

Fig. 1 General Sketch-map of Limestone-workings near Stirling. Circles indicate (1) Swallowhaugh, (2) Sauchie Craggs, (3) Craigend Limeworks. (4) Murrayshall Limeworks, (5) Cambusbarrow Limeworks

LIMESTONE WORKING
A FORGOTTEN STIRLINGSHIRE INDUSTRY

K. J. H. Mackay

The observant traveller, journeying westward from Stirling along the Gargunnock road, may notice — shortly after crossing the M9 motorway — a long stone structure nestling below a wooded knoll, a quarter of a mile to the left of the road. Closer examination would reveal a fine 15-arched lime-kiln complex some 180 feet long. In active use between 1850 and 1910, the kilns are suffering slow and gradual deterioration. They constitute the latest stage in a little-remembered Stirlingshire industry, which played a major part in the agricultural development of the neighbourhood. (See Figs. 1 and 10)

Earlier limekilns can still be traced on either side of the road to the Murrayshall Quarry and North Third Reservoir, and there is documentary evidence of their having been in production around 1790. But for the earliest traces of all, one must follow the infant Bannock Burn towards its source, to an area once known as Swallowhaugh. Here, around the year 1700, lime was being quarried for use by the tenants of Blairdrummond Estate. This article attempts to link the contemporary records of this forgotten industry and the remains to be discovered on, and under, the ground in this attractive corner of Stirlingshire.

USES OF LIME

The oldest uses for lime are connected with building: mortar, harling, plastering and white-wash all use lime to some extent or another. Lime was also used in iron-making, which was certainly undertaken in West Stirlingshire during the 16th and 17th centuries. There may well have been a local lime industry preceding 1700, but the first agricultural use in this neighbourhood is referred to by John Ramsay of Ochertyre (1736—1814) writing in his journal, later to be published as "Scotland & Scotsmen". "In 1702, the year of King William's death, Walter Mitchell introduced the use of lime to Ochertyre Estate... George Drummond of Blair also encouraged his tenants to lime their ground... The quarry at Swallowhaugh was the only one within our reach. It stood in a wild glen, part of the estate of Sauchie, and was barely accessible to horses with back loads. The lime was of excellent

quality, but the badness of the road both within and without the glen, and the inconvenience of the ferry-boats (at the Drip) rendered it an arduous operation."

GEOLOGICAL DISTRIBUTION OF LIMESTONE S.W. OF STIRLING

The eastern end of Stirlingshire, with its past history of extensive coal-mining, is underlain by strata of the Carboniferous Period (345—280 million years ago). The lowest levels within the Carboniferous are generally bracketed together as the Calciferous Sandstone Measures, and do contain a certain amount of impure limestone, which has been burnt for agricultural use in regions to the west of Kippen, for example, where the economics of transport ruled out the better quality from distant eastern seams of purer limestone.

Included in the Calciferous Sandstone Measures are the lavas and volcanic detritus associated with the Clyde Plateau lavas. These produced the stepped-edge plateau variously known as the Campsie Fells, the Fintry Hills and the Gargunnock Hills, surrounding the major vent of Meikle Bin, (1870 feet) and several lesser vents such as Dumgoyne (1402 feet). None of the 70 or so successive outflows of lava seems to have reached Stirling, though Craigforth (202 feet) only 1½ miles WNW of Stirling Castle Crag, shows at least 6 layers of basaltic lavas. The eastward extension of the Gargunnock Hills is evidently covered by an accumulation of weathering products from the volcanic layers. (Dinham & Haldane, 1932, Francis & Read, 1970)

Above the Calciferous Sandstone Measures are found the strata of the Lower Limestone Group, and above those in turn the strata of the Limestone Coal Group, of which the most important, economically - for Stirlingshire - was the Bannockburn Main coal-seam. It is however, the Lower Limestone Series which we must examine in greater detail. (Fig 2) There are no less than 7 distinguishable limestone layers totalling some 23 feet, in a total thickness of over 180 feet. These have been labelled alphabetically A to G in early research reports, but the strata of commercial value have been renamed, limestones A and B being classified together as "Fankerton" (5—9 feet in thickness) and Limestone D being known as "Murrayshall" (6 feet in thickness). Geologically, stratum G is the earliest, and stratum A the most recent. All are characterised by their fossil structure, as indeed are the majority of the shales and 83 sandstones which are interlayered

with them.

Two factors led to the exposure of these limestones in workable quantities. One factor was their near-horizontal plane in the upper reaches of the Bannock Burn, which thus had to cut a long deep trench through the successive layers. The other factor was the intrusion of the 300-foot-thick sill of quartz-dolerite which forms the line of crags we know today as Sauchie Crags, Gillies Hill, King's Park, Castle Craig and Abbey Craig. This represents an injection, during or after faulting, of liquid plutonic rock between the sedimentary rock strata already laid down. Generally, in this area, the sill overlies the Murrayshall seam of limestone, so that where the quartz-dolerite outcrops as a line of crags, a seam of Murrayshall Limestone will be found at some depth below. In the absence of the 'whin-sill', one can only conjecture that glaciation would in all probability have removed the present main exposures of limestone, and have buried the remaining line of outcrop beneath many feet of glacial debris. Undoubtedly, the nature of the local fault-pattern has led to the removal of some exposures by glaciation, and to the fortunate preservation of the upper Bannock Burn outcrop.

To sum up, the limestone strata of economic importance are exposed for about three quarters of a mile in the valley sides of the upper Bannock Burn, reaching to within half a mile of the North Third Reservoir; and are then found in a succession of arcs following the whinstone crags from Sauchie Crags to King's Park (where they lie below sea level). The total length of this latter outcrop is around 4 miles, of which 3 miles have been actively worked, by quarrying or mining, over the last 3 centuries.

THE UPPER BANNOCK VALLEY

Reference has already been made to Ramsay's account of the introduction of lime as an agricultural dressing, "in 1702, the year of King William's death". With Swallowhaugh as the only quarry within their reach, limitations on the use of lime were imposed by transport difficulties, although it was recognised that the factor contributing most to the improvement of the carse-lands was the practice of applying lime regularly. "Between 1761 and 1767, there were frequently 50—60 horses here (at Ochertyre) with back-loads of lime from Swallowhaugh. The carriage, drink money included, equalled the prime cost".

