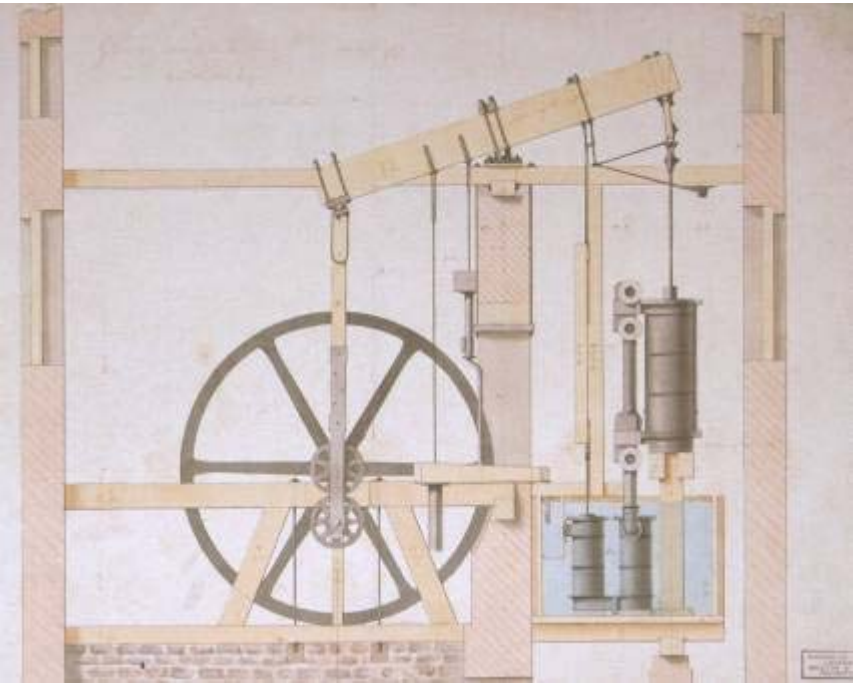
Steam engine houses in Eastern Scottish textile mills



Mark Watson

Historic Scotland

Regional typology

- Mainly built into the body of the mill, beam then vertical engines:
- Jute/linen: Dundee,
- Linen: Aberdeen, Arbroath, Montrose, Kirkcaldy, Kinghorn

- Mainly free-standing beam, then horizontal engines:
- Wool: Hawick, Selkirk and Galashiels, Borders
- Jute: Blairgowrie,

Types: beam; horizontal

- Beam engine (Prestongrange Cornish engine, 1854)

- Horizontal engine

(Lady Victoria Colliery

Grant Ritchie cross compound)

1 rotative beam engine in situ

- Flywheel and governor
- Garlogie beam engine, Dunecht, Aberdeenshire
- C1830-7, Hadden's wool mill from 1843
- Before adoption as an Aberdeenshire Council museum, 1989-92.

3 horizontal engines in situ

- Glenruthven Wool Mill Auchterarder
- Ashgrove and Keathbank Jute Mills, Blairgowrie
- This one, Keathbank, is by J&C Carmichael, Dundee, 1865
- Supplemented a waterwheel by Douglas Foundry at other end of mill.

Horizontal cylinder, Blairgowrie

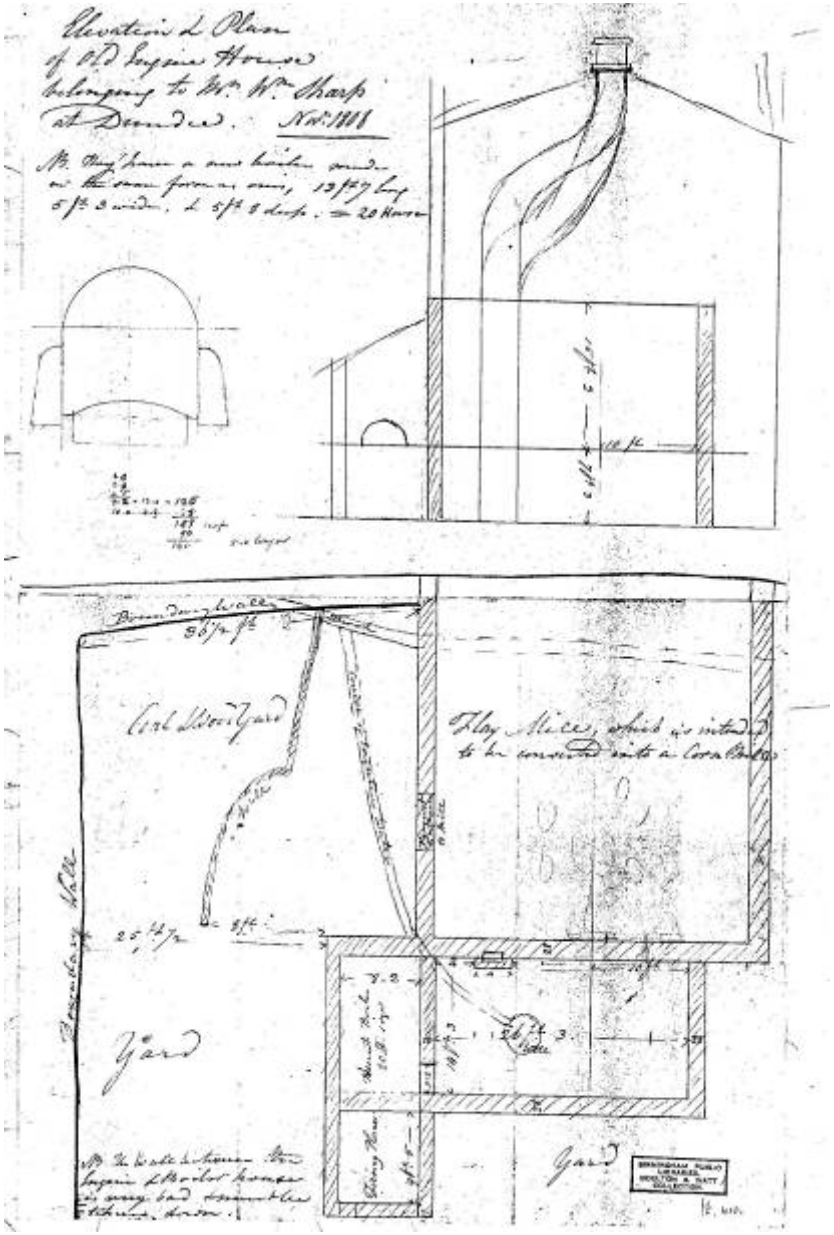
Types developed for ships

- True vertical
- Inverted vertical
- Side lever (right)
- Table

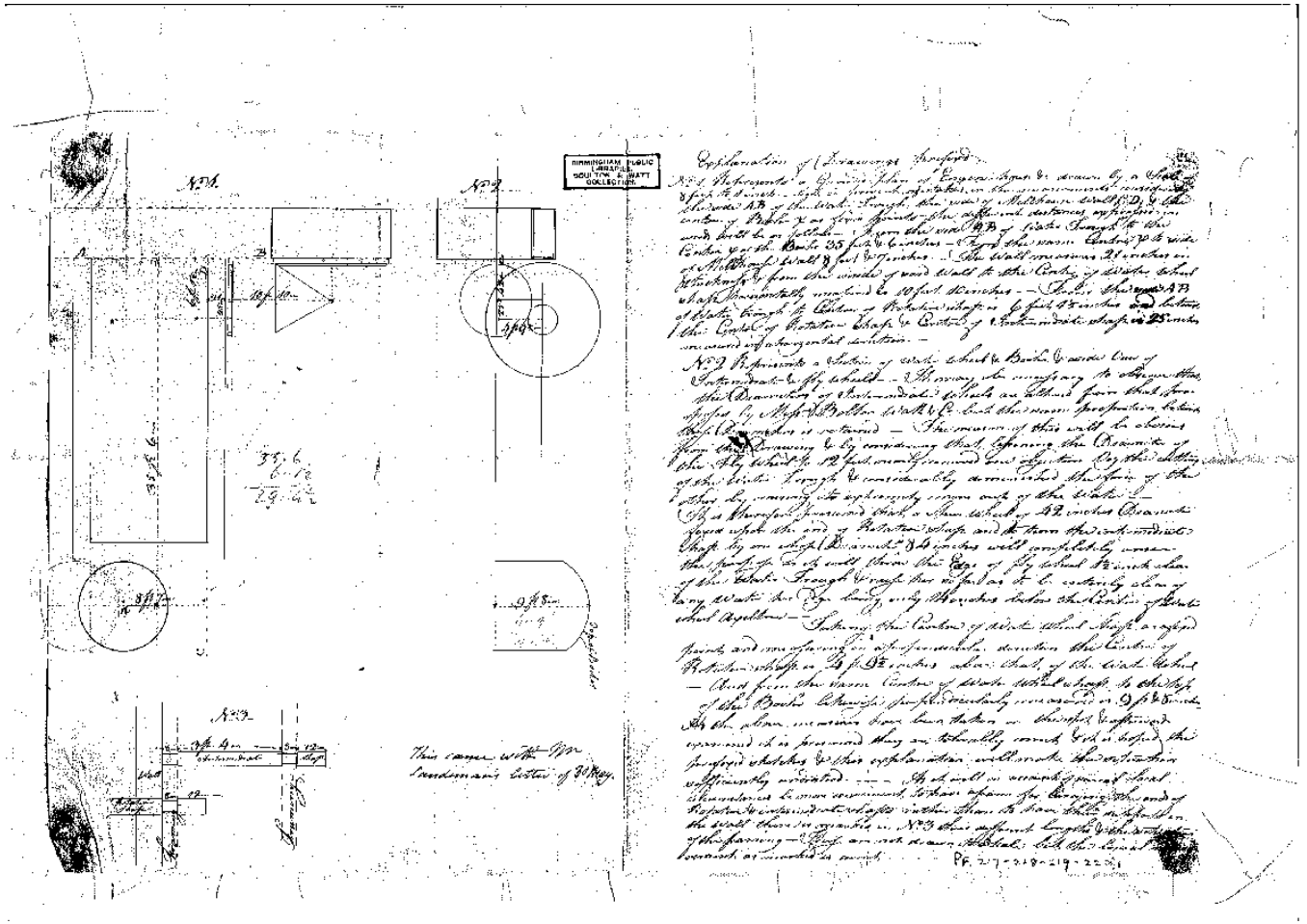
Guthrie St Mill: 1793 atmospheric engine shown in 1808

