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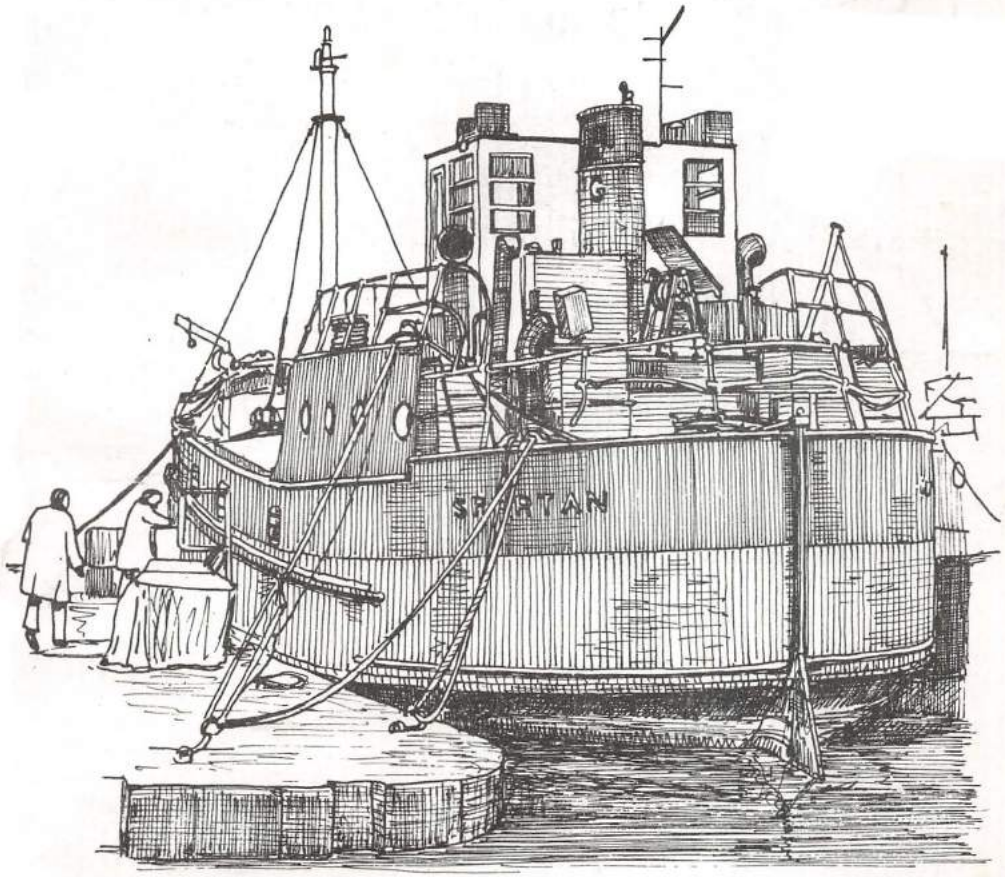

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The typescript for the present issue was prepared by Mr D MacLauchlan, University of Glasgow and the proofs were read by Mr Malcolm Livingstone, University of Glasgow.

Front Cover - The Kirkintilloch-built puffer Spartan, recently donated to the West of Scotland Boat Museum by the Glenlight Steamship Co. Ltd., in Bowling Basin.

Back Cover - One of the two ferries acquired by the Forth and Clyde Canal Society for service on the canal. The other has been taken up to the summit level at Kirkintilloch.

Both drawn by John R Hume.

SCOTTISH INDUSTRIAL HISTORY

vol. 5.1

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THE LEITH GLASS WORKS: 1689 - c.1708

by
Monica Clough

The history of infant industries in the late seventeenth century in Scotland is only beginning to come to light. One of these forgotten industrial attempts was the Leith Glassworks, which operated for nearly twenty years up to the Act of Union. The documents on which this study is based have come to light amid the mass of family papers belonging to George Mackenzie, Viscount Tarbat and later first Earl of Cromartie (1632-1714). In the late seventeenth century George Mackenzie was one of Scotland's leading magnates and politicians, under James II and VII, William and Mary, and Anne he energetically promoted a number of infant industries through enabling legislation, and by private investment. His brother, Roderick Mackenzie, Lord Prestonhall, was also an active entrepreneur; some of his activities, however, were more suspect, and in one case led the country to disaster when the national investment in the Company Trading to Africa and the Indies died dismally in the swamps of Darien. Prestonhall was the secretary to this company.

The problem with the infant industries seems not to have been the technicalities of manufacture, but the difficulties of marketing and transport in a country still regionally self-sufficient and conservative. This can be seen in the case of Nicholas Dupin's paperworks and linen manufactory in which Lord Tarbat was also interested; exports of surplus rough blue paper to Darien were disastrously misplaced. The marketing problem may also have affected the decline of the Leith Glass Works, though at the time blame for its final insolvency was placed on government officials for quartering troops - that heavy burden on public and private life in disordered Scotland in the period under consideration - and on English dumping of cheaper glass ware. Not only were Scottish markets too small and demand to low for manufactured goods, but export from Scotland was impossible in the face of the mercantilist laws of England which enforced English monopolies and carriers, and penalised Scots attempts to compete. A consideration of these points was perhaps more material in the discussion which led to the Union of the Parliaments in 1707 than the strictly political. Economic aspects were certainly much debated at the time.

Two copies of a printed proclamation In Favour of a Glass Manufactory at Leith, dated 8 October 1689, survive. The setting up was proclaimed 'at the Mercat Cross so that none may pretend ignorance', and was by Act of Parliament 'for the better encouragement of glass manufacture', and it expressly prohibited the 'import from any place abroad of any green glass bottles, chymistry and apothecary glasses under payne of confiscation'. Apparently the works quickly got under way, for a few months later the first of several orders on the glass works turns up among the Cromartie papers, addressed to Alex Ainslie, clerk to the works: 'Alex Ainslie, loving friend, deliver to Lord Prestonhall's servant 2 gross of mutchkin bottles and one gross of chappon bottles and this shall be your warrant: your aff. friend Tarbat, Edinburgh 12 April 1690'. It is endorsed 'ffor Alex Ainslie

of the Glass works, Leith, April 15 1690'; and, in another hand, 'Rec. be me James Young servitor to Prestonhall 2 gros muchkyne and on gros chappie botels from Alex Ainslie

Conform

24 doz. maskin [mutchkin](1) botels at 2d. pr. doz	02.08
12 doz. chapin [chapkin](1) ditto at 3/4d. pr. doz	02.08
To cording for 5 crells [creel baskets]	00.01
	£04.05 Scots'

(Cromartie Papers, XV.152)(2)

In October of the same year, 1690, Lord Tarbat sent a consignment of bottles to his Highland base, consigned on one of his ships which brought his annual rental of bere barley south for sale to the brewers of Leith: John Gair, master of the Eliza of Leith, gave receipt for having received on board at Leith four hampers containing 'On gross of muskne, twa gross chapkie botles, six pynt botles, Four chirnes of glass and six gross of corks in good condition for the vse of the Viscount of Tarbat ... to delyvour at Cromartie.' (XVI.64). The use all these bottles was put to can only be guessed at; there are contemporary references scattered throughout the papers to ale-brewing by Lady Tarbat, to the evil effects of too much acquavitty (whisky), and to the importation through London of a hogshead of wine, shipped by Francis Weston in May 1690 ('conforme to customes in tyme of war') which seems the most likely use. The habit of buying claret in bulk and decanting it in one's own cellar was a long-standing one, which persisted in Scotland until the early nineteenth century when every West or East Indiaman leaving the Clyde reckoned on taking a cargo of green glass bottles from Glasgow or Dumbarton, and corks, to sell with the hogsheads of Madeira or Bordeaux bought en route, or the barrels of rum or whisky carried from the distillers of Greenock.

In 1695 one of Lord Tarbat's secretaries, James Lindsay, wrote to 'Alex Ainsley Clerk to the Glass works at Leith: My Lord do desire that yo gott him 20 dozns of chapinds and 10 dozns of mut. bottels so soon as possible to be sent here if your work be goeing now lett tham be marked gif it is all [possible?] Royston, 29 September 1695'. Royston House, now called Caroline Park, was the mansion house then recently built by Lord Tarbat on the outskirts of Edinburgh, near Leith, where he had had carved over the doorway an inscription which began 'Gazae Congeste nihili Impensae usui sunt ...' - 'riches unemployed are of no use, but made to circulate are productive of much good', an excellent sentiment for the promoter of so many infant industries, though regrettably his own riches circulated so fast that they began to run out by the end of his life.

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(1) - mutchkin = 3/4 of an imperial pint, 1/4 Scots pint
chapkin = 1 imperial quart
pint Scots = 3 imperial pints

(2) - All references in Roman figures are to the numbered documents in bound volumes in the Cromartie Papers, Castle Leod, Ross Shire; with thanks to the Earl of Cromartie for his permission to quote from them.

There is then a nine year gap in the Cromartie papers, so far as any reference to the Glass works is concerned. Perhaps the households were sufficiently supplied with chapkin and mutchkin bottles.

In 1701, however, trouble is marked by two copies of a Petition (printed and in manuscript) (XII.23 and XIX.196) which reads in part as follows, and which marks the serious inroads made by English undercutting, and corrupt Scots customs officials:

> Petition of Alex. Ainslie for himself and Co-partners in the Glassworks at Leith to the Lords of the Privy Council.
> ... whereas by their Lordships' favour to the glassworks declaring same to be a manufactory and have priviledges thereof and further expressed in the Act of 8 October 1689 for better encouragement [they did] strictly prohibit all merchants and other persons to import and bring into the Kingdom from any other place abroad any green bottles Chymestry and apothecary glass under the pain of confiscation... [and] notwithstanding that we make the said glasses to the satisfaction of all that use them, and that now our merchants have in obedience to your Lordships' sett proclamation (and the Acts of Parliament whereon it is founded) given over the import [of] any glass bottles from abroad, The Master of the Glass Manufactures in England on purpose to break our trade send in great quantities of the said glass bottles to undersell and ruine our manufactorie, resolving that by the connivance of the Collector of Customs (as is apparant by the two seald instruments taken vpone ane former act of your Lordships) impouring us to sease on certain quantity of bottles at Montrose herewith produced That soon as they can constrain us to give over they will not only have our trade but the making of the price at their pleasure. And seeing to prevent this abuse never before practiced it is just and necessary (specially when we have upon our hands no less than to the value of a thousand pounds sterling of made bottles and also our own work actually Goeing) that stricter and more effectual orders be given for our encouragement and that the goode of the whole Kingdom in manner after mentioned.

The Petition then lists three points, firstly asking for stringent prohibition on customs collectors, surveyors and tidewaiters allowing entry of glass bottles, secondly for authority for Glass Company employees to search for forbidden imports, and thirdly to prohibit and discharge all skippers and masters of ships from importing glass bottles from abroad.

In spite of this plea for protection by the state the affairs of the Glassworks did not prosper, and in November 1701 Alex Ainslie had drawn up in his own hand and Inventar of the 'List of Debts with the value of the accompts of Glass in Custodie and money and materials belonging to the glassworks' for the stock of the co-partnership:

Accompt at Leith 31 November 1701

Sterling
In money £60.8.31/2d (Scots £728.3.9d or 2185 merks)
In glass bottels £333.3.2d (Scots £3996 or 11988 merks)

A list then follows of 152 names of the debtors to the glassworks, which included merchant bailies, apothecaries, nobles and lairds from places as distant as Banff (where six lived), Aberdeen and Dundee, one (William Ffea) in Kirkwall, and only one Glasgow merchant. The Viscount of Tarbat owed £10.8.9d and his son Kenneth Mackenzie 6/-; others owed much more. The Lord Elcho owed £61; Hugh Paterson, chirurgeon, (a founder of the college of Physicians) owed £3.5.9d, which is interesting though inconclusive indication of the 'Chymical and apothecary wares' that Ainslie claimed to be manufacturing. James Brown, bailie and merchant in Edinburgh, owed £25.4. Other interesting names in the shorter list of those to whom money was paid are 'Thomas Hawwood in Dertford £505.2.2d, Hugh McGlyn glassgrinder 18/- and Mr. John Dehines our accompt for ashes £15.14.6d'.

The list ends:	Glassworks for materials	£87.16.5
	George Kemp glassmaker	8. 8.3
	Isaack Dehines glassmaker	7. 7.-
	Robert Liptwax glassmaker	3.14.-
		(XX.175)

One can only conclude the whole account is, as stated, in sterling, though it is unusual for 1701, and the sums converted into the more usual merks or £Scots seem suspiciously large, except for the wages which are in line with annual sterling wages paid to servants at this time in Edinburgh. It is, however, clear that by some means the glassworks weathered the crisis of dumping and of funding, for, seven years later, in 1708, there are a couple of fragments of a court case in which the names of the co-partners are at last given; it is a reply to the Lords of the Treasury and Exchequer against the Collector and Stentmaster of the Cess, who was claiming the right to quarter troops in the Glassworks and to raise Cess. The merchants and proprietors of the Glassworks are named as George Earl of Cromartie (Lord Tarbat had been raised to Earl in Queen Anne's 1704 accession honours), James Balfour, James Blackwood and Allister [sic] Ainslie. They claimed under Acts going back to 1667 in favour of manufactories 'for the encouragement of such as shall employ any stock for or undertaking in any manufactory the same to be free of all publick and private burdens whatever' and quoted again their founding Act of 1698 which declared 'the said glassworks ane manufactory with all the freedom ... within this kingdom ... This freedom they peaceably enjoyed till of late they are not only stent [taxed] well for the manufactorie, houses and trades but also quartered upon by way of Common Billeting without regard to your Lordships ...' They then are obliged to give in a Bill of Suspension 'annent Cess in the years 1704, 1705 and 1707 [sic], which they hope their Lordships will ordain, seeing that ... sufficient caution is given'. The second document is the Reply made by James Cowan, Collector of the Cess in North Leith Parish against the Bill of Suspension claiming his public duty to enforce taxation (XIII.5 and 6). The last document certainly relating to the Glass works is also in Ainslie's own handwriting and marks a sad decline in his relationship with his co-partners. It is dated May 6 1708, and is

headed Answers to the Observations on Alex Ainslie's Accompts, Glassworks (XIV.91). Evidently the partners had queried much of his accounts. Under observation one, Ainslie rebutted a suggestion that as for two years past the glass works had made a great loss his salary should go back to £40 per annum. His answer was that it is 'plain to reason that in management of all manufactories the trouble is greatest when the profit is least, especially in glassworks and when the principal servants are under such indisposition as obliged the Clerk almost wholly to do that servants' duty'. Secondly, and even more drastically, it was resolved that Mr Ainslie should have no salary since the fire went out. 'Answer: Since Mr Ainslie when the fire is out is still at trouble and expense in the accompt of goods sold, broken glass bought for the company, persuing of debts, providing materials at home and from abroad for the goeing of the work, and seeking and securing of servants he presumes there can also be little ground for quarrelling of his article - Since he is founded on Ane Act for his sallary the same can never be diminished until he be Discharged of his Service.' The third objection was that the coals should not be charged above £4 Scots, to be backdated 'these two years past', as they could easily have been had for this price. Ainslie's long comment begins 'Every coall is not proper for this work' and in essential he said if the proprietors could find suitable coal at that price he would be delighted. It seemed that the proprietors had lost money in the venture, and confidence in their Clerk, who sounded ill-used. There is no more reference to the Glass works in these papers, though research may turn up much more in Edinburgh.

Soon after this George Mackenzie, Earl of Cromartie, returned to the north, in 1712. His co-partner, Blackwood, a merchant burgess of Edinburgh, was a creditor of the Earl's and sued his son for large sums after the Earl's death, but nothing is specifically said about glassworks, or any specific use for the money lent by Blackwood in several Bonds. A faint echo of the cargo of glass bottles to the Highlands may be heard in the time of George Mackenzie's grandson, who in 1745 went out for Prince Charles Edward. After the Annexation, when he was in the Tower, the contents of his mansion in Ross were sold. In the roup of the contents of Tarbat House in Easter Ross in April 1752 a number of local folk bought glass bottles. The laird of Scotsburn, for example, bought a gross bottles at 33/2d, Mr Robinson, Inchfuir, 1/2 gross bottles, and John McBain, tailor at Parkhill, 1/2 gross bottles (XX.161). So it is possible that any seventeenth century bottles or old fragments could be tentatively identified as belonging to Alex Ainslie's glassworks, if they turn up in Easter Ross.

Further speculations may be made: how did Lord Tarbat expect the bottles ordered in 1695 to be marked 'gif it be at all possible'; were they to be impressed with a seal or engraved with calligraphy after the current manner of Dutch green and brown glass bottles, for which there was such a vogue in the late seventeenth century? Secondly, what nationality were the glassworkers George Kemp, John and Isaack Dehines and Robert Liptwax? And what part did Thomas Hawwood of Dertford play? The word Dertford is indistinct. A London glassworks was situated in Deptford. Ainslie himself writes a rather English hand, and does not use as many Scots spellings as most of his contemporaries, he also calculates in sterling; could he (and Hugh McGlyn, glassgrinder) have gone abroad to learn their trades? Perhaps

other documents will now be identified. The biggest unanswered question is whether the glassworks survived Union taxation, unrestricted imports from England and the loss of the proprietors' confidence, or go into liquidation, to be refounded in Leith in the mid-eighteenth century. Did Alex Ainslie ever get his fire relit?

AN INTRODUCTION TO THE TECHNOLOGY OF MEAL MILLING IN SCOTLAND

by
John Shaw

(based on a lecture given to the SSIA conference on Food Production and Preservation, 24 October 1981)

Grain products, in the form of meal or flour, were the first 'processed' foods; in a Scottish context the products concerned were oat and barley meal. Milling, to break down the kernel, was only the last of several processes through which harvested grain had to pass prior to consumption. In very simple terms the others were as follows:

Threshing to separate the grain from the straw;

Winnowing to remove the chaff from the grain;

Drying to lower the moisture level enough for grinding;

Shelling to break open the husks;

Sifting to separate the husks.

At the start of the eighteenth century milling and shelling were the only mechanical processes based at the mills(1). From that time to the early 19th century the remaining processes were mechanised and, in most cases, integrated into the work of the mill.

Before looking at how this came about, and without wishing to digress too far, some of the historical background to water-powered milling has to be filled in.

Our earliest knowledge of water mills comes from two documents dating from about 2000 years ago(2). The two types of mill described differ from each other in the plane in which the water wheel is set, and, because of the context in which the references occurred, those mills with horizontal wheels have come to known as 'Greek' mills, those with vertical wheels as 'Roman'.

In Scotland, mills are recorded in charters as early as the 12th century(3). This is not to say that no mills existed prior to this time, but merely that no documentary evidence survives. Later references indicate that both horizontal and vertical types of mill

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(1) - Unless otherwise stated, the content of this paper is derived from Shaw, J P, The utilisation of water power in Scotland 1550-1750, Edinburgh University PhD thesis, 1979

(2) - See Curwen, E C, The problem of early water mills, Antiquity, 1944 XVIII

(3) - Roxburgh Mill and Ednam Mill both appear in Charters dated 1128: Chalmers, G, Caledonia, 4 vols, London 1810, I.135
Burleigh, J, Ednam and its Indwellers, Glasgow, 1912

were used in Scotland, though the relationship between them is fraught with difficulties(4).

By the late 19th century, mills with horizontal wheels were largely confined to the Northern Isles and Outer Hebrides(5). At that time similar mills were known to exist in Ireland and in Scandinavia, so a common Viking origin was put forward, a theory which tied in well with one of the terms used in Scotland - 'Norse mill' - and another, in Ireland - 'Danes' Mill' (6).

Since then, horizontal mills have come to light in widely scattered areas, from China to Portugal(7). If there is any unifying element in their distribution, it is upland, or otherwise the poor nature of the terrain in which they are situated.

There are now grounds to believe that horizontal mills once had a wider distribution within Scotland, possibly taking in the entire Highlands and Islands, though a recent suggestion that they were in widespread use in the Lowlands as late as the 17th century is quite without foundation(8).

With the horizontal mills of Lewis and Shetland, we are on firmer ground, for there is ample evidence of the machinery used and the buildings which housed it (Fig. 1). Both districts have local terms for parts of the mill, but for comparison with other mills, standard Scottish terms will be used here.

Water flows down the trough and onto the vanes of the horizontal wheel, causing it to rotate. The wheel itself stands on a bearing or bridge-tree and carries an iron spindle at its upper end. The spindle passes through the stationary bed stone and terminates in an iron rind which is set into indentations in the runner stone.

Grain is loaded into a hopper, from which hangs a wooden chute or shoe. A clapper - that is to say a stone, or block of wood - is fastened to the shoe and sits on the runner stone which in rotating agitates the clapper and, in turn, the shoe. Thus grain is shaken from the hopper, down the shoe and into the eye of the runner stone. In grinding, the grain works its way out to the circumference and after milling is gathered up from the millstone floor or stool.

The upper stone can be lichtened - that is to say raised or lowered - to vary the gap between the stones by means of a liftin tree, wedged in place at its upper end and hinged at its lower end to a bridge tree.

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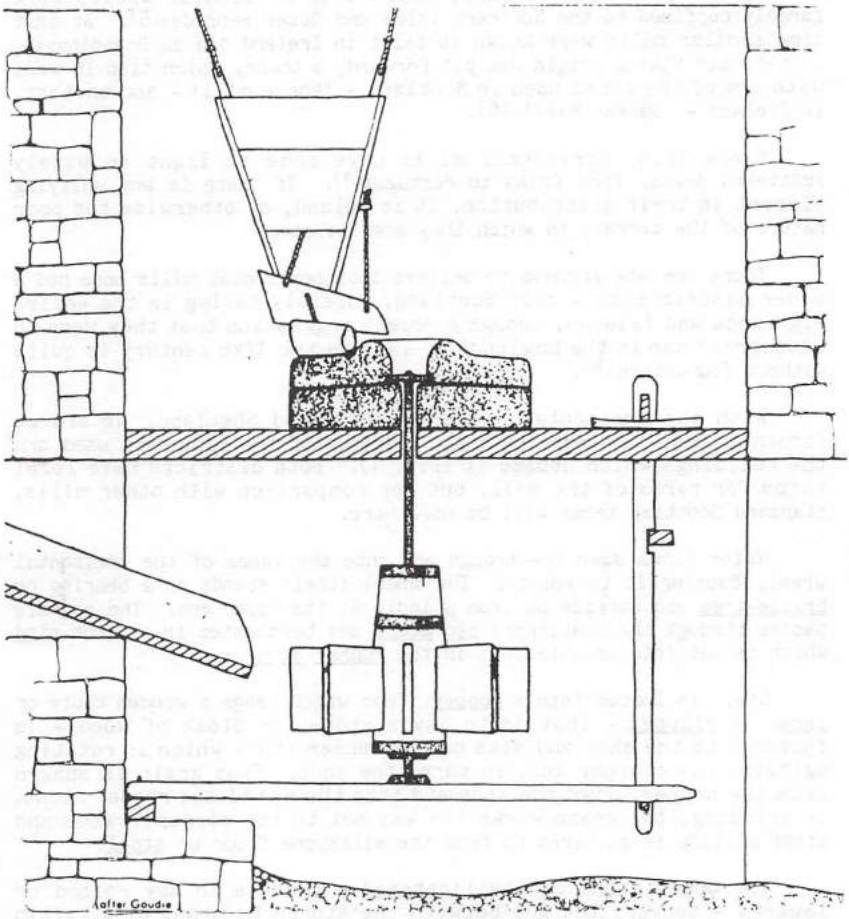
(4) - Curwen, op cit
(5) - Shaw, op cit, figures 1.2, 1.3
(6) - Goudie, G, The horizontal watermills of Shetland, PSAS, XX, 1885-6, 294
(7) - Curwen, op cit, 136
Jespersen, A (ed), Transactions of the Second 03-?^\\BhR^\CXA



Elevation of a typical horizontal mill, based on a drawing by Gilbert Goudie. The stones and the trough are shown in this section. C.1199.

Figure 1

In their internal layout, there is little to distinguish Shetland mills from those of Lewis. However, the materials used in their construction are noticeably different. From foundations to floor level, Lewis mills were dry stone built, with turf walls above this. As might be expected, even the best preserved Lewis mills have lost their upper walls (photograph 1). On the other hand, the Shetland mills were stone built throughout and much more substantial remains can be found (photograph 2).

One feature common to both horizontal and vertical mills is the provision of a water supply. On the small burns of Shetland or Lewis, several mills, interspersed with lades (ie water-courses) and gather dams (reservoirs) might be found within the course of a mile or so. Gather dams were also used by some vertical mills, although the time taken to replenish them was time lost for milling. On larger streams weirs (referred to in Scotland as damheads) could divert enough water into a lade to drive a mill. Seventeenth and early eighteenth century references suggest that such damheads were built of loosely piled boulders. During the eighteenth century these were replaced by more substantial ashlar damheads, though such materials were already being used on town mill dams in the seventeenth century.

Beside the damhead, a sluice-gate regulated the flow of water into the lade. Along its course, the lade might be widened out into a reservoir, regulated by a second sluice-gate. Before reaching the wheel, the lade split into two channels, one leading to the wheel itself, the other to the tail lade beyond the mill. The flow of water into one or other channel was regulated by a draw-board, controlled from within the mill by a long pole or draw-tree. The draw-tree could be hung vertically across the wheel channel or hinged horizontally to close across either channel.

The vertical water wheels which drove most Scottish meal mills varied considerably in their design. Such wheels are classified on two systems - in terms of the point at which water makes contact with them, and in terms of their construction.

The first is summarised in Figure 2. Under the second system, most wheels prior to the eighteenth century had flat wooden boards set around their circumference (starts) with similar boards (haavs) projecting at right angles. This type of construction was associated with breast-shot wheels; often the stone-work of the lade was built up to follow closely the outline of the wheels on either side and on its circumference so as to minimise water loss. Generally speaking, the wheels of this type surviving today have their starts and haavs mounted on a double ring. In a more unusual form, found in the north-east only a single ring is used: as yet there is insufficient evidence to say whether this is a survival of a once more widespread type or merely a local variation of comparatively recent origin(9).

Under this second classification, the other major category of wheel is the bucket wheel in which the sides of the wheel are

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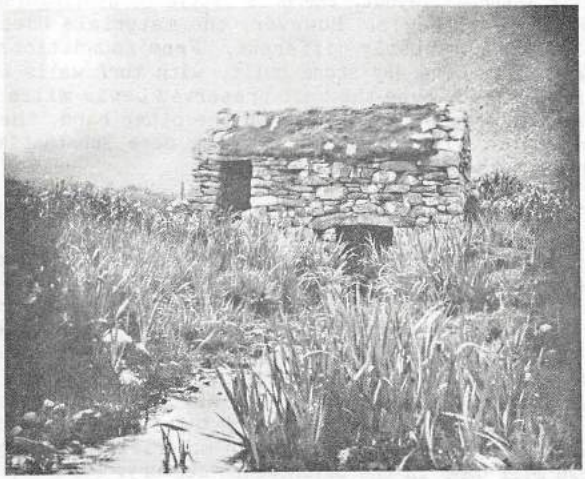
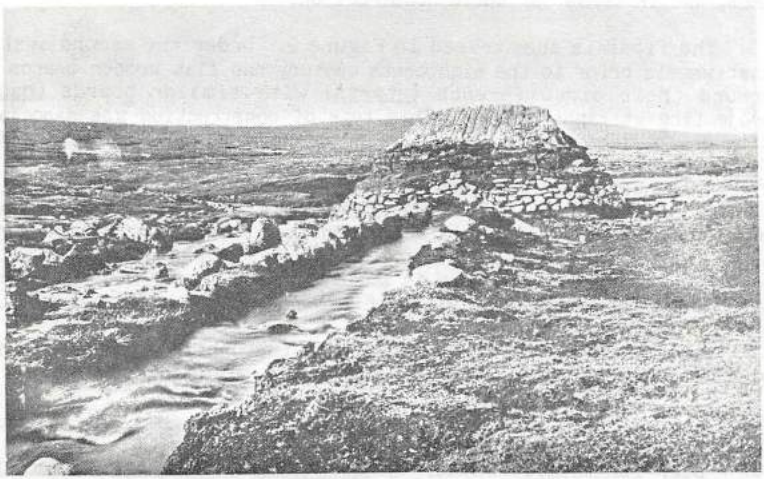
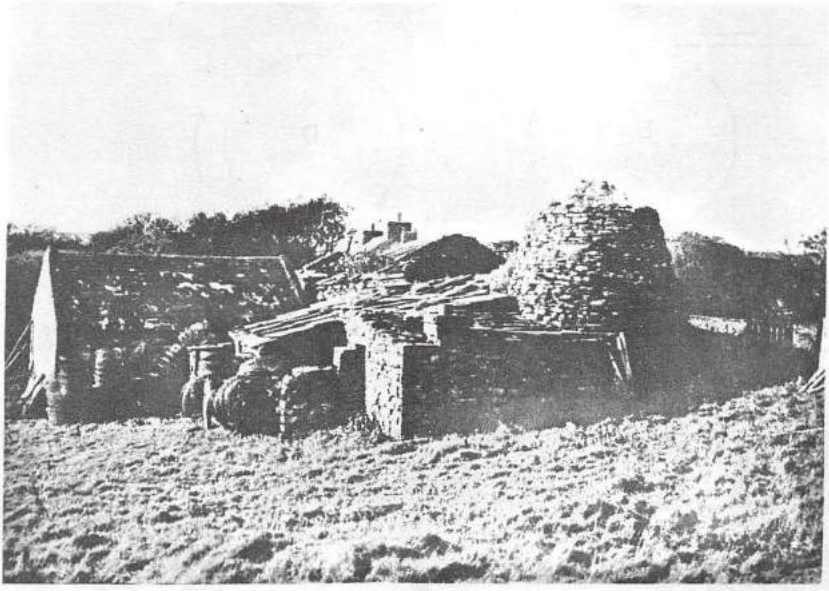
(9) - See, for example, Hume, J, Industrial Archaeology of Scotland, vol 2



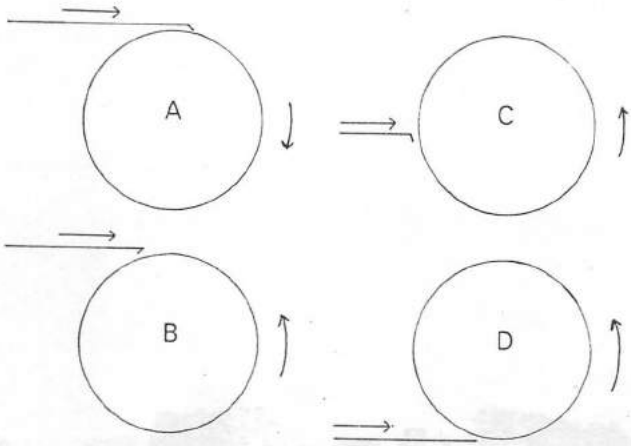
Above: A small Norse mill of the Shetland type, with the tailrace in the foreground. The horizontal waterwheel (tirl) can just be seen in the opening on the right.

