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The front cover illustration is of coalminers in the High Street, Prestonpans, East Lothian, September 1912.
(Jackson Collection, Glasgow University Archives, DC111/11/1176).

The back cover illustration is from the Coal Trades Diary and Colliery Managers Guide, 1929, p.161.

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WILLIAM SYMINGTON'S ATMOSPHERIC ENGINES AND THEIR CONSTRUCTION

by

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1967 marked the bicentenary of William Symington's first patent: his 'Atmospheric Steam Engine on Principals entirely New'.[1] He is usually remembered as an unsuccessful pioneer of steam navigation, associated with the Charlotte Dundas steamboats. It has been forgotten, however, that for much of his life he was a successful builder of engines. It is certain that twenty-nine engines were built to the 1787 patent and it is likely that there were several more. They were made in Scotland and they helped the Carron Company of Falkirk to compete against the monopoly sought by Boulton & Watt for their Soho engine manufactory.

The 1787 patent was of an atmospheric steam engine and, as such, it was something of an anachronism which in scientific terms cannot be compared with Watt's design. However, it was superior to the old Newcomen engine, and cheaper and easier to maintain than Watt's. It may have used more coal but that was of little account to those colliery owners who were Symington's main customers.

Watt's patent may have been a scientific milestone, but many engineers of the late eighteenth century found the design too complicated and, in his treatise on the steam engine, John Farey echoed other engineers when he wrote 'the novelty of ... construction and supposed difficulty of keeping such new work in order was strongly objected to'.[2] Symington began his career assisting his brother George in building a Watt engine, supplied from Boulton & Watt's Soho Works, Birmingham, on the Margaret mine at

Wanlockhead, so he was very aware of such problems. The engine that put to work in 1779, but before long there were complaints about it, and Gilbert Meason, manager of the mining company, refused to meet the stipulated royalty of £247 per annum, a huge sum in those days.[3]

Symington was therefore able to take advantage of a situation that encouraged inventive opportunity, and he set out to design an engine that would retain the Newcomen style open cylinder and would be simply constructed, cheap, and easy to operate. The engine is well described in a contemporary account:

> 'Mr Symington's Improved Steam Engine works by the pressure of the atmosphere having an open cylinder. The principal improvement is in the condensation of the steam by a new and simple method. This is affected by introducing a second piston which moves betwixt the steam passage and the bottom and below which the steam is condensed. The motions of this piston are produced without the least degree detracting from the power of the engine, and experience hath shown it to be the most complete method of producing a vacuum yet adopted.'[4]

Wanlockhead not only provided Symington with practical engine-building experience, but the situation there offered a particular advantage to the inventor in that there was an engine on which he could prove his ideas. The 1779 engine had been replaced by a larger one in 1786, but the old engine was still <u>in situ</u> and Gilbert Meason was agreeable to using it for experiment. With parts supplied by Carron Company, and paid for by Meason, Symington rebuilt the old engine to his patent, and carried out a 'Comparative Trial'. It was claimed as a great success and the previous account again provides the details:

> '[illegible] cylinder of 36 inches diameter, [illegible] quantity of coal, and having an equal number of strokes per minute, Mr Symington's wrought with a force equal to 14 pounds for each square inch contained in the piston; while Mr Watt's had wrought with a power equal to 9.1/2 pounds.'

The reality of the comparison is arguable, but the trial did demonstrate to potential customers that here was an alternative engine to that supplied from Soho, and to Carron that here was an engineer they might profitably support.

Excluding the two built for Patrick Miller's boats, Symington's first commercial engine was built in 1789 to pump the Bay Mine at Wanlockhead. Other orders quickly followed and by 1793 he was building rotative engines as well, using cranks and crossheads instead of the ratchets and chains that drove Miller's paddleboats. Most of the engines were for Scottish interests but Table 1 shows the market was not a parochial one, for engines went south to London and Yorkshire. In 1800 a shipment of parts was sent to Jamaica, probably the first Scottish steam engine sent out to the sugar plantations there.5

Details of the parts that Carron Company supplied for all these engines are recorded in the extant invoice books,6 but only five drawings of the stationary engines are known to exist; so there is little record of their construction and none as to the appearance of those supplied to individual sites.7 The Carron records provide the only hard contemporary information about Symington's engines. The invoice books not only list the various parts, but also the weight of each. All these details offer basic information which the writer has used in the present study to

examine the construction of the engines, and to show how [illegible]

Table 1

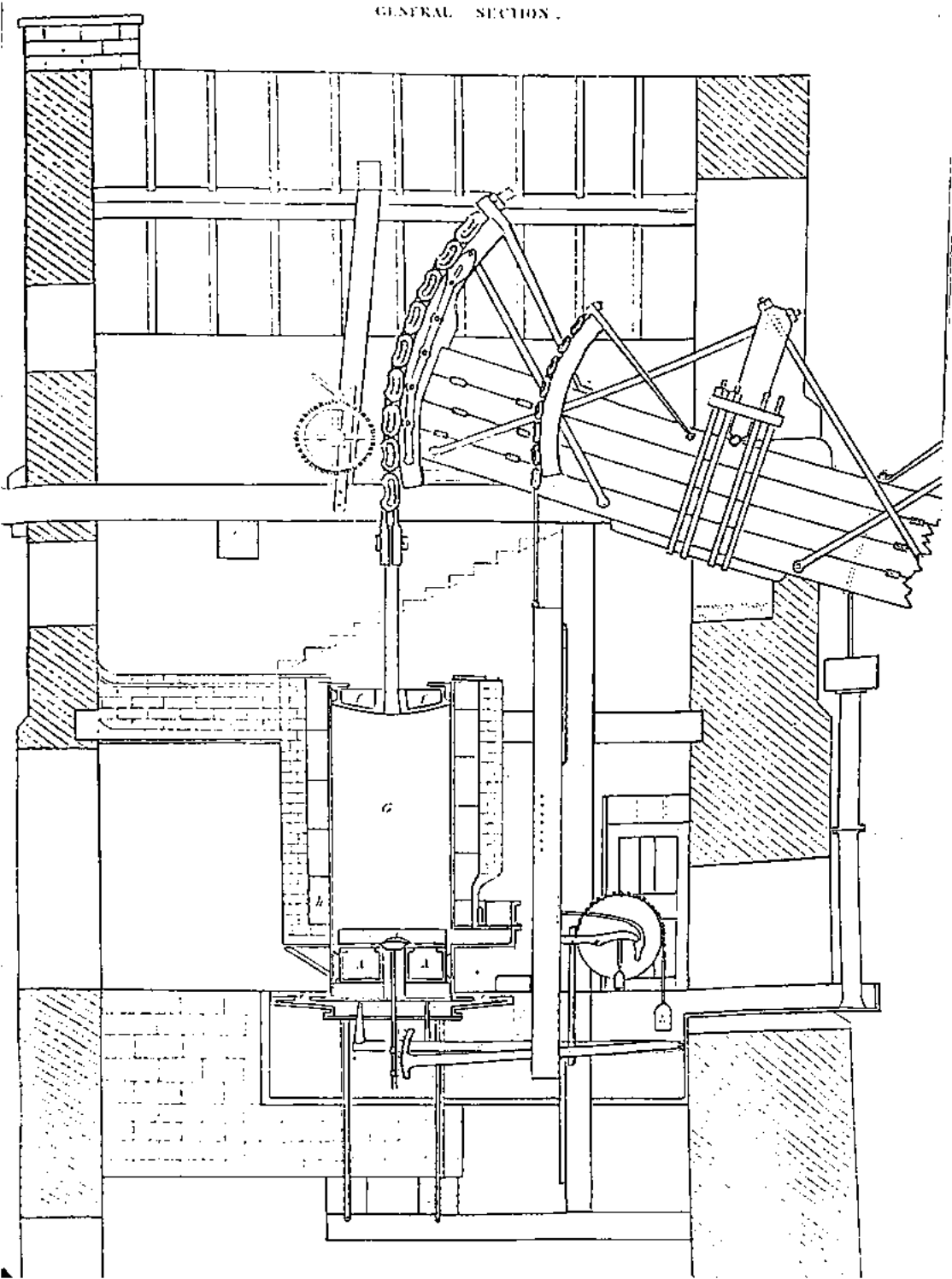
Engines built to the 1787 patent

SITE	DATE	PROPRIETOR
Dalswinton Steamboat	1788	Patrick Miller
Canal Steamboat	1789	Patrick Miller
Wanlockhead	1789	Gilbert Deason
London	1791	Charles Walker
London	1791	Richard Hare
Sanquhar	1791	Robert Barker
Leadhills	1792	Archibald Stirling
Kinnaird 1	1792	James Bruce
Leeds	1793	Couplanc & Wilkinson
London	1793	Hector Campbell
Kinnaird 2	1793	James Bruce
Torryburn	1793	Alexander Dickie
St Clements Wells	1794	George Milne
Redding Rig 1	1794	Alexander McVey
Leeds	1796	Barrow Copley
Kinnaird 3	1796	James Bruce
Craigend	1796	James Miller
Fullarton	1796	Colonel Fullarton
Alloa	1797	Robert Bald
Couston 1	1799	Matthew Sandilands
Couston 2	1800	Matthew Sandilands
Jamaica	1800	James Mitchell
Redding Rig 2	1801	Alexander McVey
Charlotte Dundas 1*	1801	Forth & Clyde Nav Co
Drongan	1803	Mungo Smith
Carronhall	1804	Carronhall Colliery Co
Redding Rig 3	1805	Alexander McVey
Dysart	1808	Dysart New Coal Co

There were probably four more engines - one in Birmingham and three in Scotland, and there may have been others for which no record remains.

* The CHARLOTTE DUNDAS 2 had an engine built to Symington's 1802 Patent.

GENERAL SECTION.



to have developed the design in keeping with operational experience, for nothing remains of any notes he might have kept himself.

The basic concepts of the 1767 patent can be seen in Figure 1, one of the drawings that accompanied the specification, and they were described as follows:

1. Separating the steam and water, though in the same cylinder, but not cooling it in the place where the powers of the steam are to be used, by the use of a medium piston fitted in the cylinder through which the steam will pass to expose it to water jetting in, but so tight as to prevent leakage.
2. Combining the steam and atmospheric pressures so that the power of the steam coming in is equal to two pounds for every square inch, and acts upon the top of the medium to depress it and expel the water and the air through valves.
3. Having the cylinder heated externally by a flue from the boiler in a spiral direction around it.

The whole concept was an elegant one. The steam passage through the medium piston meant any ingress of air at the pipe joints, one of the problems which bedevilled the early Watt engines, was avoided. Forcing out the condensate by the steam pressure on the medium piston, instead of using a pump driven from the beam, offered an improvement in mechanical efficiency. Using the flue gases to heat the working cylinder promised greater thermal efficiency and a reduced fuel consumption.

In practice, ingenuity led to complications and simplicity was the aim, so the valve in the piston was the first to go. It was tried in an experimental engine Symington built, as such a valve is shown in the rough

sketch made by one of Watt's erecting engineers, and it was also fitted in the Bridgewater steamboat engine. The concept was an imaginative one, but to have successfully applied such a valve to a large engine was probably beyond the engineering abilities of the day.

The heating case around the cylinder was also sound in concept and Watt used a steam jacket in his engines. Symington's arrangement offered higher temperatures, but proved difficult to manufacture. Table 2 suggests that part of the case for the Bay engine was cast integral with the cylinder and had 'case plates' fastened to it. This was probably the least satisfactory arrangement, and by the time Symington designed a big pumping engine for James Bruce's colliery at Kinnaird in 1792, the invoice shows he modified the case so as to have it in two halves. However the arrangement clearly proved unsatisfactory and there is no record of it being tried again.

Table 2

Comparison of the weights of the upper cylinders and heating cases for the Bay, Leadhills, and Kinnaird 1 engines

ENGINE	WEIGHT UPPER CYLINDER TC	TOTAL WEIGHT OF HEATING CASE HC	HC/TC	TC + HC
Bay Mine	10120	6775	.67	16875
	(7800)	(9075)	1.16	16875
Leadhills	7604	7877	1.04	15481
Kinnaird 1	7756	9180	1.18	16936

The figures in brackets for the Bay mine engine represent the adjusted weights assuming that part of the heating case had been cast integral with the cylinder. An equivalent weight has then been subtracted to give a weight comparable with the other two engines.

The patent drawing shows the condenser in the form of a ring round the bottom cylinder. It seems likely that this reflects the design of the experimental engine as the drawings made of the little Dalswinton engine also show the dish arrangement. However, a sketch John Hennie made of the Bay Mine engine shows the condensing chamber projecting to one side. This construction is confirmed by John Farey's reference to the condenser being arranged the way 'the foot part of a boot projects from the leg part'.[8] This extension was covered by a plate, described in the invoices as an 'apron', which contained a number of 'sniftin[g]' or non-return valves through which the condensate was expelled.

Air could neither be condensed nor easily expelled, and the leakage of air must have posed such problems that one wonders how Newcomen ever got his first engine going. Watt got round the problem of piston leakage because his cylinder was enclosed with a cover and there was steam above the piston. Leakage of steam past the piston could be tolerated, but 'applying a close cover [to the cylinder and piston rod] ... required ... accuracy of execution ... extremely difficult of attainment'.[9] Although it was not part of the patent, Symington used a steam seal in the main piston so that, as he put it, 'leakage draws steam and not air'. He seems to have accomplished this by having some sort of telescopic pipe attached to the piston for this can be deduced from Table 3. The arrangement required careful workmanship and Carron may not always have made the pipes for the parts cannot be identified on every invoice. Although demanding careful construction the telescopic pipes were probably more easily aligned than the cylinder covers and stuffing boxes Watt regarded as an essential feature of his first engines.

Table 3

Details of the pipework for the steam seal of the piston

ENGINE	REFERENCE		WEIGHT
Bay Mine	'Bored Pipe'		273
Leadhills	'Steam Pipe for the Piston'		300
	'Cover for do'		10
Kinnaird I	'Pipe and Stuffing Box'		
	'Nozzle for do'	(total)	299
Leeds	'Steam Pipe for the Piston'		364
Dockhead	'Steam Pipe for the Piston'		154
	'Cover for do'		10
	'Gland for do'		3
Kinnaird II	'Steam Pipe for the Piston'		125
Crombie Point	'Steam Pipe for the Piston'		182
Redding Pit I	'Steam Pipe for the Piston		195
Hunslet	'Steam Pipe for the Piston'		154
Fullarton	'Steam Pipe for the Piston		124
Jamaica	'Steam Pipe for the Tube'		238
	'Tube Pipe'		52

The patent envisaged rotative motion by using chains and ratchets, an idea also used by other eighteenth century inventors. Chains and ratchets promised a uniform and fast motion from the irregular movement of the single acting atmospheric engines, and were perhaps particularly suited to driving the paddlewheels of Patrick Miller's steamboats. It seems probable that an arrangement of wheels and ratchets was also tried on the two engines Symington built in London in 1791. However the manufacture and lubrication of such parts must have posed insurmountable problems at that time. An alternative method of powering machinery was to use the ubiquitous waterwheel with a pumping engine to return the water that had flowed over it. This was much favoured where a low speed but a high torque was required, and two of Symington's engines were used in this way.

The engines built to the 1787 patent, and recorded in the extant Carron records, are listed in Table 1. Other contemporary accounts make it likely that there were several more, some possibly supplied by other

Table 4

Sorted List of Engine Parts

Adjusting Pins		4
Adjusting Screws		6
Apron		1
Block Straps		2
Blocks		2
Bolsters		2
do	(R)	6
Bolster for the Medium		1
Bonnets		3
Bonnet for Cyl. Bottom		1
Bonnets for Nozzles		2
Bored Pipe		1
Bottom Cylinder		1
Brass Brasses		2
do	(R)	4
Brass Valves		6
Brass Valve Seats		6
Brass for the Medium		2
Cap for Piston Rod		1
Cast Iron Brasses	(R)	12
Catch Pin		2
Centre Piece		1
Centre Gudgeon		1
Chains		
Clove Bolts		4
Cover for Cross Pipe		1
Crane Wheel		1
Crane Handle		1
Crank Arm		1
Crank Rod	(R)	1
Crooked Pipe		1
Cross Pipe		1
Curved Pipe		1
Cutter Bolts		2
Cylinder Bonnet		1
Cylinder		1
Eye Bolts		2
Flange for Wheel	(R)	1
Flask Bushes		8
Gland for Piston St. Pipe		1
Guards		6
Gudgeon Handles		2
Handles		2
Hoops		3
Hoops for the Straps		2
Injection Pipe		1
Joint for the Apron		1
Kempstone Gudgeons		4
Large Sheaves		4
Martingales		6
Nave	(R)	1
Nozzle Pipe		1
Piston Rod Joint		1
Piston Rods		2
Piston Weights		4
Pistons		2
Presses for Stuffing Boxes		3
Racks		5
Rings for the Flange	(R)	2
Rods with Joints	(R)	2
Round Plates		2
Saddle Centre	(R)	1
Safety Valve		1
Safety Valve Seat		1
Screwed Bolts		24
Screwed Clove Bolts		4
Screwed Eye Bolts		6
Screwed Straps		3
Screwed Staples		4
Segments	(R)	8
Shears		2
Sheaves		4
Slips (Ground)	(R)	8
Snecks		3
Spanners for the Weigh Shaft		2
Spindles for the Valves		2
Square Pipe		1
Stays		2
Steam Pipe		1
Steam Pipe for the Piston		1
Steam Pipe with Stuffing Box		1
Stuffing Box		1
Tails for the Cap	(R)	2
Turned Gudgeons		2
Valve Guard Loops		2
Valve Stems		6
Working Gear		1 set
Wrought Iron Valves		2

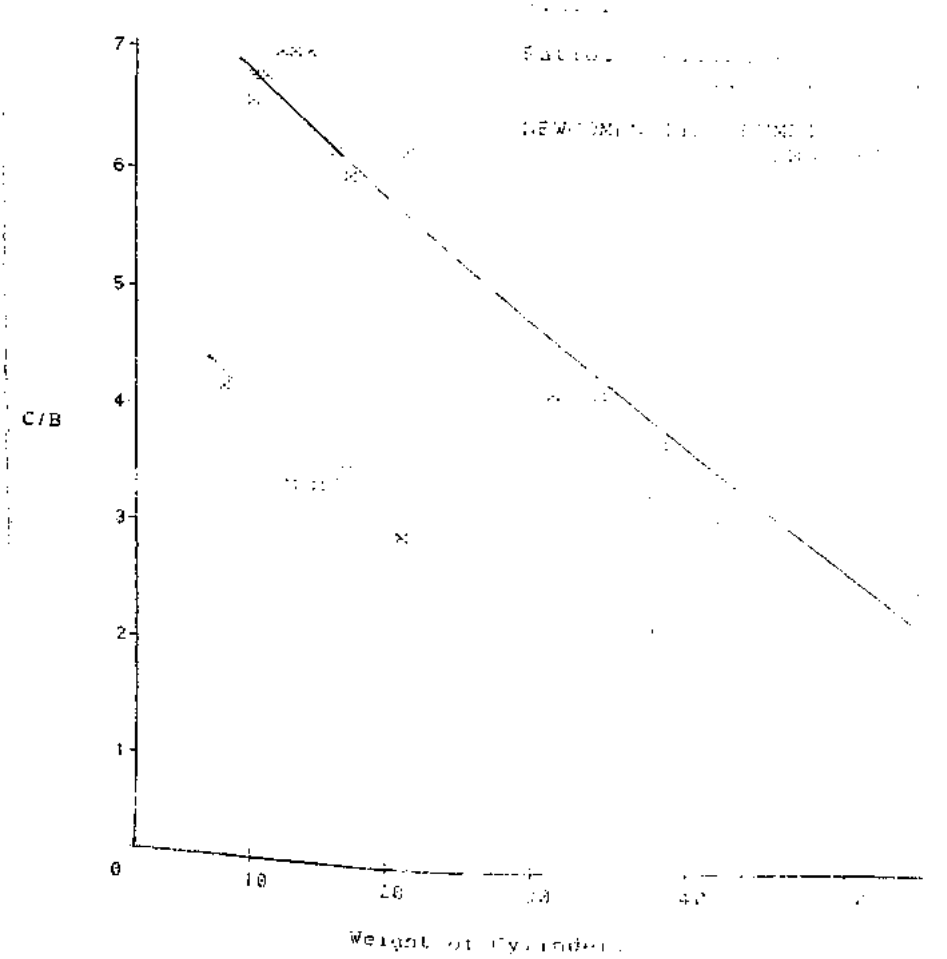
(R) Parts peculiar to the rotative engines

[illegible] the Watt may have been altered from Newcomen engines are [illegible].[10]

In many instances Carron only made the engine castings and those other parts requiring special care in their manufacture. In any event many of the invoices seem incomplete. Timber and wrought iron work could often be made in mine workshops, or by local 'wrights'. However, there seems to have been instances where the contracts Symington procured required that Carron provided everything needed, even to firebricks for the boiler and oil for the engine. Such contracts would have provided Carron with the greatest profit and been the most welcome.