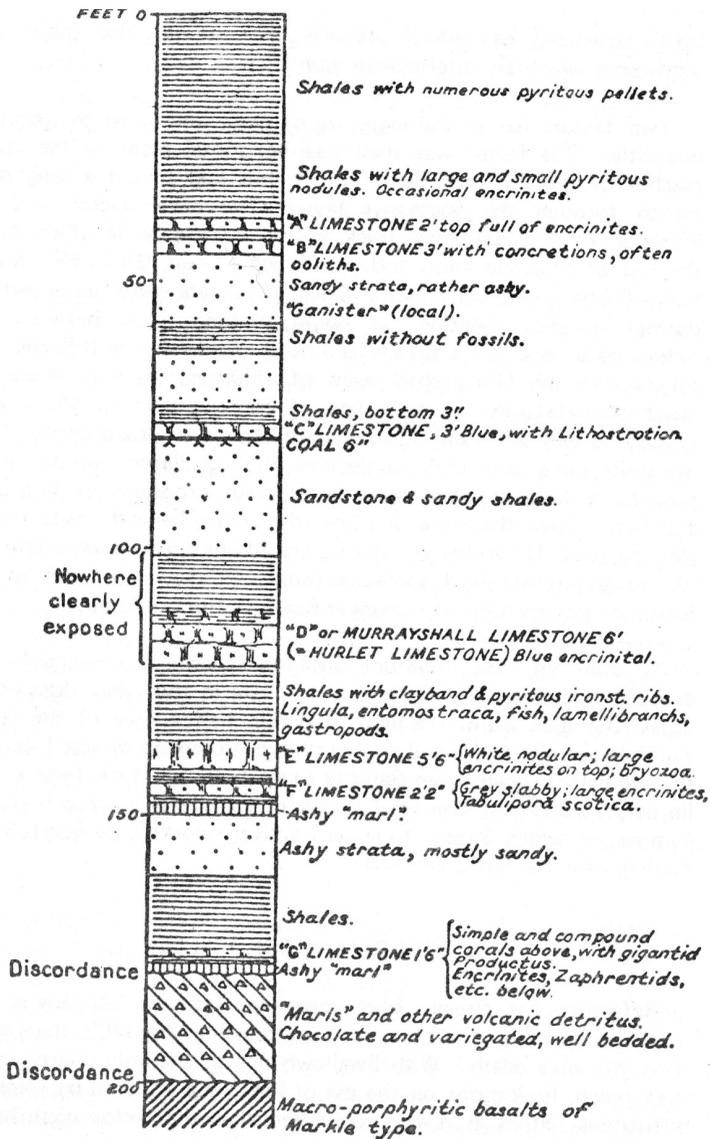


Fig. 2 Vertical Section of strata in upper Bannock Burn SW of North Third Reservoir.
 (from Proc. Geol. Assoc. vol. xxxviii, pt. iv, 1927 p. 474)

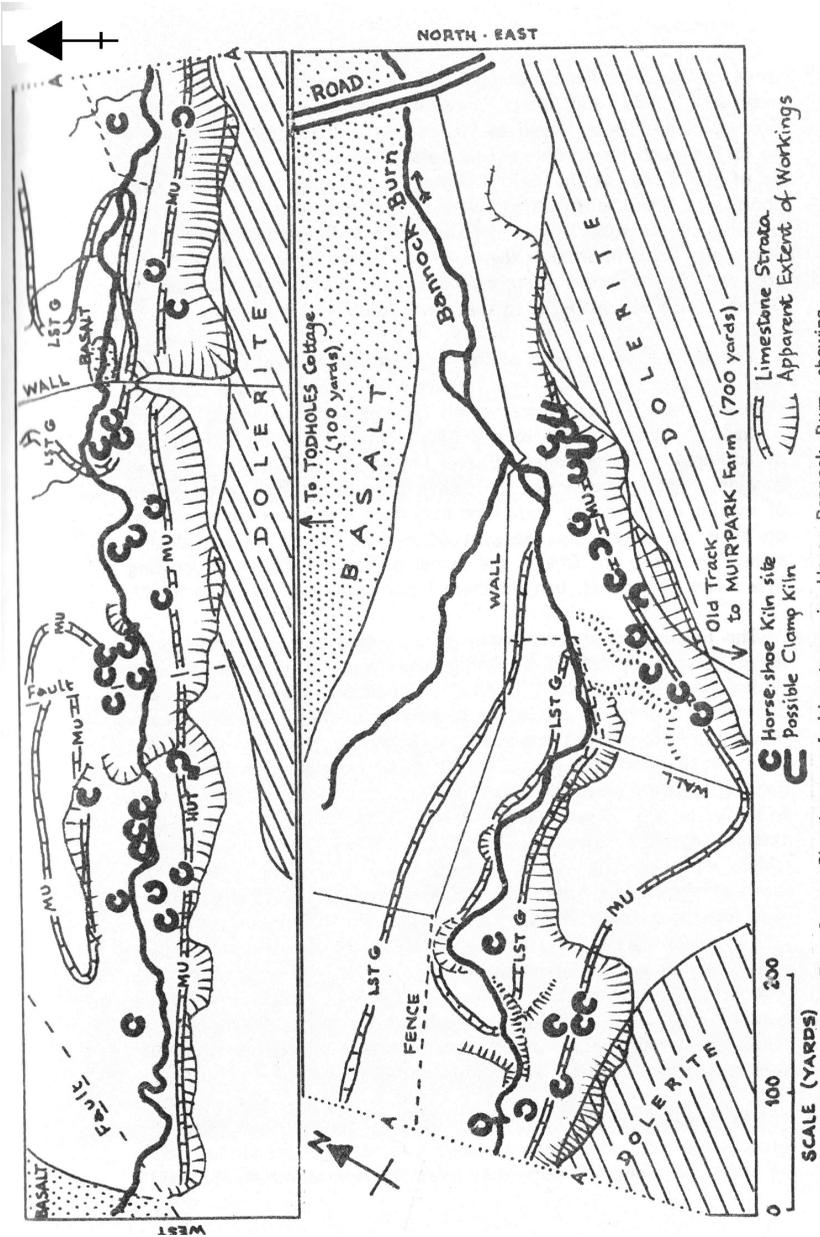


Fig. 3 Sketch-map of Limestones in Upper Bannock Burn, showing position of 44 probable Horse-shoe Lime-kilns, and 2 possible Clamp Kilns. (Geological data from Dinham & Haldane (1932), p.12)

He adds significantly - "Tenants could do very little while confined to Swaliowhaugh and back-loads". After 1760, with improved roads and carts, limestone could be brought from Broomhall in Fife by water to Manor Row, and thence to Ochertyre by cart, though the fording of the Teith at Broadford or Heathershot, or of the Forth at the Drip Crossing, was subject to suitable river conditions. These obstructions were happily removed in 1770 by the building of the stone bridge at Drip, which incidentally made Stirling Shore and Sheriffmuirlands the main lime ports (remains of lime-kilns are still in evidence at both sites) and encouraged the use of Bannockburn coal rather than that from Alloa in Carse kilns.

The growth in the use of lime agriculturally is reflected in two final quotations from Ramsay. "A farmer who formerly laid on a few chalders yearly for two-thirds of his lease, thought nothing of driving a quantity equal in value to half his rent. Instead of the old practice of adding 2 to 3 chalders per acre (1 chalder = 18 cwt), it is now considered good husbandry to double the quantity". The attraction of making quick money from lime may have led to less concentration on their cultivation on the part of tenants in the lime-producing areas. "In 1768, Mr. Cheap, the owner of Sauchie Estate, in granting new leases to tenants, banned them from burning or carrying lime".

