Llanfyrnach Silver-Lead Mine

circa 1752 to 1890

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Llanfyrnach Silver-Lead Mine

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1. Introduction and brief history of the mine.

1.1 Location and Geology

The Llanfyrnach Silver Lead Mine is situated on either side of the Afon Taf 650 metres north east of Llanfyrnach Church, partially within Clydey parish. Prior to the 19th century there were in fact two mines as ownership was divided between Maurice Morgan, to the east of the river - the Llwyncelyn mine - and the Lloyd family - Llandre - to the west. Soon after 1802, and death of Morgan, ownership was consolidated when the Lloyds bought the land east of the river.

A number of west to east and north-west to south-east trending fault fissure veins or lodes carrying lead/zinc mineralisation have been worked to a depth of 520 metres below river level in the Bala Beds. The veins are near vertical - those trending north-west to south-east having a slight underlie to the west. Lateral displacement of the veins has occurred in a number of places through the action of what appears to be post-mineralisation faulting, ie. crosscourses or 'slides'. The principal economic minerals present are galena (lead sulphide), cerussite (lead carbonate) and sphalerite (zinc sulphide). Enhanced silver levels were present in the oxidised zone, the weathered parts of the veins above the water table, but the silver content of the galena found in depth was insufficient to justify refining before new techniques became available in the mid 19th century.[1]

1.2 History

There may have been mining on the site in the 16th century. In 1542 the right to mine silver-bearing ores in Wales and the Marches was granted by the Crown 'in consideration that a mine of lead ore holding silver has been found at Kynmorthe in the lordship of Emlyn' (See Appendix 1). As the only know occurrence of silver-lead ores in the lordship of Emlyn is at Llwyncelyn, the eastern part of the Llanfyrnach Mine, there is a strong possibility that this was the site of that discovery.[2]

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[1] Although investigative work was carried by one of the universities in the early 1980s, I am not aware of any detailed published account of the mineralisation at Llanfyrnach.

[2] Calendar of Letters and Papers, Foreign and Domestic, Hen. VIII, XVII, p. 634. In the 1870s the earlier workings of the mine were reported to be narrow and attributed to the 'Romans'. Such attribution was common for workings out of contemporary memory but should not be dismissed too readily. (Mining Journal 1973, p. 655)

1.2.1 Working during the 18th century

By 1752 the minerals under Llandre, on the Llanfyrnach side of the river, owned by James Lloyd were being worked when a section of the mine was set on tribute to a partnership of local miners.[3] (See Appendix 2.) Lloyd's efforts to work the Llandre mine himself were short-lived despite an injection of capital from a relative, Thomas Lloyd of Cardigan, and a report and plan dated 1764 (Figure 1.) suggest the involvement of Cornish adventurers.[4]

All our evidence so far has been for the Llanfyrnach side of the river. The minerals on the Llwyncelyn side were probably being worked in the 1740s and 50s but it is not until 1771 that we have clear information with a lease to a local group led by Lord Milford. In the following year a lease of the Llandre minerals was taken by adventurers from Derbyshire area and in 1773 the workings on both sides of the river were brought under the control of a single partnership when the local group and the Derbyshire adventurers combined their interests.

The Derbyshire adventurers withdrew in 1776 leaving the mine under the control of Lord Milford's group who continued to work it effectively until about 1791. Drainage had evidently become a major problem at about that date as the mine probably reached the effective working depth of the available pumps. Taking the mine below the water table would have meant a declining return in silver from the lead ores raised - an assay carried out in 1789 suggested that the silver content would not pay the cost of refining - and, even with lead prices touching £20 per tonne, the cost of improved drainage could not be justified without the enhanced revenue from silver. Milford's group retained control of the mine after working ceased in 1793. They may have entertained the idea of a new pumping engine after lead prices rose to nearly £40 per tonne in 1808 but had withdrawn altogether by 1810.[5]

1.2.2 19th century revival.

Despite attempts at reopening them in the early part of the 19th century, it was not until the mid 1840s that the mine was again in work. A new waterwheel was erected by 1844 and had drained the mine sufficiently to allow investigation below the 'old levels.' Steam power was introduced for pumping in 1855 - a portable engine installed at No. 2 shaft - and it is evident that work was concentrated on the Llwyncelyn section of the mine. T D Lloyd, the landowner, evidently had a hand in the reopening of the mine but had, by 1853, leased the mine to a working company. In 1858 a limited liability company - the Llanfyrnach Silver-Lead Mining Company Limited - was formed to take over the assets and continue working the mine.[6] The company's capital came largely from the London area but perhaps the most active shareholder was Thomas Turner from Wolverhampton. He left his mark on the mine - the steam engine at No. 1 Engine Shaft on the Llandre side of the river was erected