The invoices chronicle all the parts Carron supplied, so those which clearly applied to the engines, and not to boilers or mine pumps, have been collated and sorted into the list shown in Table 4. This can be regarded as a record of most of the metal-work required to build a beam engine to the 1787 patent. Apart from their unusual bottom cylinders, Symington's beam engines followed the basic arrangement first used by the builders of the Newcomen type engines and later developed by Watt.

It will be apparent that the weights listed in the invoices relate to the mass of the parts, and therefore their size. Size relates to shape and since Symington's atmospheric engines followed the basic patented design, it seemed to the writer that much might be learnt from an examination of the relationship of the weights of those parts that came together. Comparing the weights of parts from different engines, especially their ratios, could point to differences in the proportions of the engines, and this could suggest how the design might have been further developed through time. Such a technique does not seem to have been tried before, so the present work is of an experimental nature. It demands some


C/B
7
6
5
4
3
2
1
0
10
20

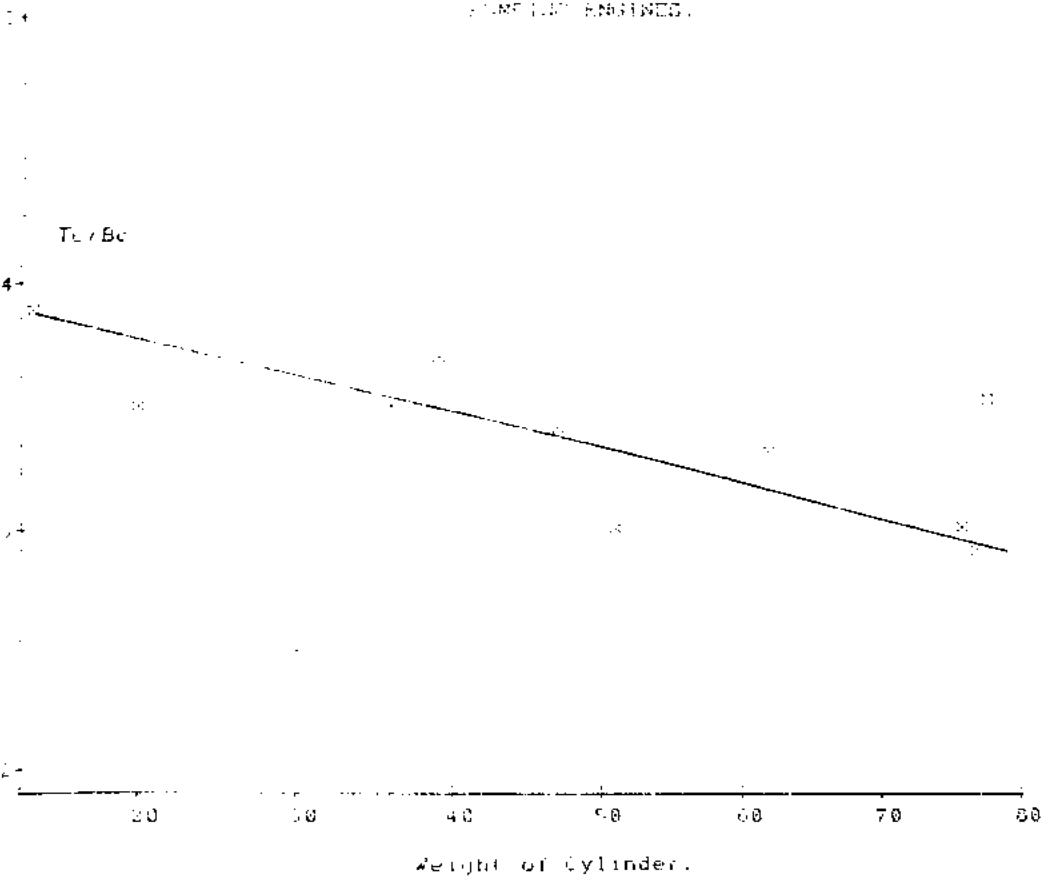
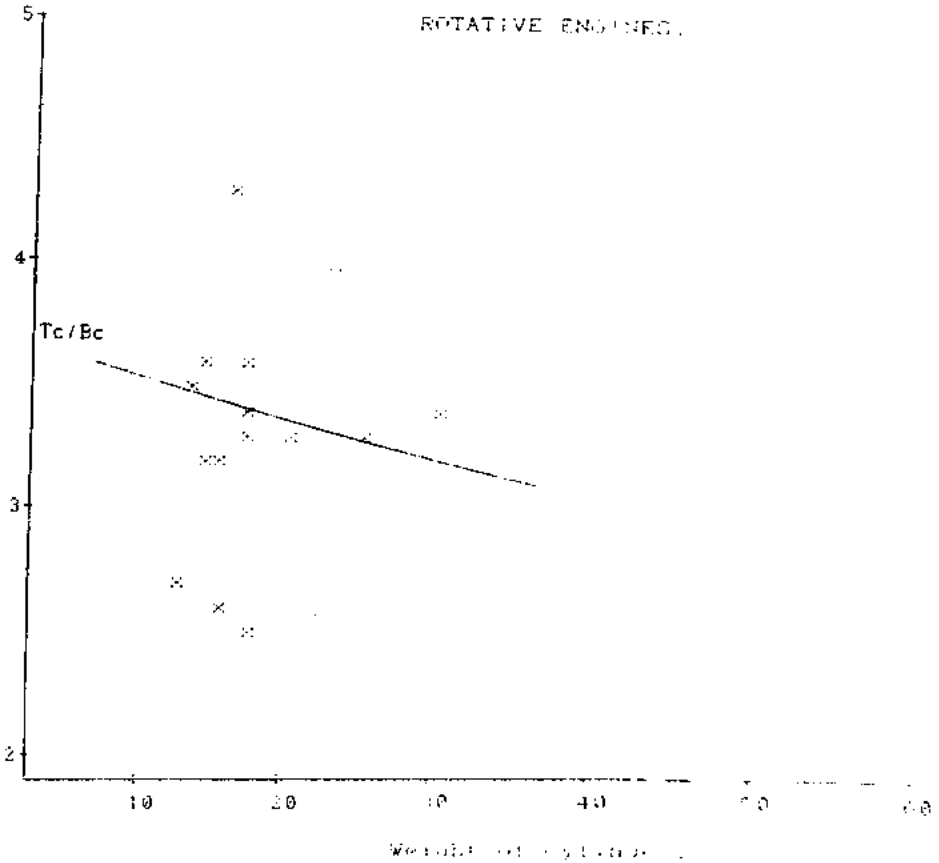

Tc / Bc
4
20
30
40
50
60
70
80
Weight of Cylinder.

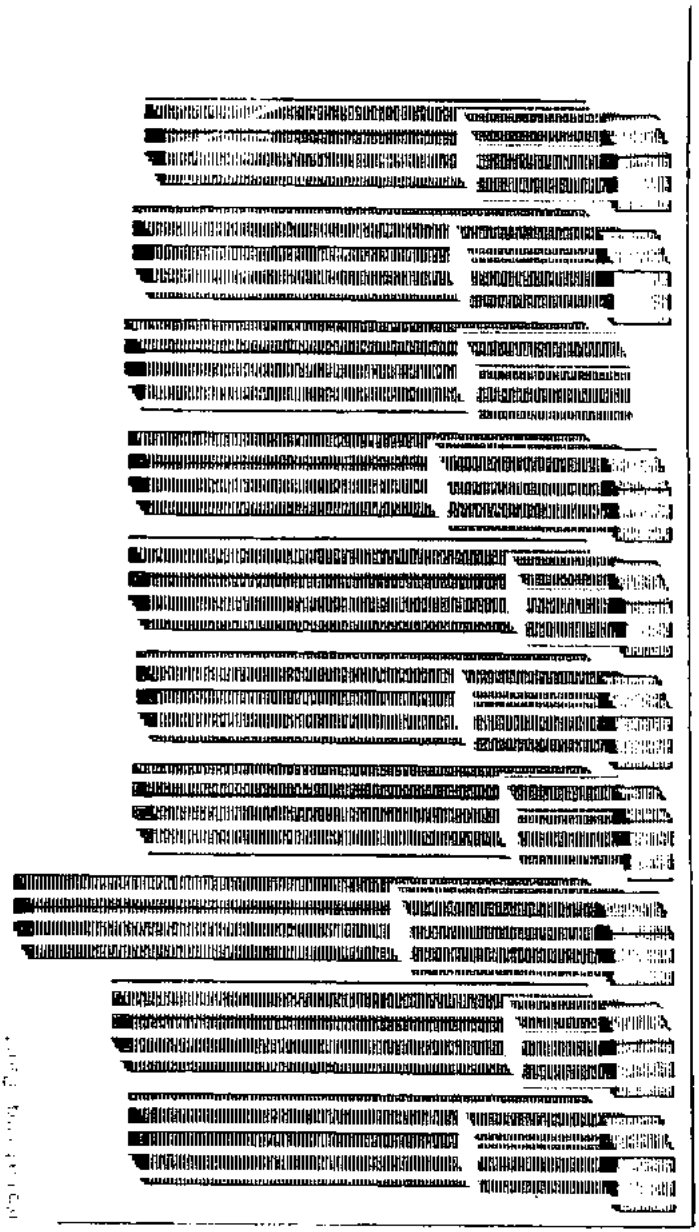
Fig. 4.

Relation [illegible]

ROTATIVE ENGINES.



[illegible]



tedious arithmetic but this is easily managed with a computer [illegible] programs. The weights of the major parts of the invoiced engines are listed in Table 5 and for convenience are expressed in pounds. The engine built for the Dalswinton paddleboat is not included. It was not supplied by Carron Company and there is no record of weights.

In order to provide a model for the technique, a comparison was made of the ratios of the weights of the upper and lower parts of the cylinders of some contemporary Newcomen type engines also supplied by Carron. Details of such engines are well recorded and, like the Symington engines, the cylinder bottoms of the Newcomen type were also large and complex castings. The relationship is shown in Figure 2. Research in the Carron books for details of the Symington engines suggest Carron may well have provided parts for almost a hundred others, so the list is only a superficial one. Nevertheless it will be seen that the figures fall along two fairly well defined bands - which also suggests that Carron were supplying Newcomen engines to two designs at that time. The graph confirms that a correlation can be expected, and it follows that points falling significantly outside the pattern could indeed point to differences in the proportions of different engines. Table 6 shows the comparative figures for Symington's pumping and rotative engines. In general those for the former fall into a band as with the Newcomen engines, Figure 3, but there seems no obvious pattern for the rotative engines, Figure 4.

Table 6

Ratios of Cylinder and Piston Weights

ENGINE	DATE	PUMPING/ ROTATIVE	TC/EC	TC/TP	BC/BP
Exp. Engine	1788	P	-	5.38	1.41
Miller Stm. Boat	1789	R	3.50	-	-
Bay Pine	1789	P	4.49	-	-
do. adjusted			3.46	-	-
London Engines	1791	R	4.00	-	-
Sanquhar	1791	P	3.83	-	-
Leadhills	1792	P	3.03	3.39	1.00
Kinnaird 1	1792	P	2.67	3.75	1.03
Leeds	1793	PR	3.36	3.73	1.00
Dockhead	1793	P	2.48	3.56	1.13
Kinnaird 2	1793	R	3.63	3.24	0.85
Crombie Point	1793	P	3.49	4.87	1.14
St Clmnts Wells	1794	R	4.28	3.56	0.77
Redding Rig 1 V	1794	P	2.96	4.48	1.04
Hunslet	1796	R	3.35	3.93	0.95
Kinnaird 3	1796	R	3.39	4.60	1.11
Craidend	1796	R	3.64	3.44	0.94
Fullarton	1796	R	3.22	3.20	0.86
Alloa	1797	R	3.23	3.58	0.89
Couston 1	1799	P	3.47	-	-
Couston 2	1800	P	3.72	-	-
F&C Co Stm. Boat	1800	R	2.50	3.96	0.91
Jamaica	1800	PR	3.26	4.11	0.95
Redding Rig 2	1801	R	2.57	-	-
Drongan	1803	R	2.66	3.86	1.00
Carrowhill	1804	R	3.30	-	1.03
Redding Rig 3	1805	R	3.25	5.68	1.08
Dysart	1808	R	3.23	4.36	1.05

PR Returning Engines ie pumping engines employed to pump water over a water wheel

With regard to the pumping engines, the ratio of the top and bottom cylinders of the Dockhead engine shows the greatest disparity. The engine seems to have been similar in size to that supplied to Barrow Copley for his mill at Hunslet. It will be seen from Table 5 that although the weight of the upper cylinders compare (3010/3010), the bottom cylinders of the two engines differ by almost a quarter (1211/898). This suggests Symington tried out some different design of the bottom cylinder

for the Dockhead engine but it proved less than satisfactory and was not continued.

The lack of any obvious pattern in the figures for the rotative engines indicates their design was more fluid. Records show that most beam pumping engines had a stroke of about eight feet. But the stroke of a rotative engine was chosen to give optimum results for particular speeds.

Not all the invoices give the individual weights of both pistons but there is enough data to provide the comparisons illustrated in Figures 5 and 6. These are arranged in a chronological order, and it is seen that there is a measure of consistency with regard to the bottom cylinders and the medium piston over the period, but a considerable variation in terms of the working cylinders and pistons particularly in the case of the rotative engines. This could suggest that Symington was using power cylinders of similar diameter but different stroke to meet particular requirements, but it is probable that he was also experimenting with the overall arrangement of his rotative engines.

The medium pistons were heavier, so presumably deeper, than the main pistons, as can be seen from Table 5, and the invoices show they were usually fitted with two rings. These were not piston-rings in the modern sense, but rings which held hempen or other packing in place. The use of two such seals points to the necessity of avoiding any leakage between the working cylinder and the lower part where the steam was condensed.

Symington's rotative engine was developed in 1791 with financial support from James Bruce of Kinnaird, and its construction may be deduced from the final columns of Table 5. These list the cranks, the heavy crank rods,

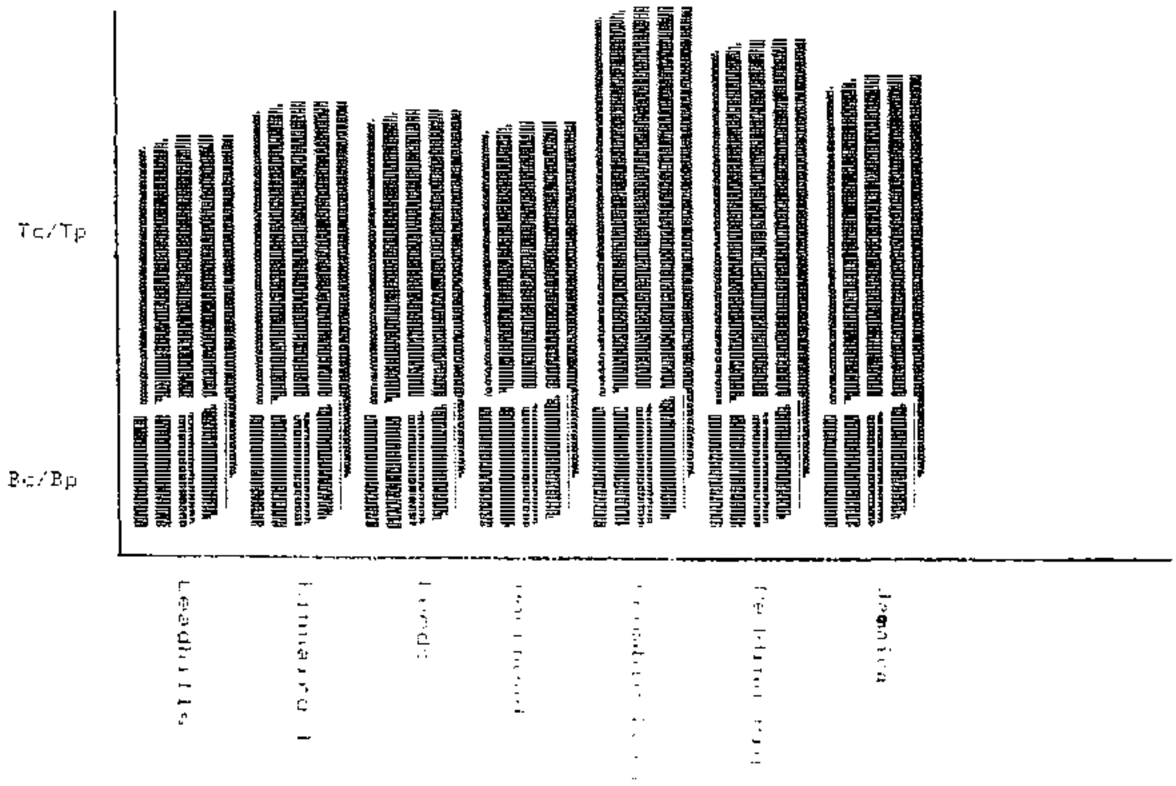
Table 5

ENGINE	DATE	PUMP/ ROTAT	TOP CYL TC	BOT.CYL BC	TOP P. TP	BOT. P. BP	BOTH P. PS	APRON A	HT. CASE hC	CRANK ARM	CRANK ROD	SLIPS	CAP	S'MENTS	NAVE
EXP. ENGINE	1787	P	1960	1232	364	872	1236	207							
MILLER STM. BOAT	1789	R	1414	408	-	-	537	-							
BAY MINE	1789	P	10120	2252	-	-	6174	-	6755						
LONDON ENGINES	1791	R	2408	602	-	-	1046	-	1857					3403	1267
SANQUHAR	1791	P	994	259	-	-	662	-	966						
LEADHILLS	1792	P	7604	2506	2240	2496	4746	578	7677						
KINNAIRD 1	1792	P	7756	2702	2065	2606	4157	392	9160						
LEEDS	1793	P	4704	1400	1260	1392	2652	336							
DOCKHEAD	1793	P	3010	1211	840	1071	1911	228		-	-	725	192	-	-
KINNAIRD 2	1793	R	1477	406	455	476	931	104		422	1239	606	200	3584	1440
CROMBIE POINT	1793	P	3570	1022	732	869	1621	278							
ST CLMNTS WELLS	1794	R	1708	399	476	518	994	100		406	896	610	188	3724	1411
REDDING RIG 1	1794	P	5096	1705	1137	1624	2761	385							
HUNSLET	1796	R	3010	698	764	938	1702	294		441	1736	730	179	4536	1463
KINNAIRD 3	1796	R	1760	516	382	464	846	119		312	910	596	-	3549	1419
CRAIGEND	1796	R	1785	490	518	520	1038	-		424	1260	610	188	3524	1400
FULLARTON	1796	R	1512	469	472	528	994	104		330	864	-	190	3591	1400
ALLOA	1797	R	1561	483	436	539	975	129		402	1462	599	188	3584	1436
COUSTON 1	1799	P	2044	588	-	-	1036	131							
COUSTON 2	1800	P	3864	1036	-	-	1638	320							
F&C Co STM. BOAT	1800	R	1776	700	448	768	1216	231		252	-	-	73	1959	-
JAMAICA	1800	PR	6216	1904	1512	2004	3516	384							
REDDING RIG 2	1801	R	1638	637	-	-	1043	172		-	1298	626	-	3528	1428
DRONGAN	1803	R	1344	504	348	504	852	116		-	1232	625	156	3612	-
CARRONHILL	1804	R	2352	712	-	685	-	219		406	-	-	116	-	-
REDDING RIG 3	1805	R	1820	560	320	518	838	140		396	1276	628	98	3560	1379
DYSART	1808	R	2128	658	488	624	1112	140		396	1244	609	120	3484	1372
NEWCOMEN TYPE															
BOGUEHALL	1800	R/N	1386	602	264			-	-	256	1442	-	-	1610	-
SEABANK	1802	R/N	1384	320	164			-	-	287	620	-	-	2576	-