The Swallowhaugh site, today, is a pleasant pastoral scene, with sheep grazing peacefully on the grassy slopes leading down to a typical moorland stream (Plate 1). True, the grassy slopes have occasional strange contours, with here and there crescent-shaped mounds of stones, but there are no industrial remains to mar the scene. It is most easily reached from the bridge near which the Bannock Burn enters the North Third Reservoir, itself a recent addition to the landscape (1911, extended 1931). The workings extend westward from MR 755 878 to MR 740 876, and consist mainly of quarrying, within a band 50 to 100 yards wide to the south of the Burn, of the 6 feet thick Murrayshall seam. Other seams have also been quarried to some extent, but their visible outcrops, with a great variety of fossils, in contrast to the almost total absence of visible Murrayshall limestone, suggest that the latter produced the best lime. The constricted nature of the site, together with the proximity of the Auchenbowie Fault to the south, ruled out the development of mines. In some places, quite large overburdens must have been removed to get at the Murrayshall seam.



Plate 1 General view of upper Bannock valley, showing mounds of debris left by limestone quarrying.



Plate 2 Typical remains of horse-shoe kiln by upper Bannock Burn.



Plate 3 Evidence of lime-burning from heart of a horse-shoe kiln — coal, cinders, and slagged rocks.

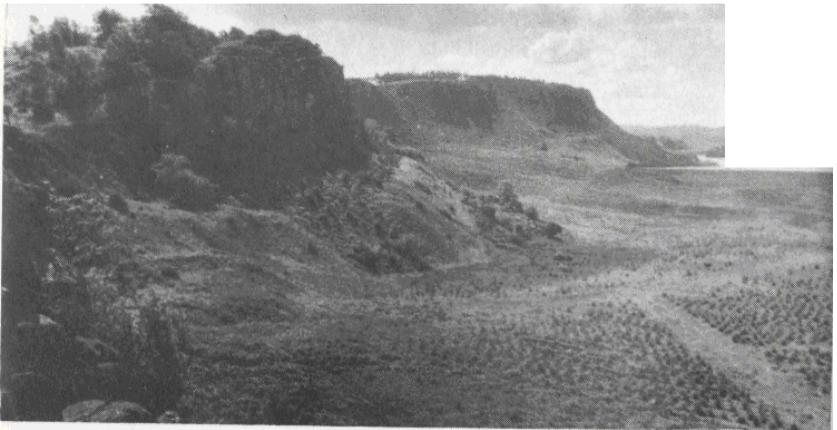


Plate 4 General view of Sauchie Crag and North Third Reservoir. A platform extending round the base of the Crag bears witness to extensive lime-quarrying.

The remains of the kilns in which the limestone was burnt are recognisable from the crescent-shaped mounds of loose stones which are scattered along the burn-side. (Plate 2) Approximately 12 to 15 feet in diameter across the crests, and perhaps 3 feet above the, surrounding ground-level, these represent the effect of 200 years or more on the circular or 'horse-shoe' kilns, built of dry-stone and turf, and originally from 6 to 12 feet in internal diameter with walls 3 feet or more thick. In the centre, a little excavation often reveals evidence of the process involved in lime-burning in the form of lumps of coal, clinker and partially slagged rocks. (Plate 3) Figure 3 shows the position of over 40 horse-shoe kilns and their relationship to the Bannock Burn, and to Murrayshall limestone as sketched by Dinham & Haldane (1932).

Transport routes suggested by the contemporary records, and a study of maps of the period, would involve coal being brought up from Auchenbowie through Canglour Glen — about 3 miles — on pack-ponies, and the burnt-lime being carried east onto the North Third road, then northwards via Cambusbarrow to the Carse, possibly using the road by Kersebonny and Kaimes to reach the Drip Crossing. From the Carse the pack-ponies could complete their triangular haulage route via Stirling and Whins of Milton.

SAUCHIE CRAGS

The dolerite sill which forms the Sauchie Crag, to the east and north-east of North Third Reservoir, has beneath it a scree-slope which covers the outcrop of the Murrayshall Limestone along its mile-long extent. (Plate 4) The presence of this limestone must have been suspected by the Swallowhaugh lime-workers, and traces of their activities are evident in regular corrugations of the scree-slopes at around the 650-foot contour, and in the occasional small limekiln such as the well-preserved one at MR 762 894. (Plate 5)

There is no known written record giving the period of operation of these workings, and one suspects that they may have been in use at the same time as the Swallowhaugh workings, and for some time thereafter, since several of the nearby farms - Townhead (748 891), North Third (793 897) and Berryhill (754 900) - have had their own limekilns, those at Townhead being of a particularly fine style. The Ordnance Survey 6-inch map of 1860 lists all 3 as disused.

CRAIGEND LIME-WORKS

Sauchie Craigs, after running due north for a mile, turn east for three quarters of a mile at MR 761 906. The Bannock Burn, flowing in a ravine below, similarly alters course, cutting down through the Murrayshall seam, and in places the 3 lower layers. On the opposite side of the stream from the corner of the crags is an old quarry - Touchadam Quarry by name — which appears to have worked an isolated outlier of Murrayshall limestone. Little now remains in the quarry but a few piles of dark-blue limestone, rich in encrinite fossils and dotted with pyrites inclusions - possibly the reason for its rejection.

There are no limekilns directly associated with the quarry, which raises the question of dating. Late 18th and early 19th century kilns tend to be massive and to leave long-lived remains. Could this quarry be of the same period as the Swallowhaugh workings? (Horse-shoe kilns presumably are less permanent if built on land desired for cultivation). Was it operated in conjunction with the farm-kilns mentioned above? Or is it a relatively recent extension of the Craigend Workings with their numerous kilns on the SE side of the valley?

Craigend Workings are, in fact, the earliest in the area which show clear evidence of mining (though it would be foolhardy to claim that mining had not been undertaken further south, along the west-facing Craigs.) Three mine-adits ("ingaun'een") are marked on the 1860 O.S. map, two being now totally blocked, those at 761 904 & 764 906. However the adit at 762 906 is still open and though its entrance is waterlogged, the dry-stone lining is in excellent condition. The adit has a width of 7 feet 1 inch and a wall-height of 4 feet 6 inches, and the roof-arch rises to a maximum height of 5 feet 8 inches. One enters it via a sunken road linking it to the nearby limekilns. On the left, outside the entrance, is a depression which may represent a sump to receive drainage water from the mine. The adit progresses for 40 yards in a SW direction, then alters to a Southerly direction for 120 yards. A short branch leads off left but is now blocked. The main heading has a high-roofed section requiring stone-built buttressing — clearly a weakness found during construction, or one which developed while the mine was in use. The heading continues southwards in the native rock over loose rubble for 60 yards, when it joins a cross-tunnel running NW-SE. The floor of this tunnel has a deep layer of red mud, and is gradually being forced up to seal the tunnel completely.



