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JISC



## THE LEAD MINES OF THE ALYN VALLEY

By C. J. WILLIAMS

The river Alyn, after rising a few miles south of Llandegla, flows in a northerly direction to Loggerheads, on the boundary of the former counties of Denbigh and Flint. Here it enters a narrow valley with steep limestone cliffs on its eastern side. Near Cilcain the river turns across the limestone outcrop and flows through a gorge to Rhydymwyn, and again turns sharply to follow a south-eastward course to Mold. Between Loggerheads and Rhydymwyn, in the Carboniferous Limestone on the eastern side of the river in the manor and parish of Mold, are some half dozen major mineral veins, running roughly from west to east, from which great quantities of lead ore have been extracted over the last three centuries.

From the late seventeenth century onwards, travellers have commented on the fact that downstream of Loggerheads the bed of the river is dry during the summer months,<sup>1</sup> for the limestone is extensively fractured and water sinks through a series of swallow-holes into a cave system. This feature was to affect mining operations crucially, because of the problems the miners encountered in pumping water from their workings. Despite the use of steam pumping engines from the early eighteenth century, these water problems were finally solved only in the present century when two deep drainage levels were driven into the area, resulting in the lowering of the water level in the mines by some four hundred feet.<sup>2</sup>

Published work on the area has concentrated on its geology and the technical aspects of mining. During the First World War the urgent need for minerals led to the Flintshire and Denbighshire orefield, in common with other mining areas, being surveyed to assess its potential, and this work was published after the war by the Geological Survey. The volume on Flintshire and Denbighshire, by Bernard Smith, describes the geology and mine workings of the Mold area in some detail.<sup>3</sup> It draws on much information gleaned from the local mining industry, which would

<sup>1</sup> In the 1690s Edward Lhuyd noted that the river flowed underground for between three quarters of a mile and a mile to emerge at Hesp Alyn (SJ 192655) (R. H. Morris (ed.), *Parochialia*, i (1909), 92).

<sup>2</sup> P. J. Appleton, 'Subterranean Courses of the River Alyn, including Ogof Hesp Alyn, North Wales', *Trans. British Cave Research Association*, i (1974), 29-42.

<sup>3</sup> B. Smith, 'Lead and Zinc Ores in the Carboniferous Rocks of North Wales', *Special Reports on the Mineral Resources of Great Britain*, xix (1921), 80-92. Mines in the Cathole area are also described in J. R. Earp, 'Mineral Veins of the Minera-Maeshafn District of North Wales', *Bulletin of the Geological Survey of Great Britain*, xiv (1958), 44-69.

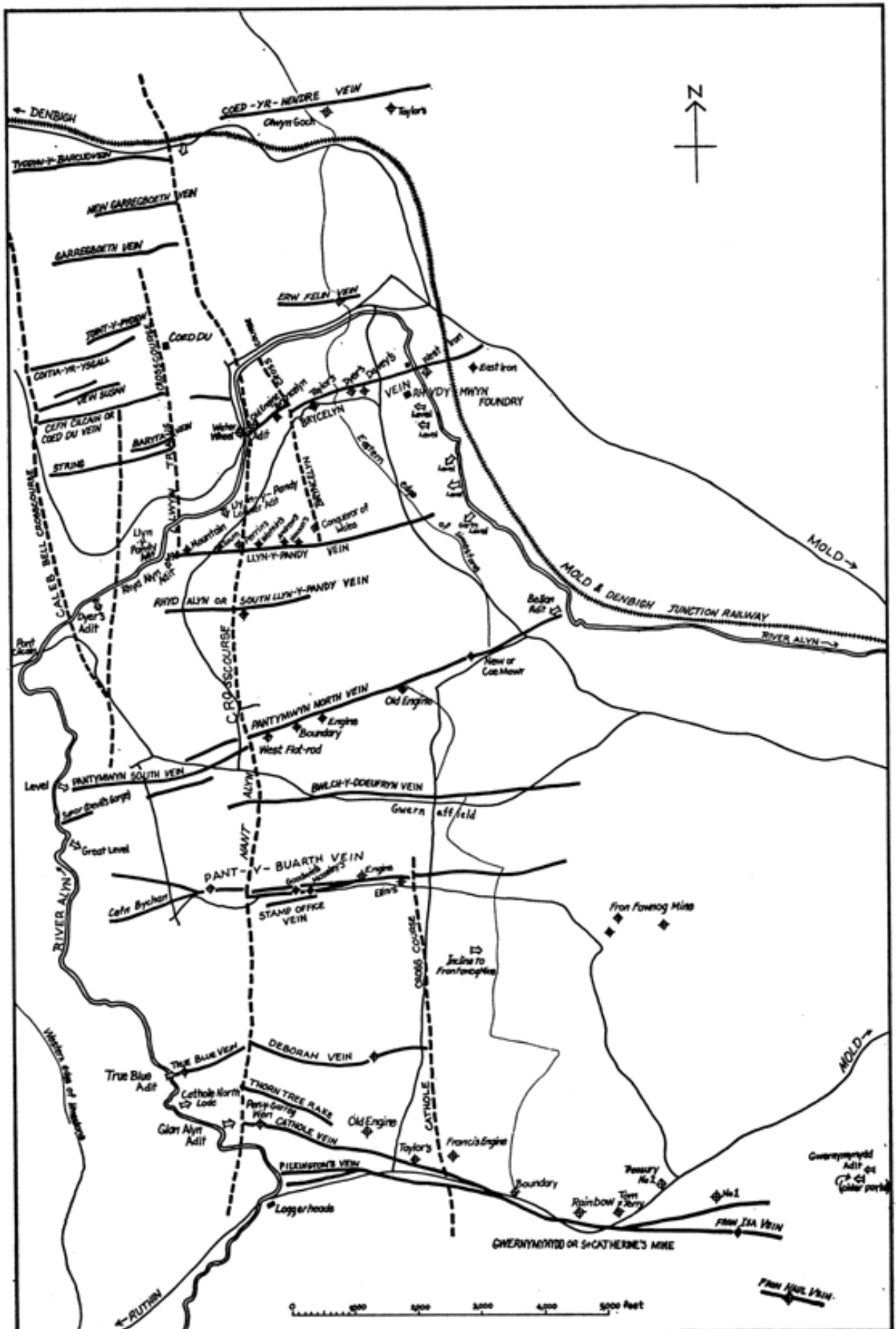


FIG. 1. The lead mines of the Alyn valley.

otherwise have been lost, but apart from its use of the official statistics of mineral production, available from 1845 onwards, its historical content is slight. The present account attempts to complement the available published work by concentrating on the historical aspects of mining, especially in the eighteenth and nineteenth centuries.

*The Manor of Mold; Mineral Ownership*

The manor of Mold, together with the neighbouring manors of Hope and Hawarden, was the property of the Earls of Derby up to the Civil War, Hawarden and Mold being granted by Henry VI to Sir Thomas Stanley, father of the first earl, in 1443.<sup>4</sup> James, 7th Earl of Derby, was prominent in his support of the royalist cause during the Civil War; he was executed at Bolton in 1651, and his estates confiscated by Parliament. His son Charles, the 8th earl, attempted to recover his father's Flintshire estates with the assistance of three Parliamentary supporters, Sir John Trevor of Plas Teg, Colonel George Twisleton and Captain Andrew Ellis. Originally it was intended that Ellis should purchase all three manors in trust for the earl, but it seems that the latter was unable to pay the agreed purchase price. Consequently, in 1653-4, the manor of Hawarden was conveyed to Sir John Glynne, and Hope and Mold to Sir John Trevor, Twisleton and Ellis.<sup>5</sup> The three entered into an agreement in 1657, under which Sir John Trevor was to divide the lordships of Hope and Mold into three parts; Twisleton and Ellis would then, at the Red Lion Inn, Wrexham, on 20 August 1657, draw lots to decide who should have the first and who the second choice of the parts so divided. Ellis won the first choice, and chose the manor of Mold (i.e. the manorial rights and privileges) and certain lands in Mold; Twisleton took other lands in Mold, while to Sir John Trevor fell the manor of Hope and remaining lands in Mold. Formal conveyances of these lands were executed in January 1657/8. With the Restoration in 1660, and the return of the Earls of Derby to a position of influence, the family attempted to regain the lost manors. Eventually, in 1682, Hope was recovered, but proceedings to regain Mold and Hawarden were only abandoned in about 1690.

Andrew Ellis's share of Mold, including the manor itself, passed by 1673 to Sir Richard Langley, and by the will of Andrew Langley of Jamaica in 1710 it was left to his nephew, Anthony Swymmer, who died in Jamaica in 1729.<sup>6</sup> His son, Anthony Langley Swymmer, by his will in 1759, entailed it on his nephew, Sir Thomas Champneys, and Sir Thomas's son, Thomas Swymmer Champneys.

<sup>4</sup> This paragraph, and the following one, is based on Henry Taylor, 'The Lords of Mold', *Flints. Hist. Soc. Jnl.*, vi (1917), 37-62, itself drawn largely from the work of W. T. Parkins in the *Cheshire Sheaf*, ii (1880), 92-124 *passim*. The grant of 1443 refers to coal mines, but not lead.

<sup>5</sup> Francis Green (ed.), *Calendar of Hawarden Deeds* (N.L.W., 1931), nos. 331, 335, 337, 341, 346.

<sup>6</sup> Clwyd Record Office (C.R.O.), D/KK/745, rental of manor of Mold, 1673-6; D/KK/294/1(4), f.4, papers concerning case *Grosvenor v. Vincent*.

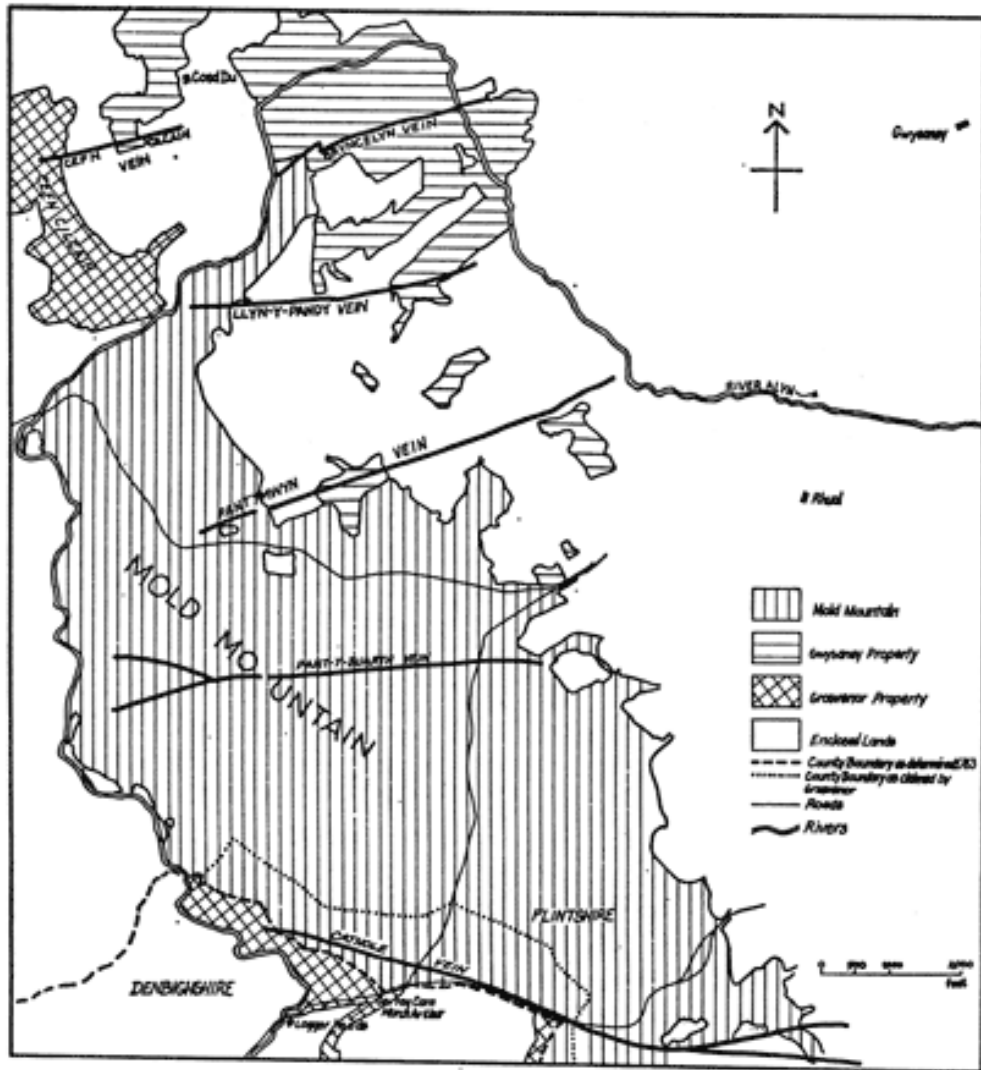


FIG. 2. Mineral ownership in the Mold area.

The trustees of the latter sold it by auction in 1801, and it was purchased by Sir Thomas Mostyn in 1809.<sup>7</sup> The mineral rights of the manor had been equally divided between the three purchasers in the 1650s. In 1737 they were owned by John Trevor of Glynde in Sussex (the main seat of the Trevor family after 1679), Edward Lloyd of Tyddyn (successor to Twisleton's share), and to Anthony Langley Swymmer, then an infant.<sup>8</sup> In time these shares were further divided, the owners being known collectively as the Lords of Mold.

To the south-west, across the county boundary in Denbighshire, the mineral rights of the lordship of Bromfield and Yale had belonged to the Grosvenors of Eaton Hall in Cheshire since 1601.<sup>9</sup> The third dominant mineral owner in the Mold area was the Davies (later Davies-Cooke) family of Gwysaney, who held a large tract of land, including the whole of the Bryncelyn Vein, enclosed by the loop in the course of the river Alyn near Rhydymwyn.