Just south of Verdant Works

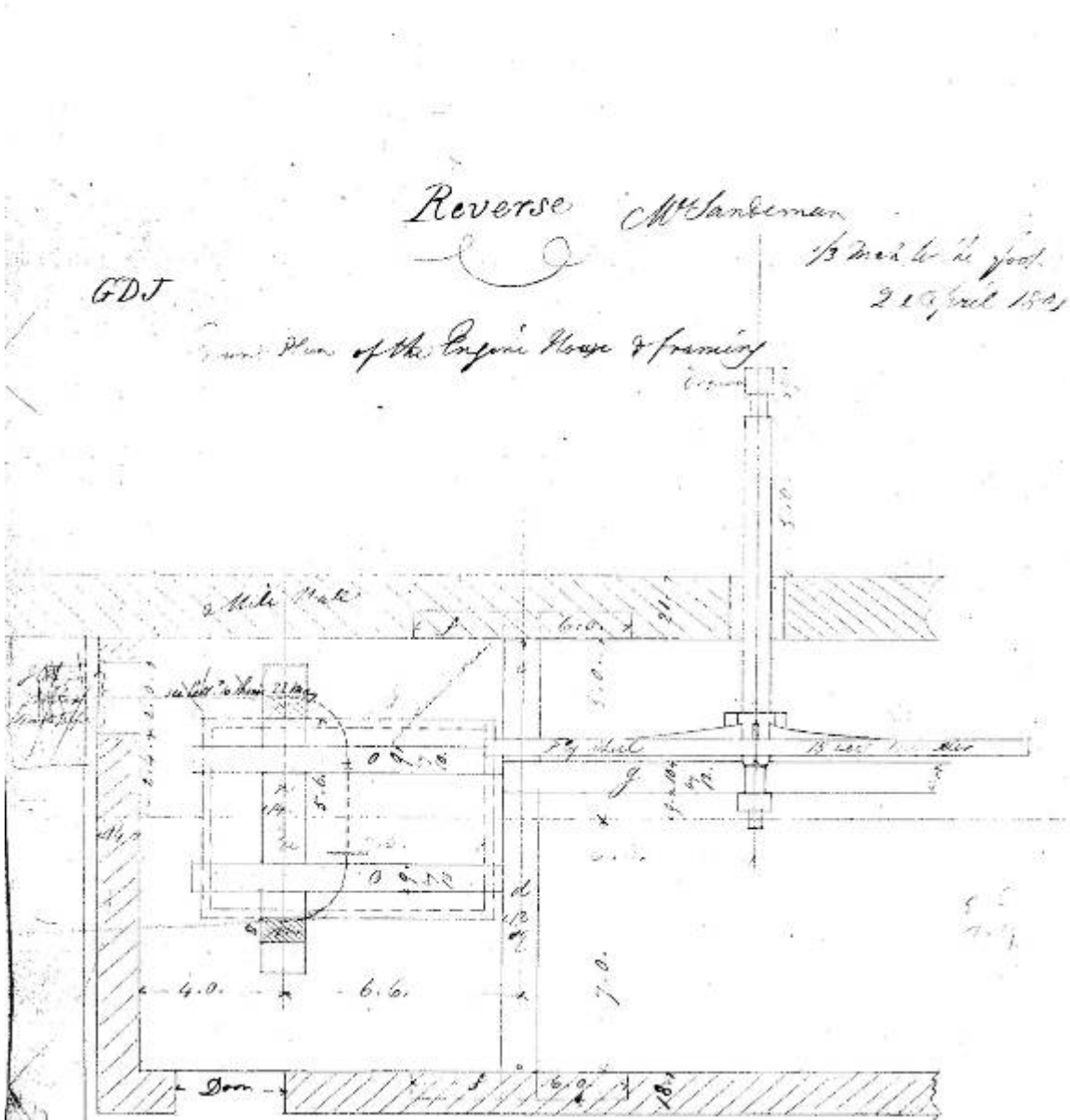
- Flax Mill which is intended to be converted to a corn mill (in fact it kept 3 pairs stones and spinning frames, when advertised 1820-1)
- Injection water to a 26 foot well
- 10 foot flywheel
- *NB they have a new boiler made in the same form as ours, 13 feet long 5ft 3 wide +20HP. The wall between engine and boiler house is very bad and must be taken down*
- 1809 Wm Sharp bought a new engine from B&W, 32 HP

