BRITISH MINING No.70

LEAD MINING IN THE DERWENT VALLEY

by

W.K. PIRT & J.M. DODDS

Covering the Mining Districts of Blanchland, Ramshaw, Townfield, Edmondbyers and Healeyfield

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Researched by

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With contributions from C. Gilfellan

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Cover illustration: Presser mine 1906 pump house with Ramshaw Rake in distance (W.K. Pit, 1980)

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(Note: all photographs taken by W.K. Pirt unless stated otherwise)

INTRODUCTION

My first experience of the Derwent Mines was in a conversation with a fellow pupil in my class at school in 1960. He described a section of the Bolts Burn valley at Ramshaw, not far from his home at Blanchland, telling of a narrow valley with numerous tunnels leading into the bank side. All were stone arched and could be followed underground for hundreds of yards uphill until one eventually emerged at the other end. It was not until the late summer of 1963, on a local Field Club outing, that I had a chance to visit the area and examine these features. I was informed with great conviction by the outing leader that the tunnels were flues that had carried poisonous fumes away from a lead smelting mill in the burn bottom. This kindled my interest in lead mining and frequent visits to the site – Jeffrey's Smelt Mill at Ramshaw – were later made.

Whilst at the local Technical College, in 1966, I became involved in an extra mural study group project to list as many of the industrial archaeology sites of the district as were known at the time. One of the group members was John Gall. As part of the group project we visited Ramshaw, where we examined and photographed the then recently bulldozed remains of a balance-bob pit immediately adjacent to the Ramshaw pumping and drawing shafts.

As my interest in the district became more widely known, I was contacted by the late Trevor Morris. Together we examined the area and combined the data that each had previously unearthed. Trevor eventually passed the information over to me so that he could concentrate on Welsh mining. He continued to feed me snippets of information on the district as and when they turned up. I am greatly indebted to his early efforts, and for the aerial photographs he took of the Ramshaw and the Reeding Mines.

A few years later I was contacted by John Dodds, who was on the Friends of Beamish "SOS" squad. As a result of the hundreds of hours that John spent in the Northumberland Records Office and at the Mining Institute archives in Newcastle, a vast array of information was unearthed. From this and from information I obtained at Newcastle Central Library, Durham County Records Office, Durham City Library Archives and other sources, a clearer picture of the history of the district gradually emerged. Shortly before the sad loss of Trevor Morris, I was introduced to Clive Gilfellan, whose simultaneous, but previously unconnected, research had uncovered information from the Lord Crewe Trust Estate papers lodged in the Durham Estates Office at Durham Cathedral. This made available historical details pertaining to the mines of the eastern portion of the district.

Because each of the contributors had unwittingly concentrated on the separate areas of the district, their respective information had amazingly few overlaps and very little effort was wasted through duplication. The collation is

certainly not considered complete, however. It has now simply reached a stage where new discoveries have become proportionately more difficult as the sources are exhausted. The search has, therefore, now given way to an appraisal. Whilst there is confidence that the historical facts have been accurately recorded, it must also be declared that misinterpretation of these facts within the text is a possibility. On this issue, the defence is simple. It is that we were not part of the historical scene at the time of its occurrence.

The true motivation now for collating the information is the simple selfish prospect of being able to return to a normal sort of existence afterwards.

ACKNOWLEDGEMENTS

My thanks are due to the following: Colin G. Armstrong (Consett Technical College) and John Gall (Beamish) for sparking off my interest; C. Gilfellan (Healeyfield & Muggleswick); Mr & Mrs Devine (for permission to visit Ramshaw); Beamish Museum (photographs); the late T. Morris (early research and aerial photographs); H.M. Parker (permission to use copyright photographs of Whiteheaps & Ramshaw Mines); The late J. Raine. (for permission to use the photographs taken of the postcards on public exhibition at Castleside); Durham City Library; Durham Records Office; Lord Crewe Trust Estates Office; Northumberland Records Office; Public Record Office; Miriam (ONNA drafter) and Jonathan (YFML critic).

Thanks are also due to A. Blackburn, H. Cannam, N.A. Chapman, S. Chapman, R.A. Fairbairn, I. Forbes, M.C. Gill, P. Jackson, the late Ned Jamieson, D. MacCallum, B. Short, C.C. Short, R.C. Thompson, L.O. Tyson and D. Wilcox. Other acknowledgements are included within the relevant texts. Gratitude is also expressed to the many others who have contributed.

It must be said that the information amassed over the past years would still be in the form of longhand text, photocopied documents and scribbled notes if it had not been for my wife Miriam. She painstakingly typed and retyped the developing drafts as required, prior to the eventual purchase of a simple word processor. This task was laboriously repeated again during transfer of the data onto a more modern PC.

W Kennon Pirt (writer), April 2000

GEOLOGICAL OUTLINE OF THE DISTRICT

The slightly domed, Middle Carboniferous strata of the region dip gently eastwards at about five degrees and are mineralized from the Great Limestone up to and including the Healeyfield Firestone. A few easterly locations are mineralized in the Lower Coal Measures.

During deposition of strata around Ramshaw and Hunstanworth, huge washouts, or drainage channels, were cut through the delta mud. After a slight change in sea level, as a result of earth movements, considerable

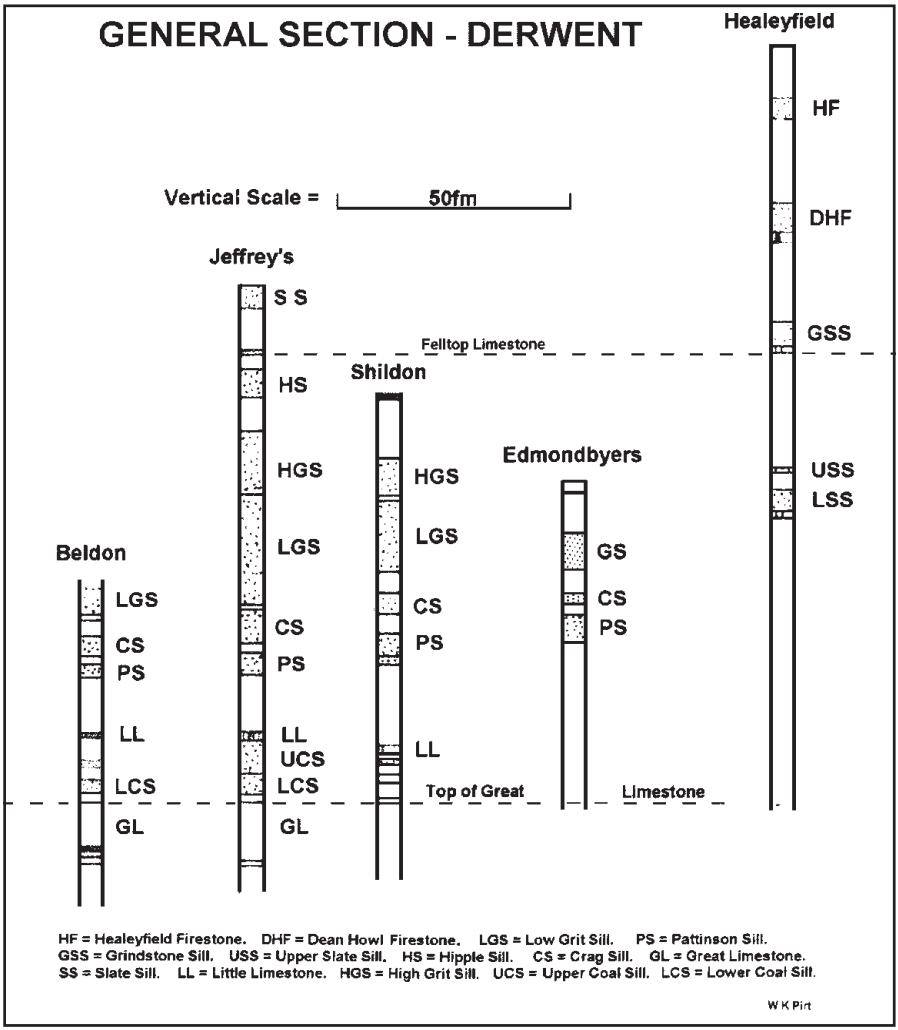

Figure 1. General geological section of the Derwent Mining District

quantities of silt were re-deposited in and around these channels, resulting in a local accumulation of exceptionally thick strata.

Earth movements in the Tertiary period cracked the strata and let hot, mineral-charged waters percolate and deposit vein-forming minerals. Some veins were up to 40 feet wide and 300 feet high and were mineralized for long distances. On working them, the miners found that veins were nearer vertical and better defined and mineralized in the hardest rock, while in the softer beds they tended to 'hade', or slope, from the vertical, and often pinched out, or became closed up through filling with fractured country rock.

The Ramshaw-Hunstanworth area, with its extensive washouts, was ideal for mineralizion because only three feet of shale separated the High Grit Sill from the Low Grit Sill (Fig. 1). Together, these beds gave 228 feet of almost continuous sandstone, which far surpassed the thickest of the Weardale 'Lead Measures' limestones. The Great Limestone, which in Weardale was from 80 feet to 90 feet thick, was only 75 feet thick at Jeffrey's Shaft, Ramshaw.

The main vein filling, or gangue, is fluorspar (CaF_2), but there were strings or pockets of lead ore (galena, PbS) near their foot and hanging walls. Other minerals were chalcedony ($SiO_2.nH_2O$), quartz (SiO_2), siderite ($FeCO_3$) and limonite ($Fe\{OH\}_2$), along with limited quantities of barytes ($BaSO_4$). Calcite ($CaCO_3$) and sphalerite (ZnS). Traces of copper minerals have been found in the deeper, modern fluorspar workings around Hunstanworth.

Most of the lead ore raised around Hunstanworth was got from the Firestone and the Slate Sills, but at Healeyfield it came from the Millstone Grit Series. Because lead miners only took the galena, which at Hunstanworth was usually in ribs of three to four inches wide, they left behind the bulk of the fluorspar, which filled the vein. This was worked in the 20th century.

K.C. Dunham gives the following distribution of ore-shoots throughout the hard beds of the Derwent Valley Mines:-[1]

DISTRIBUTION OF THE ORESHOOTS

Series	**Strata**	**Oreshoots**
Millstone Grit	3rd Grit	1
	2nd Grit	1
	1st Grit	1
Upper Limestone Series	Grindstone Sill	3
	Slate or Grit Sill	15
	Firestone Sill	11
	Little Limestone	4
	Coal Sills	2
	Great Limestone	2
		Total 40

CHIEF LOCATIONS

The area consists of fell country lying between 600 feet and 1600 feet AOD, with a fertile strip along the River Derwent. Fluorspar and a little barytes have been worked there until recently.

A mining agent commented in 1735 that the Derwent Mining District was "*in a part of the world where they* [the miners] *are seldom without rain*". He added that it is "*so mountainous and rotten here that it would be difficult for a man to walk upon the mosses in many places*". It was also stated that "*the district of North West Durham containing the mines of the Derwent Valley was a mainly upland location, remote from any beaten track. The elevation is wide ranging, between 450 ft OD in the recesses of the fertile valley floor, to 1600 ft in more exposed locations. The higher locations can suffer inclement conditions during winter months, with regular snowfalls that might remain for periods upwards of four months*".

In 1799, Arthur Mowbray told John Ord, that in the last 15 to 20 years sheep were the mainstay, whilst in the last 10 years cultivation was possible "*except on the tops that will not meet the plough*". Cattle and sheep were kept and corn was grown, but proper farming was not possible. The people were said to be "*a strong race working about the lead mines, plantations and buildings enclosures, but the roads have very little attention*".[2]

Blanchland - Hunstanworth - Townfield
This principal mining area is centred around Blanchland village and includes the hamlets of Hunstanworth, Townfield and Ramshaw. These all lie at the western end of the River Derwent, close to where it is joined by the headwater tributaries of Acton, Beldon, Nookton and Bolts Burn. The most intensive operations were between Blanchland village and Bolts Law, at the Whiteheaps (NY947466), Sikehead (NY955464), Ramshaw (NY951473) and Presser or Jeffrey's (NY959478) lead mines. Referred to collectively as 'The Derwent Mines', these four mines between them worked a number of wide, although not always rich, intersecting veins.

The principal veins at Whiteheaps and Sikehead Mines, at the head of Bolts Burn, were Red Vein, White Vein, Shield or Company's (also Bolts Shaw) Vein, and Fernygill Vein. Further downstream, Ramshaw Mine worked Ramshaw North, Middle and South Veins. These converge as they go east and intersect at Ramshaw Shaft before crossing Bolts Burn into Jeffrey's Mine, which is in a different royalty, where they become known respectively as Jeffrey's South, Middle and North Veins.

Some of the Hunstanworth mines have only recently stopped extracting pillars of fluorspar left by the lead miners. Whiteheaps Mine in 1979 was run by BSC Scunthorpe Ore Mines Division, then it passed to Weardale Mining and Processing Ltd in 1986. In 1989, however, the site was finally abandoned,

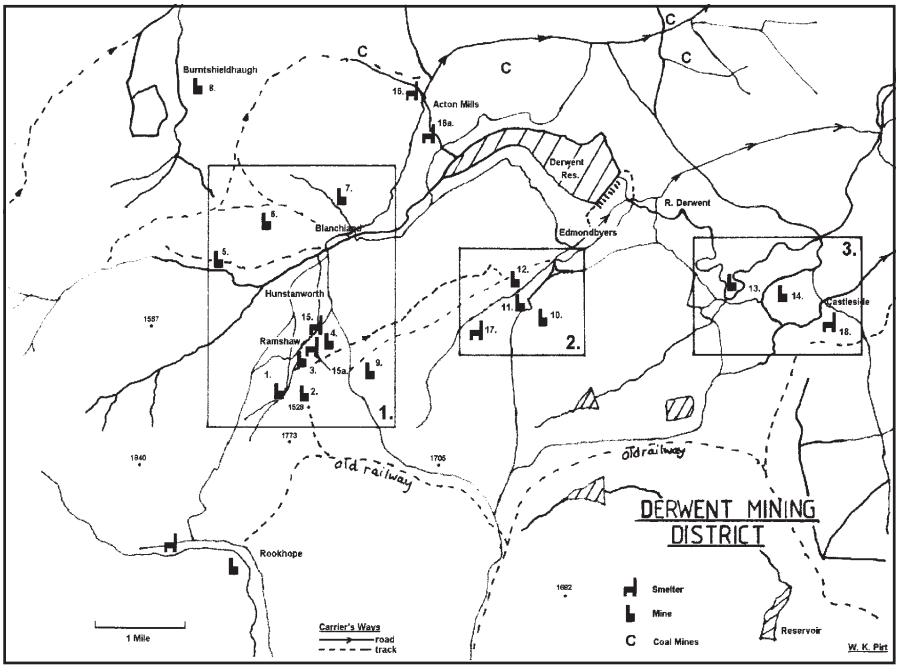

Fig 2. Sketch map of district, showing the locations of the three main areas of mining activity.

THE MINES

No	Name	NGR
1	Whiteheaps Mine	NY947466
2	Sikehead Mine	NY955464
3	Ramshaw Mine	NY951473
4	Presser Mine	NY959478
5	Beldon Shield Mine	NY928495
6	Reeding Mine	NY943506
7	Shildon Mine	NY960510
8	Hackford Mine	NY925540
9	Sandyford Mine	NY968471
10	Harehope Mine	NZ009485
11	Burnhope Mine	NZ005489
12	Swandale Mine	NZ004492
13	Silvertongue Mine	NZ056493
14	Healeyfield Mine	NZ069487

THE SMELT MILLS

No	Name	NGR
15*	Jeffrey's Mills (2)	NY953478
16*	Acton Mills (2)	NY979534
17	Feldon Mill	NZ004484
18	Healeyfield Mill	NZ077484

* evidence of two working sites

levelled, and its modern dressing machinery removed. In the last period of mining at Ramshaw, children's clog prints and the marks of sledges, said to be from the 17th century, were seen in some of the older levels and workings.

Beldon Shield Mine (NY928495), Reeding Mine (NY943506) and Shildon Mine (NY960510) all lie north of the River Derwent, in tributary valleys of the same name, and are located on a continuous belt of north-east to south-

west veins, extending westwards from Shildon, a mile north of Blanchland, to Beldon Burn. The veins worked from Shildon Gin Shaft, in the east, were Sluice, Garden House, Old and New Shildon, Fellgrove, Andrew's and Standalone Veins. There is a further reference to the discovery of Paddock Nook Vein, but this is believed to have been barren of ore.[3] The vein belt is rather more than half a mile wide in Shildon ravine, but converges as it goes west towards Beldon Shield Mine where Standalone and Fellgrove Veins become the prominent members. At Reeding Mine, trials were made on the continuing courses of Shildon and Old Shildon Veins. Ancient lead shafts were re-examined for barite at Smith's Workings (NY950522) around 1929.

Devil's Water

Hackford or Burntshieldhaugh Mine (NY925540) is at the extreme north of the main group, on Devil's Water in the River Tyne catchment. The Beaumont Company is thought to have worked Burntshieldhaugh Vein from a level and a large, but rare in this district, hush. Other trials were made in the Riddlehamhope - Harwood Shield area. Bales have also been found here.

Edmondbyers

The Harehope (NZ009485), Burnhope (NZ005489) and Swandale Mines (NZ004492) near Edmondbyers, in the Burnhope Burn valley, were worked during the 19th century on the north to south orientated Swandale Vein, around one mile west of the village. Smaller trials in Burnhope Burn include Pedam's Oak Level (NY992483), Sandyford Mine (NY968472) and Eudon Grove Mine (NY982459).

Healeyfield

The eastern edge of the lead mining district borders the outcrop of the Coal Measures near Castleside. The larger of the two mines here was Healeyfield Mine (NZ069487), at Dene Howl, which worked a strong north to south galena-bearing vein, called Healeyfield Vein. The principal drainage level at Healeyfield Mine was Derwent Low Adit (NZ062497).

