Table 1 Boulton & Watt Engines: Bristol

No.	General Details			Technical Details					Catalogue Ref	
	Date	Owner	No. of Engines	Type of Engine	Single/ double-acting	Cylinder	HP/ NHP	RPM	Page	Number
1	Dec. 1789	Bayly & Co.	1	Sun & Planet	Double-acting	17½" x 4'0"	Orig.10 increased 13	-	42/3	4
2	March 1793	Castle & Ames (Naylor, Castle & Co.)	1	Sun & Planet	Double-acting	22¾" x 5'0"	Orig. 18	-	42/3	6
3	Sept. 1799	Anthony Amatt & C0	1	Sun & Planet		19¼" x 4'0"	Orig. 12	50	42/3	5
4	April 1823	Thomas Castle & Co.	1	Crank		? x 6'0"	40	19	110/111	12
5/6	Aug. 1837	Clarke Maze & Co.	2	Crank Crank	Double-acting Double-acting	? x 7'0" ? x 7'0"	80 80	17½	110/111	13
7	June 1839	Clarke Maze & Co.	1	Crank	Double-acting	38" x 7'0"	60	17½	110/111	14
8	June 1839	Clarke Maze & Co.	1	Crank	Double-acting	? x 7'0"	80	-	110/111	15
9	1840	Clarke Maze & Co.	1	Independent		28" x 7'0"	24	27	236/7	5
10/11	1845	Bristol Water Works	2	Inverted: water works engine		39" x 6'0"	48.6	-	182/3	5

Source: Birmingham Central Library: Boulton & Watt Collection

Table 2 Boulton & Watt Engines: Bath

No.	General Details			Technical Details					Catalogue Ref	
	Date	Owner	No. of Engines	Type of Engine	Single/ double-acting	Cylinder	HP/ NHP	RPM	Page	Number
1	1800	Sayce & Kelson	1	Small side lever (independent)	"	-	3	-	252/3	2
2	1800	William Clark	1	"	"	11" x 2'0"	3		252/3	1
3	1801	J.B. & Thomas Williams	1	"	"	-	3		252/3	5
4	1806	Sommersetshire [sic] Coal Canal Lock Fund Co.	1	Canal engines	Single-acting	52" x 8'0"	57.6		133-4	-
5	1808	Bally, Ellen & Steart	1	Independent	"	19¼" x 2'6"	10	34	236/7	11
6	1824	Charles Wilkins & Co.	1	Side lever (boat	"	? x 3'0"	30	30	206/7	2