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[3] National Library of Wales (NLW), Bronwydd 3738.
[4] NLW Bronwydd 1959 and 1986.
[5] NLW Bronwydd 11,188B; Powis 4070 and 4077; Picton Castle 358 and 1661; and Carmarthen Journal 19 May 1810. The local group comprised Lord Milford, Henry Leach and John Symmon. Symmon withdrew in 1783, transferring his share to Milford. Later the partners were joined by William Marsden who also acted as manager.
[6] Public Record Office (PRO) BT31/349/1265. Much of information on the company's operations comes from reports to the Mining Journal 1858 to 1861.

under his supervision and he was subsequently responsible for building the miners cottages at Brick Row.

With the installation of the pumping engine at No. 1 Shaft in 1860 the focus of mining had shifted to the Llandre section. The Llwyncelyn section was probably never worked much under the 22 fathom level below adit. As the productive veins were in the Bala beds which dipped towards the north they had to be followed deeper on the other side of the river. With hindsight the company's new pumping engine might have been better placed (See Section 2) for they were soon obliged to install further pumps to the north-west, in Chain Shaft, in order to work the productive Gardners and Water Lodes. The increased cost of operations north of the river appear to have used up the capital available to the new company which commenced winding up in 1861 and the lease was transferred to Turner.[7]

Chain Shaft was to be the principal working shaft throughout the 1860s - the vast dump of waste rock on the Lwyncelyn side of the river, south of No. 1 Engine Shaft, was all hauled up that shaft. By the time Turner relinquished the lease of the mine in 1871, and a new lease granted to Messrs. Lawson and Evans, the mine was being worked deep under the northern hill. Compressed air drilling had been in use since the late 60s - a relatively early use of the technique. It is difficult to know why Turner gave up the mine in 1871 - lead prices were relatively stable, if falling slowly, and the previous two years at the mine had been the most productive to-date - although the dramatic fall in production in that year suggests some disruption. The loss of a productive ore body through faulting is a possibility - it was a relatively common occurrence at Llanfyrnach - and the high silver values returned at that time do suggest there had been some reworking in shallow parts of the mine.[8]

1.2.3 The 1880s - increased investment in mining.

That lead ore production failed to recover in the early years of Lawson and Evans' occupation does however highlight the technical problems at Llanfyrnach.[9] The veins, being worked deeper under the northern hill, were displaced through faulting. Extensive unproductive prospecting work was required before the ore bodies on the Water Lode were recovered and production fell to virtually nothing during 1876 and 1877. Production rose rapidly in 1878 but continued haulage through Chain Shaft was impractical and a new working shaft was required. Work on the new North Shaft, sunk vertically to adit before following the underlay of Water Lode, was underway by 1880 and had reached the 48 fathom level below adit in 1883.[10] Investment in North Shaft was justified by the increased production from the Water

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[7] NLW Bronwydd 6295 and 5209. From 1861 until its closure in 1890 the mine was in private hands. A disadvantage for the historian as less information was in the public domain - publications like the Mining Journal cease to be a useful, regular source of operational detail.
[8] Turner's death is also a possible explanation - we have little information on him but he was evidently deceased by 1873 (MJ 1873, p. 1263). Jones (Western Mail 15 August 1952) suggests that Turner disposed of a 'greater part' of the mine to the Llanfyrnach Silver Lead Mine Co., ie. Lawson and Evans, for £5100 but the source of his information is not clear.
[9] Lawson had withdrawn by 1884 and production returns were then made in the name of Lewis Henry Evans alone (Min. Stats. 1884 on.)
[10] British Geological Survey (BGS), Keyworth, Misc. Mine Data File, L117, copy of report dated 17 May 1883. The progress of work on this shaft can be gauged from the diary of David Williams, a carpenter at the mine, quoted extensively in Thomas, J H. The Diaries of a

Lode workings despite falling lead prices - the mine earned a maximum of £14,577 from lead ore sales in 1880 - although these were supplement in the late 1880s by sales of zinc ores, the price of which was steadily rising.[11]

Despite the discovery of the productive ore bodies worked in the 1880s, prospecting continued with a view to increasing the ore reserves. Crosscuts were driven either side of Water Lode in search of parallel veins. The Chain Shaft and New Lodes were cut in crosscutting from near North Shaft but neither appear to have proved productive. A new shaft was commenced in 1883 - possibly the unnamed shaft 150 metres north of North Shaft - but with no evidence of new discoveries.[12] Older sections of the mine were also re-examined - the report of 1883 recommended new work south of the railway line at Llwyncelyn - resulting in the production of high silver-bearing ores in 1884 and 85.[13]