### *Mining in the Seventeenth Century*

The lead mines of Flintshire were probably worked on only a small scale in the early seventeenth century; it was only after the Restoration, in the 1660s, that large-scale mining commenced.<sup>10</sup> In 1601 the Grosvenors had purchased a lead-smelting mill built several years before at Mold, where it is remembered in the place-name Leadmill. It was worked up to 1690, with a gap during the Civil War and Commonwealth period from 1641 to 1659. Ore came mostly from the Grosvenors' mines on Halkyn Mountain, but also from Llanferres, Llanarmon and other places including, in 1675, Cilcain. Output was almost doubled after the building of a second mill in 1661. By 1665 the annual output of the Halkyn mines had risen to about 1,000 tons.<sup>11</sup>

In 1640 Evan Edwards of Rhual, near Mold, in partnership with John Eyton of Leeswood, leased mines of coal and lead in Hawarden, Hope and Mold for three years from Robert Coytmore of Westminster.<sup>12</sup> (Coytmore, a Caernarvonshire man, was secretary to the Earl of Warwick, who commanded the Parliamentary fleet in the Civil War.) It seems that Coytmore himself was a lessee of the mines;

<sup>7</sup> A. G. Veysey, *Guide to the Flintshire Record Office* (1974), 100; C.R.O. D/KK/269, sale catalogue of manor of Mold, 1801.

<sup>8</sup> Act to enable the guardians of Anthony Langley Swymmer . . . to join in making leases of certain mines in the county of Flint . . . , 10 Geo. II, c. 22, 1737 (copies in C.R.O., D/KK/274, D/HE/267).

<sup>9</sup> These mineral rights were acquired outright by the Grosvenor family in 1634; previously they were held on short-term grants.

<sup>10</sup> W. J. Lewis, *Lead Mining in Wales* (1967), 59-60.

<sup>11</sup> J. N. Rhodes, 'The London Lead Company in North Wales, 1693-1792' (University of Leicester Ph.D. thesis 1970), 26; idem, 'The Lead Mills at Mold', *ante*, xxv (1971-2), 21-30; C.R.O. D/E/722.

<sup>12</sup> B. E. Howells, *Calendar of Letters relating to North Wales* (1967), 27, quoting N.L.W., Rhual MS. 304. The lease was for three years, not lives as quoted by Howells.

in 1651 he petitioned the Committee for Compounding Royalists' Estates for a renewal of his lease, complaining that the profits had been in the enemy's hands for five years, and his pits and works destroyed by them. He had purchased the mines in 1657,<sup>13</sup> but they probably remained inactive until after the Restoration. A detailed survey of the manor of Mold in 1651<sup>14</sup> makes no mention of mines, and a rental of Ellis's part of the manor in 1657<sup>15</sup> enters 'lead mines' under 'small rents', but records that no payment for them had been made. In 1660 there is a suggestion of a revival of mining on the Rhual estate, with Evan Edwards writing to Ralph Hughes of Dyserth for advice on mining matters. Hughes replied that he had heard that Edwards's ore was fit to be considered potter's ore, which sold for £7 and upwards, and remarked that for smitham (very small particles of ore) Edwards was 'near the mill', possibly a reference to the Grosvenor smelting-mill at Mold.<sup>16</sup> Twelve years later, in October 1672, Jasper Peck, the steward of Sir John Trevor, wrote that his master was 'altogether against the disclosing and opening the [lead] mines until the spring'. Peck gave details of the terms proposed for the working of the mines by a Major Evatt.<sup>17</sup> Evatt was to pay a royalty of 30s. a ton: '. . . he alledged he can give no better rate seeing he pays his miners £2 16s. 6d. for getting every ton, the rock being so very hard, but saith that if hereafter he can bring his workmen to forty shillings a ton or near it he will advance to the partners [i.e. the Lords of Mold] 3s. 4d. a ton more . . .' Nothing had come of the proposals by October of the following year, when Peck wrote repeating Evatt's terms and requesting consideration of them.<sup>18</sup>

#### *The Loggerheads Area: Early Eighteenth Century*

Some light on the development of mining near Loggerheads is shed by papers relating to a series of lawsuits, culminating in 1752-63, between the Grosvenor family and the Lords of Mold.<sup>19</sup> The Grosvenors owned the mineral rights of the lordship of Bromfield and Yale, including the area immediately around the

<sup>13</sup> M. A. E. Green (ed.), *Calendar of the Proceedings of the Committee for Compounding* (1890), 1113.

<sup>14</sup> C.R.O. D/KK/263.

<sup>15</sup> C.R.O. D/KK/265.

<sup>16</sup> Howells, *op. cit.*, 239. Potter's ore, suitable for making glaze, was round ore — the biggest and best pieces of ore, unmixed with stone or dirt.

<sup>17</sup> Major Edward Evatt, who in 1667 took out a lease from Twisleton, Trevor and Ellis of coal mines in the manor of Mold (C.R.O. D/G/2713); a royalist, who had served under the Duke of Ormonde in Ireland, he settled at Kelsterton c. 1650, and was also involved in coal mining at Shotton (W. Bell Jones, 'History of the Parish of Hawarden' (typescript in Clwyd Record Office), i (1943), 133-4, 149).

<sup>18</sup> C.R.O. D/G/3277, letters dated 2 October 1672, 16 October 1673 (spelling modernized).

<sup>19</sup> These survive in great profusion, especially in the papers of the Lords of Mold among the Keene & Kelly MSS. in the Clwyd Record Office, and in the Wigfair MSS. in the National Library of Wales.

village of Loggerheads, which seems to have taken its name from the disputes over the mines nearby.<sup>20</sup> The western part of the parish of Mold, along the river Alyn, was then unenclosed waste land (known as Mold Mountain) which adjoined, at Cathole, the waste of the Denbighshire parish of Llanferres. The boundary was not clearly defined, a matter of little moment when only waste land could be disputed, but of importance once mining began in a serious way in the early eighteenth century, and royalties became payable to the mineral owners.

During the disputes one aged witness, Robert Edwards, described the area (probably referring to the 1690s) as having 'ancient remains of two leadworks, the one called Twn Rake and the other y Rake Vechan and . . . some old persons used to pick up some pieces of lead there to sell to the potters without asking leave of any person.'<sup>21</sup> Mining here seems to have revived in the early years of the eighteenth century. In 1706 the Lords of Mold leased lead mines in the waste of the manor for thirty-one years to Daniel Peck, a Chester merchant who was mineral agent to the Mostyn family. He owned three smelting-mills on the Dee estuary, but was bankrupted by the development of the coal-fired cupola at Gadlys by the London Lead Company.<sup>22</sup> In 1718 Peck's mines were taken over by a group of four men, known as the Derbyshire Company. It seems that this was done on the authority of the sheriff, following Peck's bankruptcy, without a formal assignment of the lease.<sup>23</sup> The shareholders included a member of the Derbyshire Thornhill family, and two Chester men, Jonathan Robinson and James Comberbach. Accounts of ore weighed by this company in 1719-38 (the full term of the lease granted to Peck in 1706, with one year more to 'clear the banks') show that most of their ore came from the Pant-y-buarth Mine.<sup>24</sup>

At about the same time as Peck's lease was assigned to the Derbyshire Company, the Lords of Mold granted a takenote (a short-term grant) of Thorntree Rake near Loggerheads to William Brock, another Chester man, and the bailiff of the manor of Mold, Henry Roberts, known as Harry the Bailiff.<sup>25</sup> Among the miners

<sup>20</sup> The name Loggerheads is recorded on Thomas Badeslade's map of Coleshill and Rhuddlan, 1738 (C.R.O. D/GR/1679). 'Logger' was a dialect word for a block of wood for hobbling a horse, being applied to quarrelsome persons from the notion of trying whose head was harder (O.E.D.). The inn-sign consisting of the inscription 'We three Loggerheads' under two wooden heads is not confined to the inn at Loggerheads itself, where the sign is held by tradition to have been painted by the artist Richard Wilson. The third loggerhead, of course, was the person looking at the sign!

<sup>21</sup> C.R.O. D/KK/294/1(2).

<sup>22</sup> C.R.O. D/KK/743; D/HE/266; Lewis, *op. cit.*, 123-4, 141.

<sup>23</sup> C.R.O. D/HE/266.

<sup>24</sup> National Library of Wales (N.L.W.) MS. 12491.

<sup>25</sup> N.L.W., Wigfair MS. 3371. Brock had married the daughter of Thomas Williams of Broncoed, agent of the Lords of Mold (*ibid.*); he was described as of Broncoed in 1704, when he served as a churchwarden of Mold (C.R.O. D/KK/120-121), and was collecting the rents of Edward Lloyd's part of the manor of Mold by 1712 (C.R.O. D/KK/665-666). Thorntree Rake was at the west end of what was to be known as the Cathole Vein.



who worked on bargains for them at Thorntree Rake were twin brothers, John and David Jones. These two men, usually referred to as the Red Lads, also worked under the Grosvenors on the Denbighshire side of the boundary. In the middle or late 1720s they started to work at the eastward continuation of Thorntree Rake, but were warned off by Benjamin Perrin, a member of a Flint lead-smelting family with interests in the area.<sup>26</sup> Sir Richard Grosvenor granted him, with George (later Sir George) Wynne of Leeswood and others, a lease of mines on Pen-y-garreg wen, the cliff overlooking Loggerheads, in 1726.<sup>27</sup>

The fact that the lordship of Mold was divided into three parts, one of which was owned by the Langley family, who were financially embarrassed and living in Jamaica, probably encouraged Sir Richard Grosvenor to stray over the county boundary. In 1723 he leased to Thomas Pilkington of Ashby de la Zouch mines which straddled the boundary on what was to be known as Pilkington's Vein.<sup>28</sup> In 1733 two of the Lords of Mold, Edward Lloyd and John Trevor, exhibited a bill of complaint in Chancery, claiming that Pilkington had encroached onto their land. An answer was put in by Sir Richard's brother, Sir Robert Grosvenor, but no proceedings ensued, and the Grosvenors continued to lease land for mining on the Flintshire side of the boundary as well as in Denbighshire, where of course their title was clear.<sup>29</sup> In 1737 Sir Robert Grosvenor granted a new lease to Benjamin Perrin, who had taken a one-sixth share in the now insolvent Derbyshire Company following the death of Jonathan Robinson in 1735.<sup>30</sup> The lease covered what was previously known as the east end of Thorntree Rake, but since Perrin had found a cat in an old shaft there he gave it the name Cathole.<sup>31</sup>

From evidence given in the lawsuits of 1752-63 it is clear that the Grosvenors and their lessees were ready to exploit any weakness on the part of the Lords of Mold. One witness, Ann Tattum, recalled in the early 1760s a conversation with Benjamin Perrin some twelve years before, when he was working the Cathole Mine. She warned him that rumour had it that the owner of the manor was 'coming into the country to look after his concerns'. Perrin dismissed this as 'only a report'; the lord of the manor and his family had got into debt, and had gone to Jamaica and then to France. Ann Tattum said she imagined that Perrin intended then 'to take all to yourself', and he replied, 'No, you shall have some, don't you and your family get good work under me?' adding that 'if the company would not be very quiet the Grosvenors would take Pantymwyn & all!'<sup>32</sup> (The Pantymwyn Mine was over a mile into Flintshire from the county boundary.)

<sup>26</sup> N.L.W., Wigfair MS. 3371.

<sup>27</sup> C.R.O. D/GR/33. Perrin also worked mines on the Gwysaney estate; a lease was granted to him of lead mines in Hendrebiffa, Mold, in 1737 (U.C.N.W., Gwysaney MS. 568).

<sup>28</sup> C.R.O. D/GR/32.

<sup>29</sup> C.R.O. D/KK/294/1(1); British Library, Add. MS. 36198, f. 197.

<sup>30</sup> C.R.O. D/GR/35; D/KK/294/5(6).

<sup>31</sup> C.R.O. D/KK/294/2; the name was changed to Cadole in the 1950s.

<sup>32</sup> N.L.W., Wigfair MS. 3371.

Another less than scrupulous person to appear on the scene was Edward Cheney; known as 'Lord Cheney', he lived at Loggerheads and at Colomendy. He was the son of Thomas Cheney, a Derbyshire man who had charge of the Grosvenors' mines on Halkyn Mountain in the 1690s, and who gave his name to one of the richest veins on the mountain, Cheney's Rake.<sup>33</sup> Edward Cheney began mining in the late 1720s opposite Tŷ Draw, a house at Cathole near the junction of the Mold to Ruthin road and the side-road to Gwernaffield. He worked downhill in a westerly direction, and took over the mines leased by Sir Robert Grosvenor to Thomas Pilkington in 1723. Cheney claimed that Pilkington's mines were in Mold, and that he (Cheney) had a lease from the Lords of Mold of mines on that part of Mold Mountain not granted to the Derbyshire Company. Two Denbighshire justices were approached, but declined to intervene, declaring the mines to be in Flintshire. On the same day Cheney had Pilkington's working shaft thrown in, and carried on working under the Lords of Mold.<sup>34</sup>

The Grosvenor family made at least two attempts to recover these mines. About 1734-5 Cheney had ore from a pit adjoining Pilkington's mines carried to the river Alyn near Llanferres bridge to be washed. When this had been done, two men, presumably in the pay of the Grosvenors, had it carried to the smelting-house at Bagillt of Robert Pigot, Sir Robert Grosvenor's agent. Cheney took legal action, had the two men imprisoned in Ruthin gaol, and recovered satisfaction from some of those who carried the ore to Bagillt. At about the same time Sir Robert (being M.P. for Chester) complained to the House of Commons of a breach of privilege, and Cheney was served with a Speaker's warrant and brought up to London. There it was proposed that Cheney should pay royalties on ore he raised 'to any person in Chester' until it was decided on whose property the mines were, and he was then released.<sup>35</sup> He was later said by witnesses in the boundary dispute to have raised great quantities of ore — a figure of £5,000 worth was mentioned — but continued to exploit his position by paying little or no royalty on it. Eventually, in 1739, fearing perhaps that agreement might be reached, he left hurriedly with his debts unpaid.<sup>36</sup> He was sufficiently wealthy to describe himself as 'esquire' and to purchase the manor of Monyash in Derbyshire, one-third in 1721 and the remaining two-thirds in 1736.<sup>37</sup>

<sup>33</sup> C.R.O. D/KK/294/1(2), 294/5(1); J. N. Rhodes, 'Derbyshire Influences on Lead Mining in North Wales in the Seventeenth and Eighteenth Centuries', *Bulletin of the Peak District Mines Historical Society*, iii (1968), 347. Thomas, who returned to his native Derbyshire and died at Monyash in 1723, was succeeded as agent to the Grosvenors by his son Thomas, who lived in a house near Loggerheads built by his brother Edward (Rhodes, loc. cit.; N.L.W., Wigfair MS. 3371; monument to Cheney family in Monyash parish church).