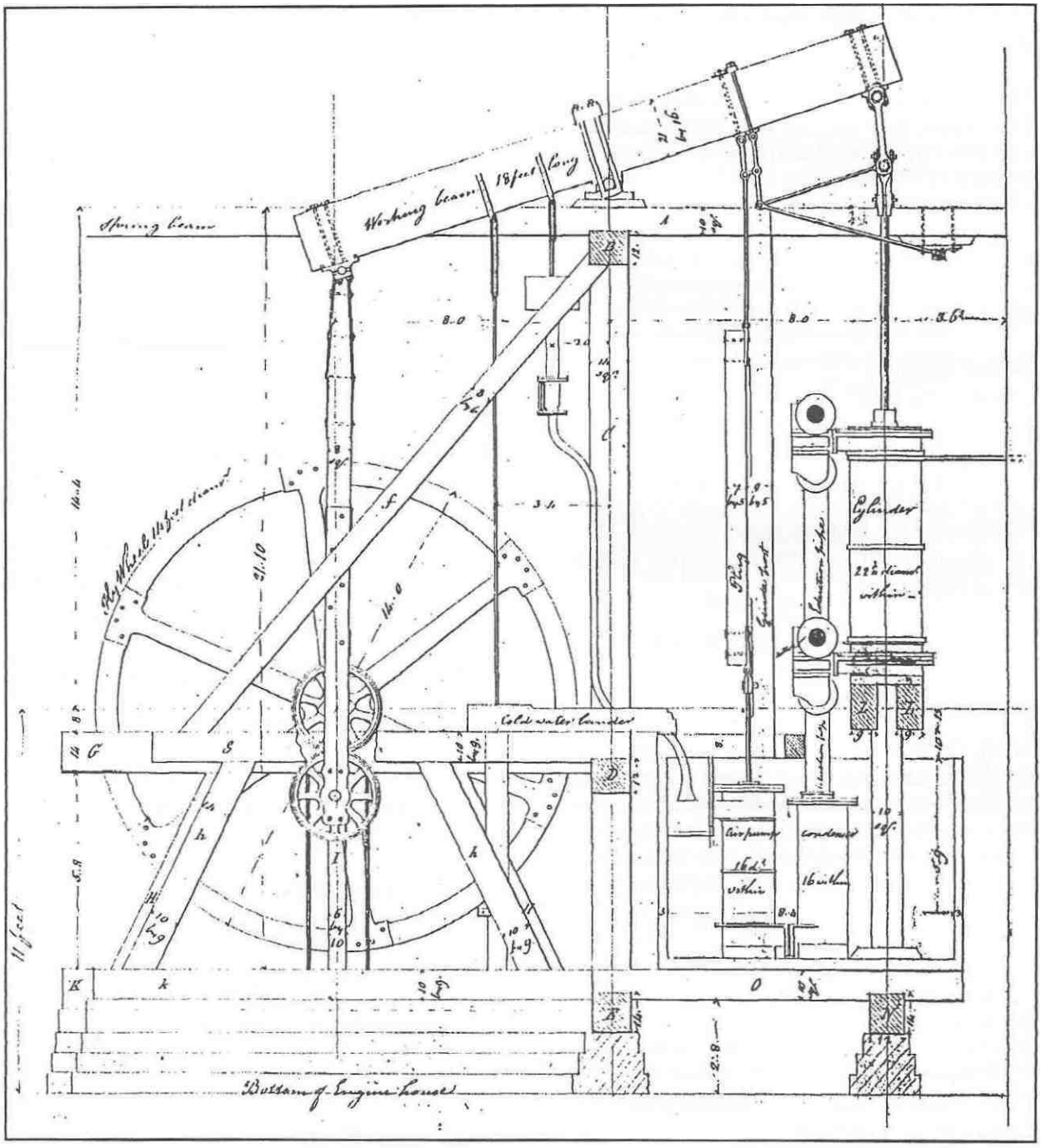
Source: Birmingham Central Library: Boulton & Watt Collection

Boulton & Watt Steam Engines in Bristol and Bath

Mike Bone

A number of contributors to BIAS Journal have made use of the Boulton & Watt Collection which is kept at Birmingham Central Library. The partnership of the entrepreneur Matthew Boulton and the inventor James Watt to produce and develop improved steam engines began in June 1775. The correspondence, order books, drawings and other papers of the partnership and its successors constitute a key source for historians and archaeologists of the industrial revolution. This brief article has the limited aim of providing outline details of all engines in BIAS 'territory'. The Bristol engines have been referred to in past BIAS journals. Those in Bath have received less attention.

The Boulton & Watt archive is a complex one but Harry Hazelton's Catalogue of Old Engines provides a good access point. Hazelton, once an apprentice at the firm's Soho Foundry, listed the different categories of engines in geographical areas. A 'name and place' index to this catalogue has also been compiled. Attention has been



Rotative beam engine for Naylor, Castle & Co, 1793. (Boulton & Watt Collection, Portfolio 101)

drawn to omissions and shortcomings in Hazelton's catalogue but a letter of 1809 from the partnership to M.R. Boulton includes a list of engines supplied to Bath and the neighbouring counties which matches catalogue entries of engines supplied in this earlier period.[1]

Engines in the catalogue are grouped by type (eg 'Engines of Sun & Planet Type') or, in the case of waterworks or canal engines, use. The earliest date on drawings for local engines is December 1789 and the most recent is 1845. Other data in the catalogue includes basic information on the engines and details of related portfolios of drawings and letters associated with the engines. It is not, however, possible to recreate a complete transaction from the surviving records. Basic information from the catalogue information is included in our tables. The catalogue also includes a 'remarks' section in which information may relate to place, notes on payment or further technical details.