Below: The Norse ('Black') mill at Arnol, Lewis, c.1900, with the headrace in the foreground. Note the turf walls.





A small Orkney steading, with corn-drying kiln on the right.



A - Overshot; B - High Breast; C - Low Breast; D - Undershot

Figure 2

Figure 3

Figure 4

heightened to form shrouds and the starts extended to completely enclose the circumference of the wheel. All overshot and pitchback wheels have buckets - buckets are also found on some breast shot wheels. Overshot bucket wheels have been used in Scotland since at least the early 18th century(10), wherever adequate falls of water were available. However, it was not until the late 18th century, when John Smeaton's experiments proved them more efficient than breast shot wheels, that they came into widespread use(11).

The eighteenth century also saw the start of a change in materials, from wood to iron. It was again Smeaton who, in 1779, first used cast iron for a water wheel shaft and, in 1780, wrought iron for buckets(12). By the early nineteenth century, all-iron water wheels were being built, but wood continued to be widely used for certain parts, notably the buckets(13). During the nineteenth century further design developments took place(14), but, as they were not generally applied to meal mills, they need not concern us here.

In dealing with the development of water wheels, I have moved forward to fairly recent times. To return to the process of milling itself, we must retrace our steps to the seventeenth and early eighteenth centuries when the work of Scottish grain mills was, like that of the horizontal mills, restricted to shelling and milling.

Seventeenth century illustrations of Scottish grain mills are extremely rare. An illustration, in John Slezer's 1693 Theatrum Scotice shows the Heugh Mills at Dunfermline - larger, though hardly more substantial than the turf walled, thatched mills of Lewis. The mills have two separate round, conical roofed kilns (Fig. 3).

If we could have seen inside one of these 17th century grain mills, the chances are that we would have seen something like the scene in Figure 4. Although this example is English(15), we know from contemporary mill inventories that this gives a fair, if somewhat compressed, impression of what existed in seventeenth century Scottish mills(16).

Harking back to horizontal mills, there are several familiar elements here - the hopper shoe and clapper, the one pair of stones, driven from below by a short metal spindle and the floor or stool on which the millstones sit. From here onwards, however, there are crucial differences. Where there was a great horizontal water wheel

(10) - See, for example, Scottish Record Office (hereafter SRO), RHP 3847, Clackmannan Coalworks, 1713
(11) - Smeaton, J, Reports of the late John Smeaton, 3 vols, London, 1812
(12) - Wilson, P N, Water power and the Industrial Revolution, Water Power, August 1954, 312
(13) - Monteath, R, The Forester's Guide and Profitable Planter, Edinburgh, 1824, 193-4
(14) - Shaw, op cit, chapter 29, 'Water power in the age of steam 1830-1870', 733-738
(15) - Based on a 17th century English edition of Vitruvius
(16) - See, for example, SRO, GD16/29/120, Comprisements of the Mylne of Banff, 1680

there is a wooden lantern wheel or trundle geared to a cogged pit-wheel and linked to a vertical water wheel by an axle tree. Minor differences include the hoops or rings enclosing the millstones - for with water confined to the outside of the building and with easy access from below, meal could be channelled down a chute at one point on the circumference of the stones to be received in a container below.

Gearing of this type stayed in use until the early 19th century; the writer knows of no surviving examples in Scotland but would be interested to hear of any. The new types of gearing, which took its place, used iron instead of wood.

Although we cannot say with any certainty who first used toothed cast-iron gearing in mills, the earliest practitioner seems to have been John Smeaton, who incorporated cast-iron gears with wooden teeth into a design for Brook mill, Deptford, in 1778(17). In 1784 John Rennie used cast iron shafts and gearing throughout for the Albion Mills, London(18). Within a few years the new gearing was being applied in Scotland. Figure 5 shows the sort of arrangement which the new cast iron gearing produced. The pit wheel is still there, but with cast iron cogs instead of wooden ones. The face of the wheel is set at an angle - or bevelled. Although we do not know for certain, the evidence suggests that bevelling was a late eighteenth century introduction. By putting another bevelled wheel, the wallower, on the upright shaft, the plane of the drive could be changed from horizontal to vertical.

Other changes have to be explained. The spindle which drives the millstones is now separate from the main upright shaft. A geared cast-iron pinion takes the place of the trundle and this is geared not to the pit wheel but to an extra wheel on the upright shaft - the spur wheel, which often has wooden cogs. With this more complicated system, more than one pair of stones could be run off the same upright shaft. The system also offers more scope for using the power from the water wheel to run other machines.

The simple grain mills of the seventeenth and early eighteenth centuries were equipped only to shell and mill grain. All other processes were performed by hand, either at the mill or elsewhere. From the late eighteenth century all this began to change.

The kiln in photograph 3 is not dissimilar to the Heugh Mills kilns; however, it is not at a mill but on a farm at Kirbister, Orkney. Nowadays, farm kilns are the exception to the rule - few remain outwith Caithness and the Northern Isles. Two hundred and fifty years ago drying kilns were, as a rule, situated on farms. In those days the exception was the south east where, as we know from

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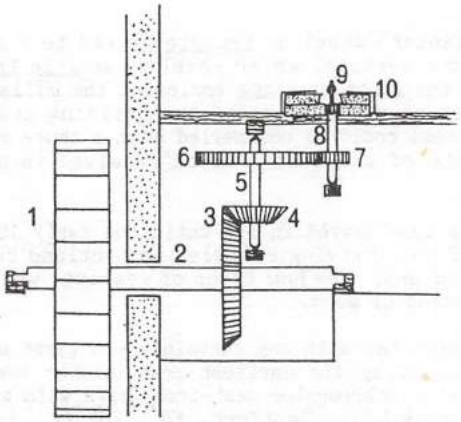
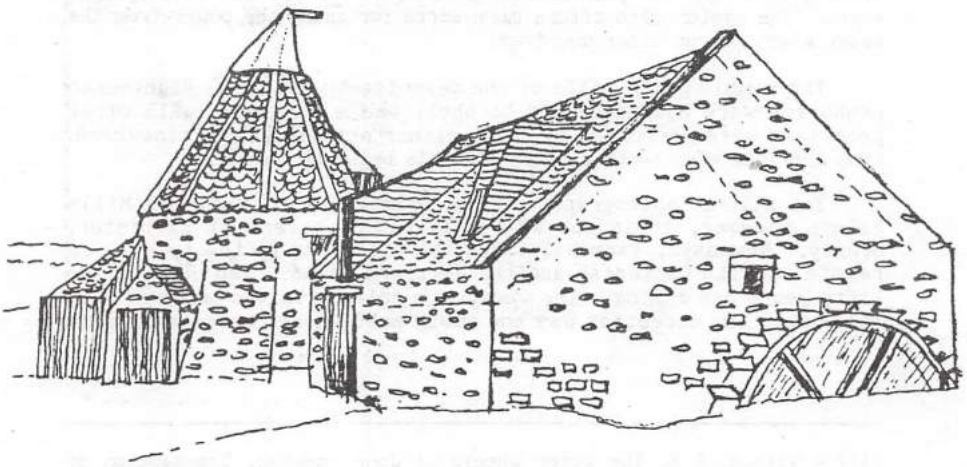
(17) - Wilson, P N, The water wheels of John Smeaton, Transaction of the Newcomen Society, XXX, 1955-7, 33

(18) - Boucher, C T G, John Rennie 1761-1821: The Life and Work of a Great Engineer, Manchester, 1963, 83



Layout of improved cornmill gearing. 1 - Water wheel; 2 - axle; 3 - pit wheel; 4 - wallower; 5 - main upright shaft; 6 - spur wheel; 7 - stone nut (pinion); 8 - stone spindle; 9 - damsel (feeder); 10 - millstones within wood or metal frame. Not shown - disengaging mechanism for pinion to and from stones.

Figure 5



Preston Mill, East Lothian (1962). S.1990.

Figure 6

Figure 7

documentary sources, mills had their own kilns(19). Preston Mill, near East Linton (Fig. 6), has a detached round kiln which in shape and roof-form, at least, resemble that at Heugh Mills. Another now ruinous mill at Luffness, East Lothian, had a similar kiln(20). Originally, the separation of mill and kiln was probably a fire precaution - early kilns had a drying platform of straw supported on wooden beams or kiln ribs.

In the late eighteenth and early nineteenth centuries kilns became integral parts of newly built or rebuilt mills. At the same time there was a change of materials, with earthenware platform tiles supported on iron ribs; by about 1800, in central Scotland, tiles were giving way, in turn, to wrought iron sheets or cast iron plates(21).

Figure 7 is taken from the 1893 catalogue of an Edinburgh millwrighting firm, Alexander Mather & Sons(22). Besides showing the sort of cast-iron kiln plates in use at that time, it illustrates, in cross-section, the kiln itself. The fire is set in the horizontal tunnel in the bottom right hand corner. Above it a flue spreads out to take up the entire width of the kiln. The flue terminates in a perforated drying platform and at the very top is a vent. Kiln design, and particularly the style of kiln vent, vary from region to region. Bowended kilns (Fig. 8) are exclusive to Angus and East Perthshire. In west central Scotland, low, louvred vents, not unlike those on dairies, were common (Fig. 9). Part-slated vents of the type shown in Figure 10 have been termed 'Aberdeenshire vents', though their distribution is somewhat wider than the former county. The extended wind vent turns the open side of the cowl down-wind. Pyramid-roofed kilns (Fig. 11) are more usually associated with maltings, but in parts of east and north east Scotland the same type of roof is also found on mill kilns. Tall, straight sided vents (Fig. 12) are peculiar to Caithness and Orkney.

The first winnowing machine or fanner in Scotland was that brought from Holland by James Meikle, wright at Saltoun Mill, East Lothian, in the early 1700s(23). For whatever reason the machine does

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(19) - Based on research. One early reference, in the Exchequer Rolls for 1575, refers to a recently built mill, granary and kiln, lying contiguous at Wester Gammelshiel, East Lothian. Exchequer Rolls, XX, 484

(20) - Photograph (Ref. C.4458) in Country Life Archive, National Museum of Antiquities of Scotland

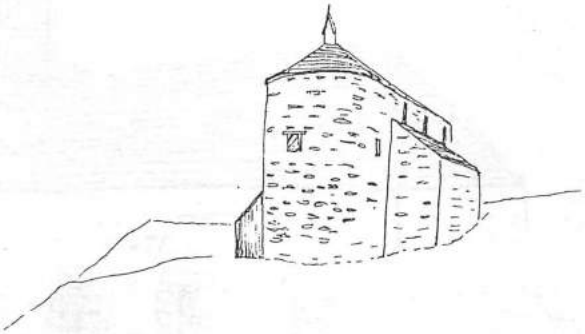
(21) - Headrick, J, General View of the Agriculture of the County of Forfar, London, 1814, 226
Robertson, J, General View of the Agriculture of South Perthshire, London, 1794, 51
(Old) Statistical Account of Scotland, XI, 602, Callander, Perthshire
Ibid, XVIII, 349, Kippen, Stirlingshire

(22) - In the possession of the National Museum of Antiquities of Scotland

(23) - Sinclair, J, General Report of the Agricultural State and Political Circumstances of Scotland, 3 vols and Appendix, 2 vols, Edinburgh, 1814, 232

Figure 8

Bow-ended kiln at Barrie, Angus (1905). C A Branch-Carter collection. C.4421.



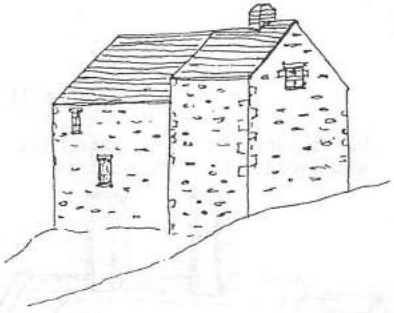


Figure 9

Mill with west-central type kiln at Mill of Beith, Ayrshire (1904). Branch-Carter. C.4467.

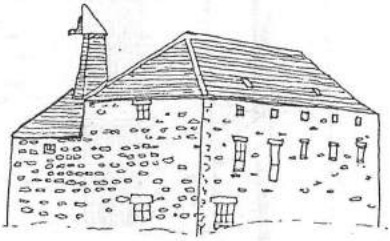


Figure 10

Mill with Aberdeenshire-type kiln vent.

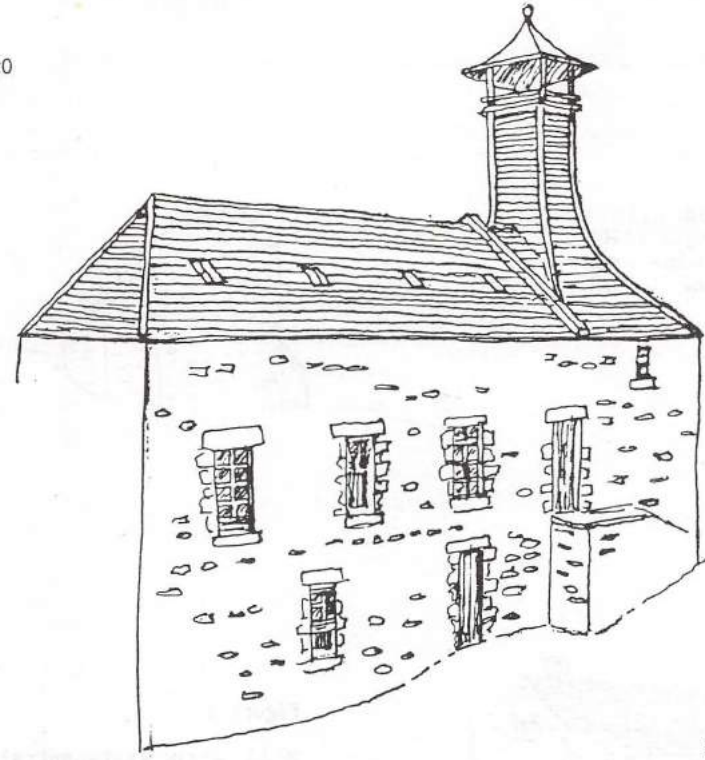


Figure 11

Distiller-type vent, Den Mill, Auchenblae, Kincardineshire

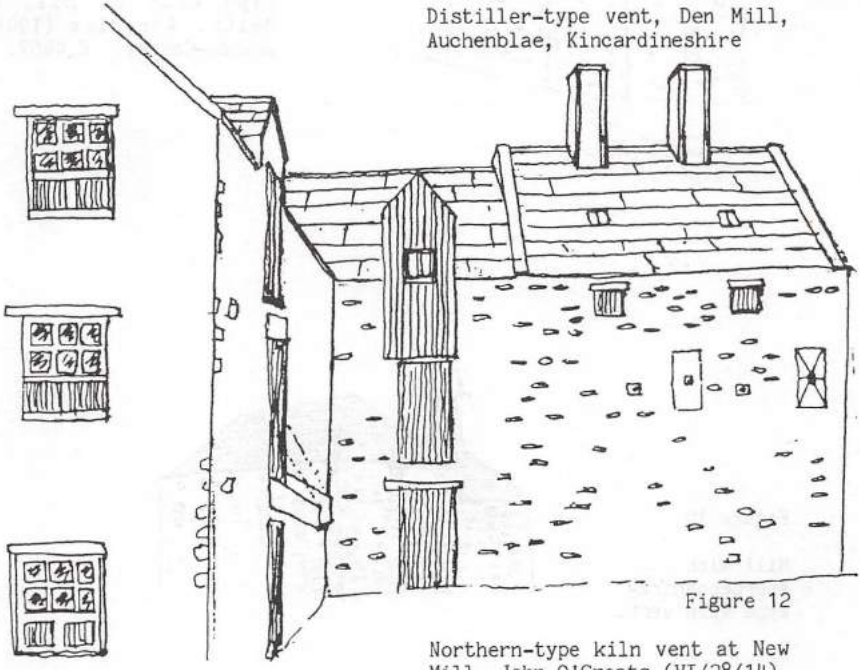


Figure 12

Northern-type kiln vent at New Mill, John O'Groats (VI/28/14).

not seem to have caught on until 1737, when Andrew Rodger, a Roxburghshire farmer, built a set of fanners based on a model brought from Holland by Douglas of Canvers(24). In the 1790s his family's firm were still producing fanners at the rate of about 60 sets per year(25). In 1768 James Meikle's son, Andrew, took out a patent on a fanner which included mechanical sieves for sifting(26). In some cases fanners were set up in corn mills: in Peeblesshire, for example, the first set was bought by a group of nine farmers for £2.50 and put to work at Flemington Mill, Newlands, in 1746(27). As a rule fanners were hand-driven and used on farms, but the combined fanners and sieves did find another use in grain mills. Between shelling and milling, the inner husks and dust had to be separated from the kernels. Shelled grain passed over a sieve hung from leather straups and driven by a wheel on a cranked shaft. From the sieve, husks and kernels dropped into the fanners through a hopper. One end of the fanners housed a set of rapidly revolving wooden vents which created a strong draught. Falling through this draught, the husks or Sids were blown out while the heavier kernels fell straight down and went on for milling.

Mechanical sieves found other applications in separating out any kiln dried grain which was too long, too short or too light for milling, or to grade oat or barley meal after milling. Any particles which were too large go back to the fanners and are re-milled. With winnowing and sifting mechanised, the only remaining manual process was threshing. The eighteenth century saw several attempts to devise a machine which would perform the same function as the flail(28). It was Andrew Meikle's 1786 machine which was eventually to succeed(29). As with fanners, these were usually situated on farms, driven by hand, by water, horse, wind and, from about 1830, by steam power(30). Some were installed in grain mills - as at Ormiston Mill, East Lothian, where the threshing machine served the needs of the village(31).

With all the processes mechanised, there was still a fair amount of manual work to do about the mill - grain, at various stages in processing, had to be carried about and millstones had to be lifted for refacing. Sack hoists began to be used in the early nineteenth century. By extending the main upright shaft into the mill attic and taking off a horizontal drive shaft, a hoist could make use of the power of the water wheel. Trap doors in mill floors gave a clear run for sacks up to the top floor of the mill if necessary. With the flaps closed again, sacks could be lowered onto whichever floor they

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(24) - (Old) Statistical Account of Scotland, VIII, 521, Hawick, Roxburghshire
(25) - Ure, D, General View of the Agriculture of the County of Roxburghshire, 1794, 52
(26) - Smiles, S, Lives of the Engineers, 5 vols, London, 1874, Smeaton and Rennie, 203
(27) - Chalmers, W, History of Peeblesshire, 1864, 235
(28) - Shaw, op cit, 211-212, 215
(29) - Ibid, 215 et seq
(30) - Ibid, 219-221
(31) - New Statistical Account of Scotland, II, 145, Ormiston, East Lothian

SCOTTISH

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WIRE-WORKERS AND WEAVERS, MILLSTONE BUILDERS,

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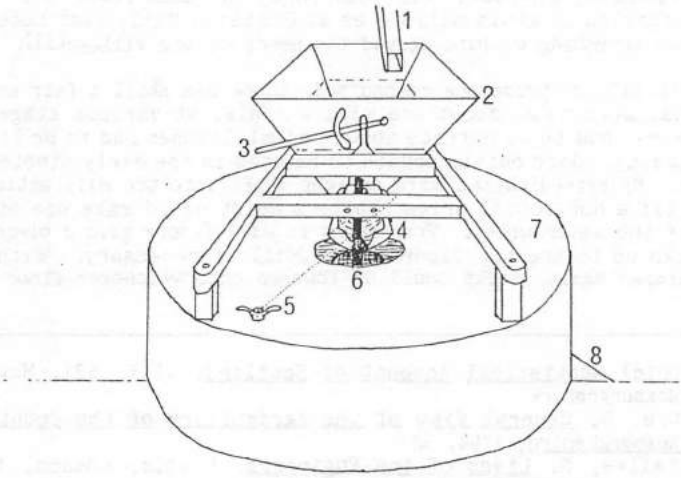
Figure 13



Feed mechanism to millstones: 1 - Spout from storage bin; 2 - Hopper; 3 - Hopper outlet control; 4 - Shoe; 5 - Shoe end height control; 6 - Feeder; 7 - Millstone frame; 8 - Feed from millstones (eye of the mill).

Figure 14

ALEXANDER MATHER & SON.

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MILLSTONE CRANES,

For Lifting Runners.

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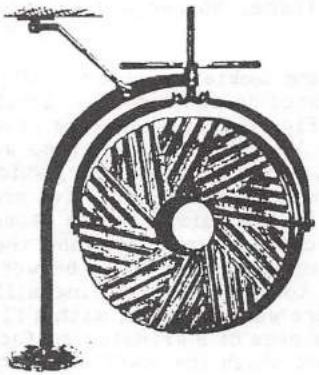

	£	s.	d.
To suit stones, 4 ft. 6 in. diameter,	8	10	0

MAHOGANY STONE STAFFS,

Best Make.

	£	s.	d.	
4 ft. 6 in. long . .	1	10	0	each.
5 ft. 0 in. long . .	1	13	0	,,

STAFF PROVERS,

Cast Iron, with Planed Surface.

	£	s.	d.	
4 ft. 6 in. long . .	2	5	0	each.
5 ft. 0 in. long . .	2	15	0	,,
Mahogany case for do. .	1	0	0	
Deal case for do. . .	0	10	0	

BEST STEEL MILL PICKS, &c.

1/4 per lb.

WOOD HOLDERS.

2/6 and 3/6 each.

STEEL HOLDERS,

With Wood Handles.

5/6 and 7/- each.

IMPROVED JACKSTICKS,

With Adjustable Level and Pointer.

£1 5 0 each.

ENGINEERS AND MILLWRIGHTS, EDINBURGH.

Figure 15

were needed on. By the late nineteenth century more sophisticated devices, suited to the bulk movement of grain, had come into use. Metal buckets mounted on continuous belts could lift grain or meal vertically; worm conveyors could move it up lesser inclines. With sufficient power, all these could be run off a water wheel.

Millstones, once quarried locally, were being supplied by specialist firms by the late nineteenth century. Figure 13, taken from an 1854 Directory(32), shows millstones being assembled at an Edinburgh works. In use, the stones would be hidden within a wooden frame, with only the feeder (a more recent version of the clapper, fastened onto the top of the spindle) protruding (Fig. 14). When the stones needed to be refaced, the frame, hopper and shoe could be lifted off together.

In some mills, a simple block and tackle was used to lift off the runner stone, but a more sophisticated device, known as a millstone crane, was also widely employed (Fig. 15). Cranes were pivoted at floor level and above, to a beam. When in use, the crane would be swung into position over the stones, and the vertical bar, which could be screwed up or down, lowered to the requisite height. Two arms were fastened onto the crane and onto fixing points on the stone, the screw was once more raised, the crane swung round and the stone lowered so that it, or the exposed bedstone, could be worked on. Figure 15 also shows the principal tool used in refacing millstones. The stone staffs mentioned here were wooden beams, with a flat edge which could be used to test the flatness of a grinding surface. The staff prover was a metal bar, against which the staff was checked for accuracy.

Much more could be said - about later types of machinery, about the buildings which housed it and about the place of the mill and miller in rural economy and society(33). If, by taking a view of technology alone, the outcome has been one-sided, perhaps recognition of the crucial role of the miller himself may go some way towards correcting the imbalance.

It was the miller who inherited generations of skill, dating from the time when mills were simple, humble buildings, through the great technological innovations of the eighteenth and nineteenth centuries to the present day when, sadly, both mills and millers have all but vanished from the Scottish countryside.

The ever decreasing stock of working mills is a monument not so much to an obsolete or even picturesque technology as one to the millers whose lives were so intricately involved with its use. Should they ever die out completely we will be much the poorer for it.

[John Shaw, of the Scottish Country Life Section of the National Museum of Antiquities, has a book in publication on Scottish water-power]

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(32) - NMAS Country Life Archive
(33) - See Shaw, op cit, chapters 2 and 10

SCOTTISH BUILDINGS FOR MEAT AND FISH PRESERVATION

A Preliminary Survey

by
Bruce Walker

This article, based on a lecture given to the SSIA Conference on Food Production and Preservation on 24th October 1981, surveys work so far carried out on the recording and classifying of installations(1) for preserving meat and fish by drying and(2) for preservation by cold.

I Preservation of Foodstuffs by Drying and Curing

The various processes of meat and fish preservation in Scotland have already been discussed in print(1) but many of the methods described would leave little specific evidence in domestic situations other than in recipe books, household accounts and inventories of household equipment. Methods such as salting, mild cure salting, brine pickle, sweet pickle, vinegar pickle, laying in fat, laying in vinegar, preserving by burying, etc, all took place in comparatively anonymous surroundings and although a room or special place might have been set aside for the process, there are normally no upstanding remains with specific characteristics. As these processes developed into industries the evidence becomes more positive, but even here the evidence can be clouded by adaptation of existing premises to new requirements

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(1) - WALKER, Bruce, 1976, Keeping it cool, The Scots Magazine, New Series, 105.6, 563-572
WALKER, Bruce, 1980, Keeping meat without deep freezing - 1, Scottish Home and Country, May 1980, 285-288
WALKER, Bruce, 1980, Keeping meat without deep freezing - 2, Scottish Home and Country, June 1980, 352-355 and 359
WALKER, Bruce, 1981, Meat preservation in Scotland, Royal Society of Health Journal, 101.1, 19-28
WALKER, Bruce, 1981, Commercial Ice Houses connected with the Scottish salmon fisheries: a preliminary survey, Duncan of Jordanstone College of Art, Dundee (for private circulation - may be examined at the library, DJCA, Perth Road, Dundee)
Forthcoming -
WALKER, Bruce, 1981-?, Commercial Ice Houses connected with the Scottish salmon fisheries: a preliminary survey and gazetteer, Scottish Vernacular Buildings Working Group, Dundee
WALKER, Bruce, 1982-?, The Scottish fresh salmon trade and its effect on east coast communications in the eighteenth and early nineteenth centuries, Proceedings of the Fourth International Ethnological Food Conference, Stainz, Austria, 1980, Graz
WALKER, Bruce, 1983, Scottish methods of preserving white fish, Dublin

(2) - GRANT, William, & MURISON, David, 1931-1978, The Scottish National Dictionary, IX, Edinburgh, 533

One of the oldest and most primitive methods of meat and fish preservation was that of drying in the air. This was particularly suitable for fish such as skate and dogfish but could be applied to any form of meat. Many houses in coastal situations still have fish haiks - a triangular timber frame with projecting nails on which split fish were hung to dry. Often the process was carried out even without this simple equipment and photographs can be found showing split fish placed on the eaves of a thatched roof or on the pebbles of a beach or even hung on the washing line, but these methods were also used to dry salted fish.