Silvertongue Mine (NZ056493) is in a narrow winding gorge of the River Derwent, known locally as 'The Sneep' or 'The Snape' on early OS maps. It worked three short veins passing through two royalties divided by the river on the boundary between Durham and Northumberland. Silvertongue Vein was the principal vein, while Middle Vein and Providence Vein were minor veins. This section of the Derwent valley is said to have yielded ores of extremely high silver content.

Isolated trial levels and shafts scattered throughout the area are evident, mainly in the higher reaches of the smaller sikes and tributaries feeding the River Derwent. These have been recorded, but not in great detail.

THE MINING PROCESSES

Hushing

This was used to discover new veins and aid their working. A dam, built above the area to be worked, was periodically released and the rush of water, aided by picks and shovels, removed the soil to expose the bedrock and any outcropping veins, which were worked by quarrying. Accumulated broken rock was flushed out by subsequent purges of water.

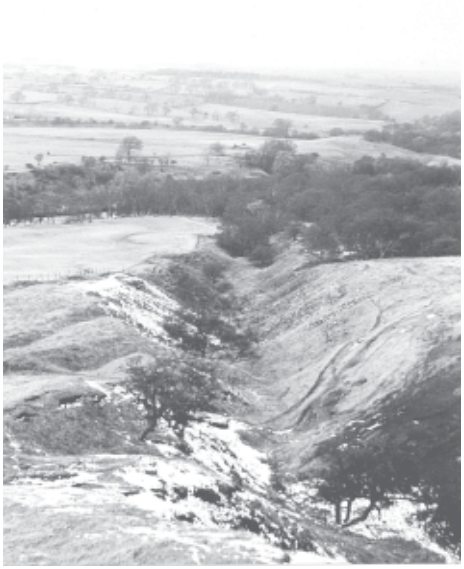

PLATE 1. Hush on Burntshieldhaugh Vein, Devil's Water. Looking north west (1980).

Hushing was seldom used in the Derwent valley because landlords felt that it damaged their property. The best example of hush is on Burntshieldhaugh Vein, south of Hackford on Devil's Water, where the hush gutter is around 500 yards long and the outline of a small dam can be seen at its head. A smaller hush, called "*Hackfords Hush*" on the 1/10560 Ordnance Survey map of 1872, is at the head of Grindstone Cleugh (NY919455) in the Nookton Burn valley. Other minor hushes, of unknown age, are to be found at NY902464 (Isaaks Hush), and at NY949458 Hush Sike (or Ords Hush) near Bolt's Law. There may be an unnamed hush at NY928458.

Adit Levels

These were of limited use in the Derwent district, because the oreshoots went below the valley floor. Nevertheless, the Derwent Low Level was used both to drain and to ventilate Healeyfield Mine, while Deborah's Level was used for haulage from the distant eastern workings of Jeffrey's Mine. Other important levels in the district include Shildon Level, driven from the north side of Blanchland village to drain the upper workings of Shildon Mine, and Skottowe's or Bolts Shaw Level at Whiteheaps Mine, which is called Bolt's Hope Level on older mine plans and served as a drainage and haulage level for parts of Whiteheaps and Sikehead Mines. A westerly branch of this level, called Bolts Head Level, gave access to Bolts Shaw or Company's Vein, which was important during the late London Lead Company period.

At Ramshaw, Burntshieldhaugh or Mill Level (Plate 2) gave early access to the eastern (Skottowe) workings of the three Jeffreys Veins, and Ramshaw

Low Level worked the western (Ord) part of the three Ramshaw veins, beyond their intersection at the royalty boundary.

PLATE 2. Burntshieldhaugh or Mill Level (1981).

Waterwheels

As the mines got deeper, horse gins and then waterwheels were used to drive pumps, crushers and winders. The shortage of surface water, for the wheels, was overcome by building a system of leats, some up to 7 miles long and covered with stone slabs to prevent them freezing-up in winter. They led water it into reservoirs, which controlled the supply to the equipment on the valley floor. The local Water Authority still uses and maintains a few leats.

To use the water most efficiently, large waterwheels were built in the valley bottoms. For example, a 52 foot diameter wheel at Whiteheaps supplied power to the Whiteheaps shafts, whilst the 48 foot diameter Jemmy's Wheel, between Ramshaw and the Derwent Smelt Mill, drove "flat rods", supported by cast-iron pulleys on wooden stands, which ran for over 1 mile to Ellen's pumping shaft at the head of Bolt's Well Sike.

At the shaft tops, counterweights or balance cocks took power from the flat-rods to spear rods running own the shaft to the pumps. The pump-water was sent into the stream and fed other wheels further down the valley. The balance cocks, weighted at their free ends by boxes of scrap metal or rock, sat on wooden trestles in pits beside the shafts. In deep shafts, similar counterweight cocks were set into recesses at regular intervals, to relieve the weight of the spear rods. A number of waterwheel and balance cock pits can still be found. They would normally be timber-clad, to protect the machinery from the weather, and the pit floors often had wooden "duck" boards.

Wheels for driving dressing machinery etc, were generally around 6 to 8 feet in diameter. Those linked directly to crushing machines were around 15 feet minimum diameter and turned the crushing rollers in opposite directions by an intermeshing train of cogs. In 1811 a London Lead Company agent calculated that the introduction of power driven crushers had increased ore production by 1/5th.[4] The machines had fluted rollers, enabling them to grip and crush the larger pieces of ore.

An earlier form of crushing machine, called stamps, was first used in the Derwent district in 1738, when Thomas Forster, a mining engineer, supervised

the building of two sets.[5] The first set, at Jeffrey's Grove, was followed by another set at Acton Mill, where they were used to break black slags.

Mechanised crushing made greater quantities of different sized feed ore. To improve the efficiency of subsequent processes, therefore, drum screens, or classifiers, were used at the bigger dressing floors at Nenthead, Allenheads and Healeyfield. Water power was also used to drive elevators, buddles, brake sieves and bellows at the smelt mills.[6]

Steam Power

Few North Pennine mines used steam power, as their distance from collieries made the cost of coal prohibitive. The proximity of coal at Acton, Wall House and Greymare Hill made the Derwent district an exception, however, and large beam engines were used at Whiteheaps, Beldon, Ramshaw and Shildon Mines. By contrast, in the 20th century, a small, high-pressure twin-cylinder steam winch, made by Petersons of Trelleborg, was used on Ellen's Shaft at Sikehead Mine (see Plate 17). It was removed around 1989. Other mines with steam engines included: Healeyfield, Beldon, Shildon, possibly Smithy Cleugh Shaft, Whiteheaps, Sikehead, Taylor's Shaft at the eastern end of Jeffrey's, and possibly Harehope Mine near to Edmondbyers. The last mine may have had an engine ordered from Messrs Hathorn, Davy & Company on November 11th 1882 by the "*Harehope Gill Mining Co. of Newcastle*". The date is close to when this vein was being worked, but the company working it was the Hexham & Edmondbyers Lead Mining Co.

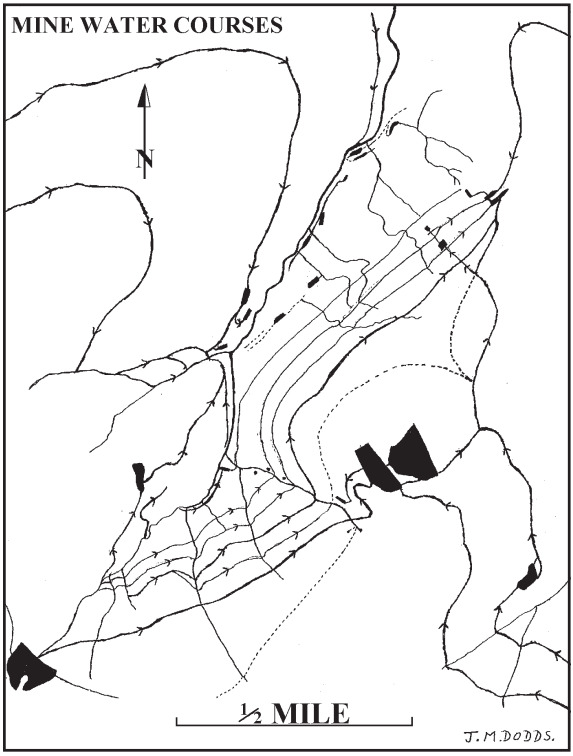

Fig 3. Main watercourses in the Ramshaw - Hunstanworth areas.

From 1806 a total of 6 steam engines were introduced into the Derwent district. That at Shildon was designed "*upon Messrs Boulton &*

Watt's improved principle", with a 64 inch diameter cylinder, and drew water from a depth of 70 fms. The beam weighed "*upwards of 9 tons and was made of cast metal*". The once typical, northern design (square chimney) engine house at Shildon Mine still retains its features, but appears to be the only example of its type remaining in Northern England. It is likely that it survived because it was converted into 5 flats, for miners at the Hunstanworth mines, and was located in a deep, sheltered valley. A second engine house, now demolished but recorded by an old photograph, was also used as a dwelling for a time. This was "*The Little Engine*", next to the road at Shildon.

PLATE 3. Possible site of gin gan. (circular walking path). The centre depression held a vertical post around which the horse gin pivoted (1980).

The Presser Mine pumping station, which dominates the skyline at Jeffrey's Rake, was built on the site of the original building in 1906 by the Consett Water Company. It and the attendant's house are now owned by Northumbria Water and the mine is used as an emergency water supply.

HYDRAULIC POWER

In the later 18th century, pumping by waterwheels was augmented by water pressure or hydraulic flood engines, which were suited to mountainous areas where a good head of water could be got. Other devices in this category, called bucket engines or 'flop jacks' converted the alternate action of filling and draining a box into the rocking motion of a cradled beam.[7]

The first reliable engine of this type worked in the Oberhartz in Germany in 1748 and the first one in Britain was built by Westgarth Forster at the W.B. Lead Mines' Coalcleugh Mine around 1765.[8] Forster was second agent, under the supervision of its inventor William Westgarth of Carrshield. Smeaton (engineering surveyor for the Greenwich Hospital) recorded four such engines working in the Coalcleugh area by 1768, and a fifth was added in 1769.[1] Smeaton presented details of Westgarth's engine to the Society of Arts, which awarded Westgarth a prize of 50 guineas in 1767.[9,10] It is not know which type of engine worked at Jeffrey's Rake, but there is evidence of a large water supply to this shaft, via an extensive network of leats.

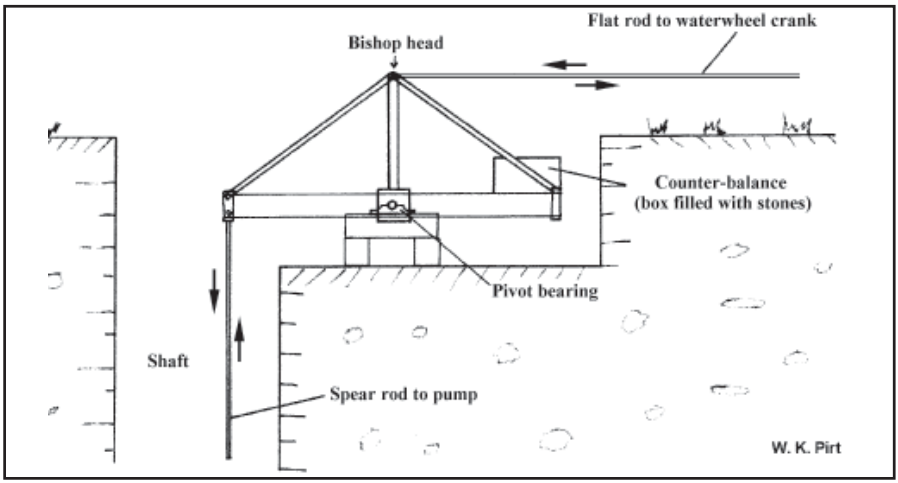

Fig 4. General arrangement of balance bob at Ramshaw pumping shaft.

The Rev W. Turner of Newcastle toured the mines in 1793, guided by W. Forster Jnr. The Coalcleugh engine was still working, and Forster told Turner of improvements that would almost double the power when complete.[10] Other mines with pressure engines in the 18th century were Wolf Cleugh at Rookhope, and Jeffreys Presser Mine. The latter, and the nearby Presser Villa, may have been named after a pressure engine which is marked on the OS map. The Derwent Mining Field Map of 1852 also records a pressure engine at this shaft.

PLATE 4. Wheel pit and balance bob chamber at Ramshaw (1982).

The 42 inch Newcomen engine at Fallowfield, mentioned by W. Brown in 1769, was in bad repair in 1762.[11] By 1773 it was out of use and William Westgarth suggested replacing it with a hydraulic engine, using parts of the "*old fire engine*" in the new engine's construction.

W.G. Armstrong's improvements to hydraulic engines, in the mid 19th century, made them competitive with steam driven machinery where coal was not readily available.

Apart from a brief time in 1842, however, waterwheels again overtook steam as the chief power source at the Derwent Mines. They were nearly as effective and far cheaper to use than steam engines.

SMELTING

Evidence of mediæval bales is to be found in the district. Miscellaneous, but unaccountable, finds of lead slag or scoria have also been found. These may indicate the existence of earlier, more primitive smelting operations.

The earliest of the smelt mills near Ramshaw was Jamieson's, Jemmy's or Boltshope Mill (NY952474), which served the local mines and smelted other London Lead Company ore. Jeffrey's New, or Derwent, Mill (NY955480) was built after the London Lead Company left and mostly smelted local ore. North-east of Blanchland were Acton High, or Old (NY979 535) and Acton Low, or New (NY982 530) Mills which smelted Shildon ore, some parcels of Blackett and London Lead Company ore.

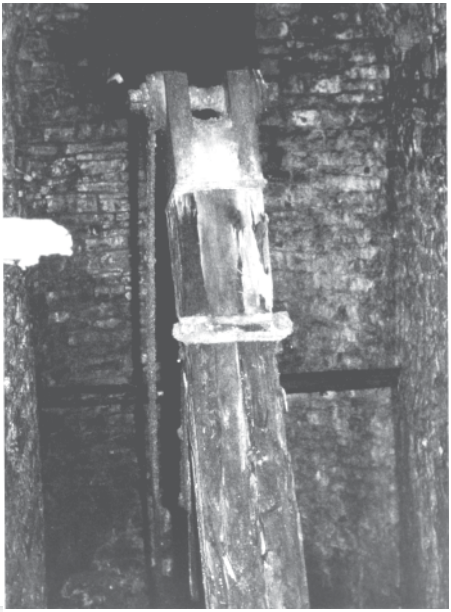

PLATE 5. Bishop head of balance bob inside chamber. This engine powered pumps in Ramshaw Shaft (1980).

PLATE 6. Typical spear rod support, Jeffrey's east end. The sheaves supported a pulley wheel upon which the round bars rested (1986).

The early Feldon Mill (NZ004484), near Edmondbyers, also smelted ore from the London Lead Company and from Rookhope Mine, which belonged to the British Lead Company and later the Rookhope Valley Lead Company.

Healeyfield Mill (NZ077484), near Castleside, smelted the Healeyfield Mining Co's own ore, ore from Silver Tongue Mine and bought-in parcels.

Transport

Smelted lead and some dressed ore was taken on "*carriers ways*" by Galloway ponies (Figure 2). One route passed over Burntshieldhaugh Fell, north of Blanchland, and joined "*the Lead Road*" (still so called locally), which passed close to the hamlet of Slaley, through Hedley-on-the-Hill, to the shipping wharfs of Stella and Ryton, the main distribution point of lead from the River Tyne. In 1711, it cost £25 to carry 500 pieces of lead from Newcastle to London.

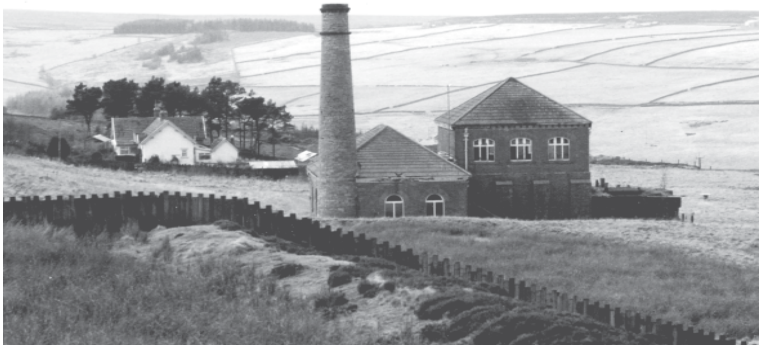

PLATE 7. Presser Mine 1906 pump house, with Ramshaw Rake in distance (1980).

The ponies were often in lines of 12 or 14 (sometimes 20) each with a specially made pannier, to support the parcel of dressed ore, hung loosely across its shoulders. The front or "*bell horse*" wore a leading bridle and bit, as well as a feathered collar with seven bells fixed to the top of its saddle. The other horses were strung behind on bridles. The pack train would start off at around 4 am in summer. At breaks the horses grazed off the path as required. When they were considered amply fed, a muzzle was fitted. This was thought necessary as the routes were so badly contaminated with ore spillage that poisoning of the horses from constant grazing was a possibilty.

In Weardale, the Bell family of Eastgate made the panniers at High Farm and at Thrushes Nest.[12] Around 1750 it took about 3 weeks to transport lime by road from Rookhope to Blaydon by packhorse. Lead deliveries took about 4 weeks.[13] Early pack trail routes are shown on the district map (see Fig 2). In April 1823 Robert McAdam and John Taylor surveyed the road network and recommended its improvement to allow the use of horse drawn carts for hauling ore, metal and coal. After 1826, therefore, the cost of taking lead from Weardale to the Newcastle wharves was said to have fallen from 4s 6d to 2s 6d per bing. Further improvements were made in 1833.