<sup>34</sup> N.L.W., Wigfair MS. 3371.

<sup>35</sup> *ibid.*

<sup>36</sup> *ibid.*; C.R.O. D/KK/294/1(7); British Library Add. MS. 36198, f. 238.

<sup>37</sup> Derbyshire Record Office (D.R.O.), Dakeyne Collection, v, 83-4. In 1721 he was described as of Halkyn, and in 1736 as of Ashford, Derbyshire.

Although maps of the Loggerheads area in the 1750s<sup>38</sup> show that the mines were worked by a series of shallow shafts sunk close together onto or alongside the vein, there were at least four horse-whims — at Pen-y-garreg wen, Cathole and Limekiln Rake. A level was driven about 1736 from Carreg Carn March Arthur (the stone traditionally held to be the county boundary) to Cheney's mines to the north-east, where he had erected a 'wind engine' to draw water from the workings. This was a windmill, probably working a simple rag-and-chain pump. It was among goods of Cheney's seized for debt in 1741.<sup>39</sup>

### *The Boundary Dispute*

The series of lawsuits between the Grosvenor family and the Lords of Mold to decide the ownership of the minerals near Loggerheads commenced in earnest in 1752, when Sir Robert Grosvenor's lessee at Cathole, Benjamin Perrin, was served with an ejectment on behalf of Anthony Langley Swymmer. The case was tried at Salop Assizes in the summer of 1753, and resulted in a verdict for Swymmer. Sir Robert Grosvenor was not satisfied, claiming that many witnesses who could have proved the mines to be in Bromfield and Yale could not attend at Shrewsbury. Legal proceedings were to continue for a further ten years, and the quantities of papers thrown up in the course of these actions, in addition to the light they shed on mining activity, are a veritable well of information on the customs of the time. Witnesses were brought forward in great numbers to make wildly contradictory statements about the boundary, and many provided picturesque details of the ancient custom of beating the bounds. Children who walked the parish boundary with aged inhabitants were made to remember important landmarks by having their ears pinched, by being beaten with twigs and whips, or being thrown into the river. Money would be tossed among them, particularly at Carreg Carn March Arthur where it was thrown into a hole in the stone. A cloth would be laid over the stone, and bread, cheese and ale set out for refreshment.<sup>40</sup> The treatment of the children was sometimes of a robust character in tune with the times. A witness recalled that as a small boy, when walking the bounds, he sat down near the stone; one person seized him and laid him on his back while another 'urined' in his mouth. The Mold parishioners commented that they had 'served that chap well to remember that stone . . . to be the true boundary', but the boy, 'thinking himself ill used', not surprisingly left the proceedings at this point.<sup>41</sup> Conflicting accounts were given of the exact place at which prisoners

<sup>38</sup> C.R.O. D/KK/311.

<sup>39</sup> C.R.O. D/KK/294/1(4), 294/5(2); N.L.W., Wigfair MS. 3371. Windmills were also used for pumping at Trelogan by the mid-eighteenth century (C.R.O. D/DM/136/4) and on Parys Mountain by 1785 (D. C. Davies, *Metalliferous Minerals and Mining* (1892), 369).

<sup>40</sup> C.R.O. D/KK/294/1 *passim*; N.L.W., Wigfair MS. 3371.

<sup>41</sup> N.L.W., Wigfair MS. 3452.

from Ruthin gaol were handed over to the sheriff of Flintshire, and of the significance of stones on Mold Mountain claimed by some to mark the boundary. Dark tales were told of the son of the rector of Llanferres cutting the word *terfyn* (boundary) on one such stone, Carreg y Fywch, early one morning.<sup>42</sup> Heaps of stones on the mountain were claimed by Mold witnesses to be placed there by surveyors 'that they might see them from hill to hill & thereby take proper points of the range or vein of ore';<sup>43</sup> or were said to be walls 'raised by some wild Irish men, formerly in that country but not suffered to dwell with any of the neighbouring inhabitants, as fences to gardens where they had planted potatoes'!<sup>44</sup>

The legal proceedings finally ended in the Exchequer in 1763 with victory for the Lords of Mold.<sup>45</sup> Afterwards, the well-known monument beside the Mold to Ruthin road was erected over the spot adjudged to be the boundary — Carreg Carn March Arthur (the stone of the hoof of Arthur's horse). The stone is said to bear the impression made when one hoof of Arthur's horse landed on it after jumping from the summit of Moel Famau, about three miles away. Both stone and monument were moved a short distance and re-erected by Denbighshire County Council when the road was widened in 1974. The inscription on the monument, which was for the greater part illegible when visited by the historian A. N. Palmer on behalf of the Royal Commission on Ancient Monuments in 1910,<sup>46</sup> is now easily read:

The Stone underneath this Arch  
CARREG CARN MARCH ARTHUR  
was Adjudged to be the Boundary of the  
Parish and Lordship of Mold in the County  
of Flint and of Llanverras in the County  
of Denbigh by the High Court of Exchequer  
at Westminster 10th November 1763

<sup>42</sup> C.R.O. D/KK/294/5(2).

<sup>43</sup> C.R.O. D/KK/294/5(1).

<sup>44</sup> N.L.W., Wigfair MS. 3371.

<sup>45</sup> An acrostic by the schoolmaster of Nercwys (N.L.W., Wigfair MS. 3450) probably dates from the final stages of the action in London:

Come courage take you gentlemen of Mold,  
And baffle fraud that dareing is and bold.  
To London march and head a joviall train,  
Have due regard the limits to maintain.  
Observe the motion of the foe at hand,  
Lay well your schemes and trust your faithfull band;  
Each man of us will stoutly with you stand.

<sup>46</sup> Royal Commission on Ancient Monuments, *Inventory of the County of Flint* (1912), 61; Edward Owen MSS. (C.R.O. D/DM/196). I am told by local people that the present plaque bearing the inscription is not the original one.

*Mold Mountain Mines 1738-60*

In early 1736 Thomas Griffith of Rhual wrote to Edward Lloyd, one of the Lords of Mold, with formal proposals for a new lease of the mines on Mold Mountain. Peck's lease of 1706 was due to expire in 1737; his mines had been taken over in 1718 by the Derbyshire Company following his bankruptcy. However the lease had not been formally assigned to the company, who took over the mines on the authority of the sheriff. Griffith complained that the works were carried on 'without any just power or right except the negligence and indifferency of the proprietors of the mines [i.e. the Lords of Mold] whereof they [the company] have for so many years taken the advantage.' The company had no preferential claim to a new lease, but Griffith had heard that Alderman James Comberbach of Chester, one of the shareholders, 'and some in the secret with him', had actually obtained a lease of some enclosed lands from the guardians of Anthony Langley Swymmer. The negligence of the Lords of Mold extended not only to the Derbyshire Company, and to men such as Edward Cheney evading the payment of royalties; coal mines elsewhere in the manor had also been worked for some time without any payment being made. Griffith's scheme enclosed with his letter proposed a partnership of up to twelve people; there would be twenty-four shares upon each of which £125 would be subscribed to make up a capital of £3,000.<sup>47</sup> This was the usual method of financing any considerable mine company before the introduction of limited liability under the Limited Liability Act, 1855, and of modern company law under the Companies Acts of 1862 and 1867. Such companies became known as cost-book companies, for either quarterly or monthly accounts of expenditure, or costs, were entered up into a cost book, and any surplus monies divided among the proprietors, while the need for more capital was met by calling on the shareholders when required. Among the Rhual MSS. is a memorandum drawn up for the Lords of Mold, recommending the setting of the ground to such a partnership rather than piecemeal. The two biggest mines, Pant-y-buarth and St. Catherine's (or Gwernymynydd), were so expensive to work that it was felt that no one person would be prepared to risk it.<sup>48</sup>

One obstacle to the granting of a new lease was the fact that one of the Lords of Mold, Anthony Langley Swymmer, was a child of eleven. An Act of Parliament had to be obtained in 1737 to enable his guardians, William and Henry Swymmer, to join with John Trevor and Edward Lloyd, the other two lords, in granting a new lease.<sup>49</sup> This was done in the middle of the following year, 1738. The deed of partnership of the new venture divided it into twenty-four shares, and capital amounting to £4,800 was subscribed. The shareholders included the Lords of Mold

<sup>47</sup> C.R.O. D/HE/266.

<sup>48</sup> C.R.O. D/HE/265.

<sup>49</sup> See above, note 8.

themselves, as well as Sir George Wynne of Leeswood, Thomas Griffith of Rhual, and Simon Yorke of Erddig. The mines were to be managed by up to five managers or directors, one of whom, John Travers of Trevalyn, acted as treasurer.<sup>50</sup>

Although the deed of partnership recited a lease from the Lords of Mold of the Pant-y-buarth Mine alone, it is clear from the accounts of the concern that the partners worked mines on the whole of Mold Mountain, from Llyn-y-pandy in the north to Gwernymynydd in the south — the same area as had been worked by the Derbyshire Company from 1718. In the twenty years from 1719 to 1738 that company had raised 4,784 tons of ore, the overwhelming majority of it (4,272 tons) at Pant-y-buarth. Small amounts were raised throughout the period at Pantymwyn, Cefn Bychan (at the west end of the Pant-y-buarth Vein), and elsewhere, including Gwernymynydd (from 1734) and Rhydymwyn (the east end of the Bryncelyn Vein, 1727-31).<sup>51</sup> The new company's production was substantially greater, over half of it (10,394 tons worth £37,339) being raised in their first eight years, 1738-46. After 1746, accounts only of the value of the ore are available, and there are no figures for the years 1748-50 and 1754-6. Those available indicate production from 1738 to 1757 worth £67,879. However the overall profit, 1738-60, was only £1,820. Most of the ore, to the value of £42,659, came from Pant-y-buarth, mainly before 1748. Ore from Pantymwyn amounted to £14,401 (mostly 1750-7), and that from Cathole (1753-7) to £5,179.<sup>52</sup> (Benjamin Perrin, who had worked Cathole under a lease from Sir Robert Grosvenor, had been ejected by the Lords of Mold in 1752.)

The Pant-y-buarth Mine reached a depth of nearly 450ft. To drain it, an adit or drainage level known as the Great Level was begun, probably soon after 1738, from beside the river Alyn (N.G.R. SJ 18906428). It was intended to be driven in a south-easterly direction towards the vein, a distance of about 1,500ft., and would have drained the mine to a depth of 270-300ft. (180ft. at the Lower Whimsey or Engine Shaft). However, in 1744 the company spent £1,544 on erecting a 'fire engine' (i.e. a Newcomen-type pumping engine) at the Engine Shaft.<sup>53</sup> The cost of the engine was less than that of completing the Great Level, which was then abandoned.<sup>54</sup> The engine was probably made at the Coalbrookdale works, to which payments of £379 were recorded in 1744. The mine accounts indicate that it was used until at least 1753.<sup>55</sup> In 1743 Coalbrookdale also supplied an engine at a cost of £397 to Benjamin Perrin.<sup>56</sup> This engine was for

<sup>50</sup> C.R.O. D/E/2475.

<sup>51</sup> N.L.W. MS. 12,491.

<sup>52</sup> C.R.O. D/E/2476, D/HE/271.

<sup>53</sup> C.R.O. D/E/2476; the engine is shown on a section of the mine, c. 1750 (C.R.O. D/KK/307).

<sup>54</sup> C.R.O. D/KK/294/4.

<sup>55</sup> C.R.O. D/E/2476.

<sup>56</sup> R. A. Mott, 'The Newcomen Engine in the Eighteenth Century', *Newcomen Society Transactions*, xxxv (1962-3), 81.

the Llyn-y-pandy Mine, and was probably at Perrin's Shaft (N.G.R. SJ 19706570). The Mold Mountain mines proprietors were working the west end of the Llyn-y-pandy Vein, known as Peter Ashe's, on the mountain or waste land near the river, while Perrin worked the vein on the enclosed lands at Perrin's Shaft and eastwards. He had leased lands or the vein near Bryncelyn Farm from Robert Davies of Gwysaney in 1724.<sup>57</sup> In 1748 it was reported to the proprietors that work at Peter Ashe's was suspended, as Perrin's engine was at a stand, and the agent was ordered to contract with Perrin for his carrying on working the engine, in order to drain the mines on the mountain.<sup>58</sup> This was probably not done, for although ore worth £1,483 was raised at Peter Ashe's in 1738-48, only £24 appears in the accounts for 1750-4.<sup>59</sup> At about the same time that the Great Level was begun, the Mold Mountain proprietors drove another level eastwards from the river (N.G.R. SJ 18856455) towards the Pantymwyn Vein, but this was stopped when a natural swallow-hole, capable of draining the water, was found in the mine.<sup>60</sup>

At the south-eastern extremity of their area, the Mold Mountain company worked the St. Catherine's Mine (or, as it was later called, the Gwernymynydd Mine): By 1739, when it was 44 yards long, an adit level had been started from a stream near Bryn Coch (N.G.R. SJ 22706262).<sup>61</sup> Its course may be traced by a series of run-in shafts<sup>62</sup> running in a westerly direction for nearly 800 yards to St. Catherine's Whimsey, or No. 1 Shaft (N.G.R. SJ 22006255). Ore worth £4,690 was raised here between 1738 and 1757.<sup>63</sup>

### *The Mines in the Late Eighteenth Century*

For sixty years following 1760, when the lease to the Mold Mountain mines proprietors expired, there is little evidence of mining activity on the mountain, except at the Pen-y-fron and Llyn-y-pandy Mines. The west end of the Cathole Vein (known as Loggerheads and Pen-y-garreg wen Mine) was worked between 1769 and 1777 by a company whose shareholders, many of them Derbyshire men, included Charles Roe of the Macclesfield Company. The detailed accounts indicate heavy expenditure on opening up the mine, sinking shafts and driving levels, including 'waggon-gates' or levels suitable for wheeled waggons. In 1772-4 a waterwheel costing £35 was installed beside the river to work pumps in Pen-y-

<sup>57</sup> C.R.O. D/GR/184.