In Shetland, air dried meat was known as Vivda(2), the meat being dried in special buildings called Skeos(3).

> A skeo is a small square house formed of stones without any mortar, with holes through which the air may have a free passage: for which purpose the building was erected on a small eminence, being at the same time protected from the rain by a roof. It is not long since it was customary before using beef or mutton, not to salt it, but to hang it up in one of these places, until the wind, by which it was penetrated, should, at the necessary degree of temperature have so completely dried the meat as to preserve it from putrefaction ... Fish was also hung up unsalted in a skeo, but in this case a slight degree of putrefaction was promoted(4).

Although skeos were well documented none appear to survive and enquiries have failed to locate any illustrations of these once commonplace buildings. In the Faeroe Islands where similar methods of meat preservation were used, the flesh of fish, sheep and pilot whale was dried in an open air food store. One such foodstore had been moved to the open air museum, Frilandsmuseet, at Sorgenfri, Copenhagen. This particular building has a loose rubble wall to the back whilst the other three walls are constructed as a light timber frame covered with vertical timber slats with an air space between each. The timber roof is covered externally with green turf. The meat being dried was hung under the ties of the roof couples and the floor space was used for barrels, creels, fowlers' nets, whale spears and fishing floats. The building is secured by a timber lock(5).

Skeos should not be confused with meat safes which were essentially storage spaces in the open air which were protected from flies by a zinc mesh.

Vivda could also be prepared in tidal sea caves(6), as could dried fish(7). When prepared in a sea cave the vivda and fish

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(3) - Ibid, VIII, 271
(4) - HIBBERT, S, 1822, A Description of the Shetland Isles, 417 & 563
(5) - ULDALL, Kai, 1972, 16 - Food store from Viderejde on the island of Viderø, Frilandsmuseet: English Guide, Copenhagen
(6) - SHIRREFF, J, 1814, General View of the Agriculture of the Orkney and Shetland Isles, 61
(7) - MACKAY, John George, 1962, The Story of Island Roan, 10

remained pliable and had a particularly pleasant flavour.

The preserving of seabirds in ashes was commonplace on some of the islands of the west coast of Scotland in the eighteenth century. The birds were stored in stone huts, wrapped inside a cow's hide. Sometimes the ash of burnt sea ware or peat was used to assist in the preservation. The earliest reference to this practice is on the islands of Bernera and St Kilda in 1697(8). Other early references to this practice on St Kilda are dated 1752(9) and 1765(10). These small stone huts or cleits may still be seen in the vicinity of the township of St Kilda.

The two most common early methods of preserving meat and fish were salting (including mild cure salting, brine pickle and sweet pickle) and smoking. These methods could be applied individually or combined to produce a particular flavour.

Dry salting was preferred for finer cuts of meat and the type of meat or fish determined the length of the salting process. Most meats were removed from the salt to be dried either in the open air or indoors. Salt fish could be dried on a pebble beach or on timber staging outdoors. Removable canvas awnings were often provided with the staging as a protection from sudden showers(11). Fish such as herring were packed in barrels, four barrels of salt being used for the packing of twelve barrels of herring.

In seventeenth and eighteenth century Scotland it was almost impossible to store and dry either meat or fish in a dwelling house without its obtaining a smoky flavour as at that time the majority of houses were without chimneys and the smoke simply escaped through the thatch or out by the entrance door on a shuttered window opening. Meat, mutton, hams, poultry and fish were all hung in the roof space, sometimes on hooks in the roof timbers, sometimes on temporary supports or staging and sometimes on purpose-made haiks over the hearth area.

The hanging chimney or 'hingin' lum' appears to have been introduced to the Scottish nobility in the late seventeenth century as a kitchen feature specifically designed for the controlled smoking of meats, hams and sausage. Lady Strathmore found it worthwhile to note the construction of such a chimney in her recipe book started in 1666 and added to in the first quarter of the eighteenth century(12). Wattle chimneys appear for the first time in appraising tickets for

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(8) - MARTIN, N, 1716, A Description of the Western Isles of Scotland, 94

(9) - BUCHAN, Alexander, 1752, A Description of St Kilda, 8

(10) - MACAULY, K, 1764, A History of St Kilda

(11) - SMITH, W Anderson, 1883, Curing and preserving fish at home and abroad, in David Herbert, editor, Fish and Fisheries, 1882, 98
DONNACHIE, I, HUME, J, & MOSS, M, 1977, Historic Industrial Scenes, Scotland, plate 67, showing a fish curer's yard with fish drying on a timber staging in the foreground and finnan curing sheds in the background; also plate 68 - packing dried fish for export

(12) - NRA Scotland 885/244, Strathmore papers

Strathmore tenants' houses in 1711 but do not become commonplace until the late eighteenth century (13).

The Scottish National Dictionary describes the 'hingin' lum' as

> a wide old-fashioned wooden chimney which descended from the roof above the fire to direct the smoke out through the chimney hole(14).

This seems unlikely as all the complete 'hingin' lums' recorded are either bracketed off a wall or built off the cheeks of the fireplace opening, and in no way 'hung', but most are provided with spars, ropes or other devices for hanging items inside the flue and many recipes refer to this practice.

This type of chimney could be turned to commercial advantage in many areas. Where the mansion house was not fitted with this apparatus, it was, and in some cases still is, the practice to send hams to nearby tenants to be smoked in their chimney. In Dumfriesshire, Robert Henderson, farmer, carried on a bacon curing business in the late eighteenth century. He wrote

> I practiced for many years the custom of carting my flitches and hams throughout the country to farmhouses, and used to hang them in their chimneys and other parts of the house to dry. Some seasons to the extent of 500 carcases. This plan I soon found was attended with a number of inconveniences, having to take along with the bacon pieces of timber, to fix up in the different houses, for the purpose of hanging the flitches and hams. For several days after they were hung up, they poured down salt and brine upon the women's caps and now and then a ham would fall down and break a spinning wheel, or knock down some of the children; which obliged me to purchase a few ribbons, tobacco, etc, to make up peace(15).

The disadvantage of this system was that the bacon had to hang awaiting orders and often became overdried thereby losing a great deal in weight. Henderson stopped using the method before the end of the century but commented on the fact that others were still using the method in 1811(16).

To improve this business, Henderson:

> contrived a small smoke house, of a very simple construction. It is about twelve feet square and the walls about seven feet high. One of these parts requires six joists across, one

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(13) - WALKER, Bruce, 1981, op cit, 23
(14) - GRANT & MURISON, 1931-1978, op cit, 148
(15) - DOUGLAS, Loudon M, 1893, Manual of the Pork Trade: A Practical Guide to Bacon Curers, Pork Butchers, Sausage and Pie Makers, 91-92
HENDERSON, Robert, 1814, A Treatise on the Breeding of Swine and Curing of Bacon, Annan, 51
(16) - Ibid

close to each wall, the other four laid asunder at proper distances. To receive five rows of flitches they must be laid on the top of the wall. A piece of wood strong enough to bear the weight of one flitch of bacon, must be fixed across the belly end of the flitch by two strings, as the neck must hang downwards. The piece of wood must be longer than the flitch is wide, so that each end may rest upon a beam. They may be put so near to each other as not to touch. The width of it will hold 24 flitches in a row, and there will be five rows, which will contain 120 flitches. As many hams as may be hung at the same time above the flitches, continued in the best manner one can. The lower end of the flitches will be within 2 1/2 or 3 feet of the floor, which must be covered five or six inches thick in sawdust, which must be kindled at two different sides. It will burn but not cause any flame to injure the bacon. The door must be kept close, and the hut must have a small hole in the roof, so that part of the smoke may ascend. That lot of bacon and hams will be ready to pack up in a hogshead to send off in eight or ten days, or a little longer, if required, with very little loss of weight. After the bacon is salted, it may lie in the salt-house as described until an order is received, then immediately hang it up to dry(17).

A description of 1893 states that a commercial smoke house was

most conveniently placed near the door of the cellars and is usually a plain brick structure, made according to the amount of smoking to be done. Smoke ovens of a portable nature were made after the design shown (figure A).

The dimensions are: 7ft high, 3ft broad, and 2ft deep. The advantage of a small apparatus of this kind is that it can be freely moved about. The flue shown on top can be led into any chimney near at hand, or directly through the wall if no chimney is convenient. It is made entirely of sheet iron: but this apparatus is only suited to a small trade and the necessities of a large trade must be met by building smoke ovens, usually of brick, although that is immaterial. All that is necessary is to provide a building about 6ft broad by 10ft high and 7ft deep. If larger space than this is sometimes required, it will be found much more advantageous to build a new oven alongside, of the same size, as it has been found by actual experiment that the best results are produced by limiting the space as indicated...(18)

The only meat processing building located which can be dated to the nineteenth century is a private slaughterhouse and butcher shop at Montquhanie, Kilmany, Fife. This slaughterhouse and butcher shop are situated in the vaulted ground floor rooms of Montquhanie Castle. The castle was a late sixteenth century structure with seventeenth and eighteenth century additions and alterations, vacated circa 1820 when

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(17) - Ibid, 51-53
(18) - DOUGLAS, Loudon M, 1893, op cit, 14-15

the present mansion house was completed. The upper portions of the castle were deliberately demolished to provide a romantic ruin in the grounds of the mansion house. The slaughterhouse/butcher shop complete with smoking kilns were formed in the two vaulted ground floor rooms, new access to each room being provided to the north. The slaughterhouse measures 430cm by 440cm and has a 30cm diameter log running lengthwise under the crown of the barrel vaulted roof possibly to provide a beam from which carcases could be hung for skinning, gutting and splitting. The butcher shop measures 480cm by 440cm and is also vaulted. Two former openings in the south wall have been converted into smoke rooms. The larger one measures 186cm by 170cm internally and has a brick outer face projecting 50cm into the main chamber. The smaller smoke room is 106cm by 95cm and is entirely contained within the thickness of the original wall. Both of these smoke rooms appear to have been vented through the vault into the space which was formerly the great hall but these openings have now been rather crudely blocked with flagstones. The larger room has a timber ceiling under the stonework. Each smoke room has joists slightly below the ceiling level. The larger room has three joists, the side joists are each fitted with six hooks and the central one has eleven. In the smaller smoke room there are two joists fitted with blacksmith-made nails, now corroded and barely projecting from the face.

The slaughterhouse appears to have been used once a year for the slaughter of Highland cattle brought to Fife from Balquhidder, Perthshire, as part of an annual cattle drive(19). The cattle were slaughtered by a butcher from Cupar brought in especially for this purpose. Presumably he also butchered, pickled and smoked the meat as required by the household.

In the early nineteenth century, it was normal for cattle to be brought from the Highlands to the Lowlands in the autumn of each year and newspaper advertisements in the Dundee Advertiser show that Dempster of Dunnichen organised an annual drive of cattle from his Sutherland estate of Skibo to his Angus estate of Dunnichen where they were sold for immediate slaughter or for further fattening(20). Perrin points out that the Scottish droving business reached its peak about 1835(21).

The chances of a small commercial or private slaughterhouse surviving from this period are remote, as many would be situated close to urban areas, or within the offices of the mansion house, and in the general expansion of the late nineteenth century would have been under constant pressure for either renewal or change of use(22).

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(19) - Information from Mrs Wedderburn, Feather House, Montquhanie, Kilmany, Fife

(20) - Dundee Advertiser

(21) - PERRIN, Richard, 1978, The Meat Trade in Britain, 1840-1914, 17

(22) - The author is indebted to Miss Kinnear, Abertay Historical Society, Dundee, for drawing attention to Montquhanie ice house and slaughterhouse. Also to Ian Hamilton, Belfast; David Henderson, Perth; and Johanne Wright, Yorkshire; architectural students at Duncan of Jordanstone College of Art who assisted with the survey.

Mrs Beeton in The Book of Household Management makes a suggestion on how to make equipment to smoke hams and fish at home.

> take and old hogshead, stop up all the crevices, and fix a place to put a cross stick near the bottom, to hang the articles to be smoked on. Next, in the side, cut a hole near the top, to introduce an iron pan filled with sawdust and small pieces of green wood. Having turned the tub upside down, hang the articles upon the cross-stick, introduce the iron pan in the opening, and place a piece of red hot iron in the pan, cover it with sawdust, and all will be complete. Let a large ham remain 40 hours and keep up a good smoke(23).

In the fishing villages of Auchmithie, Arbroath and St Vigeans, Angus, hogsheads were sawn in half and partially sunk into the ground to make a form of smoke kiln known locally as a 'smoke barrel'. The smoke barrel was used for the production of the now famous 'Arbroath smokie', a hot-cured fish originally known as the 'Auchmithie cure' or as the 'Lucken' or 'Close-fish cure'(24).

The use of halved hogsheads gradually diminished in the early years of this century and these were replaced by purpose made 'smoke barrels', square in plan to allow the use of standard lengths of triangular section timber known as 'smoke sticks' over which pairs of fish were hung prior to smoking. The square 'smoke barrels' were constructed originally in timber with an earth base and these in turn were replaced by brick structures of similar dimensions, principally after the second world war. An Arbroath 'smoke barrel' measures approximately 135cm square, is 85cm deep and the sides stand 40cm above ground level. A few miles to the north at Gourdon, Bervie, Kincardineshire, smoke barrels are normally built in brick against the outside gables of the fish curing premises and are rectangular in plan. The width running parallel with the gable is approximately 185cm by 95cm front to back. The internal depth is 116cm and the barrel sides stand entirely above ground level. This basic difference in form and dimension occurring only 40 kilometres apart shows the importance of regional studies for this type of local industry (figure B, Arbroath type smoke barrels; and figure C, Gourdon type smoke barrels).

Ross gives a good description of smokie making including the use of the smoke barrel in David Herbert's Fish and Fisheries ..., 1882(25). Ross claims that the 'Arbroath smokie' was also known as a 'Pinwiddie'(26), but this term is not used in the Arbroath area and appears to be a general term used in Aberdeenshire for any form of smoked closed fish(27).

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(23) - BEETON, Isabella, 1861, The Book of Household Management, 385
(24) - ROSS, John, jnr, 1883, Curing and Preserving Fish in Scotland and its Islands, in David Herbert, editor, Fish and Fisheries, 1882, 112
(25) - Ibid, 112-113
(26) - Ibid
(27) - GRANT & MURISON, 1931-1978, op cit

Ross also describes a smoke barrel for a large fish curing premises:

> A more scientific arrangement is built of brick, floor and all, with a sliding but airtight iron door at one end, the breadth to be within 4 inches of the extreme length of the spits employed, usually 3ft 6in. At a height of about 18 inches or rather better, the transverse row of bricks needful for every third or fourth row in brick laying is put in of half bricks only on both internal sides of the chamber. This leaves a groove from end to end of the side walls. The depth, as in other kilns, may be to suit circumstances, and again the height will be according to the trade done. This groove in the side walls may repeated ad libitum at intervals of 12 to 13 inches till the top of the chamber is reached, when a ledge is left for the upper row of spits by adopting the same plan of building half a brick cross-wise instead of a whole one. This with a light cloth to cover the open top when the kiln is charged, completes it(28).

Smoke barrels of this type were not found in Arbroath or Auchmithie where the cure started. As has already been stated, the Arbroath smokie is a hot-cured fish and is actually cooked during the smoking process and to this end the fish are normally close to the actual fire. It is difficult to see how this would have been achieved in the kiln described by Ross, as with a traditional fire the bottom fish would be burnt before the top fish were even warm. On the other hand there may have been some form of induced circulation of hot smoke-laden air which he has failed to record, or the kiln may have been for another form of closed fish cure, perhaps Pinwiddies.

The kilns for cold-cured fish such as 'Eyemouth's', 'Speldings', 'Bloaters', 'Red Herring', 'Kippers', and 'Smoked Salmon' are described as follows:

> The kiln walls may be of any of the usual house-building materials. It is commonly built from two to four void size in breadth, the depth being accorded to the external position and circumstances - the voids ... being the spaces or divisions into which the kiln is internally divided for the purpose of hanging the fish-filled spits. The height may vary to almost any extent, according to the owners' necessities. Kilns are usually roofed with tiles, but of late years, slates are being used. If of tiles they are pointed, but not invariably so. Unpointed tile roofed kilns in confined situations are very liable to down-draught, and consequent irregularity in the smoking of the fish placed within them. Those having free space about them are believed to be improved in their action by being unpointed. The side walls of the kiln are pierced about mid-height by one or more air-ducts measuring about 18in by 30in. Closed by either sliding or swivel wooden panels, worked by cord-and-pulley attachments inside. The number of such openings will of

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(28) - ROSS, John, jnr, 1883, op cit, 112

> course depend on the size and height of the kiln. As regards breadth, there is usually an opening for every two voids - most three void kilns having two openings per side and should the height exceed 15 feet, a second set of openings is usually made just at the easing. These air ducts are used to regulate the temperature of the kiln for should a kiln inadvertently become overheated, the result would be that the fish would soften and drop... The kiln-door is halved transversely, the purpose of that also being to regulate the temperature and draught. The upper half may be opened independently of the lower one, thus introducing a current of cool air into the kiln without unduly blowing the fires and dusting the fish. The internal fittings are of the simplest description. Stout wooden joists 7in by 3in, are placed exactly at the void breadths in line of the door, on beam sockets let into the wall from 6 to 7 feet from the floor. Depending from the rafters, and attached to the joists, are stout 3in square rails, say 4ft apart. Fixed transversely on both sides of these are 2 by 1in rails which form the upright rails at 14in intervals, and this completes the kiln. The fish being now spitted and spread are passed up spit by spit to the kiln-fitters, who stand with a foot on each side of the void, and commencing at one side of the kiln place the spits one after another on the transverse rails, beginning at the lowest and mounting up till the roof is reached, then placing them down again until the lowest reached, and so on till the void is filled ...(29).

The length of time taken to smoke the fish depends on the cure being used. Eyemouths take from half an hour to two hours(30); smoked speldings take considerably longer(30); kippers from eight to ten hours(32). Bloaters take about twelve hours(33) as does the Moray Firth or Buckie cure(34) and red herrings take from ten to twenty days(35). Smoked salmon was also prepared in this type of kiln being smoked simply until the desired tinge of colour was reached(36).

Two kilns of this type were surveyed by architectural students from Duncan of Jordanstone College of Art, Dundee, in 1974. Both kilns were in Gourdon, Kincardineshire. The earliest was a four-void pantiled kiln on the south side of the former railway line and the second a three-void slated kiln adjoining the harbour(37).

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(29) - Ibid, 110-111
(30) - Ibid, 111
(31) - Ibid, 120
(32) - Ibid, 125
(33) - Ibid, 124
(34) - Ibid, 121
(35) - Ibid, 124
(36) - Ibid
(37) - Survey carried out under the direction of Martin Birkhans and Bruce Walker; survey team leader for tiled kiln, Elin Grimsvedt; for slated kiln, John Baddley

The 'finnan' or 'Findon cure' required a different smoke house.

> It consists of a house - a room, it might be called - placed as free as can be managed from other buildings, for the sake of the improved draught thus gained. It must have a door in both side-walls, placed at points as far as practicable from the gable to be used in smoking ... also at least one window as near the middle of the house as practicable. The roof, slated or with pointed tiles. The internal measurement ... is quite immaterial to the working. The floor, except that part to be used as a fire-hearth, may be of any material, but for the fire-hearth brick is ... preferred... The fire-hearth must be raised not less than 9 inches from the floor-level, and it should extend the whole gable breadth. In depth it ought to be 6ft at least, measured from the gable to the edge of the step ... the hearth should slope from that edge backwards to the gable at about one in ten. Fixed to the gable wall by 'dooks' are vertical supports of 2½in x in, sufficient in number to carry light horizontal rails fixed at 13in centres, commencing 21in from the hearth and extending upwards to not fewer than five rails. This arrangement of rails is termed the 'back reest'. The smoke-house ought to be joisted, beam-filled, and plastered like any ordinary house. The joist next the gable over the hearth should be omitted, and attached to and erected upon the next joist should be a hanging chimney-brace leading the smoke to the roof at the gable, and thence by a wooden 'lum' to the open air. The lum should measure 2½in square for every lineal foot of hearth, and should be furnished with a cowl, as in mill-kilns for the exclusion of wet. Well appointed lums are also furnished with a draught-fan driven in any of the many ways devised for small machines, by which on quiet days the draught is very much improved. About 18 inches within the hanging brace, and attached to a strong beam resting upon the side walls, are the 'hangs' between which and the 'back reest' the spitted fish are suspended. These hangs are made of good 9-ply sma'line, and are put on the beam double, and knotted together at intervals, occurring always between the rails of the 'back reest', and hung about 8 inches apart on the 'balk' as the beam is termed, whence they depend. Knotted or spliced in at each knot on the 'hang' but running free, are 'lugs' of the same material as the 'hang', and long enough to reach the exact level of each rail of the 'back reest'. The whole system of 'hangs' and 'lugs' hang about 3ft 1in from the 'back reest', and as the spits used are 3ft 3in, their ends protrude an inch through the lug, and give a good hold of the spit, the other free inch being rested on the rail of the 'back reest'(38).

This arrangement provided the opportunity of re-arranging the spits during the smoking process without endangering the other spits. Spits could be removed from four to more than a dozen times in the course of one smoking.

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(38) - ROSS, John, jnr, 1883, op cit, 115-116

> This, with a couple of large cloths for hanging from the roof for the regulation of the draught by the doors, completes the 'Finnan' smoke-house(39).

The smoking of finnans takes from six to nine hours(40) but such is the degree of care taken throughout the cure that it is reckoned that the finnan cost more in handling after the fish were smoked than the Eyemouth cure cost for the whole process(41).

Smaller versions of the Eyemouth and Finnan kilns can be found in areas where fish processing is still carried out as a 'back-door' industry. Since the equipment for deep freezing and refrigeration has become readily available to large numbers of people, all of the traditional fish cures have been simplified, and the smoking time reduced to achieve a lighter taste, the yellow colour being obtained by dipping the fish in butter dye rather than from long and careful smoking.

Small smoking kilns somewhat reminiscent of outside privies can be found all over Europe where smoked meats and fish are still prepared in domestic or small commercial situations. The Arbroath 'finnan house' is typical of this class of building and is used for the production of 'golden cutlet', 'yellow fish' and occasionally a form of 'Eyemouth cure' called a 'finnan' but bearing little resemblance to the original finnan cure.

The Arbroath 'smoke barrel' on the other hand appears to be a more particular and local response to a process but even for this European parallels can be found. A photograph in the Steiermarkisches Landesmuseum Joanneum, Schloss Stainz, Austria, shows a surprisingly similar smoke barrel being used to smoke hams and sausages(42).

From this preliminary look at the readily available evidence, both documentary and in the field, it is evident that the preservation of meat and fish offers a wide field for both the ethnologist and the industrial archaeologist. The evidence presented here has a heavy bias towards ethnology as all the work completed in the past few years tends to have concentrated on the pre-industrial situation. Other writers have concentrated on fishing as an industry in itself, often with only occasional references to the fish curers, and virtually nothing has been written on the dead meat, meat curing and canning industries although Bremner does give an introduction to these subjects in The Industries of Scotland: their Rise, Progress and Present Condition, 1869(43). It is evident that much work is required before a comprehensive view of these industries will be possible.

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(39) - Ibid, 116
(40) - Ibid, 118
(41) - Ibid, 119
(42) - Steiermarkisches Landesmuseum Joanneum, Scholss Stainz, Aussenstelle, Stainz, Austria, photograph F186
(43) - BREMNER, David, 1969 edition, The Industries of Scotland: their Rise, Progress and Present Condition, 1869, 473-481

II Preservation of Foodstuffs by the Application of Cold

Preliminary surveys have been carried out on many of the buildings associated with the application of cold to preserve foodstuffs for as long as possible in a 'fresh' state(44). It is intended here simply to summarise these publications and to suggest a preliminary approach to the systematic classification of ice houses.

Ice-houses, although apparently well-documented (in terms of contemporary drawings, specifications, descriptions of constructional practices, accounts for building operations and instructions as to management), tend to have been ignored by Scottish architectural historians. In other countries some very detailed work has already been carried out(45), but mainly on ice-houses used for domestic purposes. The work that has been done in Scotland tends to follow this pattern and deals mainly with individual domestic ice-houses(46) or the domestic ice-houses of a particular locality or region(47). A general introduction to the subject was prepared and published in 1976(48) aimed at extending the subject to include both commercial and domestic structures of permanent, semi-permanent and temporary construction, and to solicit information from the general public.

The problem now facing the researcher is an embarrassment of known ice-house sites, of which very few have been surveyed, and many

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(44) - WALKER, Bruce, 1976, op cit
WALKER, Bruce, 1979, Cheese Presses (Cheese making activities on the Scone Palace Estates, Perthshire, between the late eighteenth and early twentieth centuries), Duncan of Jordanstone College of Art, Dundee (limited edition for private circulation - copy available for examination at the Library, DJCA, Perth Road, Dundee)

(45) - LUNDBAEK, Morten, 1970, ISHUSE om isning opbevaring og brug af is i aeldre tid, isaer pa Danske herrefarde, Institut for Europaeisk Folkelivsforskning, Brede, Denmark
YORKE, F W B, 1956, Ice houses, Transactions of the Ancient Monuments Society, New Series, IV, 123-132
YORKE, F W B, 1954, Ice houses, Transactions of the Birmingham Archaeological Society, 72
GRIFFITH, E P, 1969, Ice houses, Industrial Archaeology, 6, 420
BAINBRIDGE, J W, 1973, Stocking Northumbrian ice houses: an exercise in relating climate to history, Industrial Archaeology, 9, 152-171

(46) - McINTOSH, Charles, 1853, Ice houses, Book of the Garden, 1, 497-513
THOMPSON, Robert, 1859, Ice houses, The Gardener's Assistant, 616-617
LOUDON, J C, 1826, The Encyclopaedia of Gardening, 339-341

(47) - _____, no date, Old ice houses of East Ross-shire, (photocopy of newspaper cuttings lent by Jane Durham, Scotsburn House, Kildary, Ross-shire), 19-25
ROBERTSON, A Niven, 1953, Ice houses of the eighteenth and nineteenth centuries in Edinburgh and the Lothians, Book of the Old Edinburgh Club, 112-151

(48) - WALKER, Bruce, 1976, op cit

described in the vaguest of terms; an even greater number of casual references to ice-houses, coupled with the knowledge that almost every substantial house built between the mid-seventeenth and the late nineteenth, should have one; yet they are often very difficult to locate, even with the help of a guide who has visited the site before. This is due mainly to their being situated in some quiet area, often at some distance from the house and often being subterranean or semi-subterranean and covered with living turf. Many ice-house entrances were built up shortly after they ceased to be used, to prevent accidents to children or livestock, and when these became overgrown the building is often invisible even to a trained observer.

Ice-houses can be grouped under two primary classifications. The first is the cold room type where the ice pack was retained intact and the foodstuffs are stored in a chamber in close proximity to the ice. The second is the ice store where the ice was subsequently removed for use in various ways such as in fish packing and transport, confectionery manufacture and for use in domestic ice boxes, wine coolers, etc.

The basic difference between the two types is in the position of the entrance door. Where the ice was to be kept intact, access was always at a high level above the upper surface of the ice pack. This allowed foodstuffs to be laid on straw over the ice pack. In the case of ice for removal for other purposes the entrance door was usually to the lowest level of the ice allowing the ice to be quarried more easily and allowing melting ice to escape without damage to the remainder of the pack.

Often when a household decided to make use of ice-boxes rather than have foodstuffs stored at a distance from the house in the ice-house, they would organise the collection of ice into cones which were then covered with thatch. The storage of ice in cones made it easier to quarry when required for the ice-boxes and avoided the problem of broken ice melting throught the remainder of the ice pack. Ice cones were formed on an area of well drained land, usually on a gentle slope, and were normally about twenty-two feet in diameter and approximately eleven feet high. Ice would be removed from the lower side of the cone and the thatch re-formed as quickly as possible. A shallow drain was formed round the circumference of the cone to protect the ice from surface water.

Ice was normally obtained from a natural pond or a mill dam but occasionally shallow ponds were constructed with a stone or brick lining. In areas of clay soil farmers often formed a shallow hollow in a field and at the beginning of winter blocked the field drains, thus forming a shallow pond. After ice had formed, it was taken to the ice house and the field drains opened, allowing the surplus water to drain away. A crop could then be taken from the field as normal.