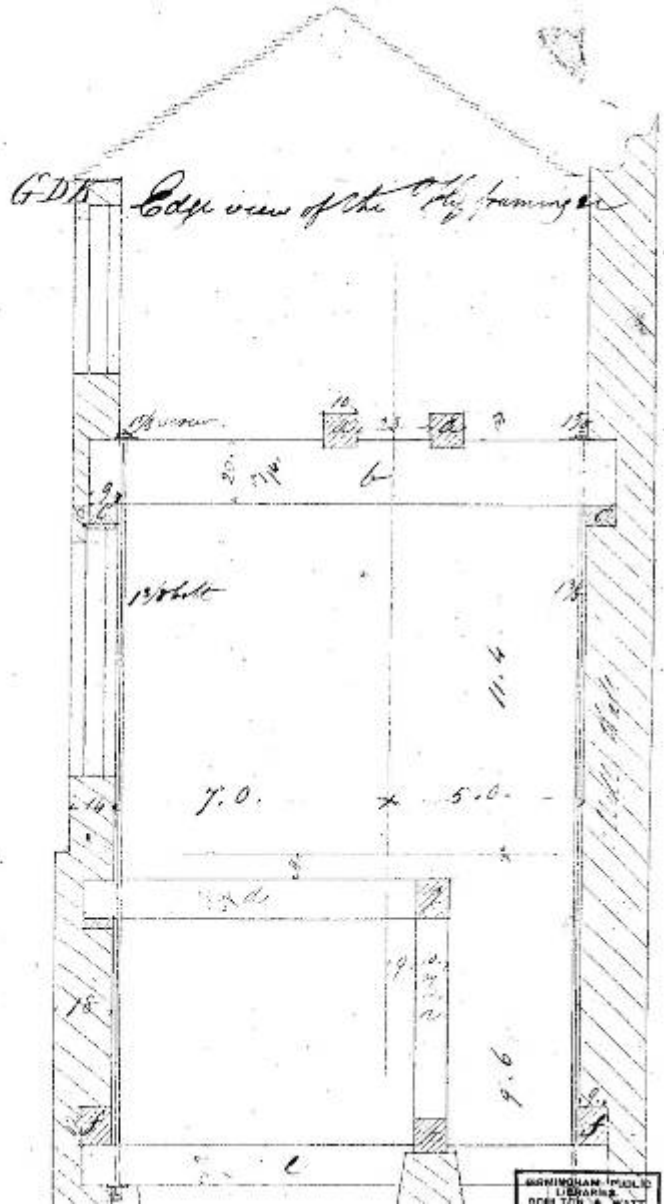


Douglasfield engine and waterwheel 1801



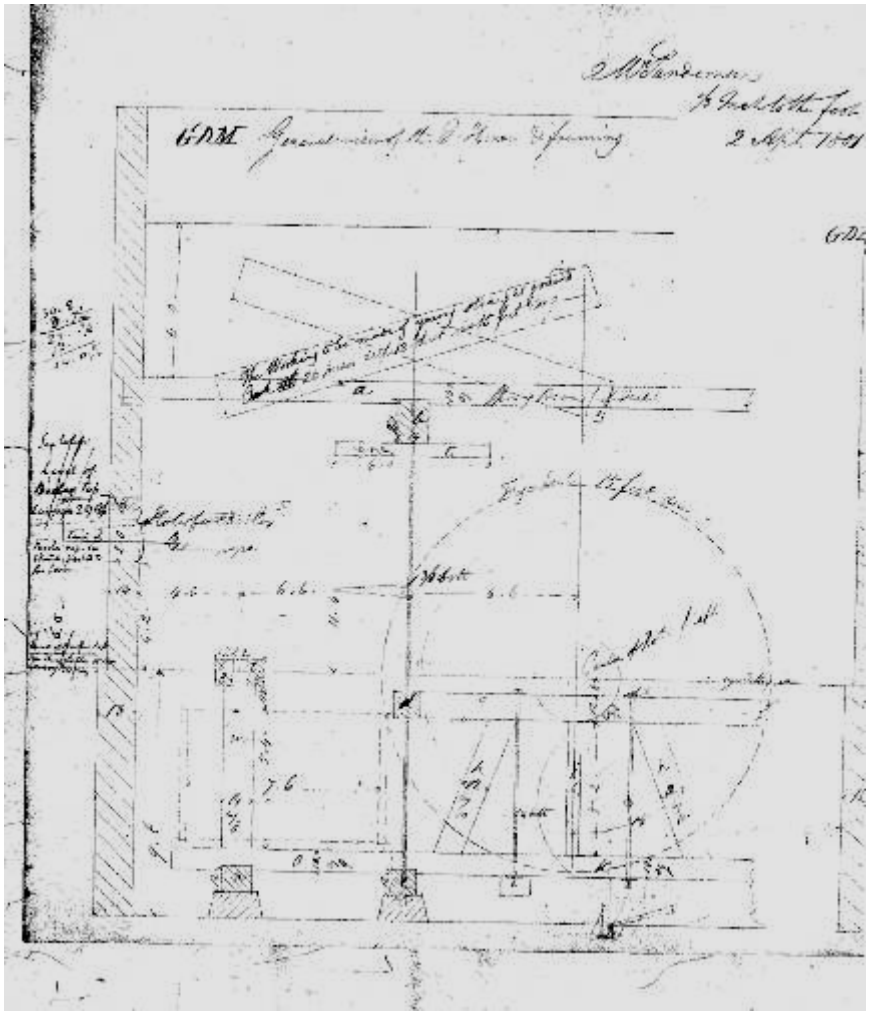
Reverse plan and section



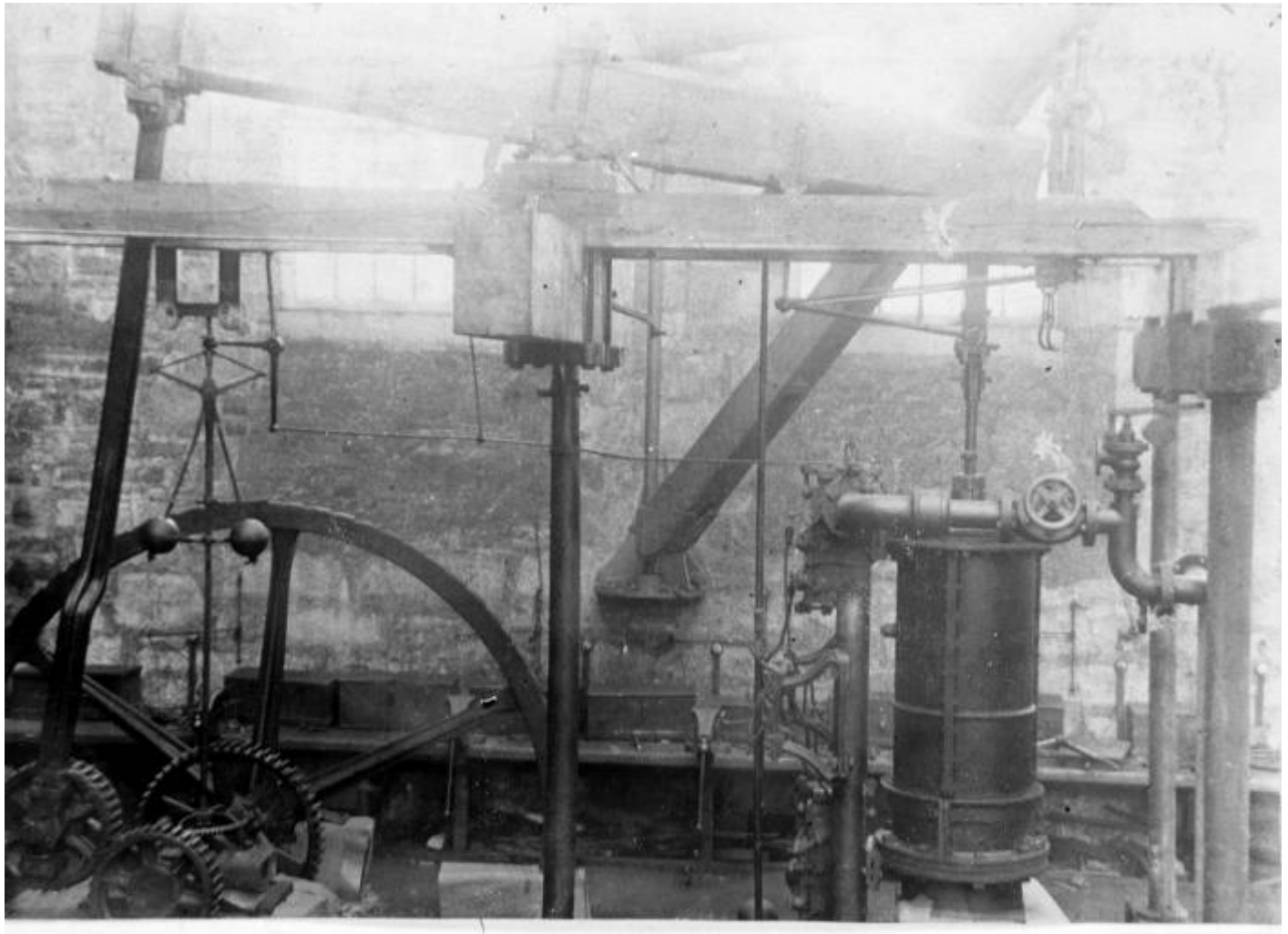


W. Sandeman 2 April 1801

- A reversed working drawing kept by Boulton and Watt
- The working to be young straight grain oak 20x12inches and 15 feet long
- Flywheel 15 feet diameter