Measures

The weights used by the lead trade were the "bing", the "horse" and the "poke". A bing weighed eight hundredweights (cwt), a horse was 2 cwt and a poke was 2 stones or 28 lbs. Metal was transported as pieces in weights of around 1.5 cwts, or 12 stones.

PLATE 8. The existing northern style engine house at Shildon Mine (1967).

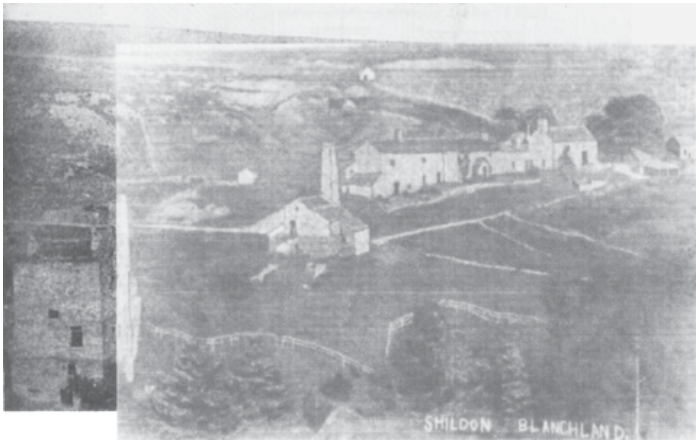

PLATE 9. Second engine house (left centre, now demolished) and main engine house (left) at Shildon, from a composite of two postcards, retouched (Circa 1910).

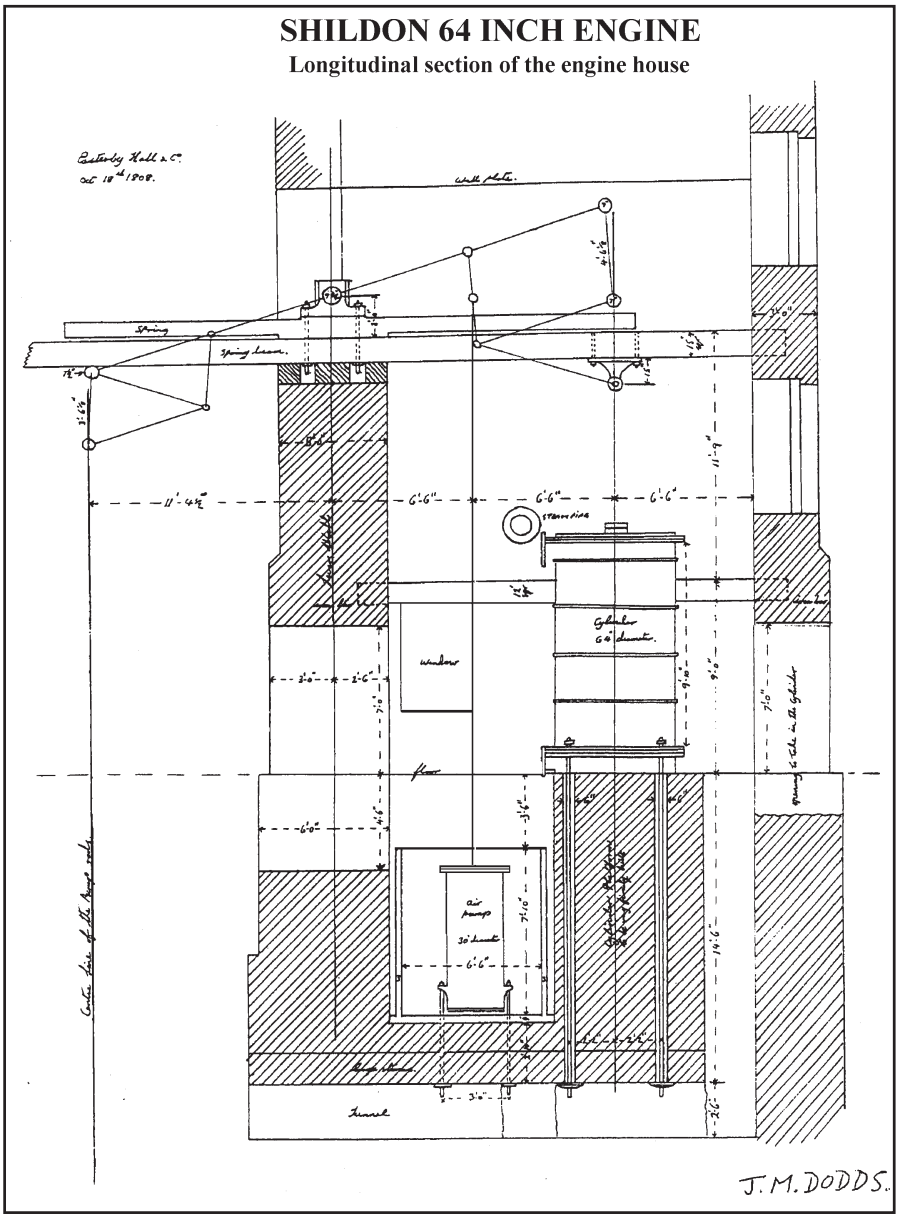

Fig 5. *Shildon 64 inch engine. Redrawn from plans in Boulton &Watt Collection, Birmingham Library records.*

SOCIAL ASPECTS

Health

Many miners suffered poor health as a result of their working and living conditions. The main hazards were poor diet, foul air, shot-firing fumes and dust which accumulated in the workings through poor ventilation. John Taylor and Sons improved ventilation at the Derwent Company's mines, but the miners' habit of using picks rather than wedges, and of dry boring holes (even though water was available – albeit sometimes at a distance) was the main cause of their suffering from "*lead miner's asthma*".

Men who had worked in the mines since the age of 17 or 18 began to feel its effect in their mid-30s and by the age of 40 their health might have declined so much that strenuous work was difficult. The few who reached the age of

PLATE 10. Piers supplying water to engine at Westgarth's Shaft, Jeffreys Rake (1980).

50 were usually unable to work at all, and could only to give their opinions to younger miners. The first symptom of the illness was severe coughing and, after the expectoration of dust, an easing of the chest. Some coughed up blood in the later stages of their illness, leading to shortness of breath, weight loss and eventually "*chest cavities, consumption and death*". On stopping work, a miner's health might improve slightly, or at least not worsen, but, since no work meant no pay, they were very reluctant to give up completely. Many chose to do lighter task around the mine.

Accidents

Lead mining was less hazardous than coal mining, mainly because of the sounder strata in which lead ore was worked. Minor accidents were common, however, and some serious ones also occurred. For example, a headstone in Blanchland Churchyard records that George Craft, the only son of Robert and May Craft, "*unfortunately lost his life in his 15th year, by a fall of stone in the Sun Vein at Jeffrey's Rake* [Jeffrey's South Vein] *on 31st August 1826*."[14] Similarly, the death certificate for J. Morpeth the Derwent Company agent, owned by T. Morpeth of Consett, one of his descendant states that he died after being crushed by a waggon at Jeffrey's Rake.

Accidents were not restricted to the miners themselves. An early 19th century traveller to Stanhope overcome by the winter weather and unable to go further, took refuge against the mounded route of a smelt mill flue from Jeffrey's Mill. Despite the comfort given by the warmth of the flue, he was poisoned in his sleep by the fumes issuing through the flue roof.

Friendly Societies ensured the payment of a small sum to an injured person or to a widow, but none were established in the area until 1864. Cornish practices introduced in the 19th century at the Derwent mines ensured that men who were temporarily unable to work received a cash subsistence.[15] In 1864 this was 7 shillings per week. Before this, the men contributed 6d per week to an accident fund, and a doctor for the men was employed by the company, which usually paid a yearly sum for his attendance.[16]

Old Payment System

The agents and men estimated the weight of ore they could raise over the time of their bargain and agreed a price per bing (8 cwt) of dressed ore produced, based on that estimate. A poor vein would, therefore, attract a higher price than a richer one. This system, called Bingtale, was used for ore production.

Miners who were driving levels also had an idea of what they could achieve in a given time. It was, of course, less in hard rock than in softer rock, and the price per fathom of advance varied accordingly. This system, which was used for non-productive work, was called Fathomtale.

A third category of worker was paid by the shift, but this was generally avoided as not giving the men an incentive. It was used to pay for specific tasks, or as a means of paying for incidental work, and was called Daytale.

In the London Lead Company's early days, bargains were agreed annually, on October 4th. Any untaken bargains were usually re-negotiated two days later. Ground was usually let, in lengths of 12, 15 or 20 fathoms, to partnerships of 2, 4, 6 or 8 men. They paid for their own candles, tools and powder, along with the cost of getting the ore/rock to the surface, and were usually paid on Lady Day, and at Michaelmas.[4] Such bargains were common throughout the North Pennine Orefield, but in the Derwent and Fallowfield districts they were replaced by Cornish practices, introduced by John Taylor & Sons, by the mid-19th century.

The Derwent Mining Company estimated that a miner's wage was between £23 8s 0d and £26 per year, but many men only earned around £1 10s 0d per month and so would usually be in debt by the end of the quarter-year. Deadwork men were paid by the fathom and earned on average 12 shillings per week. These men hired their helpers (usually their sons), who could be aged around 11 or 12 at a rate of 9d per day or 4s 6d per week. The rate was advanced until the full rate became payable at 18. There was some indication

that in the Derwent Valley youngsters were not just employed "*at bank*", but also underground, tending or driving ponies, operating the ore passes, or moving materials for the older miners.

The adult miner normally worked an 8-hour day for 5 days. The washers, who worked from 7 am to 6 pm, with an hour off for dinner, were sometimes laid off in bad weather, but could usually make up the lost time in better weather. Since none of the men had clocks or watches, the time of day and the end of the working period was guessed. Most workers wore clogs with ¾ inch thick soles edged with iron and leather uppers. Some had timber duck boards to stand on at the workplace, or even moveable fleaks (flooks), which gave some protection from the weather.

New Wages Structure

The Taylors' management style and an influx of Cornish and Welsh miners ensured that Cornish methods and terminology were used. The main changes by 1860 were to the bargain system. Bingtale became known as Tribute,with payment depending on the amount of ore raised, irrespective of its dressing costs. Fathomtale became known as Tutwork.

Under the old system, men were paid infrequently and were often in debt to local traders. Under the new system, bargains and pays were made every two or three months. It allowed men to escape a bad bargain sooner, and the management to pay a lower rate when a vein suddenly became richer or the going easier. In poor or difficult ground, however, the situation and prospects would be re-assessed by the agents, who could subsidise the miners in lean times. In the 1860s this subsidy was called 'lent money' and amounted to between £2 and £2 10s 0d per month. In addition, a fortnight's wage was kept in hand. Approximately one third of the men were tribute workers, who earned slightly more than tutwork men, but this could easily reverse in a poor vein. A tributer's wage might vary widely, but tutworkers had a fairly regular income. The least that a tutwork man could make in the 1860s was around £1 10s per month, but with regular reviewing of his settings this would not continue for long.

An average wage on the 45 Fathom Level at Jeffrey's Rake in September 1862 was 15s 2d per week. Married and single men were paid the same. All the bargains were let alike and all the money earned was in proportion to the amount of work achieved. The tutwork men made their 15 shillings over 40 hours, divided equally among 5 days.

Ore Duty Payments

A major cause of failure for lead mines was said to be the excessive rents payable for the land containing the ore, and from the proportion of duty claimed by the landowner against the weight of ore raised and "dressed" or made ready for smelting. This "duty" could be either a proportion of the ore

for which the Landlord could dispose of himself to a smelt mill of his own choice, or a proportion of the value of any ore sold to the smelt by that company. It was common for the duty level to be adjusted in accordance with the price of lead. Duty rates generally varied from 1/5h around 1800 to 1/7th after the 1840s. However, on special appeal - for example, when a mine was first developing - duties of 1/8th could be secured. Duty rate was also variable in the later period of fluorspar working. Earlier examples of duty rate variation are noted for Jeffrey's in the 1740s with variations between 1/14th and 1/7th over 7 years' working.

General Lifestyle, Religion and Education

Conditions at the mines were not ideal, but during the 1720s the owners seem to have been quite well disposed towards their workers and tried to supply their needs both at work and during respite. After the completion of specific tasks, for example, it was not uncommon for the company to supply alcoholic drink to the miners in appreciation of successful co-operation.[6]

The strong Methodist disciplines already inherent in the Blanchland area did not, however, let the company influence the social life of the miners as much as in other parts of the northern field such as in Weardale or Teesdale.

On Tuesday, March 24th 1747 John Wesley preached to the Derwent Miners in Blanchland Churchyard and members of the congregation that from as far as Allendale, 6 miles away.[6] So great was his success that Mr Westgarth (Steward of the Mines) asked him to preach there again, and offered him a house in Blanchland, where the pays were normally made, for this purpose.[14]

Wesley returned to Blanchland on March 27th 1748.[17] He is alleged to have said that the town was little more than "*a heap of ruins*", but he may have been referring to the nearby remains of the abbey.[18] Early quarterly meetings of Methodists were held in the Craven Arms at Blanchland, where the room was "*often crowded to excess for the missionary meetings*".[19]

The reputation of the North Pennine Orefield was such that the coach carrying the £250,000 for the annual May settlement of wages was usually accompanied by a band of Royal Dragoons. The miners' hard drinking reputation was also such that they were not allowed into Newcastle, so they usually made merry in Blaydon during the annual fortnight's holiday.

The Lord Crewe Charity founded Blanchland's first school in 1750.[6] Between 1862 and 1863, however, the Rev Daniel Capper rebuilt Hunstanworth village, with a school for 120 pupils. Capper and the Lord Crewe Trustees supported this school and both contributed £5 annually. Before this, it had been difficult to find a teacher willing to work for the money available and the post was often vacant for considerable periods of time. A petition from the inhabitants of Blanchland in 1778 declared one teacher to be incapable and that "*children*

who went for many years to that school were not able to read or write fit for business". That same teacher was later imprisoned for theft.[20]

In 1850, the Derwent Company opened a reading room near its mines and allowed the Wesleyan and Primitive Methodists to worship there on alternate Sundays. That same year Fordyce records that most inhabitants of Blanchland were employed in the lead works.[21]

Sustenance and Accomodation

In 1842 a Parliamentary Commission noted that the fells around the mines were "*altogether uninhabited*". When John Robinson, chief agent for the Derwent Mines at Hunstanworth for over 30 years, was interviewed, he said that some workers lived in Blanchland Parish, but many lived as far away as Stanhope and Allendale. During their working week, these men stayed in lodging shops near the mines, with often 7 or 8 of them sleeping in each poorly ventilated room. (These conditions improved when the new houses at Hunstanworth were built and families there took in lodgers at about 9d a week.) These lodgers were known as wallet men as they each brought a wallet of basic food from home to last the week. This included potatoes, oats or barley, and bread. Meat was a luxury and so they often went poaching. The landowners reported this to the lead agents, but, despite warnings from the latter, the employees took little notice. The worst offenders were said to be the lead smelters from the mills at Allenheads and Rookhope, who regularly banded together on organized hunting trips.[22] Other pastimes in the 1840s were walking, tending small-holdings and playing marbles.

In 1842 the Parish of Hunstanworth had no beer shops or public houses. Most lead miners were teetotal, and had long been so. It was also claimed that they needed more food than colliers because the poor ventilation in coal mines which lessened the appetite was not a problem in the lead mines.[23] Sometime later, as well as the Miner's Arms at Bay Bridge, a public house opened at Ramshaw, along with a miners' shop and grocery store at Jeffrey's Rake. Around 1860 the latter was owned by Thomas Pears.

Between 1801 and 1861, the population of Blanchland district grew by some 120 per cent. From the 1860s, however, people began to leave, causing a shortage of miners. The 1861 census records the arrival of Welsh miners, and it was commented that the Derwent Mines were the only ones with a significant number of immigrants from other areas. By 1871 a total of 32 people had moved in to the district from Cornwall and Wales. In this same year Mr J. Morpeth managed the Derwent Mines, and a report by Forster gives statistics for the reading and writing abilities of parents in the lead mining districts of Allendale, Weardale and Derwentvale.[24]

Edmondbyers
This parish is bounded to the north by the river Derwent, to the west by Hunstanworth parish, and to the east and south by Muggleswick parish. The principal landowner is the Dean and Chapter of Durham. It contains Burnhope, Swandale and Harehope lead mines, Sandyford and Eudon Groove trials, and the early Feldon smelting mill.

Muggleswick
This parish is bounded by the river Derwent to the north and north-east, Hunstanworth and Edmondbyers to the west, Wolsingham to the south and Castleside to the east and south-east. Its principal lead mines are at Healeyfield and Hisehope. Healeyfield smelt mill stood on the road from Healeyfield to Castleside. Muggleswick was granted to the Prebendaries of Durham in the 12th century and remains with the Dean and Chapter via control of the Ecclesiastical Commissioners. In 1648 Healeyfield township was annexed to the parish on the instruction of the Parliamentary Commissioners.

Blanchland Abbey
In 1165 Henry I granted land in Blanchland to Walter de Bolbec who founded a monastery there. After the dissolution the land was leased and then granted to John Bellow and John Broxholme by Henry VIII in 1546. They sold it to William Farewell and when he died, in 1551, it passed to the Radcliffes by his widow's marriage. It then passed to Nicholas Forster of Bamburgh.

The land stayed with the Forster family until 1704 when Thomas Forster sold some to Lord Nathaniel Crewe (Bishop of Durham) to pay off debts. The mineral rights were kept by Forster and Lady Crewe, his aunt. When she died in 1715, the Blanchland mineral rights briefly reverted to Forster.

The most significant ownership changes followed the failure of the Jacobite rebellion in 1715, however, as many of those involved held mining interests in the district and lost their tenures to the Crown as a punishment.