Deep working of the Water Lode continued to be the mainstay of production into the late 1880s. So when that lode was again lost, due to faulting, it spelt disaster for the mine. After raising near 16,000 tons of lead ore and 764 tons of zinc ore in 32 years of continuous operations the mine finally ceased production in 1890.[14] The cost of draining the mine to a depth of 96 fathoms below adit whilst a long speculative search was made for new ore bodies was clearly beyond the capacity of the lessee. He had apparently requested a reduction in royalties on ore raised - suggesting that some low grade reserves were possibly available to support the search - but this was refused by the landowner. The mine was allowed to flood and the materials sold at auction in May 1891.

1.2.4 The 20th century - the possibility of reopening

Interest in the mine has been revived at various times since closure, particularly during the wars when home ore reserves were at a premium. The strongest interest came in the run up to, during and immediately after the second world war. Mr C. Lakin-Smith, with interests in the Penberry Quarry near St. Davids, entertained ideas of reopening the mine although the government's wartime Non-ferrous Ores Committee did not consider it viable. An application for planning permission with a view to reopening was made to the county council in 1948. However, it is clear that Lakin-Smith was relying on obtaining a licence to work the minerals which were still under government wartime control, and was meeting opposition from the landowners. His plans were abandoned in 1951 after a series of boreholes, sampling the dumps (tailings?), had proved disappointing. Prior to this Cemaes R D C had become involved in the idea of compulsory purchase of the site and subsequently attempted to interest an international mining company in reworking.

Pembrokeshire Man (1876-1905), Journal of the Pembrokeshire Historical Society, No. 4 (1990-91), 9-31 and Clebran, Rhif 235 (Ionawr 1996), 26-7, a Rhif 237 (Chwefror 1996), 26-7. (hereafter referred to as the Williams Diaries)

[11]Mineral Statistics (Min. Stats.) Geological Survey 1848-81 and Home Office 1882-1913, including unpublished abstracts held by the Department of History, University of Exeter.

[12]Williams Diaries 15 Feb. 1883.

[13]BGS L117; Min. Stats.

[14]Min. Stats. - production 1878 to 1890 was valued at £100,474 and the lead ore raised since 1860 had produced a total of 94,751 ozs of silver.

A low level of interest has continued since that time with at least one lease being granted by the landowner. Although the freehold of the mine site is now in local hands the mineral rights were retained by the original landowner, Bronwydd Estates. So reworking of the mine or its tailings dump still remains a possibility. In the meantime Llanfyrnach presents one of the better examples of an undisturbed technologically advanced late 19th mining site.

2. Motive power - haulage and pumping.

Water power was used virtually throughout the life of the mine. It was an essential element of motive power from the 1770s until closure in 1890. Steam power was introduced in the 1850s first to supplement water powered pumps but later providing all power for haulage and pumping.

Through much of the early life of the mine the haulage of ore and waste rock was effected by manual or animal power. For haulage on the deeper shafts horses were harnessed to a 'whim' - a wooden drum, supported on a frame, around which the haulage rope was wound. For the shallow shafts, and underground, a simple windlass would suffice.

The removal of water from the workings was an altogether heavier task. With much of the workings below river level, Llanfyrnach had a justified reputation as a wet mine. Early haulage of water, using buckets, ropes and a windlass, had been supplemented if not replaced by waterwheel powered pumps in the early 1770s. The move to mechanised pumping is marked by the lease, in 1773, of the Nantyweirglodd Corn Mill to the mineral lessees. Not that the lessees were going to use the mill but, by taking water from the river upstream of the mill, they were depriving it of its motive power and rendering it untenable. Shortly afterwards a leat was cut from the river 700 metres upstream to feed a wheel, to power pumps, on the Llandre side of the mines. Water was also drawn from the stream in the valley north of Cefn Ddu, on the Llwyncelyn side of the mine, and used to turn a wheel working the stamps (see Chapter 3).

Whilst there are regular references to the pumping wheel and the stamps in the mine accounts from the late 18th century, we are not sure of their exact location. However, it is almost certain that the pumping wheel was on the same site as that used in the 19th century.[15] The masonry pit for a 40 foot diameter waterwheel still survives immediately west of No.1 Engine Shaft. This was erected in the mid 1840s and was the primary motive power for pumping at Llandre. However, the limitations of water power were evident in summer, when there was often insufficient surface water to develop the power to required to drain the deepest parts of the mine, and in winter, when the surface water froze stopping the wheel completely.[16] Water power was therefore augmented by the steam powered Cornish beam engine, with a 40" diameter cylinder, erected during 1860 in a masonry house at No.1 Engine Shaft.