Plate 5. Well-preserved lime-kiln at foot of Sauchie Crag. This is situated on the platform visible on lower left corner of Plate 4.



Plate 6 Bannock Burn and the main Craigend group of lime-kilns from the NE.

Of particular interest is the evidence as to the mode of construction of the adit's stone lining. Every 7 feet to 8 feet there is a clear space through the lining, linking both sides across the arch. One concludes that the tunnel-builders extracted 7 feet — 8 feet of rock at a stretch, then stone-masons built up the side-walls to 4 feet 6 inches, at which point the timber arch-support would be moved into position while the shallow arch was constructed. (A similar style of construction has been applied in some of the outhouses at Western Craigend, half a mile to the east. Here, without the tunnel sides to give support to the barrel vault, there is likely to be excessive outward pressure on the walls).

Each of the adits associated with the Craigend lime-works has a kiln-group in close proximity. (Fig 3 & 4) Near the uppermost adit, a group of very high-arched kilns (Dinham & Haldane show 4 in the group) are in a fairly advanced state of decay. Only one arch is still intact, 9 feet wide and 18 feet high, giving access to side-vents or drawholes for both the adjacent kilns. Though the style of both kilns is similar, asymmetry in the method of supporting the arch indicates that the W kiln is of earlier construction than that of the East. The light high-arch might then be explained as being designed to give mutual support to the kilns without imposing too great a load on the older structure. (MR 761 906)

Near the centre adit — the accessible one - there are two separate 3-draw kilns, now also in progressive states of dereliction. (MR 762 907)

The most impressive range of limekilns, however, is that associated with the east-most adit (Plate 6). This comprises a row of three 17 feet diameter kilns, 20 feet deep, built on a frontage of 116 feet. From the kiln-head the loading platform stretches back for 173 feet, suggesting extensive storage areas for coal, limestone and possibly burnt lime. The kiln-face is built of massive whinstone blocks, the arches of access-tunnels and drawholes being of sandstone, keyed with whin slabs. The access-arches are 12 feet high and 9 feet wide, while the drawhole arches are 6 feet high and again 9 feet wide. The 1860 6-inch map shows a fourth kiln in the same group but slightly out of line to the south. This cannot now be distinguished. (MR 766 907) Figure 5a is a scale drawing of the main Craigend limekilns.

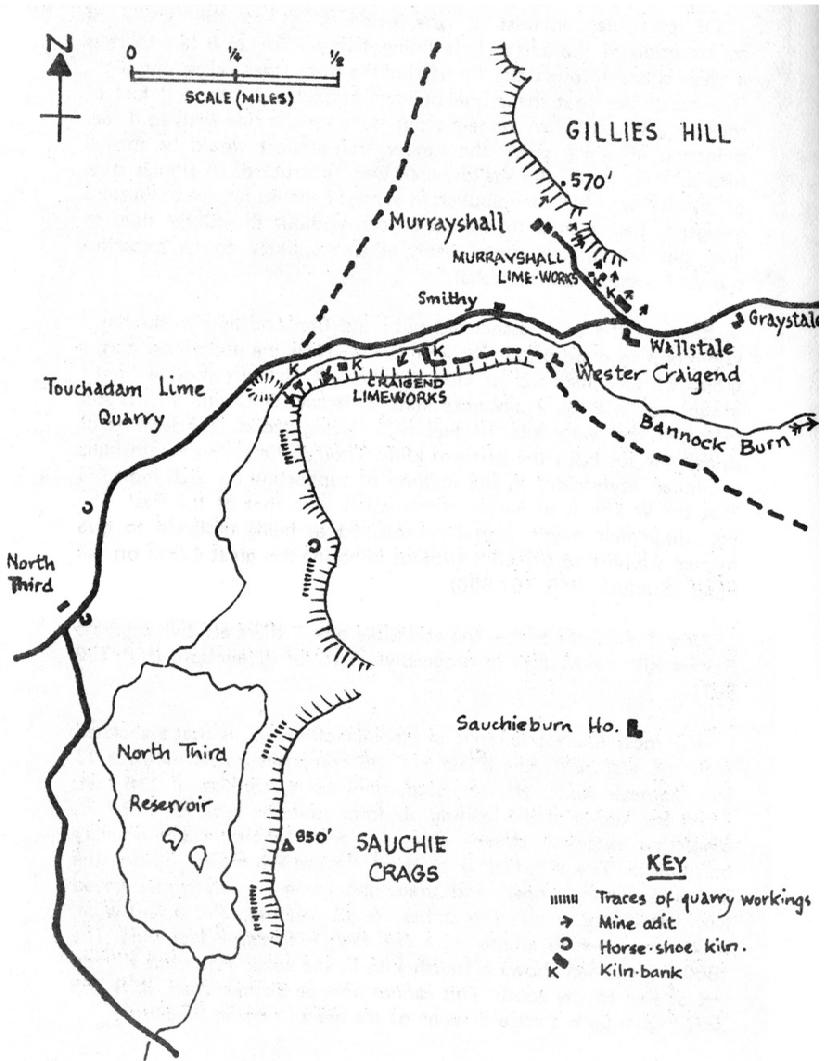
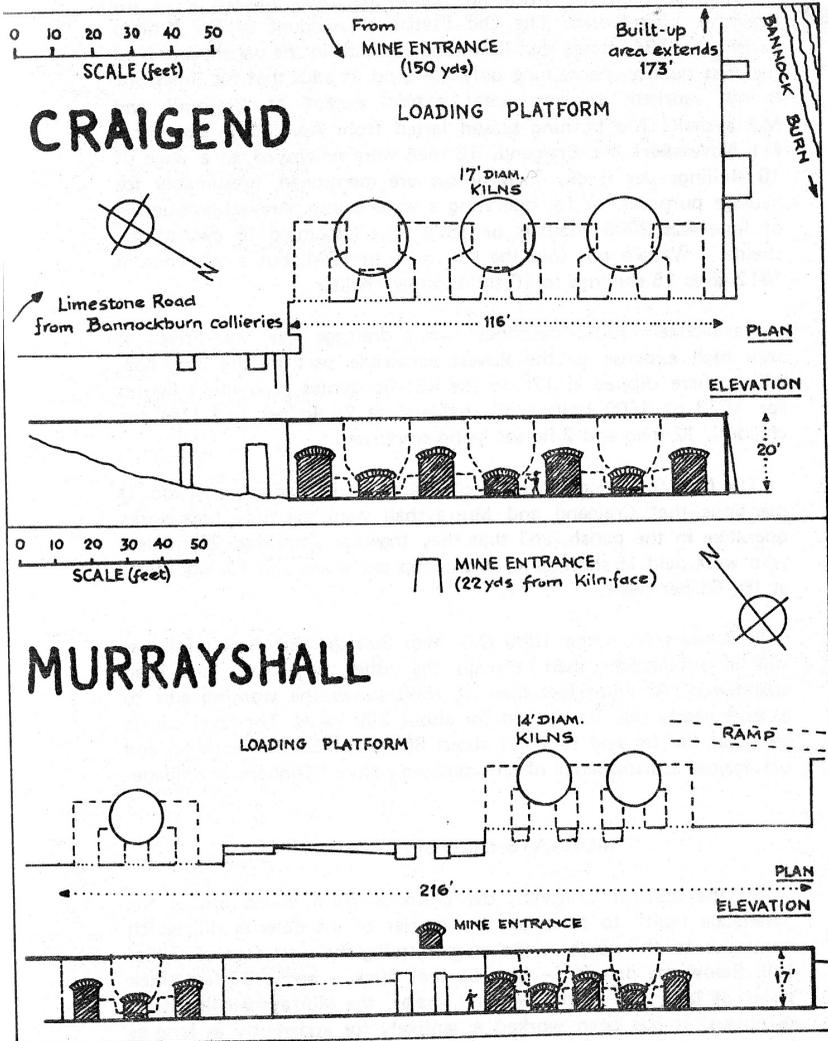