One such was Thomas Forster, who was charged with treason. His cousin, Derwentwater was executed on February 24th 1716, but Forster escaped to safety in France.[14] Sir Walter Blackett sympathised with the rebellion and the Erringtons, another mining family, were implicated, but "*escaped by renouncing their Papist faith*". The Ord family, which also had mines, suffered too, as John Ord was beheaded, Mungo Ord died in the rebellion, and Francis Ord was imprisoned, but later released. Mrs Elizabeth Ord (sister) renewed the Ords' leases in 1717.

In May 1715 the London Lead Company's treasurer told its Court that Forster had "*broken his lease for Shildon and for Jeffreys*" and ordered the preparation of a draft lease.[7]

About 1721 Lord Crewe bought Forster's forfeited tenure from the Crown Commissioners for Forfeited Estates, a committee headed by Chambers Slaughter, and set up to dispose of lands forfeited by those involved in the rebellion.[25]

On February 18th 1709 a lease had been completed by the London Lead Company for Shildon (Acton Low) Smelt Mill and the lead mines of Blanchland, Allenshill (Allenshields) and Buckshott. The lease was between Nathaniel Crewe and his wife Dorothy (Forster), John Montague (Dean of Durham Cathedral); the Rev John Bowes (Prebendary of Durham Cathedral), Sir Robert Eden and Mark Shaftoe. It was for all the mines, veins, grooves, strings and shoads (placer deposits) of lead ore, as well as for Jeffreys Grove in the possession of Magdalene Gray or her assignees (original lease from Forster). This part of the estates of James Radcliffe was purchased in 1721 by Lord Crewe just before his death, for £20,679 10s 0d. It is also recorded in the LLCoCourts Minute Books (Vol.4) entry for 5th February 1712 (1711 in our calendar) that "*This day the common seal of the Corporation as affixed to John Doubleday's lease of Shildon Mine, which he exacuted long since 29th October 1708*".[25]

Lord Crewe died without an heir in 1722 and his estates, including mines, in Northumberland and Durham, were put under the management of The Lord Crewe Charitable Trust, which still exists. The alienated Derwentwater Estates, in and around Alston, Coalcleugh and the Allen Valleys, was transferred to The Greenwich Hospital Trust for Seamen by 1735.

At this time, the other Derwent valley mines were owned by the Dean and Chapter of Durham, and the Clavering and Baker families whose properties of Hope and Newbiggin Fells were acquired by the Silvertop family in 1800. George Silvertop, owner of land to the east (Minsteracres) and west of Blanchland (Beldon), died in 1841. Ord's land passed to Robert Capper of Garston in Herefordshire in 1814 and then to Ord's nephew, the Rev Daniel Capper of Huntley in Gloucestershire in 1826.

The main landlords are now the Dean and Chapter of Durham (Ecclesiastical Commissioners), the Lord Crewe Trustees, the Joicey Estates and the Captain Parlour Estates. Lesser landholders include the Forestry Commission and Minsteracres (formerly Silvertop, now Cookson) Estates.

Mackenzie's *History of Northumberland* says that, in 1720, the Commissioners for Forfeited Lands sold Forster's rights to minerals under the unenclosed Crewe lands to Mr Stoddart, of South Shields, the London Lead Company's agent. He granted these mineral rights to the "*Incorporated Lead Company*" until 1807, but in the 1730s he sold some of the mineral lease to Coulston Skottowe, of Chesham in Bucks. The Lord Crewe Trustees kept all rights to the enclosed lands.

Hunstanworth

At the time of the Boldon Book (Co. Durham's Domesday Book), Hunstanworth belonged to Robert Corbet. He gave the original church (the Rev Daniel Capper built the present one in 1863) and part of the estate to St Giles' hospital of Kepyer. In 1439 the latter demised the vill of Hunstanworth at a rent of 40s 0d to Alexander Beckfield and his wife Mary. The boundaries ran "*up Bolts Burn to its head, across to Nookton Burn, down to Eweshope burn foot, thence to the Derwent and back up Bolts Burn*".

After the dissolution of the monasteries, the Kepyer lands were granted to William Lord Paget, Principal Secretary of State to Henry VIII, and in 1549 he was given license by Letters Patent to dispose of the King's lands. The manor of Hunstanworth along with Townfield and a parcel of land called Slemedowes were disposed of on October 17th 1545.[26] Included was a 6s 8d annual rental from Hunstanworth church and the mines of Hunstanworth manor. All went to William Eggleston (a yeoman) "*and his heirs for ever*".

After the death of one of the Egglestons on March 29th 1606, a new agreement for the Derwent Mines was required for Davison and Surtees, lessors of the mines. A later change to the deeds allowed the ownership of the property to be transferred to Eggleston's son, Robert. This lease had a further 51 years to run.[26] In 1658 the Hunstanworth mines were possessed by John Butler who sold them to Richard Thorpe of Allendale. On Thorpe's death in 1672, the mines passed to his widow Margaret who, in 1685, sold a part-share to Hugh Robinson of Upper Black Cleugh, Northumberland. In 1686 a quarter part-share in Jeffrey's Grove was sold to John Ord of Newcastle. This was part of an older lease held by Sir William Forster, and later by Thomas, Paul and Lancelot Errington.

A descendant of John Eggleston still owned most of the land in 1687, as, on May 18th that year, Thomas Eggleston agreed with John Ord of Newcastle for 1/8th part royalty of the Hunstanworth mines at a consideration fee of £12. There is also reference in 1687 to William Ord of Cowbyers, Blanchland, in the Butler/Thorpe lease of 1658. There were no direct Eggleston heirs, so the estates were eventually alienated to Ord, "*a gentleman of Newcastle*", and thereafter they passed down his family.[27,28]

Ord became a significant player, starting by procuring interests in as much adjoining property as possible. Numerous agreements in his favour were made around this time and no doubt he realized that, although not always successful, the acquisition of shares in the developing mines and the land they were on would most certainly increase his wealth.

In 1750 George Baker held Newbiggin and Hope Fells (Bulbec royalty) to the immediate west of Blanchland, whilst the Clavering family held the lands of Harwoodshield and Riddlehamhope Fells to the extreme west. Skottowe held the Lord Crewe Estate royalties to the east of Bolts Burn and immediately

north of Blanchland, and royalties on land at Nookton Park immediately south of the Clavering and Baker liberties.

That part of the (unenclosed) estates including the leases of the mines to the west of Bolts Burn, acquired in 1720 by John Ord, later passed to his son, Ralph. In 1767 the Rt. Hon. Robert Ord owned the mineral rights to this land. In 1814 John Ord Jnrs estates passed to his nephew, Robert Capper of Garston, Herts.[27]

By 1827 the Derwent Mines were divided into 5 parts.[29] These were Shildon, with 4 main veins and a few inferior ones, and held by John Skottowe of Chesham, Bucks; Beldon, owned by George Silvertop (Baker sold Bulbec in 1800) and consisting of Beldon Shields and Fellgrove Veins, with some minor intersecting veins in Beldon Burn; Jeffrey's, which also belonged to Skottowe and worked down to the Great Limestone; Ramshaw which belonged to Capper, John Ord's heir; and Whiteheaps, which belonged jointly to Skottowe and G. Capper and consisted of a number of intersecting veins "*formerly worked to great advantage*". In 1851 the Capper royalty became the property of the Rev Daniel Capper of Huntley, Glos and of Lydon Court, Herts.[27, 30]

The close proximity of the two royalties separated by a stream, on both sides of which the same veins were being worked, often posed difficulties. In 1828 a dispute occurred between Capper and Skottowe over the rights of ore recovered from the boundary stream. Both claimed the rights from this ore on the basis that it had arisen from their own dressing floors. The courts eventually decided that, since the single mining company involved was working the ore on both sides of the boundary, it was they who had the sole rights to any ore recovered from the stream (see later).

John Skottowe (Lord Crewe Trust property) had died by 1824 and was succeeded by his nephew of the same name.[31] By 1865 the Derwent Mines' leasehold lands previously owned by Skottowe had passed to Col John Joicey of Newton Hall. On February 22nd 1866 the Rev Daniel Capper wrote to John and Edward Joicey, enclosing a deed confirming that Joicey had bought the estate for £73,000. The purchase did not, however, include all the mine shares (*Beamish papers*). The estates later passed to Edward Joicey of Whinney House, Gateshead, and from him to his only son Edward Joicey (JP, DL) of Blenkinsop Hall, Haltwhistle and of Newbiggin Hall. When Col Edward Joicey died in 1944, the estate passed to Capt R.E. Joicey, and in 1948 it passed to Capt W.F. Parlour of Monkend Hall, at Croft near Darlington.

EARLY PERIOD UP TO 1600

The monks at Blanchland Abbey, who were said to have a silver refinery at their monastery, were probably the first to develop the Blanchland mines. There is reference to a grant of a part of the Derwent mines in 1228, but the earliest ratified references to mining in this area is a series of grants from Edward IV.[32] In 1468, he gave control of all the gold and silver mines, and of all the lead mines containing gold and silver above the River Trent, to Duke Richard of Gloucester, Earl Henry of Northumberland, George Willarby and John Howard. This was for 40 years, at a rent of 1/12th of all of the recovered silver to the King and 1/16th to the Lord of the soil, provided that the latter agreed.

Mackenzie, in his "*View of the County of Northumberland*", records that the mines of the district were worked as early as 1462 in the reign of Edward IV, when they are said to have been "*very productive of ore*."

In July 1474 Willarby's report told the King of "*notable mines in the North of England*" and the King commissioned an investigation which led him to grant 4 of these mines to the Duke of Gloucester, the Earl of Northumberland and two merchants named as John Marshall and Richard Godeswyk on March 23rd 1475. Three are identified as silver mines at Keswick, Blanchland and Feccheroos. The fourth is a group of small lead/copper mines near Richmond in Yorkshire. The mine at Blanchland is Shyldeyn, and Fecceroos has been identified as Fletcheras Mine, at Garrigill near Alston in Cumberland. Shyldeyn Mine was leased with Feccheroos Mine from Lady Day 1475 for 15 years. Duties payable to the King amounted to 1/8th of any refined silver, with 1/9th dues going to the Lord of the Soil and 1/10th to the local Curate.

On April 14th 1476, the King appointed the German metallurgist Walter Barsonhousen as "*master finer (smelter), purger and divider of the ores and metals from these mines*" with the fees for this appointment "*to be agreed upon amongst the mine lessees*". He had to take on and instruct as many apprentices as the lessees saw fit.[5]

Under *Jura Regalia*, a mint existed at Durham in the reign of William II and there is evidence of two separate mints in the city in the reigns of the first three Edwards. One of these belonged to the King, while the other was the property of the Bishop. The last Bishop to mint coins was Cuthbert Tunstall (who was deprived of this privilege in 1558). The silver used probably came from northern mines.[29]

As mining developed in the Derwent watershed, Ramshaw and Whiteheaps became the main producers. As they were over the river from Shildon Mine, which was in Northumberland, they were known as the Durham group. Shildon and the Durham group were rich in the 15th century and had workings that were "*continuous beneath the county boundary*".[33]

By 1478 all Northumberland and Westmorland's metal mines had been leased to Godeswyk and other merchants for 10 years, at a Royalty of 1/15th each to the King, the Lord of the Soil and the Curate of the place. In 1486, Henry VII engaged the Duke of Bedford and others to be Commissioners and

Governors of all the lead and silver mines in England, with Sir William Taylor as their Controller for 20 years. The King claimed 1/15th duty for himself, and allowed 1/11th to the Lord of the Soil. Later, Henry VIII instructed Cardinal Wolsey to improve the basic organization of this newly rising trade.

On October 1st 1528 William Thomlinson, keeper of Gateshead Park, and his son Thomas were appointed Clerks of the Mines in the Bishopric of Durham "*in whatsoever place these existed, whether of lead, iron or coal*", for a life's term, or for the life of the survivor of them. They could occupy the post themselves or select an adequate deputy for the purpose. The salary was set at 10 English marks paid from "*the Exchequer of Durham on the feast of St Michael the Archangel*" by the elected Receiver General of the time. Also due with the position was one caldron of coals, filled "*amply, as in the customary manner*", each day from a pit of their choice. William Franklin, Clerk to the Chancellor of Durham, witnessed their election.

William Thomlinson eventually married Elizabeth Gray, whose name featured occasionally in many of the district's mine deeds. She was the daughter of Robert Gray of Hebburn, whose son, Anthony, also became a bailiff.

In 1528 Cardinal Wolsey supplied most of Northern England with money from his mint. The Chancellor wrote to tell him that "*finers had been sent to Fountains Abbey in Yorkshire and other places where lead was being worked*". A man was also sent secretly to Hexham and to Weardale to view the mines and get samples from each for silver assay. Their findings led to recommendations that attempts should be made to melt the Bishop's own lead with sea coal rather than with wood. A site in Gateshead was chosen for the trials, to be conducted by Dr Strangeways and Richard Bellasis. They were also asked to survey all the mines and try to make them more profitable and they had to "*finish the new house and furnace for the trial and instruct the finers that they should be as diligent as possible, so that true profits and values could be established for a year's work*". The finers had not started their project on June 21st 1528, but hoped to be operating within a fortnight of that date. Bellasis wrote from Tynemouth in August 1528 that the finers had "*put the coining in exercise*", but the furnace had failed to hold the metal and it "*ran from all sides*". The finers asked for a new one "*constructed from a single stone*". Bellasis granted this to test their skills. He also announced that, if this failed, any further expenditure would cease. At the end of the year, Franklin explained the small returns obtained by saying that refining and refiners' expenses had to be paid, and ore for 40 fodders of lead production had to be bought. It appears that the experiment was more costly and less satisfactory than expected.[34]

THE PERIOD FROM 1600 TO 1700

The increasing demand for lead in the early 17th century encouraged mining throughout Britain as the price of lead increased, and landowners soon recognized the potential wealth that could be gained from this source. By leasing their land to merchant adventurers, they guaranteed a steady income from the lead royalties. Many large property owners, including the Radcliffes, the Fenwicks and Swinburnes, the Erringtons and, in County Durham, the Ecclesiastical Commissioners, took advantage of this upsurge of interest.[5] They were greatly spurred on by the 16th century "*masters of technology*" such as Daniel Hochstetter, a German metallurgist who, in the latter part of the century, was an instigator of the Company of Mines Royal, set up to stop the flow of unrefined lead to Spain for extraction of its silver content.

Early leases followed a very precise form, and typically named not only the lessee and the area of ground concerned, but also contained the minutest of details such as permission to remove turf, stone and timber for use in the mines, or for surface drainage. Permission was also agreed for wayleave or access for pack horses, carts etc. to and from the mines. In some leases specified routes were agreed, which traffic had to follow strictly. Initial application for a lease was usually accompanied by a simple, hand-sketched, surface plan of the vein to be worked.

In 1624 Charles I granted the lead mines in a 10-mile radius of Muggleswick to George, Duke of Buckingham, for 21 years. They were said to be Mines Royal, from which the duty on silver, or lead mixed with silver, was set at 1/10th to the King and any residue to the mint.[33] Earlier, the mines had been referred to as silver mines, but here they are called lead mines for the first time. This grant included the Blanchland (Shildon) and other Derwent valley mines, along with many of the mines of Weardale and Allendale.

With rising lead prices in the mid-17th century, exploration work led to the opening of many new mines. Many shares in mines also newly appear or change hands. On May 13th 1625, for example, Charles Thorpe leased a 1/8th part of the Hunstanworth mines to Sarah Millbank. On September 14th of that year Robert and Alexander Eggleston of Townfield, lead miners at Hunstanworth, leased land at Hunstanworth with Alexander Davison, merchant and alderman of Newcastle, and Thomas Surtees for 200 years for £100 and a rent of 4 peppercorns a year. This lease was for lead mines at Townfield in Hunstanworth Manor, and included mining, smelting and building watercourses. That same year, Thomas Farror of Beldon (Curate of Hunstanworth) made a revision of a 1624 agreement with Surtees and Davison changing the tenure of the 30 year Townfield farming agreement to include mining rights. This lease again asserts the Egglestons as landowners (see previously), Farror as the tenant and Davison and Surtees as the farming and mining rights holders.[26] (Note, in some sources, Farror is also spelt 'Farrell'. In the North West Durham mining community, 'Farror' is a common pronunciation of the name 'Farrell').

In 1657 an agreement was made between Davison and Trynsoff for a moiety each in these lead mines. On June 12th 1658 a share (originally belonging

to John Butler of Newcastle) was sold to Richard Thorpe of Hunstanworth. On May 21st 1685 Thorpe's wife sold this to Hugh Robinson for the remaining lease period.

Mining accounts for an eight week period at Boltshope Grove, from 28/5/1664 to 23/7/1664, lists the partners at this mine as:-[36]

Partner	*weeks*	*days*	*£*	*s*	*d*
Gregory Butler	*8*		*2*	*00*	*00*
Richard Thorpe	*8*		*2*	*00*	*00*
Hugh Robinson	*7*	*1*	*2*	*10*	*02*
Thomas Cawood	*7*	*1*	*2*	*10*	*02*
Ralph Mitchel	*6*		*2*	*02*	*00*
George Ludlow	*7*	*2*	*2*	*04*	*00*
John Osoley?	*7*	*2*	*2*	*00*	*04*
Cuthbert Burges	*7*		*2*	*02*	*00*
Nicholas Jennings	*4*	*1*	*0*	*16*	*08*
			20	*05*	*04*
			5	*05*	*00*
		Total	*25*	*10*	*04*

Other charges as follows	*£*	*s*	*d*
40 loads coal	*1*	*12*	*00*
For a rope	*3*	*04*	*06*
For carriage of rope and iron	*0*	*02*	*00*
For 1 bar of iron	*0*	*07*	*09*

On May 11th 1678 Thomas Errington (a Newcastle merchant) and Sir James Clavering of Axwell, Durham, took a 1/4th share in the Northumberland section of Jeffrey's Grove (Shildon?). On September 13th 1678 a lease was agreed between Henry Maddison, a Newcastle merchant, and Sir James Clavering, for lead mines in Hunstanworth. This included the Commons and Moors under the terms of the Eggleston lease, for a sum of £15, 1/8th duty and 4p (peppercorns?) yearly for the remainder of the 200 year lease. On February 4th 1684 Cuthbert Robinson of Upper Black Cleugh in Northumberland was instructed to act as administrator of the goods and chattels of Hugh Robinson of the same place, "*due to the minority of William Robinson*" the son.