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[15]Given the route of the leat in the second half of the 19th century, the lack of evidence for a leat at a lower level, and the recommendation in the survey of 1764 for a shaft at or near the site of No.1 Engine Shaft (NLW Bronwydd 1986).

[16]Surface water was subsequently supplement by the construction of a storage dam on the river above Glan Taf to satisfy the demands of the dressing floors.

Water power was also used in the 1840s and early 1850s to drive pumps on the Llwyncelyn side of the mine, in the No.2 Engine Shaft. There a 25 foot diameter wheel, 60 metres south-west of the shaft, was fed with water from the stream north of Cefn Ddu via a leat and aqueduct, and power transmitted to the pumps in the shaft by flat-rods.[17] The problem of a surface water shortage was alleviated to some extent by a storage pond on the stream upstream from the abstraction point. Nevertheless, a portable steam engine, with its boiler in the building adjoining the surviving round chimney 24 metres north-east of the shaft, was in use at No. 2 shaft in the late 1850s. It is clear that the two sections of the mine, either side of the river, were not connected below the 14 fathom level - hence the need for separate pumping arrangements.

As working of the mine was focused on deeper deposits north of the river the need for pumps at Llwyncelyn was sidelined - the portable engine was probably in use elsewhere on the mine but the waterwheel was still in situ, and probably capable of being worked, as late as 1883. Pumps were installed in Chain (No.4) Shaft, to facilitate working below the 22 fathom level, in 1860 as No.1 Engine Shaft was sunk no deeper than that level and, if it were, the length of the drainage levels required to reach the rich ore bodies in the lodes under the hill would be prohibitive both in cost and time required to drive them. The name given to the shaft suggests that the pumps were linked to the engine at No.1 Shaft by a chain.

Haulage was mechanised in the 1850s and 60s with 'drawing machines' attached to the waterwheels on both sides of the river. Such machines comprised a wooden drum, around which the haulage rope or chain was wound, connected to a gear on the wheel by means of a clutch mechanism allowing the drive to be disconnected or reversed as required.[18] Much of the waste rock dumped south of the river was hauled up Chain Shaft by this method.

When North Shaft was sunk in the 1880s new means of pumping and haulage were required, and steam power was the only real option. A large engine house was erected a short distance north-east of the shaft to accommodate a horizontal cylindered winding engine - probably the double 10" engine listed below - used to wind ore and materials on a double skip way in the shaft. Immediately to the south-east of the shaft was a smaller house for another horizontal engine, this one connected to the pumping rods in the shaft. The pumps themselves were set in a number of lifts down to below the 96 fathom level. At the bottom of the shaft was a bucket, or suction lift, pump discharging its water into the cistern for a plunger pump which forced the water up a 'rising main' to discharge into the cistern for the next lift, and so on until the final lift discharged into the adit allowing free drainage to the river.

The final sale[19] of plant shows that there had been considerable investment in the latest technology to increase output and compensate for the falling price of lead. It provides a catalogue of steam power available at closure-

- Several boilers, 28 feet by 6 feet and 18 feet by 5½ feet;
- Cornish engine, 40" cylinder, 8' 6" stroke;

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[17]The route of the leat, commencing 225 metres upstream from Bridgend, may be the same as that used to feed the stamps wheel in the late 18th century.
[18]See Bick, David E. The Old Metal Mines of Mid-Wales, Part 2, 1983, p. 52 for a more detailed explanation of the drawing machine as used in Welsh metal mines.
[19]MJ, 1891, p. 489

- Double 10" winding engine, 2' stroke, with two winding drums;
- Horizontal engine, 10" cylinder, 12" stroke, with pumping gear;
- Winding engine 17" cylinder, 2' stroke, with winding drum;
- Double Robey 12" cylinder engine, with pumping gear;
- Portable engine;
- Locomotive boiler by Robey;
- Blast fan, driven by 6" engine;

But water power still had its place at the mine, as testified by the sale catalogue -

- Turbine;

This turbine was probably used to power machinery on the dressing floors and had been installed 'before 1886'.[20] To provide a sufficient head to drive the turbine water had to be drawn from the Gafel near Rhydau and channelled by culvert under the high ground, through Hermon, to storage ponds on the hill to the west of the mine. From the ponds water was run across the hill to a header tank and into a 12" diameter cast iron feed pipe descending the hill, passing under the spoil from North Shaft, to the lower part of the mine.