Ice was also imported from Norway by schooner. One letter received after the Scots Magazine article referred to ice being imported into St Andrews and distributed from the town's ice house. Professor Hjulstad of Norway remembers ice being cut from lakes in the vicinity of Oslo and sold in the city or for export to Britain and Europe.

The first time an ice-house was used the ice melted quickly, but if it could be refilled again before the end of winter it set up a permafrost in the surrounding soil and the ice pack was thus insulated permanently provided it were topped up each year. Commercial ice-houses tended to rely on the sheer volume of ice rather than on the permafrost principle.

In general terms, the earlier the ice-house, the higher the building specification. Seventeenth century ice-houses were carefully constructed of double-skin brickwork or ashlar and even today are perfectly dry whereas nineteenth century examples are often poorly constructed and are now perpetually damp.

Commercial ice-houses were often lined in timber on timber straps dooked into the wall. The space between the lining and the stonework was filled with sawdust. Sawdust was also used as an insulator in the timber ice-house illustrated in Herbert's Fish and Fisheries ..., 1882.

Ice houses connected with salmon fishing were often subdivided internally by a stone wall in an approximately one-third to two-thirds proportion. The one-third section was used in the early season and the remaining two-thirds retained for the second season after the closed period.

Commercial ice-houses often had a lean-to fish house over the door where fish would be prepared for sending to London.

A range of ice-house types of various sizes are illustrated to the same scale to give some impression of the size of the various fishings. Size of ice-house is not always a clear indicator, as the Seggieden ice-house used by the Kinfauns estate, Perthshire, is one of the smallest commercial ice-houses recorded yet the fishing is the largest on the Tay. Here ice appears to have been stored in ice cones and the ice-house was possibly refilled regularly from this source.

The system of classification of ice-houses used by Robertson(49) tends to be somewhat ambiguous in its classification and limited in its approach. It concentrates on the obvious stone or brick built domestic ice houses of the seventeenth and eighteenth centuries which have, because of their superior constructional techniques, tended to survive in considerable numbers. Less attention has been paid to the timber-roofed types of the late eighteenth and nineteenth centuries(50) whose ruins can often be mistaken for circular corn or lime kilns or to the many other structures constructed to contain ice to cool dairies or milk houses or for larger commercial concerns such as ice for confectionery or for the fresh salmon trade. Considering Robertson's classification, there is a certain ambiguity between 'type A - Domed or Globe shaped' and 'type B - Circular chambers', as both are circular in plan; a 'circular chamber' (which is intended to describe a cylindrical building) can have a domed roof and a 'domed or globe shaped' ice-house should include cup shaped ice-houses even with

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(49) - ROBERTSON, A Niven, 1953, op cit
(50) - An example survives at Ballechin House, Strathtay, Perthshire

thatched or slated roofs. The same type of criticism can be made of 'type C - rectangular chambers' and 'type D - Tunnel shaped chambers', as both tend to be rectangular and both can have barrel vaulted roofs making a tunnel shape. The biggest challenge to any investigator, however, is in the second classification where they are asked to distinguish between:

1. Those built above the ground under a natural mound;
2. Those built above the ground under an artificial mound;
3. Those built under a natural mound;
4. Those built under an artificial mound

- especially after perhaps 200 years of care and attention as part of a formal or landscaped garden, or a similar period of semi-neglect in a remote part of the estate.

A composite digital system, capable of adaptation to computer use would allow more flexibility in use and a greater degree of accuracy in describing the structures. It would also be capable of extension in the future to provide more detailed information without the destruction of the initial system. A seven digit number would serve most purposes at present and could be written as sets of digits, thus 0/00/00/00.

The first digit would deal with the classification by the principal entrance level - particularly important in distinguishing between ice-houses designed to contain an ice pack indefinitely and where the pack is intended to remain intact and provide a cold room for storage, and those such as the large commercial ice-houses where the ice pack is designed to be quarried to provide ice for other purposes such as fish packing or confectionery. Thus the first digit (a) could represent:

0 - no details available;
1 - entry floor level with upper level of ice pack;
2 - entry at intermediate level;
3 - entry to base level of ice pack;
4 - entry above the top level of the ice pack;
5 - sealed ice-pit - no access except for filling;
9 - other.

In each case except no 5, the entrance being considered is the principal entrance for personnel, and not the openings for loading the ice, unless both functions were carried out through the same opening. Number 5 is intended to cover ice-pits under other buildings such as dairies and milk-houses where the ice was sealed in during the winter months to help keep down the temperature in the room above and remained unopened until the following winter when the ice pack was renewed.

The second group of digits would deal with (b) entrance orientation and (c) relationship to the topography.

Thus, the second digit (b) considers the entrance:

0 - no information available;
1 - facing north;

2 - facing north-east;
3 - facing east;
4 - facing south-east;
5 - facing south;
6 - facing south-west;
7 - facing west;
8 - facing north-west;
9 - entrance within larger structure containing the whole ice-house.

The third digit (c) considers topography:

0 - no information available;
1 - completely underground;
2 - partly underground - flat site;
3 - partly underground - steep site;
4 - above ground;
5 - embodied in a larger structure;
6 - other.

The fourth and fifth digits would deal with (d) the plan form of the main ice chamber and (e) the form of entrance passage/vestibule.

The fourth digit (d):

0 - no information available;
1 - circular;
2 - square;
3 - rectangular;
4 - triangular;
5 - hexagonal;
6 - octagonal;
7 - elliptical;
9 - other.

The fifth digit (e):

0 - no information available;
1 - no passageway or vestibule;
2 - straight passage;
3 - straight passage and cold room;
4 - 'dog leg' passage;
5 - 'dog leg' passage and cold room;
6 - complex passage;
7 - complex passage and cold room;
8 - vestibule used as workroom;
9 - vestibule part of a larger building.

The 'cold rooms' mentioned above do not refer to the space directly over the ice but to a form of ice house passageway which drops and wraps round the ice pack wall thus providing additional cold room space.

The final group of digits would deal with sectional form (f) describing the walls of the ice chamber and (g) describes the roof.

The sixth digit (f):

0 - no information available;
1 - curved batter;
2 - straight batter;
3 - vertical;
4 - other.

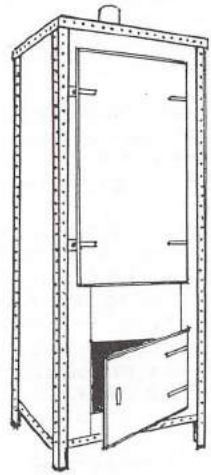
The seventh digit (g):

0 - no information available;
1 - dome;
2 - corbelled dome;
3 - barrel vault;
4 - shallow vault;
5 - corbelled chevron;
6 - chevron;
7 - slab;
8 - other.

It should be noted that the above classification only considers the principal roof construction and not secondary structures erected over the principal - therefore a stone vault with a timber pitched roof over it would be listed simply under the vaulted roof.

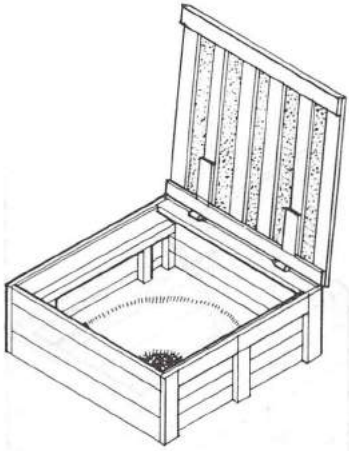
No attempt has been made to classify by: the volume of the ice chamber; materials; flooring; type of drainage; access for ice; provision of lifting devices; steps into ice chamber; scarcements for temporary floors; lining of walls in timber or lath, either vertical, horizontal or chevron pattern; methods of construction of doors; sealing of openings; insulation; cavity construction; nor the subdivision of the ice packs in the large commercial ice houses to allow for ice being supplied during the two separate parts of the salmon fishing season.

(Bruce Walker, of the Department of Architecture at the Duncan of Jordanstone College of Art in Dundee, and also in association with the University of Dundee and the Scottish Vernacular Buildings Working Group, has done and conducted considerable pioneer work in this field of study and others. The footnotes will direct anyone who wishes to go further into the subject.)

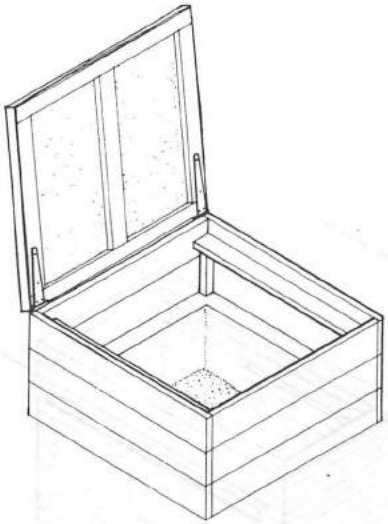


Portable Smoke Oven

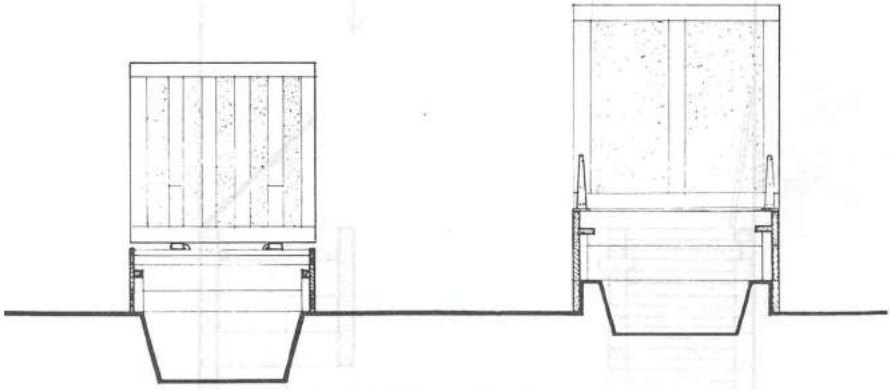
Figure A



John Ness, 20 High Street

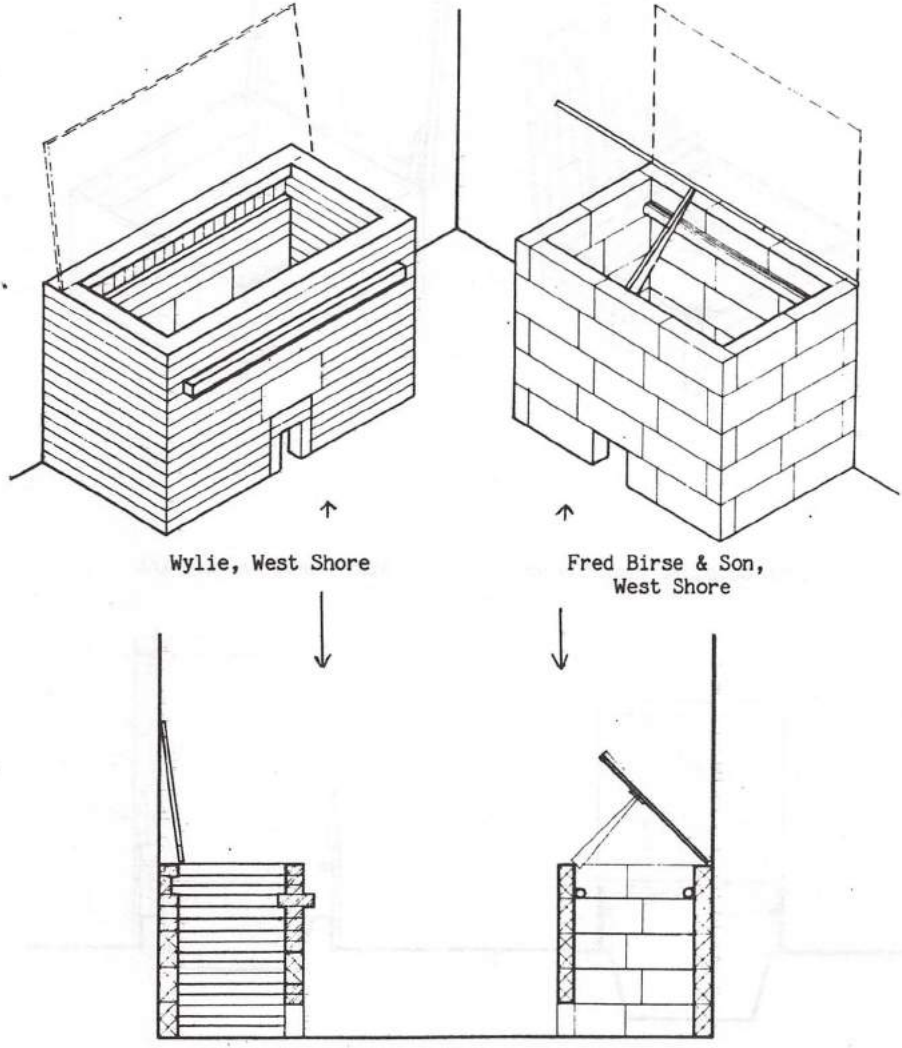


Alex Pert, Dangerpoint



Arbroath Smoke Barrels

Figure B



Gourdon Smoke Barrels

Figure C

INVESTMENT AND RAILWAYS IN NINETEENTH CENTURY SCOTLAND

by
Ranald C Michie
(University of Durham)

There appear to be five central explanations for the growth of the British railway system in the nineteenth century. A favourite is that which stresses the importance of single dramatic events, such as the opening of the Edinburgh to Glasgow Railway in 1842:

> Its success changed public opinion, and from holding back and shaking their heads people soon rushed to the opposite extreme, and were ready to support even the most visionary schemes,

reflected one Scottish writer in 1886(1). Allied to this episodic explanation is that approach which stresses the development and use of a novel technology. The progress of the railway system is seen as a consequence of the numerous inventions and improvements made by engineers, which circumvented the difficulties that had held back construction and successful operation(2). Those writers who have looked closely at railway companies concentrate upon the internal momentum behind the growth of railway mileage. Each company expanded its own system in response to competition from other companies, and to increase the traffic on existing routes. The provision of branch lines, extensions, junctions, and additional track were conditioned more by company policy than by any other considerations(3). Another popular explanation for the appearance and spread of railways is the obvious one - that there was a need for them. Britain's expanding industrial economy required both additional and improved means of transportation, and this the railways did provide(4). Finally, there is the geographical approach which stresses the gradual evolution of the railway system as it conquers such physical barriers as hills, valleys and estuaries, while the actual routes are conditioned by the

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(1) - Anon (ed), Memoirs and Portraits of One Hundred Glasgow Men, Glasgow, 1886, 2 vols, 176
cf H Pollins, Britain's Railways: An Industrial History, Newton Abbot, 1971, 23
H J Dyos & D H Aldcroft, British Transport: An Economic Survey from the Seventeenth Century to the Twentieth, Leicester, 1967, 123
P S Bagwell, The Transport Revolution from 1770, London, 1974, 95.

(2) - Bagwell, op cit, 88

(3) - M C Reed, Investment in Railways in Britain, 1820-44, Oxford, 1975, 20-1, 27; Pollins, op cit, 27

(4) - E A Pratt, A History of Inland Transport and Communication, London, 1912, 242

distribution of population and general economic activity(5). However, increasingly a sixth explanation has been put forward, suggesting that finance was of major importance in determining both the nature and timing of railway construction(6). This has since been denied and the issue remains unresolved(7).

Though the first public railway in Scotland - the Monkland and Kirkintilloch - was not opened until 1826, numerous railway projects had been suggested and many promoted since the beginning of the century. As early as 1807 an attempt was made to promote a Berwick to Kelso railway while a Glasgow-Edinburgh rail link was proposed in 1812. However, most failed to attract sufficient financial support and so were abandoned(8). One of the few that was constructed was the largely private Kilmarnock and Troon Railway. This line was promoted in 1807 and opened in 1812. It proved most successful, expanding its carriage away from coal and into general merchandise(9). Despite the proven success of the few established Scottish railways, the existence of an adequate though primitive technology, and the knowledge of the routes for which rail transport was both feasible and profitable, it was not until the mid-1820s that the public showed any willingness to provide the finance necessary to construct railways(10). The factor that changed, altering the popularity of railways with investors, was that savings grew, money for investment became more abundant, but the outlets for it were limited. It was neither the demand for railways, nor their prospects, nor the technology they employed, that radically changed, but the supply of the funds necessary to finance their construction. The technology, for example, was readily available

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(5) - A C O'Dell & P S Richards, Railways and Geography, London, 1971, 44-65
A C O'Dell, A Geographical examination of the development of Scottish railways, Scottish Geographical Magazine, 55, 1939, 129-132
I D M Whyte, Scottish historical geography: a review, Scottish Geographical Magazine, 94, 1978, 10

(6) - W Vamplew, Railways and the transformation of the Scottish economy, PhD thesis, University of Edinburgh, 1969, 41
W Vamplew, Sources of Scottish railway capital before 1860, Scottish Journal of Political Economy, XVII, 1970, 425-8

(7) - T R Gourvish & M C Reed, The Financing of Scottish railways before 1860 - a comment, SJPE, XVIII, 1971, 213
P O'Brien, The New Economic History of the Railways, London, 1977, 57-9

(8) - Vamplew, 1970, op cit, 426
M Robbins, Sir Walter Scott and two early railway schemes, Railway Magazine, Feb 1951, 89

(9) - E F Carter, An Historical Geography of the Railways of the British Isles, London, 1959

(10) - Vamplew, 1970, op cit, 425
N Wood, A Practical Treatise on Railroads, London, 1825, XII, 7-8
C Landale, Report on the Proposed Railway between the Valley of Strathmore and Dundee, Dundee, 1825, 9

from the North-East of England(11).

In the first half of the nineteenth century Britain, and more especially Scotland, was still an agricultural economy, in spite of the rapid industrial and commercial advances. The rhythm of economic life was largely determined by the prosperity of agriculture and the price of its products. A series of good harvests, in conjunction with a rising demand, had a dual cumulative effect upon investment. On the one hand, real income rose through a reduction in the price of food. This, in turn, left more money free for saving, and thus expanded the amount of funds looking for investments. On the other hand the growing volume of sales, though at lower unit prices, led to increased income in the agricultural sector. As a consequence, agriculture became more self-financing, releasing funds for investment in other areas of the economy. These cycles of good harvests occurred periodically, such as in the early 1820s, early 1830s and early 1840s(12). After the excellent harvests of 1821 to 1824, it was estimated that the Edinburgh banks had some £5m on deposit for which they had no immediate use. The rate of interest paid on deposits was reduced to 2.5 per cent in December 1824, and some banks refused to accept additional deposits above a ceiling of £5000 per customer(13).

As early as November 1824 the Edinburgh Weekly Journal reported that

> Never was the capitalist so much at a loss how to turn his money to account, and live decently on the produce ...(14)

The same newspaper also noted the consequence of such a situation, with a large number of joint-stock companies being promoted in the hope of attracting the spare funds of investors. Among the most prominent fo these enterprises were the banks, insurance companies, gas and water works, industrial and commercial concerns, and railways. However, in the mid-1820s railways were probably the least successful of all ventures seeking the financial support of the investor. The Dundee Commercial Banking Company was supported by 202 investors but the Dundee and Newtyle Railway attracted only 18. The Edinburgh based National Bank of Scotland had 1238 shareholders while the Edinburgh and Dalkeith Railway had only 87. In addition, many other railway companies were abandoned due to lack of support(15). Even in the mid-1820s railways continued to have to rely largely upon the financial

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(11) - H Scott, Kelso, to J Buddle, Newcastle, 2 April 1825
N Crathorne, Tennant's Stalk: the Story of the Tennants of the Glen, London, 1973, 90

(12) - R C Michie, The Scottish stock exchanges in the nineteenth century, PhD thesis, University of Aberdeen, 1979, 82-3

(13) - Edinburgh Weekly Journal (EWJ), 17 November 1874
C W Boase, A Century of Banking in Dundee, Edinburgh, 1867, 330, 343

(14) - EWJ, 17 November 1824

(15) - Michie, op cit, 107-8, 128
J A Hassan, The Development of the coal industry in Mid and West Lothian, 1815-1873, PhD thesis, University of Strathclyde, 20

support of those with a direct stake in the success of the line. The supply of capital was still limited and alternative investments, especially banks and urban utilities, were more attractive to investors in terms of both direct and indirect benefits. This restricted railway routes to the carriage of goods in which transportation was a major item in the final cost. A mineral railway, such as the Edinburgh and Dalkeith or Monkland and Kirkintilloch, did not have to be very profitable in itself, as long as the expanded market for coal meant a higher return for the capital invested in both the mine and the railway. The railway was merely a cost of production in the price of coal, as was the sinking of the shaft to reach the coal. Consequently, it was the cost of capital, combined with the willingness of investors to provide it, that largely determined the location and timing of the early railway developments in Scotland by restricting their provision to only a few uses(16).

Railway construction and promotion did not cease with the end of easy money in October 1825. Those railways that had obtained sufficient capital were proceeded with. Both the Monkland and Kirkintilloch and the Edinburgh and Dalkeith were completed and operated successfully. This was despite technical imperfections, such as the use of horse-pulled wagons for many years. Such was the success of the Monkland and Kirkintilloch that the construction of complementary mineral lines was encouraged and again largely financed by those involved in the trade(17). In contrast, the only non-mineral line - the Dundee and Newtyle Railway - exhausted its initial capital and found additional finance most difficult to obtain. By June 1829 the railway was reported to be '... nearly at a stand owing to a want of funds, the expense having greatly exceeded the original estimate'(18). Attempts were made in the early 1830s to promote new railways, especially the Edinburgh and Glasgow line, which all experts regarded as an overdue necessity(19). Buchanan, writing in 1832, felt that

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(16) - D O Hill & G Buchanan, Views of the Opening of the Glasgow and Garnkirk Railway: Also an Account of that and other Railways in Lanarkshire, Edinburgh, 1832, 4
A Mitchell, Political and Social Movements in Dalkeith, 1831-1882, Dalkeith, 1882, 218
Crathorne, op cit, 91
J A Jardine, Report of the Committee of the Edinburgh and Dalkeith Railway Company, Edinburgh, 1826

(17) - Hill & Buchanan, op cit, 5-7, 10
J Butt, Industrial Archaeology of Scotland, Newton Abbot, 1967, 177
Anon, Early Scottish railways, Three Banks Review, June 1967, 31
Mitchell, op cit, 41
Anon (ed), op cit, 162-3
Hassan, op cit, 42-4

(18) - Dundee, Perth and Cupar Advertiser (DP&CA), 18 June 1829

(19) - In 1831 George Stephenson was of the opinion that '... all Railways on which Passengers may be expected to be conveyed to any great extent must pay.' G Stephenson to W T Salvin, 21 Sept 1831

> The long-desired and much and often agitated plan already alluded to, of a direct communication between Edinburgh and Glasgow, and their respective Ports, so as to unite also at these points the Eastern and Western Seas, seems now ripe of execution, and no mode appears calculated for effecting this great object so simply and effectually as the railway; combining, as it does, the advantages of economy in transport with such an unparalleled facility and dispatch. The great intercourse between the two cities, even with the present communication, is demonstrated by the number of coaches, loaded with passengers, which we daily see arriving at, and departing from each, and which may convey some idea of what it would be, if the time of performing the journey was reduced to three hours, or two hours and a half, which is quite practicable and safe; and the fares, perhaps, at an average of inside and outside, to five shillings(20).

An Edinburgh and Glasgow Railway Company had been promoted in 1824 and again in 1832 and 1834 but failed to attract the necessary finance. This was despite the success of the comparable Liverpool and Manchester Railway. It was not until 1838 that a company was successfully floated, and the line was not opened until 1842 - at least thirty years after the project was suggested and twenty years after it was technologically feasible(21).

In the 1830s, as in the 1820s, it was not until funds for investment were again very plentiful that investors were willing to consider the stocks and shares of railway companies as outlets for their capital(22). Scottish banks, for example, looked upon lending to railways as something to be done once the needs of all other borrowers had been met, and large funds still remained unavailable(23). By the mid-1830s a surplus of funds seeking investment was apparent once again in the Scottish economy, and many railway schemes re-appeared with the hope that this time their appeal to the public for funds would be successful. The Dundee and Arbroath Railway Company suggested to potential investors that,

> At a time like the present, when it is with the utmost difficulty (money being so plenty) that capital can be safely invested at more than 3 to 3 1/2 per cent, no more equitable nor promising investment exists at the present time than on that great invention which essentially belongs to the nineteenth century, viz railroads(24).

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(20) - Hill & Buchanan, op cit, 11
(21) - R N Millman, The Making of the Scottish Landscape, London 1975, 182
H G Lewin, Early Scottish Railways, 1801-1844, London, 1925, 187-193
Crathorne, op cit, 92-3
Anon (ed), op cit, 162-3
(22) - DP&CA, 20 Nov 1835
(23) - Anon, Coronation contrasts, TBR, June 1953, 39
(24) - DP&CA, 11 July 1834

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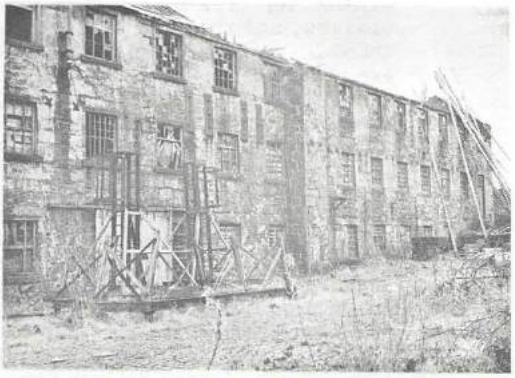

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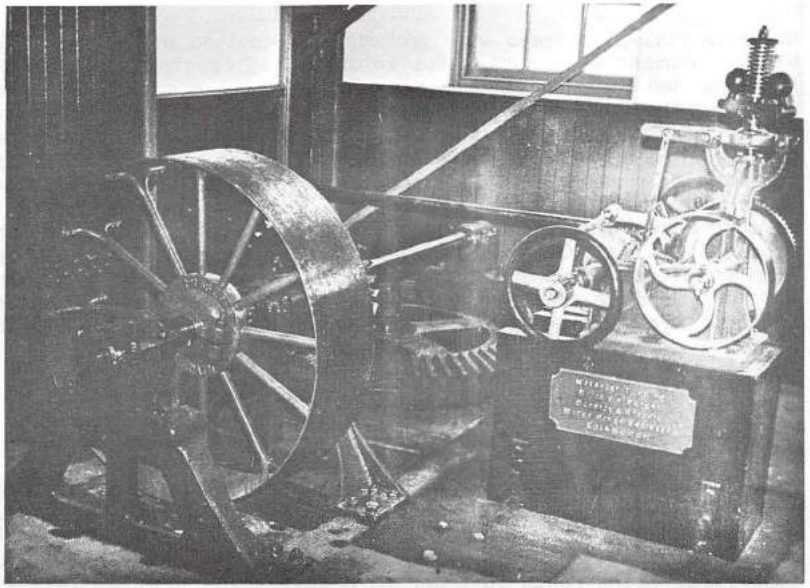
Cross Arthurlie Mill

1: View from north-west just before demolition.

2: Western face during demolition.

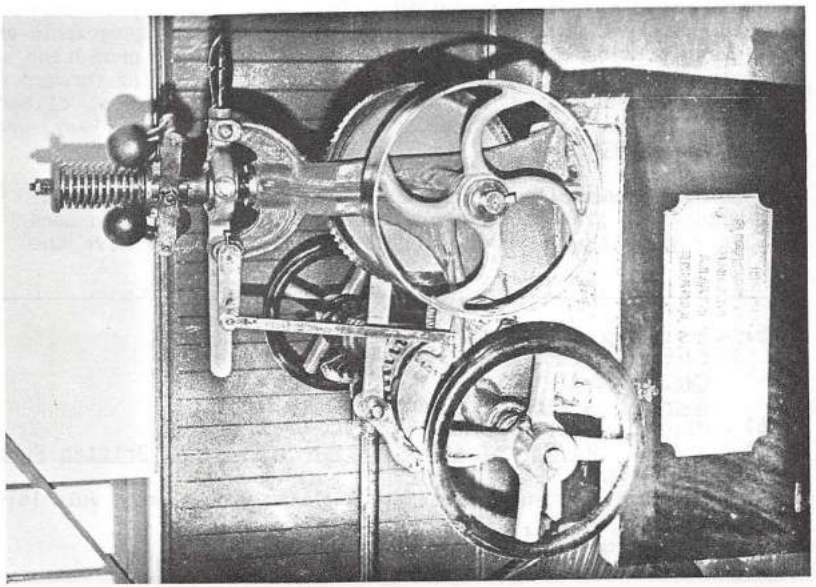
3: Paisley Museum staff surveying.

