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POST-MEDIEVAL FIRESETTING IN BRITISH METAL MINES: THE ARCHAEOLOGICAL EVIDENCE

By John Barnatt and Terry Worthington

INTRODUCTION

Starting in 2000, detailed research into the surviving evidence for firesetting employed in mines, and its interpretation, has been carried out in the Peak District. While a few examples of mines in the region where archaeological evidence exists have long been known,[1] until recently this had not been widely publicised nor studied in any detail. It had often been assumed that the use of this extraction technique had been the norm in the Peak lead mines since time immemorial, before being rendered redundant with the introduction of gunpowder for blasting in second half of the 17th century and its common adoption in the early 18th century. While firesetting in prehistoric and later metal mining contexts is well attested throughout Europe and beyond, the recent research suggests its use in the Peak District lead mines may well have had a narrow date range, with much of this activity restricted to the 16th-17th centuries AD and only taking place under specific circumstances.

In the Peak District 31 mines, out of about 90 mines searched, have produced good evidence that firesetting has been employed (with evidence at High Tor Rake found subsequent to going to press).[2] In all but one case the primary fuel used for the fires was coal. Most of these mines have evidence for only isolated small-scale trials in which firesetting was employed but there are several notable exceptions where it was used extensively. The first detailed results of the research project have recently been published, which include a review of historic documentation, a corpus of known sites, a detailed assessment of the Northern Dale mines and preliminary general observations.[2] Further accounts of specific mines and a final overview will follow.[3] Many of the arguments given in summary in the current short paper for British Mining are presented in full in the previously published work.

This paper for the Northern Mine Research Society has two main purposes. It presents four new radiocarbon dates that have been obtained from firesetting detritus in Peak District mines. It also gives a summary of the character of the archaeological evidence in the Peak and reviews known examples of post-prehistoric firesetting elsewhere in Britain. While these topics have been presented elsewhere, they are repeated here in the hope that this will encourage others to search their respective regions of Britain to establish whether comparable evidence is common, or whether the use of firesetting in metal mines had distinctly different trajectories from region to region. In the case of the character of the archaeological evidence, further observations are presented here when compared with the previous publication, as an aid to others who want to take up the challenge.

RECOGNISING THE ARCHAEOLOGICAL EVIDENCE

The use of firesetting in Peak District mines has left a series of distinctive archaeological character traits that can readily be identified. Some may well be common to fireset

mines wherever they are found, others reflect the nature of the limestone that was fireset, while other rocks elsewhere may have been changed differently and some could potentially be specific to mining activities in the Peak. They are as follows:

Passage Shape

Most fireset vein workings are particularly narrow, where not enlarged later they usually are only 0.3-0.5m wide. Some comprise tall stopes, but other veins were only trialed at specific horizons and here fireset passages are sometimes only about 1m high. In other instances mineralised flattings were followed using firesetting and these workings are often only 0.3-0.6m high. Normally all such passage forms can only be identified with confidence as modified/created using firesetting by the presence of distinctive fireset surfaces (see below). However, fireset workings often also have distinctively-shaped passage details. At veins, fireset workings narrow at the top in similar fashion to a 'Gothic arch'. In addition, sometimes the vein itself has been picked as a slot after sooting of the top took place. At flattings the low fireset workings commonly have curving sides and roofs, with a low 'Romanesque arch- or dome-like' appearance. This is not always the case, because in places the heat-altered surfaces have been broken

Figure 1. A typical fireset flatting with domed roof and sides, with a good example of heat-altered surfaces to the left, at Lords and Ladies Mine in Northern Dale (copyright: Paul Deakin FRPS).

away by miners and here the passage roof can follow the natural bedding. In some cases curving 'pillar-like' areas of rock exist between individual close-spaced areas of firing. The sites of specific fires can sometimes be identified by small discrete domes in the roof.

COLLIERY INRUSHES AND THE DISASTER AT THE MOORCROFT COLLIERY, BRADLEY, AUGUST 1813

By Barry Job

Mining has always been recognised as a dangerous industry. The danger of an inrush of 'water or material which will flow when wet'[1] is a traditional mining hazard. Historically the risk was from strata water or surface water but as mines became exhausted and worked deeper, the risk from old flooded workings became greater. An inrush may result in a long rescue operation and, along with explosions, they have always captured the imagination of the public. Early events were largely unrecorded, but once the coverage of the press had become established; the event would be well publicised, increasing the interest.