3. Ore Preparation

Lead and zinc ores, as mined, required considerable preparation before they could be smelted to produce metallic lead and zinc. The ores seldom occurred in a sufficiently large mass to be mined free of waste material. Waste had to be separated from the metallic ores. Throughout the life of the Llanfyrnach mine, this was achieved using gravity separation methods. These were complex processes and only a basic outline can be given here.[21]

Some sorting was done underground with waste rock sent to abandoned stopes, ie. places where the ore had already been removed, as infill or dumped at surface. Veinstuff - ore intermixed with waste - was brought to surface and trammed to storage hoppers above the dressing floors. The initial process was to break up the veinstuff, using hammers, and manually sort out obvious pieces of waste. With increased mechanisation, veinstuff, heavily mixed with waste, would be sent straight to a stone breaker and then on for further reduction by Cornish rolls or a stamps mill.

The concentration of larger veinstuff was carried out by 'jigging' - where a box with a mesh bottom was filled with veinstuff and moved rapidly up and down in a vat of water. Fine material passed through the mesh and was sent on to the next process. The heavier metallic ores settled at the bottom of the box whilst the lighter waste material accumulated at the top to be skimmed off and sent to the waste dumps. Richer ores at the bottom were removed whilst the middling section was sent for further crushing and re-jigging. At closure there was a double plunger 6 compartment jigger on the mine.[22]

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[20]Lewis, E T. Llanfyrnach Parish Lore, no date, p. 90

[21]For more detail see Burt, Roger. A Short History of British Ore Preparation Techniques in the Eighteenth and Nineteenth Centuries, published by De Archaeologische Pers Nederland, 1982.

[22]MJ, 1891, p. 489

Fine material was treated in the buddle. When passed across the shallow sloping surface of the buddle in a stream of water, the heavier metallic ores settled first whilst the lighter waste was carried away . A set of four round buddles are visible on the 1888 mapping of the mine site.[23] These were fed with material at their centre and a small waterwheel, supplied from the engine leat, powered a set of brushes on each buddle which agitated the material as it passed down the buddle, encouraging the removal of the waste. Where zinc and lead ores were intermixed the buddle was used to separate them, taking advantage of their differing specific gravities.

Once concentrated, the ores were packed in sacks for shipment to the smelter and it was there that metallic lead was refined to extract the silver. The waste material was trammed to dumps at the southern end of the mine. Those barren grey heaps with only a few lead tolerant plants growing on them still contain significant but uneconomic amounts of lead.

In the early years of working the miners themselves were responsible for ore preparation - see Appendix 2 - but, as the scale of operations increased, the work became more specialised and was let as a separate contract at an agreed price per ton of ore prepared fit for smelting. Work on the dressing floors was largely carried out by women and boys. However it was a skilled process and not unusual for men to follow it as a career, rising to a supervisory position.

With few of them being paid daily wages, control of workers on the dressing floors could be difficult. They would absent themselves during periods of heavy rain, being unwilling to work all day in their wet clothes. The floors were not, in the 1860s, covered by any form of roofing but mapping of the late 1880s suggests that a part of the floors had been protected from the elements.[24]

4. Mining and the community.

The tributers employed at the mine in 1752 were described as being 'of Llanfyrnach' so they were probably then regarded as local men, but where had they acquired their mining skills? Whether they were immigrants into the area who had been assimilated into the population or local men who had acquired their skills through prolonged familiarity with the mines, they are an indication that lead had been worked at Llanfyrnach for some time and was already bringing money into this and the adjoining parishes. By 1783 up to nine working partnerships were being paid subsistence, the largest of which might receive in the order of £40 in a three month period.

With increased mechanisation, particularly in haulage, the miners were expected to work regular hours. In the 1870s a three shift system was in use with work commencing at 6 am, 2 pm, and 10 pm.[25] In some mining fields this met with resistance from miners who were used to integrating their work underground with that on small agricultural holdings. At

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[23]Ordnance Survey (OS) 25 inch map, 1st edn., surveyed 1888, Carmarthenshire Sheet XXI:11.
[24]MJ 1860, p. 22; OS 25 inch, Carmarthenshire Sheet XXI:11 op cit.
[25]MJ 1873, p.655.