The Ords

Robinson passed a 1/12th share of the Hunstanworth mines to William Ord of Cowbyers. This seems to be one of the shares which had belonged to John Butler and was later sold by Richard Thorpe's widow, Margaret. It was the first of a series of shares which the Ord family eventually acquired.

On January 10th 1686 Baron James Clavering of Axwell released his 1/4th share of Jeffrey's Grove to John Ord for £6 per annum. This share was collected from Thomas, Paul and Lancelot Errington in redemption of an unpaid bond. The Errington family had later connections with the ancient Feldon smelting mill, but no link has as yet been found around this date.

In 1687 a meeting of the Society of Mines Royal reported that 54 ozs of silver had been recovered from the Muggleswick mines, which were said to contain "*a great quantity of silver ore*". This caused further interest in the Derwent Mines, as more changes were seen within the partnerships in the same year, again mainly to Ord's benefit.

Ord's efforts to secure as many leases as possible are shown by a letter to John Armstrong, a London Attorney, in which Ord indicates that cash should

be offered to the tenants of a property (originally belonging to a Mr Bainbridge), if necessary, to secure the lease. Armstrong was instructed to offer up to £20 rather than to fail. He was to *"break not for (the sake of) 20s, 40s, or £3 and if he have noe estate yet give him what you think fit and take his deeds and such a sale as he can make. Pray fail me not*".[26] Ord did not get what he wanted, however, and on June 18th 1698 Mary Bainbridge transferred the property to a John Carleton (Coulston?) for £20.[35]

Other examples of lease changes which took place to Ord's apparent benefit include:

04/2/1687. James and Cuthbert Robinson lease land from John Butler and William Ord.

16/2/1687. James Clavering offers his one-eighth part to Thomas Ord for the remainder of the 200 year lease.

18/5/1687. Thomas Eggleston (the Egglestons were the majority owners of the property) made an agreement with Ord for a one-eighth part of the Hunstanworth mines, for a £12 consideration fee.

11/7/1687. Lionel Vane of Long Newton and George Vane of Durham City passed their quarter-shares to John Ord for £24.

16/9/1687. James Clavering transferred a one-eighth share to Thomas Ord. Clavering had originally acquired this share from Robert and Alexander Errington (again in lieu of an unpaid bond) to hold for the remainder of the 200 year lease at a consideration fee of £50 plus £4(??) per annum.

11/10/1687.Richard Mowbray passed his one-twenty fourth share to William Ord of Cowbyers for the remainder of the 167 years term for a £10 fee and 1p. [peppercorn?] *per annum.*

11/11/1687. Anthony and Jane Proctor and Elizabeth Swinburne gave up their quarter-share to Thomas Ord, for the consideration of £29 and a rent of one peppercorn (here peppercorn is spelt out in full) per annum to be held for the remaining 130 years of the lease.

19/12/1687.John Rogers made an agreement with Ord and Richard Armstrong for a three-eighth share of the Hunstanworth and Townfield mines. Half of the income was to be paid to Rogers.

20/12/1687. The Blacketts [John and William] *made an agreement with Ord for a moiety of the Hunstanworth and Townfield mines for 5/- per annum.*

Between 2nd June and 30th August 1687, Jeffrey's Grove sent 10 bings and 3 horse of lead ore to Dukesfield Mill. The price was about 4s 0d per bing.

In 1690 William Forster of Bamburgh leased Jeffrey's Grove Mine to Thomas Rawling of Durham City for 21 years, at a rent of 1/7th of the ore raised. A later lease reset the rent at 1/10th and covenanted that the lessees must restrict their work to within 30 yards each side of the grove.[36]

The London Lead Company

In 1692 the London Lead Company was formed by Letters Patent to exploit the mines of Britain. It was an amalgamation of several earlier chartered companies, these being the Royal Mines Copper, the Company of Mine Adventurers, the Company for Digging and Working of Mines, and the Company of Copper Miners in England. Many of them were chartered in Elizabeth I's reign, but, owing to the scale of their operations, it became more economical to conduct their business as one unit. The company was formed on October 14th 1692, with the official title of "*the Governor and Company for Smelting down of Lead with Pittcoals and Seacoals*" and "*on the following thirteenth day of that month an inaugural meeting was held in the Half Moon Tavern at Cheapside, London*".[37] The Royal Mines Copper Company continued separately for a short time, when some of its members were associated with forming the Ryton Company in Newcastle.

The Royal Mines Copper Company eventually folded because of the inefficiency of its smelting process and by 1697 the Ryton Company was processing parcels of Alston Moor ore at its Ryton-on-Tyne works. One of the founder members of the new company was Dr Edward Wright. Thomas Cooper and John Haddon, active with the Welsh Company of Royal Mines Copper, were also involved in forming the new Company, whose members were all Quaker landowners and businessmen. This enabled them to influence the London Lead Company's rulings to such an extent that the new and larger company was eventually referred to as "The Quaker Company".

THE LONDON LEAD COMPANY PERIOD (1700 TO 1750)

In 1702, two London Lead Company agents toured the north, looking for mines of worth. They arrived at Corbridge, then went on to Hexham from where a guide took them to Acton Mill, Shildon Mine and to Feldon Mill. They were probably acquainted with the Blanchland mines from earlier visits as a company policy at the time was to send agents touring the lead markets to buy up parcels of ore to keep their mills supplied. This was especially true after 1703/4 when the company's Gadlis Smelt Mill opened in Flintshire.

Ryton Smelt Mill

By 1704 the Ryton Company had merged with the London Lead Company. The ore smelted at Ryton Mill, on the site of what is now Blaydon railway station, included parcels purchased from both the Alston and the Blanchland mines. Refining, to extract silver from the unrefined metals of other mills, was later done here under the direction of John Pattinson, inventor of the desilverisation process which bears his name. Cookson Plc, which still has a lead refinery on the north bank of the River Tyne, was also established in 1704 and is possibly a descendant of the Ryton Company. The original works at Elswick was called Meadowfoot Smelter and in 1778 it was owned by Messrs Walker, Fishwick & Ward.[38, 39, 40]

Bolts Burn and Shildon

The mines of Bolt's Burn and Shildon are too intertwined to be treated separately and so, for continuity, some information may be repeated. Much of the history also still remains unclear.

Edward Wright, Edward Leeds and Thomas Forster met on January 4th 1708 to discuss the dues for Shildon and the purchase of ore from Jeffreys Grove, and also to bargain for the best tenure, but later that year Forster had to sell the mines to pay off a debt. On June 1st 1708 John Doubleday offered to assign the Shildon Mine lease from the Bishop of Durham to the London Lead Company for about 20 years, for a sum of £200, and on January 11th 1709 dues were agreed at £1 10s 0d per bing for Shildon and £1 13s 0d per bing for Jeffrey's. It was also agreed to govern the price of cutting ore (small sized) and give the London Lead Company preference in ore purchase.

Ore from the London Lead Company's Blanchland mines was smelted at its new Acton Mill during 1708.[41] A further lease is recorded, dated February 4th 1709, for Bolt's Well Foot and Whiteheaps, running for 1000 yards west of Bolt's Burn.[42] This agreement was between Elizabeth, Robert and George Rogers (for John Rogers and John Ord), and John Mowbray of Dukesfield, George Mowbray of Allenheads, John Johnson and William Mowbray of London. Also involved were Joseph Longhorn of Stanhope, John Hepple of Styforth, Northumberland, Rowland Harrison of Muggleswick, Cuthbert Ward of Newbiggin and John Ellison of Northumberland.[42]

After the London Lead Company developed Jeffrey's, Ramshaw and Whiteheaps, it built a new mill (Derwent Mill) further down Bolt's Burn valley in 1713.[43] It smelted ore from the above mines, along with purchased parcels of duty ore. The old (Ramshaw) mill on Bolt's Burn was on Ord's leasehold, but the new mill was on Dean & Chapter land (Skottowe leasehold).

The works forfeited by the Forster/Crewe alliance after the Jacobite rebellion, were some quarries and mines at Shildon Grove, Shildon Smelt Mill and Jeffrey's Grove Mine. Also included were mines at Allens Hill (Allenshields) and at Buckshott, in Durham and Northumberland respectively. The leases for these gave the holders permission to work the mines, sink pits, and make trenches, levels and grooves for getting ore. They also covered supplying water and air, along with the removal of foul air and other obstacles. Other rights included permission to build houses, works, gins and engines, and to quarry stone and slate for these. The leases also gave the usual permission of leave for heaproom and wayleave for entrance by foot or with horse and carriage. A later lease for Shildon included the condition that no new level could be driven "*within the enclosed ground that contained the level* [Shildon Low Level] *in use at Shildon Grove*". Nor could any new level be driven "*in any other enclosed ground except on the said moors, without the consent of Lord Crewe or his heirs*". Other conditions were that "*if any mine is worked in enclosed ground, recompense will be expected by the tenants"*. One example of the duty levied on ore raised from Forster's land, is on May 17th 1715 when the London Lead Company paid him an advance of £100 for duty ore from Jeffrey's and Shildon Mines.

After the Earl of Derwentwater's execution for his part in the Jacobite rebellion, the Commissioner for Forfeited Lands administered his estates and for a time, the collection of duty ore was sporadic. Nevertheless, on December 7th 1717, 70 bings of (duty?) ore from Jeffrey's Grove were paid to the Commissioner.[42] These problems of collection form part of a series of letters from Jonathan Maughan to Chambers Slaughter, Crown Administrator for the Forfeited Estates, between 1719 and 1720.[44] In them, the Commissioners are informed that Mr Gray (agent for the Bishop of Durham) had been reprimanded for removing washed ore before payment of duty.

Maughan, who had been either the Earl of Derwentwater's mining or mineral agent, described himself as "*a Protestant and follower of the King to such an extent ... that he had suffered financially as a result of his devotion*". Having lost this position on Derwentwater's demise, he offered to manage the alienated estates of Dilston and Langley along with the mines in Alston Moor and at Jeffrey's Grove, offering a valuation of the latter mines as they stood. Included in the letters to Slaughter are accounts for Jeffrey's Grove from February 27th 1717 to November 18th 1719.

Maughan's petition was successful and he was made manager of the lead mines in Alston Moor and Jeffrey's, together with those of the Manors of

Dilston and Langley, and those formerly belonging to Forster. One petition letters confirms Maughan as being a "*true Protestant and well qualified for some useful office*", and is signed by "*Henry Blencow Vie Com Cumberland*", and Jos. D. Appleby, Peter Brougham, William Fergus, Thomas Jackson, Thomas Fletcher, Roger Law, John Laughton, Richard Robinson, Walter Lutwidge, George Lamplugh, Jonathan Cockell, and Ty Fetherstonhaugh.

Maughan reveresed Slaughter's order to Mr Gray's sub-agent to remove engines from Forster's alienated Jeffrey's Grove mines because it would "*devalue the property and that these should be left until the property was sold*". Maughan also commented on the folly of removing equipment, and on the lack of a watercourse between Norham and Beldon Burn over Mr Baker's and Lady Clavering's property, noting that "*water could be laid on to cause the Gynns to go winter and summer*" at Reeding. If the owners allowed, he could take water from the burn between Norham Burn and Beldon Cleugh, and take it to Reeding "*where no ore had been worked for 7 months for lack of water*". Also, without water for pumping, the mine often flooded.

Around 1720, Maughan described the mines. He said Shildon Mine had "*good ore in the eastern forehead at £1 per bing ready for smelting"* with underground wheels at a depth of 19 yards and 30 yards, and three hand pumps in the lowest workings, at a depth of 41 yards. The water gins ran at the mine's expense, but the workmen paid for the hand pumps. Working the ore would be cheaper than 20 shillings per bing if a shaft (pump) and sump were sunk, since at least 30 men were needed to get the ore to bank because of the distance.[42] As the ore was in solid rock, gunpowder was needed for winning it. Shildon workings could not be inspected "*as the mine was presently flooded due (disgracefully) to the fact that insufficient surface water had been laid on to give all year round pumping*." Gray, Weatherley and John Steward, Weatherley's agent, thought Maughan and Stoddart were interfering with their operations and claimed it was the intention of the Bishop's agents (Messrs Gray and Stonehewer) to dispute the Crown's total rights to any forfeited ore duties. This was because Forster's tithe had been only one half of the Jeffrey's and Shildon workings. The Boundary Book, then in Gray's hands, would be required to settle any dispute. As an extra measure, a letter informed the Trustees that, as the lease was effectively expired, all the cutting ore would be seized and guarded for five days to prevent unlawful removal. This action had been anticipated, however, and all the cutting ore, with many of the ropes and tools, had already been moved across the stream to Ord's liberty.

On March 11th 1719, Ord leased Ramshaw Rake to Edward Weatherly of Leadgate, Henry Gray of Hunwick, and Thomas Wood of Burton. They agreed to build a bingstead for the duty ore, and to employ at least six pickmen for a minimum of nine months each year. The duty was divided into fifty-sixths. E. and J. Rogers got three shares, H. Hudson got one and John Ord four. The total duty amounted to 1/7th of the ore raised.

In 1720 the London Lead Company became a victim of the South Sea Bubble, as on June 3rd it floated 1270 of its own shares at £20 per each, and used £3775 of this to buy 500 shares in the South Sea Trading Company. A considerable loss was announced at a later Court meeting.[44]

William Stoddart renewed the London Lead Company's leases of Shildon Mine and Acton Mill on June 27th 1722. The lease for Shildon included a proviso that the lessees should work no more than 600 yards from Dixon's Shaft on Shildon Vein, "*and from that shaft to Birk Sike Pasture hedge to the west, keeping within thirty yards either side of Shildon Vein*".

By June 6th 1721 Shildon had produced 400 bings of ore, with a silver content of about 15 ounces per ton.[44] Each bing contained 8 cwt, or 64 stones, and five bings of ore, "*if the ore is well washed*", produced one fother or 21 cwt of lead. Each fother of lead yielded 20 ounces of fine silver. By using the gins more, it was expected that output could be increased. Maughan's letters state that the late Lord Derwentwater's mines were mostly let by an annual Jack Note, at 1/5th duty.

The Derwent mines developed steadily under the London Lead Company's management, and, having established itself at Shildon and on Bolts Burn, the company turned its attention to neighbouring mineral localities, such as the extensive Ramshaw Veins and the Bolts Burn valley. In 1722 the Company leased adjoining property on the east bank of the burn, from the Lord Crewe Trustees, to give it access to a greater length of vein.

Around 1725 the London Lead Company obtained Feldon Mill, near Edmondbyers, and the right to pursue "*certain trials in its vicinity*". A trial level at Pedams Oak Sike (Burnhope Burn) is recorded as one of these. No details of this level have been found, but it was probably driven to prove the eastern extremities of the Jeffrey's-Ramshaw belt of veins.

On March 27th 1727 William Stoddart of the London Lead Company renewed the lease of Shildon Mine and Acton Mill for 21 years, at a duty of 1/7th of the dressed ore. By June 20th that year the Shildon Works had been enlarged and on July 4th it was asked that a copy of William Stoddart's lease of Shildon be given to Mr Ware (executor of the estates of John Coulson of South Shields). After examining it, and the lease of Jeffrey's Grove, an incorrect signing and sealing was noted, and a redrawing of the lease was requested.

Watson, the mine agent, believed the mines would get better and recommended purchase of the Blanchland royalties for an anticipated price of £6700. Ware was inclined to sell at this time because of the poor duties. The London Lead Company Minutes Books for April 17th 1730 record that Ware, the landholder of Shildon Grove, had complained about Shildon and

Jeffrey's Mines the previous summer, and had asked for some of the company agents to inspect the workings.

In 1735 Ware agreed to renew the London Lead Company's lease of Jeffrey's Grove and included the right to work Linnbank Vein, in Smithy Cleugh off Nookton Burn, for 15 years at 1/6th duty of unrefined ore. At this time, all the landowners dealt with Mr Stoddart, the London Lead Company's agent.

Both Shildon and Jeffrey's Mines expanded in the 1730s and a new level (Shildon Low Level) was being driven between May 1st 1729 and May 1st 1730. At Shildon Mine, each ton of ore yielded 14 cwt of lead, from which between 16 and 22 ounces of silver were recovered, but values as high as 26 ounces per ton were known, whereas at Jeffreys a ton of ore only yielded from 10 to 12 cwt of lead, containing 16 to 18 ounces of silver per ton.

The increased output, generated by the use of deeper drainage levels, made improved dressing methods necessary, and so stamps were installed to break the ore smaller and so get a better yield from the bouse. The stamps were installed by Thomas Forster, an engineer at the mines who is said to have built numerous "engines" (probably waterwheels) throughout the north and in Derbyshire. The following is an account of their cost:[5]

Jeffreys Mill - December 1737:			***£***	***s***	***d***
Thomas Forster, Engineer, making a wheel	*14 days*	*@22d*	*1*	*5*	*8*
Thomas Forster & son setting up the stamps	*18 days*	*@ 6d*	*1*	*4*	*0*
George Grey for walling up the stamp case	*24 days*	*@16d*	*1*	*12*	*0*
Work at the watercourses	*4 days*	*@10d*	*0*	*3*	*4*
Jos Ramsey 10 fodder timber for ye wheel	*8d/fo*		*0*	*15*	*0*

At this time pitwork was also progressing at Shildon Mine, with the company accounts recording the purchase of 50 yards of air pipe at 20d per yard, along with two angle pipes at a cost of £4 2s 4d. In June 1738 the company's minutes books record costs for drawing water and for installing air pipes during the driving of a level at Jeffrey's Grove. Raistrick and Jennings found only two entries for powder in 1740, which suggests that blasting was only used when very hard rock was cut. It was issued in 10 lb lots to one of the drivers, but the benefit of gunpowder was appreciated, and by 1743 ten half-barrels a year were regularly ordered from London. These orders were followed by regular orders of 50 half-barrels at a time, but these might have been for general distribution throughout the London Lead Company mines, as other orders are recorded for upwards of 100 half-barrels at a time.