P Pumping Engine

R Rotation Engine

Fig 5
Cylinder / Piston Ratios
Pumping Engines



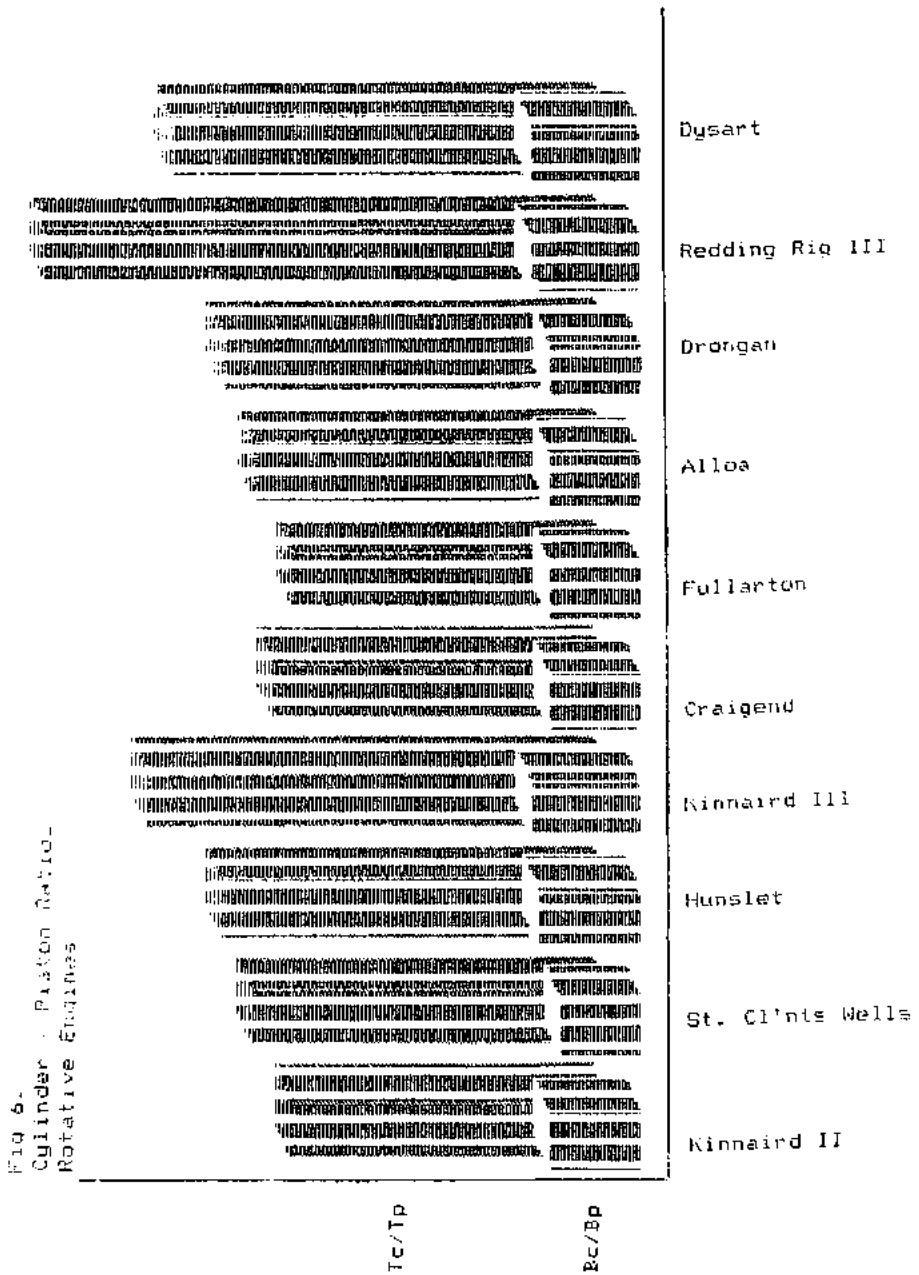


Fig 6.
Cylinder - Piston Ratio-
Rotative Engines

and other rotating parts. The cap and tails made the crosshead, and the slips, which were ground, must have been the crosshead guides. The flywheels were built from segments fastened to a nave or to flanges.

The Kinnaird engine may in fact have been the first rotative engine Carron supplied, but the crosshead arrangement seems to have been Symington's own for there is no record of Carron using it for other engines. Details of two such Newcomen type rotative engines have been added to Table 5 for comparison. It is interesting to note the way the cranks and flywheels seem to have been standardised for most were of similar weight, and therefore to similar patterns, as can be seen in Figure 7. The Hunslet engine was much larger than the rest. It drove a woollen mill and the total mass of the rotating parts was more than four tons.

The writer believes his comparative explorations confirm the ongoing nature of the design of the engines Symington built to the 1787 patent. They were not built to a 'one off' concept but seem to have been developed through time with the aim of improving the engine's performance. That Carron Company were part of, and benefited from the demands made by Symington's engineering seems very probable. On their own assertion they were not prepared to design engines but would 'execute machinery when furnished with drawings'.[11] This must have demanded a developing production organisation, and it seems equally probable that the totality of their engine manufacture contributed to the way engineering itself developed in Scotland at the turn of the eighteenth century.

Symington's engines continued to be built into the nineteenth century, after he had patented his double acting engine and the expiry of Watt's patents had opened the market to other builders. The situation is paralleled by the way the building of the traditional Newcomen type also

contributed [illegible], and shows how the low cost and simplicity of the Watt engine ensured its popularity to users in spite of its high consumption of coal.

Records indicate that most of Symington's engines worked for many years, and the way in which three engines were supplied to the colliery at Redding, Falkirk is of particular interest. It was leased by Carron in 1793 and was therefore under their control. They then had the option of supplying any type of engine they chose, and so their decision to continue with Symington's points to its satisfactory operation.

The Carron records make few references to any complaints and, although Symington had a streak of perversity in his nature, his relationship with the foundry remained firm over the years. It is likely his influence on the company was considerable for there are many references in their letters to the need to work to 'Mr Symington's satisfaction'. His more sophisticated double acting steam engine was patented in 1802.[12] A number were built, including the engine of the second Charlotte Dundas steamboat and another pumping engine [illegible]ed. They can be seen as the logical development of Symington's ideas and Carron's capabilities. However, it has only been Symington's steamboats that have excited much public interest. This has means that William Symington is remembered for his heroic defeats, not for his real successes and his contribution to Scottish industrial history.

FOOTNOTES

1. Patent No 1610, 3 Jul 1787. Steam Engines.
W S Harvey and G Downs Rose, 'Mr Symington's Improved Atmospheric Engine', Transactions of the Newcomen Society, Vol 46 (1973-4), pp 27-32.

2. John Farey, A Treatise on the Steam Engine (1827), p 326.

3. For an account of the Watt engine built at Wanlockhead, and of the quarrel between Watt and Gilbert Meason, see W S Harvey and G Downs-Rose, William Symington - Inventor and Engine Builder (hereinafter cited as William Symington) (1980) chapter 2.

4. Birmingham Reference Library, Boulton and Watt MSS. Mr Symington's Engine, parcel E, shelf 30.

5. For details of the engines, see William Symington.

6. Scottish Record Office, Carron Company MSS, GD58/6.

7. There are the three that Symington made for his patent, one drawn by his son and reproduced in the Mechanic's Magazine in 1833, and rough contemporary sketches of the experimental engine and of that built on the Bay Mine. All can be found in William Symington.

8. John Farey, op cit, p 658.

9. Ibid, p 329.

10. There are passing references to two more Scottish engines and one at Birmingham. The two which may have been modified were at Dunmore and Lochrin. Again, details may be found in William Symington.

11. Quoted in R H Campbell, Carron Company (Edinburgh 1961) p 74.

12. Patent 2544, 3rd April 1802. Steam Engines, Propulsion of Vessels, etc.

ASPECTS OF MINING TECHNOLOGY in the GLASGOW REGION, 1700-1850

by

Brian S Skillen
Mitchell Library, Glasgow

The technical expansion of Glasgow mining in the eighteenth century was attributable to dynamic capital investment in techniques and technology in response. This article identifies some of the technical developments taken to improve local mining efficiency.

The heavily faulted geological nature of the Glasgow coalfield dictated seam access and exploitation. Workings ranged in depth from a few feet to over 200 feet even by the mid eighteenth century,[1] the access to such workings being by one or more shafts, set in clusters or at opposing sides of the mine. Barrachnie had two shafts down to the main coal seam in the eighteenth century, with a third being placed in the early years of the nineteenth century in response to demand.[2] Collieries working a number of seams employed numerous shafts spread across the mining property, plan dimensions varying according to their purpose, the largest being used for mineral haulage.

Shafts were generally lined due to local geological conditions. Strata dictated the form this lining took, which was of two forms, the first was open lining consisting of horizontal timbers braced by vertical members a few feet apart; the second form of lining, which was common to the area on account of poor material stability, was closed lining, where closely boarded timbers or masonry work was employed.

The masonry lined circular shafts which were introduced to the Glasgow area by the late eighteenth century, proved more successful than square

FIG:1.

Generalised diameter ranges of mine shafts in the Glasgow area.

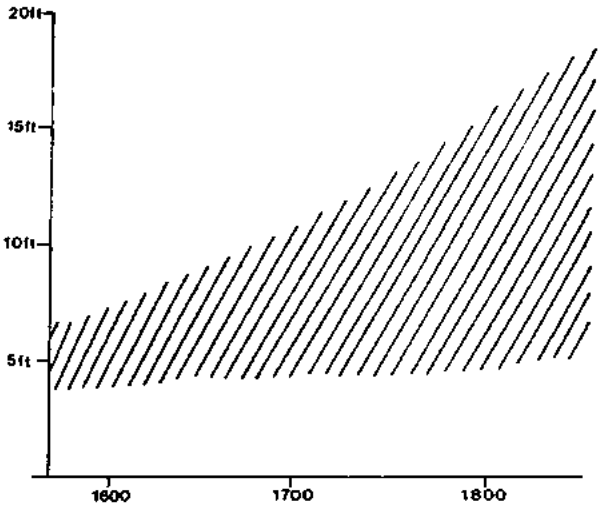
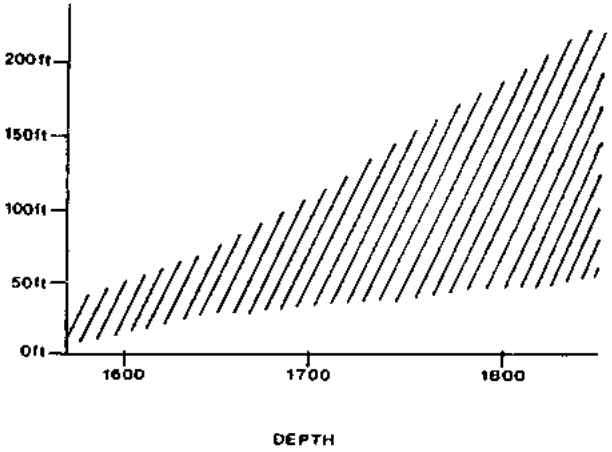


FIG:2.

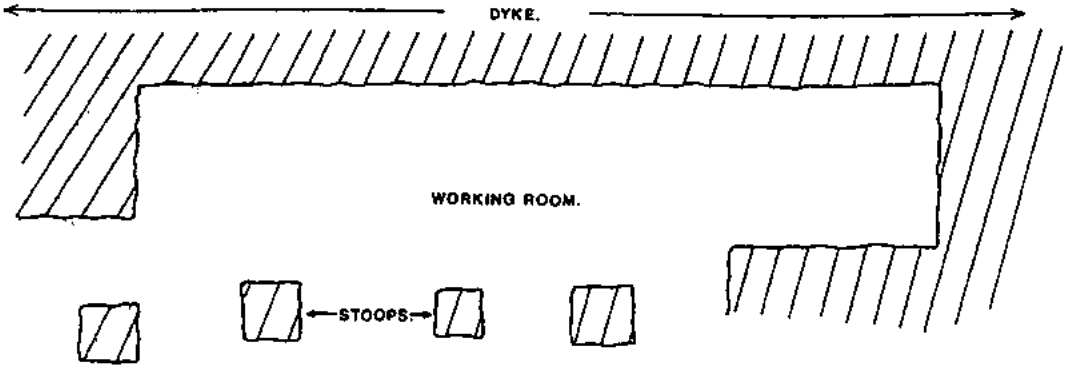
Generalised depth ranges of mine shafts in the Glasgow area.



sinking. Examples of rectangular shafts, cutting square planes parallel to the axis of the seam, were subject to acute ground stresses which the curved lines of circular shafts disseminated. Knowledge of what form of shafts were applicable to particular areas can only have come through experience, which also dictated the employment of iron shaft cylinders for sinking in areas of low ground stability. The Barrowfield Colliery, immediately east of the old town of Glasgow, employed pit cylinders 7.5 feet in diameter by 5 feet in depth, to sink in running sand and low density surface materials.[3] Sinking in such bad ground must have been expensive and only the promise of a door-step market provided the impetus for such heavy investment. Elm sheet pilings were also used to give extra stability. Figures 1 and 2 show the generalised development of mine shafts in the Glasgow area.

Shaft construction was the work of experts and was no doubt very expensive. A shaft sunk on the Milnfauld Farm lands of Campsie, in July 1612, cost £52 10s for its 105 feet. The sinking of other pits in the locality cost £62 10s. These were so-called 'pick and hammer' shafts which were probably tedious in construction.[4]

Where local topography suited, the coal seams were wrought by levels driven in on the crop. The thin coals of the Dawsholm area were wrought in this manner from the banks of the River Kelvin.[5] It was a method of working shared in the hill country to the north around Campsie and Kilpatrick. In Campsie it was traditional, with lengthy day level systems developed to work both coal and limestones. Levels were driven to the limits of natural ventilation and an air shaft was then sunk, normally at the end of the mine. The miners then took the workings across to the rise, opening up room and stoop systems along the seam. Late eighteenth century rooms averaged 8 feet by 14 feet and the stoops 8



Section in Campsie Main (Hurlet) Coal and Limestone.

2ft 6ins Limestone.

2ft 6ins Shale.

3ft 6ins Coal.

0 60 FEET.

FIG.3. BALGLASS COAL and LIMESTONE MINE–DETAIL.

SOURCE–Report of the Coal and Lime workings of Tarfin and Balglass Mine, 29 June 1849. S.R.A. TLX6.

feet by 12 feet,[6] a term of working shown in limestone mining to the north of Lennoxtown at Southbar.

> 'The main road from the mine mouth at the east end of the quarry runs into the hill for about 60 yards and is nearly level. It has crossed a hitch of about 4 feet up to the north which causes some irregularity in the dip but the limestone is expected to flatten again. There are five working rooms or faces running parallel to this main road, viz two below or to the dip of it, and three on the rise or east side'[7]

The coal which lay below the limestone had been worked from the seventeenth century, and chance findings of coal in clearing out old pits during nineteenth century limestone mining, led to the re-working of the area for coal. A profusion of shallow pits were opened up and show clearly that every opportunity was taken to work out profitable seams.[8] Figure 3 illustrates typical Campsie mining practice.

The areas to the south of the River Clyde and into Renfrewshire, shared this pattern of exploitation, with tiny workings opened up on thin coals cropping close to river banks. The fine arched day level of the Toad's Hole in the Preachin' Brae, Cambuslang, suggests some finesse when seams proved profitable. But the mouldering burrows of the Capelrig Burn, near Deaconsbank, or along the River Levern, near Barrhead,[9] were the more common. Support was left to nature, and the 'Creepy Heughes' of Kilbarchan on the Foul Coal of Quarrelton were aptly named.

Though averages can be formed there was really little conformity in patterns of support, this, of course, was dictated by the geological

conditions encountered. Scullionpour may again be cited as a case in point, for the workings were irregular and the roof was jointed to the rise. The poor quality roof meant that only small workings proved possible and the rooms to the rise were about 6 feet wide and unprofitable. To make the most of the mine the rooms to the dip were made considerably larger and opened out to 16 feet wide.[10] The development of room and stoop workings in relation to cleats and conditions in the ground strata show clearly that technology developed to match geology.