Llanfyrnach there is no record of unrest although a number of miners are known to have followed dual occupations in agriculture.[26]

There had been an influx of Cornish miners in the mid 1840s. This suggests that mining skills had been lost since the mines closed in the late 18th century. Although a number of 'old miners' were recorded they had no doubt found other employment in agriculture or quarrying during the intervening period.[27] Some of the Cornish remained but many moved on in the uncertain years of the early 1850s to be replaced by men from the mid Wales mines. Gradually, as the mine developed in the 1860s, more local men took up employment and acquired the skills required in mining. By 1871 the majority of those employed at Llanfyrnach were born locally.[28]

With the downturn in production in the mid to late 1870s lack of work forced miners to move away. Many left their families behind and returned when the new ore deposits were opened up in 1878. Others stayed away, finding work in the South Wales coalfield where the new steam coal collieries were opening up in the southern valleys. Some took their families with them, finding work on other metal mines or in the coalfield, to return again when employment prospects at Llanfyrnach improved. In 1890 the move to find work in the coalfield was repeated. This time there was little prospect of employment in other metal mines and no chance of a return to mining at Llanfyrnach. Some men will have found work in agriculture. Others, like John Davies - fitter and engine driver at the mine who set up as a coal and lime merchant - found alternative employment but most moved away leaving a community largely populated by women and children.[29]

Most miners lived in the scattered tenements of the surrounding parishes - some as far away as Castellan - with a concentration in the settlement of Hermon to the west of the mine. In the mid 1860s Thomas Turner was instrumental in providing dedicated housing for the mine when Brick Row was built on the Llwyncelyn side immediately opposite the mine office which also served as the mine agent or captain's residence. Brick Row is unusual, if not unique, for metal mine worker's housing in Wales, being a block of twelve back to back houses, and owes its design to Turner's Wolverhampton origins. The bricks may have come from Cardigan but the iron window frames were probably imported from the English Midlands. On Turner's departure ownership of the Row would have passed to the landowner. One of the houses acted as a Post Office and, with the arrival of the railway, the residents were increasingly employed in areas outside mining.

On the mine the only other worker's housing was the Storehouse, adjacent to No.2 Shaft - its name suggests it was originally a store in the 18th century but it was in use as a habitation

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[26]Typical was Rees Davies at Bwlch Stop in 1871, lead miner and farmer of 15 acres (Census Returns, Llanfyrnach parish, 1871)

[27]NLW, Druid Inn Bundle 56, report dated 1842.

[28]Home Office census returns for Llanfyrnach and surrounding parishes.

[29]The basic evidence for the employment pattern is in the Census Returns (op cit.), where the movement of miners can often be traced through the birth places of their children. The Williams Diaries (op cit.) have provided much additional evidence but study would benefit markedly from an analysis of material collected in local family histories. John Davies was the father of Mansel Davies, and the coal and lime merchant became the haulage firm of that name - now probably the largest employer in the area and a worthy successor to the mine.

from at least 1841 until the mine closed. In the early 1880s Lewis Evans - the son of the lessee - lived with the mine captain, Edward Rees, and acted as manager. He subsequently married Anna Sandbrook and built the large house Celynen, later Garregwen, immediately east of the railway and road.[30]

5. Further investigation - the way forward

5.1 Mining Archaeology - understanding what remains on the site.

The Llanfyrnach Mine site is relatively undisturbed - with no reworking of spoil or tailings - and is one of the better examples of a late 19th century silver-lead mine in South Wales. Although in a ruinous state it displays a wide range of 19th century mining and dressing technology underlying which will be evidence of 18th century working. The main features of the site are listed at Appendix 3 below.

There are, however, many aspects of the site which are unclear. Of the seven steam engines listed in the final sale catalogue (Section 2 above) only the sites of four are known, and even then we are not certain which of the winding engines resided in the house at North Shaft although it was most likely the double 10". Chain Shaft presents us with an interesting palimpsest of features covering over 30 years of mining operations involving all aspects of motive power. Only with careful investigation will it be unravelled.

Another feature which currently remains a mystery is the flue, leading from the area immediately west of the engine house at No.1 Engine Shaft and terminating in a chimney on the hillside to the west. It passes under a building - Appendix 3, 13 below - which may have been used as a miners dry but that in itself would not justify such a long flue commencing some distance below the building.

Beyond investigating the outlying prospecting adits, there has been no underground exploration at Llanfyrnach in at least 50 years. The one opportunity in recent years - when a shaft opened up 45 metres north of No.2 Shaft , revealing the Llwyncelyn adit level - was lost when the shaft was immediately filled. There is some doubt as to whether the Llandre section can ever be successfully explored at adit level. The main drainage adit itself is evidently blocked, with water standing in No.1 Engine Shaft to its collar and flooding the adjoining wheel pit, and a release of that water into the Taf would have severe environmental penalties.

A full archaeological survey of the mine site would be welcome but is unlikely without external funding. Some environmental work will eventually be required to minimise the leaching of lead, and zinc, into the river from the tailings. A survey and limited investigation in advance of that work would bring benefits but on the whole the result would be archaeologically negative as the physical evidence for mining and ore preparation would be destroyed in the process.