Were inrushes the great danger that the public might imagine? Following the Coal Mines Regulation Act in November, 1850, the Mines Inspectorate became established and it became a requirement to record all fatalities in coal mines. From 1851 fatal inrushes were recorded as a warning to others so that the circumstances should not be repeated. Thus from that year the inrush danger could be compared to others that the coal miners of England, Scotland and Wales[2] faced. Table 1 clearly shows that deaths from Inrush were only a fraction of those from Explosion, which themselves were less than deaths from Falls of Ground.[3] The latter category may include multiple deaths from a major fall but most of the deaths in this category were single fatalities, particularly where coal was undercut by hand and the collier might hew up to six feet under the face to weaken the coal prior to bringing it down with a pick. Of course this slot should be adequately supported whilst the collier was lying on his side under the coal but often it was not. The deaths from Falls of Ground did not excite the public's imagination in the same way as inrushes and explosions, so there was never the same public outcry and calls that 'something must be done'. This cause of death would only be removed with the introduction of undercut machines and rules for effective support of roof and sides. Figure 1 depicts the number of fatal inrushes and deaths for every decade. Two major peaks can clearly be seen in 1891/1900 and 1921/1930. These are attributed to the inrush at Audley Colliery, North Staffordshire[3] in 1895 when 77 died, and the inrushes at Redding Colliery, Falkirk in 1923 with 40 dead and Montagu View Colliery, Northumberland in 1925 when 38 died. These have been the most serious inrushes since 1851. Prior to that date the inrush with the highest loss of life was Heaton Main, Northumberland in 1815 when the death toll was generally given as 75, although interestingly the total was never established exactly and some accounts put it as high as 90.

The causes of an inrush[4] are varied and may arise from contact with surface water or glacial deposits, during shaft sinking or clearing old shafts, failure of an underground dam or seal, or contact with strata water, although the latter is surprisingly rare. However, by far the most common cause, resulting in 78% of fatal inrushes, is contact

GOLD IN THE MAWDDACH

By John Bennett and Jeremy Wilkinson

The history of the discovery of significant quantities of gold in the quartz lodes of the Dolgellau gold belt and their subsequent exploitation by numerous mining companies over the years has been well chronicled by Hall[1] and Morrison[2] and efforts to raise gold from the Mawddach river should be seen against that background. Figure 1 shows mine site locations and places referred to in this paper.

The individual credited with making the initial find in 1843 was the prominent Mining Consulting Engineer, Arthur Dean, who spotted gold among the lead concentrates at the Cwm-heisian mine, some miles to the north of Dolgellau, which itself lies on a tributary of the Mawddach. This led to a quickening of interest in the gold mining prospects, culminating in 1853 in what is sometimes referred to as the Welsh gold rush, though not in capital letters, neither miner nor speculator meeting with any remarkable success at this stage.

Towards the end of this period, in 1852, is found the first reference to efforts to pan the alluvial gold in the river, though it is entirely possible that occasional adventurers may have washed the riverbed any time before 1852 and back to the Roman occupation or before. If they did, it does not seem to have been worthy of record.

Attention was brought to the 1852 venture in an article by Prof. A.C. Ramsay[3] in the Proceedings of the Geological Society in February 1854, in which he states his belief that washing the bed of the river might be rewarding, gold having been discovered there in significant quantity by the Hon. Frederick Walpole and Mr Augustus Webster during that year.

These two were gentlemen of some substance, both Royal Navy officers, Walpole a scion of the family of the first Prime Minister, Hugh Walpole, Webster subsequently to be knighted but, perhaps most significantly, both sometime directors of the Quartzburg Gold Mining and Importing Company of Mariposa County in California.[4] This was an important centre of placer mining, as the recovery of mineral deposits from the sands and gravels on the bed of a river or sandbank is described. California had experienced the great gold rush of the ‘49ers just two or three years previously, when attention had been heavily concentrated initially on the extraction of the placer gold deposits, though Quartzsburg miners were turning their attention to mining the gold-bearing quartz by 1851.

Walpole and Webster would, therefore, have been conversant with the techniques required to wash the gold and would have been much aided with their prospecting by exceptionally low water in the Mawddach in 1852. Morrison[5] drew attention to this state of the river in that year and also in 1870 and 1897, dates which, it will be seen