The engines listed here constitute a small proportion of those supplied by Boulton & Watt. Estimates of their engine sales vary but have been put at 451 in Britain during the period 1775-1800 with a cumulative total of 1095 by 1825, i.e. those in the BIAS area constitute a very small proportion of these totals.[2] However, engines supplied are not without local significance and the following notes are intended to add a few further details to data summarised in Table 1 and Table 2.

Bristol Engines

1. Bayly & Co 1789

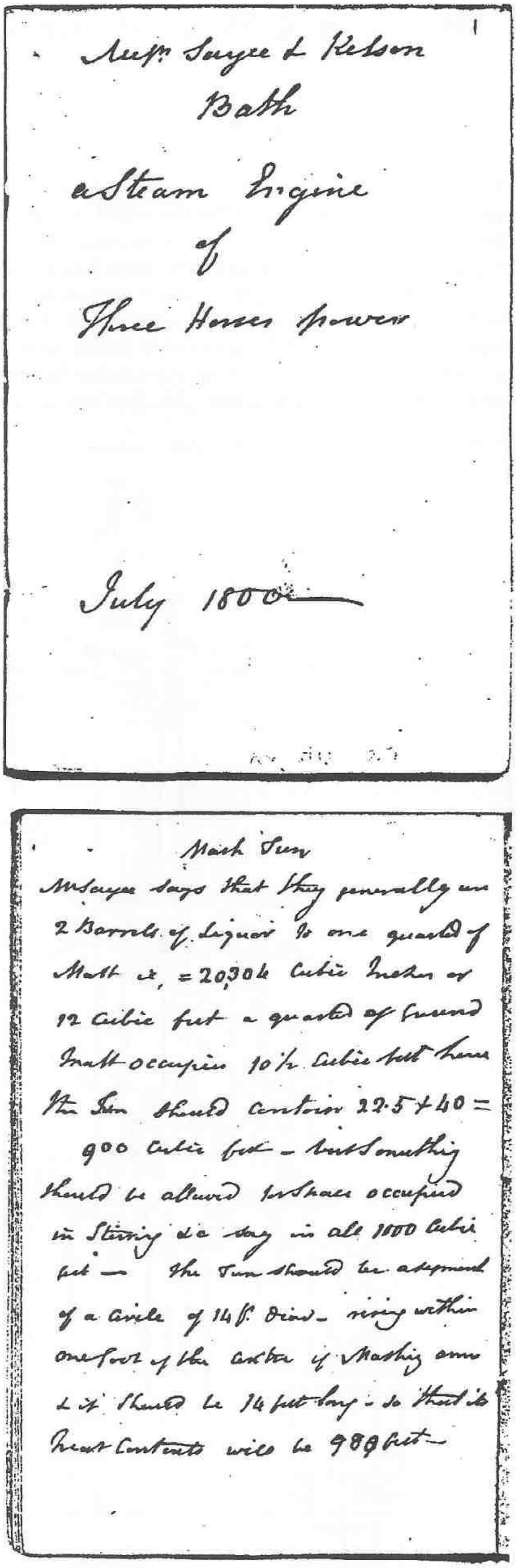
The first engine was supplied to Robert Bayly of Clifton, John Bettington Jnr and John Bettington of Bristol for leadworks at Lawrence Hill. A drawing of this engine is included in George Watkins' article in BIAS Journal 14.[3] Robert Bayly & Co, lead merchants are listed in Matthews' 1795 Directory (at Castle Green) and in the 1797 directory (at Upper Easton).