<sup>58</sup> C.R.O. D/E/2477.

<sup>59</sup> C.R.O. D/E/2476.

<sup>60</sup> C.R.O. D/KK/294/4.

<sup>61</sup> The level is shown on a map of Mold Mountain by Samuel Fearon and John Eyes, 1739 (U.C.N.W., Mostyn MS. 7171).

<sup>62</sup> Shown on early editions of the Ordnance Survey 6-inch maps, and some still visible today.

<sup>63</sup> C.R.O. D/E/2476.

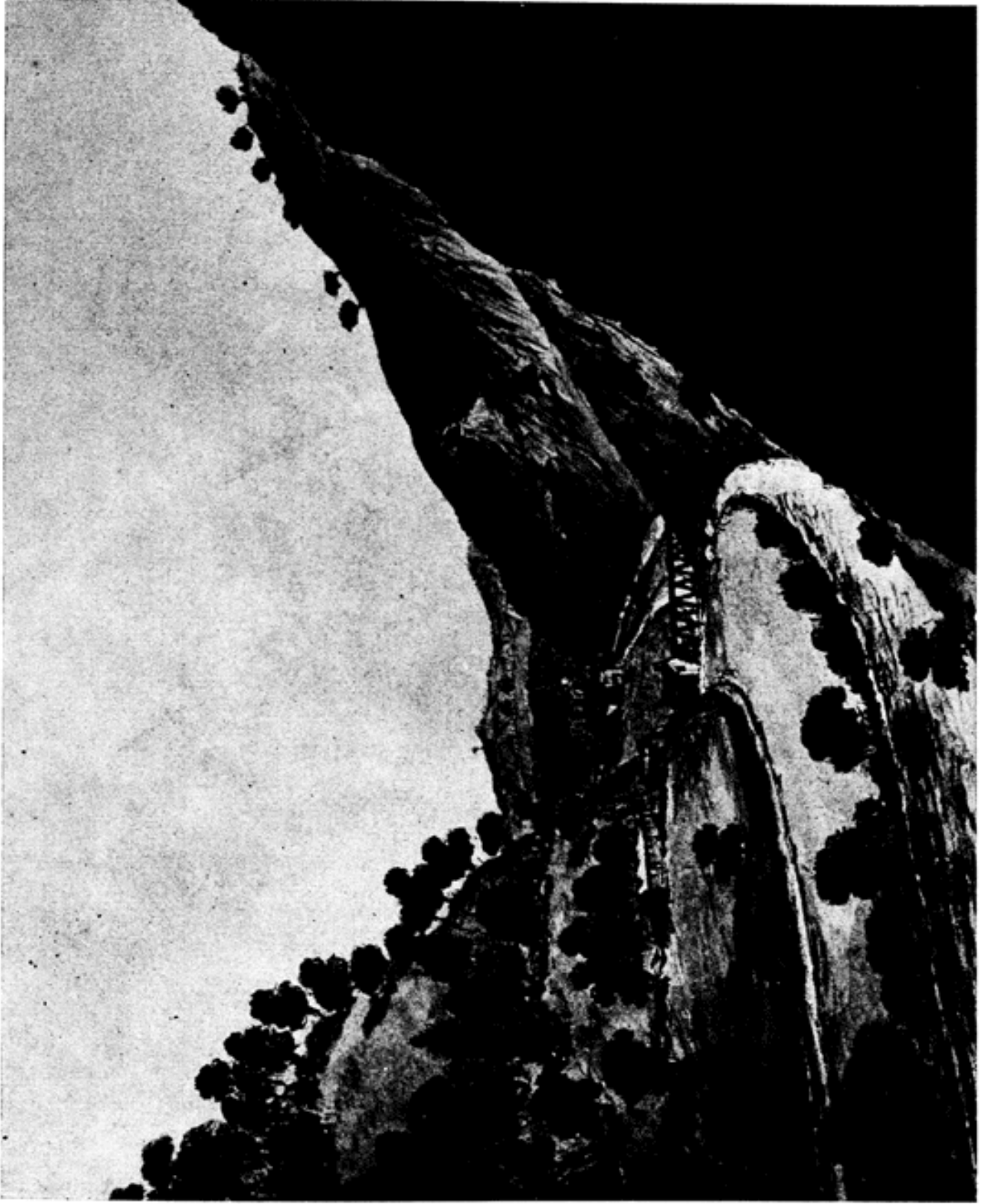


PLATE 1. *Watercolour of Pen-y-iron Mine by J. Ingleby, 1796. The buildings in the distance (with waterwheels on each side of them) were a smelting-works. Halfway up the hill is the engine-house at Old Engine Shaft, and below it a horse-whim at Nell's Shaft (National Library of Wales).*





PLATE 2. Watercolour of Llyn-y-pandy Mine by J. Ingleby, 1796, showing the engine-house for the lower engine, and (at the top of the cliff) the engine-house at Mountain Shaft (National Library of Wales).

Nid yw'r hawliau gennym i  
arddangos y deunydd hwn.

We do not have the rights to  
display this material.

*PLATE 3. Removal of the beam of a Cornish engine at Cathole Mine, 1897. The beam, made by the Perran Foundry Co., Cornwall, in 1868, was probably for an 85in. engine purchased by the Glan Alyn Mining Co. from the same foundry (Clwyd Record Office).*



garreg wen Shaft by means of rods in a gully running up the hill (Appendix II). A watercourse several hundred yards long was cut to supply the wheel from a weir across the river. The pumps were of wood, forty yards of them costing £42 18s. 8d. The whole arrangement was set to work in 1774, 15s. being allowed for ale for the miners in celebration. Despite all this work, only tiny quantities of ore were raised in later years, and a loss of at least £2,919 was made in the period for which accounts survive.<sup>64</sup>

Accounts of ore raised on Mold Mountain in the latter half of 1784 show that forty-seven tons of ore were raised at Pantymwyn, and very small quantities at Pant-y-buarth, Cathole and St. Catherine's (Gwernymynydd).<sup>65</sup> In the following year, a letter from Richard Ingleby (then working the Llyn-y-pandy and Pen-y-fron Mines) to John Lloyd, one of the Lords of Mold, urged the continuation of the Gwernymynydd adit level to Pen-y-garreg wen Shaft at the west end of the Cathole Vein.<sup>66</sup> About 1786 St. Catherine's was leased with Cathole to Richard Kirk of Wrexham and others, but three years later Kirk was forced to mortgage his share, while receipts for payment for shares in the mine held by Hope Eyton of Leeswood indicate that it was making a loss.<sup>67</sup>

### *Pen-y-fron Mine*

The west end of the Bryncelyn Vein, known as the Pen-y-fron Mine, was worked in a small way in the early eighteenth century; four abandoned shafts are shown near the river Alyn on a map of Mold Mountain in 1739.<sup>68</sup> The eastern end of the vein, or Rhydymwyn Mine, probably received more attention until the last two decades of the century.<sup>69</sup> About the beginning of the 1780s a former grocer, Richard Ingleby, took an interest in the mine, at first making a great loss; but by the middle of the 1790s he had made his fortune.<sup>70</sup> According to Walter Davies (Gwallter Mechain), 'with no other engines than pickaxes, buckets, ropes, windlasses, and wheelbarrows, he for some time . . . quarried out from 30 to 50, and sometimes as much as 100 tons [of ore] per week.'<sup>71</sup> The expense of raising the ore and

<sup>64</sup> Manchester Central Library C17/1/1, accounts of Loggerheads Mine, 1769-77 (photocopy in C.R.O., NT/148).

<sup>65</sup> N.L.W., Wigfair MS. 2295; C.R.O. D/KK/669.

<sup>66</sup> C.R.O. D/KK/766. The Cathole and Gwernymynydd Mines were not in fact connected until over a century later.

<sup>67</sup> D.R.O. 513M/E403A; N.L.W., Leeswood MSS. 1068-1069, 2417.

<sup>68</sup> U.C.N.W., Mostyn MS. 7171.

<sup>69</sup> A map of the area in 1757 (C.R.O. D/GW/655) shows a line of eight shafts (two of them whimsey shafts) over a distance of nearly four hundred yards along the east part of the vein.

<sup>70</sup> N.L.W. 1755 (3/15), notebooks of Walter Davies.

<sup>71</sup> W. Davies, *General View of the Agriculture and Domestic Economy of North Wales* (1810), 57.

dressing it was no more than 10s. a ton, while it sold at an average of £9 a ton.<sup>72</sup> The main vein is said to have been over seven feet wide.<sup>73</sup> About 1786 Ingleby built a smelting-works at the mine, and a rolling-mill a short distance downstream.<sup>74</sup> Here the lead was rolled into sheets, and sent to Flint for export.<sup>75</sup> But by the middle of the 1790s Ingleby, like Wilkinson at the Llyn-y-pandy Mine further upstream, was being troubled by water making its way into the workings. Pumps worked by waterwheels, and later by a steam engine, were unable to cope, and the lowest workings were accessible only when the weather was particularly dry. The Revd. Richard Warner described these pumping arrangements when he visited the mine during a walking tour of Wales in 1798.<sup>76</sup> There was a 60½in. engine 'upon the old construction' (that is, a Newcomen engine) at Old Engine Shaft, which worked one 16in. and two 14in. pumps. These, with two 12in. pumps worked by a waterwheel, raised water 44 yds. from a level to the adit driven into the mine from the river Alyn. Two other waterwheels raised water from the lower workings to the main level.<sup>77</sup> One of these wheels was probably the one at Waterwheel Shaft, on the west bank of the river, visible in a watercolour of 1796 (Plate 1). Another wheel, shown on the east bank, probably worked flat-rods running through the adit to Old Engine Shaft.

The ore raised at Pen-y-fron by Ingleby probably accounted for a good part of the 27,553 tons estimated to have been raised before the 1820s (Appendix III). The rentals of the Gwysaney estate, which included all but the most westerly part of the mine, record 2,544 tons in the years 1796-1801, but production then slumped for several years to below fifty tons.<sup>78</sup> Gwallter Mechain noted of this period that 'during the reign of the late proprietors, discord paralysed every exertion; now [1809] heaven-born concord has brought about a confederacy of interests, which prognosticates better success.'<sup>79</sup> Output did in fact improve for a few years, 769 tons being raised on the Gwysaney estate in 1811, but afterwards dropped to a trifling level until the 1820s.<sup>80</sup>

<sup>72</sup> *ibid.*

<sup>73</sup> Richard Warner, *A Second Walk through Wales* (1800), 253.

<sup>74</sup> Rhodes, *op. cit.* (1971-2), 30.

<sup>75</sup> N.L.W. MS. 1755 (3/15); Davies, *loc. cit.* Ingleby also owned a smelting-works at Flint (Thomas Pennant, *Whiteford and Holywell* (1796), 282).

<sup>76</sup> Warner, *op. cit.*, 252-3. The precision of the details Warner gives for the Pen-y-fron and Llyn-y-pandy Mines suggests that they were obtained direct from the proprietors or their agents at the mines.

<sup>77</sup> *ibid.*

<sup>78</sup> C.R.O. D/GW/335-336.

<sup>79</sup> Davies, *op. cit.*, 57. Davies claimed that Llyn-y-pandy and Pen-y-fron produced about 300 and 1,200 tons respectively in 1801, but the rentals record only 135 tons for Pen-y-fron in that year, which suggests that the figures should either be reversed or discounted as exaggerated.

<sup>80</sup> C.R.O. D/GW/337-338.

*Llyn-y-pandy Mine*

The Llyn-y-pandy Mine, further up the valley, appears to have been worked intensively earlier than Pen-y-fron. The name of the mine came from a *pandy* or fulling-mill near the point where the vein runs down to the river (N.G.R. SJ 193657).<sup>81</sup> As described above, Benjamin Perrin and the Mold Mountain mine proprietors worked part of the vein with an engine, probably at Perrin's Shaft, installed in 1743. The mine was leased to Richard Ingleby at about the same time as Pen-y-fron; accounts of ore raised on Mold Mountain in the second half of 1784 show him raising 268 tons of ore at Llyn-y-pandy in the half year.<sup>82</sup> There was probably an engine at work pumping, for one 'erected by the former lessees' is mentioned in a detailed report on the manor of Mold by D. Walker in 1791.<sup>83</sup> Walker described how these former lessees, who had worked for several years 'with various success', were defeated by water: '. . . but they have now either assigned their lease to, or called in the aid of the celebrated Mr. Wilkinson of Broseley in Shropshire and it is reasonable to infer that the prospect of success is very flattering and even reduced to a certainty, otherwise a man of his experience would not have gone to the expence he has already incurred . . .'<sup>84</sup> John Wilkinson was already involved in lead-mining at Minera in Denbighshire, near to his Bersham ironworks where he made cylinders for Boulton and Watt steam engines. In 1791 he already had three engines at work at Llyn-y-pandy, and three more were added by the end of the decade. These engines were described in some detail by Walker in 1791, by Richard Warner in 1798, and by Gwallter Mechain.<sup>85</sup>

<sup>81</sup> A *pandy* is shown here on the map of Mold Mountain by Fearon and Eyes, 1739 (U.C.N.W., Mostyn MS. 7171).