Basic ignorance of underground technology on the part of management often took collieries beyond the safety threshold. The Green Coal Company's colliery collapsed simply because the management had decided that the support pillars could be cut down from five yards to a yard square. No matter how much their miners complained, they were told to cut out the pillars. Increasingly alarmed by the cracking and creaking around them, they removed the pit horses and machinery from the mine on their own initiative on 7 March 1797. The next day the mine fell in and the seam was lost, due to the fact that the mine owners, a group of merchant adventurers, had not the slightest idea of what they were doing.[11] Lessees of varied competence left many mines at risk of structural failure and that greater problems were not experienced was solely on account of the quality sandstone measures, which commonly formed the roof of mine workings.

The problems of underground technology were overcome in a piecemeal way, barely within the safety threshold. A clumsy dangerous form of longwall working was forced on William Dixon I in working two seams in ground of low stability. Inter-lying strata between the seams was too weak to maintain support and the coal could only be worked by going after the

bottom seam first and then allowing the strata to fall down and consolidate the open space of the lower seam. The men then went in on top of the fallen debris and pulled down the next seam. The mine was worked for the immediate and no attempt was made to maintain anything other than the basic airways to the faces. The caustic commentary of contemporary reports as to how the mine was falling down around the heels of the miners, points to the narrow margins of safety.[12]

Structural problems were almost constantly exacerbated by water percolating along strata interfaces. Drainage was imperative for mining to succeed. Adit drainage proved successful only in hilly country and with comperatively shallow workings. In the Campsie district, pits to the north of the Glazert Water were 60 to 90 feet in depth and, as workings radiated out, adits were driven from the nearest low ground to drain the mines. These were often driven in from the nearest stream beds and the fact that shafts were often sunk near declivities with stream beds suggests that some thought was given to the possibilities of adit drainage when sinking.[13] Adit systems were common too in the Kilpatrick area, west of Campsie, and in Renfrewshire, where extensive adit drainage existed around Kaimhill and Locher.[14] These three areas of similar topography, all seem to have exploited natural drainage successfully, even resorting to wooden runnels laid along the floor of the mines, following the angle of the seam and back out the entrance of the day level.

Less successful were the early adit drainage schemes of the eastern districts. The drainage systems of Queenslie seldom coped and if there was a flood, as at Lightburn in December 1760, then it took days for the mine to dry out.[15] Human and animal labour supplemented natural drainage, but animal fodder, necessary for the relays of horses used to

work bucket and chain gins, was too expensive and other means to drain mines were soon sought. In his quest for a cheaper system John Gray of Shettleston tried a windmill, which pumped Westmuir successfully for three years from 1737 to 1740 when it was blown to pieces.[16] A similar windmill pump was used in a quarry near Hurlet, simply because the lessees could not afford to bring coal over the hill from the Hurlet Colliery to fuel a proposed steam pumping engine.[17]

Economic considerations encouraged innovation and even a few water powered mines operated in the region, though they were not so common as in some other Scottish mining areas, notably Fife. The successful water powered mines were found mainly in Renfrewshire where topography and land rights suited. Local landowners often worked their own minerals and this favoured water power, for had they been leased then agreement would have been necessary with the landowners to obtain a water supply, an expensive process apart from any legal obligation. Where landowners, such as William Cunningham of Craigends, chose to use their own supply as a power source, water powered mines became economic. Cunningham's Craighead Colliery was worked by water power,[18] as was the Crossfore lime works of McDowall & Houston.[19] A tiny water powered mine at Crofthead, near Neilston, situated close to the Arthurlie Burn was also successful.[20]

Water power was investigated for use at the Kennuirhill Colliery, east of Glasgow.[21] A launder was placed in 1826, cut through the rocks from the River Clyde, but what use it was put to is uncertain and the expense of cutting the launder cannot have made it economic. Water powered mines were a passing phase, for as one observer commented: 'there is not that conveniency of water every where'.[22] A more positive approach was necessary and this was recognised as early as 1760 when the Trades House of Glasgow tried to drum up support to buy a steam pumping engine.[23]

Glasgow's first steam pumping engine appeared in the Shettleston area in about 1764. This was followed by engines in Carntyne and, to the west of the town, in Kelvinside in about 1769. It performed a necessary job in the area, combating the continual problem of water seeping along the interfaces of seams outcropping close to water level on the River Kelvin.[24] Pumping engine deployment was a direct response to local problems and larger and more powerful machines soon began to appear. In [illegible]erge 24 inch diameter cylinder steam engine was in operation by 1774, working 6 inch diameter pumps.[25] Camlachie soon had a 42 inch type, working a double lift of pumps that totalled 300 feet of foot wide pumps.[26] These powerful engines were probably the Newcomen type for only they had this capacity. At twelve strokes per minute, the Newcomen could have raised ten gallons of water per minute against a head of 155 feet through a number of pump units placed one above the other.

Newcomen engines saw widespread use and were often combined winding and pumping engines, one being established at Govan in 1810. This particular engine had a 42 inch diameter cylinder with a stroke of 5 feet 8 inches. One drawing rope went down to 180 feet and the other 264 feet. It pumped water from 136 feet with 8 inch bucket pumps. It drew 150 to 200 tons of coal per day and pumped four to five hours in any twenty-four hours at a consumption of 34 hundredweights of dross over that time.[27] Apart from combined engines, there were at least fifty pumping engines in use locally around Glasgow, such as at Skaterigg where the engine pumped 297 feet of 12 inch bucket pumps in three relays.[28] The Skaterigg engine pit was the main drain for other local colliery workings, part of Jordanhill being drained by:

> 'a syphon pipe laid along the coal pavement and down No 2 pit towards the splint coal, where the water is discharged and

passes off to the Skaterigg engine pit, where it is lifted to the surface'[29]

The use of steam pumping engines spread across the region, and small engines were used in the Campsie and Kilpatrick districts, and in Renfrewshire as, for example, at Lochlibo and Uplawmoor. It was only the use of powerful engines to pump water percolating into workings that allowed the successful nineteenth century exploitation of this area.[30] Though contemporary records show that the pumping engines could easily be overwhelmed and that sheer quantity of water could get the better of them. Certainly, if a mine engine could no longer cope, it was replaced by a more powerful machine. This, however, could bring trouble. If an engine was used to pump out a flooded mine it could bring about a roof fall across the whole of the working. This was especially the case in broken strata, a common problem of many mine workings in and around the area. It was a recognised problem and was one reason why flooded mines were seldom re-opened successfully. Steam power was the only effective way of dealing with any quantity of water.

The nature of mining operations dictated the best form of drainage and in some cases neither adit nor mechanical drainage was appropriate. The Balglass mine in Campsie was much troubled by water in the vicinity of a dyke and a report of the workings in 1849 shows how this problem was overcome in an extensive day level working:

'the water was entirely confined to several rooms along side of a dyke and far from the railway...when it was in great quantity it had to be regularly waggoned out every night'.[31]

Presumably the water was collected in buckets and carried or run to the

mine was level via a tramway where it was collected and taken out the mine mouth.

Winding up to the surface was effectively the main constraint on exploitation, for, unless the output could be brought out, there was little incentive to continue mining and improve techniques. This can be shown citing a quarry working near Neilston. There freestone at the bottom of the bank of the River Levern was quarried, the river bank was precipitous and it was only with great difficulty that stone was got up the bank and to Neilston. This did not encourage the continued quarrying of stone and in turn forced up the price of building materials, due to the cost and shortage of local stone which could not easily be got to town.[32]

The Renfrewshire limestone industry suffered the same problem of material movement. It was overcome at first using hand barrows which were portered by two men, but two men on such a simple task was not economic. It was only in about 1770 with the introduction of wheel barrows that any labour saving was made in mine and quarry transportation. Wheel barrows were introduced to the Renfrewshire mineral industry following their successful deployment in William McDowall's drainage scheme at Lochwinnoch. McDowall's connections with the mineral industry optimised the transfer of this new found technology.[33]

As shallow seams and outcrops were worked out, mining ventured deeper and the problems of winding became pressing. Handline and windlasses were the first form of winding, and the windlasses were a regular feature of colliery sales, as for example the three windlasses employed at the Milton mine, near Provanmill, in late 1771.[34]

Technical improvements came only with the introduction of horse gins. They made a significant impact on mining and found [illegible] praised for having civilised Campsie mining around about 1775 with the introduction of horse gins to the region.[35] In an effort to encourage the exploitation of their lands, some estate owners were prepared to finance the building of winding gins, such as Sir John Maxwell of Pollick, who financed the gins placed for his Arden Coal & Lime Works, near Eastwood, in 1792.[36] The gins wound on a 42 feet deep shaft, working a coal seam 4 feet thick which was used locally for limestone calcination. Readily available cheap local coal would have reduced the cost of lime working, bringing a reduction in selling price which in turn encouraged sales.

Output levels and shaft depths almost certainly dictated the use of horse gins. Depths varied from a few feet to the 42 feet cited above and at Neilston,[37] and to very deep workings below 200 feet by the mid eighteenth century.[38] Large collieries generally made use of them, examples being found at Eastmuir, Govan, Hamiltonhill, Hutchison, Rutherglen and Westmuir. The gin at Westmuir was 21 feet in diameter and is recorded in use in 1791,[39] at a time when women coal bearers were still regularly employed at that colliery[40] and the combination of manual and mechanical removal was commonplace.

No example of wind power has been found as employed in winding, whilst steam winders evolved only towards the end of the eighteenth century. Steam winders were employed at Barrachnie by 1799[41] and at Renfrew in about 1805,[42] and thereafter they saw widespread use, being commonly referred to as gigs where they were winding engines only. A Boulton & Watt 6 hp steam gig was in use at Quarrelton in the 1820s.[43] Skaterigg had three gigs by this time, one with a 4 feet stroke working the 222 feet

deep main shaft.[44] Double purpose engines were also common, the 9 hp at Jarrow colliery being geared additionally for winding.[45] Much larger engines were employed in the eastern collieries, for example, a 35.75 inch diameter cylinder atmospheric winding and pumping engine at Belvidere.[46] They wound the most frightening of cages, such as the one at Knightswood, described thus by Thomas Tancred:

> 'The one I went down in was formed at the bottom of a frame of wood, through the side bars of which were inserted, in the middle of their length, two iron pins, with eyes to hook on to the chain, which is double at the end, and secured in the wood by pins. The four sides were wattled hazel; I should consider them hardly safe, but they are the most common; some have only a single hook and eye'.[47]

The faith of the miners who consented to travel in these cages was tested still further by the ropes from which they were suspended. Flat ropes which were common until replaced by the woven wire type in the nineteenth century, often gave way. One reason for this was the miners' method of carrying sharp edged tools over their shoulders as they were descending; these frayed or cut the ropes. Ropes were sometimes found partly cut through, sometimes just as the miners were about to descend, as at Rutherglen, one November Friday, in 1792.[48] But even when half cut through or snapped, the ropes would be spliced and joined with a flat metal clasp. This in turn would fray the rope, due to the constant movement over the head gearing, and it would suddenly give way, bringing death to those in the shaft. With a good rope there could still be problems, as two miners found out one Saturday in May 1787, they stepped into the bucket to go down the shaft and went down it at speed, as someone had not attached the horse to the winding gin.[49]

The mines of the Glasgow area were generally gassy and there are many instances of suffocation and explosion from an early period, as, for example, the two explosions at James McNair's Lightburn Colliery in 1787, one of which wrecked the gin at the pit head on 29 June 1787.[50] However, suffocating gases were generally the more common. The four main forms of ventilation were: day levels with periodically placed air shafts; forced air feed; upcast and downcast ventilation; and coursing the air. Ventilation was seldom done according to the text book and the Glasgow mines show such variety on these themes that only a few examples will be cited.

The principal form of ventilation was air fed in from day levels or pit heads and drawn around the works by fire-lamps in regularly placed air shafts. Air shafts provided additional ventilation even without fire-lamps and, as they were often sunk immediate to new working faces, they also gave access and egress, thus providing more efficient mineral raising, if not ventilation. The costs of ventilation were probably considerable and can be identified in the Campsie context, citing the Newlands Colliery in the 1850s:

5 waggons of coal at 4/2d per waggon	£1	10s	
Physical carting to the air pit		17s	6d
Man attending the fire-lamp for 60 days at 2/- per day	£6		
15 days for surveyors inspecting air provision in Newlands Colliery at 3/- per day	£2	5s	
total	£10	12s	6d

Ventilation for a small colliery like Newlands must have been a constant financial burden.[51] Therefore, other methods were sought and one of the first recorded mine ventilation fans was installed at one of Houston's

Johnstone Colliaries. This circular fan, with vanes working horizontally inside a casing, made an air tight connection with the mouth of the pit. It was being operated and so powerful that its effects could be felt to three quarters of a mile. Spontaneous combustion had ignited part of the pit which meant that a section of the mine could not be reached. The fan was so strong that it pulled the flame and gases of combustion in one direction towards it. This allowed the miners to make their way round the fire, seal it off,[52] and open the fire threatened seams once more to exploitation. Technical achievement helped make the mine economic once more. Glasgow's mines, from the early nineteenth century, tended to use some sort of forced ventilation. Obviously there were exceptions and natural ventilation was still relied on in some small workings early this century. But the maintenance of a successful below ground working environment was one of the most important technical achievements in mining.

How good was Glasgow's mining expertise? Diagnosis is difficult with clinical listings and so other evidence must be sought; this becomes available in early accident statistics. The chief causes of accidents are identified in Table 1. In percentage terms it is clear that shaft related accidents were the single most common cause of disaster between 1740 and 1830. The rise identified in the late eighteenth century reflects how mining was crossing the primitive technical thresholds of earlier times as it ventured ever deeper. It seems likely that technical resources were stretched to the limit in deep workings and cost cutting by re-using old ropes and simple carelessness must also have been causes of disaster.

Falls of strata, which reflect the problems of support, show a decline over the period. This probably reflects a better knowledge of seam

technology, for example, in cutting out rooms and stoops in relation to the natural cleating. It also reflects deeper workings around roadways where good roofs might be achieved. Flooding accidents also show a marked decline, suggesting that mechanical pumping was effective. Though the new technology itself caused many accidents.

Table 1

Causes of accidents, 1740-1830

NATURE OF ACCIDENT	1740-1769	1770-1799	1800-1829
Shaft accidents	40%	63%	52%
Falls of strata	40%	17%	27%
Flooding accidents	10%	6%	-
New technology	-	-	6%
Methane	10%	11%	12%
Ventilation failure	-	3%	3%

Notes: The term new technology refers to the use of machinery principally steam engines, which are identified as having caused accidents

The term ventilation failure refers mainly to suffocating accidents

Source: Glasgow Courant; Glasgow Courier; Glasgow Chronicle; Glasgow Journal; Glasgow Mercury; and Herald & Advertiser

The problems of ventilation were never truly overcome until the general introduction of forced ventilating techniques. Ordinary ventilation failure becomes identifiable from about 1770 onwards, suggesting that mining had then gone beyond the range of natural ventilation. This is

also shown in the rise of methane gas explosions which reflect, not only, ... getting very much deeper, but also the fiery nature of the seams that were wrought extensively in the late eighteenth and early nineteenth centuries. These were principally the productive, yet very explosive, hurlet seams which were accountable for several serious disasters. The problems of suffocating and explosive gases were overcome in a piecemeal way by stimulating air flow. This enabled mines to enjoy a longer life and thus produce more coal.

The theme running right through the growth of technology was the urge to improve production. Glasgow's mining was very successful in this. Its heyday was the eighteenth century when it was financed by merchants who formed partnerships with experienced coal masters and formalised mining into one of Glasgow's most important period industries. Its legacy was a maze of coal wastes, even in the eighteenth century when they often remained accessible and were put to other uses. In March 1787, the officers and men of the 63rd Regiment descended on the mining community of Carntyne. They went down one of the shafts and found three stills in the old workings. 150 gallons of poteen were seized and carried off to Glasgow, and like much of Glasgow's mining, its fate remains a matter for conjecture.

ACKNOWLEDGEMENTS

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26. Ibid, 26 Feb - 5 Mar 1770.

27. Glasgow Courier, Apr 1789 and Glasgow Mercury, 7-14 Apr 1789.

28. Proceedings of the Institute of Mechanical Engineers (1903) p 87.

29. Glasgow Argus, Aug 1836.

30. GRA Smith of Jordanhill Estate Papers. Geddes Report, 1843.

31. Taylor, op cit.

32. GRA TD[illegible]. Lennox Estate Papers. Report of Tarfin and Balglass Mines, 29 Jun 1846.

33. OPA, CC (1795), Parish of Neilston.

34. Crawford, op cit.

35. Glasgow Journal, 31 Jan - 7 Feb 1771.

36. OPA, CC (1795), Parish of Campsie.

37. Glasgow Mercury, 10 Apr 1792.

38. Glasgow Journal, 5-12 Jul 1764.

39. Glasgow Courant, 14-21 Sep 1747.

40. Glasgow Courier, 5 Sep 1791.

41. Ibid, 26 Jan 1792.

42. Buchanan, op cit.

43. Glasgow Courier, 30 Apr 1803.

44. Glasgow Chronicle, 10 Jan 1826.

45. Glasgow Argus, Aug 1836.

46. Glasgow Chronicle, 8 Aug 1827.

47. Ibid, 4 Aug 1830.

48. Children's Employment Commission, 1842.

49. Glasgow Courier, 20 Nov 1792.

50. Glasgow Mercury, May 1787.

51. Ibid, Jul 1787.

51. Skillen, op cit, p 19.

52. Report to the Commissioners on the Employment of Children: Appendix to First Report of Commissioners: Mines: Part 1 reports and evidence from Sub Commissioners, 1842, p 131.

'MODEL' COLLIERY HOUSING IN FIFE: DENBEATH 'GARDEN' VILLAGE, 1904-1908

by

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Mining communities have always constituted a notoriously volatile sector of the Scottish housing stock, the success or failure of individual pit workings providing an explanation for frequently radical fluctuations in the size, structure and distribution of local populations. Two maps of Denbeath in Fife record precisely such a transformation. The first (Plate 1) dates from a survey of 1893 and is of a partially industrialised setting, also encompassing more than thirty acres of farmland, overlooking the Firth of Forth and bordered to the north by the Den burn and to the east by Old Denbeath village, soon to be engulfed by the workings of Wellesley colliery. By 1913 (Plate 2) the greater proportion of this landward area had been turned over to housing, with single rows of cottages to the north and south and, in the centre, a grid-like pattern of terraces, gardens and allotments. The valuation rolls for 1905-6 confirm that by this date 216 houses were already occupied, every one of which was owned by the Wemyss Coal Company.