On August 1st 1748 the London Lead Company renewed its lease of Ramshaw Vein and Whiteheaps (Boltswell Foot) Mine from Ord at £21 per year and at £1 10s 0d consideration money. The duty was set at 1/14th for seven years, then at 1/12th for the remainder of the term. Ramshaw Mill (Boltshope) was also leased in that year. These leases ran until 1769.

On September 27th it was resolved that John Smith should be appointed chief agent for the north in place of Thomas Westgarth (deceased), at a salary of £100 per annum "*from next Michaelmas*."

Westgarth Forster (Snr & Jnr)

In 1738 Westgarth Forster (Snr), son of George Forster, was born at Manor House (Plate 11), the family's home at Jeffrey's Rake, but there has been confusion over how long, or even if, his son, Westgarth (Jnr), lived there. For example, Forster's book, *Section of the Strata …*, suggests that the first three years of his life were spent there, but this seems to be wrong. Wilkinson has shown that the Westgarth family (of Coalcleugh fame) lived at the Manor House until 1736, when George Forster, grandfather of Westgarth Forster Jnr, married Mary Westgarth at Hexham.[45] The couple lived at Jeffrey's Rake for 17 years and their first-born son was given his mother's maiden surname as a forename. This son, Westgarth Forster Snr, married Lucy Emerson in 1766, and their son, Westgarth Jnr, was born at Coalcleugh in 1772.

Westgarth Forster Jnr became an eminent mining engineer, mineralogist and geologist, and in 1809 published *Treatise on a Section of the Strata from Newcastle-upon-Tyne to the Mountain of Cross Fell in Cumberland, with Particular Interest in the Mineral Veins,* which became the North Pennine mine operators' most valuable reference work of the time.

Thomas Forster described the district's mines to Thomas Skottowe on October 18th 1745.[46] At Shildon Burn, he records that a new vein at Andrews Quarry was supposedly "*the same as that in Blanchland Lane*". Wood Vein was being tried by driving a new level (Shildon Level) up the burn, with the ultimate objective of laying off the engine by draining Old and New Shildon Veins. The vein was said to be very strong in Forster's Close, but when it and a nearby vein were tried by a sinking, no ore was found. Old Shildon

PLATE 11. Manor House, Jeffreys Rake, with fenced-off collapse in foreground (1980).

was still producing a lot of ore. The recently discovered New Shildon Vein was working well and producing a good yield, while Fellgrove Vein "*lately leased by a company of gentlemen"* was going briskly. Ellison's Ford Vein had been tried previously by Mr Liddle of Newcastle, but had yielded no ore. An unnamed vein "*crossing Shildon House*" had not been tried.

In the Birkside Burn area "*a small trial on Espybank Vein made by William Forster had yielded no ore*". A newly discovered vein above Wood Vein had not yet been tried, and a vein in Birkside West Field, in this and the opposite liberty, had yielded no ore, while several "*strings were not yet tried*".

Rough Bank Vein, in the Beldon Burn area, "*formerly tried by Mr Mowbray and partners had yielded very little ore*". Forster's Grove, worked by William Forster on a "*jack note from Mr Ware before the present owner came of age*", had yielded a "*considerable amount of ore*". Beldon Shield Vein was reported to be strong and worked formerly with the adjoining veins. The Round Island Vein had been tried only in places and was known as Johnson's Hole Vein in the opposite liberty, from where it had "*previously been wrought and got*". Linnbank Vein had been wrought at a good yield by Mr Stoddart and was supposedly the same as Roughbank Vein.

In the Bolt's Burn area, the east-end of Whiteheaps was said to be untried, but the opposite liberty had yielded much ore. Old Jeffrey's, North and Sun Veins were still working after many years. New Jeffrey's, lately worked by Mr Mowbray, had been good, but was "*now laid in*". Shilford Haugh Vein had not yet been fully tried in New Jeffrey's Low Level.

PLATE 12. Aerial view of Bolt's Burn. Jeffreys (L) and Ramshaw (R) Rakes are marked by the shrub-line across the valley (T. Morris, 1979).

LONDON LEAD COMPANY PERIOD (1750 TO 1800)

Bolt's Burn

By 1750, the London Lead Company mines were being worked to greater depths using water power. The catchment area had been increased by building long water leats around the surrounding valley contours, but Bolt's Burn was the principal source of water, and, when its flow was split among a number of waterwheels, the resulting power was poor.

In contrast with Jeffrey's and Shildon Mines, the Company's workings on Whiteheaps Vein were never considered rich because the ore was intermixed with spar and rider minerals. The value of the duty ore from these mines from 1750 to 1765 was £5,542 (£369 10s 0d per year). At a rate of 1/6th, this represented a total ore value of £33,252, or £2216 16s 0d per year.[5] Sundry purchases in this period include coal, wood, iron bars, nail rods and 14lbs hog's lard at 4d per pound. The coal came from "*Kirk's Pitt, Hares Pitt and Lighton Pitt*" on Greymare Hill. Haulage costs for 25 loads of coal were 18s 9d or 9d per load. In this period about 130 fathoms of ground were cut at the lead mines.[47]

With the old lease due to expire in 1754, Skottowe passed a new one for Bolts Hope Grove to the London Lead Company on January 1st 1753 at 1/7th. The royalty was bordered at Bolts Burn both by Ord's land and by enclosed land belonging to the Dean and Chapter of Durham, which eventually led to great problems. On August 17th 1758 Ord renewed the lease of Ramshaw Rake to the London Lead Company, extending 1000 yards west of Bolts Burn at 1/12th duty which increased to 1/6th after seven years. The option to increase the distance to 2400 yards was written into the terms of the lease. The low initial duty was possibly to reduce the financial strain on resources until the mine reached a reasonable state of development. The heavier duty would then become effective when the mine became more profitable.

Around this time, numerous leases became due for renewal. Some went to the London Lead Company mainly because of their policy of acquiring as many interests as possible, but others were purchased by businessmen, keen to cash in on the profits being made. By May 28th 1767 the Rt Hon Robert Ord held 46/64th shares in the Hunstanworth Mines, and in this year a lease for one year of a moiety of these mines was made between Robert and John Ord for a charge of five shillings. On September 29th 1767 the Hon Edward Montague, the Rev John Thompson, William Archdeacon, Henry Ellison and Mary Gilpin leased the lead mines of Ramshaw Grove and Ramshaw Rake to the London Lead Company for 21 years, at a royalty of 1/6th of the refined ore. The part-shares were divided into 1/15ths as follows: Montague (6); Thompson (3); Archdeacon (3); and Ellison (3). Ord leased the mines on the same terms as above and included Boltshope Mill at a royalty of 1/12th, the mill rent being set at £12 10s 0d per annum.

On April 18th 1780 William Midford, William, John and Charles Roddam, and Joseph and Isaac Murray, all of Townfield, leased some land at Whiteheaps Mine extending 110 yards west from Boltswell Foot, along with Ramshaw Rake Mine, both at 1/6th duty.

Indentures for working the Hunstanworth mines were agreed on April 15th 1787 between John Barnes, Oswald Simpson and John Rumney, Henry Ellison, Ralph Ramsey and John Ord, and also between John Huddleston, Ralph Ramsey, and Ord for the release of three 1/32nd shares in the property. On October 8th that year Ord leased 1100 yards of Fernygill Vein to Nicholas Jennings, Ralph Ramsey, William Westgarth, Thomas Parker and John Simpson. On April 9th 1788 John and Cuthbert Roddam, of High House, Hunstanworth, and James Murray, of Ramshaw, leased Ramshaw North and South Veins from Ord. On May 23rd 1789 Ord leased a 1200 yards length of Whiteheaps Vein to Joshua and Matthew Makepiece, John Dixon and George Dixon.

Shildon

In 1755 the Prebendary of Durham renewed a lease for the construction of a level or watercourse to be made up Shildon Burn. The right to peat from the wastes of the Manor was covered by the lease, for burning at Acton and Jeffrey's Mills, and at other mills which might be erected. The lease covered all the mines in the lands enclosed before 1709 and was for 21 years at 1/7th duty. The rent was £2 for the watercourses and £10 for use of the peat. The enclosed land was bordered by Coat House and Birkside to the east and northeast, Reeding Burn to the southwest, and a mill race from Baybridge to Blanchland to the southeast.

In 1760 the draft of a lease from Skottowe to the London Lead Company for Old and New Shildon Veins was prepared. Nine years later, Shildon Mine was recorded as one of the principal lead works of the Northern Pennines, the others being at Coalcleugh, Allenheads and Fallowfield. Shildon had been "*very rich until of late years, giving employment to several hands*", and was said to have had two subterranean engines (waterwheels) to remove the water. Other veins in the area were not considered worthy of mention.[48,49]

On October 6th 1785 the Company changed its policy of yearly payment to half-yearly payment, to try and stop the underhand practices of some of its agents. The new pays were to be made each Michaelmas Day and only included ores which had been dressed and weighed and for which a ticket was held. A resolution was passed to prevent company agents dealing in commodities such as food, or being party horse-letting, ore haulage or the supply of candles, wood etc. Any money paid to the men had to be paid directly in cash, and not as goods or bank notes. It was also decreed that ore from the London Lead Company mines should be kept in separate bingsteads at the smelt mills and that all the ore from one year should be smelted before any from the following year was processed. One of the biggest offenders in

this had been J. Stagg, the company's chief agent.[5] He was not popular in Weardale, because of the way he treated the people under his control.[12]

The price of lead in 1788 was £23 per fother but in 1789 it fell to about £16 per fother. Despite this, the agents did not immediately lower the bargain prices. After the price fall, however, Thomas Dodd, Robert Stagg and Joshua Watson were summoned to the court to discuss the situation. Stagg was then instructed that the new May Day bargains should be let at no more than 28 shillings per bing. It was decided that, in the need for economy, "*the waste heaps of Acton and Jeffreys Mills should be worked up at a cost per ton of lead metal not to exceed £8 8s 0d*", and it was agreed that a gift of £10 10s 0d each should be given to Stagg, Watson and Dodd.

Nookton Burn

The London Lead Company surrendered its lease of Linnbank Vein and other mines in Nookton, held since October 14th 1782, on December 17th 1787.[5] The Lord Crewe Trustees then leased a 1100 yard length of Linnbank Vein, with 50 yards on either side, to Henry Errington, of Sandhoe, and Joseph Liddle, of Moorhouse in Cumberland, on March 19th 1789. The duty was set at 1/7th each to the Lord Crewe Trustees and John Ord. This vein coursed north-south across the Great Nookton Burn property boundary, from where levels were driven on the North and South bank into each respective property.

Ord leased Yawd Sike Level in Low Nookton Burn on May 12th 1794, to Thomas Parker, blacksmith, of Baybridge, and Nicholas Jennings, miner, of Priestburn. The proprietor of Boltsburn Mill had first refusal of the ore. Ord also leased the Smithy Cleugh workings to Thomas Smith and George Beckness of Rookhope on May 12th 1795 at a duty of 1/6th. Their ground ran for 1100 yards south of Nookton Burn, but was not to interfere with any of the other veins being let. Boltshope Mill had preference for the ore. The miners undertook to drain the mine to a depth of 24 fathoms below the bottom level, within three years, by erecting a pumping engine near Nookton Burn.

On May 12th 1798, Ord leased 1400 yards of Grindstone Cleugh Vein to Robert Hackworth of Burtreeford, James Harrison and Ralph Philipson (both of Stanhope). They undertook to drive a flank level south from the level mouth to the east end of Dry Rigg. Ord also leased Little Nookton Mine (Yawd Sike Level) to Isaac Hunter and William Westgarth of Dukesfield, and George Beck, a miner of Wagtail Hall, Hunstanworth, who had to employ 4 men. Both companies had to give Boltshope Smelt Mill the first option of buying their ore. Ord made a further lease of 1400 yards on Grindstone Cleugh to Robert Hackworth and partners on May 28th 1798.

Dispute at Slaley

On April 28th 1788 an agreement was made between the agents of the Lord Crewe Trustees and James Roddam, a lead smelter of Slaley, that the latter

should pay compensation in lieu of prosecution for taking roofing slates from a quarry on the south side of Acton Burn. Two fothers of slates had been removed to re-roof a smith's shop owned by Captain Bainbridge. Roddam had received 12 shillings for this, but, since he had not asked permission from the Trustees, it was decided that he should pay 17s 0d compensation if he wished to avoid prosecution. The sum was payable to Mowbray, the Trustees' Steward, and Robert Wall, George Wood and William Routledge were witnesses.[36] In 1788 James Roddam occupied Slaley (Acton?) Smelt Mill and Captain Bainbridge still lived in Slaley around 1820.

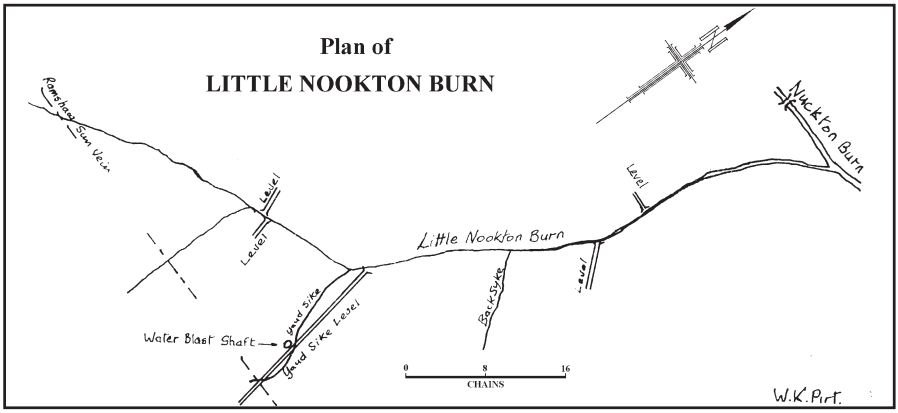

Fig 6. Sketch map of Little Nookton Burn.

Hunstanworth

Ord granted the London Lead Company a 21 year lease of ground extending "*from Bolts Burn Head to Boltswell Sike, then up to Bolts Well and on to the Currick, then on to the Bolts Law currick, on to Pocklets Pin, Bolts Head boundary stone and along Bolts Well Sike*", on August 12th 1798. An area including Whiteheaps Red and White Veins (459 acres), worked by the Whiteheaps Company (Shakespeare, Blenck and Partners), was excluded.

Newbiggin Mines

In 1751, 52 days were worked at Newbigginhope (Reeding). The mine's pay bills for April 28th 1750 to November 28th 1751 and November 28th 1751 to August 13th 1752 were £353 5s 3d and £135 13s 1½d respectively.[47]

On August 16th 1753 the lease of Newbiggin or Newbigginhope Mine was read over. The property was in the Manor of Bulbeck and belonged to George Baker (*see Beldon section*). In 1765, he and all the future Lords and owners of Bulbeck were given the right to work the mines, minerals and quarries in the manor, provided that any resulting damage was compensated for. On May 28th 1788 William Curry, tenant of the herbage concerned, asked permission to occupy the east side of Birkside Farm (Reeding) in Blanchland Parish to work a lead mine, offering 1/7th of any ore found as rent.

THE PERIOD 1800 TO 1850

During the 18th century, the Derwent Mines supported a fairly small population, but increased output in the 19th century was reflected in the population of Hunstanworth. As the following table shows, it rose steadily from 1801, peaked in 1861 and returned to its 1801 level by 1901.

Year	Population	Year	Population
1801	215	1861	778
1811	386	1871	704
1821	411	1881	502
1831	511	1891	271
1841	567	1901	220
1851	615		

In the late 18th century, the London Lead Company neglected its Derwent Mines and let the water management system deteriorate, contrary to the terms of its leases. Much equipment was dilapidated and buildings had been demolished. Some shafts had been filled in or had collapsed. Levels were in a poor state and the company was under pressure to surrender its leases.[50]

On February 27th 1800, John Skottowe took a letter from some north country mining agents to a meeting of the Company's Court. They wanted to divide the company's lease between it and them, adding that, if this was contested, they would try to obtain the whole property instead. Skottowe wrote to the London Lead Company on May 1st 1800, asking for the Shildon lease to be surrendered, owing to the mine's "*state of abandonment*". In its reply, the Company agreed to meet him to discuss the matter.

When the Court met on May 22nd, it decided to keep driving a deep horse level (Deborah's?) towards Jeffrey's North and South Veins and to pursue any other trials that might restore their credibility with the mineral lords. Skottowe was unimpressed, however, and, because of the state of the mines, he and the Lord Crewe Trustees refused to renew the Company's leases, setting a pattern that would eventually force it to leave the Derwent Valley.[50]

Other companies working in the area at this time included William Taylor and partners, who by June 28th 1802 had spent £2650 on driving Yawd Sike Level. Taylor's partnership was split as follows, but in September 1802, some of the shares were about to be sold.[51]

William Taylor	1/4	John Walton	1/16
Thomas Longridge	1/8	Simon Smith's assignees	1/16
John Head	1/8	Thomas Parker	1/16
Thomas Robson,	1/16	Mr Featherstonhaugh	1/16
John & Thomas Grey	1/16	Thomas Pringle	1/32
Thomas Head	1/16	Thomas Coleman [deceased]	1/32

On July 20th 1800, Ord permitted George Race of Wolsingham to take over William Roddam's 1769 lease of the Ramshaw Mines for a further 10 years at 1/6th duty.