<sup>82</sup> N.L.W., Wigfair MS. 2295.

<sup>83</sup> C.R.O. D/KK/267, p. 52.

<sup>84</sup> *ibid.*

<sup>85</sup> *ibid.*, pp. 52-3; Warner, *op. cit.*, 249-51; Davies, *op. cit.*, 56; N.L.W. 1755 (3/15); Ifor Edwards, 'Some Notes on John Wilkinson and his Relations with Boulton and Watt', *Denbs. Hist. Soc. Trans.*, xxi (1972), 112. The Lower engine, at a shaft beside the river (Plate 2), had a 48in. cylinder, 8ft. stroke, with 20in. pump raising water at a rate of nine tons (2,000 gallons) a minute from a depth of 45yds. (1791). At Mountain Shaft in 1791 was a 32in. engine, pumping from a sump 30yds. below the level; this shaft had previously been worked 'by a water engine with rods and wheels' — perhaps a waterwheel beside the river working rods through the level. By 1798 this engine had been replaced by a 52in., 8ft. stroke, with 21in. pump at a depth of 60yds. This engine had been 'lately erected' to work the supposed westward continuation of the vein at Cefn Cilcain, under a lease from Earl Grosvenor; however no workings are shown west of the river on sections of the mine. Further east, at Perrin's Shaft in 1791 was a 38in. engine pumping about 70yds. below level; by 1798 this had been replaced by a 27in., 6ft. stroke, working a 12in. pump. In 1798 Richard Warner also mentioned a 38in., 8ft. stroke, engine working a 12in. pump at a depth of 60 yards. Two other engines at Llyn-y-pandy, an 18in. (January 1792) and a 26in. (December 1793), appear in a list prepared for Boulton and Watt of pirated engines made by Wilkinson, but their location is not known. The sixth engine, 'of greater powers than the other five', was being prepared when Gwallter Mechain visited the mine c. 1798.

Most, if not all, of these were pirated engines, made illicitly by Wilkinson at Bersham without payment of royalties to Boulton and Watt.<sup>86</sup> Walker estimated in 1791 that expenditure of £8,000 would be required to erect the engines, sink shafts, and clear the levels, which had for some time been full of water, of sludge and roof falls.<sup>87</sup> There were two adits, both probably dating from Wilkinson's time; one following the vein, the other driven to Perrin's Shaft from the river bank about four hundred yards downstream (SJ 19646588).

When Richard Warner visited the mine in 1798, work was at a standstill, for the French Wars, and the resulting closure of the continent to exports, had 'almost suspended the demand for lead'. The price had dropped to nearly half of what it had been before, and thousands of tons of ore were stockpiled, waiting for a market.<sup>88</sup> The miners were thrown out of work in large numbers. Those employed at the Grosvenors' mines in the parish of Llanarmon fell from 500 to about thirty. The men at the Mold mines 'would have been reduced to great extremity' about 1795-7 had there not been alternative work available in the enclosure of waste land in the parish under an Act of Parliament obtained in 1792.<sup>89</sup> Between that date and 1800, when the award was signed, Mold Mountain was divided into fenced enclosures, and much of it converted into agricultural land. The old tracks across the mountain to what was to become the village of Gwernaffield (from Cathole, and from Pont Cilcain through Pantymwyn) were straightened into the course they follow today, while the rectangular field boundaries on the former mountain are still easily distinguishable from the old enclosures lower down, east of Gwernaffield and Gwernymynydd.

In the late 1790s Gwallter Mechain recorded that Wilkinson had pigs of lead metal to the value of £24,000 in the yard of his smelting-works at Brymbo, where ore from the Minera mines was smelted. Elsewhere he had pigs of lead worth £9,000, and lead ore on bank at the mines worth £7,000 — £40,000 in all.<sup>90</sup> Some of this lead ore and metal may have been at Wilkinson's smelting-works at Buckley, built for the Llyn-y-pandy ore. When Richard Warner visited the mine in 1798 this works was being erected, ready for the peace.<sup>91</sup> Carts and horses to take the ore from the mines to the smelting-works were provided by local farmers. Gwallter Mechain complained that those in the Mold area paid more attention to the carriage of lead and coal than to the tillage of their farms.<sup>92</sup>

<sup>86</sup> Edwards, loc. cit.

<sup>87</sup> C.R.O. D/KK/267, p. 53.

<sup>88</sup> Warner, op. cit., 251.

<sup>89</sup> N.L.W. MS. 1755 (3/19). In his published report for the Board of Agriculture (Davies, op. cit., 58) Gwallter Mechain implied that it was the *Llanarmon* miners who were employed on the Mold enclosure, but examination of his original notebooks (N.L.W. MS. 1755 (3/19)) reveals, as common sense would suggest, that it was those of Mold.

<sup>90</sup> N.L.W. MS. 1755 (4/2).

<sup>91</sup> Warner, op. cit., 251; G. Lloyd, 'The Smelt at Buckley', *ante*, xix (1961), 91.

<sup>92</sup> N.L.W. MS. 1755 (3/15).

The production of the Llyn-y-pandy Mine before the 1820s has been estimated at 20,000 tons (Appendix III). Wilkinson was probably responsible for much of this. The mine seems to have been practically abandoned from about the time of his death in 1808. His estate was left to trustees, resulting in a series of lawsuits before it was sold under a decree in Chancery in 1828. A valuation of 1824 included only £120 13s. for the Llyn-y-pandy Mine.<sup>93</sup>

#### *John Taylor and the Mold Mines*

The years from 1823 to about 1845 saw the amalgamation of nearly all the mines on Mold Mountain, from Pen-y-fron in the north to Cathole in the south, into one enterprise, the Mold Mines. The company was managed by the mining engineer, John Taylor (1779-1863); a well-known figure in the mining industry, he lived for many years at Coed Du, Rhydymwyn, where he was succeeded by his eldest son, John Taylor junior.

John Taylor, who came from a cultured, nonconformist Norwich family, was made manager of Wheal Friendship, one of the largest copper mines in Devon, at the remarkably early age of eighteen. Despite his youth and inexperience, he was most successful; he constructed a series of leats or watercourses to supply water power to the dressing floors at Wheal Friendship, making it the most mechanized installation in the south-west. In 1812 he moved to London to set up a chemical works at Stratford in Essex, and it may have been at this period that he developed contacts with sources of finance in London. His connection with Devon and Cornwall continued, and he was appointed agent to a number of great mineral owners including Earl Grosvenor, who owned the mineral rights of much of Flintshire and Denbighshire, and the Duke of Devonshire, with mining interests in Derbyshire and Yorkshire. He was involved in other mining areas such as Central Wales, Mexico and Spain, and founded the firm of John Taylor & Sons, mining engineers. He was a man of wide interests, taking a part in the affairs of University College, London, and the British Association for the Advancement of Science. In 1829 he was host at Coed Du to the composer Felix Mendelssohn, whose piano fantasy *The Rivulet* is said to have been inspired by the river Alyn.<sup>94</sup>

The principle underlying Taylor's ventures was heavy investment in the latest technology, made possible by his contacts with sources of capital in London far greater than those available locally. Up to this time, the men who put money into the Mold mines were (apart from the Derbyshire men of the eighteenth century) local gentry — Thomas Griffith of Rhual, Simon Yorke of Erddig, Sir George Wynne of Leeswood — or else lead-smelters, merchants and industrialists

<sup>93</sup> A. N. Palmer, *John Wilkinson and the Old Bersham Ironworks* (1899), 38-9.

<sup>94</sup> For Taylor's career see R. Burt, *John Taylor* (1977), *passim*. Mendelssohn's letter of thanks after his stay at Coed Du is printed in Burt, pp. 82-3; a plaque in Rhydymwyn commemorates him and also the author Charles Kingsley, who frequently walked along the Leete.



such as Benjamin Perrin, Richard Ingleby and John Wilkinson. By contrast, the fifty-nine shareholders listed in Taylor's report on the Mold Mines in 1827 had, with one possible exception, no local connections at all. They included members of two Norwich families, the Martineaus (whose influence had secured Taylor his post at Wheal Friendship), and the Hudsons; there were a number of prominent men — the astronomer Francis Baily, Colonel Thomas Colby, the director of the Ordnance Survey, John Gorwood, later the Duke of Wellington's private secretary, Dr. Edward Maltby, later Bishop of Durham, and the British ambassador in Paris, Sir Charles Stuart. Samuel Hoare, of the banking family, was the largest shareholder, with twenty of the 200 shares.<sup>95</sup>

In the first four years, up to the end of 1826, the sum of £160,333 was spent for a return of £40,969. In 1826 itself, 1,575 tons of ore worth £18,888 were raised, but a loss of £9,800 was made.<sup>96</sup> No later accounts are available; over the period 1823-45 57,939 tons of ore were produced, but the value is not known (Appendix III). To judge from the accounts for the early years, the enterprise may have broken even, but it is unlikely to have made substantial profits.<sup>97</sup>

Much of the expenditure in the early years of the Mold Mines must have been spent on engines and pumping equipment. By 1829 seven steam engines and four 44ft. waterwheels were at work, pumping up to 8,000 gallons of water a minute — more, Taylor claimed, than at any other mine in Britain (Appendix I). In his reliance on these four waterwheels, and others used to power ore-dressing machinery, Taylor was continuing with a use of water power begun with his successful use of it at Wheal Friendship in 1801. Although it had been used in the Alyn valley previously, at Cathole and Pen-y-fron in the late eighteenth century, for instance, Taylor built a series of leats or watercourses far longer and more ambitious than anything attempted before. The longest of all, the watercourse known as the Leete, was nearly three miles long, and is by far the most impressive structure associated with the Mold lead mines which remains on the ground.

Half of the ore raised at the Mold Mines between 1823 and 1845 came from the mines at the northern and southern extremities of their area — Pen-y-fron and Cathole (or South Mold) (Appendix III). By 1827 a section of the Pen-y-fron Mine shows that it had been linked by an adit with the Rhydymwyn Mine to the east. Pen-y-fron had reached a depth of 50 fathoms below adit, 8½ fathoms deeper than the deepest workings of Ingleby's time. Work at Pen-y-fron ceased in 1830,

<sup>95</sup> C.R.O. D/DM/219/92. One shareholder, Mrs. Ann Rigby, may possibly have been connected with the family who owned the Hawarden ironworks. William Rigby of Hawarden was a lessee under the Lords of Mold of mines on Cefn Mawr in 1812 (U.C.N.W., Mostyn MS. 7054).

<sup>96</sup> C.R.O. D/DM/219/92.

<sup>97</sup> An article on Welsh mining in the *Mining Journal*, 1865, p. 507, claimed that 'the old Mold Mines, although possessing some of the richest courses of lead ore ever known in Europe, failed to be remunerative, and were, consequently, stopped.'

but continued at Rhydymwyn until 1837. The mine had previously been worked from a level 20 fathoms below adit. This had been deepened to 30 fathoms by 1827. The eastern part of the mine was in alluvial gravel, from which water made its way into the workings. To prevent this a brick-lined shaft, Brick or West Iron Shaft, was sunk by 1827, but since this was not entirely successful, a water-tight iron lining was added shortly afterwards. A similar shaft, East Iron Shaft, was later sunk at the edge of the gravel to the east. The Llyn-y-pandy Mine was re-opened, and pumps worked up to 1830, as this assisted in drawing water from Pen-y-fron.<sup>98</sup> The easternmost shaft on the mine, which had been sunk by Wilkinson 35 fathoms to the adit, was deepened by Taylor and named Conqueror of Wales Shaft. (The name is said by local tradition to come from an expansive remark by Taylor that he 'would conquer Wales'.) About 1827-8 an 80in. engine was erected, but proving inadequate, it was removed to Cathole (later to Minera) and the mine abandoned. Only 125 tons of ore were raised.<sup>99</sup>

Pantymwyn Mine, in 1827, had reached a depth of sixty fathoms. The Bellan Level, an adit driven from the Alyn towards the eastern end of the mine, and abandoned within twenty fathoms of the lodge, was about to be continued.<sup>100</sup> A 50in. engine had been erected at the Engine Shaft; it also worked pumps in West Flat Rod and Boundary Shafts, to the west, by means of flat rods. A large feeder of water intercepted at the bottom of Taylor's Shaft in September 1844 caused the closure of the mine on account of the expense of pumping.<sup>101</sup> Production in 1825-8 and 1834-45 amounted to 7,312 tons. Pant-y-buarth, which had been so productive in the eighteenth century, was worked by Taylor in 1825-33 and 1841-5, but only 2,296 tons of ore were raised.

At Cathole (or South Mold) little was being done in 1827. The old Gwernymynydd Mine, on the east side of the Cathole Vein, seems to have been sub-leased by the Mold Mines to a separate company.<sup>102</sup> The adit from the Alyn below Loggerheads (later known as the Glan Alyn Adit) had reached a point 120 fathoms east of the (Old) Engine Shaft. Pumping was resumed in 1828, and the 80in. engine from Conqueror of Wales Shaft was installed about 1830. Some of the production of 21,000 tons recorded for these South Mold mines came from the Fron Fawnog Mine, where flat runs of ore, following the dip at an angle of about one in four

<sup>98</sup> This paragraph and the two following are based, unless otherwise indicated, on Taylor's report on the Mold Mines, with accompanying sections, 1827 (C.R.O. D/DM/219/92), and on details of pumping and production (Appendices I, III).