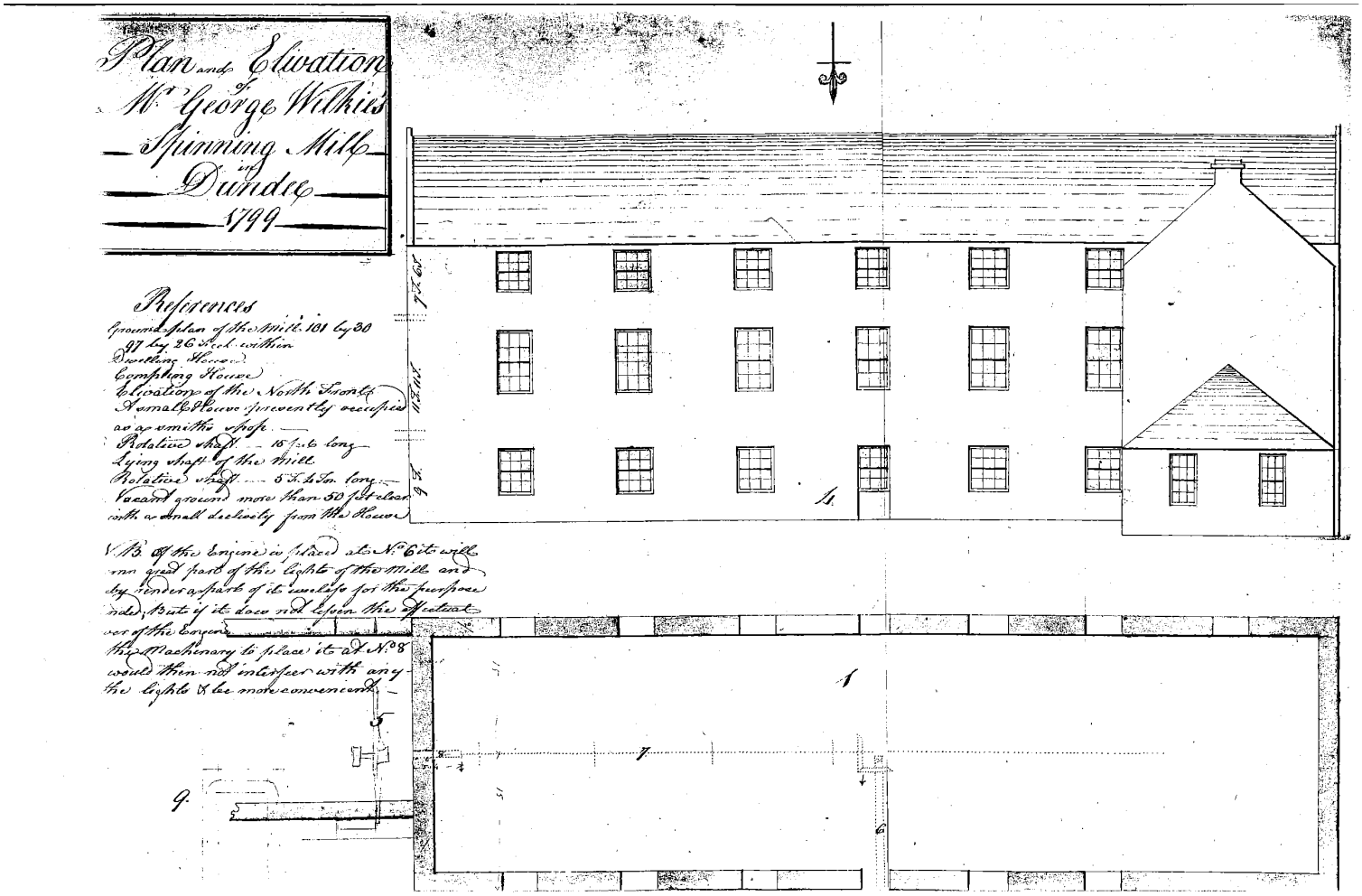


14 HP rotative engine with sun and planet gears at Douglasfield bleachfield,1801-1899



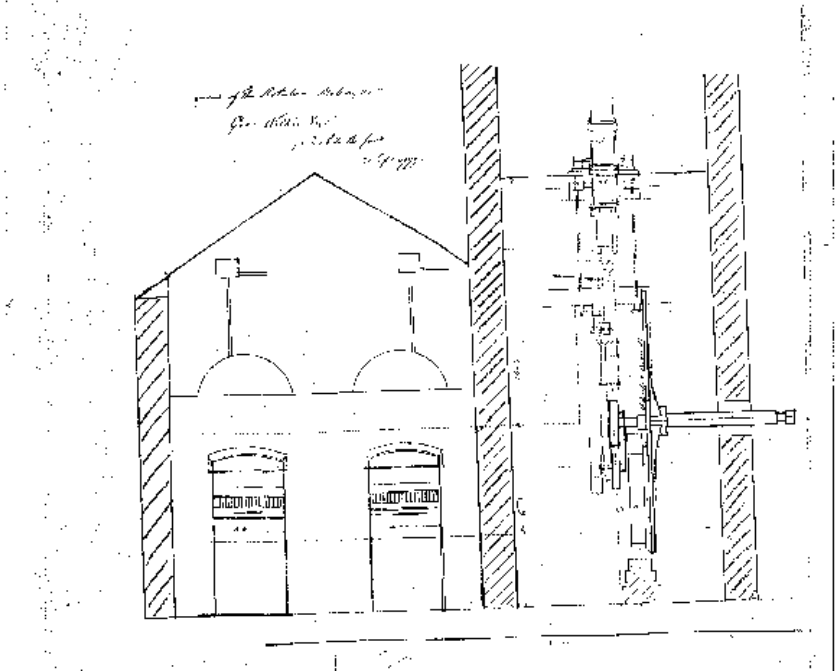
THE ORIGINAL WATT-BOULTON ENGINE (now at Dudhope)

East Mill conversion from tannery in Boulton and Watt archive



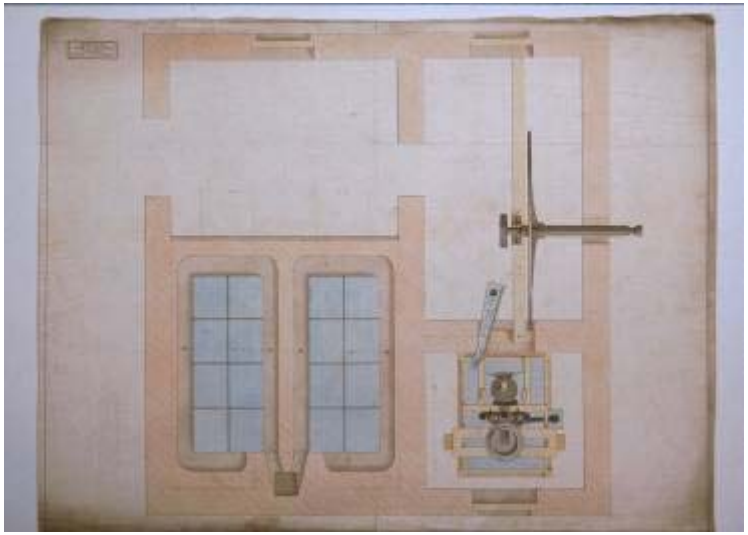
East Mill and Ward Foundry Dundee

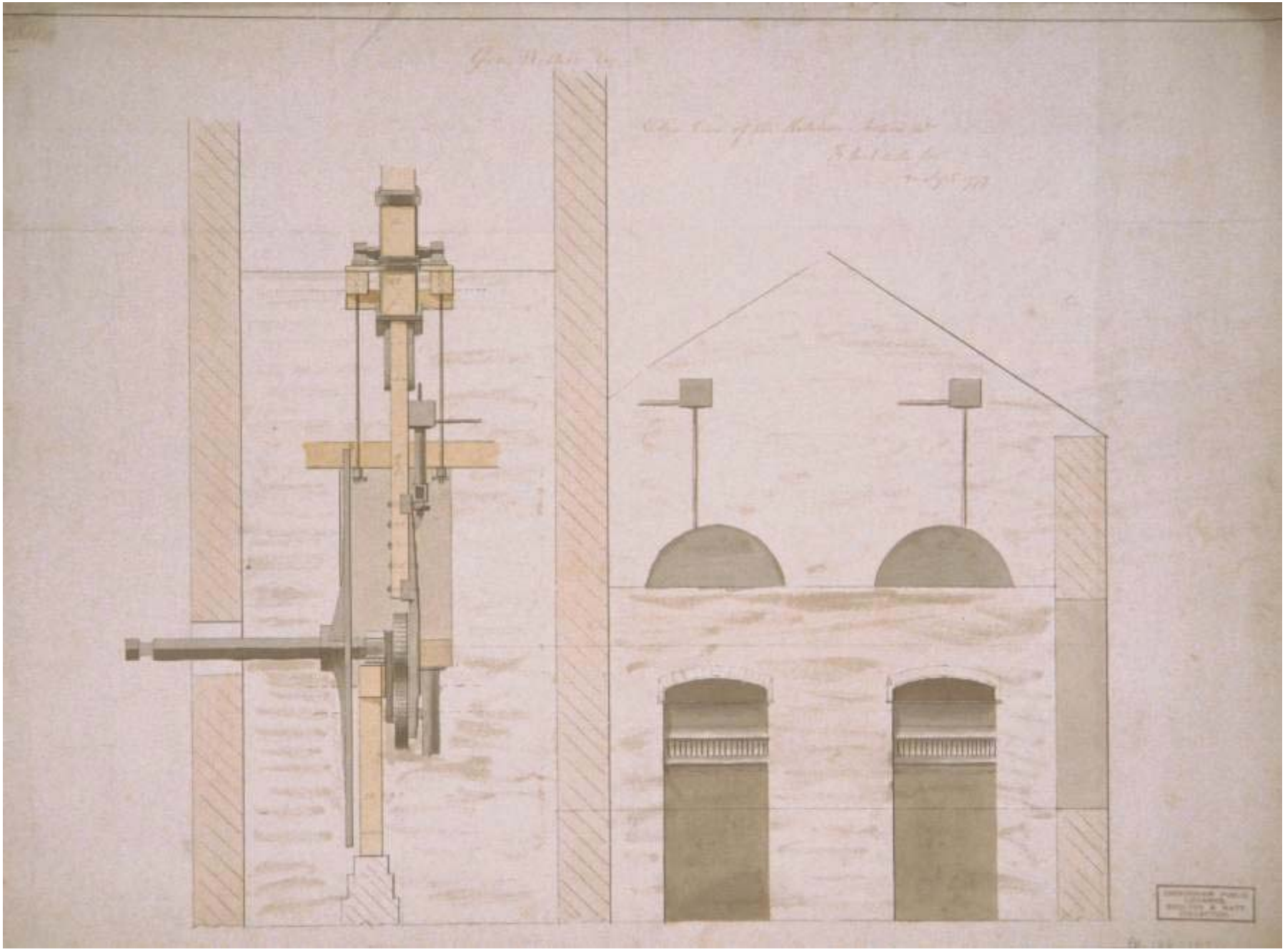
East Mill horizontal drive shaft



- *Mr Wilkie's is in the same state of filth in which it has always been…stopped for want of flax…* considering an iron beam (James Watt jun. to M Boulton, 1808)

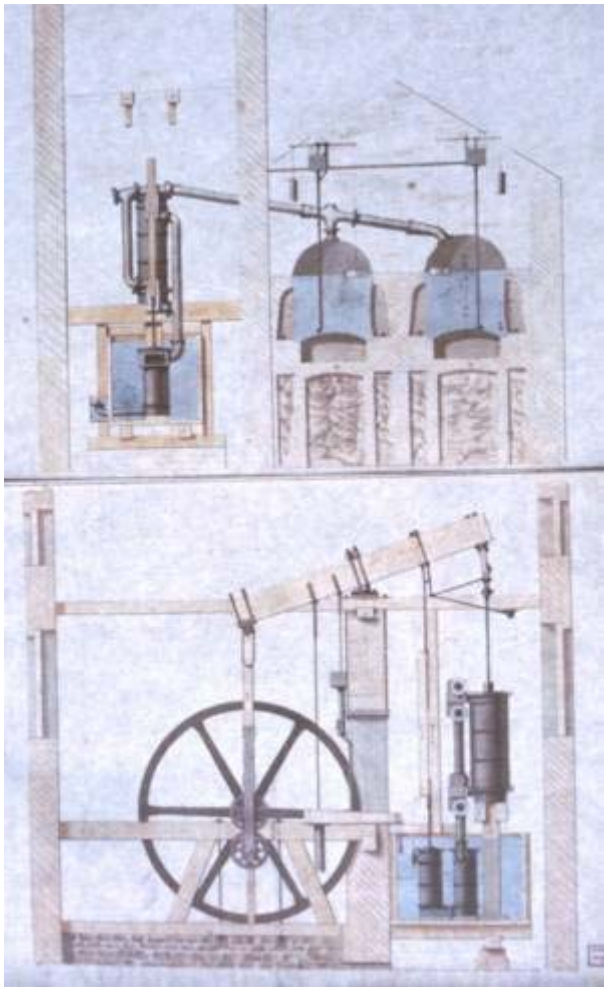
East Mill: iron beam surround; horizontal drive from flywheel centre