2. Castle & Ames or Navlor. Castle & Co 1793

The partners identified in associated correspondence are Robert Castle, John Ames and Michael Castle, distillers, of Bristol. Matthews' Bristol Directory for 1793-94 lists Naylor, Castle & Co, distillers, Cheese Lane. This engine was installed to grind cereals and malt and to pump water and worts (ie a solution from the initial mashing stages in the distillation process). This has been described as a brewery engine by some historians. It clearly worked in a distillery but its function would be the same in both trades as early processes of distilling and brewing are very similar.[4]

3. Anthony Amatt & Co 1799

This engine was supplied for a woollen manufactory at the corner of Thomas Street and Portwall Lane in Bristol, the site of a former glassworks. Amatt, Harris, Watts & Peall, worsted manufacturers of Thomas Street are listed in Matthews' 1801 Directory.[5]


Messrs Sayce & Kelson
Bath
a Steam Engine
of
Three Horses power
July 1800

Mash Tun
Mr Sayce says that they generally use
2 Barrels of Liquor to one quarter of
Malt i.e. = 20304 Cubic Inches or
12 Cubic feet a quarter of Ground
Malt occupies 10½ Cubic feet hence
the Tun should contain 22.5 + 40 =
900 Cubic feet – but something
should be allowed for space occupied
in Stirring &c say in all 1000 Cubic
feet – the Tun should be composed
of a Circle of 14 ft Diam – rising within
one foot of the centre of Mashing arms
& it should be 14 feet long – so that its
Neat Contents will be 989 feet –

Pages from one of John Rennie's notebooks

4. Thomas Castle & Co 1823
A second engine for the Bristol Distillery. Drawings of the engine include plan and sections of the beam engine and two boilers.[6] George Watkins has outlined the subsequent history of the engine which, together with *'a condensing beam engine of 20 horse power of even more ancient date'* is noted by Alfred Barnard in his tour of all the whisky distilleries in Britain and Ireland in 1886.[7]

5-9. Clarke Maze & Co 1837-1840
According to the catalogue, five engines were provided for the Great Western Cotton Works at Barton Hill in Bristol. George Watkins has described the role of four of these engines in his BIAS Journal article on steam power in Bristol.[8]
A contemporary guide includes the following description of the works:

> *'An immense pile of buildings, for the purpose of cotton spinning and weaving, has been erected in the Out-Parish of St Philip and Jacob, and the works are now in full operation, having four engines of eighty-horse power each, and two of twenty each constantly at work. The bleaching works are complete.'*[9]

A ground plan of the works, taken from the portfolio of drawings, has been published in Jennifer Tann's Development of the Factory.[10]

10-11. Bristol Water Works 1845
Correspondence between Boulton & Watt and Bristol Waterworks Company, together with a drawing and photographs of these Bull engines is outlined in Peter Skinner's BIAS article of 1978. [11] The engines were originally ordered (in 1845) to pump water to Clifton from an engine house at Black Rock but were actually installed at a pumping station near the White Ladies Convent. The engines are thought to have started work in 1848 and were scrapped in 1913.

Bath & District Engines
l. Sayce & Kelson 1800
Material in the Boulton & Watt papers on the first three engines to be supplied to Bath is limited but it seems that they were all supplied to work in the city's breweries. Hugh Torrens has identified the connection between John Rennie, then attending the works of the Kennet & Avon Canal in Bath, and Sayce & Kelson, as recorded in Rennie's surviving notebooks.[12] Sayce & Kelson had written to Boulton & Watt on 10 September 1797 for information about *'a 3 Horse power (engine), for a small Brewery'*. They expressed the hope that the forthcoming expiration of the partnership's patent (ie in 1800) would enable them to obtain one 'upon more reasonable terms, than has hitherto been the case .. '[13]

Full technical details of an engine are recorded in a separate notebook in Rennie's papers. They show an engine to operate millstones, a malt machine, mashing machine and pumps.[14] The portfolio in the Boulton & Watt papers includes a general view of the engine.[15]
Sayce & Kelson's brewery, later known as the Northgate Brewery (in Northgate Street), was considerably expanded by various partnerships over subsequent years and had a 25 hp steam engine when described in George Measom's Official Illustrated Guide to the Great Western Railway of 1860.[16]