4: Stone walls and wooden ceiling at start of demolition.



Above: The main gearing, drive pulley and governor of the Waverley turbine at Pollok House, as restored by the SSPHM.

Below: The governor of the Waverley turbine at Pollok House, as restored by the SSPHM.



Numerous railway schemes were promoted in Scotland in the mid-1830s. While a number were successful in obtaining capital, such as the Arbroath and Forfar or the Paisley and Renfrew, other major lines, including the Aberdeen to Dundee or Forth and Tay, had to be abandoned because of lack of support(25). Though familiarity with railways had increased the investor's willingness to subscribe to their construction, railways had still to compete for capital with a host of other joint-stock projects in the 1830s. Many of these continued to be more attractive than railways, especially banks, insurance and urban utilities. Communities were still providing for their own internal needs rather than improving outside contacts. However, this was less the case than in the 1820s as there was growing competition in these fields of enterprise(26). Nevertheless, even in 1840 the Edinburgh stockbroker, Reid, advised his clients that,

> Railways are justly regarded at best as hazardous ventures, and we would advise capitalists to be on their guard when they embark in them(27).

Enough interested investors were available to finance small local schemes, though even there it was difficult to obtain all the capital promised at the time of promotion. In 1839 the merchants with most to gain from the Glasgow, Paisley, Kilmarnock and Ayr Railway Company had to provide extra funds in order to complete the line, as the less committed shareholders were defaulting on their calls(28). The Scottish investing public were not yet willing or able to support larger projects in which the public dividend paid was the only return. The Edinburgh and Glasgow Railway was forced to rely heavily upon the support of the more numerous and affluent English investor in order to obtain the necessary finance(29).

By December 1838 Scotland had 49 miles of railway in operation coompared to 497 in England(30). This was equality in terms of population or wealth but a severe deficit in terms of geographic area or economic need. For the next five years railway promotion was largely dormant in Scotland. Those interested in putting forward new schemes were awaiting an improvement in the financial climate. Bannatyne, one of the promoters of the Glasgow-Carlisle Railway, wrote in September 1836:

> In consequence, however, of the revulsion in the money market which took place this spring, nothing further has been done in regard to the present railway. Indeed, we have the

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(25) - Lewin, op cit, 187-193
Carter, op cit, 54-7, 73
EWJ, 20 April 1836
Aberdeen Herald (AH), 3 Oct 1835, 19 Dec 1835
(26) - Michie, op cit, 143-162
(27) - J Reid, Manual of the Scottish Stocks and British Funds, Edinburgh, 1842, 36
(28) - Contract between John Fleming, William Brooks, etc, July 1839
(29) - Vamplew, op cit, 436
Hassan, op cit, 50-1
(30) - O'Dell (1939), op cit, 131

> impression here [Glasgow] that it must sleep until a reaction occurs in the public mind as to the value of such undertakings. At the same time, it might be expedient that the parties interested should meet and understand one another, and that a general survey should be now made, in order that we might avail ourselves of any change(31).

Revival came in the mid-1840s. By December 1845 the plans of 115 new Scottish railway projects had been deposited with the Board of Trade, while many more were in the process of formation(32).

The promotion of railway companies certainly characterised the speculative mania of 1843-5. As early as October 1844 an Edinburgh newspaper had noted that,

> It is to the gigantic extension of the railway system and its promising field for investment that men's minds are now turned. Every capitalist is inflamed with visions of unprecedented profits. Indeed, nothing but some unforeseen accident affecting the money market in an unfavourable manner could check the present rush of capital into investments so profitable as railroads(33).

To many the Railway Mania is both unique and explicable by developments within railways themselves. Improvements in technology, and the commercial and financial success of railway companies, made the public realise the enormous advantages to be gained from improved transportation by rail, and demand its immediate provision. At the same time the fruition of a number of major railway projects was releasing capital for investment in new schemes, many of which were supported by established railway companies as complementary to their own systems(34).

However, this argument is severely flawed. The Railway Mania was one of a series of nineteenth century speculative manias centering upon joint-stock companies. Though railways featured prominently in the mid-1840s mania, banks, urban utilities and other forms of enterprise were not neglected. This was despite the fact that there was now less scope for their promotion because of the numbers formed in earlier decades. Many of the railway projects successful in obtaining capital in 1844-5 were the very ones put forward and rejected at earlier times. The Glasgow-Carlisle Railway re-appeared in 1844 as the Caledonian Railway and obtained the capital it required(35). For railways such as these there was a long-standing demand for their construction. However, the abundance of capital led to many railways of limited utility being promoted. The Bankers' Magazine observed in

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(31) - quoted in G Graham, The Caledonian Railway: Account of its Origin and Completion, Glasgow, 1888, 15-16
(32) - Vamplew, op cit, 436, 426
(33) - EWJ, 25 Oct 1844
(34) - Reed, op cit, 27, 29
A G Kenwood, Railway investment in Britain, 1825-1875, Economica (NS), XXXIII, 1965, 316
(35) - Graham, op cit, 12, 51, 68, 70, 77

June 1845 that in Scotland,

> Anything in the shape of a Railway seems to be acceptable - no matter whether the contemplated line be a good one or not. The only question asked is - 'will it go at a premium'.(36).

Those railways that were built at this time were often grossly over-capitalised compared to the immediate traffic prospects. As a consequence many Scottish railways paid low dividends or none at all for years after their completion(37). Relative to the demand for rail transport too many railways were established in the 1840s and too much capital was expended on their construction.

In contrast to the mid-1840s the next ten years were a lean time for railway company finance. The Aberdeen Herald voiced their annoyance in 1850,

> Five years ago any scheme of Railway extension no matter how absurd, impracticable, or useless, was sure to find subscribers. At present, no scheme, however wise, proper and necessary, will receive the slightest support(38).

This position gradually improved in the second half of the nineteenth century as established railway companies began to pay dividends regularly. However, even the five concerns that dominated the Scottish railway network after 1865 could do no more than generate sufficient profits to finance maintenance and minor works. Railways still had to compete with alternative investments for the funds necessary to finance the more substantial capital projects. The Firth of Forth Railway Bridge had been proposed originally in 1865, but abandoned because of insufficient finance. When it was put forward again in 1873 the same fate befell. It was not until 1883 that the project gained acceptance and the bridge was not opened until 1890(39). Similarly, the minor boom of railway construction in the remote Highlands in the 1890s was mainly occasioned by the low interest rates at the time and the temporary absence of competing investments(40).

When the chronology of cause and effect in the growth of the Scottish railway system is closely examined, the major determining factors are clearly highlighted. It is quite obvious that railways had no special position on the capital market but had to take their place along with a variety of other joint-stock companies. There is also not a strong relationship between supposedly important events in railway history and the growth of a railway network. The gap in time

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(36) - The Bankers' Magazine, June 1845
(37) - L E Hopkins (ed), The Universal Railway Manual, London, 1911, 15
Michie, op cit, 314-5
(38) - AH, 6 July 1850
(39) - W M Acworth, The Railways of Scotland, London, 1890, 51
O'Dell (1939), op cit, 133
(40) - J Thomas, The West Highland Railway, London, 1965, 79
Aberdeen Free Press, 27 Aug 1890

between the event and the later successful appearance of new railway projects is too great. In railway construction and operation, technology can be relegated to little more than a passive role. Railways were built and run using established technology which was modified and improved with practice. Company policy did become more important when the Scottish railway system was dominated by a few large companies, but even then any major additions had to depend upon a successful appeal to the investing public. Demand for improved transport always existed and was growing, but the appearance of new railways was hardly responsive to it. The need for an Edinburgh to Glasgow link existed for decades before a line was finally built. Conversely, in the 1840s a number of railways were built ahead of effective demand. Landscape was important in determining the pattern of railway development but only through its influence on the location of economic activity and thus wealth. The overcoming of physical barriers, through breakthroughs in technology which allowed new routes to be constructed, was of little consequence. Undoubtedly, the major factor determining the cycles of railway construction in Scotland was the availability of capital. The willingness of investors to invest in railways conditioned the nature and location of the railways that were built, as well as the timing of their construction. It was only when there was sufficient funds available to finance the construction of an extensive railway network that most non-mineral lines became viable propositions. These lines could not generate sufficient traffic by themselves to justify their cost. However, as part of a system they could become remunerative because of the expansion of non-local traffic. This change took place in the 1840s. Other factors were important in influencing railway construction but the one that mattered in the final analysis was the supply of funds.

SOCIETY NEWS

Memorandum from the Council of the Scottish Society for Industrial Archaeology (SSIA) and the Committee of the Scottish Society for the Preservation of Historical Machinery (SSPHM) to the Secretary of State for Scotland concerning the Williams Committee Report, 'A Heritage for Scotland'.

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1. The Committee and the Council, on behalf of the Societies, welcome the Williams Committee Report, and are particularly pleased to see the prominence given to the proposals for a Museum of Industry.

2. The Societies would stress to the Secretary of State the urgent importance of preserving Scotland's industrial heritage, having full knowledge from their activities of the rate at which objects are disappearing, and knowing that when the present economic difficulties ease and industry begins to re-equip itself, the rate of destruction of plant will be vastly increased.

3. The Societies would therefore urge the Secretary of State to implement at once the recommendations incorporated in paragraphs 2.8 and 2.9 and summarised in 9.7 and 9.8 of the Report, and to put in hand arrangements for the provision of an appropriately managed store. Bearing cost in mind, we suggest that the store might be in a building already in public ownership.

4. The Societies would point out that the building initially designated as a store might itself become the proposed Museum of Industry. This possibility arises largely from the high cost of moving industrial equipment from one site to another, and should be remembered when a store is being sought.

5. The Societies remind the Secretary of State that a number of Groups and Societies, including the SSPHM, have been actively collecting artefacts over the years, and now have substantial holdings - substantial both in terms of number of items and of weight. They have been severely handicapped by lack of adequate storage space, and would probably be very willing to see the bulk of their collections transferred to a government-operated store.

6. The Societies would expect the establishment and use of such a store to strengthen the case in the public mind for the setting up of a Museum of Industry by activating the latent interest which they know to exist in Scotland.

7. The Societies are disappointed that the establishment of a Museum of Industry appears as late as Phase 3 in the time-table of figure 7 of the Williams Committee Report. They urge that the provision of a store under Phase 1 be made before 1986, especially as this could be done under modest cost. If, as recommended by the Societies, the store building were chosen with the possibility of conversion to a permanent museum in mind, then the advance of the project to Phase 2, of figure 7, with

completion by 1985, might be feasible.

8. The Societies note the need, expressed in paragraph 2.9 of the Report, for liaison between the Museum of Industry and other national museums in order to prevent unnecessary overlap of their collections. They would draw attention to other museums, either in existence already, or in the planning stages, which are concerned with industrial collections, and urge that liaison extend to them also.

9. The Societies would be delighted to meet the Secretary of State or his appropriate officers to discuss matters arising from the Williams Committee Report, especially the establishment and management of a store, and they offer their full co-operation.

LOCAL NEWS

A Demolition and a Project in Barrhead

Barrhead, Renfrewshire, now has a schools resources officer with a strong interest in Industrial Archaeology in the person of Alan Steel. As a result, the demolition of Cross Arthurlie Mill (NS 498588) is being marked by a schools project. Alan is being assisted technically by staff of Paisley Museum, and Sylvia Clark has done some research. The following reports are a by-product of this activity.

Cross Arthurlie Mill

(Notes of a survey made rapidly in February 1982 prior to demolition)

The mill is a three storey building and is of stone construction throughout. Originally of 17 bays, a 2-bay extension was added to the northern end, using an identical style of building. The length to the original gable-end was 46.82m; the total length, including this additional section was 54.47m. The width was 12.35m. This concurs approximately with the sale notice of 1828, which gives the width of the building as 36ft.

The southern end of the mill showed the outline of a number of original openings, all blocked by masonry infill similar to that of the main walls. These openings consisted of a door on the ground floor, a window of standard size on the first and on the second floor, and a small window in the upper gable. Also at the southern end were the remains of a stone-built extension to the height of the first floor. The ground level is higher at this end of the building, and the extension wall does not stand more than 3ft above this level. There was no indication of the original height of the extension. At first sight this appeared to be the housing for a water wheel and it may originally have been the wall of a wheel pit which was converted to use as an engine house when the three storey mill was erected. There were no marks on the gable wall of the mill to indicate the mounting for a wheel or the trail of its revolution.

The north gable wall had a stone out-building to the height of the second floor. Above the out-building roof three windows of the standard size were visible, with a small window in the upper gable.

Windows were regularly placed along each facade, 52 on the western side and 51 on the eastern side (including blocked-in windows). The windows on the ground floor measured 1.26m wide by 1.55m high with intervals of 1.55m between the windows. Most windows were wooden-framed, with six lights on the ground and second floor, and with eight lights on the first floor. There were some iron-framed windows (three on the east side, nine on the west side). The windows

all had a masonry surround and stone sills flush with the facade.

There was a wide doorway near the centre of each facade, but the one was not opposite the other. These were probably later features. On the west side, the doorway gave onto the large cobbled yard, with an ornate gas lamp mounted on the wall above it; there was a small door reached by steps under a covered wooden porch near the original north-west corner of the building; and near the southern end a door onto the raised ground used as a loading bay. On the east side was a doorway with masonry surround similar to that on the windows and with a wooden door, possibly the original door.

There were five sanitary towers, one on the west side and four on the east side. The OS maps of 1860 and 1901 show the four eastern towers clearly. The 1901 map also shows the one on the west side with a width of 1.72m and projecting 1.1m from the facade. All rose to the full height of the building, with very shallow pitched roofs. Their appearance suggested that they were all contemporary with the mill. On the east side, an external timber structure at first floor leve, supported by a cast iron pillar, possibly an extra toilet adjoined one of the towers.

A series of cast iron pillars ran along the centre of the mill on all three floors, supporting wooden beams and timber flooring. There were 20 pillars on the ground floor, including those in the extension at the north end. Sixteen pillars were counted on the first and second floors; there may have been other pillars, but the north of the building was obscured by later partitioning and was inaccessible. The pillars on the ground floor measured 2.18m in height, 0.40m in circumference; on the first floor 2.73m in height, 0.38m in circumference; and on the top floor approximately 9ft in height, 0.35m in circumference. All were evenly sited 2.55m apart. In the 2 bay extension to the north only the pillars on the ground floor were measured and they were 2.6m in height (difficult measurement at ground level due to debris on the floor) and 0.35m in circumference. Pillars in the main building had square tops; in the extension they had round tops. Wooden partitioning on all floors between bays 12 and 17 was almost certainly a late addition, and provided office accomodation.

On the map of 1860, entrance to the mill is clearly marked from what is now Cogan Street along the lane to north east corner and round the mill to an entrance porch on the west side. By 1901 Gladstone Avenue had been erected and a building, possibly acting as a lodge, had been constructed between the northern end of the mill and the street. This building still stands next to the large gate which opens onto an extensive cobbled yard. Outbuildings on the east side had been extended by 1901 when they were being used by the Imperial Laundry. One of the outbuildings was still standing at the date of the survey.

Margaret Blackburn
Extension Services Officer
Renfrew District Council
Museum Service

Cross Arthurlie Mill

Gladstone Street, Barrhead (NS 498588)

A firm called Martin and Lee erected a mill here in 1825 to weave fine cotton net by steam. Weaving plain and fancy cotton net was one of Barrhead's lesser specialities; according to Taylor (Levern Delineated, 1831) several local handloom weavers' shops produced according to their own secret ways of adapting the loom. It was the kind of ingenuity the Renfrewshire weavers were renowned for. Martin and Lee may or may not have had the priority, but it was they who took out a patent and started a factory to apply steam power to the mechanism. They chose their time unluckily; by March 1826 they were among the numerous bankrupts of that year. Also in March 1826 the acquisition of the premises was legally completed, probably to set things straight for the creditors; such formalities were often postponed for years. Adam Hamilton senior of Haircraigs took the site from Margaret Adair on a sub-lease for 1900 years from Martinmas 1825 (probably the date when the factory was in starting order). He was the patriarch of the bleaching firm of Adam Hamilton and Sons of Blacklandmill, Paisley, and not himself active by this time; he may have been an unofficial partner of the bankrupt net-weavers.

The lessee and his nominees had the right to use the water of the Kirkton Burn, where it flowed through the property, for manufacturing purposes, to the same extent as they were currently doing, with stipulations against pollution and re-sale of water. Margaret Adair and her heirs reserved the right to make a dam in the lower part of the property, and to carry out work on an already existing dam just above it, with an agreed compensation for damages. The relevance of this existing dam will appear presently.

The principal creditors were William Dunn of Duntocher, John McDowall the Johnstone machine-maker, James Laird of Paisley Foundry, Henry Dunlop of Gateside Cotton Mill and Edward Campbell, bleacher, of one of the two pre-Heys South Arthurlie fields. Evidently, Martin and Lee had not managed to pay for their initial equipment or materials. The creditors put the mill up for sale later in the year, including a 10hp steam engine, about 70 looms (some apparently for fancy net-weaving and some for ordinary power-weaving) and the right to the patent. There was no mention of water-rights. Failing a buyer for the whole, the machinery and patent would be offered as a separate lot from the building and power.

Adam Hamilton took the mill and it can be inferred from later documents that he also subsequently bought the lease of another piece of ground of roughly equal size immediately to the north, bounded by what is now Cogan Street. Here the manager's house, etc, were afterwards built. But by April 1828 his trustees were trying hard to dispose of the mill, at 'less than half' its cost price and allowing the price to remain unpaid as a mortgage on the property. This advertisement states the dimensions of the mill as 70-80ft by 36ft. The machinery may well have been scattered throughout Barrhead; according to Taylor there were about 60 net-weaving looms at work there in 1831 in various small shops working to local and Glasgow

manufacturers and producing about 1,200 yards daily. Among these small manufacturers were Martin and Lee, now separated and seeming to have changed their Christian names (or were they operating under the names of relatives, because they were undischarged bankrupts?) who appear in the Directories up to the 1840 crisis. There were also in the 1829 Directory a specialist in making Patent Net-Weaving Looms.

John and Robert Cogan of Glasgow rented the mill on a short-term basis and made it a powerloom factory. The Hamiltons made at least one more attempt to find a permanent occupant, in September 1830, at an upset price of £800 with the Cogans as sitting tenants, but in vain. Soon afterwards, however, the Cogans must have had an accession of capital. They bought the Pollokshaws Weaving Mill in 1834-5, and the Cross Arthurlie Mill in 1837 (adding in 1839 the site to the north, which by this time had buildings on it which Margaret Adair made them insure for £200). The New Statistical Account reported in 1837 that there was a net-weaving factory on the Kirkton Burn which was just being doubled in capacity. This was probably correct except that it had long ceased to be a net-weaving factory. The length of the mill in 1828 was, as already said, 70-80ft, and by 1858 (OS map) the main building was about twice that length, as it still was in 1982.

The problematic history concerns the relationship of this site to Cross Arthurlie Bleachfield. There is general agreement that this was started in 1773 by Peter or Patrick Adair from Lismore; Taylor, writing in 1831, says Adair was in the parish from 1765, bleaching on the Levern Water on the site which, when he moved from it, became Fereneze Printfield. In 1782 Cross Arthurlie is noted as a highly mechanised bleachfield for its time and place, 'more properly a mill', for heavy goods and 'Knittings', powered by water. William Adair (who was Patrick's eldest son) was then running a separate bleachfield said to adjoin Cross Arthurlie Field. There is no information as to exactly where the water-powered 'mill' was. The Adair family seemed to have owned land all along the strip of 30 acres or more between Cross Arthurlie Street and the Levern, from the bridge over the Levern at the north end of the street to the bridge over the Kirkton Burn at the south, and perhaps some on the other side of the street as well. They also had the Stewarts Rais estate to the south of Barrhead, and Patrick was a partner in James Dunlop and Co, the cotton-spinning firm which owned Dovecothall and Gateside mills.

In 1796, on Patrick's death, William sold out of the cotton-spinning firm and then or soon afterwards he gave up bleaching and built a water-powered pirn-mill. Pirns, the slender bobbins which carried the yarn inside weavers' shuttles, were in constant demand in the area, and this mill seems to have been the only one of its kind for miles around, so 'Pirnie Adair' no doubt prosepered. Tradition still pointed out the site of that mill in the time of James McWhirter, who died in the 1970s, and it was at NS 49755925, where certain ruins in the river bank were believed by him to be its relics.

William's defection did not, however, end bleaching at Cross Arthurlie. His younger brother John inherited at least the southern end of Patrick's extensive property there and was described as 'bleacher, Cross Arthurlie' until he died, unmarried, in 1813, leaving his two sisters as co-heirs. It was one of the sisters, Margaret,

relict of Charles Black, bleacher of Springfield, who sub-leased the site of the Weaving Factory to Adam Hamilton. During the interval since 1813 the bleachfield ahd evidently been abandoned and several portions along the main road were sub-leased to various lessees. Margaret's sons, James and John Black, wanted neither Springfield nor Cross Arthurlie, but started a new 'Fereneze Bleachfield' - probably the later 'Cross Arthurlie Printworks' and still later 'Cross Arthurlie Dyeworks' at NS 501590.

On an undated estate map, not primarily concerned with this side of the Levern, the words 'Mrs Adair's Property' are written large across most of the area already referred to as the family property. This presumably refers to Janet Donaldson, Patrick Adair's widow, who outlived him by 28 years. She may have had a life-interest in the whole property - in which case there should be some connection between her death in 1824 and the leasing of the site of Cross Arthurlie Mill in 1825 - but it seems more likely that she had one in the part of the property which was to revert of William. John had had Stewarts Rais and had acknowledged her life-interest in that; the part of Cross Arthurlie which was his might reasonably be expected to be smaller than his elder brother's, and since the adoption of chlorine the area required from carrying on a bleachworks had grown much smaller.

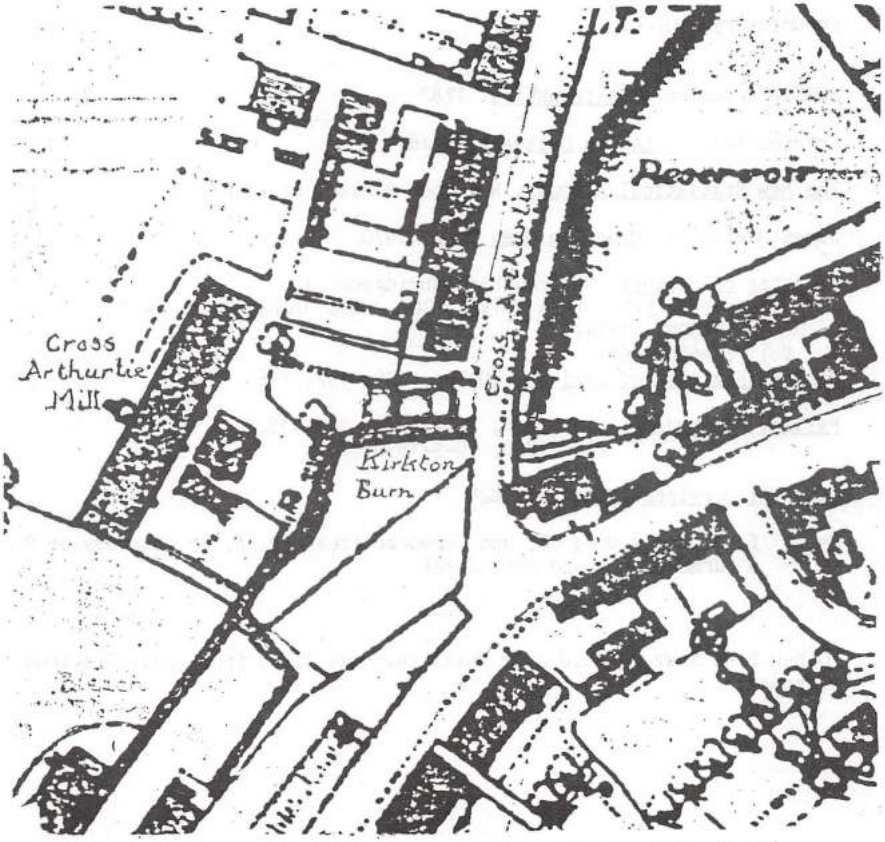
All this leads S. C. to think that Cross Arthurlie Mill was most likely on the site of Patrick Adair's notable bleachworks which went by water. Patrick and later John would use the Kirkton Burn for power, possibly the Levern for steeping and grassing. William would have the Levern for all purposes.

Although water-power was not used at Cross Arthurlie Mill, examination of the ground in 1982 suggested that it had been used at some time on that site (as indeed the terms of Adam Hamilton's lease suggest). Beside the south gable wall of the mill there was a sharp drop in ground level which would have made a wheel-pit. This small area had been covered by a lower structure, shown by the 1858 OS map and by marks on the wall; and there were patches in the wall which could have admitted shafts; so perhaps the disused wheelpit was made into an engine-house. A convenient route for a lade to this point can still be traced in spite of the alteration in the ground made by the railway viaduct. The burn itself is now channelled on the other side of the viaduct, and even by 1857 it was following an artificial course dictated by the requirements of the West Arthurlie Bleachworks. Some embanking was necessary to keep it on this course, and the dam there has a higher retaining bank to the north than on the other sides; the natural course may have gone more to the north.

However, some argument has arisen between your reporters as to the probability of Patrick Adair's preferring the Kirkton Burn to the Levern for his power; may not the pirn-mill have been built on the site of the original bleachworks? The explanation of Patrick's choice might be that the Kirkton Burn gave a better head than the Levern at the points where they were respectively available. The Blacks never took up the option, secured in the lease, of making another reservoir in the Cross Arthurlie mill grounds; but instead they built a larger reservoir on the other side of Cross Arthurlie Street in 1831 and Taylor observed that they thus secured a fall of 45ft for the new printfield, whereas they could only have had a few feet from the

Levern. Their immediate upstream neighbours on the Levern, Fereneze Field, had a lade about half a mile long from a point near Chappel. There would hardly have been water enough for both to construct such lades. And if Adair did indeed vacate a place on the Levern in favour of the printing firm, there might be some agreement limiting the use each would make of the water in future. Patrick Adair would need a greater head for his machinery than William did. The West Arthurlie works arrived on the scene later than Cross Arthurlie (about 1780) and perhaps interfered increasingly with the head available there; this might be why Patrick's grandsons preferred to make a fresh start lower down.

As may be gathered from M B's survey, the building at Cross Arthurlie did not look as though it consisted of an 1825 portion and an 1837 portion; the main stone structure, about 150ft long without counting the extension, seemed continuous and uniform. We therefore date it from 1837. There was very much additional later woodwork, and



From OS 1858

before demolition could begin we got the impression that the only interior features not of timber were the cast-iron columns.

These columns could, in S C's opinion, very easily have been of a later date than 1837. There was a single row of them in both sections of the building, supporting a longitudinal timber beam which seemed to be responsible for holding up a floor more than thirty feet wide. It seemed a little noticeable also that the gable walls had centrally-placed windows in them. A double row of columns would have been more expected. The explanation appeared as demolition proceeded. Hidden between the floor and the ceiling - both of stout planks - was a set of transverse fish-bellied cast-iron beams. Precisely how they relate to the columns will perhaps come to light after this has gone to print. It looks rather as if the whole internal structure had been altered at some point. There is no record of a fire; the motive could have been to clear the floor-space by eliminating a row of columns.

Sylvia Clark

Documentary Sources:

Semple/Crawford's Renfrewshire, 1782

Charles Taylor, Levern Delineated, 1831

The New Statistical Account, Neilston Parish, written 1837

James McWhirter, Mine Ain Grey Toon, 1970

Register of Sasines, Renfrewshire Abridgements:
Vol 1; 228, 3196, 4436, 5633, 6067, 6068, 6073, 8476, 8477, 10977, 11347
Vol 7; 4686, 4687
General Register of Sasines, 3005pp, 129, 132, 138

Paisley Advertiser, 7-12-1824, 23-3-1826, 7-10-1826, 26-4-1828, 18-9-1830

Index of Services of Heirs, 1824

Maps: first and second OS, and Fereneze Estate Plan, by courtesy of P A Burns-Graham and Alan Steel

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[Other Site News is held over until the next issue from considerations of space]

RESTORATION AT POLLOK

by
G Beveridge

The power house at Pollok estate in Glasgow was installed in about 1900 to provide a DC supply to the house and was in use until the mains electricity was connected in the 1930s. The power house is situated on the bank of the River Cart adjoining an already existing water-powered woodworking shop which is still in working order and has been in occasional use until quite recently.