Fig. 4 Sketch-map of Limestone-workings in area of Sauchie Crags, Craigend and Murrayshall.



There is relatively little on record regarding operation of the 92 Craigend Lime-Works. The Old Statistical Account of St. Ninians Parish, in 1794, states that limestone abounds in the parish, and is of the first quality, containing only 1% sand. It adds that the limestone is not worked to any great extent except at Craigend and Murrayshall. The burning season lasted from April until Martinmas (11 November). At Craigend, 16 men were employed, at a wage of 10 shillings per week. Two horses are mentioned, presumably for haulage purposes, or for operating a water-pump. Annual production of lime was 2000 chalders or 1800 tons (assuming 18 cwt to the chalders). We are not told the sale price in 1794, but a reference in 1812 gives 15 shillings to 16 shillings per chalders.

Carmichael (1837) describes how a drainage level was driven at very high expense to the lowest accessible part of the lime bed, which there dipped at 12° to the SE. He quotes production figures for 1833 of 4500 bolls (750 chalders) at 2s 4d per boll (14s per chalders), 12 men and 2 horses being employed. The New Statistical Account, of 1842, has little of value to add. It mentions that Craigend and Murrayshall were the only lime-works operative in the parish, and that they together employed 24 miners, who were paid 15 shillings to 16 shillings per week, and 10 labourers, at 10s 6d per week.

It appears from the 1860 O.S. Map that the east-most mine was still in production then, though the other two mines had been abandoned. An imperfect plan of 1858 shows the working adit to extend nearly due Southward for about 230 yards. The level course seems at the far end to trend about 30° S. of E. The workings end off against a disturbance of an unknown nature. (Dinham & Haldane)

MURRAYSHALL LIME-WORKS

To the east of Craigend, the Bannock Burn makes use of the "Wallstale fault" to penetrate the barrier of the dolerite sill, which continues to the north as the crags forming the west face of Gillies Hill. Below the dolerite - here 82 feet thick - and a 63 feet thick series of layers of sandstones and shales, the Murrayshall limestone reappears. It has been worked extensively for apparently as long as the Craigend mines, though with two distinct disadvantages in that the downward tilt of the strata meant firstly, difficulty in drainage, and secondly, extra work in bringing the extracted limestone to the surface.



Plate 7 Northernmost lime-kiln of main Murrayshall group.



Plate 8 Last visible mine entrance to Murrayshall lime-workings. It lies only 22 yards from the kiln-face

A plan of 1866 shows 5 "Old Mines" along the foot of the 93 Murrayshall scrap, but not the site of the then-operating mine. The 1868 Stirling Directory lists J. Morrison as lessee of the Murrayshall limeworks (Plate 7). However, close examination of the site of the Murrayshall limekilns has shown the existence of an almost concealed stone-arched adit only 22 yards behind the kilnface (Plate 8). The Map references of six known adits are as follows — starting from the NW end:- 770 914, 771 912, 772 911, 772 910, 773 909, 775 908. That at 773 909 is the only one distinguishable, though the lines of several of the other approach-roadways can be followed until they vanish into a tumble of fallen rocks.

For a description of the mines as they were in operation, we turn again to Carmichael (1837). "The mine penetrates into the hill upwards of 400 yards with various cross paths... the chambers are worked from 18 to 20 feet wide, and wards are left from 8 to 10 feet apart", the roof being supported by pit props where necessary. The seam was about 6 feet thick and the dip was about 25° to the SE. The workings at that time were at the base of an inclined plane drained by a horse-pump. Twelve men and 2 horses were employed and the annual sale was 1500 chalders at 14s per chalder (1350 tons at 15s 5d per ton).

An earlier account by Imrie (1818) gives the following analysis for the Murrayshall limestone:—

Carbonate of lime	94.75%
Carbonate of magnesia	0.76
Peroxide of iron	1.03
Siliceous matter	2.26
Phosphoric acid	0.47
Water	0.25
Organic Matter	0.15
Alkalis	<u>Trace</u>
	<u>99.67</u>

The kilns, four in number, lie to the east of the road to Murrayshall Quarry. One, on its own, and in very dilapidated condition, is at MR 772 901. It appears to have been of the square three-vent type, with curved 'wings' to catch the wind. The other three kilns form a kind of ensemble, stretching 216 feet along the road-side, at 773 908. (Figure 5B) The NW one is separated from the remaining pair by a 75 feet buttressed wall supporting a loading platform. All are of the

three-vent type, with access-tunnels originally about 8 feet high to the centre of the arch. The kilns are slightly smaller than the Craigend main group, being only 17 feet deep and 14 feet in diameter. They are built of whinstone which has been roughly squared and laid in courses. The arches are built of shale sandstone with a whinslab keystone. At the SE end of the kiln-row stood, until recently, a cottage, and behind it a ramp led up to the kilnhead. On the 1866 plan, this cottage is marked 'Bates' House'; an account by Campbell (1925) mentions that it was then a tile-roofed cottage, occupied by a Miss Low, aged 80, a relative of the Lows who had tenanted the nearby farm of Graystale for several generations. The farm of Walistale, directly south of the kilns was tenanted by successive members of the Galloway family.

A second cottage near the first-mentioned kiln, is described in 1866 as 'Kay's House'; this has only recently been abandoned, having been latterly occupied by a Mr. Taylor.