On November 2nd 1801 Ord and his co-partners gave permission for John and Cuthbert Roddam and Joseph Murray to work Red and White Veins (at Whiteheaps) for 1100 yards west on each vein, with the duty ore to be "*washed clean and made ready for smelting*". The lease specified that records of the ore obtained be kept, adding that none of it could be disposed of without written permission. The lease also included permission to use an existing smithy, plus some storehouses and offices. A minimum of seven men were to be employed and the workings were to be left "*in good condition*" on vacation of the site.[36] On November 13th a duty rate of 1/6th was agreed and the minimum number of workmen to be employed reduced to four.

Easterby, Hall and Company

The partners in this company, which sought a lease of mines in the Derwent Valley on December 2nd 1800, were Anthony and John Easterby, George Doubleday, Walter and Frederick Hall, and John Surtees. They were generally known as Easterby, Hall and Company, and also worked the Arkengarthdale Mines in Yorkshire. The Halls also had lead mines at Grassington and Cononley, in Yorkshire.[52, 53] In 1804 the Halls had their own wharf at Bill Quay on the Tyne, where Frederick Hall was also part-owner, with Easterby, in a works supplying the glass industry with red lead. Frederick Hall, the most dominant of the partners, managed the Arkengarthdale Mines and lived at Scar House, near the Octagon Smelt Mill. He later built Ruffside Hall, on the south bank of the Derwent, from where he ran the business.[21] In 1814, Hall was also appointed manager of Old Gang Mine in Swaledale to replace John Davies who was also the AD Lessors' agent. Hall quickly sacked the latter for the two men disliked each other intensely.

John Ord had leased his Newbiggin Estate to Easterby, Hall & Company by January 2nd 1801 in return for 1/6th duty and on condition that at least eight pickmen were kept employed. An area around Grindstone Cleugh, in Nookton Burn, extending south to the estate boundary at the eastern end of Dry Rigg (land granted to Markwood, Mawson and Philipson) was also leased. The land at Whiteheaps Mine, which was leased to Joshua Shakespeare, Edward Blenk & Partners was, however, excluded from the lease. Also excluded were Fernygill Vein, leased by Jennings, Ramsey & Partners; Ramshaw North and South Veins; and Boltsburn Head (Bolts Shaws Vein) which remained with the London Lead Company. On September 19th Messrs Easterby, Hall were given the option of either erecting a steam engine at Newbiggin (Beldon) or driving a level in the Great Limestone, in order to secure adequate future drainage of the mines.[26] At the same time, the company was leased a 1400 yard length of Grindstone Cleugh Vein and, on condition of employing at least eight pickmen,

was also permitted to work Yawd Sike Level. Both levels are in Beldon Royalty.

Auburne Surtees, a principal partner of the Surtees, Burdon and Brandling Bank of Newcastle, also joined Easterby, Hall and Company a little later. When the bank suffered financial problems in 1803, the Surtees brothers were declared bankrupt, but their interests appear to have been covered by the creditors and this resulted in the payment of a large sum of money to Messrs Easterby, Hall and Company.[54]

Unfortunately, the derelict condition of the mines imposed great expense on Easterby, Hall and Company and by 1811 the company was in financial difficulties again and was eventually forced into liquidation. The Easterbys and Doubledays both backed out of the partnership because of the financial strain caused by these costly undertakings, but Hall rallied other shares, from London merchants. The primary shareholders then comprised twenty-three London gentry and merchants, headed by Sir John Cox Hippersley, Richard Puller Snr and Jnr, and Robert Skelton, and they formed the Arkendale and Derwent Mines Company on January 9th 1812. This company continued until July 5th 1817, when the directors decided to dissolve it on September 1st of that year. The assets were purchased by Walter Hall and Richard Puller Jnr, who continued for another three years before finally giving them up in 1821.[55]

London Lead Company Dereliction

The London Lead Company's neglect of its Derwent Mines at the end of the 18th century led to a subpoena being served on Thomas Dodd, its chief northern agent, on October 15th 1801 as a result of a Bill filed in Chancery. This related to the condition of the mines (possibly the Eudon Grove and Sandyford workings on Burdenhope Vein) purchased from the company by Messrs Errington and Company.

A further claim for compensation arose from an incident at Jeffrey's Rake, where a hush gutter had been made on Skottowe's royalty (LCT) in 1802. This washed away the tops of the pits and shafts associated with the workings and flooded both the Jeffrey's and Ramshaw sections of the veins, causing considerable pitwork damage. To avoid any recurrence, the pitwork repairs had to be made good and a trench had to be cut on the high side of the workings to capture any future flows of water. This trench had to be eight feet wide by 18 inches deep and 40 yards from the hush gutter, and filled with a 12 inch layer of clay at a cost of £768 7s 0d. Damage costs were awarded to the Lord Crewe Trustees as required.[56]

The London Lead Company also paid compensation to Easterby & Hall, with Thomas Dodd paying them two sums of £2 10s 0d for damage to ground at Jeffrey's Rake in 1805 and 1806, and his son and successor, William, paying £17 10s 0d in 1807. Both Skottowe's and Easterby & Hall's solicitors

attended the London Lead Company Court on February 13th 1806, to discuss the state of disrepair at Shildon Mine. The Court asked for the complaints in writing, so that copies of each could be given to Thomas Dodd. Compensation was agreed and on May 29th a letter from the solicitors requesting payment for damages at Shildon was passed on to Smith and Tilson, the London Lead Company's solicitors.

Thomas Dodd reported from Nenthead on July 17th 1806 that Bolt's Shaw Mine and Jeffrey's Mine were both returning poor values, though J. Armstrong and partners "*were driving in the vein in search of better success*" at Bolts Shaw and at Jeffrey's they were "*driving as best as possible*" until the renewal of the leases was settled. On October 25th, Dodd urged that the mines of the Derwent area "*should be given up as there were no encouraging prospects*."[41] Boltshaw was "*still very poor*", but Joseph Vipond and Company were "*still driving the level*" on January 24th 1807.

Frederick Hall was appointed as Skottowe's agent for settling the dispute over neglect at Shildon Mines on December 4th 1806, and he agreed with Dodd that the Derwent dispute should be settled by March 3rd 1807. On this day Thomas Dodd terminated the London Lead Company's official leasings of the Derwent Mines, but a few men were kept on until October 31st 1809 to finish the commitment work of sinking a shaft at Bolt Shaw.[41]

On May 23rd 1807 a list of the London Lead Company's materials at Acton and Jeffrey's Mills, and at Shildon and Jeffrey's Mines, was requested, so it could be offered for sale to Messrs Easterby, Hall. The London Lead Company, however, refused to sell Boltshaw Mine to Easterby, Hall while they were in dispute over alleged damages. The washing floor and bingsteads at Acton were also scheduled for repair in readiness for the imminent lease expiry. Dodd was aggrieved that good money for the repairs was being "*thrown away to a cause which had no prospect*", and thought Hall was "*too fond of the Law that he was becoming unable to be pleased*". Frederick Hall had also acquired a bad reputation in 1806 through buying lead from the mining fields and selling it directly to the London market to avoid paying commission to the shipping agents to such an extent that it was said to have affected the general market selling price of lead.

On June 18th Easterby, Hall successfully claimed the final damages due to them for neglect at Shildon Mine and on July 23rd the London Lead Company Court met to order the surrender of all the leases. These were with Montague and Ord for Ramshaw and other mines; with Coulson Skottowe and the Lord Crewe Trustees; with Thomas Skottowe for Linbank; with Coulson Skottowe for Boltshaw; and with Joseph Ware for Jeffrey's. On July 30th 1807 Frederick Hall finally withdrew his action against the Company at Durham.

The London Lead Company Court Minutes of October 27th 1807 record that the lead market was generally very poor, "*no lead having been sold on the*

moor, with the smaller companies being almost at a standstill". Of Derwent, Mr Bainbridge reported that at Bolts Head "*J. Bell & Co are driving on the vein which is poor and can only be disadvantageous; and there is no peace to be looked for with the modern Bonaparte* [Hall]*; but the usurper is not expected to reign long*".[41] On October 23rd 1809 the Court minutes record Thomas Bell sinking a shaft at Bolts Shaw, where they were "*now working in a strong stratum but the vein was unsuccessful, nor of any prospect*".

The London Lead Company was still steadily being excluded from the Derwent Mining District. On July 13th 1809, Mr Tilson, its solicitor, told its court that "*judgement would be made soon and that any payments would be required soon afterwards regarding the compensations for damages incurred through the negligence of the Company"* in the Derwent Valley.

The Company kept a presence for a few more years, however, and on April 21st 1810, the Court was told "*we are merely supporting the lease at Bolt's Shaw* [Vein?] *at a considerable expense and loss*". On November 17th, the Derwent district was felt unworthy of pursuit and on April 13th 1811 Bolts Shaw was said to be in a "*miserable state*". The Derwent Mining Company's 1852 plan shows Bolt's Shaw Vein as a strong west-north-west vein, also called Company's Vein, while Bolts Head Vein is a small westerly vein.[41] The reference to Bolts Shaw is, therefore, unclear, as is its correct spelling. Boltshaw level is a sub-level of Skottowe's Level, which itself is marked Bolts Hope Level on early plans. The 1852 plan shows this level starting at the base of Bolt's Well Sike on the Lord Crewe Trust (Skottowe) royalty and leading to Bolt's Shaw Vein. The London Lead Company probably last worked from this adit. On later plans the level is called Skottowe's Adit and, for later convenience, this name has been adopted throughout this text.

By January 18th 1812 Richard Pears & Partners were cutting across to a north string at Bolts Shaw, but Dodd, the chief agent, did not expect any success. On July 18th 1812 he reported that the Boltshaw Mine venture would "*remain good for nothing, there being not more than 5 or 6 bings of ore...raised this past year*". On October 31st Dodd informed the Court that Pears was "*drawing in the vein to no purpose, and with no prospect*".

Development under Easterby, Hall & Company

The Derwent miners felt that the company's new developments would soon be "*as productive as any in the Kingdom*", and, as none of the mines had been sunk deeper than the top of the Little Limestone, 12 to 15 fathoms above the Great Limestone, they were thought not to have reached their full potential. Another promising factor was the unusually high silver content "*of around 22ozs per fodder*". The mines were shallow because they were in the valley bottom, which precluded the use of all but shallow adits. Some waterwheels had been used, but they were inadequate for deep drainage and for much of the year the water supply was insufficient. Steam engines were not used because coal was too expensive. It was claimed, however, that "*the coming of Frederick Hall... changed all this*."

In 1853 John Dolphin wrote in the *Mining Journal*, that Hall had achieved many things, including the leasing of Mr Silvertop's Beldon Mineand Mr Ord's Ramshaw Mine in 1805 (by 1853 the latter belonged to Ord's great nephew, Rev Daniel Capper). When the London Lead Company's lease expired in 1807, Hall also leased Skottowe's mines, belonging to the Lord Crewe Trustees.[57] He was then able to develop them as single unit, in which the linked royalties depended on each other for "*watercourses, reservoirs, roads and other facilities and accommodations*". Hall's other improvements included the instigation of a Miners' Fund, the erection of the area's first crushing mills, the substitution of square tubs and brake-sieves for round tubs and hand sieves, and the replacement of upright flues at the smelt mills with more cost-effective horizontal flues.

Hodgson and Mackenzie have both left useful accounts of the mines and the engines installed there during the Easterby, Hall period. Generally they agree, but there are some differences. The Rev John Hodgson, renowned Northumbrian historian and schoolteacher at Lanchester between 1803 and 1805, described the district between 1804 and 1806 and this was published around 1822 in the Bywell "Guards" or Churchwardens Book.

One of Hall's first tasks, after reopening existing shafts and some of the old workings, was to deepen some of the shafts to the Great Limestone. A Boulton and Watt engine, with a 40 inch cylinder, a 25 foot beam and a six to eight foot stroke, was built at Beldon in 1805 at a cost of £1,400. The Beldon pumping and drawing shafts were also sunk a further 50 fathoms to four fathoms below the Great Limestone, thus opening several veins and some "*quick strings*". Hodgson, however, wrote that "*no ore was found, although a little was obtained at Ramshaw but insufficient to repay expenses*".

The London Lead Company had three waterwheels at Shildon Mine, one set below the other for pumping in the 67 fathom deep shaft, where was "*sunk a sump, 17 fathoms deeper to the top of the Little Limestone"*. Here the 'old man' had placed three lots of hand pumps which needed 72 men to work them. Hall enlarged and repaired the pumping shaft (57 fathoms) and equipped it with a Boulton and Watt engine on October 18th 1808. Mackenzie tells us that "*The cylinder was 64 inch in diameter with a cast iron beam* [possibly cast in two sections] *that weighed upwards of 9 tons* ... [it] *drained the mines to a depth of 70 fathoms, and is still going deeper*".[50] This engine, which had an eight foot stroke, ran at 7½ r.p.m. and cost £2054, was later moved to Backworth Colliery. The Shildon Shaft eventually reached a depth of 102 fathoms, which was below the Great Limestone. New crosscuts and drifts were driven at various levels above and below the Great Limestone, to drain Old Shildon, New Shildon, Fellgrove and Standalone Veins, plus a number of other veins to the south of Old Shildon Vein. New stables were cut in the Great Limestone so that horses could be kept permanently underground for the haulage work, but "*Very little* [ore] *was obtained at Shildon in the Great Limestone*".[48]

Hodgson wrote that Shildon Mine was worked in freestone and the vein was filled with coarse chalcedony, with only small amounts of fluorspar. The four veins at Shildon were Shildon Old Vein, Shildon New Vein, Fellgrove and Standalone Veins. The most productive strata were the Slate and the Hipple Sills. The latter was allegedly named by the first man to work Shildon Old Vein. The High and Low Ground Sills (Grit Sills) also contained lead, but, unlike other horizons, it was here intermixed with chalcedony. All the veins haded to the north. The remains of old pits and heaps, most of which were overgrown, running westwards towards the western hilltop indicated that Old Shildon Vein had already been worked in this direction. Hodgson stated that "*Originally there was only two engines at Shildon, one was smaller shafted*", but added that "*Messrs Hall and Puller of Whiteheaps, had three engines at Shildon. One of these had a 70 inch cylinder*" and was a winding engine "*used for lifting mud and earth which is shifted*". At the time of the letter, the owners of Walker Colliery "*who had recently purchased it for their own use*" were dismantling the larger engine.

Mackenzie, who does not mention the 70 inch winding engine referred to by Hodgson, goes on to say that a 6 hp steam engine (Hodgson's "*smaller shafted*" engine?) worked on New Shildon Vein, where work had been continued to deepen the shaft. Like Hodgson, he noted that, through the negligence of one of the keepers, this engine caught fire in the autumn of 1810 and, because much of the machinery was wooden, it was completely destroyed. To cover this loss, Hall considered running flat rods to the damaged shaft from the main engine at Old Shildon Shaft, a distance of around 200 yards. He felt this would enable him to "*drain the workings without any additional costs regarding engine fuel*".[50]

Hodgson noted that Ramshaw Mine, on Bolt's Burn, worked two veins, and that "*there are two* [veins] *nearby at Whiteheaps and another at Boltshaws. Also another at Farneygill which is a crop vein. All have been worked*". Bolt's Shaw Vein was reportedly worked entirely by the Quaker Company, and Whiteheaps Vein, said to be the best, by Monkhouse and Brammel. Farneysike (Fernysike) Vein was worked by a Messrs Crawhall & Company.

At Ramshaw, Hall built a 30 hp steam engine on a shaft at the intersection of Jeffreys and Ramshaw Veins, near the Ord-Skottowe boundary, to enable water to be pumped from both royalties. This engine was recorded in 1812, but research by Nigel Chapman suggests that it was not one of Boulton & Watt's. The former shaft had been sunk 28 fathoms with the aid of a waterwheel and had a 9 fathoms sump drained by sliding rods. This and the drawing shaft were both deepened to 86 fathoms, which was 5½ fathoms below the Great Limestone and about four feet into what may have been the Four-Fathom Limestone. Hall also considered the possibility of driving an 800 yard long drift under the Great Limestone from Ramshaw to Whiteheaps to drain Whiteheaps Red and White Veins. Meanwhile, he sank or deepened Whiteheaps Shaft and operated a water pressure engine there.

Easterby, Hall & Co., through Surtees, leased mines in the manor of Hunstanworth at a rent of £100 plus 1/5th duty, on July 11th 1806. The area encompassed Boltshead to Boltswell Currock, Boltswell West Currock, Pocklets Pin and back to Boltshead. Whiteheaps was also leased at rent of £75 and 1/7th duty. Because of Skottowe's and the Lord Crewe Trustees' dual ownership of mineral ground at the Derwent Mines, two leases were needed. A similar situation occurred when Easterby, Hall & Company took over some of the mines from the London Lead Company in 1806.

A 2 hp Boulton & Watt engine, originally made in 1801 for Mr Jonathan Addenbrook of the Tyne Iron Company, was transferred to Easterby, Hall and Company's Derwent Mines in March 1802. Its location is unknown, but the shaft at Smithy Cleugh is a possibility. A large shaft was begun here, but sinking was suspended a little below the Coal Sills.

On July 9th 1802 Jonathan Brammel sought permission from Matthew Woodfield, of the Lord Crewe Trust, to sink a large shaft "*expedient for the effective winning of the mines*" and to erect "*a very powerful steam engine*". The shaft was to be located in the vicinity of the three boundaries belonging respectively to the Trustees, Mr Silvertop and to Ord, to provide a common centre for the working of all three properties, on condition that the other landlords agreed.[42] This engine may have been at Beldon or Ramshaw, but Sikehead must also be considered.

On August 8th 1808, a thunderstorm burst a dam at Sikehead and swept a large amount of ore away from the new smelt mill. A local bard wrote a poem called "*The Ramshaw Flood*" to mark the occasion.