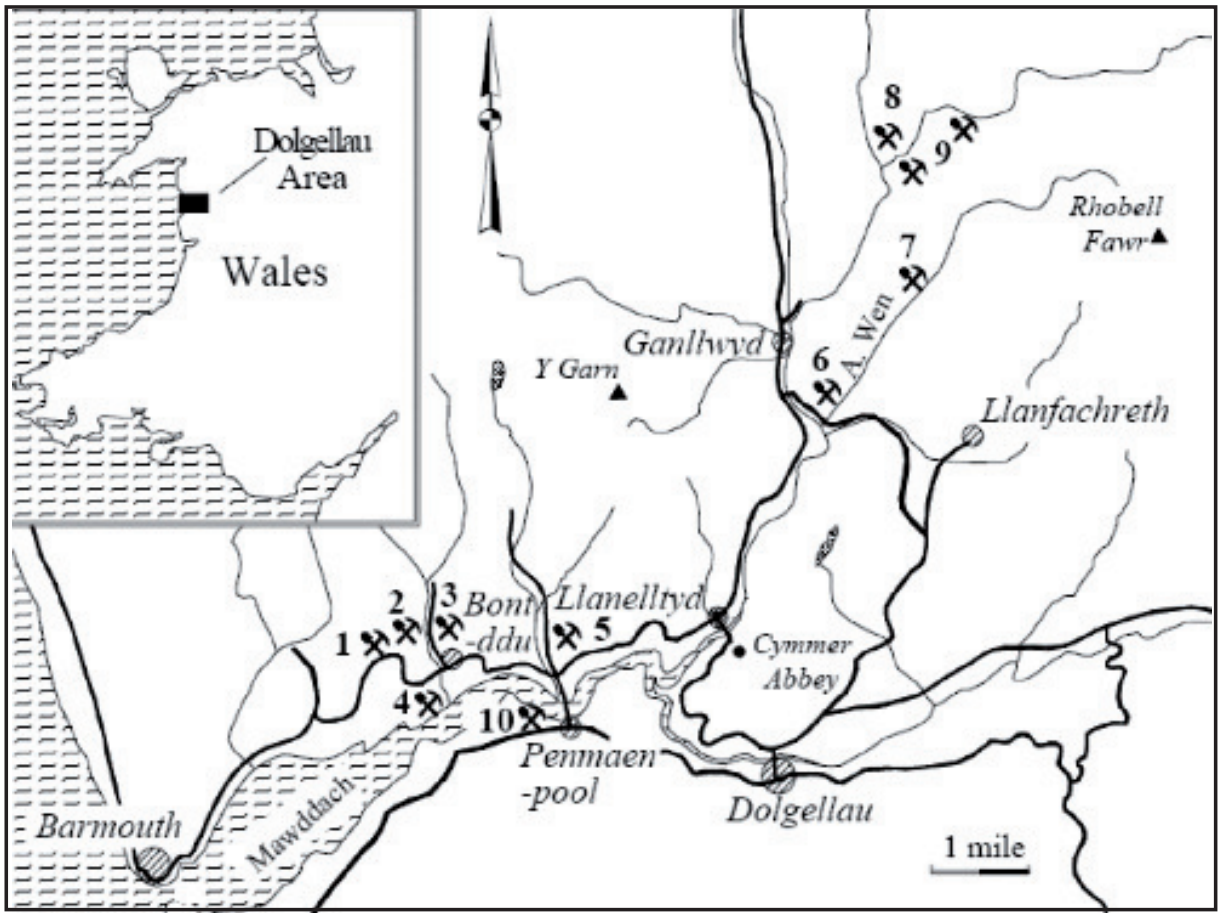


Figure 1. Dolgellau / Mawddach area showing the locations of gold mining operations referred to in this paper.

1. Cae Gwian. St. Davids Gold Mining Co. Ltd (1862). 2. Vigra 3. Clogau.
4. Bontddu Works (1897). 5. Caemabseifion. East Clogau Gold Mines Co. Ltd. (1862).
6. Tynbenrhos. Readwin placer mining (1862). 7. North Dolfrwynog. Placer mining (1862).
8. Gwynfynydd. 9. Cwm Heisian mines. 10. Penmaen Smelting Works

later, were not without significance. Perhaps surpnsingly, Ramsay's report in 1854 that gold may well be found below the confluence of the Mawddach and the Afon Wen and elsewhere did not appear to lead to any concerted effort to recover this treasure, in spite of the apparent success of Walpole and Webster two years before.