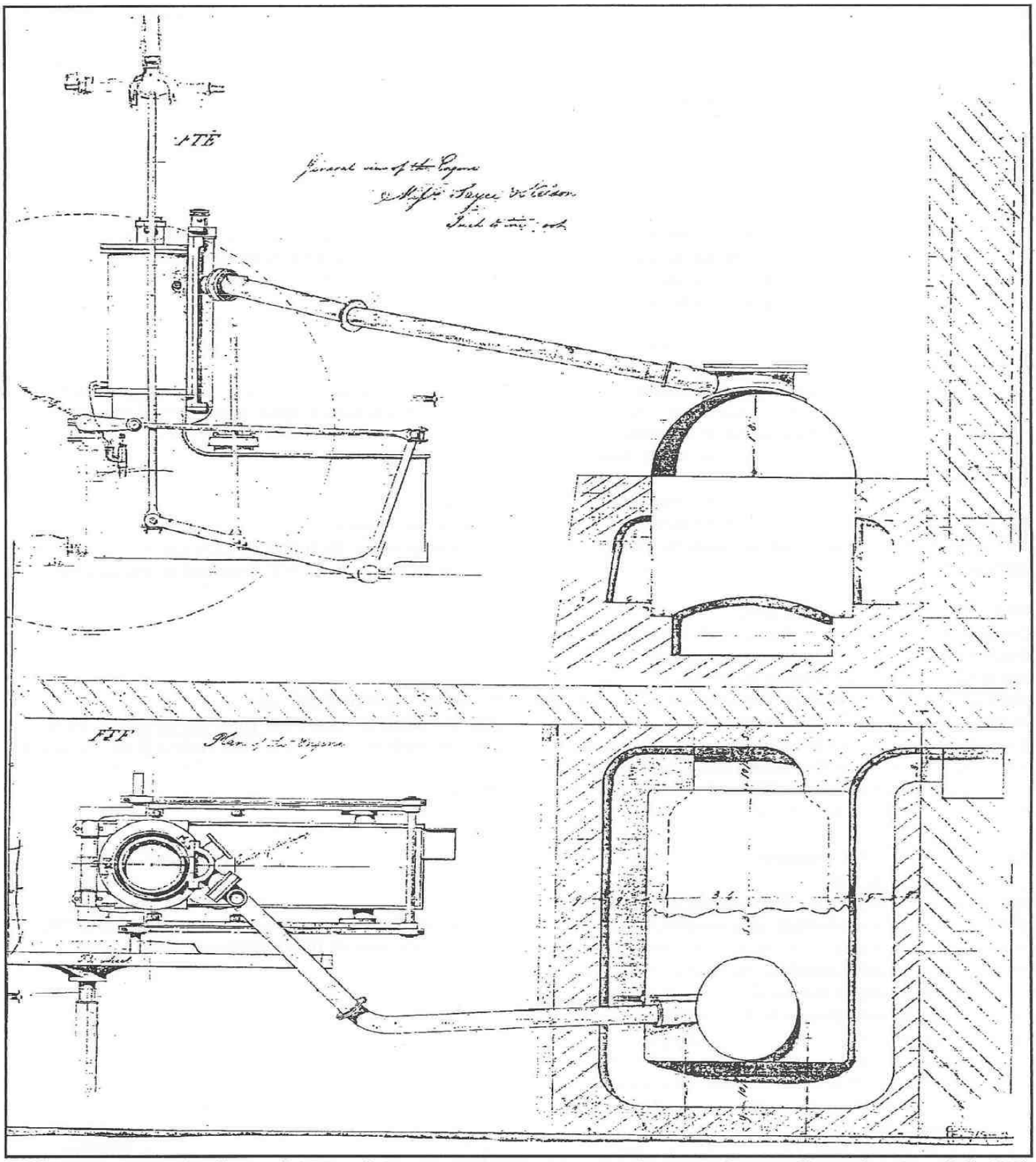
2. William Clark 1800
This engine is similar to Sayce & Kelson's engine and is shown in the catalogue's *'remarks'* column as provided for *'Bath or Bristol'*. This engine appears to have been destined for William Clark's brewery in Walcot. Robbin's Bath Directory for 1800 includes the entry *'William Clark Porter and Pale Beer Brewer Lower East-hays'*.