A listing of the occupations of their respective heads of household reveals that 204 were tenanted by miners, six by locomotive drivers or enginemen, three by labourers, two by surfacemen and one by a blacksmith, all at an identical annual value, £10.8.0d.[1] Notwithstanding their proximity to the company's coastal pits the new houses accommodated the workforce recruited in conjunction with the expansion of the four miles distant Earlseat colliery, Thornton, to which direct access was provided via the Wemyss colliery private railway, the northernmost section of which

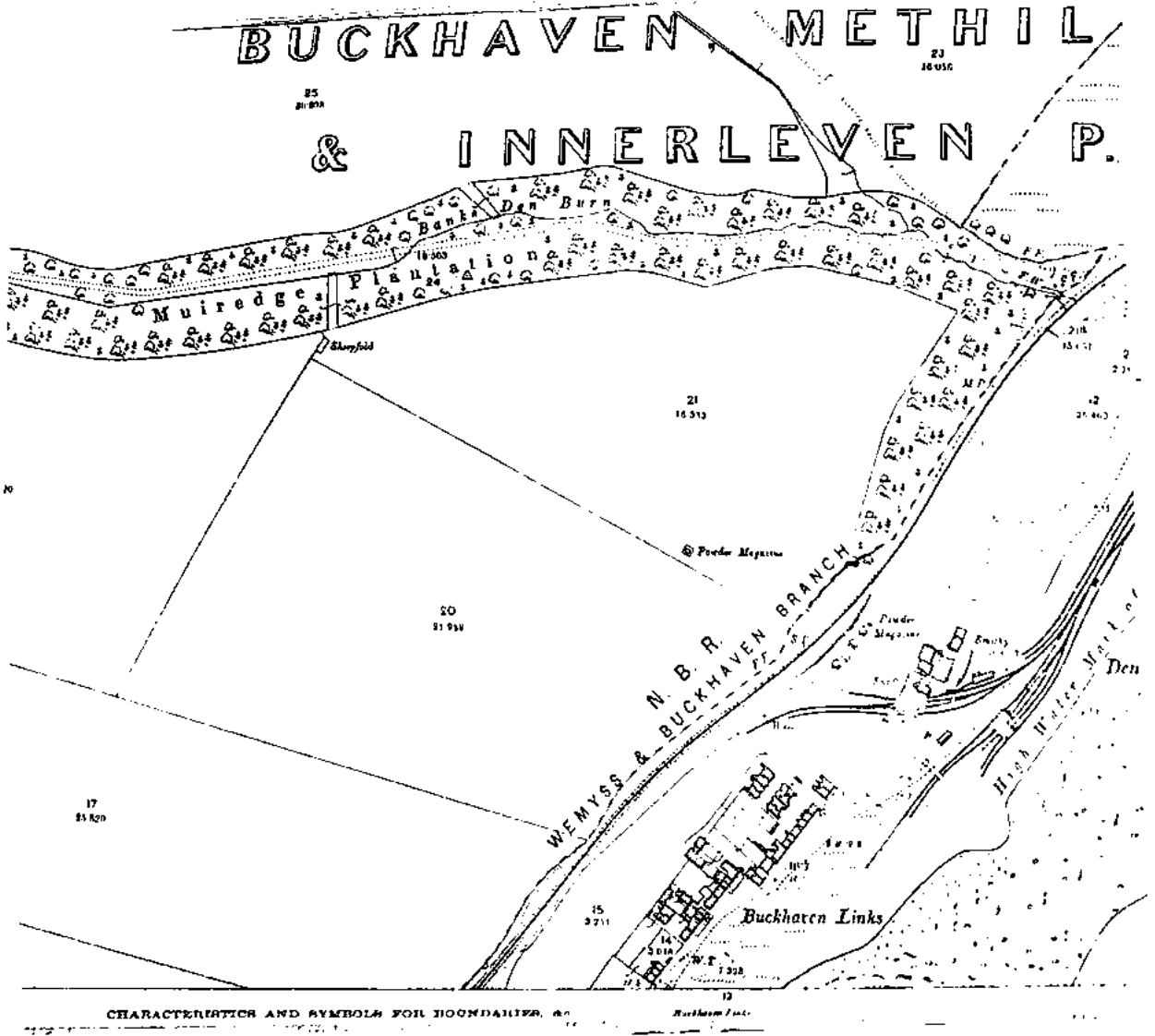

Plate 1. The Denbeath/Buckhaven links hinterland. Ordnance Survey 1893.

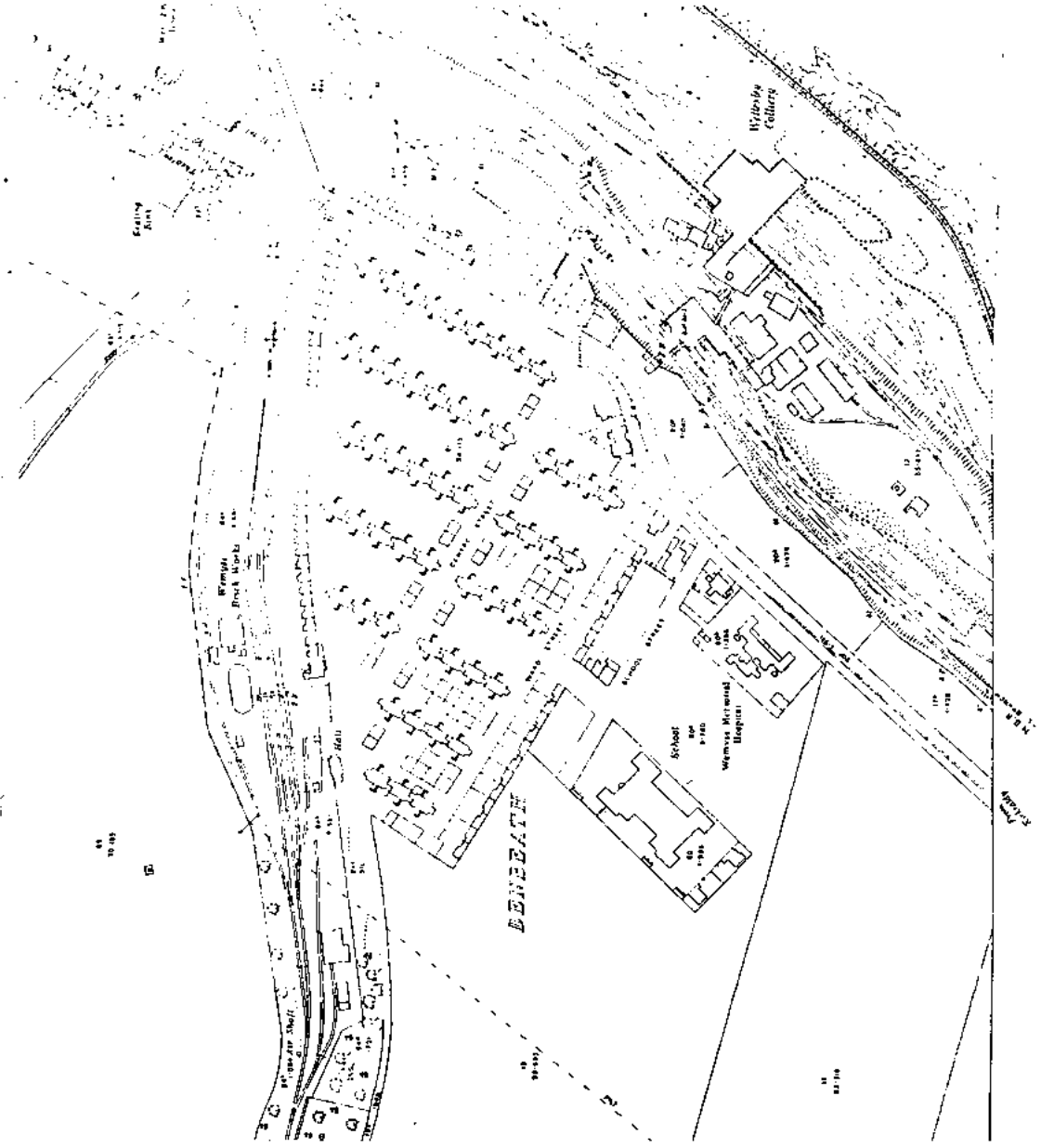

Plate 2. Denbeath Village. Ordnance Survey 1913.

is just visible in the 1911 map, running along the bottom of the (by now culverted) Den burn.[2]

The 1890s and early 1900s had witnessed a remarkable upturn in the fortunes of the Wemyss Coal Company, widely attributed to the policies introduced under the energetic directorship of Randolph Wemyss.[3] Annual production figures reveal that the output of coal, which had stagnated in the 1880s, increased to 140,065 tons in 1894, rose further to 371,305 tons in 1902 and (following the commencement of operations at the Earlseat pits) reached 1,377,212 tons in 1906 and 1,469,987 tons in 1909.[4]

Contemporary workforce figures mirror the above statistics and are, in turn reflected in the expansion of the population of Wemyss parish, from 7,307 in 1881 to 10,543 in 1891, 15,031 in 1901 and (again confirming the massive impact of the Earlseat workings) an estimated 22,000 in 1909.[5] As these last statistics suggest, house building played a critically important role in the company's expansion, the provision of houses serving as an inducement to potential workforce recruits.[6] The company's building activities focused on West Wemyss (42 houses erected, 1890-1903), East Wemyss (210 houses, 1896-1907), Coaltown of Wemyss (105 houses, 1902-07) and, last of all, Denbeath itself, where work began as early as 1901, but which was largely completed in two phases, between 1904 and 1905 (220 houses) and 1907 and 1908 (46 houses).[7]

In all these cases, details of house design and estate lay-out appear to have been arrived at by a process of consultation, involving the paternalistic Wemyss and his 'estate architect', Alexander Tod, a collaboration that extended to a wide range of projects, including schools, churches, masonic halls, public houses and two cottage hospitals,

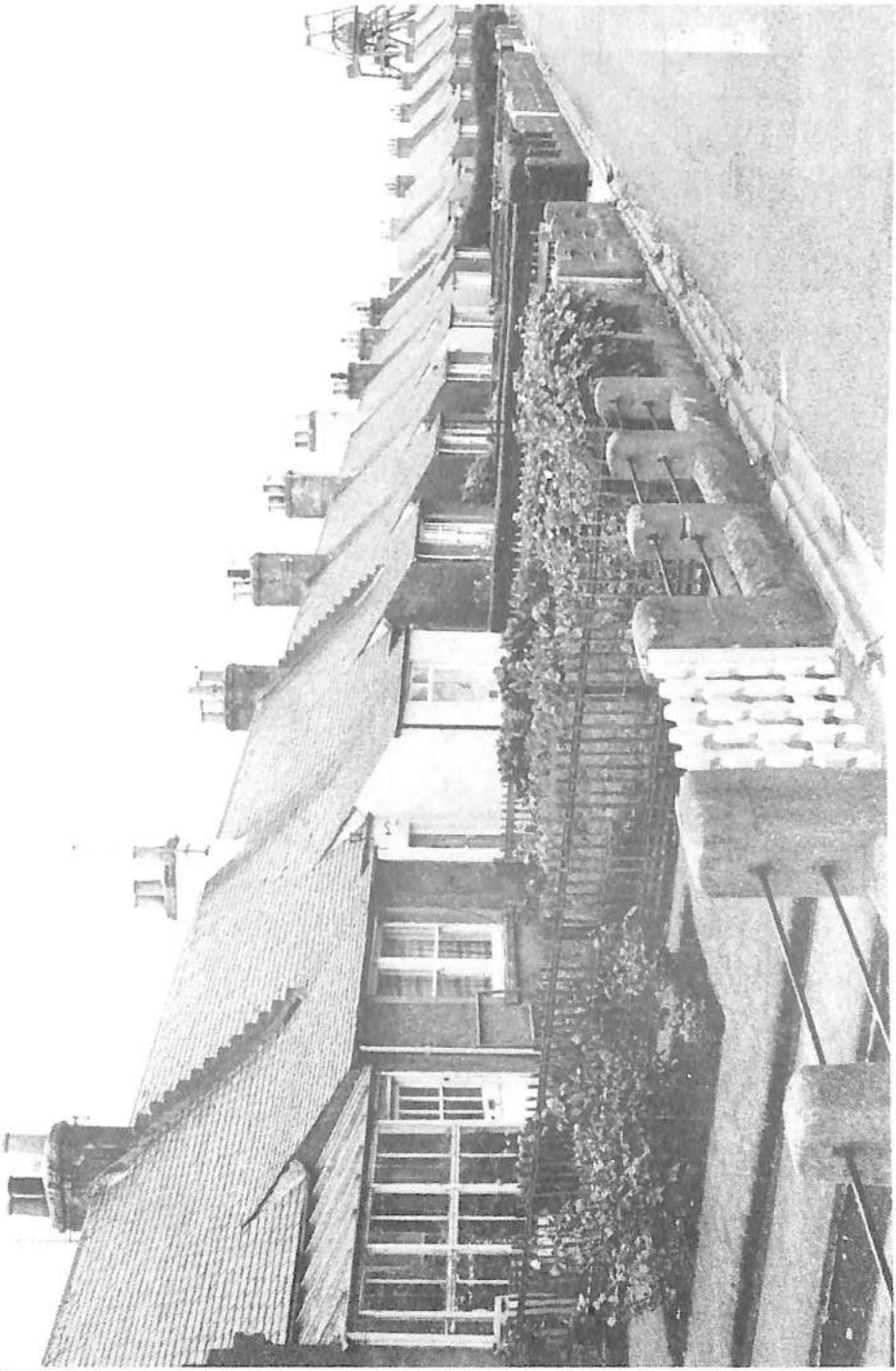

Plate 3. Randolph Street, East Wemyss. Two apartment terraced cottages, c.1900

Plate 4. Don Street, Denbeath. Viewed from the north west.

those last including the Wemyss (later Randolph Wemyss Memorial) hospital, designs for which were drawn up in 1907-8. Throughout the 1890s the company's housing developments had exploited a single storey cottage terrace formula, to all intents and purposes abandoned at Denbeath where the central terraces were all of two stories and flatted (Plates 3 and 4). Breaking with tenement conventions, each dwelling was entered separately, necessitating the introduction of external stairs providing direct access to the upper floor flats.

All of the flats adhered to an identical arrangement of lobby, living room, two bedrooms, scullery and wc, this representing an enormous advance on generally prevailing standards of colliery housing in Fife where one and two roomed dwellings (without bathing facilities and internal wc) continued as the norm throughout the World War I period.[8] The additional accommodation was assimilated within a sequence of 'T' shaped interlocking plans, alternately facing east and west with overlaps of bedroom and bedroom, and bathroom and scullery (Plate 5). All the houses were constructed of locally manufactured brick, disguised by a rendered finish. Combined with the terraces' high pitched pan-tiled roofs, eye-lid dormers, crow-stepped gables and external stairs, this provided a convincing evocation of the Fife vernacular tradition, in which architect and patron could claim a pioneering revivalist interest (Plate 6).[9]

Tod's essay 'Cheap Houses and How to Build Them', published in two instalments in the 1910 edition of the Wemyss Magazine, can be referred to usefully at this point.[10] The title was a topical one, taking inspiration from the Letchworth Garden City 'cheap cottage' exhibition of 1905, one condition of which had been that house prices should not exceed £150, satisfied by Tod's two apartment cottage estimate of £140.[11] Tod's remarks reveal him, indeed, as an immensely pragmatic designer,

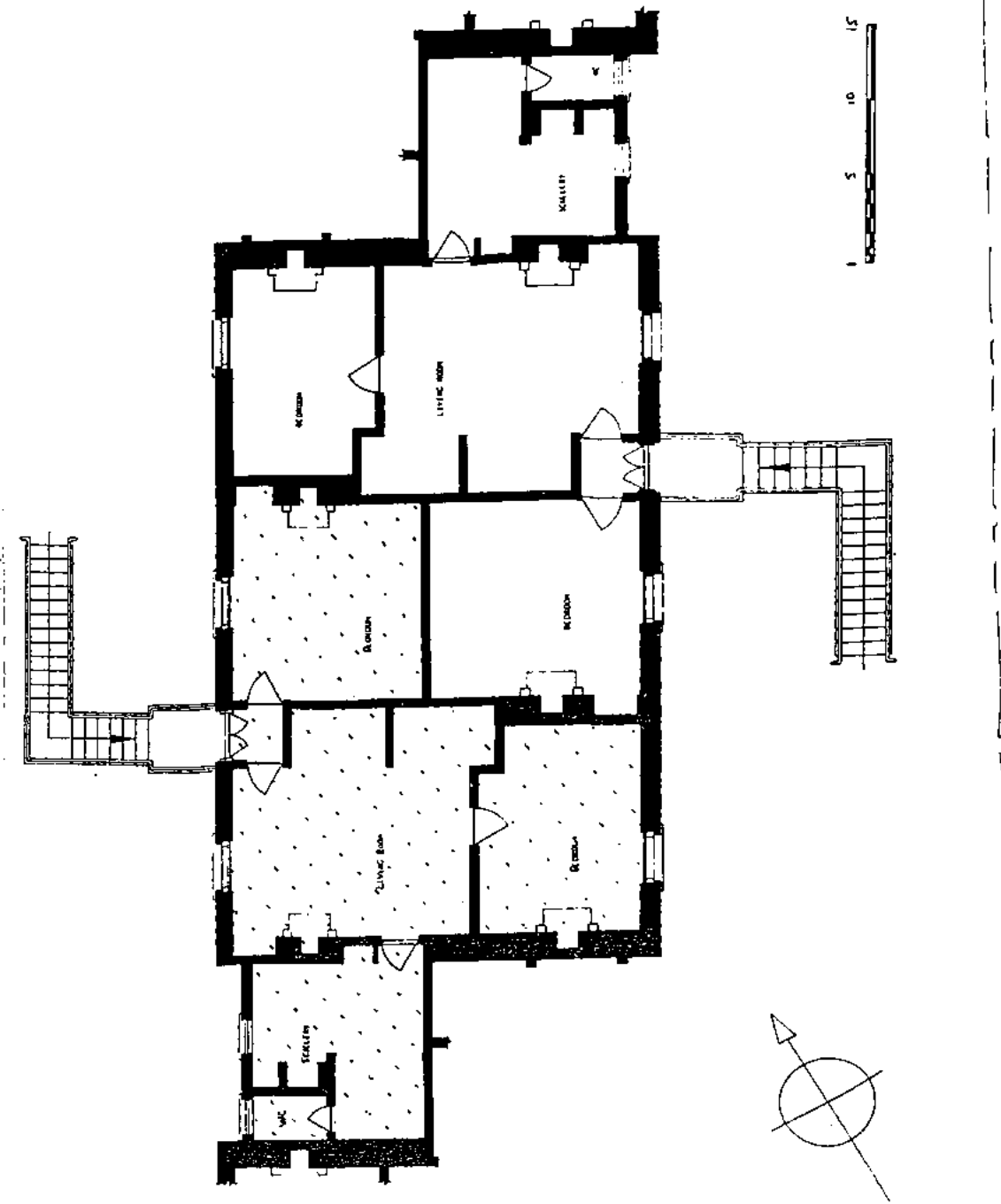

Plate 5. First floor flat plans. Nos. 202 Dee Street (facing north west) and 192 Dee Street (facing south east) Denbeath.