Midway between the Murrayshall and Craigend Limeworks stood the Touchadam Smithy; in 1818 the smith was John McFarlan, and a copy of one of his bills to William Low runs as follows:—

		May 25th 1818	William Low	£	s.	d.
June	9	For a new mell (large hammer)	8 pund 3 quarters	0	4	11
		for 2 borray (barrow) foot	2 pund	0	0	10
		for Huping a borray		0	0	2
July	2 29	for a great (grate)	9 pund 3 quarters	0	4	10
		for a Chimnie	1 stone 7 pund	0	9	7
		for a Bonok iron (girdle)	7 pund weight	0	3	6
		for a pair of tong and poker	3 pund 8 ounce	0	1	6
		for a Crook and Ranteltree	4 pund 8 ounce	0	1	10 ¹ / ₂
		for a pair of Bowls	1 pund 4 ounce	0	0	7 ¹ / ₂

(The reference to "Crook and Ranteltree" is particularly interesting. The Crook was a rudimentary chain, terminating in a hook, which was hung from a metal bar — the Ranteltree — projecting across the cottage chimney. This was the simple predecessor of the 'swey', as a means of supporting a cooking pot over a fire. Originally, the Ranteltree was made of a rowan-branch, which is where it got its name.)

A second bill to the tune of £2:3:11 "for mind work" submitted to William Low in 1827 is from a John Lawson, blacksmith, and deals

with a great variety of items of mine-upkeep: — "Tone and caing, new shoes (for a mine pony)", "Mending the mind cart", "Munting a winlse", "Chanes to the Mind", "Lean a Killhead hammer", "Chane and pine a Bolt to the Mind cart", "Repairing the Mind Cart whels", "Mending a shufel", "links to a bretchen", and "Shoen a pir of whel and Lethen the hipes". In 1868, the Directory gives R. Towers as the blacksmith.

Other documents relative to the operation of the mine are in the possession of Miss E. M. Dewar of 8 Albert Place, Stirling, a relative of William Low of Graystale. (Figures 6 and 7) These throw light on the business side of the local lime industry in the 1820s. The landowner, William Murray of Murrayshall, also owned the mineral rights, which he leased to William Low for 10 years from 1821 for £40 per year. William Low entered into an agreement with Robert Downie, miner, to operate the mine, and guaranteed to buy either a set amount of the limestone mined per year, or all the production, at an agreed price per chalder (7s.3d in 1818/19 and 7s.7d in 1820). Low seems to have operated the kilns, using his own workforce. Low then either used the lime himself, or sold it to others. There is an account from Wm. Low to Wm. Murray for sales of lime back to the landowner (price, in 1831/3, 14s per chalder).

CAMBUSBARRON LIME-WORKS

Faced with increasing problems of drainage and haulage of limestone from the foot of the inclined strata at Murrayshall, it must have seemed a reasonable deduction that, by going round to the north-side of Gillies Hill, one would be able to mine an upward-trending seam, which would drain naturally into a day-level, and from which the limestone could be brought out under gravity. Test-bores, undertaken about 1850, confirmed that the same seam lay at about 50 feet above sea level, below the Fir Park of what was shortly to become Polmaise Castle policies. The 134 feet test bore at 774 923, just south of the Drove Road from Cambusbarron, was enlarged to provide an air shaft, and simultaneously a gently rising level was driven south from a point (775 927) near Hayford Mills. This met (but almost missed) the counter-level being driven north from the base of the air-shaft. This drainage level then was driven south-east in the limestone seam eventually reaching a faulted region only 100 yards short of Polmaise Castle. From the drainage-level, workings were carried up the slope of the stratum, working on the stoop and room system. There seems to have been a

I Robt Downie agrees to give Wm Low all the Limestones that I (or those thro or on my behalf) shall work out of Murrayshall Limeworks from October Eighteen Hundred & Eighteen to Martinmass Eighteen Hun^d & Nineteen at the rate of Eighteen shillings p heap the heap being equal to two & a half chalders _____

and I also agree to give the said Wm Low all the Lime stones that I (or those that thro my means or on my behalf) shall work out of Murrayshall Lime works from Martinmass Eighteen Hundred & Nineteen to the Thirty first December Eighteen Hund & Twenty at the rate of Nineteen shillings p heap the heap being equal to two 4 a half chalders and the said Wm Low agrees to pay me viz. Rob Downie Twenty pounds pr month untill the Lime stones delivered to him shall be paid up at the above rates

(signed) Robt Downie

St Ninians
No 21st 1818

Wm Low
Witness John Mitchell

I Robt Downie Agrees to give Mr Low all the
 Limestones that I (or those that thro' my or on my behalf)
 shall work out of Murrayhall Lime works from before
 Eighteen Hundred & Eighteen to Martinmas Eighteen Hun.
 & Nineteen at the rate of Eighteen Shillings p heap
 the heap being equal to two & a half Chalden
 And I also Agree to give the said Mr Low all the lime
 stones that I (or those that thro' my means or on my
 behalf) shall work out of Murrayhall Lime works
 from Martinmas Eighteen Hundred & Nineteen to
 the first of June next Eighteen Hundred & Ninety at the rate of
 Nineteen Shillings p heap the heap being equal to two
 & a half Chalden And the said Mr Low agrees to
 pay me viz. Robt Downie Twenty pounds per Month
 untill the said ^{working} shall be paid us
 at the above rates

ROBTDOWNIE
 Mr Low
 Witness John Mitchell

At Newcas
 26th 10 18

Mr William Low

Polmaise 10th Feby 1821

Sir

I have received your letter of the 13th Jany last, and memorandum enclosed, offering Forty pounds of yearly rent for the lime works at Murrayshall on a lease of Ten years and nine months from Candlemass next 1822, with liberty to put in a level near James Galloway's well, and a road near the houses at Murrayshall gate, of which I hereby accept under the following conditions.

I am to be at no expence for damages done to James Galloway in Wallstale, and you are to maintain in good repair both your own house at the upper Kills, and the houses at the gate and leave them in the like condition at the end of the Tack or when you leave them - the Rent to be paid half yearly at Whity and Marts by equal portions beginning the first payment at Whity 1800 & twenty three.

I am Sir

Yours etc

(signed) William Murray

at Murrayshall

Mr. McClelland Law

Polinaise 10th July 1821

Sir I have received your letter of the 13th Inst last, and Memorandum enclosed, offering forty pounds of yearly rent for the lime work at Murray's Hall on a lease of Ten years and nine Months from Candlemas next, 1822, with Liberty to put in a level near James Gallaway's well, and a Road near the houses at Murray's Hall Gate of which offer I hereby accept under the following conditions: I am due at no expense for Damages done to James Gallaway in Walsdale, and you are to maintain in good repair both your own house at the upper Killes and the houses at the Gate and leave them in the like condition at the end of the Term or when you leave them - The Rent to be paid half yearly at Whitsy and Mart by equal portions beginning the first Payment at Whitsy 1800 & Twenty Three.