Boulton and Watt archive 1799

- East Mill built as a tannery 1792, became a spinning mill 1799 with engine by Boulton & Watt for George Wilkie. Bought 1809 by J and W Brown.
- The youngest of the company, having gone through a course of training under Scott of Trottick Mill, applied himself to the spinning in earnest. (*People's Journal* 1870 on William Brown, 1791-1864)



East Mill, Dundee, copy of 1820 insurance plan

A Carding

B Spinning

C Reeling and mechanics workshop

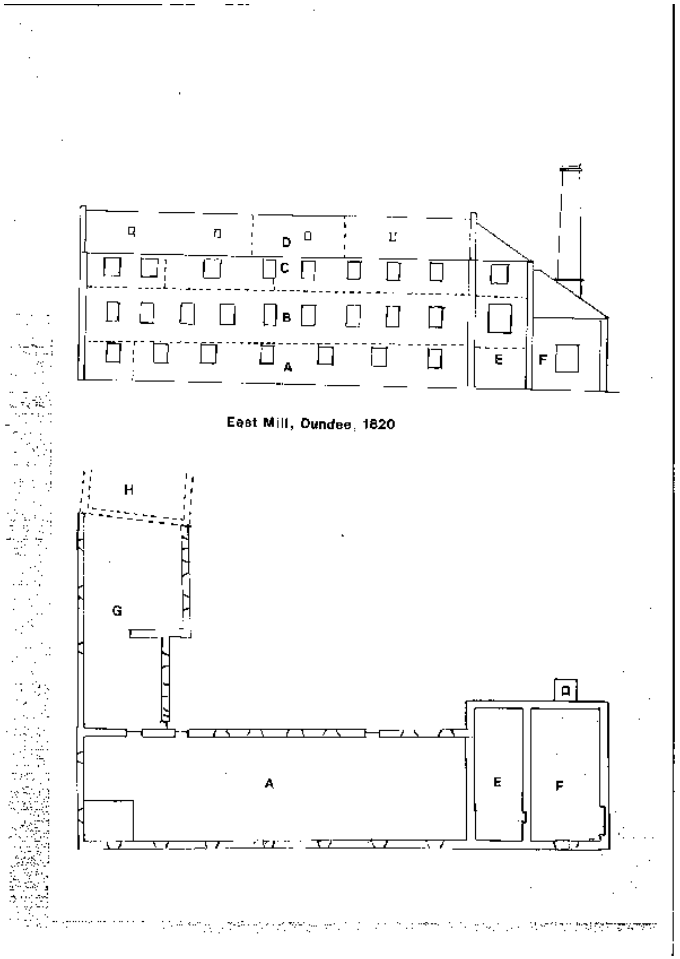
D Garret in three divisions

E Engine Room

F Boiler House

G Flax preparing

H Warehouse and Hackling house (not insured)




BEDROOMS

Brothock Mill, Arbroath, Samuel Renny 14hp engine started in 1806 by James Watt senior

“ one of the best kept in Scotland”

J. Watt jun. to M.R. Boulton, on his northern excursion to Boulton and Watt engines in 1808. In Fife:

- St Andrews: Dempster 6hp engine [bell crank ordered by R Miller, Perth, 1804]
- Kinghorn Loch was speedily drained by three mills built in the 1790s, so
- 1800 Walter Fergus and Co ordered a 12hp from B&W for a cotton mill, but it was covered in flax in 1808:
- ***"very indifferently kept, turning only 450 spindles with a waterwheel to help it. They propose to order another from us to replace an atmospheric engine (of 30 inch Dr, 4 ½ feet stroke, 22 pr m) now at work in another of their mills in Kinghorn."[a coalwork engine installed by James Aytoun before he left in 1802]***

– *“the last sun and planet wheel to be seen in the country was until lately at the Low Mills”*

- [i.e. the tenement opposite Kinghorn Town Hall)

- *“Prior to its removal, which was only a few years ago, visitors from all parts of the country came to see …this exceedingly ingenious but somewhat complicated arrangement.”*

<u>Industries of Kirkcaldy and District 1872</u>

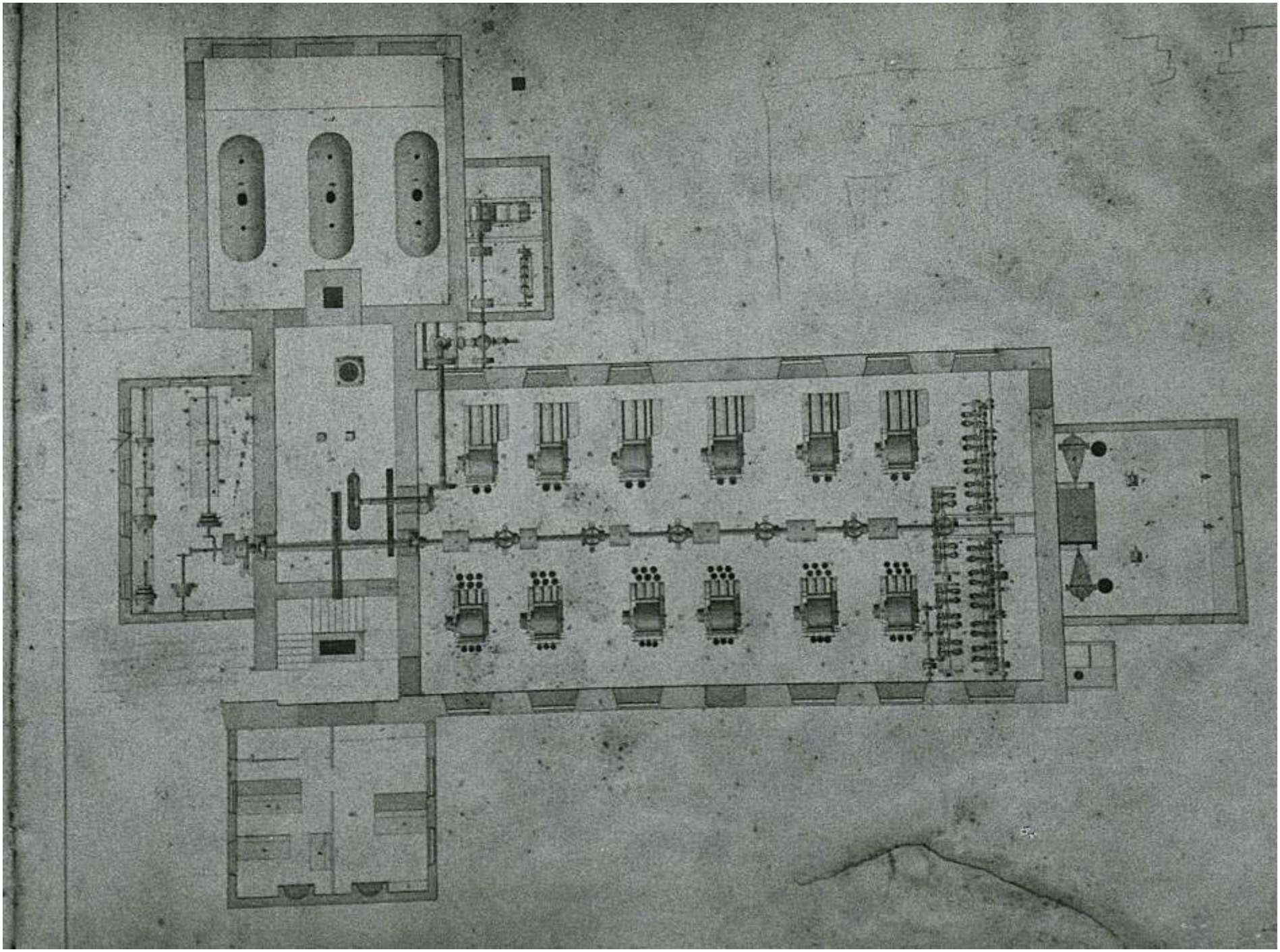
1809 North Mill, Kirkcaldy. ED Mitchell ordered a 16 HP B&W engine. It finally broke down in 1839, and a 25HP Carmichael engine was then fitted, compounded by Lonsdale of Kirkcaldy in 1850.