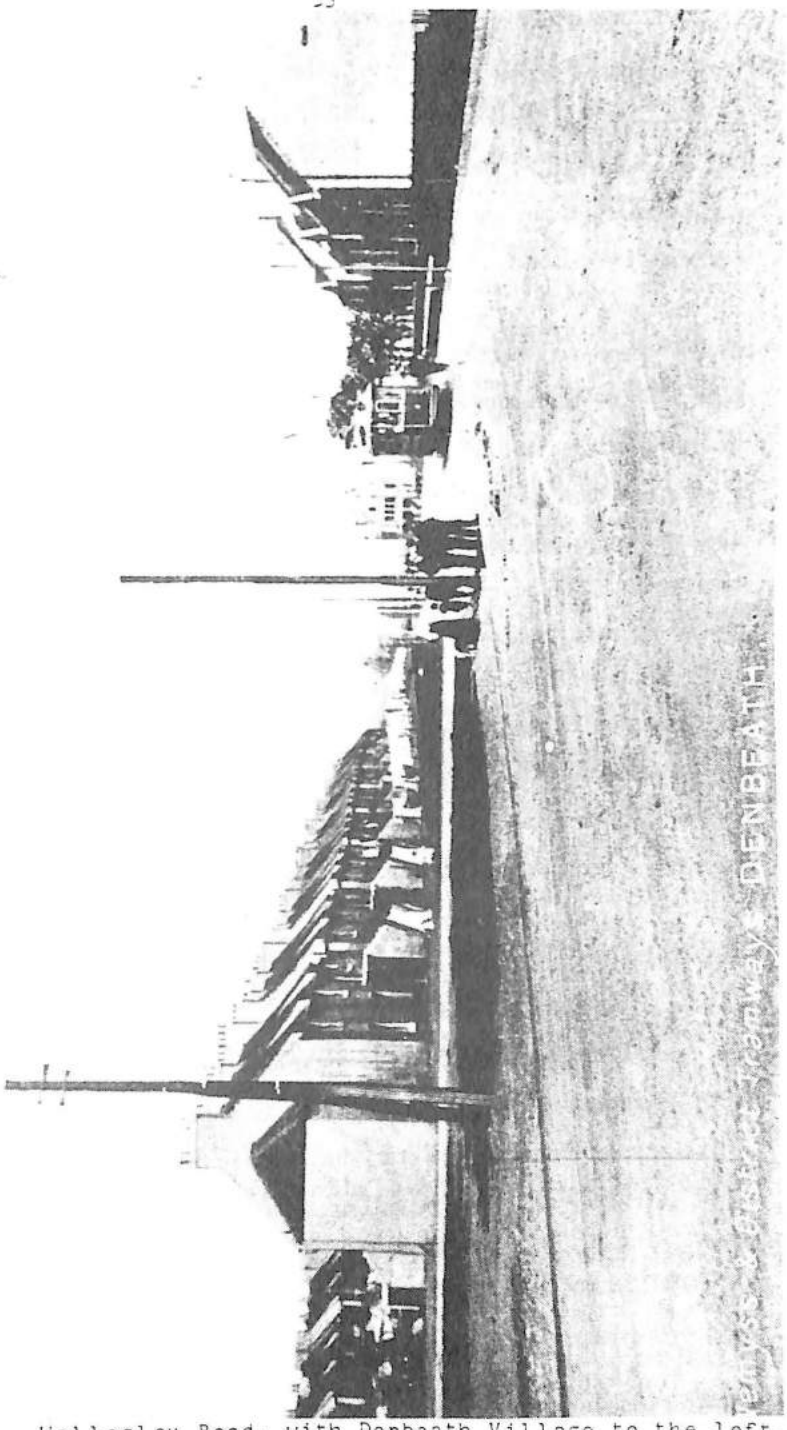

Plate 6. Wellesley Road, with Denbeath Village to the left. Photographed in c.1920.

fully conscious of his responsibilities to the mining community, revealed, for example, by the importance he placed on the provision of bathing facilities, both at the pit-head ('I believe the Germans, in this as in many other of their industrial arrangements, are miles ahead of us')[12] and, when funds permitted, within the home itself.[13]

Despite these strictures fitted baths were not provided in the Denbeath houses, which thus conformed to the highest level of what he described as the 'minimum' or 'smallest' class of housing, aimed at families supported by only one wage earner.[14] In what his audience would presumably have interpreted as an admission of the deficiencies of his own earlier experiments, Tod nevertheless now adopted a critical attitude towards the simple cottage terrace as a solution to 'minimum house' requirements, providing an alternative solution - introduced at Denbeath, where it provides a major variation on the flatted terrace theme - in the shape of semi-detached units, one room and two rooms deep, 'which economises the ground and ensures thorough ventilation' and, when correctly aligned, 'commands a proportionable share of the daily sunshine'.[15]

The architect's most scathing comments were however reserved for tenement building, dismissed as a system that had created 'enclosed shelves, raised tier upon tier, and crowding the largest possible number on the smallest possible acreage...colonies of humanity that will deteriorate into dens not much superior to the cellars and slums that were vacated not so many years before'.[16] Disappointingly, no alternative to the problems posed by high density housing are provided in the 1910 essay.

Despite this silence it is clear that Tod believed such a solution to lie in recent English developments, in what he described as 'the open built or Garden City system', laid out to the satisfaction of 'thoughtful and

philosophic mind...so that the amenities and properties of humanity may be secured for the million'.17 He was only too aware, however, that the fulfillment of this particular vision lay well in the future, hence the effort and the insistence that the realistic objective of his plan should be one which provided, in the shape of 'improved' house designs capable of assimilation within any Garden City development or town planning that may take place [and which] can be worked out and become part of any scheme which may arise'.18

Judged from this standpoint the Denbeath terraces take on an obvious transitional significance, striking a calculated balance between the old and the new, the generous provision of rooms, scullery and internal w.c. complementing a number of less 'advanced' features, notably the inclusion of living room bed recesses, justified on the ground that they 'seem to be the desire of the locality'.19 The 'interlocking' terrace plans, with successive flats partially overlapping and facing in opposite directions, can be interpreted in similar terms, on the one hand providing an echo of the most primitive of 19th century mass housing types, the 'back to back', on the other creating an exaggeratedly 'open' effect, achieved by eliminating conventional distinctions between front and rear gardens, and presumably intended as a deliberate - if highly unconventional - concession to the Garden City ideal.

The significance of Denbeath can thus be seen to lie in the fact that it provides remarkable evidence of the way in which the still freshly formulated values of the Garden City movement were assimilated at provincial level, in this case by an architect working in association with an industry not usually identified with an enlightened attitude towards housing reform. It would, however, be misleading to equate the

experiment with simple idealism. Recognition of the need to offer high quality housing and stable and efficient workforces was fundamental to the creation of innumerable 'model' developments of the Victorian and Edwardian period, and it is worth observing yet again that its provision on this occasion signalled the development of the Denbeath workings, and that these were recognised as being of vital importance to the Wemyss Coal Company's long term economic strategies.[20] What is not to be doubted is that the construction of the village involved the company in a heavy financial outlay, presumably accounting for the bulk of the estimated £75,000 devoted to Wemyss estate building between 1903 and 1906,[21] a figure that does not include revenues devoted to the provision of a school and cottage hospital built to coincide with the latter stages of the village's development and sited conveniently in its south eastern boundary.[22]

The impressive scale of the undertaking belied the fact that it was originally conceived of as only the first part of a larger programme, the next stage of which was to have encompassed an additional 500 houses, extending to the north and south of the village and linking it to the neighbouring communities of Buckhaven and Methil.[23] With the premature death of Wemyss in 1908, aged forty-four, all further progress on the Denbeath houses nevertheless came to a halt, compounding the effects of a by now general slump in the East and Central Fife building trades.[24] The importance of the experiment was not, however, lost on contemporaries, and Tod must have been gratified by expressions of local pride in 'what is known as the "Garden City"...on the high land above Methil Dock' and the boast that this had been 'constructed in accordance with modern ideas of sanitation and public health', constituting 'a decided advance' on other colliery villages in Fife or 'any other county'.[25]

Appropriately, therefore, the density of ten houses per acre fell well within the figure (twelve per acre) subsequently popularised by Garden City advocates. A simple comparison with the floor areas recommended under the 1919 Housing Act (Table 1) further reaffirms the right of the Denbeath houses to be judged within a reformist context, explaining the estate's survival, without serious modification (other than the introduction of service roads)[26] throughout the inter war period.

Table 1: Comparative floor areas (square feet)

	Denbeath terraced flats	Municipal four apartment (1919)
Living Room	184 (236 including bed recesses)	180
Bedroom 1	169	150
Bedroom 2	140	100
Bedroom 3	-	65
Scullery	95	80
TOTAL	588 (640 including bed recesses)	575

* Report of the Committee appointed...to consider questions of building construction in connection with ..dwellings for the working classes, London, 1918, p. 29.

The development's subsequent history, reflecting the massive contraction of the Fife coalfields, has been a less happy one, successive changes of ownership failing to prevent a steady decline towards its present state of near dereliction. The recent implementation of a compulsory purchase order by Fife Regional Council, with a view to demolition and redevelopment, seems certain, indeed, to result in the village's destruction, threatening to eliminate virtually all trace of what is now revealed as by far the most remarkable of Fife's Edwardian colliery settlements.

FOOTNOTES

1. Valuation Roll of the County of Fife, [illegible] (Scottish Record Office, VR 101/51), pp 227-231.

2. Work on the Wemyss Buckhaven-Thornton railway was completed in August 1861, constituting the first major [illegible] initiated on behalf of the Wemyss Coal Company under [illegible] direction. A S Cunningham, Randolph Gordon Erskine Wemyss, An Appreciation, Edinburgh and Leven 1910, pp 104, 125, 176-[illegible] (emphasising its relevance to Denbeath) 165, 186.

3. His contribution to the East Fife coalmining industry is summarised in ibid pp 113-120, 144-6, 150-4, 160-72, 185-[illegible] and examined by I Russell in 'Randolph Wemyss and the development of Methil as a Coal Port', Scottish Industrial History, Vol 5.2, 1982, pp 82-91.

4. Cunningham (1910), op cit, pp 160-1; A S Cunningham, Mining in the Kingdom of Fife, Edinburgh, 1913, pp 45-6.

5. Cunningham (1910), op cit, pp 162, 166. The pressure brought to bear on the 'Methil district' housing (brought about by a large influx of the labouring classes) is described in East of Fife Record, 21 Apr 1905, p 5.

6. Cunningham (1910), op cit, p 163.

7. Ibid, pp 163-6; A S Cunningham, Rambles in the Parishes of Scoonie and Wemyss, Leven 1905, pp 127, 282.

8. The 1911 census records that 55 per cent of the houses (1,562 out of an overall total of 2,803) of the neighbouring Buckhaven, Methil and Innerleven burgh constituted either one or two apartments. This compared with 54 per cent (2,449 out of 4,427) in Wemyss parish and 52 per cent (30,687 out of 58,650) for Fife in general. Report on the Twelfth Decennial Census of Scotland, Vol 1, Edinburgh 1912, pp 1009, 1010.

9. Cunningham (1910), op cit, p 164 confirms Wemyss' interest in Fife vernacular buildings, linking this to Tod's East Wemyss cottage designs. Anticipating their Denbeath counterparts, these were crow-stepped and pan-tiled.

10. Alex Tod, 'Cheap Houses and How to Build Them' The Wemyss Magazine, Vol I, 1910, pp 80-86, 358-364.

11. '...with grates, paintings and boundary walls complete'. Ibid, p 86.

12. Ibid, p 362.

13. Ibid, p 358.

14. Ibid.

15. Ibid, p 85.

16. Ibid, p 165.

17. Ibid.

18. Ibid, p 162.

19. Ibid, p 55.

20. Explained in Cunningham (1910), op cit, p 160.

21. Ibid, p 166.

22. Ibid, p 195-7.

23. Easterdyke its eventual assimilation by Methil, Buckhaven and Innerleven burgh, a consideration that appears to have been a major factor determining the original siting of the village. Ibid, pp 165-6.

24. East of Fife Record, 2 June 1905, p 5; 30 May 1904, p 5; 3 June 1904, p 4.

25. Ibid, 26 May 1905, p 5.

26. Running between the terraces at right angles (ie on an approximately north-south axis) to the existing Ward, Centre and Conley Streets, and named (from the east) Forth Street, Clyde Street, Tay Street, Tweed Street, Don Street, Dee Street and Spey Street. Scottish Record Office Plan 33101 (1947) is the first to depict the new layout which dates from c1930 (ex information H Smith). Bathrooms were not introduced until 1965-6, at the expense of one-third of the former scullery area.

THE COMPANIES INDEX OF THE NATIONAL REGISTER OF ARCHIVES

by

L A Ritchie
Historical Manuscripts Commission, London

The National Register of Archives was established in 1945 to act as a central point for the collection and dissemination of information about manuscript sources for British history outside the public records. This information is in the form of lists and catalogues (referred to collectively as reports) sent to the NRA from over 300 record offices, libraries and museums and 5,000 private owners, individuals and institutional, in this country and abroad. The Register now contains over 31,000 reports and new information comes in at the rate of about 2,000 lists each year.

A list submitted to the NRA goes through the process of registration during which it receives a title and a sequential number, unless it is an addition to or a replacement of an existing report. At registration a report is assessed for material relevant to the personal, subject and companies indexes. In due course, specialist teams of indexers will summarise the material and add it to the appropriate index.

While the lists in the NRA remain the principal source for the indexes, it is recognised that this is not sufficient in itself. The information is therefore supplemented by the monitoring of published guides, annual reports of repositories and other secondary sources. Principal among these is the Commission's own Accessions to Repositories, an annual digest of the main manuscript deposits in the previous year.

Yet the Commission is not merely a passive recipient of information. It

actively seeks to fill gaps in its knowledge. In the course of the preparation of a guide to sources for the textile industry 1760-1914, contacts have been established and lists received from museums and libraries which had not hitherto submitted information to the NRA. Similarly, companies were approached and, where necessary, Commission staff undertook summary listing of their records. The results of such enquiries serve further to expand the size and scope of the Register.

The increasing volume of information in the NRA and its indexes in itself argued the case for computerisation. Indeed, as long ago as 1970 the personal index was computerised. However, the computer on which it was stored was off-site and all amendments had initially to be made manually by Commission staff on input sheets. It was a laborious task. Whole index print-outs were made at the end of the year with several updates in the course of the next twelve months. Although these print-outs could only properly be used in the Commission's search room, they were nevertheless given a limited distribution (British Library, Scottish Record Office, etc.) where they remain cherished and much-consulted finding aids.

The companies index did not suffer from the same pressure as the personal index which, in its final print, ran to approximately 4,500 pages. Therefore, computerisation of the details of its c.13,000 businesses did not take place until the computerisation of the NRA as a whole in June 1987. At that time the Commission installed a Prime 2350 supermini computer with a 240 megabyte fixed-media disk supporting fourteen terminals and two printers. The applications development had been undertaken by the Small Systems Unit of the Treasury's Central Computer and Telecommunications Agency based on Prime INFORMATION enhanced by a

PACE system generator from Ampersand Systems Ltd. and processing facilities were also included in the package.

Since then, the process of registration and the maintenance of indexes has begun to be conducted on-line. The personal index has been transferred to the in-house system and the companies index backloaded. There are, however, a number of problems still to be resolved before public access becomes possible. While the companies index appears to be free of bugs, the backloaded information requires careful checking to ensure that all data has been transferred from the manual system and that new errors have not crept in. In due course, the public will be able to use the computerised system in the Commission's searchroom. Because of its relative smallness, compared to the personal and subject indexes, the companies index will almost certainly be the first of the indexes to be publicly available.

The companies index only emerged as a distinct entity in the mid 1970s. Meanwhile, a portion of the subject index remained devoted to the records of various businesses and trades. The dividing line between the two indexes has been indistinctly drawn at times. The original division was based on the idea that major companies could easily be distinguished from small businesses and individual traders. Only the former, it was felt, properly belonged on the companies index. In practice it has not proved easy to make such a distinction in the numerous cases where the scale of an enterprise could not be assessed. The adoption of limited liability status could not, in itself, be used as a determinant, given that this would exclude businesses which were partnerships or which remained unincorporated despite their size and importance. The matter therefore still requires a fair measure of judgement on the part of indexers and the

[illegible] has afforded the opportunity to correct a number of anomalies.

For [illegible] the companies index was arranged solely in an alphabetical sequence by company name. Its usefulness was consequently enhanced when, while keeping the alphabetical sequence, the same information was re-arranged in twenty-three classified sections. The structure was based on the Central Statistical Office's Standard Industrial Classification, modified to suit the Commission's requirements.

1. Agricultural, Forestry and Fisheries
2. Mineral Extraction
3. Metal Processing and Manufacturing
4. Chemicals
5. Glass, Pottery, Bricks and Cement
6. Mechanical Engineering
7. Electrical Engineering
8. Instrument and Scientific Engineering
9. Textiles
10. Leather
11. Timber and Furniture
12. Paper, Printing and Packaging
13. Food, Drink and Tobacco
14. Miscellaneous Manufacturers
15. Building and Construction
16. Utilities
17. Transport and Communications
18. Commerce and Distributive Services
19. Finance
20. Insurance

21. Property

22. Business and Professional Services

23. Domestic and Leisure Services

While such an arrangement assisted by narrowing the range of search on some enquiries, it still necessitated an extensive trawl by the researcher. In section 9, for example, the details of over 1,500 companies remained to be perused. The advent of computerisation brought with it the opportunity to refine search techniques so that records for silk or lace manufacturers could be isolated from the mass of textile records. For the purposes of computerisation the section number became the code and within each code an internal structure was developed which became the sub-codes, e.g.

9	0	TEXTILES
9	1	cotton
9	2	wool
9	3	linen and flax
9	4	silk and pile fabrics
9	5	man-made fibres
9	6	jute
9	7	rope, twine and net
9	8	hosiery and knitwear
9	9	lace
9	10	carpets
9	11	narrow fabrics
9	12	household textiles
9	13	elastic
9	14	canvas goods
9	15	textile finishing

[illegible]

In these sections it was felt that no sub-codes were necessary (miscellaneous manufacturers, insurance are properly) but this is not a final decision and refinement of the structure is a continuing process.

The screen which the public will use for their searches will look like this:

COMPANY REF :
SORT NAME :
BUSINESS CODE :
BUS SUB-CODE :
TOWN/PARISH :
COUNTY :
DOCUMENT DATES :

The company reference is a number assigned automatically at the time a record is created. It may be useful for searchers to note this number in order to return to a particular record swiftly. The sort name, which is used to determine a company's position in any alphabetical sequence, can also be used as a search field. For a family firm the sort name would be the surname. For any other firm it would be the first element of the title, barring the definite articles. In a number of cases two words will be used in the sort name e.g. those companies whose titles begin with

the words North, West, British etc. Three words [illegible] for North of England, West of Scotland, etc.

A list of business codes and sub-codes can be displayed on screen. If, after consulting this, a searcher is still not clear which codes he should be searching a business vocabulary list can also be displayed. Alongside each description there will be the relevant business code and sub-code e.g:

	CODE	SUB-CODE
curers	13	4
curriers	10	1
custard powder mfrs	13	13
cutlery mfrs	3	7
cutlery case mfrs	11	3
cutting equipment mfrs	6	2
cyanide mfrs	4	2
cycle dealers	16	21
cycle mfrs	6	6

Some companies will, of course, qualify for a number of code-sub-code combinations and it is possible to enter up to twelve of these. Searchers will be able to display them on request.