Yours Sir
Yours L^o &c

William Murray

at Murray's Hall.

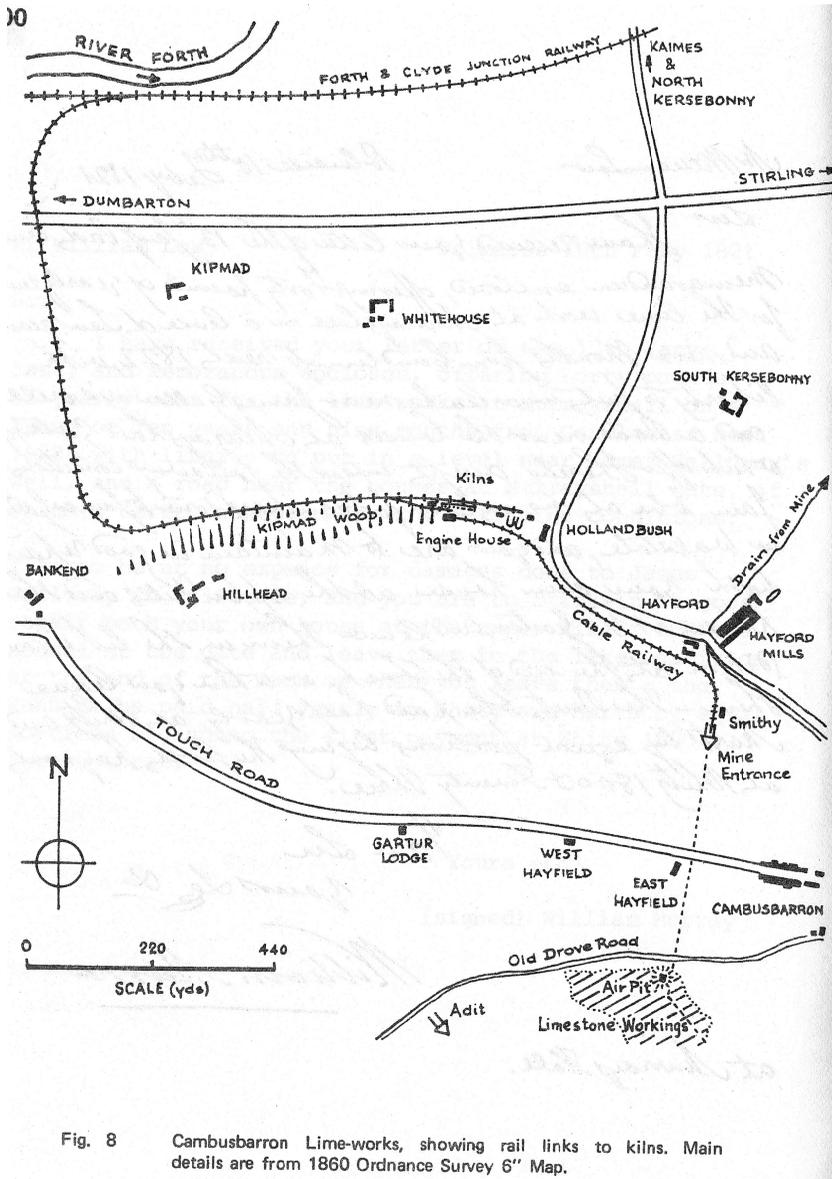


Fig. 8 Cambusbarron Lime-works, showing rail links to kilns. Main details are from 1860 Ordnance Survey 6" Map.

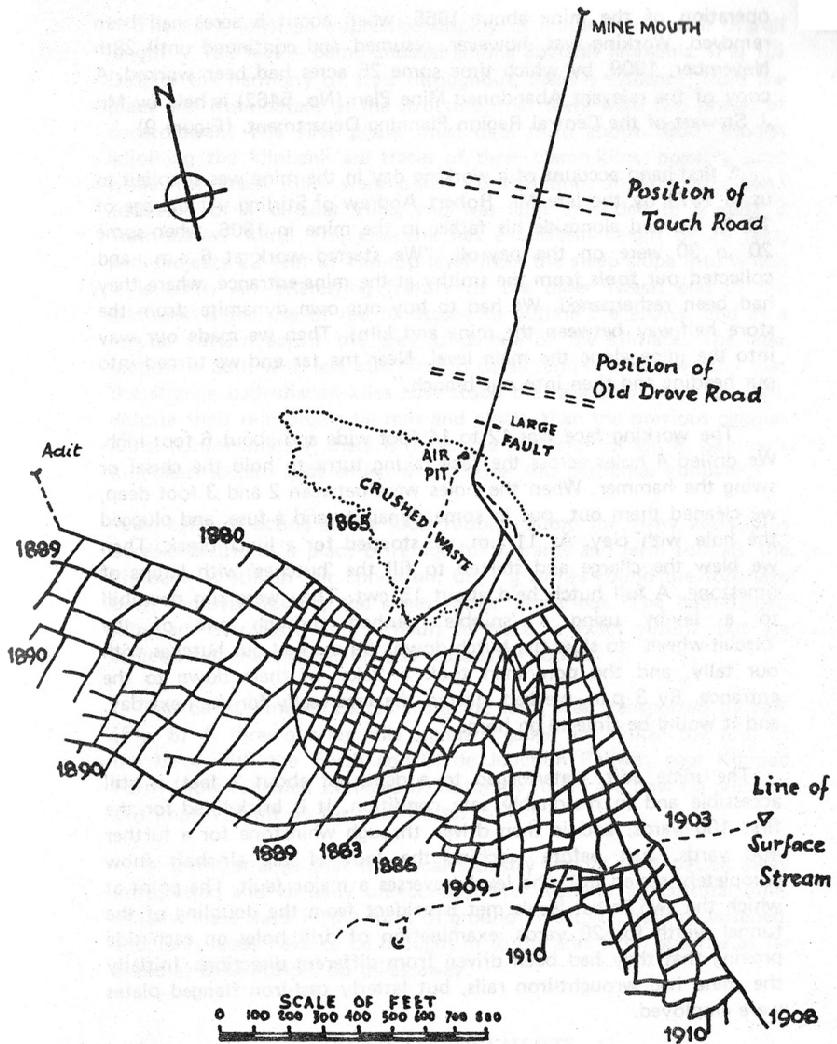


Fig. 9 Sketch-map of Cambusbarron Lime-workings in 1910 as shown in Abandoned Mine Plan No. 5462. Dates indicate survey year in which extent of working shown was first recorded.

There seems to have been a break in the operation of the mine about 1865, when about 5 acres had been removed. Working was, however, resumed and continued until 28th November, 1909, by which time some 25 acres had been worked. A copy of the relevant Abandoned Mine Plan (No. 5462) is held by Mr. J. Stewart of the Central Region Planning Department. (Figure 9)

A first-hand account of a working day in the mine was supplied to us in 1971 by the late Mr. Robert Andrew of Stirling. At the age of 16, he worked alongside his father in the mine in 1906, when some 20 to 30 were on the payroll. "We started work at 6 a.m., and collected our tools from the smithy at the mine-entrance, where they had been resharpened. We had to buy our own dynamite, from the store half-way between the mine and kilns. Then we made our way into the mine along the main level. Near the far end we turned into our heading and then into our branch."