The original power installation consisted of a water turbine located in a chamber below the power house and driving a large crown wheel at ground level which in turn drove a pinion on whose shaft was mounted a belt pulley providing the drive to an overhead lineshaft. Two DC generators were driven by belts from the lineshaft and a standby oil engine was provided which could drive the lineshaft via a fast and loose pulley system in the event of low water or breakdown of the turbine. The extent of the wear on the loose pulley bearing indicates that it must rarely have been necessary to use the engine. At some later date an extra pulley was mounted on the lineshaft to allow a drive to be taken from the adjoining woodshop turbine. Finally, a rotating ball governor was driven from the lineshaft. This governor is of an interesting design incorporating a force multiplying arrangement to move the heavy ring sluice on the turbine and it is hoped to describe this fully in a future article.

All that remains of the original installation are the turbine and gears, the governor and control gear and the overhead lineshaft.

Our initial impression was of a mountain of dirt and rust which would have to be removed before any attempt at restoration could start. The intention was to restore the machinery to as nearly new an appearance as possible, and as nearly as possible to working order.

The turbine itself was found to be silted up solid and no attempt has been made to tackle this, as it would be necessary to lift it out of the chamber together with the crown wheel and a task of this magnitude was well beyond the capability of the working party. The cross shaft carrying the pinion and main belt pulley was lifted out by a job creation group and this made the task of cleaning the crown wheel, the bearing stands and the shaft itself very much easier.

The governor and sluice control gear were also dismantled at this stage and this proved to be a fairly lengthy business due to the rather involved construction. Surprisingly, though, all the nuts and bolts came off very easily, including those holding the control gear stand to the floor, the nuts being under the floor in the turbine chamber and exposed to the wet conditions for something like 80 years.

Removal of the dirt, which seemed to be mainly pigeon droppings, was straightforward if messy and laborious. A water soluble degreasing agent was applied followed by scraping and washing with clean water. Rust on the bright parts proved to be a greater problem as this had caused severe pitting in places. The method adopted was

to use coarse emery cloth lubricated with paraffin to prevent the scratching usually associated with the use of emery, and so restore, more or less, the original finish. However, the more severe damage could only have been removed by remachining and so this still remains in places.

Some minor repairs were carried out such as building up and reshaping, by hand, a broken tooth on a brass gearwheel.

The general condition of the governor was very good apart from the rust, and on subsequent reassembly all the parts fitted well and by rotating the drive pulley with a hand crank it was possible to observe the action of the weights and force multiplier.

The structure of the crown wheel is interesting in that the rim and centre are formed from a one piece casting and the teeth are made from hardwood and inserted into slots in the rim. The wooden teeth would considerably reduce the noise invariably associated with straight tooth gears. Lubrication was presumably by the application of heavy oil or grease by hand to the teeth. The pinion shaft and the lineshaft run in plain brass bearings with oil bath lubrication and the oil baths are provided with drain cocks to allow the oil to be changed periodically. A considerable amount of wear was observed on the crown wheel, indicating that the system had had a lot of use.

After the worst of the dirt and rust had been removed from the machinery at floor level, a start was made on the lineshaft working from a scaffold. Again, the initial problem was a thick layer of dirt and severe rusting. It was obvious that the shaft had lain indisturbed for a long period as the dirt and rust were much thicker on the upper surfaces. Even so it was possible to turn the lineshaft by hand before any cleaning was started, showing the value of the oil bath bearings, all of which still had oil in a more or less fluid state in them.

Where possible, ie where it was within the capacity of our muscles, the pulleys, which were all made in two parts, were split and lowered to the floor for cleaning. This made things a lot easier but the two generator pulleys were too heavy to be taken down and had to be cleaned in situ.

The most severe rusting of all was on the lineshaft and pulleys, and this was tackled using an industrial disc sander and was without doubt the dirtiest and most tiring part of the operation.

After the worst had been removed, a belt was fitted to drive the lineshaft from the woodshop turbine, and with the lineshaft rotating at about 40rpm the sander was walked along the shaft in the manner of a tool in a lathe to achieve as uniform a finish as possible. This trick proved to be remarkably successful and although there is still some severe pitting the effect viewed from floor level is very good.

When all cleaning was complete and a few repairs had been carried out, all the parts were painted in the following colours:

Rotating and moving parts	- Red
Bearing pedestals and caps and governor frame	- Green
Crown wheel and pinion and governor plinth	- Black

Everything was given a coat of primer, a coat of undercoat, and two top coats and all parts were painted before assembly to avoid overlapping of colours. The painting was done during a particularly cold period and it was always a bit of a surprise to find that the paint had dried when we returned the following week.

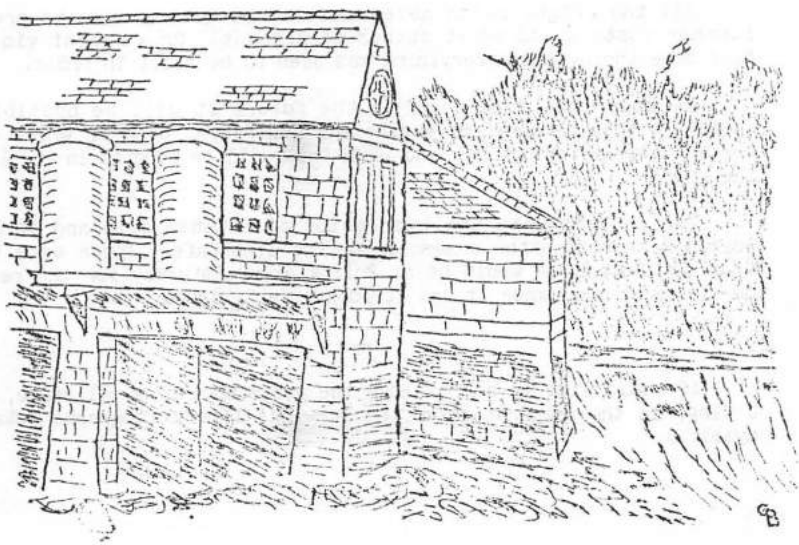
When painting was completed the parts were reassembled and the motions tested for running where possible. The governor and control gear have deliberately been reassembled out of gear with the sluice so that they can be run for demonstration.

All the bright parts have been coated with grease to prevent further rusting and so it stands at present. On a recent visit to take some photographs everything was seen to be still in order.

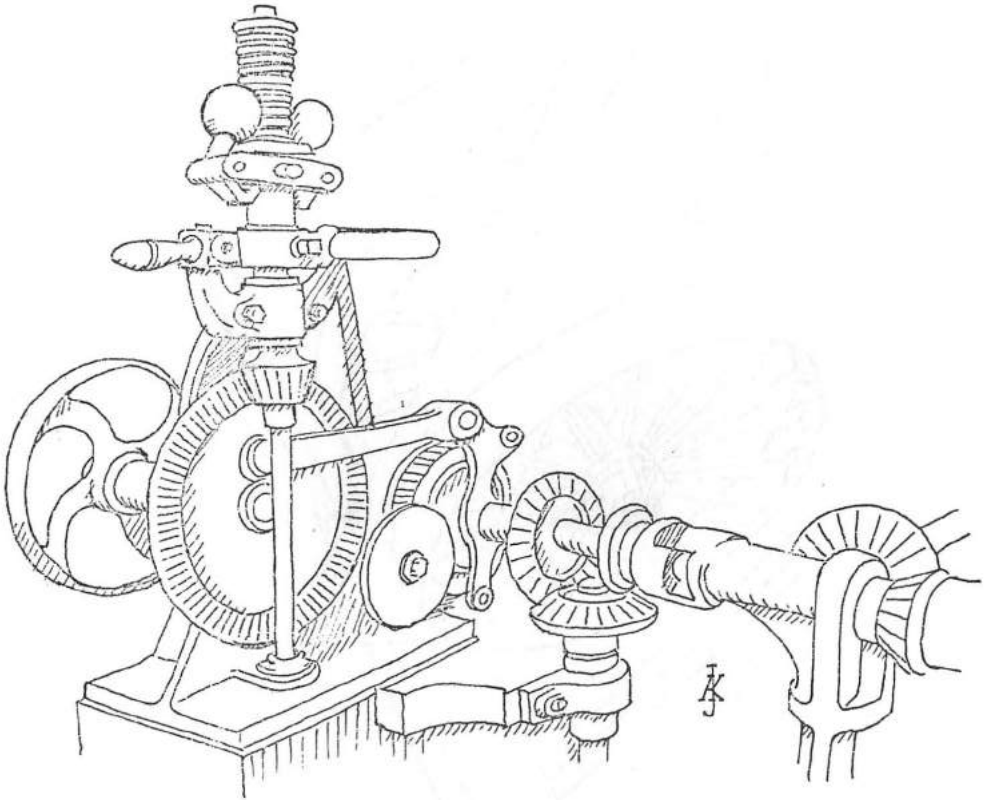
We hope that some time in the future it will be possible to install a typical paraffin engine and generator, both of which exist and are available, but how and when this will be done is in the lap of the gods.

One is left with the impression of intense cold and of being coated with rust after a session on the lineshaft. There were times when we thought we would be at Pollok every Saturday for the rest of our lives, but we made it and it looks pretty good.

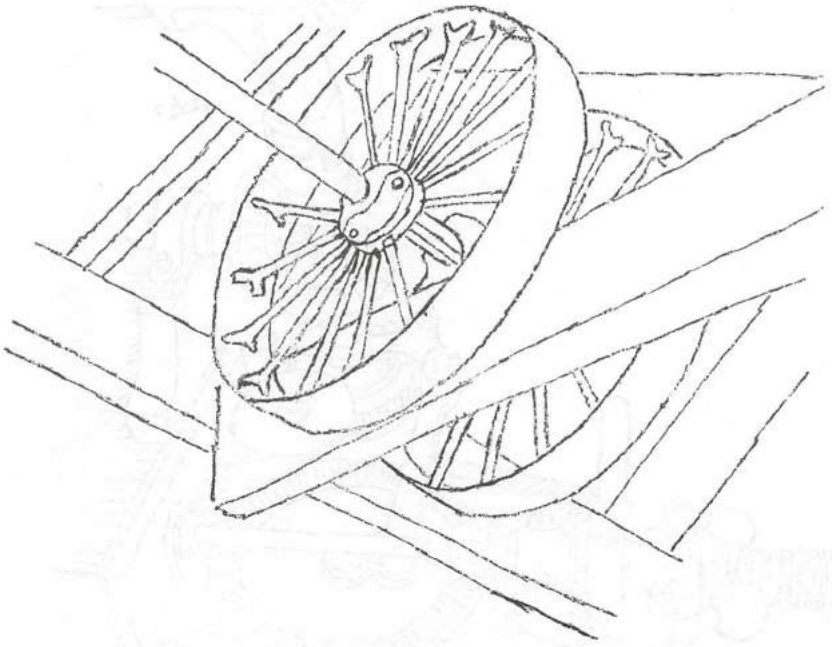
(I would like to acknowledge the assistance of a colleague, Mr A J King, in the preparation of the drawings from photographs taken by myself.)



Power House at Pollok



Governor at Pollok



Lineshaft Pulleys at Pollok

SUMMARY LISTS OF ARCHIVE SURVEYS AND DEPOSITS

1 National Register of Archives (Scotland)

Surveys completed by the Registrars since publication of Scottish Industrial History, vol. 4. Full details are available from: The Secretary, National Register of Archives (Scotland), P.O. Box 36, H.M. General Register House, Edinburgh EH1 3YY.

AGRICULTURAL, ESTATES, LAND AND PROPERTY

1021 Colonel A. J. C. Hope of Luffness. Deposited in S.R.O. (GD. 364). Title deeds, East Lothian, 1452-1922, and Fife, 1640-1908. Estate papers, East Lothian and Fife, 1756-1938.

1830 Captain Colin Farquharson, Alford. Whitehouse estate and household accounts, 1788-1927; wages books, 1858-78; estate diaries and notebooks, 1841-93, n.d., including factor's diary, 1862-93, and notebook concerning conditions of tenure, early 19th century; estate and legal correspondence, 1756-1930; inventory of estate effects, 1844-80; miscellaneous schedules and estimates relating to mansion house of Whitehouse, 1887; Breck estates legacies accounts book, 1870-8.

1882 Hay-Fleming Reference Library, St Andrews. Papers of David Hay-Fleming. Titles to lands in Banff, 1467, and St Andrews, 1534-1872. Papers relating to dispute over pasturing cattle on commonty of Prior Muir, 1753-95.

1883 Skene, Edwards and Garson, W.S., Edinburgh. Papers of and relating to Lady Emily Gordon Cathcart and Sir Reginald A. E. Cathcart, mostly concerning Long Island and Cluny estates, 1736-1968. Titles and legal papers relating to lands in the Uists, Barra and Edinburgh, 1737-1954; rentals, 1814-1948; accounts, 1892-1944, including house stewards' accounts, 1892-1909, and farm accounts, 1921-42; inventory and valuation of Cluny Castle, 1932. Correspondence and papers relating to Long Island affairs, 1878-1944, subjects include crofting problems. Robertson of Inches: titles to lands in Inverness-shire, 1724-1860. Wedderburn of Balindean: titles to land in Inveresk, 1718-1848; estate, household and personal accounts, 1796-1862. Miscellaneous papers, 1437-1722, including titles of Clifton and Cliftonhall, 1437, and Pumpherston, West Lothian, 1488.

1892 Martin Henderson of Hensol, Esq. Cuninghame of Lainshaw and Duchrae. Titles and estate papers relating to Lainshaw, Ayrshire, Duchrae, Kirkcudbrightshire, and Kilbucho, Peeblesshire, 1655-1939, including rentals, 1767-1863; memoranda books of William Cuninghame of Lainshaw, giving details of tenants, methods of farming, etc. on estates of Duchrae and Kilbucho,

1786-97.

1907 Francis I. J. Fraser of Tornaveen, Esq. Titles to lands in Leith, Kincardineshire and elsewhere, 1547-1835. Legal, financial and general papers relating to Fraser family and estate, mainly regarding Findrack, 1547-1939, including rentals, 1802-65; farm valuations, 1774-1838; estate and household accounts, 1752-1902. Estate and personal correspondence, 1666-1939. Miscellaneous notes concerning historical development of estate and district, n.d.

1910 Kinross-shire Antiquarian Society. Titles, correspondence and papers relating to property and persons mainly in Kinross-shire, 1706-1945, including Shanwell rental book, 1759-1804; Channel farm cash book, 1918-49, and farm produce book, 1933-49.

1913 Glasgow University Archives. Anderson, Young and Dickson, solicitors, Glasgow. Titles and related papers concerning lands and property in Glasgow, 1674-1842, Edinburgh, 1765-1802, Argyll, 1835-62, Ayrshire, 1787-1820, Lanarkshire, 1720-1851, Renfrewshire, 1695-1845.

1915 Laurence Blair-Oliphant of Ardblair, Esq. Titles, legal and estate papers of the lands of Ardblair, Gormock, Scone and Gask, Perthshire, 1657-1923; rental of barony of Gowrie, 1724. Plans of estates of East Gormack and Gask and Tay basin, 1831-55.

1919 C. S. McPhie, Esq., Glenbervie. Titles to lands in Kincardineshire, 1517-1716. Estate and business papers relating to lands of Glenbervie, 1490-1835; inventories and valuations of lands of Auchtocher, Knockbank and Mill of Glenbervie, 1719-94.

1921 Dundee City Archives and Records Centre. Papers relating mainly to family of Wedderburn of Pearsie, Forfarshire, 1701-1910, including titles, 1748-91; tacks, 1731-7; financial papers relating to estate and business matters, 1748-74.

BANKING

1819 Glasgow University Archives. Miscellaneous banking records. Thistle Bank: administration and maintenance accounts, 1795-1836; postage accounts, 1795-1834; bankers' licences, 1813-34. Glasgow Banking Company: bills of exchange, 1809-45; insurance premium receipts, 1834-42. Financial papers and correspondence of the Glasgow Union Bank, 1832-43, Glasgow and Ship Bank, 1834-44, and Ship Bank, 1834-7. Union Bank of Scotland: managers' business and personal correspondence, 1853-1911. Annual reports of various Scottish and English banks, 1869-1927.

COAL-MINING

1910 Kinross-shire Antiquarian Society. Central Fife Coal Co., leases, report, prospectus, and correspondence, n.d.

CONSTRUCTION AND ARCHITECTURE

1021 Colonel A. J. C. Hope of Luffness. Papers relating to building of Rankeillor House, 1791-1848, and Luffness House, 1803-61.

1898 Nairn Floors Ltd., Kirkcaldy. Plans and drawings, 1850-current, mostly of land, buildings and machinery owned by company, but including projected extension of Kirkcaldy Cottage Hospital, 1947.

1900 Archibald Scott Ltd., coachbuilders, Bellshill. Miscellaneous architectural plans relating to Bellshill area drawn by founder of firm, c. 1890.

1911 Sir Hector Laing, Edinkillie, Moray. Dunphail House drawings. Architectural drawings, 1787-c.1964, architects including John Baxter, John Paterson, W. H. Playfair and Alexander Ross.

1912 Royal Commission on the Ancient and Historical Monuments of Scotland. Balmoral Castle and estate drawings. Copy plans by John and William Smith of proposed alterations to castle (not executed), 1848. Copy plans by William Smith of castle, 1853-4. Plans by Mills and Shepherd, Dundee, 1922-4, of construction of estate buildings and gates. Miscellaneous prints of castle and estate, 1850-1961.

1920 W. A. Fairhurst and Partners, consulting structural and civil engineers, Glasgow. Job-book, 1930-65, with related drawings, contracts, correspondence and other working papers.

ENGINEERS

1890 Robert H. Cuthbertson & Partners, consulting engineers, Edinburgh. Records, c.1952-current, including contract files and documents; data sheets, reports; operating manuals; drawings and progress photographs; general files on jobs; publicity brochure, 1977, giving history of firm and information of major projects.

1897 Thomas Laurie & Co. Ltd., electrical engineers and automobile dealers, Falkirk. Directors' minutes, 1927-current; accounting records, 1920-61; schedules, costing sheets and quotations for electrical equipment, 1939-44; service and sales agreements, 1920-56; letter book, 1906-7. Printed material c.1935-50. Photographs of firm's premises and of work carried out on St Michael's Church, Linlithgow, 1934-c.1955.

1920 W. A. Fairhurst and Partners, consulting structural and civil engineers, Glasgow. Job-book, 1930-65, with related drawings, contracts, correspondence and other working papers.

INSURANCE

1819 Glasgow University Archives. Glasgow Banking Company: insurance premium receipts, 1834-42.

1913 Glasgow University Archives. Anderson Young & Dickson, solicitors, Glasgow. Insurance policies, 1812-13; charter parties and insurance policies for vessels trading in mahogany between London, Liverpool and Belize, 1838-51.

1918 General Accident Fire and Life Assurance Corporation Ltd., Perth. Minutes of directors, 1885-1970; trustees department committee, from 1931, and investment department, from 1946; accounts, 1885-current; investments records, from 1887, including guarantee department special files; shareholders' records, from 1906; papers relating to policies, from 1901, including underwriting records, from 1907; staff records, from 1889, including wages books and staff regulations. Scottish General Fire Insurance Co. Ltd: board minutes, 1895-1900.

MANUFACTURING - COACHBUILDING

1895 Alex. Laurie & Sons Ltd., coachbuilders, Falkirk. Printed catalogues of trailers, c.1930-50. Photographs, c.1920-55, including views of staff and premises, c.1920, and of vehicles built, c.1920-40.

1900 Archibald Scott Ltd., coachbuilders, Bellshill. Accounts' ledgers, 1877-1900; job ledgers, 1900-12; wages book, 1932-40; employees' time books, c.1880-1905. Photographs of family, employees, premises and vehicles produced by firm and others, c.1880-1977.

MANUFACTURING - SHIPBUILDING

1450 Scott & Sons (Bowling) Ltd., shipbuilders. Deposited in S.R.O. (GD. 322), shipbuilding records (additional).

MANUFACTURING - TEXTILES

1896 N. Lockhart and Sons Ltd., weavers, Kirkcaldy. Accounting records, 1805-1929, including payments books for handloom weavers, 1805-14; shirting pattern book, 1912. Records relating to firm's machinery, including correspondence, 1857-1974, and technical reports, specifications and diagrams, 1859-1937. Personal and business diaries of Robert Lockhart, partner in firm, 1852-62. Photographs, mainly of firm's premises, staff and machinery, c.1890-c.1978.

MANUFACTURING - MISCELLANEOUS

1898 Nairn Floors Ltd., Kirkcaldy. Michael Nairn and Co. Ltd.: minutes of meetings of directors, 1893-1959, shareholders, 1932-58, and joint production committee, 1942-60; share and dividend records, 1893-1962; wages records, 1872-1962, including regulations to be observed by workmen, 1872; price lists, 1882-1958; legal papers, 1886-1961, including co-partnery agreements, 1858-94, and agreements with associated companies in America, France and Canada, 1886-1920; business and family correspondence, 1847-96; drawing office jobs book, 1929-51; pattern and samples books, c.1850-1960; specifications and other technical data relating to linoleum and its production, 1907-33; patent for improved printing machinery, 1876; miscellaneous printed and typescript material, including company magazine, 1959-78, notes on question of trade recognition, 1939, and account of wartime activities of firm, 1946; photographs of staff, premises and processes, 1894-current.

PRINTING AND PUBLISHING

1542 John Cossar and Sons Ltd., newspaper publishers, Glasgow. Bound sets of Govan Press, 1885-1977, Clydebank and Renfrew Press, 1892-1922, Clydebank Press, 1923-76, and Renfrew Press, 1923-76. Papers relating to 'Cossar Printing Press', 1911-49, including patents, drawings, photographs, parts' lists, instructions, correspondence and printed histories. Miscellaneous instruction manuals for printing machinery manufactured by other companies, n.d. Wages book, 1911-37.

1899 Alloa Printing and Publishing Company Ltd. Copies of Alloa Journal, 1811-current

1915 Laurence Blair-Oliphant of Ardblair, Esq. Correspondence and papers of William Creech, Edinburgh publisher (1745-1815): correspondents include Hugo Arnot, Joseph Black, 'Jupiter' Carlyle, Sir John Clerk of Eldin, Archibald Constable, Henry Mackenzie, Thomas Sheridan, Sir John Sinclair, Lords Hailes, Kames and Jeffrey and academics from universities of Edinburgh, Glasgow and Aberdeen. (Microfilm in S.R.O., RH. 4/26.)

SOLICITORS

1903 Anderson and McVie, W.S., solicitors, Haddington. Cash books, 1938-54; letter and case files, c.1945-65.

1910 Kinross-shire Antiquarian Society. G. Bogie, solicitor, Kinross, cash book, 1855-72.

1913 Glasgow University Archives. Anderson Young & Dickson, solicitors, Glasgow. Legal and financial papers, 1674-1878; miscellaneous executry papers, mainly relating to merchants and tradesmen in west of Scotland, 1802-78; papers relating to bankruptcies, mainly of Glasgow tradesmen, 1831-60, and to debts due to Glasgow merchants and tradesmen, 1674-1821;

apprenticeship indentures, 1757-1841; miscellaneous legal and financial papers relating to Buchanan and Cuthbert families, 1802-40, 1854-5, business interests of Robert Napier, 1765-1877, lease of powder manufactory at Coatfield, Argyll, 1827-56, and improvements on spinning-jenny by William Craig and William Douglas Sharp, 1839-40.

TRADE - MERCHANTS

1742 J. C. Robertson, Esq., C.B.E., Oldhamstocks, East Lothian. Low, Robertson and Co. Ltd., wine merchants, Leith: ledger, 1869-1902; press cuttings relating to 150th anniversary, 1963.

1892 Martin Henderson of Hensol, Esq. Cuninghame of Lainshaw and Duchrae. Papers relating to Cuninghame family and tobacco trade, including letter books of William Cuninghame and Company, tobacco merchants, Glasgow, 1767-77.

1894 Glasgow University Archives. Thomas Lang papers. Papers and correspondence relating to business affairs of Thomas Lang senior, merchant and sea captain, and his brother James, grocer, Greenock, 1760-94. Papers relating to business and personal affairs of Thomas Lang junior, 1802-64.

1901 John Fleming and Co. (Southern) Ltd., timber merchants, Glasgow. Minutes of directors' and annual general meetings, 1973-7; annual return, 1974. Watt Torrance Ltd., timber merchants, Glasgow: minutes of directors' and annual general meetings, 1919-73; annual returns, 1948-73; wholesale whitewood prices, 1891-1930; letters from Ministry of Supply relating to wood stocks, 1945-6. Photographs of staff premises and plant in Glasgow and Grangemouth, 1910-c.1955.

1913 Glasgow University Archives. Anderson Young & Dickson, solicitors, Glasgow. Miscellaneous executry papers, mainly relating to tradesmen in west of Scotland, 1802-78; papers relating to bankruptcies, mainly of Glasgow tradesmen, 1831-60, and to debts due to Glasgow merchants and tradesmen, 1674-1821.

TRADE - RETAIL

1894 Glasgow University Archives. Thomas Lang papers. Papers and correspondence relating to business affairs of James Lang, grocer, Greenock, 1760-94.

1897 Thomas Laurie & Co. Ltd., electrical engineers and automobile dealers, Falkirk. Directors' minutes, 1927-current; accounting records, 1920-61; service and sales agreements, 1920-56; letterbook, 1906-7. Printed material, c.1925-50. Photographs of firm's premises and vehicles.

1902 Arbuckle, Smith (Holdings) Ltd., warehousing agents and hauliers, Glasgow. Balance sheet and profit and loss account, 1899. Photographs of staff, premises, vehicles and goods in Glasgow, Liverpool and elsewhere, c.1910-70.

1910 Kinross-shire Antiquarian Society. Kinross and Milnathort Gas Light Co., meter books, 1868-86.

TRANSPORT - RAILWAYS

1908 Lancashire Record Office. Photographs of Tay railway bridge at various stages of construction, n.d. Tay Bridge supplement of Dundee Advertiser, 1887.

TRANSPORT - SHIPPING (INCLUDING HARBOURS AND PORTS)

1883 Skene, Edwards & Garson, W.S., Edinburgh. Papers of and relating to Lady Emily Gordon Cathcart and Sir Reginald A. E. Cathcart, mostly concerning Long Island and Cluny estates, 1736-1968. Correspondence and papers relating to Long Island affairs, 1878-1944, subjects including local harbours. Papers relating to Collieston harbour, Aberdeenshire, 1890-1908, including minute book of meetings concerning proposed harbour, 1890-4; papers concerning legal proceedings between Alexander Melville, civil engineer, and Collieston Harbour Trustees, 1894-9; correspondence about unsatisfactory state of completed harbour, 1897-1908.

2 Strathclyde Regional Archives

The following business, industrial and commercial records have been received since the appearance of the last number.

Applications for access should be made to the Principal Archivist, Strathclyde Regional Archives, P.O. Box 27, City Chambers, Glasgow G2 1DU, or, if calling, at 30 John Street, Glasgow (Basement Office). Telephone: (041) 221 9600 Ext. 2021.

Engineering: shipbuilders

G. Langmuir Collection (Additional): further yard drawings of Clyde paddle steamers, mainly from A. & J. Inglis. 19th century.

Alfred Mylne and Co., marine architects. Yacht design drawings for their productions, c.1860-c.1940.

Manufacturing: textiles

Journal of an unidentified textile merchant, Glasgow, 1786-1791. Probably the house of Monteith.

Manufacturing: general

John Wallace & Sons Ltd., Cardonald and other sites, agricultural machinery makers, including the 'Glasgow' tractor.
Records c.1915-1957.

British Dyewood Co. (later Hartshaws), records 19th-20th centuries. (uncatalogued).

Shipowners

Lilburne & Aitken Ltd (Loch Line); Colin Scott & Co.; Burmese Steam Navigation Co. records 19th-20th centuries (uncatalogued).

Trade

Dr. Fraser Stuart, Glasgow, pharmacist's records, 20th century.

Glasgow cinemas: cash books and ledgers, 1933-52.

McGow, newsagent, Gallowgate, Glasgow, accounts. 20th century.

John Symington & Co., booksellers, Glasgow, sales ledger, 1837-9.

Forrester & Co., general warehousemen, Glasgow: stocklist, 1847.

Plans of town centres in Strathclyde showing traders, 1970-1, prepared by Board of Trade Census of Distribution. Include Glasgow centres and Coatbridge, Motherwell, Wishaw, Hamilton, East Kilbride, Clydebank, Dumbarton, Greenock, Kilmarnock.