Nor did Ramsay's, article, though encouraging in his description of the potential of the gold mines in the neighbourhood of the Cwm-heisien mines, where Dean had made his original discovery, stir any great interest among miners or speculators during the years after the first 'rush'. They were, no doubt, suspicious of the whole exercise after the chicanery and the disappointing results which followed the initial excitement of the first 'rush'. Not, as Hall points out, that this means to say that useful quantities of gold were not recovered in the early 1850s, and he points out that gold production increased during the years immediately before 1862, especially in the Clogau, or St Davids Mine, which lay near Bontddu, well down the river from the Cwm-heisien mines.[6] This venture, promoted by Messrs Readwin and Williams was producing significant and steadily

A TENTH CENTURY LEAD SMELTING SITE IN WEST ALLENDALE

By Raymond A. Fairbairn

INTRODUCTION

In April 2007, the author's attention was drawn to the discovery of lead slag in a service trench that was dug on haugh land below Parmontley Hall on the west side of the River West Allen south of Whitfield (Figure 1). Lead has traditionally been mined in the region though the site is north of the main mineral veins. Part of the Allendales may have been the property of Hexham Church, built by St Wilfred on land given by Queen Aethelthryth about 674, although the exact details of the grant are unknown. The church and monastery may have been destroyed in 875 by Halfdene the Dane, though there is a suggestion that the church continued to function in some form but did not have a bishop. As early as 688, Bishop Eadbert had succeeded to the see of Lindisfarne and had set about rebuilding the abbey in stone, using lead for the roof. During the late 9th century, Northumbria became a Danish kingdom centred on York until the Irish-Norse conquest of 919. A period of some stability followed during the reigns of Edward the Elder and Athelstan and thoughout England rebuilding took place. There was a need for lead for ecclesiastical buildings at York, Lindisfarne and Hexham and elsewhere and this is the most probable use for the lead made at the smelting site.[1,2]

THE SITE

The site, NY 78112 55055, is on the Blackett-Ord Whitfield estate and it was during their works to install gas and electricity services that the slag was revealed (Figure 2). It is an unlikely location to carry out lead smelting being situated at the extreme western edge of the haugh below a steep slope and thus protected from the prevailing wind and is away from the present river, though where the river flowed at that time is not known. It should be noted that the site is on private property and has been fully restored so that there is nothing to be seen there now. The service trench was sufficiently deep to cut the heap of slag and also to penetrate the original land surface beneath. The cross section revealed is shown in Figure 3. A series of very small pits was dug at 1.5 metre intervals through the agricultural layer to detect the hard slag layer. This revealed that the trench had only cut through the edge of the slag heap and, in all, it was probably about 9 metres diameter, though there may have been some spreading of the site due to ploughing.

The lead slag lies upon a mound consisting mainly of fine silt with an addition of what appears to be wood ash. Within the lower mound, mainly near the upper surface some small pieces of charcoal are present. The origin of the mound is not obvious, it could have been the remains of a clamp for producing charcoal but the ground is not reddened.

The slag is vitreous, black and shows surface evidence of flow; vesicles and occasional small prills of lead are present within the slag. No attempt seems to have been made

MINING IN MID - ARGYLL

By Alexander G. Rankine

During past volcanic activity, molten rock material has pushed up into the surrounding country rocks. This material gave off hot water, rich in dissolved minerals, and, as it rose through the existing faults and cracks, these minerals were deposited as the water evaporated. Left behind were the familiar veins of quartz and calcite or barytes, which we can see today running through the rocks of the area. In some of these veins were also deposited metallic ores of copper (copper pyrites), lead (galena), zinc (blende) and nickel (nickeliferous pyrrhotite).

It is possible that prehistoric man first worked these ore-bearing veins looking for copper but, if he did, any signs of his workings will have been obliterated by later mining. In more recent times, the earliest reference is to be found in the records of payments made by the Constable of Tarbert. In 1326, his accounts show a payment for *'coal and materials supplied to the lead mines'* but it is not known where these mines were.[1]

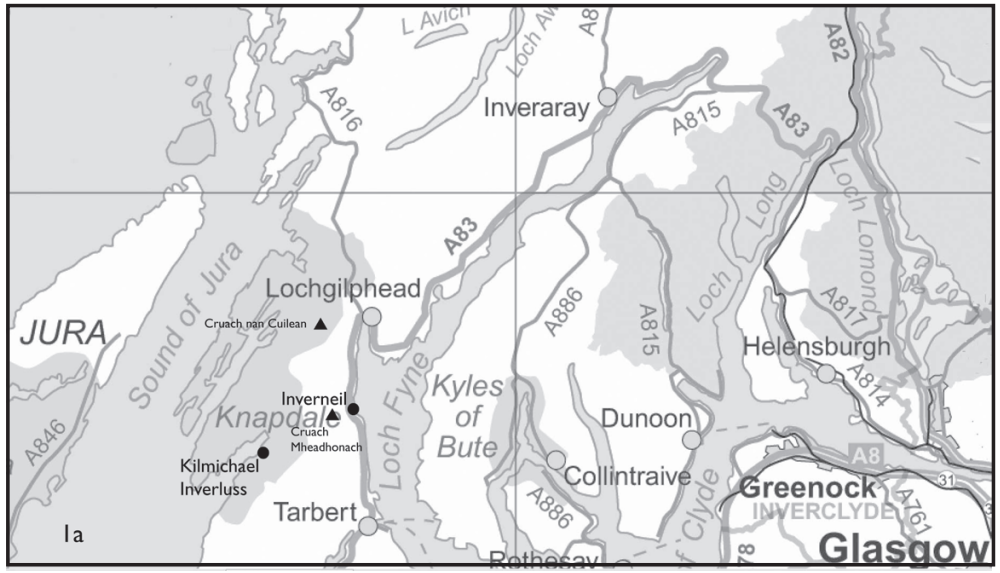
During the reign of Charles II, an Act of Parliament states *'Our Soverane Lord, with advice and consent of his estates of Parliament, ratifies and approves and confirms, ane letter of gift be His Maiestie under the great Seale of His Kingdom of the date of the first day of May 1662 years, whereby His Maiestie gave and granted to Charles Maitland of Haltone, and William Scott of Ardross, power and liberty to search out, work, and use all mines and minerals within the Sheriffdom of Argyle'*.[2]