<sup>99</sup> Smith, *op. cit.*, 83; Appendix III.

<sup>100</sup> Several other levels, including the Garth level, were driven westwards from the Alyn (Fig. 1), but only those on the Pen-y-fron Mine, and the Bellan on the Pant-y-mwyn Mine, seem to have been completed.

<sup>101</sup> Smith, *op. cit.*, 85. Taylor's Shaft was between Engine Shaft and Boundary Shaft (see section in A. Strahan, *The Geology of . . . Flint, Mold and Ruthin* (1890), 187).

<sup>102</sup> N.L.W. MS. 12430, ff. 21, 25.

eastwards, were worked by shafts (including an engine shaft), and by an incline from near Pant-glas (SJ 20826375).<sup>103</sup>

Although work at most of the Mold Mines had ceased by 1845, a foundry established by the Taylors at Rhydymwyn in 1837 to service the mines was longer-lived. As the local mines declined it turned to the making of mining machinery for export. In 1862 it was moved to a more favourable location, at Sandycroft on the river Dee, where it made ore-dressing plant, winding engines, waterwheels, pumps and other products (including, from 1894, electric motors) until its closure in 1925.<sup>104</sup>

### *Smaller Mines*

The withdrawal of the Taylors from the Mold mines in 1845 saw the virtual abandonment of large-scale mining until the present century. Ironically, it is at about this date that two of the most useful sources for the historian of nineteenth-century mining, the *Mining Journal* (published weekly from 1835), and annual official statistics of mineral production (from 1845), became available. These sources make it clear that production from most of the companies working in the Mold area in the latter half of the nineteenth century, even on formerly productive veins such as Bryncelyn and Pant-y-buarth, was intermittent and on a much smaller scale than before. Indeed, this was the period when company legislation encouraged speculation in lead-mining by a wider public, and allowed the pushing of shares in mining concerns whose prospects could at best be described as mixed. It is these sort of ventures which form part of the background to Daniel Owen's novel *Enoc Huws* (1891). Statistics of the production of the mines are given in Appendix III; only a few merit description in any detail.

At the north of the area, the Garregboeth Vein produced at least £10,000 worth of ore (not reflected in Appendix III) in the late 1820s. The mine was drained by a level begun from the Mechlas brook, to the north, in 1824, and an engine was erected in 1827-8, probably in the engine-house whose ruins are still visible (SJ 18706700). That the mine had been worked successfully before then is suggested by a remark, made during a dispute between the proprietors which suspended work in 1829, that it 'till lately yielded its riches with very little cost and trouble'.<sup>105</sup> Apart from a few tons in the 1850s and 1860s, it does not seem to have worked again with any success until it was reached by the Halkyn Deep Level in 1908. In the Coed Du and Cefn Cilcain area numerous shafts and extensive open work along the Cefn Cilcain or Coed Du Vein point to early mining activity, probably

<sup>103</sup> In 1839 there was 'little doing' on the mountain except for Fawnog (N.L.W. MS. 12430, f. 21).

<sup>104</sup> *Annual Report of the County Archivist* (Clwyd County Council, 1978), 11-13.

<sup>105</sup> N.L.W., Longueville MS. 908.

in the eighteenth century. The vein was explored by a level driven from Nant Alyn in 1880.<sup>106</sup>

The Rhyd Alyn or South Llyn-y-pandy Mine was worked by an adit driven southwards for 256 yards from the river Alyn at Llyn-y-pandy, and from Coed Mawr Shaft at the east end of the vein. It was operated successively by the Rhyd Alun, South Llynypandy and Llynypandy Mining Companies at intervals between 1876 and 1906, and produced 6,840 tons of ore.<sup>107</sup> Pantymwyn Mine accounted for 1,870 tons between 1859 and 1883. It was worked by the Pantymwyn Mining Co., formed in 1900, between 1901 and 1913, producing 1,654 tons of lead ore and 1,154 tons of zinc ore (Appendix III). Later operations took place at New or Cae Mawr Shaft at the north-east end of the vein; the shaft was deepened and a big pumping engine installed about 1909.<sup>108</sup>

The west end of the Cathole Vein was worked by the Glan Alun Mining Co. They installed a turbine, and a new waterwheel for pumping through the adit (Appendix II), and purchased an 85in. pumping engine (erected at Francis Engine Shaft) in 1869 from the Perran Foundry in Cornwall. The same foundry supplied another engine of the same size to the Fron Fawnog Mine, where it worked in 1872-3.<sup>109</sup> Production of the Glan Alun Mining Co. was 234 tons, 1867-72. Exploratory work at Cathole and Gwernymynydd was carried out by Brunner, Mond & Co. between 1896 and 1903. They re-opened the old Gwernymynydd adit, re-driving the first 340 yards from a new portal, and extended it westwards to Francis Engine Shaft on the Cathole Mine, thereby joining the two mines for the first time. A big pumping engine was erected at Treasury No. 2 Shaft, Gwernymynydd.<sup>110</sup> The Fron Isa Vein (a branch from the eastern end of the Cathole Vein) and the nearby Fron Haul Vein were worked independently of the Gwernymynydd Mine between 1858 and 1888.

### *The Drainage Tunnels*

In the present century many of the mines in the Mold area have been worked extensively from two deep drainage tunnels, the Halkyn Deep Level and the

<sup>106</sup> Smith, *op. cit.*, 78, 143-4. Leases indicate that Cefn Cilcain, for instance, was being worked as early as 1718 (U.C.N.W., Gwysaney MS. 564), and that mines here and at various places on the Gwysaney estate west of the Alyn were being worked in the mid-eighteenth century (C.R.O. D/HE/46-48; U.C.N.W., Gwysaney MS. 577). The lessees included, in 1729-37, Thomas Barker of the London Lead Company (U.C.N.W., Gwysaney MSS. 566, 567, 569). In 1767 the Mines Royal Company proposed to work Garregboeth, Erw Felin and Vein Susan (N.L.W., Gwysaney Letters and Deeds, 951).

<sup>107</sup> *ibid.*, 84; report on Rhydalun Lead Mining Co., 1880 (C.R.O. D/DM/448/38).

<sup>108</sup> Smith, *op. cit.*, 84; prospectus of Pantymwyn Mining Co., 1900 (C.R.O. D/DM/448/29), and plan, 1909 (C.R.O. D/HE/550).

<sup>109</sup> D. B. Barton, *The Cornish Beam Engine* (1969), 80, 156-9. An earlier 60in. engine at Fron Fawnog, built at the Hawarden ironworks, was advertised for sale in 1850.

<sup>110</sup> Smith, *op. cit.*, 92; Earp, *op. cit.*, 53.

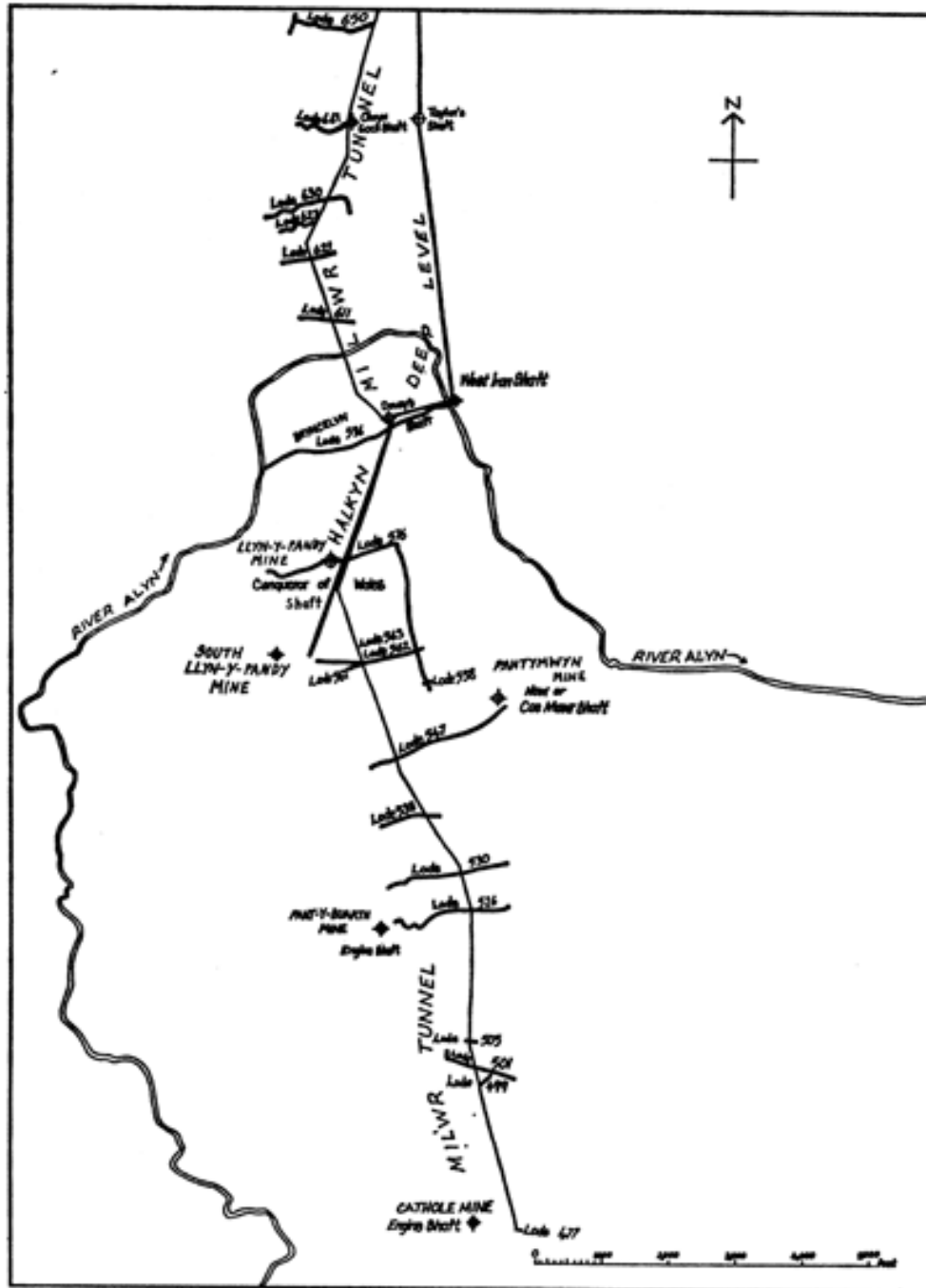


FIG. 3. The Halkyn drainage tunnels. The numbers of the lodes relate to a grid system adopted for ease of reference in the 1930s.

Milwr Tunnel.<sup>111</sup> The Halkyn Deep Level, or Old Drainage, was begun in 1818 by Earl Grosvenor at Nant-y-Flint (SJ 230711), about 180ft. above sea-level, and driven westwards to unwater his Halkyn mines. It was continued intermittently until 1875, when it was taken over by the Halkyn District Mines Drainage Co. The company obtained an Act of Parliament empowering them to levy royalties on mines in the area drained by the level, and between 1878 and 1883 extended it southwards to the Rhosesmor Mine. It was then continued to the Bryncelyn and Llyn-y-pandy Veins. In November 1901 it tapped the main feeder of water at the intersection of the Llyn-y-pandy Vein and Bryncelyn Crosscourse, and lowered the water levels in the Pen-y-fron, Llyn-y-pandy and South Llyn-y-pandy Mines from about 440ft. to 255ft. above sea-level. The South Llyn-y-pandy Mine, the level's furthest point south, some five miles from its portal, was reached in 1903 (Fig. 3).

The second drainage level, the Milwr Tunnel, was begun in 1897 at sea-level near Bagillt (SJ 213760) by the Holywell-Halkyn Mining and Tunnel Co. in order to drain the mines north of the Halkyn District Mines Drainage Co. area. In 1913 the latter company obtained an Act of Parliament to extend the Milwr Tunnel into their district, whose boundary, beneath the hamlet of Windmill on Halkyn Mountain, was reached in 1919.

During the First World War the desperate need for minerals led the Ministry of Munitions to subsidize to the extent of £42,000 an emergency scheme to pump water from the mines in the Rhydymwyn area up into the Halkyn Deep Level. In 1917 a generating station was built near Taylor's Shaft, North Hendre (SJ 20436780)<sup>112</sup> to power two pumps in the shaft capable of raising 4,000 gallons of water a minute to the Halkyn Deep. Some two miles of overhead transmission lines ran from the generating station to Davey's Shaft, Bryncelyn, and Conqueror of Wales Shaft at the east end of the Llyn-y-pandy Vein. Both shafts were deepened and 2,000 gallon pumps, powered by the central generating station, installed at each. The total volume of water pumped from these mines, with existing capacity, would have been 15,000 gallons a minute. Launderers were also installed in the Llyn-y-pandy Mine as a precautionary measure to ensure an adequate flow in the Halkyn Deep Level, from which water was supplied by a pipeline to the munitions factory at Queensferry. The whole scheme was nearly completed when the armistice was signed, and work was suspended. It proved impossible to get the mining interests to pay the drainage royalties necessary to make the scheme

<sup>111</sup> Unless otherwise indicated, this account relies on Smith, *op. cit.*, 23-8; G. A. Schnellmann, 'Lead-Zinc Mining in the Carboniferous Rocks of North Wales', *Future of Non-Ferrous Mining in Great Britain and Ireland* (1959), 239-41; and Appleton, *op. cit.*, 34-5.