Solicitors and Accountants

Turner, Hutton & Lawson, chartered accountants; accounts of intromissions, 1897-1950. 48 volumes.

Carruthers, Gemmill & McKillop, solicitors; sederunts of trusts and executories, chartularies and valuations, 19th-20th centuries, 104 volumes.

Employers' Associations

Clyde Shipbuilders' Association, additional (1,652 files), 1902-1977.

Incorporation of Tailors of Glasgow, records, 1527-1974.

Incorporation of Bonnetmakers and Dyers of Glasgow, records, 1557-1970.

Photographers

G. V. Holmer, commercial photographer, Glasgow: negatives (c.8,000).

Biographical material on businessmen

John McKinnon of Carnbroe Ironworks, papers recording his life in Glasgow, 1802-c.1880.

Memoirs by R. D. Henderson of the Hendersons of Pittenweem and Glasgow, shipbuilders and shipowners, 1861-1925.

Laird family of Greenock and Liverpool, shipbuilders and shipowners, c.1770-1840.

3 Scottish Film Archive

Recent acquisitions related to industrial history. Full details from The Archivist, Scottish Film Archive, 74 Victoria Crescent Road, Glasgow G12 9JN.

Retail Trade/Manufacture

1927-1960 Scottish Co-operative Wholesale Society Limited

- food manufacture 1927-1960
- clothing manufacture 1933
- soap manufacture 1927
- tobacco manufacture 1940s
- retail distribution 1949
- retail management 1949

Textiles

1912 FROM WOOL TO WEARER
Hosiery manufacture, Hawick knitwear industry.

1936 DUNDEE
Jute milling.

Railways

1943 THE OTHER MAN'S JOB
Building utility locomotives at the
North British Locomotive Company, Limited, Glasgow.

1949 NORTH BRITISH
The North British Locomotive Company.

c.1960 EAST NEUK OF FIFE STEAM RAILWAYS
Amateur film.

c.1963 STEAM LOCOMOTIVES IN SCOTLAND
Amateur film.

Shipbuilding

1941 STEEL GOES TO SEA
Burntisland shipyard

1949 VISIT TO A SHIPBUILDING YARD
John Brown's, Clydebank

Miscellaneous

c.1947 PADDY'S MILESTONE
Manufacture of curling stones at
Ailsa Craig and Mauchline

1951 OCHILTREE TILE WORKS

1946	THE WHEELWRIGHT
1965	OPENING OF CRUACHAN HYDRO-ELECTRIC DAM
1949	SCOTTISH INDUSTRIES EXHIBITION
1959	SCOTTISH INDUSTRIES EXHIBITION
1943-1953	Scottish Institute of Agricultural Engineering Collection. Records of argricultural machinery examined by the Institute.

BOOK REVIEWS

Maxine Berg (Ed.). Technology and Toil in Nineteenth Century Britain. (London: CSE Books: Ill. Pp 246. £3.50)

It is highly predictable that this useful collection of fifty-one predominantly nineteenth-century documents illustrating 'themes of workplace resistance' to technical change is prefaced by inflated claims for the book by the series editor and Maxine Berg herself. The reviewer, searching for the tablets, can readily miss the much more rewarding view from the mountain top.

The book's introduction is said to offer 'a re-interpretation of the complex structure of the labour process as it developed in Britain ... making the book a self-contained reader for the story of British industrialisation'. It is neither of these. Twelve pages of text are hardly enough to provide a summary of the issues, let alone a re-working of them. Ms Berg's essay is in fact a fairly dull and predictable quasi-Marxist account of the 'phases' of capitalist development from the eighteenth century. Of particular interest to her is the distinction between 'manufacture' (where the worker has some control over the machine) and 'modern industry' (where labour serves the machine). The 'tendency' (Ms Berg makes frequent use of such terminology) throughout the century was for industry to subordinate labour's skill element to capital and the machine thereby increasing what Marx described as relative surplus value.

Rightly, Ms Berg wants to see a closer relationship between economic and social history, particularly where labour is concerned. Perhaps it might serve her well to incorporate some business history too - motivational forces are surely a little more complex than she suggests, or can everything be understood in terms of increasing surplus value? Historians should always be a little wary of books produced or inspired by distinct political groupings, in this case the Conference of Socialist Economists. Althought perhaps the less critical will be satisfied with the cool assertion that the 'new unions' 'were created in the 1880s to organise the mass of the working class in Britain by waging struggles based on class solidarity' even Ms Berg should have her doubts. She includes a document relating to the Scottish rail strike of 1890 which points to excessive overtime working being the major grievance of the men. For Ms Berg Victorian capitalism is highly organised and thus during the 'Great Depression', 'the strategy of British industry was to shift investment to shipbuilding' - this reviewer was previously unaware that 'British industry' had a conscious overall strategy, let alone this one.

Those responsible for producing this book hoped it would aid our evaluation of the analysis of work done by Babbage, Ure, Owen and Marx. Its achievement is in fact a good deal more modest. The collection of documents (which do provide the bulk of the book) will make such evaluation more fruitful by making more readily available material from trade unions, journalists, contemporary observers, and, interestingly, late nineteenth century editions of the Economic Journal. Thankfully, we are spared the lengthy extracts from Marx, Dickens and Gaskell which invariably find themselves incorporated into

the more bland offerings of this sort. Dr Andrew Wynter's 1867 account of the occupational diseases of Sheffield file-grinders and others is eloquent reinforcement of Ms Berg's plea for closer examination of the labour process in the workplace. Surprisingly, only marginal use is made of business records themselves. Therein lies one of the better tests for Ms Berg's hypothesis.

UNIVERSITY OF DUNDEE CHRISTOPHER A. WHATLEY

Brian Bracegirdle. The Archaeology of the Industrial Revolution. (London. Heineman. 1979. Ill. Pp 207. £6.50)

The appearance of this book in hardback form in 1972 was greeted enthusiastically, particularly by the non-specialist press. Now that it is available more cheaply in paperback format, unchanged from the earlier edition, it will be even more widely available.

Certainly, as a marketable commodity, the book is undoubtedly a publishing triumph. It is probably the best illustrated book on the Industrial Revolution, with 138 fine colour plates which are well supported by black and white maps, diagrams and photographs. Each illustration has a full explanatory caption, with the visual material being linked by ten subject chapters, from a brief 'Introduction to Industrial Archaeology' by Brian Bracegirdle himself, through a series of chapters which concentrate on transport and power, concluding with a contribution from Jennifer Tann on 'Building for Industry'.

There is an onus on a reviewer to judge a book on its own terms, paying proper attention to the aims set out by its publisher and author. In this case they are fairly modest, first that specialists should 'find the photographs and captions a useful reference source for key sites' and secondly 'to communicate the visual appeal and intellectual fascination of industrial archaeology to readers who are relative newcomers to its study'. Where the book achieves both of these aims admirably is in Jennifer Tann's article which illustrates how industrial archaeology can be fruitfully used with other historical disciplines. Unlike at least a couple of the contributions (notably those on iron and steel) she admits to the existence of historical problems (and so provides 'intellectual fascination') and asks whether there might be 'general rules which might help to explain the variations in size of ... factories'. For her at least there is an active relationship between an industry, its technology and economic and social factors.

Another measure of a book's worth must be comparison with other material in the field. In this case there is J Butt and I L Donnachie's Industrial Archaeology in the British Isles (1979) which, although, not nearly so lavishly illustrated, does overshadow Bracegirdle's offering. Comparison shows the latter's organisation to be lop-sided, with three of the ten chapters covering transport (including a remarkable 'Other Means of Communication' section which lumps together roads, harbours - and airports) and another four on sources of power. Somehow a distinction is drawn between 'Natural Sources' and coal and steam. The inclusion of a chapter on electrical power is difficult to justify given the title of the book.

Furthermore, with the exception of Tann's article, the context in which the technologies operated is often ignored. There is a distinct lack of historical input, something which dogged the generality of industrial archaeology texts from the outset. The paucity of that skill (there is no lack of scientific/technical understanding) has led to simple errors, for example on page 80 where a caption offhandedly suggests that 'a bonded warehouse was quite a new concept in the 1840s'. Such a system had operated in the previous century.

It is to be hoped that the general reader will read this attractive book. Perhaps he/she will be led to explore some of the industrial history of their own locality. Such a course is not greatly facilitated here though. Further reading suggestions are few, dated and often direct the searcher in a technological rather than a historic direction. The student of coal mining will find no further sources here. This is not unfair or irrelevant criticism - it is what happens when one places oneself in the role of the 'relative newcomer'. The excellent illustrative material, however, should lay to rest many variants of the notions that history is a 'dull' subject.

In an intellectual sense the historian and the more experienced industrial archaeologist will not be satisfied by this book. On the other hand, it does, for a very reasonable price, provide an interesting and colourful diversion from matters of scholarly concern.

UNIVERSITY OF DUNDEE CHRISTOPHER A. WHATLEY

A. Brown. Cuthbert Heath: Maker of the Modern Lloyd's of London. (Newton Abbot. David and Charles. 1980. £6.95)
L. Dennett. The Charterhouse Group, 1925-1979: A History. (London. Gentry Books. London. 1979. £9.95)

These two books should have much in common. They are both presentation publications financed by firms of relatively recent origin, for long dominated by single personalities, and operating in the broad field of financial services. Certainly, both books are reasonably priced and lavishly produced, with numerous photographs, including a number in colour. Whoever designed and printed them can take much credit for their successful presentation of the author's material, especially in the case of the Cuthbert Heath volume. However, it is upon the author's words, not the designer's expertise that these books should be evaluated as business histories, and, on that judgement, one is a complete failure while the other is a modest success.

Cuthbert Heath (1859-1939) was born into a successful military and professional family. In 1880 he entered Lloyds as an insurance broker with the firm of Henry Head & Co and, in 1881, he began underwriting on his own account with the aid of a loan of £7,000 from his father. His father's connections also generated much of the business undertaken by Heath in his early years. However, this only obtained a beginning for him. The success of Heath, and the firm of C E Heath & Co, which he founded, stemmed from the simple expedient of responding to the demands of his customers. Whereas other brokers rejected requests to consider insuring previously neglected items or

areas of economic activity because of the risks involved, Heath and his firm researched each one carefully and produced a premium to match. Thus, as the economy grew and changed, Heath replied with appropriate policies such as an insurance against burglary; accidental loss of valuables; interruption of profits due to fire; hurricane and earthquake activity; or the risks of aviation. Once proven these were rapidly taken up by other brokers or firms though, initially, many at Lloyds did not approve of the innovations being made. It can be seen, therefore, that Heath was, to a large extent, responsible for many of those branches of insurance upon which the success of Lloyds from the late nineteenth century rested.

All this can be culled from Brown's biography, though it is carefully hidden amongst a mass of extraneous and largely irrelevant matter. The author seems to feel that a book, confined to the activities of one of the major pioneers of the modern insurance profession, must be dressed up with all manner of anecdote and social information to make it palatable. For example, eight pages are devoted to a description of the Royal Exchange in 1880. The book is aimed at the '... ordinary reader ...' (p 9) and there is almost no attempt to explain why things happened, such as why Heath entered insurance and why only he seemed to respond to customer demands, or to investigate the management, capital, profits and organisation of the business conducted by Heath. However, the only readers I can imagine for this book are those involved or interested in insurance and, apart from a few additional details, they will learn nothing from the book which is little more than a popular biography. As a business history or the biography of a businessman it is a compete failure, and is best forgotten.

The task facing Miss Dennett was a quite complicated one for, though the original Charterhouse Company was not formed until 1925, a number of the firms absorbed had much longer histories, and they played such a major role in the present firm that their past could not be ignored. The merchant bank, S Japhet & Co, was, for example, founded in 1880 and not taken over until 1954 but it would be inconceivable to ignore its development before that date. Consequently, these other enterprises have to be woven into the narrative and, despite some loss to chronology, this is done fairly successfully.

The Charterhouse Investment Trust was founded in 1925 with Nutcombe Hume (1893-1967) as managing director, a post he held until 1964. It was largely created by Hume and Arthur Wheeler, a Leicester based company promoter, with the aim of actively managing a portfolio of investments and acting as an issuing house and underwriter. The development that makes the history of this company exceedingly interesting, and different from the numerous other investment companies in existence, took place in 1934. In response to the findings of the Macmillan Committee, which was of the opinion that small/medium sized company finance was in short supply, the Trust formed the Charterhouse Industrial Development Company to remedy the defect. The new company was flooded with applications and, after considerable research, funds were placed in a variety of small concerns operating in manufacturing, distribution and property. These proved to be very profitable but progress was halted by the war.

After 1945 the Charterhouse group of companies developed along a broad financial front. The Charterhouse Industrial Development Company continued to concentrate on the finance of smaller concerns and its activities and capital grew rapidly. At the same time the Group's activities were stretched into other financial fields such as merchant banking, insurance broking, investment management and hire purchase finance, while the purely passive role of investment trust was abandoned.

Overall, Miss Dennett has produced a helpful account of a financial group that helped pioneer the institutional provision of venture capital, and which became, through growth and amalgamation, one of the established financial concerns of the City of London and one of the most wide-ranging. Where appropriate, internal company affairs are related to relevant external events but the narrative rightly concentrates upon the changing structure, composition, and management of the firm. However, one would have liked much more evaluation of the success of the firm in such fields as small business finance or tables showing the changing nature of investments or the differing sources of the profits being made. The book lacks a certain depth that detracts from its utility though its strong narrative mitigates that somewhat.

These two books represent extremes in business history. The function of one (Cuthbert Heath) is purely to be given away for it contributes nothing and does not warrant purchase. In contrast, the other (Charterhouse) does give glimpses into the operation of an important and pioneering concern and, though numerous questions remain, many others have been answered.

UNIVERSITY OF DURHAM R. C. MICHIE

I. C. R. Byatt. The British Electrical Industry 1875-1914: The Economic Returns to a New Technology. (Oxford. Clarendon Press. 1979. Pp 228. £8.50)

Within the confines of a relatively short volume Dr Byatt has presented a remarkably comprehensive and clear account of the growth of the British electrical industry before 1914. As well as examining the development of electricity for lighting, traction and power the book also analyses standards of entrepreneurship in the industry, its market performance and the public control of electrical utilities. The final chapter assesses the impact of electrical development on the economy as a whole.

The process of electrification in Britain went through two distinct phases. In the fifteen years before 1905 the great bulk of investment was in traction, particularly for urban tramways operated by the larger municipalities. The horse tramway mileage had reached its maximum of 940 route miles in 1889. By 1906 Britain possessed 2,300 miles of tramways of which 2,200 were electrified. Thereafter, new building fell dramatically: between 1906 and 1913 only 400 miles of electric tramway were built. Although there was growing interest on the part of the railway companies in electrification in the final years before 1914 the application of electricity after 1906 was

dominated by the power requirements of industry. Whereas in 1907 only ten per cent of the total power used in British industry was provided by electricity, by 1912 the figure had risen to 23 per cent. Within the industrial sector there were major differences. The engineering industry, which had already made the greatest progress before 1907, had raised the percentage of power derived from electric motors from 40 per cent to 70 per cent by 1912. At the other extreme the equivalent figures in textiles were five per cent in 1907 and less than ten per cent by 1912.

As for the suppliers of electrical products, the market was dominated by the large multinational American and German firms - Westinghouse and General Electric in the former and Siemens and AEG in the latter - together with their British subsidiaries. The multinationals were especially prominent in the supply of power station generating plant and traction equipment. Only in the cable-making sector of the industry was there a strong British presence with the market being controlled by British Insulated Wire and Callenders.

The dual pattern of a persistent lag in the spread of electrification in Britain as compared with Germany and the United States, together with the small size of the domestic industry, would seem to lend support to those who adopt a critical view of Britain's economic performance and the quality of its entrepreneurs after 1870. Whilst he draws attention to the 'conservatism' of British businessmen in viewing electrification primarily as a means of reducing costs rather than as a potential contributor to increased output and labour productivity, Dr Byatt is concerned to emphasise the objective constraints on the more rapid development of the electrical industry in Britain. Thus, he points to the fact that on the eve of the electrical era Britain already possessed an extensive and efficient gas industry which retained a cost advantage over electricity for lighting until immediately before the First World War. Similarly, Britain was well ahead of the United States in the provision of a steam railway system with good inter-urban facilities and this inevitably retarded the development of inter-urban tramways. Tramway electrification was also held back by a relatively slow rate of suburban house building together with a slackening in the rate of growth of incomes after 1900. As for capital requirements, although the electrical utilities were in a favourable position due to the preference of British lenders for fixed-interest stock, the electrical manufacturers were unable to call on the volume of resources available to the large American and German firms. Finally, and perhaps most important of all, Dr Byatt considers the structure of the British economy. In other countries, as well as in Britain, the coalmining and textile industries were slow to switch to the use of electric power. But these two sectors dominated Britain's industrial structure and since industrial output was growing relatively slowly in the late nineteenth century, they acted as an effective brake on electrification.

In view of the fact that Dr Byatt's book is based upon his doctoral thesis which was presented as long ago as 1962, it is perhaps inevitable that it does not incorporate the findings of more recent work on the diffusion of technology. What is most striking, however, is the complete absence of any attempt to utilise the techniques of the new economic history. From the methodological standpoint,

therefore, the book is something of an anachronism. Having said that, Dr Byatt's reasoning is cogently presented. His grasp of the technological complexities of the industry is obvious and he presents an extremely useful case study of one of the most dramatic examples of the American (and German) impact on British industry in the generation before 1914. This reviewer, at least, read the book with pleasure, confident in the knowledge that it will have a wide readership among undergraduate students of the period.

UNIVERSITY OF STIRLING M. W. KIRBY

Roy Church (Ed.). The Dynamics of Victorian Business: Problems and Perspectives to the 1870s (London: George Allen and Unwin. 1980. Pp 274. £15)

A review which gives some indication of the general impression made by a collection of essays is often impossible because of the great variety of approaches adopted, and the diversity of views expressed by the contributors, in which case the less satisfactory alternative of allocating a sentence to each essay is adopted. That it is possible to comment on the present collection as a whole indicates its unusual, and commendable, cohesion, even though the essays range widely from the inevitable studies of the heavy industries of coal, iron, engineering and shipbuilding and of cotton and woollen textiles to more unexpected ones on railways, building, shoe and leather, drink, commercial enterprise. The unity in this diversity lies in the acceptance by all contributors of a common objective and method, and to the reader having the guidance of Professor Church's elucidation in the introductory chapter. The essays are not only valuable independent discussions of particular industries, but are all directed towards an assessment of the state of the British economy in the mid-nineteenth century, particularly to find if the complex economy which they reveal can be subjected to some unifying generalisations. Each essay provides the evidence for an assessment of the nature of the challenge faced by a particular industry and how effectively it was met. Though quantitative material is used, it does not demand comprehension beyond the powers of even the statistically innocent, but its inevitable variety leads to some more convincing studies than others. Overall the collection does not support the proposition that the mid-Victorian industrialists were resting lethargically on profits earned from earlier successes and favourable marketing opportunities. The evidence suggests that technical innovation took place and profits were probably under pressure. Doubtless, readers will be able to make their own exceptional examples, but in general the essays make convincing cases for innovation, less so the analysis of the level of profits. Professor Slaven's perceptive study of shipbuilding shows the problems faced by most contributors. Very properly, he has to qualify his calculations of profit so that they become correspondingly uncertain, but, again very properly, he is able to assert the pace of innovation boldly. Even if all the essays enable the existence of innovation and of low profits to be accepted as characteristic of the period, the link between them is either not discussed or assumed rather than proved. Perhaps both those who think innovation is linked to inadequate profits and those who think the lack of it is linked to

adequate profits need to study causation between the two variables more fully. The present essays suggest convincingly that there was innovation in mid-Victorian industry, less so why, but they are still an excellent collection, perhaps because they possess that appropriately rare mathematical absurdity of a whole greater than the sum of its parts.

UNIVERSITY OF STIRLING R. H. CAMPBELL

Alastair J. Durie. The Scottish Linen Industry in the Eighteenth Century (Edinburgh: John Donald. 1979. Pp xvi + 180, 9 plates. £12)

Dr Durie has produced a scholarly, workmanlike study of this significant segment of the eighteenth-century Scottish economy which will deservedly become the standard work on the subject. With Warden's pioneering work having achieved its centenary the time was ripe for a major re-awakening of the area and the author has served his, and later generations, well.

The work opens with a commendably lucid account of the processes of linen manufacture in which most of us are less well versed than in other areas of the textile industry. The description is supported by a glossary conveniently located at the back of the book. Subsequent chapters deal largely with the efforts of the Board of Trustees for Manufactures and, to a lesser extent, of the British Linen Company, to raise the quality and physical level of output of linen in the nineteenth century.

Though the chapter headings are austere, their contents offer the reader a wealth of fascinating detail carefully woven together with a clear thread of analysis leading to sensible, balanced judgements and conclusions. A recurrent theme coursing through Dr Durie's study is the difficulty experienced in achieving expansion and enhanced quality of product of an order which would allow Scottish linen to sit comfortably alongside that of Holland and Germany. This was never achieved. Despite impressive growth which spilled over into exports Scottish linen remained dependent upon the props of protection at home and export bounties abroad. This endemic state of affairs was partly a function of the inadequacies of Scottish-grown flax, the industry never freeing itself from dependence upon imports; it also resulted frominsufficient labour skills in the various preparation and manufacturing processes, the Board of Trustees' well-meaning efforts in this regard making no more than a marginal impact.

Nonetheless, Scotland was able to boast a fine-linen sector centred mainly in the west, and especially at Dunfermline where lawns, diapers and damasks were successfully manufactured for home consumption. The fact that by the 1780s possibly a third of Scottish output was being exported was due to developments at the lower end of the quality spectrum located largely in the east. Here the British Linen Company scored a notable success by making a fair copy of the popular German 'Osnaburg'.

While recognising the reviewer's obligation to restrict himself to an assessment of the writer's work in the light of his own scope and objectives (by which criteria Dr Durie scores high marks), it is

nonetheless a little disappointing that the author did not address himself more to the macro-economic impact of Scottish linen especially in the light of the imminent 'industrial revolution' and of the current interest in so-called 'proto-industrialisation'. This dimension is perhaps too quickly passed over whereas greater discussion of this issue would have heightened the book's appeal to historians of economic growth and reduced the tendency towards insularity to which all single-industry studies are definitionally prone.

Such a stricture, however, weighs only lightly in the balance of the book's overall worth. It is comprehensively researched, pleasantly written and well-produced (despite the eye-taxing print) and represents a major contribution to the economic history of modern Scotland.

PORTSMOUTH POLYTECHNIC CLIFF GULVIN

C. A. Hempstead (Ed.). Cleveland Iron and Steel: Background and Nineteenth Century History (British Steel Corporation. 1979. Pp 275. £1.75)

On 4 April 1879 a group of local ironmasters and businessmen assembled at the Middlesbrough Works of Messrs Bolckow, Vaughan and Co to witness an experiment for the manufacture of steel by a new process. The demonstration lasted for 31 minutes: it was successful and the quality of steel produced excellent. This was the first public demonstration of the basic process of steelmaking which had been patented two days earlier by Sidney Gilchrist Thomas after a lengthy period of experimentaion in collaboration with his cousin, Percy Gilchrist. The present volume, which has been published to mark the centenary of this event, has been compiled by a team of five local historians. The book is particularly good in its description of the evolution of a distinctive 'Cleveland practice' of ironmaking in the period 1866-1875 and also in dealing with the background to the innovation of the basic process of steelmaking in the Bessemer sector of the industry.

When the boom in the iron trade began in the 1850s Cleveland ironmasters possessed two important advantages over their counterparts elsewhere in Britain: they enjoyed easy access to the Durham coalfield with its supply of high quality blast furnace coke, and the Cleveland ironstone was available in huge quantities. The ironstone was, however, of relatively poor quality and it was to overcome this problem that a series of innovations known as 'Cleveland practice' was introduced after 1866. These included blast furnaces which were much larger than elsewhere, direct-acting blowing engines of high efficiency and regenerative hot-blast stoves. Together, these innovations placed the Cleveland ironmasters at the forefront of technological development in the industry before 1875. Thereafter, the rate of innovation in the Cleveland iron industry slowed down dramatically as attention was directed to steelmaking and as the industry began to suffer from foreign competition both at home and abroad. In addition, the fact that much of the Cleveland investment was so recent discouraged local ironmasters from keeping up with the

most modern practice as it was developed in the United States and Germany after 1880.

Although the Thomas-Gilchrist process inaugurated the age of cheap steel it is ironic that its large scale commercial application was not especially rapid in the area which had provided the facilities for the final stages of experiment. Why this should have been so is not clear from the analysis presented in this book. Apart from referring in the most general terms to the well-known prejudice against basic Bessemer steel and the easy availability of non-phosphoric Spanish and Algerian ores, the author can only point to the limitations set by the continuing difficulties encountered in producing blast furnace metal acceptable for the Thomas-Gilchrist process utilising the highly phosphoric Cleveland ironstone. It would be churlish, however, to be overcritical of the book in this respect since it must be judged primarily as a technological history of the industry of iron and steelmaking on Teesside. It is not an economic history of the industry and therefore has little to contribute towards the debate on standards of entrepreneurship in late Victorian Britain. But judged on its merits it is unfortunate that there is only limited reference to the Siemens-Martin open-hearth furnace. This was an innovation of immense importance in the British steel industry of the late nineteenth century and although the author in question states that he is aware of the deficiency it would have been valuable to have had an account of its introduction on Teesside. In short, the authors have produced a good technological history of the Cleveland iron and steel industry up to 1880. At the price of £1.75 it must be rated as extremely good value for money.

UNIVERSITY OF STIRLING M. W. KIRBY

C. H. Lee. British Regional Employment Statistics, 1841-1971 (Cambridge University Press. 1979. Pp 48 + tables. £20)

The title of this volume could not more accurately or succinctly describe the contents, for the book contains two tables of figures on British regional employment statistics from 1841 to 1971. Two tables rather than one are necessary because of a substantial change in the collection and presentation at the beginning of the twentieth century. The two tables then are for 1841-1911 (Series A) and 1901-1971 (Series B), thus providing an overlap and the basis for some comparison. The figures provided are for 42 English counties and for groupings of Welsh and Scottish regions plus various aggregates such as Scotland, North, South East, etc: and they are in all cases for male, female and total employment. In all cases the sources are the decennial censuses from where the hundreds of occupations listed have been rearranged into the 27 industrial groups corresponding to the Standard Industrial Classification of 1968. In addition to almost 400 pages of tables there are 48 pages of text, being a guide to the dangers in the data and some cautions that are necessary to the user.

Collected data series such as this greatly facilitate the work of the social and economic historian of modern Britain. Quite apart from the claim that Dr Lee makes, that in the absence of income and other macro-economic data they are the best single indicator of structural

change in the economy, they provide the historian with an excellent coverage in the readily usable form of occupational data. They open up for the applied economist and other social scientists a whole range of possibilities for analysis - cross-sectional investigations at regular points over time in a critical period in Britain's industrial growth and relative decline, and scope for other investigations where supporting data is available.

Of course, the main difficulty in producing series of this kind is the achievement of internal consistency in the data. There are several obstacles in the path to this goal; those before 1841 were insurmountable hence the starting date. Even after 1841, in Series A of this collection, irritations for the economic historian arise. For example, retired workers are included in the workforce figures under the heading of their former employment, and inmates of mental asylums and gaols get counted as hospital patients. But the important specific problems of this kind for individual industrial groups are dealt with in the text. For the twentieth century, however, the problems are less serious and a series had been produced that achieves most of the desired consistency.

The collection of data will appeal to a wide variety of users, including researchers and students interested in broad trends.

THE CITY UNIVERSITY FORREST CAPIE

Ian Lloyd. Rolls-Royce: The Growth of a Firm. Pp xxiii + 164
The Years of Endeavour. Pp xviii + 265
The Merlin at War. Pp xvii + 188
(London: Macmillan. 1978. 3 vols. £10 per volume)

There has recently been a spate of books concerned with automobile manufacturers. The names of Austin, Morris, their various subsidiaries, Beardmores and the component manufacturers like Lucas come readily to mind, and if these have familiarised readers with the background of engineering excellence, marketing techniques, problems of involvement in armaments production and the subsequent peacetime readjustment to overcapacity and receding demand levels, they have done so from the standpoint of the popular car. The addition of Rolls-Royce to this list does more than add another case study. The examination of these themes from the exalted position of the luxury car market allows a different slant on entrepreneurial abilities to be obtained, and Lloyd offers a lengthy though readable account of the complicated cross-weave of the industrial historian - product development, market analysis and penetration, costs and business psychology - and does so in the complex schizophrenia which saw Rolls-Royce divided between the roles of car manufacturer and aero-engine producer.