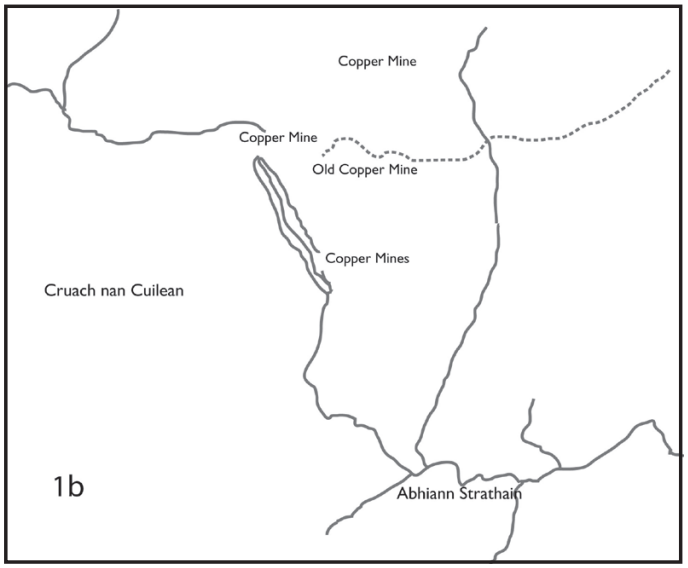
Whether Charles Maitland and William Scott ever found much in the way of mines and minerals we do not know. However, twenty years later, in 1683, a German chemist who at that time was living in Edinburgh, speaks of *'Copper Ore found in Cantyre, in a hill the colour of gold'*.[3] So perhaps they struck lucky with their royal gift.

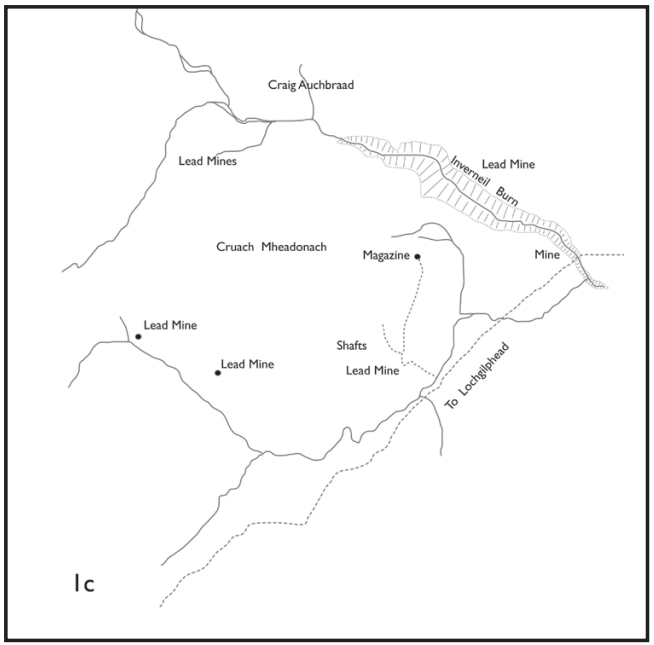
As the following century wore on, lead and copper mining seems to have grown more popular in Argyll. In 1731, Campbell of Ederline, who owned Brenchoille (also known as Craignure), was in dispute with some of his tenants over land rights.[4] It seems that signs of lead had been found on the land and Campbell had miners at work, much to the annoyance of the tenants, who claimed he was breaking agreements. Certainly, a map published by George Langlands of Campbeltown in 1801 shows old copper mines at Craignure, so perhaps Campbell or his successors had some success in exploiting the minerals. From the third Duke of Argyll's instructions to his chamberlain in 1747, it appears that lead mines were being worked in Glen Shira; that air pipes and candles were needed in them suggests that these were not merely surface diggings.[5] In fact, there is some evidence that there were three adits, driven up to about 400 feet. In 1748, the mines are still being worked when the following miners' names appeared:

James Taylor and Donald McFarlane……1/2d per day
Dugald Cameron…… ...8d per day
Malcolm Munro …… ...6d per day

David Williamson came for 12 guineas from Leadhills to advise on the mines.