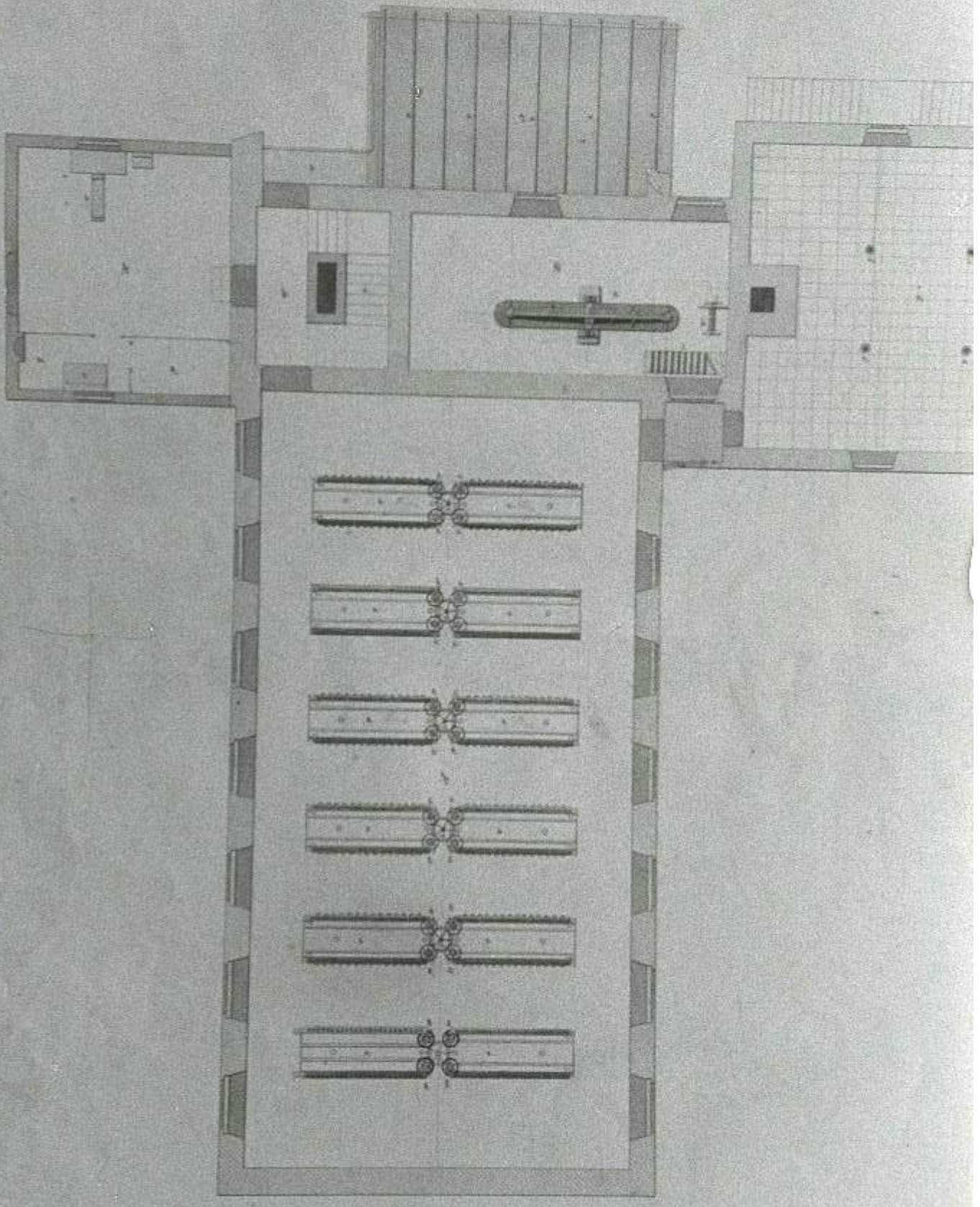
Boulton and Watt rotative engine orders in Scotland

- 22 Sun and Planet engines 1798-1802
- 25 crank engines 1800-1815
- 9 bell crank 1802-7
- 2 wiggle waggle 1809 and 1815

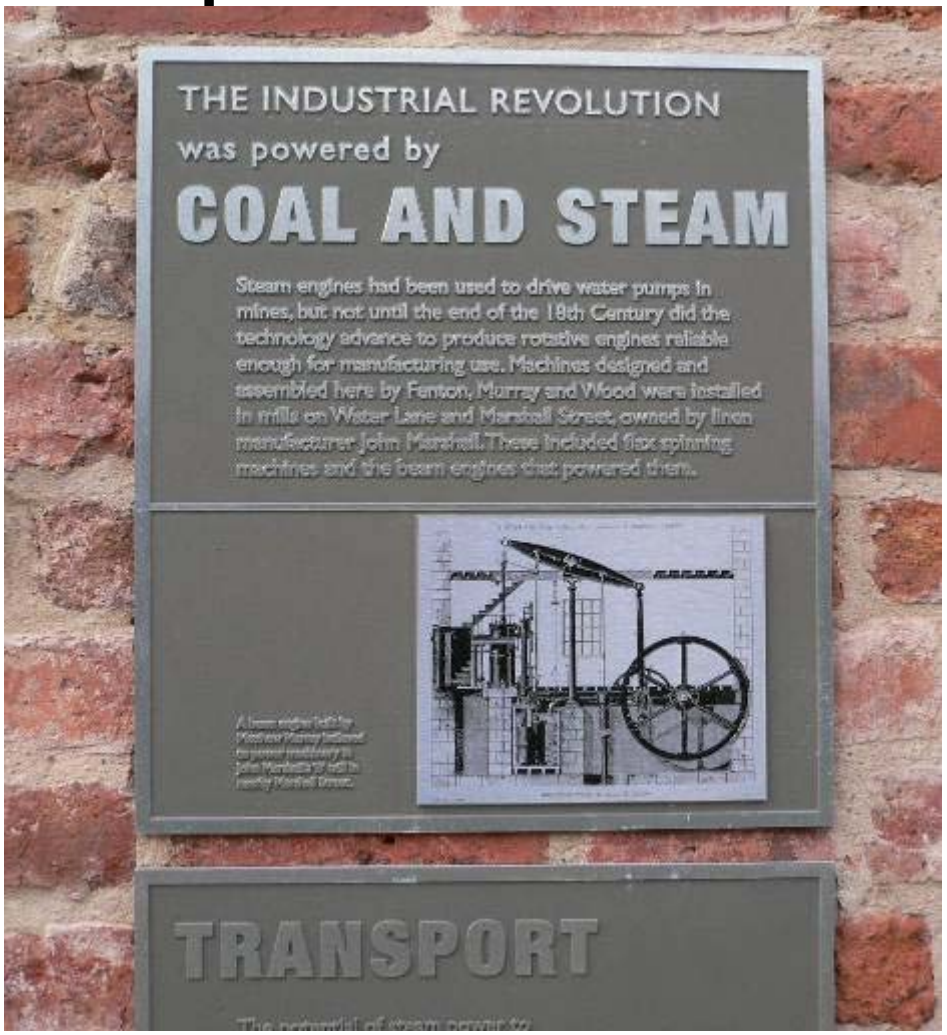
So as Scottish competitors geared up after the patent ended in 1800, Boulton and Watt lost their near-monopoly. They had only one order in 1820s and one in 1830s

Old Mill 1808; South Mill 1825; New Mill 1915 Broadford Works





Matthew Murray's Round Foundry, Leeds: oldest mechanical engineering shops in UK



J&C Carmichael engineers, est 1810
Logie Works 1828/ 1833 flywheel

Logie Works, recess for bevel gear. Ashlar wall for wet spinning

Coffin Mill or
Logie Works 1828/ 1833

Logie Works

- Built 1828 by A and D Edward,
- Fireproof flax mill engineered by Umpherston and Kerr, Douglas Foundry
- Neo classical tripartite engine houses for engines by J&C Carmichael

Upper Dens Mill 1833/1850

Tripartite windows built in 1828

The place to be in Dundee was:

Exchange Coffee Rooms (Winters) or

Thistle Hall, Union St Dundee

Douglas Mill 1835

Tay Works

- Wm Boyack Hospital Ward Mill, 1836, later part of Tay Works, Dundee
- Removal of ashlar blocks by crowbar

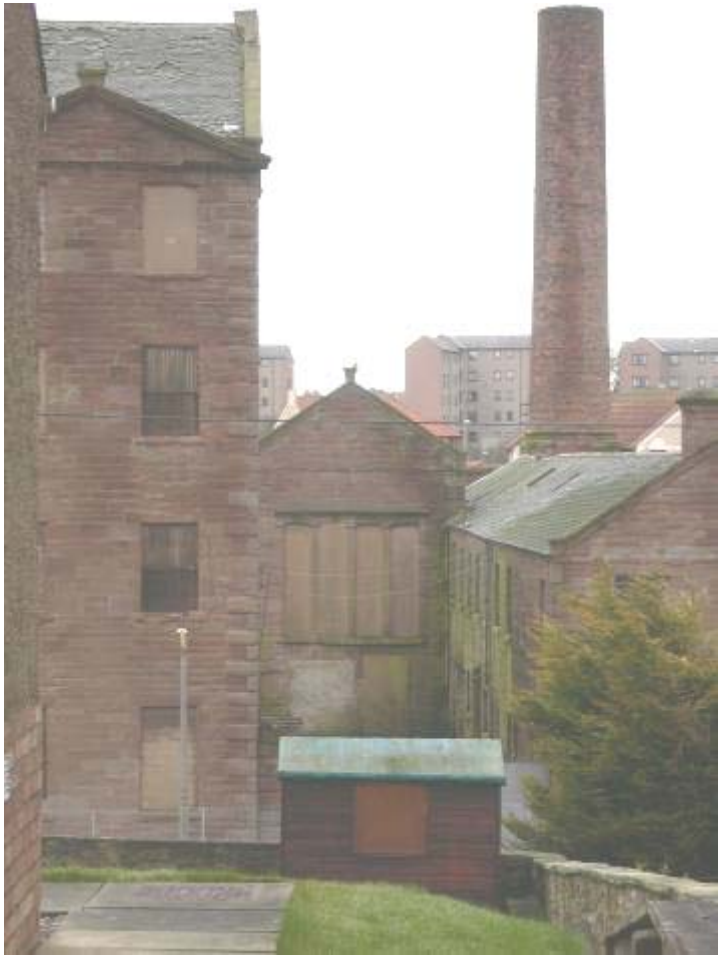
Halley's. Wallace Craigie Works Dundee, 1836/ 1865