The author has drawn extensively on the company files and personal correspondence of the founding triumvirate, Rolls, Royce and Johnson. Though the specific sources are rarely mentioned, the clear and at times critical account of company development makes Lloyd's statement in the Preface that the books, written as a Cambridge thesis thirty years ago were suppressed by the company in the politically

delicate climate of post-World War II defence and aero-engineering contracts. Thus to a degree the volumes, while occasionally dated in their appreciation of the inter-war economic setting, are also untrammelled by the stockpiled views and interpretations of later historians of the automobile.

Any review of a three volumed work would be guilty of unjust compression and selectivity. There are, however, many themes which would be fascinating to any reader quite apart from the unfolding chronological saga of Rolls-Royce from prestigious endurance car racing to mass produced engines for the aircraft programmes of two world wars. One such theme is the enduring paradox of maintaining profitability while protecting exclusiveness, the major distinguishing feature of the Rolls-Royce company. The fewer the number of cars produced the larger the premium paid by the wealthy for the conferment of status attached to the ownership of the Rolls insignia. Yet insufficient production runs meant inadequate revenue to bear the very expensive development, repair and quality control costs. Insistence that cars would only be made upon receipt of an order prevented advantageous bulk buying discounts. Other rigid company preconceptions, for example that American mass manufacturing was poor quality engineering and could add nothing to the traditions of excellence at the Derby works were arrogant and ill-founded as Royce reluctantly admitted, though never publicly, by incorporating synchromesh gearboxes, subcontracted components manufacturing, crankshaft casting and improved instrumentation, all introduced as standard by American producers. The rigid managerial insistence that the American subsidiary at Springfield should replicate the Derby models also illustrates how the American operation was hamstrung by a product ill-suited to the American luxury market and an inflexible preoccupation with quality to the detriment of long-term financial viability.

There are many interesting side issues as the Rolls story unfolds. The temporary financial controlling interest obtained by Max Aitken in order to restructure the company under Canadian law and the early marketing advantage through endurance tests and Rolls flamboyant publicity stunts and rally driving skills are just two examples. The successive siting of plants at Derby, Crewe and Hillington to draw on an existing railway workforce is another. One omnipresent company concern was in wartime when national emergency and the pooling of information ran counter to longer term commercial considerations of individual firms as their practices were exposed to competitors. Yet obstructionis stances were not adopted and corporate interests were subjugated to national considerations. One of the richest insights Lloyd's work affords is the account of company dealings with the government agencies in two wars appointed to oversee the air programme. Here the author's account of the Admiralty Board during the First World War and the strategic straitjacket within which it perceived the roles of both motorised transport and aerial combat is particularly incisive. Again the paradox of prestigious exclusivity and mass-produced Eagle aero engines, the juxtaposition of long and short term company interest, national and corporate objectives, comes through. The Eagle engine was another of Royce's refinements to existing design limitations and stemmed from his boredom with cars in 1908. The design and production success of the Eagle engine shortened the duration of the Great War according to Lloyd, and if the balance

of company activities moved decidedly, if temporarily, towards aero-engineering for the war years, the expansion of capacity and the capital investment undermined the quasi-monopolistic position of Rolls-Royce, based as it was on limited production of luxury cars. If peace reasserted the dominance of car production, rearmament reversed this in the middle years of the 1930s, and towards the end of volume two the author offers a perceptive commentary seen through company negotiations with the Air Ministry on capacity extensions and the inept handling and imprecise co-ordination of the rearmament programme. Substantial monthly reappraisals by the Ministry of its likely requirements strained the Chairman's patience and his comment that 'The manner in which the air expansion programme is being handled is terrible ...' is a theme which Lloyd repeatedly emphasises.

The third volume is entirely devoted to the Second World War years and dovetails company history with strategic developments and military operations. Household names such as Spitfire, Hurricane, Halifax, Lancaster, Mosquito and Mustang owe much of their familiarity to the superiority they achieved through the power and reliability of their Rolls-Royce Merlin engines whose memorable throb is further testimony to the widespread adoption of the Rolls-Royce product. Another development in the field of tank production and the co-operation with Leyland demonstrates the flexibility and willingness of the company to sustain its innovatory role even during periods of hostility. The final volume is perhaps less successful than its predecessors in that it is concerned with a narrowly circumscribed period and a single theme, the war, though there are many interesting slants on the logistical battle for air supremacy and the organisational arrangements underlying this objective. The final chapter presents a summary of the principles of Rolls-Royce company policy and though of limited assistance to those who have not read the preceding pages, it does draw together many of the strands which the books explore and points to weaknesses in company decision-making.

Shortcomings there inevitably are. Labour relations are virtually overlooked and for a work that stresses the importance of the managerial personnel the methods and circumstances of promotions to the Board of the second generation of executives merits greater attention. But such reservations are only minor irritants. Lloyd's lengthy work, thirty years delayed, deserves a prominent place on the library shelves not simply, to mix the metaphor, because he deals with the flagships of the British car and aero industries, but because it is a sensitive analysis of the company and its industrial setting.

UNIVERSITY OF LEICESTER RICHARD RODGER

Ian MacDougall (Ed.). Essays in Scottish Labour History: A Tribute to W H Marwick (Edinburgh: John Donald. 1978. Pp xvi + 265. £10.00)

This volume is a just tribute to Mr William Marwick's long and scholarly career. It is fitting that these essays should be contributed by writers gathered round the Scottish Labour History Society. The essays illustrate much of the strengths and weaknesses of current labour history. Gordon Wilson writes a detailed analytical account of miners' strikes, 1842-1874. He is less impressed by the

influence of ownership structure than Alan Campbell in The Lanarkshire Miners ..., 1775-1874 and shows that strikes often succeeded in forcing up wages in periods of good trade but usually failed bitterly in attempts to stop reductions. This sort of analysis is a valuable addition to the traditional insitutional and ideological histories but they are a rather passionless aid to understanding.

Several of the authors approach indirectly and cautiously an issue thrown at us recently by J D Young, The Rousing of the Scottish Working Class. What was it that was specific to the development and situation of the Scottish working class? For Hamish Fraser, the trades councils were more important in Scotland than England. He suggests that this arose from the more complete destruction of the Scottish unions in the 1840s and the suspicion which the rest of Scotland has always had of the predominance of the Clyde. Ian Wood looks at the awkward situation of the Irish community in Scottish politics, organising around the Irish National League, loyal for the most part to Gladstone's Liberal Party, but until some measure of self rule had been gained by Ireland, unable to take an uninhibited part in Scottish labour politics. Jim Treble shows that the unskilled labour market in Glasgow differed from London in that boy labour could move into a trade because of the demand from the shipyards. These are fragments of a larger puzzle. None of the contributors have been able to engage the difficult issues of 'colonialism' and 'nationalism' in the manner of Eric Hobsbawm in his recent survey of Europe, Age of Capital, ch 5, or in the manner which recent events have forced upon the historians of Northern Ireland (Paul Bew, P. Gibbon and H. Patterson, The State in Northern Ireland, 1921-1972, and Michael Farrell, Northern Ireland, the Orange State).

As the essays move into the 20th century they show the increasing involvement of working class fortunes with the state, Barbara Robertson on the farm servants, John Butt on Glasgow housing and Ian MacDougall on the General Strike. The state appears variously as legislator, as provider of material welfare and as class aggressor. The concepts of 'citizenship' and 'incorporation' are offered briefly as a basis for generalisation but not developed.

The last two essays celebrate the importance of minority politics in the labour movement. William Thompson writes of Lawrence Daly, the Fife Socialist League and the New Left in Scotland, and John Caldwell on the life of Guy Aldred who took part in a string of causes of vital importance to himslef and his friends - it is the only essays which comes anywhere near Mr Marwick's own important involvement in pacifism and the Quaker movement - but it leaves us with the question, what influence did all this have on working class consciousness, and why was it so limited?

Despite the quality of scholarship and the breadth of political experience in these essays, they leave a worrying impression. They show that Scottish labour history is not yet ready to make general claims about the specific nature of class experience in Scotland. We lack the confidence to make broad analytical and empirically based claims about the nature of the recent past (see Raphael Samuel, Sources of Marxist history, New Left Review. 120. March-April 1980. pp 85-96, for comments on this theme). We lack the confidence of books like Tom Johnston, History of the Working Classes in Scotland, and A L

Morton, People's History of England (1938), or even Mr Marwick's own Short History of Labour in Scotland. They knew what was important and wrote about it. When that confidence returns, essays like these will provide the raw material from which a fuller understanding of Scotland's recent past will be forged.

UNIVERSITY OF EDINBURGH R. J. MORRIS

Keith Middlemas. Politics in Industrial Society: the Experience of the British System since 1911 (London: Andre Deutsch. 1979. £5.95 pb)

This is a weighty and often provocative study, which is an attempt at nothing less than a comprehensive analysis of the transformation of state power in Britain during the 20th century. In terms of historiographical tradition, it is curious blend of rather old-fashioned Whiggish narrative combined with a leavening of theoretical concern derived from the insights of Gramsci and Habermas. In this respect, Politics in Industrial Society can be regarded as an attempt by a fundamentally conservative academic historian to assimilate some of the recent trends in Marxist historiography in Britain. His purpose is to explain the relative 'harmony' expressed by the 'corporate consensus' that began to be established during the 1920s and was to survive until the late 1960s.

Yet amidst the wealth of often fascinating detail, drawn from archival material as well as an extensive reading of secondary sources, the author's central argument that 'harmony' was achieved by a process he calls 'the corporate bias' does not escape entirely from the charge of teleology in imposing upon his material almost 'ideal-type' categories. This is especially true of his concept of the character of state power in Britain. Thus Dr Middlemas writes (p 20):

> ... The line of greatest social conflict, like the earthquake fault between continental plates, lay through industrial politics. Here the triangular pattern of cooperation between government and the two sides of industry, which is the main theme of this book, led to the elevation of trade unions and employers' associations to a new sort of status: from interest groups they became 'governing institutions'. Arnold Toynbee once observed that institutionalisation is the price of durability; what happened in Britain in the 1930's and 40's, however, went further. Equilibrium was maintained because the governing institutions came to share some of the political power and attibutes of the state, itself avid to admit representative bodies to its orbit rather than face a free-for-all with a host of individual claimants. I have called this process corporate bias ...

The problem with such an analysis is that it assumes 'the state' as an abstraction, as something ultimately 'neutral' and 'impartial'. It is this concept of the character of the state that leads Dr Middlemas to emphasise its crucial role in the construction of 'public opinion' and 'consensus' politics. The thrust of his argument that formal institutions of employers and trade unions came to mirror each other, inasmuch as they became incorporated into the state itself,

implies and equal weighting to the corporate institutions of capital and labour, which has only to be properly represented by the state's 'impartiality' for social equilibrium to be realised. In the process, Dr Middlemas also reduces the institutions of capital and labour to abstractions, devoid of people, aspirations and struggle.

In his discussion of the 1920s, for example, what Dr Middlemas calls the 'dinosaurs' of the Triple Alliance, the shop stewards' movement, the miners, the Minority Movements and the National Unemployed Workers' Movement hardly seem to balance the 'dinosaurs' of the mine owners, whilst the state's preparations for and conduct of the subsequent General Strike scarcely conform to a role of 'impartiality' or 'neutrality'. The author's later argument that this was the basis for 'social harmony' as established during the 1930s is thus clearly rooted in an unconvincing conceptualisation of the character of the British state during the 1920s, when the arguments of the Treasury and the interests of the City of London overcame the pleadings of 'progressive' industrialists like Sir Alfred Mond as well as the more overt hostility of the trade unions. A more convincing case for the role of corporate bias might be made for the late 1940s and 1950s, when economic conditions created a relatively more equal balance of capital-labour relationships, but in pushing this line of argument back to the 1920s Dr Middlemas implies a historical theory of political determinism that is perhaps indicative of his essentially Whiggish assumptions, Gramsci and Habermas notwithstanding.

ROEHAMPTON INSTITUTE KEITH BURGESS

Douglas Niven. The Development of Housing in Scotland (London: Croom Helm. 1979. Pp 136. £7.50)

The title of this book is misleading. Though there is one historical chapter, most of the material relates current problems in housing and house design in Scotland. Comparative information is also provided on Western Europe, Scandinavia and England. The general thesis is that the bureaucratic, local and central government dominated approach to housing in Scotland has produced abysmal results. Policies are seen as neither humane nor coherent and, in conclusion, a call is made for more self-help and community involvement in housing linked with the sweeping away of many restrictions, much greater use of housing associations and more socially responsible attitudes to housing finance by government, financial institutions, building societies and trade unions. Scottish practice is compared unfavourably with that on continental Europe and in England.

This thesis, however, is not fully substantiated by the text and one has the impression that the author, himself an architect, has allowed his frustrations over bureacratic housing practices, poor design and low expectations to cloud his analysis of the scope for improvement. For example, while European housing policies are praised, it is also pointed out that Scotland averages more rooms per house than both France and Italy while the proportion of houses with flush toilets is greater than in Holland. These standards have been

attained despite comparatively low levels of spending on housing in Britain. Some criticism is also made of a multi-storey preoccupation in Swedish housing yet strong attacks on the quality of Scottish local authority housing are accompanied by the view that many new local authority houses are being built to better standards than contemporary private housing.

At heart, Niven is concerned about the overall quality of the environment rather than with quantitative indicators but, in the short space of some 130 pages, he is over-ambitious in attempting to relate a broad sweep of continental and English experience to the special features of the Scottish housing tradition and the scope for reform in both policies and attitudes. There is no doubt about his own commitment to improved housing but his recommendations betray weaknesses in the understanding of the economic, social and political realities of housing in Scotland. The argument over the reduction in bureaucracy and the growth of community involvement and greater diversity in housing must go on but it needs to be rooted in a firmer grasp of the relevance of external comparisons and of the relationship between popular attitudes, 'party' politics and housing goals and procedures.

UNIVERSITY OF GLASGOW T. HART

T. C. Smout (Ed.). The Search for Wealth and Stability: essays in Economic and Social History presented to M W Flinn (London. Macmillan. 1979. Pp 291. £12.50)

The essays assembled in this particular Festschrift mark the (happily very active) retirement of Professor Michael Flinn whose contribution to the study of economic history, both in his own writing and by means of sustained encouragement of others, has been a distinguished feature of the academic scene in Scotland since the 1950s. None will question the appropriateness of some sort of tribute. Nevertheless, the usual problems posed by Festschrift at once rear their heads. This is a very wide-ranging volume, as its three section headings indicate. They are 'The Wider World', 'Britain' and 'Scotland'. The selection of articles therefore reflects the enormous range of interests of Professor Flinn's pupils here summarised in a bibliography compiled by Ailsa Maxwell. The editor frankly states that the only condition he imposed on the contributors was that 'they should write something exciting and important to themselves', though he also argues that the thirteen pieces here presented do possess 'a kind of coherence' which is summarised in the title. It is a defensible strategy for constructing a Festschrift. It is not the only possible one, for J H Plumb in editing Studies in History: a Tribute to G M Trevelyan back in the 1950s defended his policy of selecting one central theme and of severely restricting the number of contributors on the grounds that 'Festschriften' have an unhappy knack of quickly becoming formless and unreadable'.

'The Wider World' section starts with an interesting piece by J R Ward on relations between a planter and his slaves in eighteenth century Jamaica showing how much the planter relied on his negroes to

discipline themselves. Thereafter, we are plunged by Alan Milward into the totally unrelated field of strategies for development in nineteenth century European agriculture. The usual problem of writing 'European' history - that only superficiality can impose coherence on the evidence - is to some extent sidestepped by concentrating heavily but not exclusively on the Danish case and them demonstrating that other successful agricultural transformations in this period were carried through on legal, social and economic bases totally different from those obtaining in Denmark. The conclusion that generalisation is dangerous seems impeccable, but the charge from Jutland to the Hungarian puszta (or prairie) leaves the reader breathless. Michael Palairet then exposes him to a piece on Slavic migrations to America before 1914, looking mainly at Yugoslav evidence and arguing that attitudes towards migration on the part of both migrants and the communitites whence they came were not dissimilar in both periods insofar as there was always a refusal to face up to the realities of what was happening.

From Montenegro the reader is transported by G Hammersley, in the opening essay of the British section, deep into the recesses of the Forest of Dean to investigate the reasons for the failure of the Foley's charcoal iron works. Here we are close to the heart of Professor Flinn's own scholarship, for he made his name on the iron and steel industry. Dr Hammersley seems to establish that the Foleys failed in the eighteenth century more through bad management than through inexorable cost pressures, though when even this meticulous scholar admits that the accounts he bases his conclusions on 'are to some extent an artificial construct', the spirit of the reader wilts a little. Bob Morris's analysis of the property cycle in middle-class families in the period 1780-1860 is based on a couple of families, but does reach interesting conclusions which common sense suggests may be susceptible to generalisation. From the vice-chancerial heights of York the former Professor S B Saul contributes an appropriately olympian survey of research and development in British industry from the end of the nineteenth century to the 1960s. His conclusions are in one sense indeterminate, but on the other hand they incisively and decisively destroy the facile illusion that Britain's recent economic failure is rooted in inadequate investment in R and D. Quite the reverse: many more successful countries invest proportionately much less.

At this point, an intellectually punch-drunk reviewer found that even in the second section he still had three items to face. Wray Vamplew documents the developments the control of soccer-crowd behaviour in England before 1914, reaching the conclusions which five minutes rumination in an armchair might suggest without going through the agony of research. Michael Cullen uses statistical methods to re-examine the poverty cycle in late Victorian England as exemplified in Charles Booth's poverty survey work. Booth emerges as a good student who deserved his first. Roger Davidson uses the working of the Conciliation Act of 1896 to argue that British governments before 1914 were much more interventionist in industrial relations than is often thought.

Exhausted after so long a swim in such bracing intellectual seas, the reader finally reaches the third part of this volume which is devoted to Scotland. Blessedly, all four contributions here are

grouped around one theme - the Scottish poor laws. Rosalind Mitchison starts off the section with an important piece developing her recent work on the process whereby Scots poor law after about 1750 became progressively less generous. Here she concludes that the 'rule' which required disablement as well as destitution as a qualification for relief was manufactured by Whig lawyers and cooperative judges in the early nineteenth century. Christopher Smout offers a detailed examination of the uniquely severe depression in Paisley in 1841-2. It illuminates not only the history of Paisley but also the devious procedures whereby the British government did offer relief in Paisley while declining to accept responsibility for the situation or its own behaviour. Ian Levitt brings this theme down to the 1920s showing the process whereby relief was slowly extended to the unemployed as such. Stephanie Blackenden demonstrates how the Poor Law Amendment Act (Scotland) of 1845 naturally sponsored outdoor medical supervision of the destitute poor at parish level and how the extension of these services was restricted by absence of funds and the social stigma of admission to a parochial poor law hospital.

All in all, there is much that is good in this important assemblage of work, though it is uneven, and it is hardly a book in its own right. Aware of his limitations, this reviewer would like to suggest that future volumes of this kind should be treated as Longer Catechisms. Shorter versions (perhaps in this case part 3) should also be available for those, like himself, of weaker capacity.

UNIVERSITY OF ST ANDREWS BRUCE LENMAN

G. I. Turnbull. Traffic and Transport: an Economic History of Pickfords (London: Allen & Unwin. 1979. £12.00)

Transport historians have in recent years shown a welcome willingness to move away from their earlier concentration on railways, but few books, apart from general introductory texts, have linked developments on road, rail and water. In Pickfords, the oldest surviving British transport firm, Dr Turnbull has found a unifying theme for a book which ranges from road freight carrying in the eighteenth century, through the supremacy of the canals and railways, to the impact of the motor vehicle. The surviving records of the firm are at best patchy - nothing, for instance, exists from before 1756, when James Pickford already owned a substantial carrying business, to confirm or deny the later tradition of a seventeenth century origin, and there is limited evidence on the details of Pickfords' uneasy relationship with the London & North Western Railway in the second half of the nineteenth century. From the available evidence, Dr Turnbull has woven a coherent and convincing analysis. For the century before 1850, which takes up two-thirds of the text, he adds a valuable examination of road and canal carrying in general, and of the first impact of the railways. Thereafter, the broader background fades in importance, and the treatment of the period after 1918 is brief and much less meaty than the earlier chapters.

Pickfords survived and for the most part flourished by being adaptable, and occasionally by luck. Their chosen territory, between Lancashire and London, included the most rapidly expanding areas of

English industrialisation. As rivals collapsed in the face of successive transport innovations, Pickfords led the moves to canal carrying and to the use of the first railways, and in 1847 started a profitable if disputacious half-century as agents for the London and North Western. On the other hand, the story gives some support for theories about the weaknesses of hereditary management. James Pickford's grandsons ran into severe trouble in 1817: two got out just in time and two went bankrupt. The firm was rescued by the redoubtable Joseph Blaxendale, who as a future chairman of the South Eastern Railway was well qualified to lead it into the new era. His grandsons in turn took the catastrophic decision in 1901 to end the London & North Western agency, whence in nine years the firm declined to final loss of independence, becoming first the junior partner in an incomplete amalgamation with its chief rival, and later the property of the railways.

Dr Turnbull does much more than simply tell the story. From his material he has built up a persuasive analysis of the nature of freight carrying, the basis of changing policies, and the difficulties and profitability of the operations. He reminds us valuably of the importance of overland carrying, both in the eighteenth century and as a later ancillary to canal or railway. The book is generally well presented (as at a price of 6p per page it ought to be), though some small slips have crept in: on page 114, for instance, apart from a reference to 'Pickforks' and the addition of an extraneous 'London &' to the South Eastern Railway, one sentence only makes sense if 'Lancashire' is substituted for 'London'. There is little of specifically Scottish interest (Pickford's Scottish operations are covered in one paragraph), but transport historians in general are indebted to Dr Turnbull for a concise, readable and most informative work.

UNIVERSITY OF ST ANDREWS C. J. A. ROBERTSON

John Vaizey. Capitalism and Socialism: a History of Industrial Growth (London: Weidenfeld & Nicolson. 1980. £12.50)

This is the latest of Professor Vaizey's attempts at a popular account of the historical background to current issues in economics and politics, and as such it deserves to be welcomed. It is perhaps misleadingly subtitled, 'a history of industrial growth', since it is an ambitious survey of world history beginning with the Ancient World and concluding with a discussion of the period since the Second World War. The book's major strength derives from the author's approach that seeks to explain how changes in the mode of production determine and are, in turn, affected by the shifting forms of political power. In this respect, Professor Vaizey is a timely protagonist for the intellectual tradition represented by political economy - that much maligned 'dismal science' which is in danger of extinction amidst the proliferation of over-specialised academicism. What strengthens the case for this book further is that it is written in a simple and uncomplicated style, and it is refreshingly free from the jargon or other academic obscurantism that does the social science disciplines so much disservice in the eyes of the general reading public. Yet the book's qualities in these respects are combined with a wide-ranging

erudition, thus making it an example to academics generally who are presently seeking to justify their existence in a climate of increasing financial stringency.

Any book so ambitious in approach and scope as this can, of course, be readily faulted in matters of detail, and 'Capitalism and Socialism' is no exception to this caveat. Thus Professor Vaizey's account of the origins of the movement for greater state intervention in economic and social affairs, which in varying degrees has distinguished the development of all the advanced capitalist nations since the end of the nineteenth century, is rather crudely mechanistic and is framed in outworn categories like 'laissez-faire' and 'paternalism'. It ignores much of the current research in this area that has emphasised the contribution of capitalists themselves to the changing climate of opinion which has regarded state welfarism, for example, as a valuable form of investment in 'human capital', as well as an essential support to public order and social stability. By implication, there is no discussion of the consequently ambivalent attitude of the working class to the 'benefits' of state welfarism, particularly in Britain where this has often (and mistakenly) been interpreted as an indication of the persistence of principled conservatism amongst the working class. More serious than this, perhaps, is Professor Vaizey'a failure to give full credit to the rich flowering of a genuinely popular socialist culture during the period between the 1880s and the 1930s. In his treatment of British socialism, for example, the discussion is confined entirely to the various luminaries of the Fabian Society - the 'voiceless' thousands who joined Clarion cycling clubs or flocked to hear John Maclean's lectures on Marxism have been lost to history.

These sins of omission have to be seen, of course, in the context of Professor Vaizey's own intellectual tradition and generation, which in Britain has defined the problems of both socialism and capitalism in its own peculiar way. Professor Vaizey defines 'socialism', for example', as 'a self-conscious middle way' between the extremes of 'capitalism' and 'communism' (p 246). Yet, where does this leave the prospects for socialism in today's world where the development of international capitalism has made a virtue of 'extremism' by way of its own internal contradictions? Circumstances and the pace of events do not augur well for the democratic and parliamentary decorum of Professor Vaizey's 'socialism'. Capitalism and Socialism succeeds to the extent that it is a lucid exposition of the historical background to many of the major questions facing the world today, yet the answers to them that are implied may prove just as 'utopian' as the schemes of Proudhon or Robert Owen.

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James D. Young. The Rousing of the Scottish Working Class (London: Croom Helm. 1979. Pp 242. £9.95)

The intentions of James Young's book are wholly laudable and would promise, inter alia, a long overdue excavation of Scottish working class history and combativity. If this had been Young's sole endeavour then The Rousing would have to be considered a qualified

success. However, the author has set himself a far more ambitious task than the reclamation of working class history and attempts to situate its contribution to the making of Scottish society in a context which stresses the social, political and economic forces which structured that contribution, imposed constraints and limitations and, most importantly for Young, which gave to working class activity its distinciveness and ultimately its 'implicitly more revolutionary character'.

Therefore, in seeking to explain the development of Scottish society, Young sees it as central 'to look at history from above as well as history from below'. However, the claim to present a view of the development of the working class as a dynamic and dialectical process is advanced no further than the assertion that 'It was against this background of an authoritarian social ethos ... that the labour movement fashioned its own form of puritanism, temperance and self-help'. There is no further elaboration of the role of religion or how the working class's negotiation of its dominant values influenced the form ot trade unionism or gave it a distinctive ideological flavour. The labour movement's adherence to temperance is interpreted simply as a wholesale acceptance of middle-class values which further impelled the isolation of the organised from the mass of the unorganised. It would have been more worthwhile to explore the extent to which commitment to temperance could be construed as an expression of the belief within Calvinism that spiritual and economic immiseration were two sides of the same coin. With the exceptions of the occasions when the labour movement expresses sentiments which Young unconvincingly argues are nationalist, he subscribes to the rather one-dimensional view of the nineteenth century trade union movement as 'bourgeois-minded' and incorporated into the dominant value system.

Despite Young's claim to be concerned to unearth the major forces which shaped Scottish society, he casts as the unrivalled villain of the piece the provincial bourgeois elite and leaves little room for either co-stars or supporting players. This elite is the product of the particular colonial relationship between Scotland and England which involves 'the political incorporation of a culturally distinct group by the "core"'. The repressive nature of the offspring of this unequal union is explained by reference to their 'complex sense of provincial identity and inferiority' and their 'schizophrenic nationalism'. Thus the complex process of the development of class structure and class consciousness is reduced to an explanation which hinges on the Scottish elite displaying on a collective basis all the traits of an authoritarian personality.

The preoccupation with what is interpreted as the colonial relationship between Scotland and England acts as a distorting influence throughout the book and blinds Young to the more significant factors influencing the formation of Scottish society. Not only is an analysis of the development of industrial capitalism in Scotland largely ignored, but it rarely features as a backcloth to the episodes in working class history sketched by Young. The economic dimension is so neglected that the sparse references to its significance appear as startling incongruities.

The quite legitimate concern to counter the view of the Scottish working class as docile and tractable leads the author to resort to a

quixotic use of evidence and to assertion in place of sustained argument. For example, we are informed that by 1831 'the Scottish working class were already the most militant, class conscious and politically aware working class in Europe'; and the claim that Scottish women were more militant than their English counterparts is substantiated by reference to two strikes.

Young is not unaware of the alternative interpretations which could be made from the evidence and the rather confusing result for the reader is a rash of contradictory statements which often involve a complete volte-face. An alternative theoretical stance to internal colonialism might have yielded more fruitful insights. However, given the scope of the book and its time span, and its ambitious theoretical aims, it is not surprising that Young falls far short of the mammoth task he has set himself. There are, however, some precious gems of information scattered throughout the book and one occasionally glimpses an approach to the study of Scottish history which is refreshing and would be worthwhile pursuing. But they surface ony momentarily and become rapidly submerged in the mire of nationalist sentiment and wordy prose.

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