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[30]Married 29 April 1882 (pers. comm. Dr J H Thomas, 28/11/1996). Anna died in childbirth in Dec. 1884 and is buried in Capel Llwyn yr hwrdd, Tegryn. Lewis Evans subsequently moved to the Mysore Gold Mines in India (PRO BT31/2850/15685).

5.2 Mining and social history

In the short term our best chance of advanced understanding of mining operations and particularly their social effect is through further archival research. Information on the impact of mining on the community might be gained through locally held collections of memorabilia and photographs - there are no known photographs of the mine in operation and only two from the period immediately after closure. Oral accounts, passed down from previous generations with first hand knowledge of mining, can also play an important role. The Williams Diaries have already illustrated how useful such collections can be, particularly for the later period when the mine was in private hands and little information was in the public domain.

It is surprising how little we know about the lessees of the mine during its later years of operation. This is a line of enquiry which might be followed up to good effect in both Wolverhampton and London - the last lessee, L. H. Evans, was a stockbroker with offices in the City. There is also at least one collection of un-catalogued papers - W. Evans George, solicitors, of Newcastle Emlyn, who acted for the last lessee - in the Carmarthenshire Record Office which might yield further information.

For those with an interest in further investigations into mining at Llanfyrnach a list of resources is provided at Appendix 4.

Appendix 1.

Mineral Ownership.

A right of prerogative over silver-bearing ores was first exercised by the English Crown in the mid 13th century, prior to that date ownership of all minerals including silver had resided with the lord of the soil. Welsh law makes no mention of mineral rights but, if a parallel can be drawn with the position in Ireland during the medieval period, silver mines were probably regarded as private property. The English Crown exercised its right of prerogative in those parts of Wales under its control but it was not applied in full until the Act of 1534 extended the rule of English law to the whole of Wales. A challenge in 1564 upheld the Crown's right to all ores bearing precious metals. It was not until the Mines Royal Acts of 1689 and 1693 that Crown prerogative was removed from all minerals excluding precious metals found in their free state, ie. not combined with other ores. Thereafter the mineral rights at mines like Llanfyrnach again resided with the owner of the soil except where they were specifically reserved in the sale of the freehold.

Appendix 2.

Employment and working practices.

The nature of mineral deposits and the methods by which they were worked made close supervision at the work-face, the point of extraction, difficult. To counter this miners were generally employed on a form of subcontract - usually referred to as 'tribute', when the contract was between the miner and the mineral owner, or, when mines were taken on lease and operations organised by mining companies, as the 'bargain' system.[31]

Tribute agreements usually ran for periods of up to one year where the miner or group of miners contracted to work a section of mineralised ground in return for either a portion of the ore raised or, as in case of the agreement at Llanfyrnach in 1752, a fixed sum for each measure of ore raised. Whichever was the case the ore had to be prepared fit for smelting and a monetary allowance could be given for working in dead, ie. barren, ground.

The agreement of 1752 was therefore fairly typical when it recited -

> *That James Lloyd hath and doth hereby agree to sett at work for the term of three months from the date hereof unto the said Samuel Jones, Benjamin Jones and Jenkin Jones the work on the west-south-west side of the minework now at work upon the lands called Llandre, in the said parish of Llanvyrnach, and will permit the said Samuel Jones, Benjamin Jones and Jenkin Jones to enter upon the said work and to work the same for the term aforesaid, And the said James Lloyd, his heirs ...., paying unto the said Samuel Jones, Benjamin Jones and Jenkin Jones the sum of fifty shillings a fathom for every fathom they shall sink, digg and cutt and five and forty shillings a ton for every ton of oar that they the said Samuel Jones, Benjamin Jones and Jenkin Jones shall land out of the said work exclusive of the said fifty shillings herein agreed to be paid to them by the said James Lloyd for every fathom they shall cut, sink or digg as aforesaid, And the said James Lloyd doth promise and agree to pay unto the said Samuel Jones, Benjamin Jones and Jenkin Jones, and those concerned as workmen under them, the sum of four shillings a week apiece till the said term of three months is expired for their subsidence and the remainder thereof the said James Lloyd doth promise to pay at the expiration of the said term unto the said Samuel Jones, Benjamin Jones and Jenkin Jones, And the said James Lloyd is to find them all the necessary implements for working, draining, landing, cleaning and washing of the said oar other than and except candles and gunpowder which is to be found and provided by the said Samuel Jones, Benjamin Jones and Jenkin Jones at their own expense, And the said Samuel Jones, Benjamin Jones and Jenkin Jones do promise and agree to deliver unto the said James Lloyd the said oar to be by them raised and landed out of the said work clean, well washed, merchantable and fitt for market and that they*

[31] Even in the 19th century some mining fields in England, eg. certain areas of the Derbyshire Peak District, continued to operate according to custom based on early medieval practice. That gave miners the right to work where they wished provided they registered their claim and paid over a portion of the ore raised to the mineral lord. Such custom was used in parts of north-east Wales but had fallen into disuse by the early modern period.