<sup>112</sup> Not to be confused with Taylor's Shaft, Bryncelyn. The number of Taylor's Shafts must be one of John Taylor's most enduring memorials — there were others at Pantymwyn, Cathole, Fron Fawnog, Long Rake (Halkyn), and at Minera.

commercially viable; much of the plant was sold off, and work at all the Halkyn mines was suspended in 1921.<sup>113</sup>

In 1928 the various mining and drainage interests were amalgamated into one company, the Halkyn District United Mines. This company continued the Milwr Tunnel southwards, gaining the world tunnelling record by advancing it 2,037 feet in fourteen weeks in 1930.<sup>114</sup> In 1934 five hundred men were at work and Flintshire produced 21,689 tons of lead ore, nearly all from Halkyn District United Mines. Output remained above 14,000 tons a year until 1939. Unfortunately this work was done in a period of very low prices; ore sold for £3 17s. 10d. a ton in 1938, probably its lowest price for three centuries.<sup>115</sup> Twelve new veins were discovered in the process of driving the tunnel, which in 1936 reached the intersection of the Bryncelyn Crosscourse and the Llyn-y-pandy Vein, thereby draining the mines to about 40ft. above sea-level. Apart from drainage of the mines, the Milwr Tunnel was also used for underground haulage to Pen-y-bryn Shaft, where a new mill was built for dressing the ore. Halkyn District United Mines also, between 1931 and 1938, carried out a good deal of work in the bed of the river Alyn downstream of Loggerheads in an attempt to prevent water sinking through a series of natural swallow-holes into the mines.<sup>116</sup> The company also deepened New (or Cae Mawr) Shaft on the Pantymwyn Vein, and connected it by a level to the Milwr Tunnel. Work was suspended during the war, when the mine was used for the storage, among other things, of poison-gas shells from the large munitions factory, extending down the south side of the river from the site of the old Rhydymwyn foundry. Mining was resumed after the war (for limestone as well as lead ore), and the tunnel was extended further south, eventually, by 1958, reaching the Cathole Vein, ten miles from its portal at Bagillt.

<sup>113</sup> Smith, *op. cit.*, 25; Lewis, *op. cit.*, 231-2. Many details of the scheme are given in Ministry of Munitions files among the records of the Ministry of Power (P.R.O., Power 16/137-139).

<sup>114</sup> J. L. Francis and J. C. Allan, 'Driving a Mines Drainage Tunnel in North Wales', *Transactions of the Institution of Mining and Metallurgy*, xli (1931-2), 234-302.

<sup>115</sup> Lewis, *op. cit.*, 233.

<sup>116</sup> J. B. Richardson, 'Attempts at Sealing off River Water from Underground Workings in North Wales', *Bulletin of the Institution of Mining and Metallurgy*, lxiv (1954-5), 211-22.

## APPENDIX I

## PUMPING AT MOLD MINES 1825-45

The Mold Mines were remarkable in the Taylor era for the quantity of water pumped from them. In his *Records of Mining* (1829) John Taylor claimed that more water was lifted by pumps there than at any other mine in Britain: ' . . . The power applied is derived both from steam-engines and overshot water-wheels; of the former there are seven with cylinders from 36 to 66 inch diameter, of the latter, four of 44 feet diameter each. The pumps are of extraordinary dimensions, being from 22-inch bore to 10-inch, but the principal part of 18-inch, reckoning always the diameter of the working barrels or the plunger poles. Fifteen lifts discharge into the different adits, and often deliver more than 80,000 pounds [8,000 gallons] of water *per* minute, from a depth averaging about 50 fathoms.' Pumping costs at the mines between 1824 and 1845 amounted to £60,747.

The location of the various engines and waterwheels (and the size of the pumps, where known) was as follows:

## PEN-Y-FRON MINE — Pumps worked 1825-30

Old Engine Shaft	66in. engine	22in. pumps
Bryncelyn Shaft	64in. engine	18in. pumps
Taylor's Shaft	63in. engine	Erected 1827; replaced a water-pressure engine and rods from 64in. engine at Bryncelyn
Waterwheel Shaft	44ft. waterwheel 7ft. breast	18in. pumps
Nell's Shaft	—	18in. pumps [? worked by waterwheel at Waterwheel Shaft]

## RHYDYMWYN [i.e. E. end of Pen-y-fron Mine] — Pumps worked 1826-37

Brick or West Iron Shaft	46in. engine	Also worked Whim Shaft by rods across river Alyn and through a level
Wheel Shaft	44ft. waterwheel 8ft. breast	18in. pumps

## LLYN-Y-PANDY MINE — Pumps worked 1825-30

Mountain Shaft	44ft. waterwheel 8ft. breast	
[?Perrin's] Shaft	44ft. waterwheel 8ft. breast	Wheel probably on leat below Mountain Shaft working Perrin's Shaft by rods



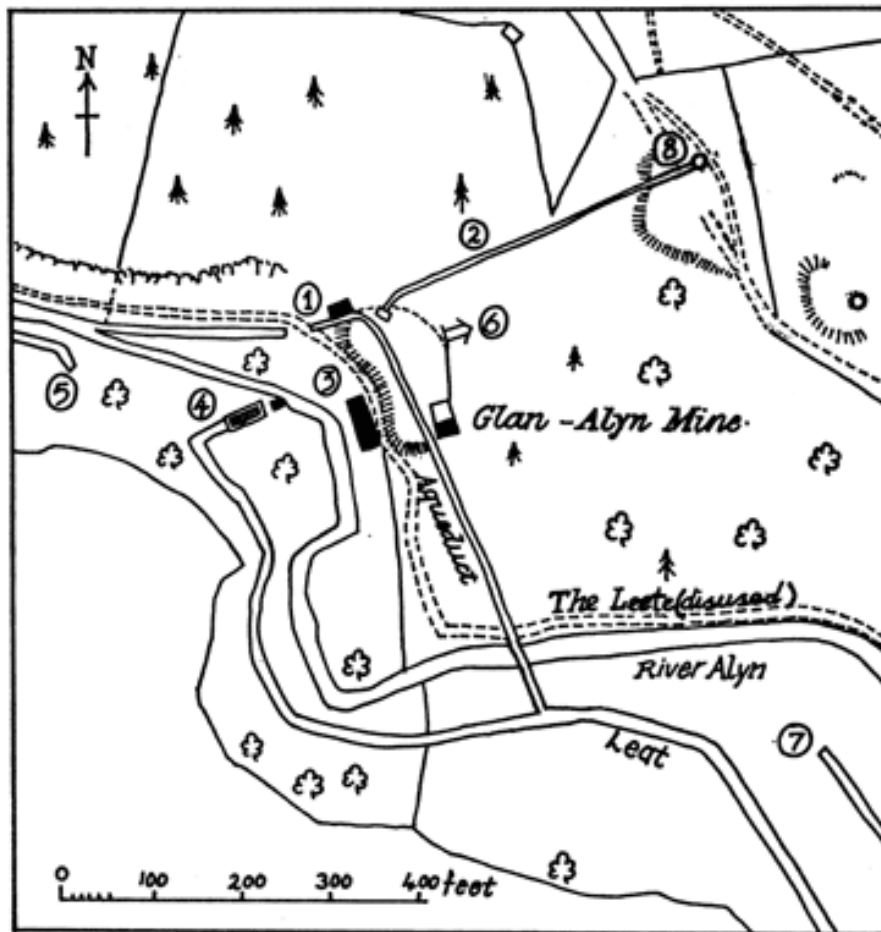


FIG. 4. The Glan Alyn Mine, from the O.S. 25-inch map, 1870. (1) pit for waterwheel installed 1772-4, and adapted in 1864 for a turbine; (2) flat rods to Pen-y-garreg wen Shaft; (3) site of waterwheel installed by 1863; (4) 40ft. waterwheel, installed by 1870; (5) tailrace of leat to waterwheel flowing from culvert; (6) adit; (7) tailrace of leat from corn mill enters culvert; (8) Pen-y-garreg wen Shaft. (For further details, see Appendix II.)

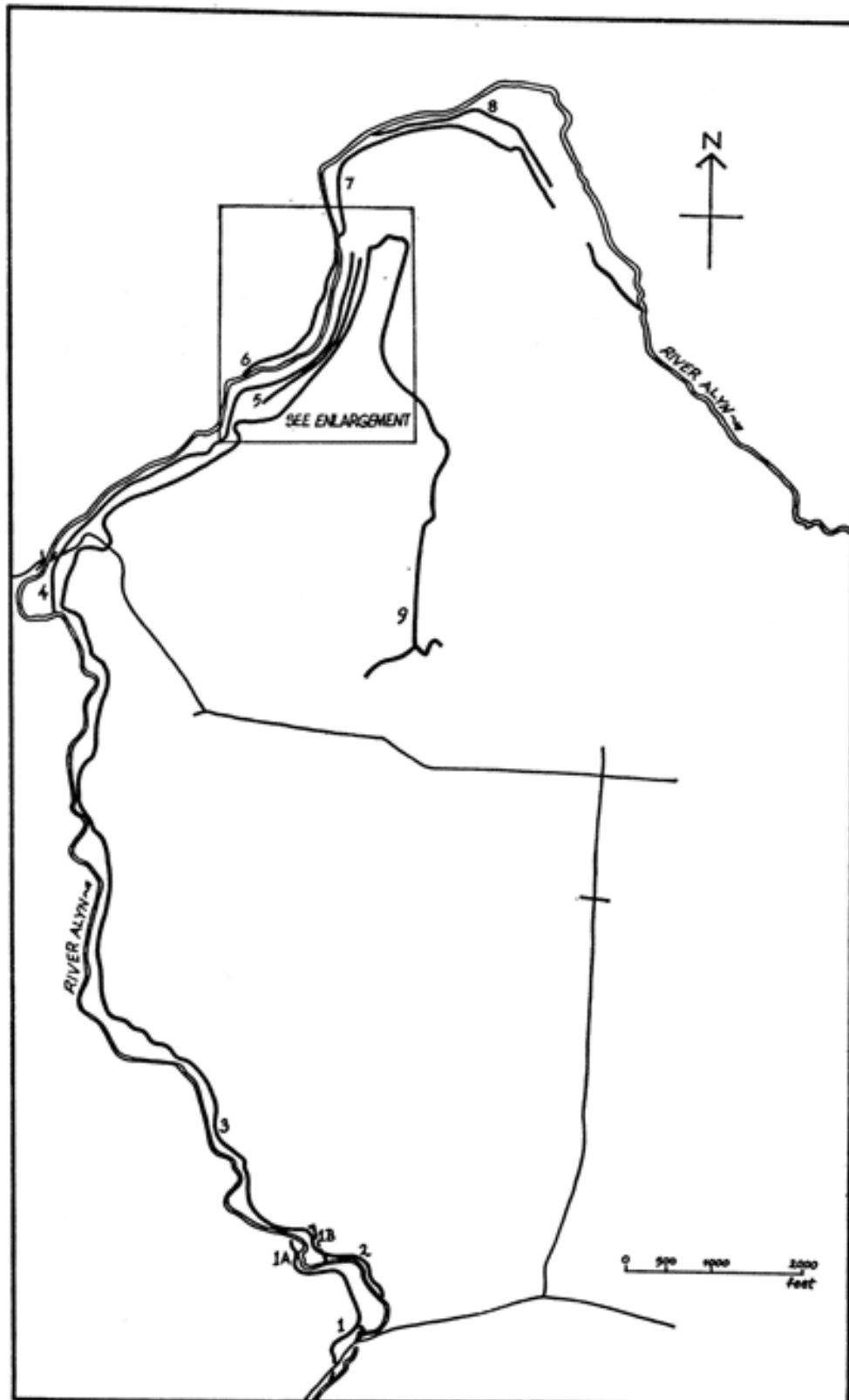


FIG. 5. The leats of the Alyn valley: (1) corn-mill leat, later extended (1A, 1B) to Glan Alyn Mine; (2) upstream extension of the Leete; (3) the Leete; (4) lower leat to Pen-y-fron (Bryncelyn) Mine; (5) middle leat to Pen-y-fron; (6) eighteenth-century leat to Pen-y-fron; (7, 8) leats to Rhydymwyn foundry area; (9) leat taking water pumped from Pantymwyn Mine to Pen-y-fron. (For enlargement of the Pen-y-fron area, see Fig. 6; and for further details of the leats, Appendix II.)

Andrew's Shaft	Water-pressure engine	At work 1827
Conqueror of Wales Shaft	80in. engine	Erected about 1827-8. Later removed to Cathole and Minera
PANTYMWYN MINE — Pumps worked 1825-8, 1834-45		
Engine Shaft	50in. engine	Also worked West Flat Rod and Boundary Shafts by rods
PANT-Y-BUARTH MINE — Pumps worked 1827-33		
Engine Shaft	36in. engine	Erected 1827
SOUTH MOLD — Pumps worked 1825, 1828-39, 1845		
Cathole Engine Shaft	80in. engine	Formerly at Conqueror of Wales Shaft
Rainbow Engine Shaft	A 'small engine'	

Sources: report on Mold Mines, 1827 (C.R.O. D/DM/219/92); evidence of John Taylor junior in connection with Halkyn District Mines Drainage Bill, 1875 (C.R.O. D/KK/1143); Smith, *Lead and Zinc Ores* . . . (1921), p. 83.

## APPENDIX II

### THE LEATS IN THE ALYN VALLEY

A series of watercourses or leats supplied water to the mines in the Alyn valley. Some of these leats date from the eighteenth century, but most were built during the period when the Mold Mines were operated by John Taylor, 1823-45. The leats are shown in Fig. 5.

The furthest upstream of the leats (No. 1 on Fig. 5) may also be one of the oldest. It leaves the river a short distance above Loggerheads and feeds a corn mill (which was in existence by 1796)<sup>117</sup> before continuing (probably at a later date) down the west bank of the river to the Glan Alyn Mine on the west side of the Cathole Vein. Originally a waterwheel installed in 1772-4<sup>118</sup> on the east bank (about SJ 196629) worked pumps in Pen-y-garreg wen Shaft by means of flat-rods running up the

<sup>117</sup> The mill is shown in a watercolour, 'View from the Loggerheads', 1796, by J. Ingleby, in the N.L.W.

<sup>118</sup> C.R.O. NT/148, accounts of Loggerheads Mine, 1769-77.