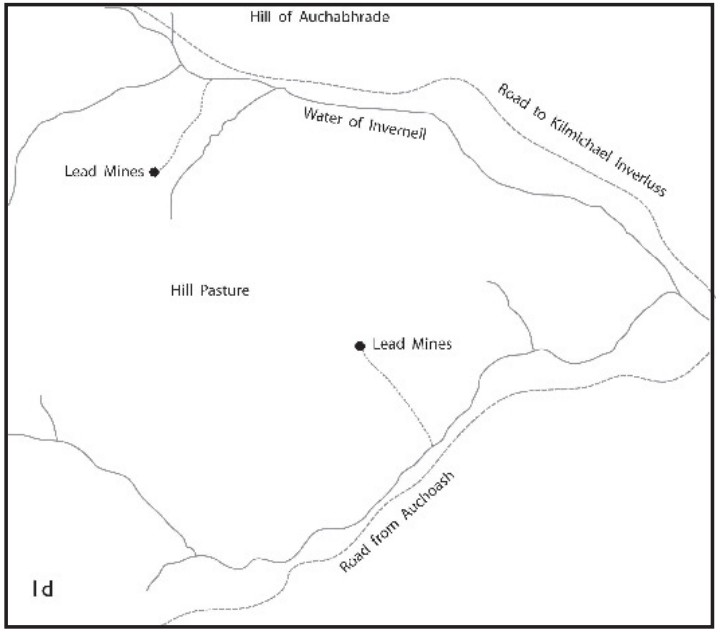


Figure 1 from top left clockwise:

1a Area map of the Knapdale area of Mid-Argyll.

1b Abhiann Strathain mines from the 1872 OS map.

1c The Inverneil Estate from the 1867 OS map.

1d The Inverneil Estate from an estate survey of 1771. Figures 1c and 1d cover the same area but show different place names, details and mines.

TOWARDS A CHRONOLOGY FOR BRITAIN'S COAL INDUSTRY FROM 1854 ONWARDS

By Mike Gill

INTRODUCTION

The 60th anniversary of the nationalisation of the coal mines by a Labour government, in 1947, has passed with little remark.[1] It is more likely that the 70th anniversary of the legislation leading to the nationalisation of the coal itself, by a Conservative government in 1938, will be even quieter.[2] Nevertheless, interest in coal mining continues to grow.

Long before it powered the nation's industrialisation, coal mining was an important rural industry, providing fuel not only for the domestic hearth, but also for, amongst other things, lime burning, iron smelting and smithing, salt making, brick and tile making and brewing. Coal-related developments also had wide ranging effects. For example, Newcomen's fire engine was adopted and adapted by metal miners, while the need to move coal ever further afield to the growing towns and cities, spawned canals, railways and also the locomotives which ran on them.

Unlike the study of metal mining, however, the study of coal mining has been dominated by academic historians, both social and economic, who have sought to answer broad questions on such topics as industrial relations, capital structure and the effects of legislation on the coal industry. Mining historians, on the other hand, have tended to dismiss the study of Britain's coal industry as being unrewarding, too big a task, or simply unglamorous. Except for the work of a few eclectic amateurs, therefore, the sort of detailed studies which have been common amongst historians of non-ferrous metal mining since the mid-1960s are absent, although a myriad books on explosions, inrushes and entombments provide ample testimony to 'blood on the coal' and represent the industry's Menin Gate.

As a result of this neglect, there is a lack of basic research tools to which one can turn when studying coal mining history. There are, of course, some exceptions, especially relating to technology, for example, Pohs' book on mine lights or Alan Hill's books on coal technology and colliery ventilation.[3,4,5] In particular, however, there is a need for an accurate and comprehensive chronology of the industry's rise and demise. Should, for example, researchers wish to know when a particular mine was sunk, by whom, the seams it worked, or when it closed, they are often faced with a bewildering and apparently conflicting range of dates for what is ostensibly the same event.