Three further search fields are available: town/parish, county, and document dates. Searchers can opt to display a list of relevant companies, from which further choices can be made and records displayed. Alternatively they can consult the companies index record summary. This will present, in concise form, the required information about companies and the nature, date and location of their records. It will also remove

the need for the operator to move constantly between screens. The provision of so many search fields allows very specific questions to be answered. It is, for example, possible to display all co-operative societies in Lanarkshire (thirty), all Port Glasgow shipbuilders with records dating from the nineteenth century (two) or simply all the Dundee firms on the index (120).

The picture at the moment therefore is of an index which has acquired very sophisticated search capabilities. Computerisation has allowed re-appraisal and refinement of the basic structure and has forced greater precision on an index whose piecemeal growth has militated against consistency of style and description. Much remains to be done and possible further enhancement of the system is already being considered. It is unclear when the computerised system will be available for public consultation, but in the meantime the manual systems may be consulted in the Commission's offices at Quality House, Quality Court, Chancery Lane, London WC2A 1HP Monday to Fridays, 9.30 a.m. to 5 p.m. Limited and specific enquiries can be answered by post.

Archive Report Number Three

THE SCOTTISH BREWING ARCHIVE

Although thought of primarily as a distilling nation, Scotland has a long and rich tradition of brewing which stretches back well beyond that of distilling. Indeed, it is believed that even in pre-Roman times, the indigenous population of Scotland was producing a primitive type of ale from fermented barley and certainly by the early Dark Ages the art of brewing was fairly well established in Scotland, being extensively practised in monastic establishments in particular.

At this time, and for several centuries to come, brewing was very much a domestically-based occupation, a by-product of the agrarian economy, but by the sixteenth century there was beginning to emerge, in the larger centres at least, a brewing industry in which the beginning of a formal business structure could be discerned. After 1750, in common with other primary processing industries such as tanning and glass manufacture, brewing began to respond to urbanisation, as population growth, and the rise of the wage economy, and commercial brewing for public sale resulted in the establishment of 'publick' breweries in many Scottish towns. Overall, however, the growth of large scale breweries was slow, due to burghal and craft restrictions, and to the imposition of the hated Malt Tax.

By the turn of the nineteenth century most of these ancient restrictions had been broken down, and with rising real incomes amongst the mass of the Scottish population, breweries were established in most Scottish towns of any size, except perhaps in the far North West of the country. By the third quarter of the nineteenth century the brewing industry had become one of the most significant in Scotland, employing a good number of people

directly, and through its links with other industries such as coal-mining, barley cultivation, sugar-refining, and glass manufacture, many more people indirectly. Furthermore, 'Scotch Ale' had become famous world wide and was exported to the farthest corners of the globe, with Scottish brewers accounting for more than one-third of all British beer exports.

This situation prevailed little changed until after the Second World War, when, with the loss of many export markets abroad due to the breakup of the British Empire, and falling domestic sales due to changing tastes, the industry in Scotland found itself with substantial over-capacity. This, coupled with a trend towards larger units, resulted in a marked contraction in the brewing industry in Scotland, with a wave of takeovers, mergers and closures which resulted in the demise of some of the most famous names in Scottish brewing.

As the brewery closures continued into the 1980s, a number of people began to express concern that unless something could be done to preserve the records of this historic and important industry, they could be lost for good. Nowhere was this concern more evident than at Heriot-Watt University in Edinburgh, which for long has had a tradition of education and research into brewing, and which still provides the only undergraduate degree course in brewing available at any United Kingdom University. Heriot-Watt has always maintained close links with the brewing industry, and accordingly approaches were made to the extant Scottish brewery companies to see what could be done to preserve their surviving records. These approaches met with a sympathetic response, and it was agreed that Heriot-Watt University itself, which already held a good deal of material relating to the brewing industry, was the obvious central collection point

and home for these records and other items which [illegible] to donate.

The announcement, in March 1982, of the inception of the Archive (to be known as the Scottish Brewing Archive) devoted to maintaining and preserving the records of the brewing industry in Scotland met with an overwhelming response. The volume of material received from the breweries themselves, from private individuals, and from other sources, was such that it was soon found necessary to appoint full-time staff, to be employed under the Manpower Services Commission's Community Enterprise Project. The remit of the Archive staff was to list, catalogue and shelve the existing material, answer enquiries regarding the Archive and the material held therein and supervise visits to the Archive by interested parties.

The inflow of material was such that the Archive soon outgrew its original premises in the centre of Edinburgh, and as a short-term expedient, a move was made to the Riccarton Campus, situated a number of miles from the city centre. This proved to be a less than ideal site from the Archive's point of view, and after several years there the Archive returned to Heriot-Watt's Chambers Street building in 1987.

The material held by the Archives consists of, in addition to strictly archival material (largely in the form of company records), a collection of rare printed volumes, mostly relating to various aspects of the science of brewing, known as the Brewing History Collection. Material from both these categories dates back to the late 16th century. There is in addition a fairly extensive collection of artifacts, ephemera and memorabilia, ranging from large items such as screens, water-engines and

pub mirrors, mats and trays, labels, bottles and pump-clips. There is also a collection of toys, glass and photographs.

At an early stage of the Archive's existence, informal approaches were received both from the brewing industry on the English side of the border, and from the whisky industry in Scotland, enquiring as to whether the Archive would be prepared to incorporate some of their material in the collection. Reluctantly it was decided that due to the constraints of space, finance and manpower, this would not be possible, although the Archive staff decided to unilaterally annex Berwick-on-Tweed for Scotland.

The Archive produces a regular newsletter, which is published twice yearly, and a wide range of articles have been produced for other publications. Radio broadcasts have been given at fairly frequent intervals, and the Archive has been host to a film crew from the Central Office of Information.

As from April 1984, the Scottish Brewing Archive has been in receipt of direct funding from the Scottish brewing industry through the good offices of the Brewers' Association of Scotland, the MSC scheme meanwhile having come to an end. Sizeable deposits of archival and other material continue to be received, but, in addition, the Archive staff are engaged on some long-term research projects for the industry, one of which 'Wee Heavy Ale' (1986) has already been published in book form.

In conclusion, to date the Archive has amassed a sizeable collection of records, books and artefacts relating to all aspects of the brewing industry in Scotland, ie historical, scientific, economic, social, technological and even political (for the brewing industry has strong political connections). The firms represented in the collection include

some of the most famous names in Scottish brewing history, including Aitken's of Falkirk, Fowler's of Prestonpans, Lorimer's of Dalkeith and Geo. Younger's of Alloa, as well as records of all the surviving extant breweries in Scotland, such as Tennents, Belhaven, Deuchars etc. These records have now been made available to researchers, writers, students and interested laymen alike, and provide the most comprehensive and accessible collection of brewing records to be found anywhere in the United Kingdom.

The Archive, which is always pleased to receive any addition to its holdings, can be inspected by appointment on weekdays between 9.30 am and 4.30 pm by telephoning 031-225-8432 ext 5.

C H McMaster
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Errata: Archive Report Number Two

Please note that W S Harvey is not archivist of the Allan Ramsay Library and does not live in Leadhills. The Library is run on a voluntary basis and does not enjoy professional help.

Editor apologises to all concerned.

SUMMARY LISTS OF ARCHIVE SURVEYS AND DEPOSITS

1. National Register of Archives (Scotland)

Full details of the surveys are available from the National Register of Archives (Scotland). All enquiries and requests for access should be addressed to the Secretary, The National Register of Archives (Scotland), Scottish Record Office, HM General Register House, Edinburgh EH1 3YY.

Agriculture, Estates, Forestry and Fishing

2765 **National Library of Scotland** Newhailes papers. Titles, Edinburgh, East Lothian and Midlothian, 16-18 cent; legal and estate papers, 16-18 cent, including building contract by Robert Hylne, 1701, vouchers for building work at Newhailes, 1708-09, receipt by Allan Ramsay for portrait of Lord Stair, and coy labour books, Newhailes, 1726-36.
Titles and papers of Stansfield family, 1504-1724, including accounts and papers of Sir James Stansfield and his son John, 1663-1724, concerning trading, voyages, prizes captured, sale, equipment and victualling of naval and other vessels, and the Newmills Cloth Manufactory; estate and architectural plans, Midlothian, 1766-20 cent. (Replaces Survey No 909)

2766 **National Library of Scotland** Chalmers of Aldbar papers, 1684-1920. Estate papers, 1697-c1900, including papers relating to Aberdeenshire estates of Fedderate and Hazlehead, 1697-1744, Auldbar, Angus, 1755-c1900, Hanbury Hall, Worcestershire, 1833-54. Accounts and correspondence concerning Arbroath and Forfar Railway, 1840-64. Correspondence and accounts relating to trade and administration of Gibraltar, 1724-52, including account book of William Samuel Chalmers recording shipments and

sales of goods from Gibraltar, Portugal [illegible], 1790-91.

2769 **Miss I Smart, Arbroath** Papers relating to the Smart family, 1770-1905, including: rental of Strone [illegible], Kirriemuir, 1770; roup roll of crops at Little Inch, Kirriemuir, 1856; correspondence concerning John Smart's service in the Royal Navy, 1784-1814.

BUILDING INDUSTRY

2759 **L Grandison & Son, plasterers, cement workers, tile fixers and haulage contractors, Peebles** Accounting records, 1934-55; fireplace catalogues 1926; building plans, 1912-59; books of designs, nd.

ENGINEERING

2768 **Dundee City District Archive and Record Centre** Austin & Pickersgill Ltd, shipbuilders, Southwick Shipyard, Sunderland. Engineering drawings of ships' fittings including tanks, pipes, and valves, nd.

FINANCE

2764 **Glasgow University Archives** Ivory and Sime: accounting records, 1882-1967. British Assets Trust Ltd: accounting records, 1911-71; registers of investments, 1899-1943. Second British Assets Trust Ltd: accounting records, 1923-68; registers of investments, 1922-67. Independent Investment Co Ltd: accounting records, 1924-69; register of transfers, 1924-28. Investors Mortgage Security Co Ltd: minutes, 1891-1977; registers of stockholders, 1935-72; accounting records,

1[illegible]- [illegible] Land Investors Mortgage Security Co Ltd: minutes, 1[illegible]; accounting records, 1914-66. The Scottish Mortgage Trust Ltd: minutes, 1928-76, accounting records, 1928-75. Edinburgh American Land Mortgage Co Ltd: register of directors, 1901-06; accounting records, 1880-1919. Atlantic Assets Trust Ltd: accounting records, 1954-68. Clydesdale Investment Co Ltd: accounting records, 1927-88. Third Scottish Western Investment Co Ltd: registers of investment, 1929-62. Second Caledonian Trust Co Ltd: registers of investments, 1927-63; Third Caledonian Trust Co Ltd: registers of shares and shareholders, 1929-63. Edinburgh Trust & Agency Ltd: register of members and accounting records, 1912-27. Edinburgh Securities Trust Ltd: minutes, 1907-20. Canning Downs Estate Ltd: minutes, 1901-06. Caledonian Assets Trust Ltd: minutes, 1903-05. (Replaces Survey No 1577)

FOOD AND DRINK

2752 **Hiram Walker & Sons (Scotland) Ltd, whisky distillers, Dumbarton** Minutes, registers of members, and accounting records of Hiram Walker and associated and subsidiary companies, including: Alexander Brothers (Wines) Ltd, 1953-63; Ardbeg Distillery Ltd, 1958-77; B W & Co Ltd, 1930-69; Balblair Distillery Co Ltd, 1949-70; George Ballantine & Son Ltd, 1922-65; James Barclay & Co (Scotland) Ltd, 1935-65; Bloch Brothers (Distillers) Ltd, 1936-65; Coulmore Distillery Co Ltd, 1949-65; Dumbarton Warehousing Co Ltd, 1937-65; James Ferguson & Sons (Glasgow) Ltd, 1930-65; Fieldford Proprietors Ltd, 1957-65; Gavin Distillers Ltd, 1946-65; Glencadam Distillery Co Ltd, 1923-65; Gordon & Grant Ltd, 1929-67;

Hiram Walker & Sons (Scotland), 1936-61; Hiram Walker & Sons (Gin Distillers) Ltd, 1939-67; Hiram Walker International Ltd, 1980-86; Jardine & Co (Glasgow) Ltd, 1928-67; Robert Kilgour & Co Ltd, 1932-67; Archibald Lauder & Co Ltd, 1934-65; Lauder and MacGregor Ltd, 1929-67; Luncie Brothers, 1951-65; Alexander McDougall & Co Ltd, 1930-69; Donald Macfarlane & Co Ltd, 1935-67; MacGregor & Stuart (Distillers) Ltd, 1934-67; MacIntosh & MacIntosh, 1935-45; J A T MacKenzie & Co Ltd, 1960-65; Mackintosh & Mackintosh Ltd, 1923-67; Harvey MacNair & Co Ltd, 1923-65; Robert MacNish & Co Ltd, 1908-83; Charles Marchant Ltd, 1912-65; Ross & McCallum Ltd, 1933-84; L T Russell & Co Ltd, 1951-58; Samothrace Investment Ltd, 1979-80; Scotia Distillers Ltd, 1937-65; R Stevenson Taylor & Co Ltd, 1906-65; Stewart Pott & Co Ltd 1933-67; Stirling Bonding Co Ltd, 1921-65; James & George Stodart Ltd, 1926-65; Taylor & Ferguson Ltd, 1931-65; Robert Thorne & Sons (Whisky Merchants) Ltd, 1931-65; miscellaneous accounting records, 1930-73.

2754 **Mothers Pride Bakery, Glasgow** Beattie's Biscuits Ltd: minutes 1928-32.

2756 **British Fish Canners (Fraserburgh) Ltd, Fraserburgh** Photographs of plant, production and shipment of meal and fish by Maconochie Brothers, c1895-1970.

2760 **Cardowan Creameries Ltd, margarine manufacturers, Glasgow** Minutes 1930-current; register of members, 1930-70; memorandum and articles of association, 1930; accounting records, 1928-80; presscuttings.

MANUFACTURERS

2751 **Cessna Fluid Power Ltd, hydraulic equipment manufacturers, Glenrothes** Accounting records, 1961-70.

2758 **Clyde Combustions Ltd, oil and gas burner manufacturers, Glasgow** Accounting records, 1921-79; minutes, 1920-73; registers of members, 1920-54; reports, 1954-67; tenders, 1926-27; patents, 1921-51; wages records, 1936-66.

2770 **G B Papers plc, paper manufacturers, Guard Bridge** Culter Mills Paper Co Ltd: minutes 1865-1984; accounting records, 1869-1968; letter book 1871-91; reports on water supplies, 1880-95, papers concerning merger with Guard Bridge Paper Co Ltd, 1967. Guard Bridge Paper Co Ltd: minutes, 1960-current; accounting records, 1923-79. Scanreg Business Systems Ltd: minutes, 1970-77; company registers, 1972-4; register of members, 1970-76. Culter Guard Bridge Exports Ltd: minutes 1975-85. Culter Guard Bridge Holdings Ltd: minutes, 1967-current. Guard Bridge Memorial Institute: minutes, 1921-58; membership records, 1928-39; accounting records, 1928-39. Guard Bridge Home Guard sports club minute book, 1942.

RETAIL

2753 **Finnie & Co, wholesale tool distributors and ironmongers, Glasgow** Minutes, 1944-86; accounting records, 1901-68; stock records, 1916-23; scrapbook, 1897-1971; plans, 1908-09.

2771 **Glasgow University Archives** Forth Tugs Ltd, tug operators, Grangemouth. Minutes, 1895-1968; accounting records, 1861-

1971; declaration of ownership and registration of vessels, 1861-73; lists of vessels towed, 1861-73; [illegible], 1871-73.

2. **National Register of Archives (Scotland): Register of Oral History Tapes**

This Register provides a central body of information on tape material, based on data supplied by the custodians of the tapes and in most cases it also covers such matters as the quality of the recordings, the type of equipment used and particulars of any published work based on the tapes concerned. The collections are listed under the name of their present custodians to whom requests for access should be directed. The presence of recordings on this Register must not be taken to imply any right of public access to them. Dates given in the entries refer to the date of recording or to the date to which the recordings relate.

36 **Drew Ratter, Ollaberry, Shetland.** Northmavine Community History Project. Interviews with inhabitants about crofting economy, local culture and employment. Shetland dialect, 1800-current.

37 **Mrs Ann Manson, BBC Radio Orkney, Castle Street, Kirkwall, Orkney** Orkney Sound Archive. Recordings on all aspects of Orkney life, nd.

38 **Assistant Keeper (Water Transport), Department of Transport, Science Museum, South Kensington, London** Interview with Mr D A MacMurchie, particularly concerning his work as angle ironsmith at Caledon Shipyard, Dundee, 1939-45.

39 **School of Scottish Studies, University of Edinburgh, 27 George Square, Edinburgh** Sutherland Field Trip, 1983. Interview with crofters, lighthouse keepers, pearl fisher and lighthouse keeper, Assynt parish, concerning folklore of Assynt, Lord League activities, place-name evidence, witchcraft, local history and reminiscences of retired lighthouse keeper. Gaelic and English, 19 cent-current. Interviews with travelling people, farmers and others concerning vocabulary, superstitions, life and work of pedlars, packmen and tramps in counties of Perth, Fife, Kirkcudbright, Argyll, Moray, Banff and Inverness. Interview with William Birrell, wood contractor, Tulliemet, Perthshire about his work and rearing Clydesdale horses. Reminiscences of Peter Taylor, retired mill worker, about life in Dundee. Interviews with inhabitants of East Fife about farm life, place names, fishing and local history. Interviews with inhabitants of Methil about mining, social conditions and General strike, 1926. Interviews with inhabitants of Ross about folk life, pearl fishing and local lore, Gaelic and English, 20 cent.

40 **Lynn Jamieson, Department of Sociology, University of Edinburgh, 18 Buccleuch Place, Edinburgh** Interviews with unnamed people, mainly town dwellers, concerning their childhood and first jobs, 1895-1930.

41 **Mrs Ann Manson, The Orkney Library, Laing Street, Kirkwall, Orkney** Orkney Sound Archive. BBC Radio Orkney's tapes; tapes of late Ernest W Marwick; tapes relating to Orkney folklore, farming, fishing and local history, no.

42 **Scottish Mining Museum, Lady Victoria Colliery, Newtongrange, Midlothian** Interviews with miners and their wives about life and work at Lady Victoria Colliery and the mining community at Newtongrange. Early 20C-current.

43 **Murdoch Rodgers, 10 Queens Park Avenue, Edinburgh** Personal archive. Interviews with unnamed miners, housewives, tailors and ice-cream vendors in central Scotland, mostly first or second generation immigrants, on their lives and work, 1900-30.

44 **Dundee City District Archive and Record Centre, City Square, Dundee** Interview with Mr Alexander Robert Anderson, Subiaco, W Australia, about his childhood in Dundee and work at his father's, R J Anderson, aerated water factory, 1910-23.