3. J.B. & Thomas Williams 1801
The catalogue locates this engine in Bath. Drawings in the portfolio show the engine driving an upright shaft which meshes with a horse wheel.[17] Robbin's Directory refers to *'Williams & Sons, porter brewers on the Quay'*.

4. Somerset Coal Canal 1806
This engine was purchased to pump water at the Combe Hay Locks. Details of its purchase and a drawing of this beam engine are included in Kenneth Clew's history of the canal. The engine was removed to Dunkerton in the 1840s.[18]

5. Bally Ellen & Steart 1808
Brief notes in the catalogue identify this engine as ordered for 'Montalt' Paper Mill in Bath. Bally, Ellen & Steart of Montalt Mill, Monkton Combe, are listed as paper-makers in The New Bath Directory of 1809, *'the only manufacturers of the fine rolled Bath Vellum Papers'*.
The site is included in Brian Attwood's BIAS survey of paper mills. The mill, built in 1805, was originally powered by a waterwheel, said at the time to be the largest in England.[19] The portfolio includes a plan of the premises and a water-colour drawing of a wheel of 56 ft diameter and a 36 ft cog wheel, together with a paper engine, steam engine and boiler. The Boulton & Watt archive thus establishes the size of this significant waterwheel.[20]

6. Charles Wilkins & Co 1824
The catalogue locates this engine at Twiverton (ie Twerton) Mills near Bath. The associated drawings include details of the engine house.[21] A number of Boulton & Watt engines had been supplied to west of England woollen manufacturers and an earlier enquiry, not followed by an order, had been made by J. Hills of Bath in 1816.[22] Kermeth Rogers' study of local woollen mills outlines the history of the Twerton and Weston mills and a 'boat engine' of 30 hp is mentioned at the lower mill in Twerton. This is presumably the engine supplied by Boulton a Watt in 1824. The lower mill and machinery were destroyed by fire in 1836 and immediately rebuilt after this date.[23]



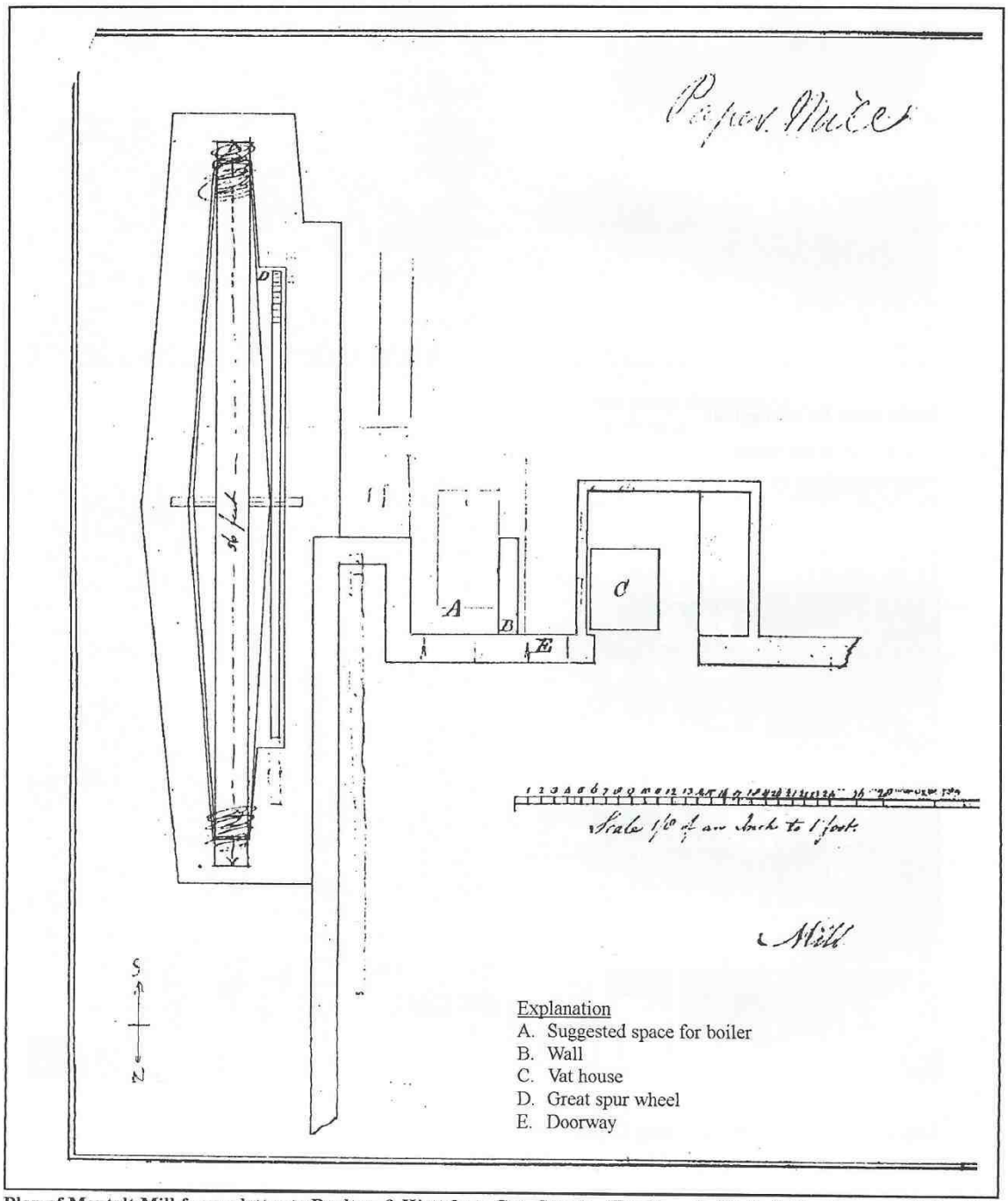
Bell-crank engine for Sayce & Kelson's Brewery, 1803. (Boulton & Watt Collection, Portfolio 719)