Ignoring errors and wild guesses, this frustrating problem is caused by otherwise reliable authors failing to specify precisely what they mean by 'opened' and 'closed'. A date given for the start of a colliery may, therefore, be the date that a lease was agreed, the first sod was cut at a new sinking, the seam was reached, production began, or even when there was an official opening ceremony.[6] In the case of a deep mine, these dates

will range over a number of years. The same may also apply to closure. Some seams are abandoned during a mine's life and should, since 1872, appear as such in the Mines Inspectorate's list of plans of abandoned mines. At the end of a mine's life, however, there will be a date for the last coal being worked which, if there was an intention to resume working, may be given as a date work was discontinued. There is also a date for the shafts or drift being capped or filled, and another for the formal abandonment of the entire mine. Again, these dates may fall over many years.

Roger Burt's group at Exeter University collected similar chronological data for Britain's metalliferous mines from 1845 to 1913 in a pioneering project which began in the 1970s. This was the first time that mining historians used a mainframe computer to manipulate data, originally stored on punched cards, to prepare print-ready text for a series of ten county-based volumes, which were published between 1981 and 1992. These made an important contribution to understanding the mineral wealth of Britain and its exploitation and the data has been incorporated with other studies as, for example, an aid to identifying areas of contaminated land. Even now, some 30 years later, the project is still alive, as Mining History UK and is creating on-line documentation and data relating to the UK mining history. It builds on work done with The Mineral Statistics and now includes Duchy of Cornwall and Stannary Returns.

Since Burt's volume on Yorkshire appeared in 1982, the author of this paper has produced a greatly enhanced and extended volume of statistics for Yorkshire's metal mines.[7] David Williams is also working on a similar project covering Derbyshire's non-ferrous metal mines.[8] Similar work on the coal industry is long overdue.

SOURCES OF DATA

Having defined the problem, what data are available to solve it? There are various archival sources which could, and should, be used to painstakingly build up a detailed picture of each mine's history. Nevertheless, faced with over 20,000 variously sized coal mines in Britain, it will be some time before this approach pays substantial dividends. In the meantime, therefore, the approach favoured by Burt's group of extracting data for each mine from the annual List of Mines, along with other government-produced statistics, was adopted.[9]

What became the annual List of Mines was first published in 1854, when a 'List of Collieries' appeared in the Memoirs of the Geological Survey Mineral Statistics of the United Kingdom of Great Britain and Ireland. This and later lists, was based on voluntary returns made by the mine owners to Robert Hunt of the Geological Survey's Mining Record Office.[10] There was some under reporting in the early years but Hunt's persistence and the requirements of the Coal and Metalliferous Mines Regulation Acts of 1872 helped minimise avoidance. At first only the colliery's name, its location (often the nearest town) and the owner's name were given. From 1878, however, the lists give the names of managers and under-managers (the numbers of their Certificate of Competency to Manage a Mine were given later) and, from 1893, they include details of the seams worked and the numbers employed on the surface and underground. Information also varies slightly from inspector to inspector. For example, the 1892

EXPANDING MARKETS SERVED BY THE PRINCIPAL WEST RIDING COALFIELD BEFORE C. 1850

By John Goodchild

EARLY TRADE WITHIN YORKSHIRE

The Romans worked coal in various places within the West Riding exposed coalfield, including that demonstrated by modern archaeology to have been taken from the vicinity of Garforth for use in Yorkand in medieval times coal was taken from the Wakefield area to York. In either case this was by road carriage or more probably by making use of the natural river navigation which in medieval times extended upstream on the river Aire to Knottingley. By the end of the 17th century coal from the Barnsley area was being carried to York, via Knottingley. An account refers to over 103 tons of it being sent in 1699, before the opening of the Aire & Calder Navigation to Leeds and Wakefield at the end of 1700. Vessels carrying up to 30 tons apiece then traded up to Knottingley but it is significant that in 1675 in a lease of Castleford Mills, (above Knottingley Mills) prohibited the leaving of coal on the owner's land adjoining the mills, as it would be to the detriment of the mill owner, who was also a colliery owner. This suggests the possibility of the existence of some sort of pre-navigation method of passing the weir at Knottingley Mills, perhaps borne out by the navigation agreeing in 1699 that the owner of the same mills and colliery should, when the proposed navigation was opened, have toll-free passage up to and from Castleford Bridge.