J&G Paton, Chapel Works, Montrose

- First mill 1828 designed by Carmichael,
- Other engines added, some in houses bigger than the mills that were actually built (Hackling Mill, 1845)

Chapel Works, Montrose, double beam engine house

Baltic Works, Arbroath, 1851



Tay Works 1851

Coal Wynd Mill, Kirkcaldy 1864: entablature of 150HP compound beam engine (by St Rollox Foundry Glasgow)

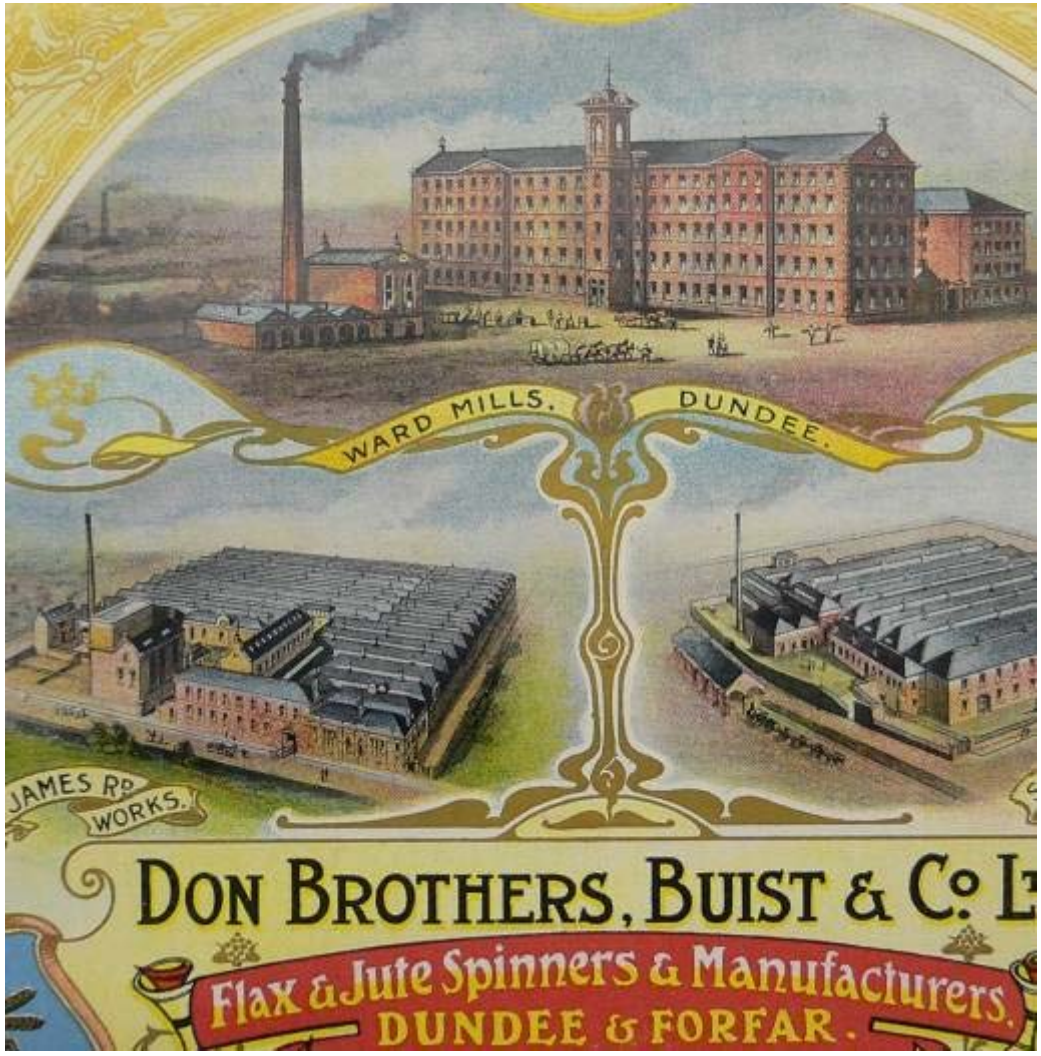
Camperdown Works calender 1862

Camperdown Works Calender engine house

- Musgrave's engine columns and entablature were retained as a platform for refrigeration plant by Wm Low, but was closed when TESCO built a bigger store

Victoria Works, Dunfermline 1876

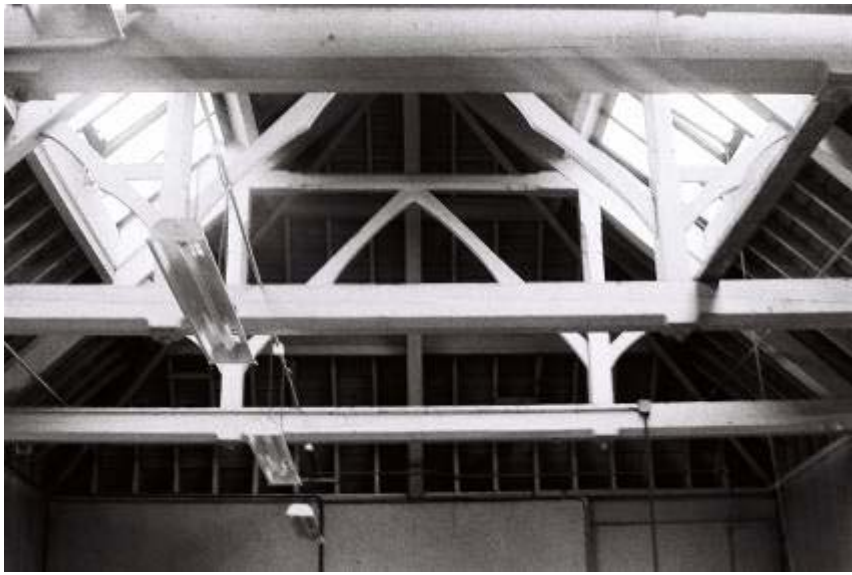
Last beam engines, Bowbridge Works 1885; Ward Mills 1888

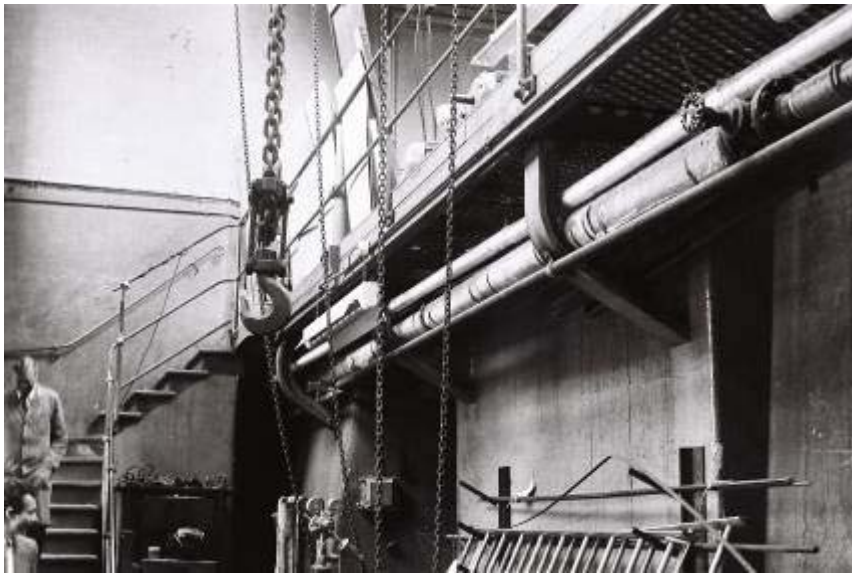


Manhattan Works 1874,
for Col Frank Sandeman,

Manhattan Works

- 1874 Horizontal Corliss 500 HP engine by J&C Carmichael
- jute spinning and weaving
- Extended forward c1910 with travelling crane. High foundations





J&D Wilkie, Kirriemuir
held a Douglas & Grant engine of 1903.