Acknowledgement
We are grateful to Birmingham Central Library for permission to use illustrations from the Boulton & Watt Collection.

References

1 Tann, J ., 'The Employment of Power in the West-of-England, wool textile industry, 1790-1840' in Harte, N.B. and Ponting, K.G., Textile History and Economic History (Manchester 1973) 207 (This refers to a letter of 10 March 1809 in Letterbook 33 in the Boulton & Watt Collection).
2. Tann, J., ed., The Selected Papers of Boulton & Watt (1981) 7, 18
3 Watkins, G., 'Steam Power in Bristol', BIAS Journal 14 (1981) 6-7
4 Birmingham Central Library (BCL), Boulton & Watt Col-

lection, Box 28/37, Agreement 1 March 1793
5 Watkins, note 3, 6
6 BCL, note 4, Portfolio 191
7 Barnard, A., The Whisky Distilleries of the United Kingdom (1887) 454-5
8 Watkins, note 3, 6, 8 t
9 Chilcott, J ., Chilcott's Descriptive History of Bristol (Bristol, 5th edn. c.1841) 86
10 Tann, J., The Development of the Factory (1970) 26
11 Skinner, P., 'Pumping Bnsto1's Water', BIAS Journal 11 (1978) 14-17
12 Torrens, H., The Evolution of a Family Firm: Stothert & Pitt of Bath (Bath, 1978) 18
13 BCL, note 4, Box 3/10/13, Letter 10 September 1797
14 National Library of Scotland, MS1992l, Notebook
15 BCL, note 4, Portfolio 719
16 Measom, G., Official Illustrated Guide to the Great Western Railway (1860) 721
17 BCL, note 4, Portfolio 722
18 Clew, K.R., The Somersetshire Coal Canal and Railways (Newton Abbot, 1970) 62-63
19 Attwood, B., 'The BIAS Paper Mills Survey', BIAS Journal 3 (1970) 17
20 BCL, note 4, Letter 5 April 1808, Portfolio 846
21 BCL, note 4, Portfolio 1031
22 Tann, note 1, 222
23 Rogers, K., Wiltshire and Somerset Woollen Mills (Edington, 1976) 168-171



Plan of Montalt Mill from a letter to Boulton & Watt from Geo. Steart (Boulton & Watt Collection, portfolio 846)