While some coal passed to York from the West Riding coalfield in Roman times, the towns of York and Hull and their neighbourhoods in the Vales of Ouse and Humber were by the 1690s served almost exclusively with coal brought down the coast from the Tyne and Wear coalfield. The markets for coal produced in the West Riding were very largely internal ones, with some evidence of a little coal also passing downstream on the River Don, naturally navigable as far as Doncaster, to Thorne. It was the opening of the Aire and Calder Navigation from 1700 and the subsequent opening of the 'Dun' - the word then used for the Don - from 1740 to Rotherham and to Tinsley (Sheffield) in 1751, which offered a potential for the wider sale of coal within the Humber/Ouse/Lower Trent basins. Thus was first recognised and taken up by new capitalists in the Aire Valley by 1712 and soon expanded both geographically and technologically. There were also the growing internal markets of the exposed coalfield, while further afield the natural limits of navigation at Tadcaster on the River Wharfe (which was not extended artificially) and of the Ouse to Boroughbridge, the Derwent upstream towards New Malton, the River Hull to Beverley and beyond, the Don to Doncaster and the Aire to Knottingley were all extended artificially from the earlier 18th century onwards and canals came into existence from the 1770s. Even on the River Swale, coal was taken some five miles upstream to Helperby in the 1830s. On the Trent, West Riding coal regularly travelled by water to be sold as far as Newark and on the restored Fossdyke Canal to Lincoln and beyond. Only the Wharfe and the little River Idle were not extended artificially. Canals were opened on the south bank of the Humber and Yorkshire coals travelled in quantity to Louth and Brigg (and beyond) and as far west as Ripon, beyond which town their use in the lead smelting mills was augmented by coal from the poorer quality seams of small local coalfields, which had been long worked and also with the use of moorland peat.

AN INVESTIGATION INTO THE LEGEND OF A MINING DISASTER IN ARKENGARTHDALE

By Alan Mills

INTRODUCTION

This paper describes an investigation into a persistent local legend of a mining disaster in the lead mining area of Arkengarthdale, North Yorkshire in the late 18th or early 19th century. This legend appears to have been corrupted almost beyond recognition in some modern sources and raised to the status of a myth. Research using contemporary sources identifies the most likely source of the legend as being in 1812 when an inrush of water, probably in Moulds Level, resulted in the deaths of three miners.

THE LOCAL LEGEND

In 'The Hidden Side of Swaledale', John Hardy recounts a tale, told to him by Fremie Hutchinson, known locally as the last lead miner in Swaledale and told to him by one 'Bolt Tom' Coates, a native of Booze, Arkengarthdale. Bolt Tom, 'an old man' at the beginning of the last century said *'in the eighteenth century the miners were driving on to a vein when they blasted into an underground lake. Twenty-four miners perished that day; they never had a chance and the two ponies were washed out of the level. Eighteen of the men came from the small hamlet of Booze'*.[1] John Hardy muses that this is how the Waterblast vein got its name. In his later book, he picks up on the story.[2] Here we learn that of the 24 killed, three or four came from the C.B. Yard. John Hardy appears to have sought some evidence for the accident and its magnitude but found none in the parish registers or elsewhere. He says that it never occurred to him to doubt the veracity of the story and so he comes to the astonishing conclusion that the death of twenty-four miners was the subject of a cover-up, deliberately suppressed by curmudgeonly mine owners. John goes on to assert that this accident probably occurred in the early eighteenth century, a date he favours because of the 'viciousness of the times' and that the only surviving evidence for this tragedy is the name 'Waterblast Vein'.

This unlikely account has found its way onto the Web in an even more fanciful form entitled the *'Miner's Tragedy'*:[3]

> *'Swaledale has many secrets, some of them dark. Of some only trace memories remain, for the burden of sadness has proven too heavy to carry. The following reconstruction is an account of one such: .... It was the final day. The jumper was hammered into the face to bore a deep blast hole in the rock face. ...The bore hole bled with water, not an unusual occurrence; the miners were used to "bulling the hole" to make it water tight in order not to impair the blasting powder. ...Seldom was so much powder used but the Blaster compensated by preparing a fuse of five inches rather than the normal three giving more time to retreat from the face.*
>
> *...A large underground explosion is a terrifying event. The very earth protests at its ill treatment and waves of painful sound assault the ears in their reverberations...*

EXHIBITION DESIGN : A PLAIN MAN'S GUIDE

By R.M. Callender

INTRODUCTION

In my professional life, I often had to prepare exhibitions for a variety of venues - conference halls, reception areas, school classrooms, corridors and lobbies. There was a never-ending need to solve a problem - how to compress years of research endeavour into a single poster which fulfilled the demands of a specification drawn up by a symposium organiser. Once freed of the discipline of company house styles, I had the chance to turn my talents to exhibition design again but on my own terms. I relished occasions when there was not a big budget, but just enough to encourage a search for a good result.

Figure 1. In Finland's Gold Museum, the small display featuring the story of gold is augmented by two display cases that show a range of tourist souvenirs which reinforce the country's popular image.