Inset is Lawside Works, Dundee, 1888

Beam supplanted by vertical engine

- Wellfield Works, Dundee, 1866
- Beam engine house below cast iron lintel
- vertical engine added c1890 for a marine-type engine

Edward St Mill, 1890 vertical engine and rope drives

- C&L Ower, architects
- Vertical engine because it is at right angles to the rope alley, which is itself at right angles to the mill (originally built for damask weaving, 1851, by 1890 was Sharp's spinning mill)

A multi-tube boiler

- Balgay Linen Works, South Road, Lochee,

  later East Brothers' Furniture Factory.
- No Lancashire boilers seen in Dundee since a Hume sighting in 1974
- 1 Economiser (Green's) Taybank Works

Dundee and Fife engineers

- Ward Foundry, Dundee

J and C Carmichael, 1810-1929

- Lilybank Foundry, Dundee,

Pearce Brothers,

WB Thompson from 1886 (at first in Tay Foundry),

- Dundee Foundry1790-1908

Gourlay Bros from 1843

- Douglas and Grant, Kirkcaldy,

- Beam and later horizontal and vertical engines. Some early railway locomotives and paddlesteamers

- marine and land engines

- marine engines (and initially Stirling air engines

- Corliss valve horizontal engines for rice milling, saw and textile mills

Ward Foundry erecting and boiler shops, Brown St Dundee

Ward Foundry Dundee

- J and C Carmichael est. 1810
- Boiler shop with riveting tower
- Dundee Mosque now built in the yard where sheerlegs assembled largest engines

Pearce Bros/ WB Thomson. Lilybank Foundry/ Caledon Shipyard

- New spinning mill built on site of engineering shops

  in 1949 for Taybank Works
- Office re-used as a health centre, now closed.

Gourlays Dundee Foundry: now M&S

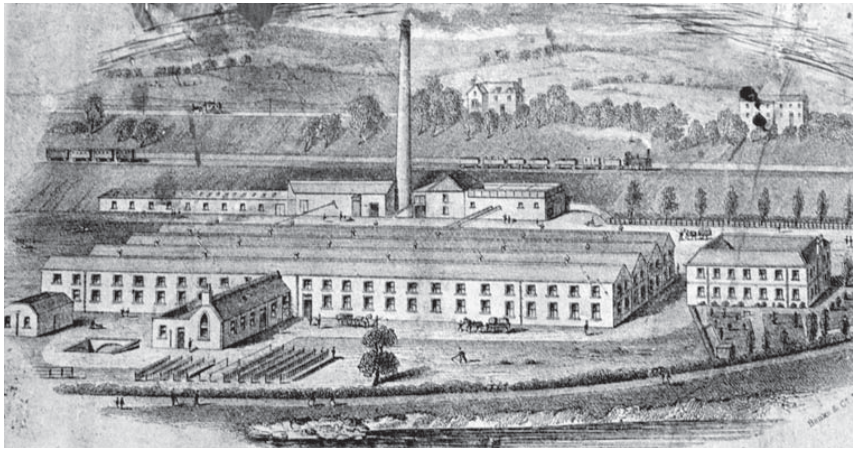
Scottish Borders, local engine makers

- James Melrose, Hawick
- Thomas Aimers, Galashiels

- Photo: beam engine house at Gala Mill

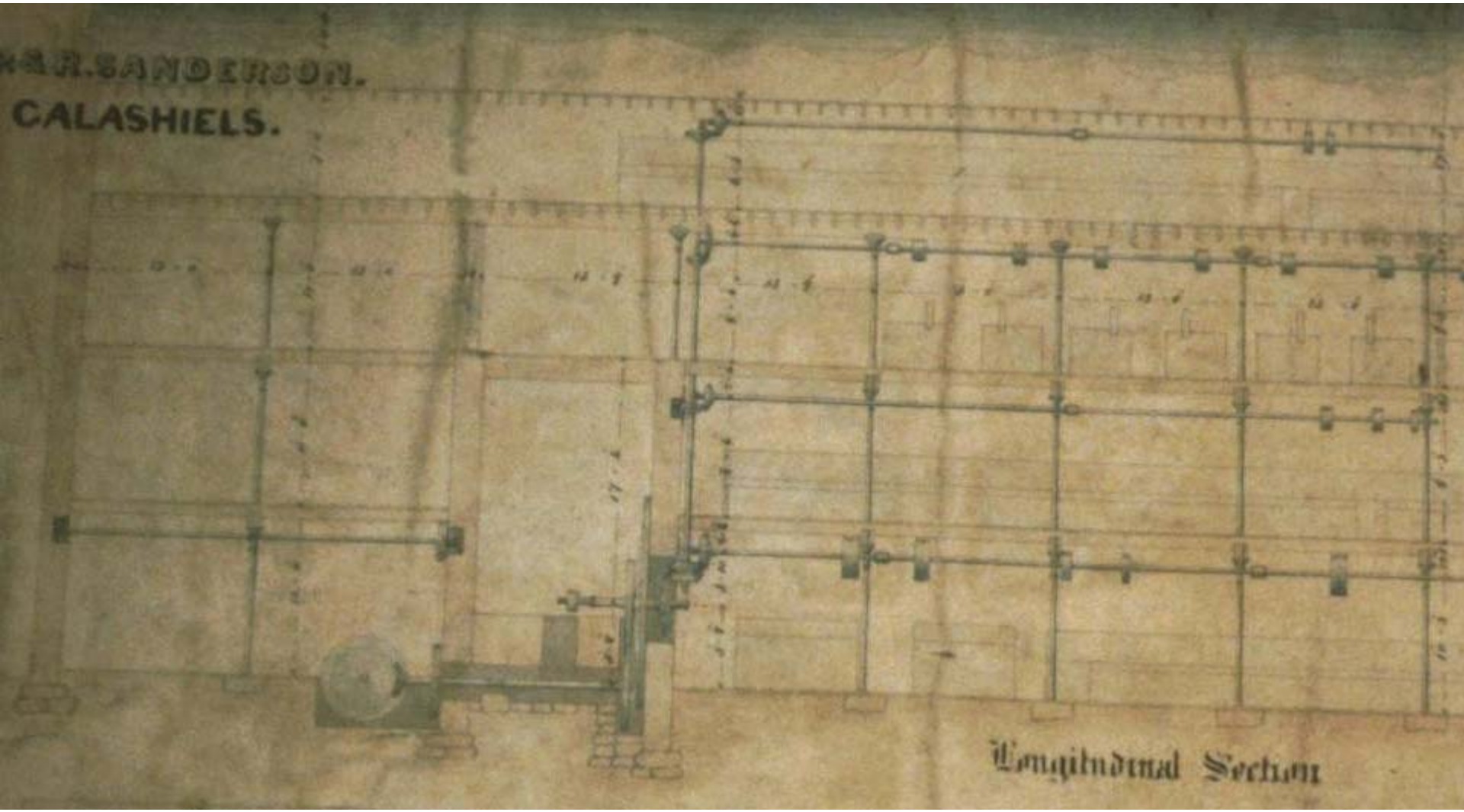
(1850s weaving shed)

Nether Mill, ashlar inserted at end of water powered mill (and right)
Comelybank Mill, the first fully-steam powered mill, 1851



Tweed Mill

Tweed Mill 1851 by Randolph & Elliott (later Fairfields', Glasgow)



Bevel geared power transmission

- Most Borders mill engines were free-standing, with power transmitted uunderground or overhead into the Mill (here Dangerfield Mill, Hawick, 1872)

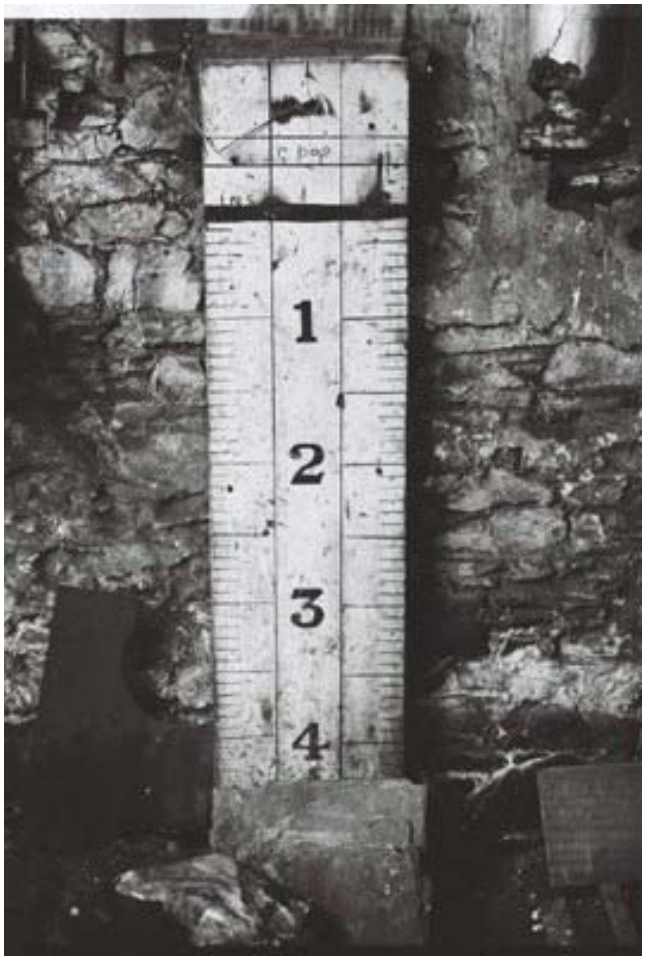
Mid/ Valley Mill, Gala, 1866 double beam engine (RCAHMS)

Forest and Dunsdale Mills Selkirk

Dunsdale Mill beam engine 1863

Engine house, Dunsdale Mill, Selkirk

Yarrow Mill, Selkirk: horizontal?



Philiphaugh wool mill: Petrie cross compound engine