45 **Mr K W Hinshalwood, Local History Department, Central Library, High Street, Paisley** Linwood oral history workshop: interviews with unnamed informants about local history, nd. Interview with Mrs McCluskey, one of the first mill girls at Mile End Mill, Paisley, now retired, nd.

46 **Mr C U McMaster, Scottish Brewing Archive, Heriot-Watt University, Riccarton, Edinburgh** Interview with J Morison Inches, last head brewer of J C J Morrison & Co Ltd, concerning later stages of his brewing career and his involvement with Heriot-Watt College and University, late 1950s.

47 **Arbroath District Library, Hill Terrace, Arbroath** Arbroath History Project. Interviews with unnamed informants about

[illegible] work in Dundee and Arbroath. Topics include [illegible]; housing and sanitation; politics; church and religion; school teaching; textile and engineering industries; butchering trade; cinema business; trade unions; leisure activities; fortune tellers and superstition, 1890-current.

48 **Central Edinburgh Resource Team, South Bridge School, Infirmary Street, Edinburgh** Old Town Oral History Project. Interviews concerning life and work in the Old Town from childhood to retiral, nd.

49 **Miss S M Selwyn, Strathkelvin District Museums, The Cross, Kirkintilloch, Glasgow** Strathkelvin Local Studies Project. Interviews with unnamed miners, mining family members and mine managers about life and work, with some technical information, nd.

50 **Librarian, Craigie College of Education, Ayr** Ayrshire Sound Archive. Interviews with inhabitants of Ayrshire concerning all aspects of life and work in Ayrshire towns and villages including childhood, school and sports; memories of Ayrshire industries including Kilmarnock carpetmaking, farming, fishing, mining, Irvine Valley lace industry, Glengarnock steel works, Dauchline box factory, Stewarton bonnet-making, Dreghorn brickworks. Reminiscences of World War I, including Gallipoli and home front; General Strike, 1926; conference at Largs on D-Day landings, 1943. Recollections of local personalities including Lord Ross of Marnock. Tales of local history. Early 20th cent-current.

52 **Strathclyde Regional Archives, Mitchell Library, North Street, Glasgow** Autobiographical and family records of Mrs Mavor, wife of managing director of Mavor & Coulson, civil engineers, 1890s-20 cent.

54 **Dr M Ash, 42 Woodburn Terrace, Edinburgh** Interview with Mr Alan Hynd about farm work in Fife, 1962. Recordings of recitals by George Paterson, Dabby Scott, Maud Butler and Willie Scott of Scots music and poetry, 1976. Interviews with relatives of Dr Marinell Ash concerning life in Arizona and New Mexico, 1840-current.

55 **Mr H Firth, Orkney Sound Archive, Castle Street, Kirkwall** Interviews concerning fishing, farming, local history, childhood, customs, games and amusements, 1937-84.

57 **School of Scottish Studies, University of Edinburgh, 27 George Square, Edinburgh** Interviews with inhabitants of Dundee about work in textile mills, booth boxing, social conditions, nursing, fire brigade duties. Reminiscences of various occupations from people in Lothians, Borders and Fife. Interviews with inhabitants of lace-making district of Ayrshire and of New Lanark. Reminiscences of tea planting, administration and family and native life in British India. Interviews with medical and nursing staff about mental hospitals in Britain. Early 20 cent-current.

58 **Springburn History Project, 57 Keppochhill Road, Glasgow** Interviews with seamen, waiters and railwaymen concerning work and life in Springburn, c1910-39.

59 **Dundee City District Archive and Record Centre, City Chambers, City Square, Dundee DD1 3BY** Interview with Royal Navy engineering captain concerning his life and service in the UK, Mediterranean, and Australasia, 1886-1945.

3. **The Scottish Film Archive**

Applications for access should be made to the Curator, Scottish Film Archives, 74 Victoria Crescent Road, Glasgow G12 9JN

Acquisitions 1987

THE LOCOMOTIVE (c1960)
sp Locomotive Manufacturers Association of Great Britain
Sound 30 minutes

INDUSTRIAL STIRLINGSHIRE (1950)
sp Scottish Educational Film Association
Silent 30 minutes

Brickmaking and events surrounding the community of J G Stein of Bonnybridge, brickmakers. (1932-1945)
Silent 30 minutes

THE 'SOVEREIGN' SCOTCH (c1928)
Bottling King George IV whisky
Silent 5 minutes

CALTREX CALENDERING LINE (1978)
sp Wilkie and Paul, Edinburgh
Sound 10 minutes

VILLAGE BLACKSMITH (1935)

Silent 3 minutes

MODERN BAKERY (1934)

Silent 3 minutes

FALKIRK (1938)

A survey of the principal industries of Falkirk and its environs, including the Carron Company and Sunnyside Iron Company.

Silent 20 minutes

QUARRIERS HOMES (1936-1949)

Activities in the Home

Silent 20 minutes

LAUNCH AT DENNY'S (1901 or 1903)

Launch of Sir Thomas Lipton's yacht 'Shamrock' II or III.

Silent 1 minute

Dundee Perth and London Shipping Company, Dundee (1937-58)

Ship launches: 'Kingennie', 'Lochee', 'London' and 'Broughty'

Silent 10 minutes

BOOK REVIEWS

Peter Pagnamenta and Richard Overy, All Our Working Lives (London: BBC, 1984, pp 288. £10.75)

This book, which accompanied the television series of the same name, contains a series of essays on a variety of mostly manufactury industries: cotton, aircraft, steel, retailing, shipbuilding, chemicals, coal, farming, and electronics. These vary in quality and insight, but all draw on the reminiscences of those engaged in the industry to illustrate the theme. This approach, which can work well in television and radio, is less convincing in print for this subject. In looking back on their working experiences, most people naturally deliver their opinions with the benefit of hindsight. This is a pitfall which all historians are supposedly trained to beware, but throughout the book the authors regularly seem trapped by their evidence, partly because it tells them what they want to hear. Underlying each essay there is the tacit assumption, only confirmed at the very end of the book, that Britain would have been much better off with 'direct industrial democracy, which has been the feature of some of the most successful economies western Europe'. We are constantly told that everything in these economies is on the whole better; yet these comparisons are made with little substance or reference to chronology. It is generally agreed that British industry performed better than its German competitors in the inter-war years and in the modern period unfavourable comparison is usually confined to best practice and not to the generality of continental industry.

With these reservations in mind, the book is a good read, full of interesting glimpses into part of our heritage which has gone almost unrecorded. The extracts taken from recorded interviews with shop floor

workers, their supervisors and managers, provide a fascinating perspective on popular attitudes and perceptions. Each essay is excellently illustrated with contemporary photographs.

M.S. Moss University of Glasgow

L.E. Cochran, Scottish Trade with Ireland in the Eighteenth Century (John Donald, Edinburgh, 1985. £16.)

Because of the relatively unspectacular nature of trade in the North Channel, the commercial interdependence of Scotland and Ireland has tended to be underplayed by historians. Albeit trade with Scotland was a minor element in Irish overseas trade throughout the 18th century, and the ending of customs posts at the Borders following the Union of 1707 has inhibited quantative assessment of Scottish imports and exports, the North Channel trade consistently represented around a fifth of the non-English overseas trade of both countries. Ireland served as a stabalizing influence for Scottish commerce during the refashioning of continental markets in the aftermath of the Union and helped maintain the solvency of leading merchants houses on the Clyde during the American Wars of Independence. Moreover, because of the bulk of the commodities traded, about 30% of Scottish shipping capacity found meaningful employment in the North Channel, the Irish trade being of particular importance for the development of the mercantile community in Greenock and Port Glasgow, as for the Ayrshire coalfields.

Dr. Cochran is to be commended for providing a lucid and impressive rehabilitation of North Channel trade based primarily on the quantative

analysis of customs records; a statistical minefield through which she pounds a sure and assured path. Her thorough approach, while cognizant of the distortive impact of smuggling with respect to tea, tobacco, wines and spirits as well as grain and livestock, tends perhaps not only to underestimate the illicit trade in such commodities in the North Channel, but also the legal but indirect trade between Scotland and Ireland, notably with respect to textiles manufactured outwith the West of Scotland and re-exported from English ports. Further consideration must also be given to west coast fishermen, from the Highlands as from the Clyde, who landed their catches in Ulster, but outwith the eastern ports, and illicitly brought over curing salt.

Of the specialist divisions following the introductory discussion on the historical significance of Scottish trade with Ireland, the first two, devoted respectively to appraisals of Scottish exports to and imports from Ireland are notably more satisfactory than the third on commercial reorganization. A clear and informative picture emerges not only of the basic value and volume of the commodities exchanged - principally coal, fish and textiles for grain, livestock and pastoral produce - but also of the importance of Ireland for the burgeoning Clyde entrepot trade up to the 1780s through the re-export of such colonial commodities as tobacco and, more especially, muscovado (semi-processed) sugar to which Scottish, unlike Irish merchants, had unrestricted access as a consequence of Union. The relative shrinkage in Irish markets in the closing decades of the eighteenth century can be attributed to the higher gearing of the Scottish economy towards industrialization and the resultant increase in domestic demand for native produce. At the same time, increased provision of primary and semi-processed products appeared to confirm Ireland's role as a feeder colony for central Scotland; a colonial position shared by the Highlands. Such categorisation of the Irish economy requires greater

discrimination with respect to the industrialisation of east Ulster centred on Belfast from the end of the eighteenth century - a process enhanced by the investment of capital and expertise by Scottish textile entrepreneurs; a feature the book merely comments on rather than explores. Moreover, the commercial pull exerted by Dublin throughout the eighteenth century was an important secondary influence to the droving trade (whose take-off in the Highlands, incidentally, dates from the 1680s not post-1745) in stimulating economic development as far afield as the Western Highlands and Islands, as evident from the portfolio of companies created by enterprising clan gentry such as the Campbells of Ardchattan and their associates in Glenetive. Although co-partneries are cited in the sources, the manifest failure to develop such commercial links through registers of deeds, sequestrations, wills and testaments, along with the neglect to examine banking facilities for the general merchants on the Lower Clyde who dominated North Channel trade, are critical weaknesses of this pioneering study. Clearly much work remains to be done on commercial interdependence of Scotland and Ireland in this early modern period.

Allan I. MacInnes

University of Glasgow

Perilla Kinchin and Juliet Kinchin, Glasgow's Great Exhibitions: 1888, 1901, 1911, 1938, 1988 (White Cockade Publishing, Bicester, 1988, £10.95)

For two classicists - one now embarked on a career in the Fine Arts - to show such historical sureness of touch in their account of a century of Glasgow Exhibitions is no mean feat. Although they apologise in the Preface for the 'unfairly tantalising' lack of detail in some instances, the authors often choose shrewdly in the examples which they use to place

Glasgow in a much wider context than that of a city which has just celebrated its fifth major Exhibition (or Festival) in the space of a century.

Beginning with the Great Exhibition of 1851, this elegantly written book traces the changing ethos of such ventures from the Victorian preoccupation with Art and Industry to the present emphasis on entertainment, especially for the younger generations, coupled with the demonstration of Science and Technology. The first exhibition in 1888 was not truly international but concentrated rather on the twin foci of Scotland and Empire, a pattern which was retained right through until the largest of them all, the 1938 Empire Exhibition which drew more than 12.5 million visitors. As appears to have happened in the 1980s also, the Glaswegians stole a march on their Edinburgh rivals in 1888, when attendances comfortably exceeded those achieved at the Edinburgh International Exhibition of 1886. (It is interesting to note, however, that the organisers of the first two Glasgow Exhibitions were not above a bit of sharp practice to falsely inflate the visitor figures; in 1901 some 7,500 attendants had solemnly been included in each day's totals!)
Although each of the five events is treated as an entity there are some recurring themes. Not least among these is the changing attitude shown towards women in the organisation and presentation of the various exhibitions. The separate women's sections - essentially middle class but with some examples of careers for working class women - of 1888 and 1901 had disappeared by 1911, perhaps as a result of concern at the extent of suffragette agitation. It is unfortunate that space precluded the authors from identifying more fully those women who did play a part in this Exhibition, the prime purpose of which was to raise sufficient funds to endow a chair of Scottish History and Literature at Glasgow University.

(It did, and it was.) Miss Story, for example, one of the few women to act as Convener (of the committee concerned with the Decorative and Ecclesiastical Arts), was the daughter of the late Principal of the University while Miss Frances Melville, another rarity as head of a committee, was the Principal of Queen Margaret College. Women were again given little responsibility when it came to 1938, although Miss Margaret Brodie, assistant to Thomas Tait, the Architect-in Chief for this massive undertaking, did act as site architect for a gruelling six months. Curiously, and possibly as a sign of changing times and growing equality, the chapter on the 1988 Garden Festival makes no reference at all to a distinct role for women.

Not surprisingly, the authors have had a wealth of illustrative material to choose from, and have done so to telling effect, although restricted almost entirely to black and white reproduction, presumably on grounds of cost. It is particularly helpful to find a detailed map or site plan (carefully redrawn from the originals in most cases) at the beginning of each chapter. There is also a very useful comparative table of sites, architects, admission prices, attendances and profits immediately after the Introduction. It is a sobering indication of changing times that the cost of admission remained constant at one shilling in 1888, 1901, 1911 and 1938, compared with a figure one hundred times as great in 1988, and that this is the first event of its kind in Glasgow not to make a profit. Perilla and Juliet Kinchin conclude by expressing the desire to see Glasgow's motto, 'Let Glasgow Flourish', "given a hopeful new meaning." As every Glaswegian knows, the full text of the motto stresses that this should be achieved 'by the preaching of Thy word.' In the words they have penned the authors have done Glasgow, and its Exhibitions, proud.

Derek A. Dow

University of Glasgow

Edgar Jones. Foreword by Sir Trevor Holdsworth. A History of G K N Volume I Innovation and Enterprise. 1759-1918 (London: Macmillan Press, 1988, pp.xxxviii and 44. £25)

Guest Keen & Nettleford, or G K N as it is now known, are familiar names to almost everyone in Britain who has ever had occasion to buy a woodscrew. This large book by Edgar Jones is the first volume in a history of the company. It traces the origins of the three principal constituents of the modern company, the Dowlais Iron Co (founded 1759), the Patent Nut & Bolt Co Ltd that dated back to 1845, and Nettlefords that had its origins in 1823. After the merger that resulted in the formation of Guest Keen & Nettlefords in 1902, the history of the enterprise is taken up to the end of the First World War. Writing the history of a company with such diverse origins is always a daunting task for the business historian, particularly if each constituent, as in the case of Guest Keen & Nettlefords, contributed equally to its formation. Edgar Jones has chosen to break the book up into four parts. The first is an account of the development of the Dowlais Ironworks and the Guest family's involvement from 1759 to 1850, particularly the role of the remarkable Lady Charlotte Guest, wife of Sir John, in the financial management of the business. The second deals with the development of Nettlefords & Chamberlain (later Nettlefords) and Arthur Keen's involvement in the foundation of the Patent Nut & Bolt Co, from 1850-1900. There is a good deal of fascinating information in this section, particularly relating to the acquisition of the wood screw patents by J S Nettleford and the involvement of his well-known brother-in-law, Joseph Chamberlain, in the subsequent development of the enterprise. The third section returns to Dowlais to explore the massive changes in the iron and steel industry during the sixty-five years before the outbreak of the First World War. The last and briefest section takes the history of the group to the end of

the war. For the history of a major manufacturing company, the chapter dealing with the war itself is surprisingly brief.

The test of such a monumental history is whether it is a good read or whether it provides fresh insight into economic and business history. Unfortunately, largely because of the fragmented nature of the G K N's history, the narrative is often difficult to follow. This may have been inevitable, but at times Edgar Jones's well structured plan confuses rather than illuminates the reader. There are occasional nuggets that further knowledge of British corporate activity in the nineteenth century, particularly in relation to competition, but, on the whole, the text is curiously antiquarian, overburdened with detail and people. Despite these criticisms, the book is a quarry of information that deserves a place on the shelves of anyone interested in Britain's industrial past. Throughout, the book is well garnered with tables and lavishly illustrated, particularly the breathtaking early nineteenth century paintings of Nant-y-glo and Dowlais.

M.S. Moss

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W. Hamish Fraser, Conflict and Class: Scottish Workers 1700 - 1838 (Edinburgh: John Donald, 1988, pp.vii + 202. £20)

Work in this field has often been marred by sweeping, and sometimes by acrimonious assertions based on flimsy evidence. Of such there is no trace in Dr. Fraser's study which is always restrained in interpretation and based on the fruit of a successful search for information on the organisation and activities of trade societies of all kinds, about which even the late W.H. Marwick was hard pressed to produce much evidence.

His balanced view is evident in his demonstration of how the associations are shown to have led not only to conflict but to compromise and sometimes even to co-operation.

The industrial transformation between 1700 and 1838 provides the background: the change from an economy in which tradesmen worked within the framework of near-medieval burgh organisation and restraint to one in which the industrial structure of the west of Scotland had assumed much of its modern form. In these conditions many of the trade associations did not direct their attention primarily to increasing or defending wages, important as that was, but to influencing work patterns and more generally towards ensuring a degree of control over their activities. The cotton spinners at the end of the period were just as anxious to retain their valued independence even in the factories as were the old journeymen in the burghs at the beginning. Indeed responsibility and respectability is notable among unions in the early nineteenth century, which were often alleged to be violent. Not all shared the extreme interpretations of Sheriff Alison. Violence there was, but it was intermittent. Its origins can frequently be traced to the use of disreputable strike-breakers.

The change to confrontation which so worried Alison and others came with the emergence of new ideas of the desirability, even of the necessity, of allowing wages and conditions of work to be regulated by the free market, in which case no organ of state, high or low, had any regulatory function to perform. This change had more dramatic consequences in Scotland, where in the earlier eighteenth century the magistrates and the courts assumed the right, some would even have suggested that it was their duty, to control conditions of work. Combination as such was not illegal; what was illegal was action against the public good, and that was for the

courts to decide. Dr. Fraser suggests that many of the senior judges, who came from the ranks of the minor landed gentry, feared the social unrest which unregulated industrial relations might generate, and so they were willing to countenance intervention. The change came in the early nineteenth century, not only because of decreasing sympathy with those of lower social rank and their perceived insubordination, but because of the new doctrines of political economy, in which there was a decreasing place for anyone to interfere with the free operation of market forces. Paradoxically radical lawyers were often the most ardent advocates of the new beliefs. Dr. Fraser draws attention to the comparable evolution of the poor law, where it has also been suggested that the law was changed by judicial decision and the re-writing of the textbooks to accord more with contemporary idealogy. The conflict came to a head in the defeat of the cotton spinners in 1837-38, but that only completed the process begun with the earlier onslaught on the workers' organisation in the 1820s.

Dr. Fraser modestly and wisely points out that his study is of trade unions, which is only part of the story of the emergence or making of the working class, but that it is a part which has been unduly neglected. He has probably achieved more than he claims. He has certainly set an example of careful investigation for others to follow.

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