> *will at the end of the said term yield up and quit the said work together with all the implements that do or shall belong and appertain to the said James Lloyd during the term aforesaid in good and workman-like order - wear and tear only excepted - unto the said James Lloyd.*[32]

The payment of 'subsistence' was a standard feature of this type of tribute agreement as it was of later bargain agreements between miners and mining companies. Its payment ensured the miners had sufficient to live on pending settlement of the full account at the end of the agreement.

Once the mineral lord had ceased to take a direct interest in the working of mines on his land, and had leased them out to mining companies or partnerships, the agreement with the miners took on a different form. The company, through its agent - the mine captain - exercised tighter control over the working of the mine. Under the 'bargain system' miners were allocated specific pitches to be worked at the lowest rate that could be agreed - re-let on a monthly basis.

On a typical setting of workplaces at Llanfyrnach in 1860 T. Pascoe, the agent, reported that -

> *Yesterday being our pay and setting day, the following is an account of bargains set for the month of March:- No. 1 stope, on Gardner's lode, by four men at £2 10s. per fathom, No. 2 stope by six men at £2 10s. per fathom; the lode in these stopes will yield fully 12 cwts of lead ore per fathom. .... An end to drive by four men, on Turner's lode, south of the said shaft (No. 2) at £4 per fathom. ....*

And so the list continued for all the productive, or potentially productive, parts of the mine. There were parts of the mine which did not, in the eyes of the agent, justify the settings of bargains. Those areas were set on tribute - paying the miners for the ore they raised -

> *A pitch in the back of the 14, on Llanfyrnach lode, south of No.1 shaft, by two men at £7 10s per ton. A pitch between the 14 and 22, north of the said shaft, by four men at £6 per ton. Also a pitch in north end of old winze, below adit level, by two men at £7 10s. per ton.*

The amount paid reflects the amount of work required to raise the ore.

Few miners employed on extractive work were paid daily wages. That was restricted to some workers employed on the dressing floors, the engine drivers, shaftmen, carpenters and smiths.

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[32]NLW. Bronwydd 3738.

Appendix 3

Archaeological features connected with Llanfyrnach Mine

1. 18th century shallow shaft workings along outcrop of two veins on hillside to west of the river (NGR 22273168 to 22473174) remain undisturbed. Other 18th century workings to the east covered by 19th century operations comprising three engine / winding shafts, various minor shafts and two adits all now filled or collapsed.

2. Boiler house (ruin) with round chimney (intact) at No.2 Engine Shaft (NGR 22543148), circa 1850.

3. Cornish style beam pumping engine house (ruin), originally housing a 40" cylinder engine, erected in 1860 (NGR 22483165); adjacent to No.1 Engine Shaft.

4. Waterwheel pit (intact), pumping and winding, (NGR 22473166) adjacent to No.1 Engine Shaft.

5. Pumping and winding engine sheds (foundations only) adjacent to North Shaft (NGR 22383186).

6. Masonry lined pit for drawing machine circa 1860 (intact) adjoining Chain Shaft (NGR 22433169).

7. Ore hoppers and loading platform (substantial walling and support columns remaining) adjacent to North Shaft (NGR 22363185).

8. Tramway system (earthworks only) from North Shaft to spoil heaps and dressing floor; from Chain Shaft to spoil heaps east of river; and from dressing floors to tailing heaps.

9. Dressing floors (central point NGR 22483169) including ore hoppers (ruin); four round buddles with associated waterwheel pit and settling tanks (earthworks); dressing waste heaps.

10. Spoil heaps, comprising extensive heaps from North Shaft on western hillside, 1880s; and from Chain Shaft on the east side of the river, 1860 - 70, all displaying indications of temporary tramway system.

11. Tailings heaps, with earlier heaps around dressing floor and extensive later heaps at southern end of site.

12. Leat system - comprising leat from stream to south east of site feeding pumping waterwheel to west of, and connected with, No.2 Engine Shaft, probably of 18th century origin (feeding stamps mill), with later compensation dam at NGR 229308 (earthworks); engine leat from Afon Taf to area of No.1 Engine Shaft, plus compensation dam two miles upstream at NGR 198331 (substantial earthworks); and late 19th century turbine feed, leat system originating near Bwlch Stop to the west of Hermon with storage ponds