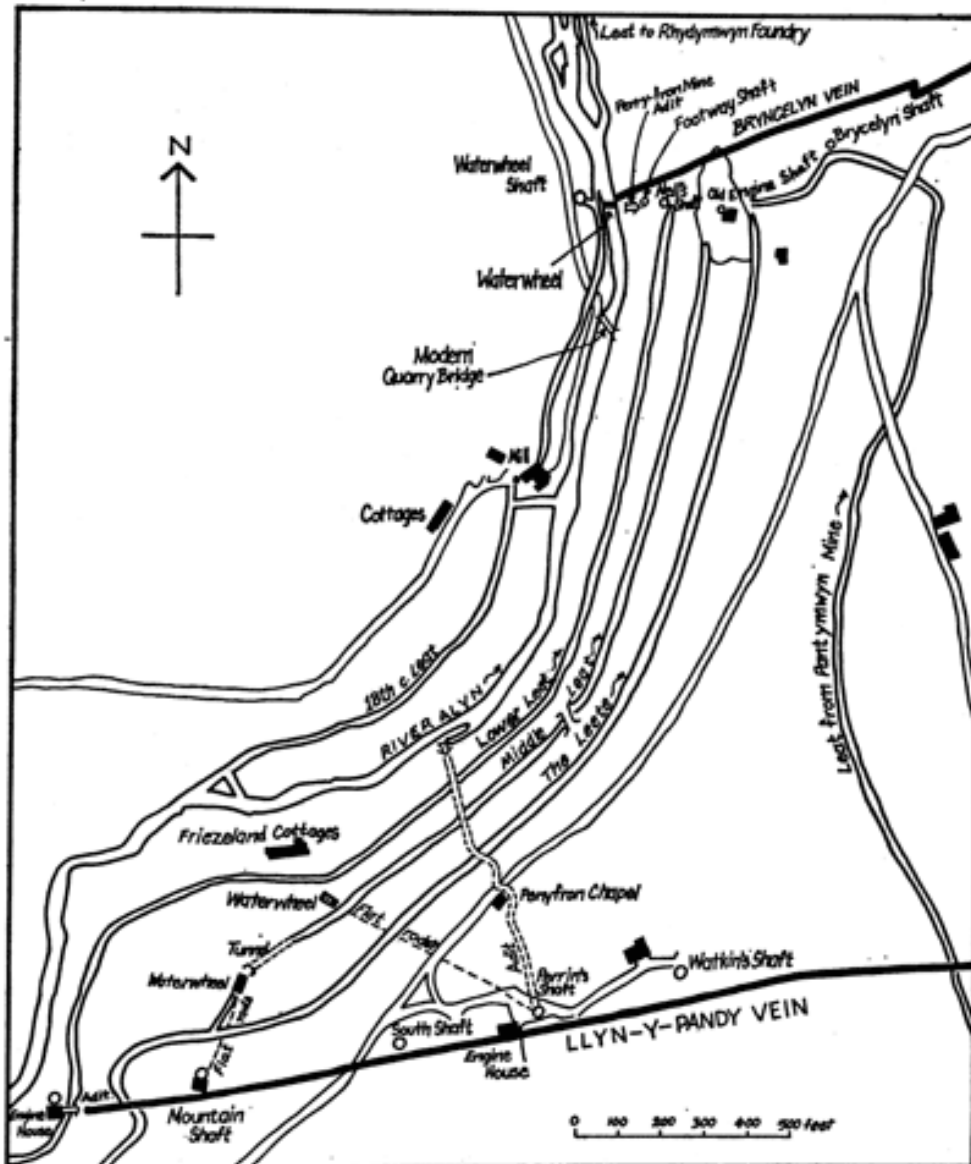


FIG. 6. Leats running to the Pen-y-ffon (Bryncelyn) Mine. (See Appendix II.)

hill. The gully cut for the rods is still visible, although it has been partly quarried away. Accounts refer to a leat several hundred yards long, presumably running up the east bank of the river.<sup>119</sup> By 1863 a wheel in a wheelpit on the east bank a short distance upstream (since removed, at SJ 19626291) worked rods running into the mine through the Cathole or Glan Alyn adit (now run in, 40 yards away from the wheelpit).<sup>120</sup> This probably worked pumps in a shaft further east than Pen-y-garreg wen Shaft. The wheel was fed by a leat (2) running up the east bank of the river to a point where there is now a footbridge over the river (SJ 19876270). In the lower part of its course it follows the Leete, which it apparently post-dates. By 1870 this wheel had been superseded by a bigger wheel, 40ft. in diameter, and 6ft. breast, in a wheelpit on the west bank of the river opposite (SJ 19586290), fed to a continuation (1A) of leat 1 (Figs. 4, 5).<sup>121</sup> To judge from its alignment, this wheel also worked pumps in the mine by flat-rods running up the adit. From the same leat (1) a raised launder (1B) ran across the river to a building at the foot of the gully running up to Pen-y-garreg wen Shaft, on the site of the eighteenth century waterwheel. A pit about 14ft. square is still visible in the ground at this point; it probably represents a rebuilding of the original wheelpit to accommodate a 40 h.p. turbine, installed in 1864.<sup>122</sup>

The Leete itself (2(part) and 3 on Fig. 5) leaves the river about a quarter of a mile downstream of Loggerheads (SJ 19686282), and runs down to the dressing floor at the Pen-y-fron Mine (SJ 19866623). This position, on the crest of the hill, would allow waste water from the dressing floor to be used for the wheel in the bed of the river below for pumping in Waterwheel Shaft (Fig. 6). The Leete was begun by 1 January 1824, for it is shown as a 'new watercourse' on a map endorsed on a lease of that date from Earl Grosvenor to the proprietors of the Mold Mines.<sup>123</sup> Examination of well-preserved sections, and tunnels where it passed under roads, shows that it was about 7ft. wide and between 4ft. 6in. and 5ft. deep. A lower, shorter leat (4) was also built to supply the wheel at Waterwheel Shaft; it leaves the river at a bend about 350yds. upstream of Pont Cilcain (SJ 18776501). The Leete itself is shown as a watercourse on the first edition of the Ordnance Survey 1-inch map, surveyed in 1834-5.<sup>124</sup> By 1827 it had reached Mountain Shaft on the Llyn-y-pandy Mine, for a wheel (SJ 19486571) worked from it is shown on a section of the mine in Taylor's report of that year.<sup>125</sup> From this wheel a middle leat (5) took waste water to the Pen-y-fron Mine, where it supplied either the dressing floor or the wheel at Waterwheel Shaft. An eighteenth-century leat (6), later used

<sup>119</sup> *ibid.* Both an upper and lower watercourse are referred to.

<sup>120</sup> C.R.O. D/GR/1764, map of Glan Alun Mine, 1863.

<sup>121</sup> *Mining Journal*, 1870, p. 59, 1872, p. 269.

<sup>122</sup> *Mining Journal*, 1864, p. 845.

<sup>123</sup> C.R.O. D/GR/44.

<sup>124</sup> Photostats of surveyors' drawings in C.R.O.

<sup>125</sup> C.R.O. D/DM/219/92.

by a corn mill, supplied an earlier wheel at this shaft when the mine was worked by Richard Ingleby. It is shown in a watercolour of 1796 (Plate 1) and on a map of c. 1799.<sup>126</sup> This leat also supplied another wheel on the east bank by a launder running across the river near the corn mill (SJ 19706608). From below Pen-y-fron Mine two leats ran to Rhydymwyn foundry. The older (8) is shown on an estate map of 1757<sup>127</sup> as supplying wheels at two buildings; these were probably corn mills, although their position near shafts at the east end of the Bryncelyn Vein may indicate use for mining purposes. The later leat (7) is shown on a map of 1820.<sup>128</sup> Lastly, a leat (9) took water pumped from the Pantymwyn Mine to augment the Leete at Pen-y-fron.<sup>129</sup>

### APPENDIX III

#### PRODUCTION OF THE MOLD MINES

These figures for the production of the Mold Mines are taken from a report on the output of lead concentrates prior to 1930 in the Halkyn District United Mines area, from Halkyn to Llanarmon, compiled by the mining engineer, Captain J. L. Francis, in 1937 (C.R.O. D/GR/531). They are based on official statistics, from 1853, supplemented by figures supplied from balance sheets and by the secretaries of mining companies operating in the present century, and on Taylor's reports on the Mold Mines, from 1825. (The present location of these, apart from one for 1827 (C.R.O. D/DM/219/92), is unknown.) Estimates for the earlier period are based on the area stoped in each mine, obtained by study of old mine plans and examination of the workings. The remarks in the last column are by Francis, unless otherwise indicated. References with the date 1740 are from maps by Thomas Badeslade, then in the Halkyn Estate Office, and now in the C.R.O. (D/GR/1679-1680). The numbers for each lode refer to a grid system adopted for ease of reference in the 1930s. The figures exclude production by Halkyn District United Mines after 1930, which reached a peak of 21,689 tons in 1934.

<sup>126</sup> C.R.O. D/DM/50/1.

<sup>127</sup> C.R.O. D/GW/655.

<sup>128</sup> C.R.O. D/GW/693.

<sup>129</sup> Plan of Pant-y-buarth United Mines, late nineteenth century (copy in possession of Mr. P. J. Appleton, Minera).

<i>Lode or Mine</i>	<i>Operator or Mine</i>	<i>Date</i>	<i>Lead concs. (tons) known</i>	<i>Estimated addnl. prod.</i>	<i>Total prod.</i>	<i>Remarks</i>
GARREG BOETH (Lode 627)		1853-4 & 1863	83			Lode previously extensively worked at western end. Lode worked by tributaries after 1912. †Smith (1921) ascribes 5,614 tons lead and 89 tons zinc ore to Bryncelyn (CJW).
		1909-17	5,713†	5,796	—	
PYDEW (Lode 621)	South Halkyn & Rhydymwyn Mining Co.	1909-12	120			
BRYNCELYN CROSSCOURSE	" "	1908-9	99			
CEFN CILCAIN, or COED DU	Cefn Cilcen Mine Co.	1862-3	48	267	—	267
BRYNCELYN (Lode 596)	Mold Mines Bryncelyn Mining Co.	1825-37	13,703			The lode had been very extensively worked by Ingleby prior to 1825 when output is stated to have been 70 tons per week when mine was drained. Estimate [of additional production] based on areas stopped. †Also 90 tons zinc concentrates.
		1875-7	35			
LLYN-Y-PANDY (Lode 576)	South Halkyn & Rhydymwyn Mining Co.	1903-7	242†	13,980	27,553	41,533
		1826-30	125			
		1903-8	223†	348	20,000	20,348

Lode or Mine	Operator or Mine	Date	Lead Total Estimated		Remarks
			concs. known (tons) prod.	addnl. Total prod.	
SOUTH LLYN-Y-PANDY (RHYDALYN) (Lode 563)	Rhydalun Mine Co.	1876-84	1,315		This lode is the only modern example of 'tribute' working in the area.
	South Llynypandy Mining Co.	1888-98	4,452		
	Llynypandy Mining Co.	1904-6	1,073	6,840	
PANTYMWYN (Lode 547)	Mold Mines	1825-45	7,312		Lode extensively worked prior to 1825, and had been worked in 1740. Worked intermittently from 1859 to 1883. Estimates based on areas stoped. †Entered in statistics as Pantymwyn or Mold. ‡Also 73 tons zinc concentrates. §Also 1,267 tons zinc concentrates.
	Hargreaves & Others†	1859-83	1,870†		
	Pantymwyn Mining Co.	1905-9	1,654§	10,836	
BWLCH-Y-DDEUFRYN	Mold Mines & Cross & Co.				Worked intermittently by Mold Mines from 1830 to 1851, but details of output lacking. Probably included under 'Small Mines'. The mine was an old one when taken over by Mold Mines. It was known as 'The Great Lead Work' in 1740. Estimate based on John Taylor's statement that output had been immense. †Also 619 tons zinc concentrates. ‡Probably includes 240 tons from Trevathen Lode.
PANT-Y-BUARTH (Lode 524)	Mold Mines	1825-33			The mine was an old one when taken over by Mold Mines. It was known as 'The Great Lead Work' in 1740. Estimate based on John Taylor's statement that output had been immense. †Also 619 tons zinc concentrates. ‡Probably includes 240 tons from Trevathen Lode.
		& 1841-5	2,296		
	Pantybuarth Co.	1860-3	94		
		1874-9	28		
	Brunner, Mond & Co. Pantybuarth Mining Co.	1882-91	224		
		1898-1906	382†		
		1911-19	271‡	3,295 20,000 20,295	



<i>Lode or Mine</i>	<i>Operator or Mine</i>	<i>Date</i>	<i>Lead concs. known (tons) prod.</i>	<i>Total Estimated addnl. prod.</i>	<i>Total prod.</i>	<i>Remarks</i>
<b>DEBORAH</b>	Wasley	1878	1	1	1	
<b>CATHOLE (Lode 477) &amp; FRON FAWNOG FLAT</b>	Mold Mines	1825-57	21,000†			Mold Mines reports include Fawnog Flat in Cathole output. Mine extensively worked prior to 1825. Pumping stopped 1845. Estimate based on areas stoped. Much of the output after 1857 was probably from flats at Gwernynydd, Fron Isa and Fron Haul Mines. The western end of the Cathole Lode had been worked in 1740. †Also 18 tons zinc concentrates.
	Glan Alun Mining Co.	1867-72	234			
	Gwernynydd Co.	1879-80	149			
	"	1886	13			
	Brunner, Mond & Co.	1900-4	48			
	Fron Isa Mining Co.	1858-63	153			
	Fron Haul Mining Co.	1863-5	83			
"	"	1875-88	223	21,903	42,000	63,903
<b>SMALL MINES</b>	Mold Mines	1824-49	13,503	13,503	—	13,503
Total lead concentrates: 186,978 tons			Total zinc concentrates: 2,081 tons			

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