"The working face was 12 to 14 foot wide and about 6 foot high. We drilled 4 holes across the face taking turns to hold the chisel or swing the hammer. When the holes were between 2 and 3 foot deep, we cleaned them out, put in some dynamite and a fuse, and plugged the hole with clay. At 11 a.m. we stopped for a lunch-break. Then we blew the charge and started to fill the 'hutches' with lumps of limestone. A full hutch held about 15 cwt. They were run downhill to a lay-by using a 'snibble' pushed through one of the 'biscuit-wheels' to slow the hutch down. We marked our hutches with our tally, and the pony-man took a 'rake' of them down to the entrance. By 3 p.m. we had cleared the face ready for the next day, and it would be time to go home."

The mine adit, waterlogged to a depth of about 2 feet, is still accessible and in reasonably safe condition. It is brick-lined for the first 100 yards, and is then driven through whinstone for a further 400 yards. Just before reaching the foot of the air-shaft (now completely sealed up), the level traverses a major fault. The point at which the two initial levels met is evident from the doubling of the tunnel width for 20 yards, examination of drill holes on each side proving that they had been driven from different directions. Initially the mine had wrought-iron rails, but latterly cast-iron flanged plates were employed.

The hutches were drawn to the kiln-top, 600 yards away, by an endless chain driven by a steam-engine, and charged into one of the 6 kilns with alternate layers of coal. Burning continued for 3 days, and it took another 2 to 3 days for the kiln to cool down for unloading.

The kilns form an impressive display of mason-work, their overall 103 length — 182 feet — being unusual among Scottish limekilns. (Fig 10) Despite the harmony of style throughout, there is evidence, from the plans and from details of the structure, that there were two phases of construction. The first phase must date from about 1850, though adjoining the kilnbank are traces of three clamp-kilns, possibly used while the main kilns were under construction. Initially the bank consisted of 4 circular kilns, and was later extended to include 2 'bath-shaped' kilns. The kilnbank has a uniform height of 25 feet, and projects 22 feet at kiln-top level from the steep slope into which it is built. An interesting feature of the older (west) end of the kilnbank is the use of red sandstone to outline the arches, and as a regular pattern across the grey sandstone of the kilnface. The later section is built with less attention to detail, and it is noteworthy that the strange bath-shaped kilns have stood the ravages of time less well, despite their reinforcing tie rails and plates, than the previous circular kilns. (Unfortunately, there is no simple extension of Mr. B. Skinner's kiln-classification code which would cover this particular kilnbank.)

In spite of acting as the local rubbish dump for many years, plus occasional use as a place of refuge for vagrants and farm animals, the kilnbank is still in fair condition. Coping stones round the top have been removed leaving the edges rather precarious. The bath-shaped kilns are overgrown and difficult to trace in exact outline, but the structure of the circular kilns is reasonably sound. The burnt lime extracted from the kilns was transported by rail. (Fig. 8) A three-quarter mile standard gauge line linked the foot of the bank with the Forth and Clyde Junction Railway near Kipmad Farm (now renamed Bankhead). Naturally, there are now no relics of this improvement on the pack-horse.

It seems strange that this local industry should have passed away unregretted and virtually unrecorded. The need for agricultural lime, usually these days in the form of ground limestone, has not lessened, and lorry-loads have to be brought in to the area from quarries as far afield as Blair Atholl, 65 miles away.

ACKNOWLEDGEMENTS

This article owes a great deal, over several years, to a large number of people - too many perhaps to list individually. I would particularly mention Mr. A. Jeffrey, of the Library Service, who introduced me to the Cambusbarron Limestone workings, members of staff and pupils of Queen Victoria School, Dunblane, Mr. W. McEwan, Miss E. Dewar, Miss J. Thomson, members of the Glasgow Speleoogical Society, Mr. J. Stewart of the Central Region Planning Department, Mr. R. McCutcheon, Mr. A. Bean, Mr. S. Murray, Mr. D. Burnie, Mr. D. M. Dickie and members of the Clackmannanshire Field Studies Society. I owe a special debt to several companions on innocent afternoon hill-rambles who found themselves unwittingly, and invariably uncomplainingly, drawn into a spot of industrial archaeology.

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STIRLING DIRECTORY 1868.

MAPS

- 1860 Ordnance Survey of Stirlingshire (six inches to one mile) Sheet 17
- 1866 Plan Showing line of footpath claimed in process Jenkins and Others v Murray RHP 10675

EDITOR'S NOTE:

The above article has used Imperial, rather than the recommended metric, measures because of frequent references to old sources where Imperial, or even older, measures were quoted. An attempt to include metric conversions throughout proved extremely cumbersome, and it was decided to publish as above, appending the following table of metric equivalents: —

1 inch = 0.0254 m	1 acre = 0.4047 ha.
1 foot = 0.3048 m	1 ounce = 0.02835 kg.
1 yard = 0.914 m	1 pound = 0.4536 kg.
1 mile = 1.609 km	1 cwt. = 50.803 kg.
	1 ton = 1016.06 kg.
1 penny = £0.00417	
1 shilling = £0.05	1 boll = 152.41 kg.
	1 cwt. = 914.45 kg.

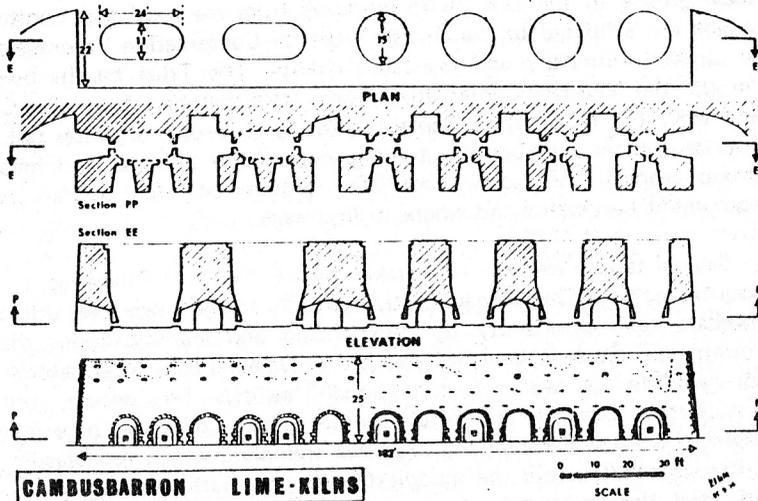


Fig. 10 Plan and Elevation of Cambusbarron Lime kilns.