Easterby, Hall & Company stepped up their interest in the Derwent district on May 13th 1805, by taking new leases on Lord Crewe Trust land, at Nookton, Birkside, Allenshields, Buckshott, Baybridge and Blanchland. All were at 1/7th duty for lead and 1/5th duty for any coal or other ores found. The area enclosing Nookton and Hunstanworth was 2000 acres and that of Birkside, Baybridge, Blanchland, Allenshields and Buckshott was 700 acres. The lease was for 21 years from May 28th 1805 and the rent was £100 per annum, with at least six men to be employed.[26] A further rent of £150 was payable for outstroke and instroke from the adjoining mines, with another rent payable for any coal which might be worked. On September 16th 1805 the London Lead Company Minutes Book record that "*Messrs Skottowe and The Lord Crewe Trustees are about to grant a lease of mineral ground and Acton Mill to Easterby, Hall & Co at the expiry of our lease...in 1¾ years*".[41]

Around 1850, John Robinson, who had been a mining agent at the Derwent Mines for 46 years and one of Hall's check agents in Arkengarthdale, wrote of Hall's attempt to develop the Great Limestone. During the company's first years, a steam engine was built at Beldon Shield, and then another at Ramshaw, plus a 50 foot diameter waterwheel which worked nearly a mile

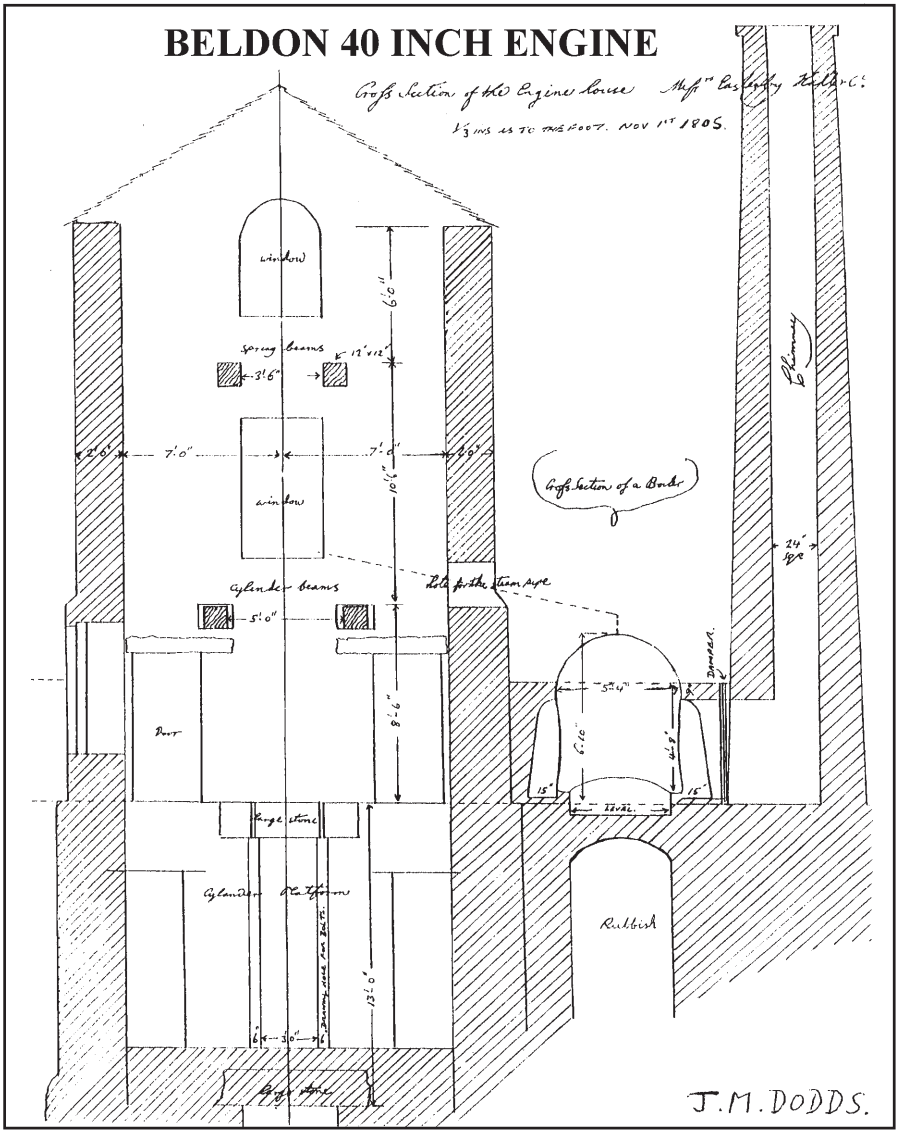

Fig 7. Side elevation of Beldon engine house.

of horizontal rods. A few years later a hydraulic engine was used Whiteheaps Mine. With this and other machinery, "*a considerable quantity of lead ore was obtained to the amount of 10,000 bings in one year*".[21]

On November 28th 1808, two men robbed the Easterby, Hall & Company's agent, William Richardson of Allenshields, of £934 9s 6d two miles from Hamsterley on the road from Wolsingham. The money, for wages, was in

100 five-guinea notes and £402 in one pound notes "*of the Bank of Mowbray, Hollinsworth and Co (Darlington), except a pound note of the Durham Bank and £7 9s 6d in cash*". A £50 reward was offered for information given to Mr Hall of Stanhope, Mr Ward of Richmond or Mr Gregson of Durham. Some suspects were apprehended, but escaped prosecution owing to a technicality. William Richardson was eventually suspected of the crime and was later convicted and imprisoned in Durham Gaol. When he emerged, the blackening of his character ruined him, even though his behaviour indicated that he was totally innocent.

Sopwith estimated that there were around 86 lead mines in County Durham in 1809. Of the four working in the Derwent Valley, Jeffrey's Rake was said to be the most profitable. Apart from Blaydon Mill at the Tyne end of the valley, four smelt mills are listed. Sopwith's list of the mines and mills at that time is as follows:

Mine	**Owner**	**Occupier**
Healeyfield	Dean & Chapter	Elliot & Co.
Whiteheaps	Wm Ord	Monkhouse & Co
Jeffrey's Rake	Mr Skottowe	Easterby, Hall & Co
Shildon	Mr Skottowe	Easterby, Hall & Co

The smelt mills were-:

Ramshaw Old Mill	Monkhouse & Co
Jeffrey's	Easterby, Hall & Co
Feldon	J. & H. Errington
Healeyfield Mill	Elliott & Co

(NB. *there is no mention of Acton Mill, as it was in Northumberland*.)

Hall's determination to sink Beldon, Shildon and Ramshaw mines to the Great Limestone, which was so rich elsewhere, was part of his undoing. The profits from the other mines should have generated capital to finance the exploration of the Derwent Mines, but his financiers began to struggle to meet his requirements owing to their own financial commitments.

Mr Hopper Williamson, the WB Lead Mines' agent, recorded an enquiry, on January 13th 1810, into the imminent collapse of Easterby, Hall & Company.[58] The current debits amounted to £460,558 16s 5d with further debts to come, whilst stock assets amounted to £41,000. The assets included the following figures for pig lead from the Arkengarthdale mines.[36]

YEAR	**PIECES**
1807	14200
1808	18000
1809	24000
1810	41600 (Estimated)

The estimate of 41,600 pigs for 1810, weighing a total of 2,723 fodder, gives an average weight of a pig of 0.0655 of a fodder. At the Tyne wharves where a fodder was 23 cwt, each piece weighed slightly over 1½ cwt or 12 stones. At 3s 6d per stone or £32 per fodder this makes a total value of £87,136. As the rent for the property was £2,850 per year and expenses were £700 per week, a net income of £47,886 was expected for 1810 from the Arkengarthdale mines. The buildings, stock, machinery and Eskeleth estates were valued at between £116 and £124.

The 1810 report of the Derwent mines covers Jeffrey's, Ramshaw, Shildon and Beldon workings, and some "*unexplored country which contained many valuable veins of lead ore*". Jeffrey's and Shildon Mines were leased until June 1828, Ramshaw and Beldon Mines until 1826, with all the leases being regarded as renewable before their termination date. Ramshaw's output for 1810 was estimated at 1411 fodders which, at £32/fo, was worth £45,152. An estimated silver yield at 18 oz/fo gave a further £4,233. After deducting the cost of mining, which was £18,720, the total of returns was expected to amount to £30,665. Shildon was expected to contribute £18,413 and Arkengarthdale £47,886 making a grand return for the company of £96,964.

In 1811 some of the shafts at Shildon, filled in by the London Lead Company, had still not been cleared out, but the miners were optimistic that, once these were cleared to below their present working depth, "*the strata below...will be the most fruitful*".[50]

The London Lead Company's neglect of Jeffrey's Mine meant that four years were spent on simply re-opening levels, repairing shafts and landings, and making good the timber. This meant no profits for three years, but damages worth £10,000 offset the loss to some extent. The London Lead Company had worked the two main veins and some others at Jeffrey's by water gins, but Hall replaced these with a 30 hp steam engine, on the adjoining Ramshaw Mine, supposedly to drain both mines.

By 1811 Hall had completely refitted Jeffrey's Mine and the men were moved from Shildon to start new development work. Extra men were also recruited. At this time lead prices were poor and many mines were struggling to survive, but with Jeffrey's Mine starting a new lease of life, Easterby, Hall & Company had to bring in skilled miners from other mining fields to supplement their workforce. This had been done in Arkengarthdale by offering weekly wages.

On July 13th 1811 the London Lead Company reported that their retained lease at Bolts Shaw Vein would "*always be a losing concern*", and by November 1st 1811 Thomas Dodd was despairing of the situation resulting from poor lead prices. He reported that the mining districts were "*getting into great distress, with people flying in all directions for employment and no one to assist them but Frederick Hall who employs all that go into Derwent*". Dodd added that there was no prospect at Bolt's Shaw and that

"*the workmen kept there simply to preserve the lease and thus retain a last foothold in the district, were working to no purpose*" and that he "*would be glad to relinquish that disagreeable concern*".

Unfortunately, the great expense imposed on Easterby, Hall and Company by the derelict condition of the mines caused such a shortage of capital that the company was eventually to forced into liquidation. The Easterbys and Doubledays both backed out of the partnership because of the financial strain caused by these costly undertakings. Hall rallied other shares, however, from London merchants Hippersley, Skelton, and Richard Puller and Son.

Arkendale and Derwent Mining Company

On January 9th 1812 the creditors, including Hall, formed the above company to control the remaining interests, valued at £330,000. According to Tyson, the leasehold was divided into 50 shares.[55] In return for putting up £70,000 as working capital, plus £146,000 purchase money, the primary shareholders received 27 shares. The secondary shareholders were expected to tender £184,000 for the remaining 23 shares, but this money was apparently never forthcoming. The company continued until a meeting of the directors on July 5th 1817 decided to dissolve it on September 1st of that year. The assets were valued at £9,287 12s 5d and the board allowed Walter Hall and Richard Puller Junior to buy them. Hall and Puller continued for another three years, before giving up in 1821.[51] The new company's first action was to stop development work at the newly fitted out Jeffrey's Mine and so cut the repair expenses. Men were transferred to Shildon Mine, where it was hoped the immediately workable ore would ensure quick sales and give badly needed capital. This new income was intended to finance repairs at Jeffrey's Mine until all the required pitwork or underground repairs were completed.

A Lord Crewe Trust letter of 1852 recalls that in 1811 Easterby, Hall and Company was forced to sell some of their interests to the Arkendale and Derwent Mines Company. Some of the new company were unhappy with the profits and sold their interests in 1817 (see later). The Great Limestone was "*hard and costly*" to work, and "*the ore raised did not bear the costs of winning it*". The newly installed steam engines were expensive to run, because coal had to be carted 10 or 12 miles over bad roads, and it was decided to replace them with waterwheels and pressure engines for pumping. The letter states that water from reservoirs passed over several wheels and engines used for pumping, crushing, washing and smelting. There was a water pressure engine at Whiteheaps Mine and a waterwheel at Ramshaw, used for drawing, along with a 44 foot wheel for pumping. The tail water of two wheels at the crushing and washing floors fed a 48 foot wheel further down Bolt's Burn. This used spear rods to pump from two shafts on Jeffrey's Rake. From there the water went over a wheel at the smelt mill and, a little further on, over one wheel for crushing and one "*for drawing a sinking chain with buckets, which also worked a great number of sieves in the washing*

tubs". Water from the same reservoirs also drove a powerful, double-acting, water pressure engine on Jeffrey's "Presser" Shaft, into Deborah's Level, at Jeffrey's Sun Vein. This machinery, plus labour improvements, "*increased ... produce and realised large profits for several years*".[32]

The Lord Crewe Trust dues accounts for Allenshields, the Derwent Mines, Jeffrey's mine and Acton Mills were made payable by "*Messrs Moore and Co.*" on May 1st 1812. The reason for this arrangement, which continued until 1815, is not clear, but Moore & Co. may have been solicitors or accountants handling the bookwork during the difficult period of debit.

A hint of the tensions within the Arkendale and Derwent Mining Company is given in Dodd's report of January 9th 1813, in which he says the new company had "*seen their errors and are now economizing on some of the tremendous expenses 'till now outlaid, and they are controlling the actions of Frederick Hall, which up to the present time have been most unaccountable*". Of Hall, he added, "*He is almost mad, raving and swearing like a madman and tells them to smash the equipment to pieces in his fits of rage*".

If the London Lead Company hoped the new company would want to buy its Bolts Shaw Mine, it was to be disappointed. On April 10th 1813 Dodd noted that it "*was still in the same good for nothing state*", but he had "*met with no favourable opportunity of learning where or not it could be disposed of*". He still had not done so in July – "*as that concern is likely to fall to pieces ... Hall and Co. have been throwing money away very fast ... five or six of the company have been to see Hall and have banished him from all management of their concerns ... it is plain that any perseverance will be with heavy losses*". In this, his last report, Dodd appears convinced that all the mines in that area of the orefield were "*not worth a shilling*".

Easterby, Hall & Company paid the first dues on their Lord Crewe Trust leases on May Day 1808, when £75 became payable per year for the mines. On June 5th 1813, Mr Durnford, the Lord Crewe Trust's agent, wrote to Archibald Mearns stating that he had not received the royalties due from the Hunstanworth Mines "*since he had become the heir to Mr Isaacson*". The £55 due was eventually paid on July 23rd 1813. On that same day an indenture of lease and release by Martinmas 1815, along with compensation of £5, was requested for the damage caused by washing operations at Shildon. Also on July 23rd an indenture of lease and release was drawn up between Andrew Montague, Isaacson Durnford, John Ord and John Jones, for two undivided moieties of a 1/32nd part, for £55 5s 0d each. Further duty ore due to the Dean and Chapter on September 27th 1814 amounted to:

					£	s	d
124 bings	*5 cwt of*	*bouse ore*	*@£3 16s 0d/ bing*		*436*	*03*	*09*
25	*0*	*Cutting ore*	*@£2 7s 0d*		*54*	*07*	*06*
				TOTAL	*490*	*01*	*03*
Duty at one-sixth to Dean & Chapter					*82*	*11*	*10½*

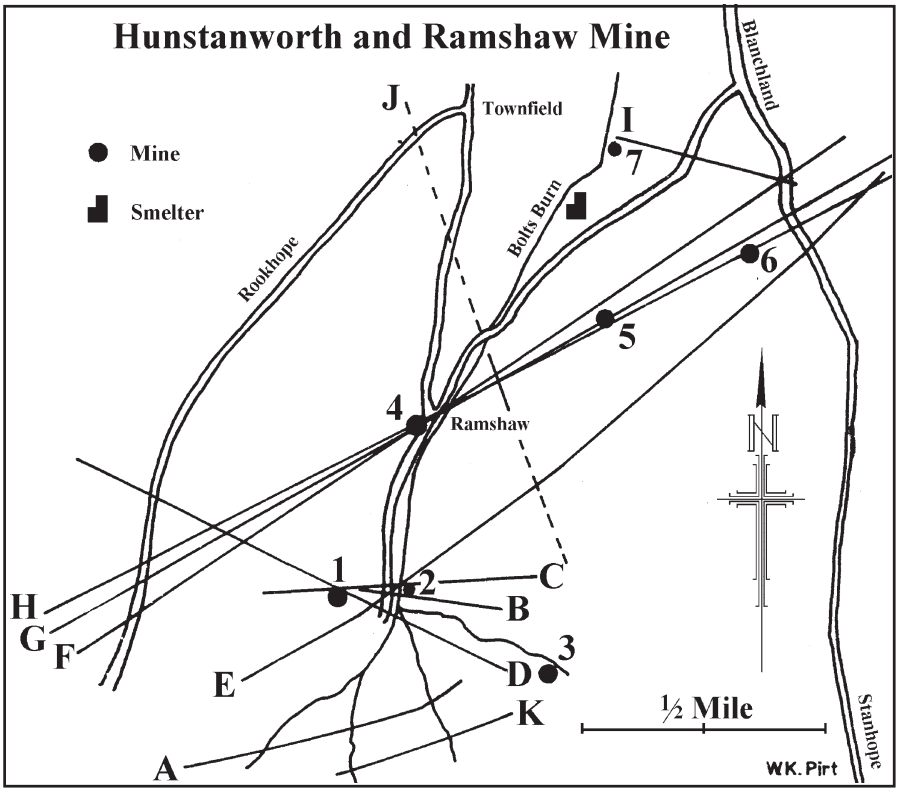

Fig 8. Outline plan showing principal veins at Hunstanworth and Ramshaw.

MINES	1	High Whiteheaps	
	2	Low Whiteheaps	Whiteheaps Group
	3	Sikehead	
	4	Ramshaw	
	5	Jeffries	
	6	Presser	Derwent Group
	7	Deborah Level	
VEINS	A	Boltshead	
	B	Red	
	C	Company's	
	D	White	
	E	Farneygill	
	F	Ramshaw South	= Jeffrey's North
	G	Ramshaw Middle	= Jeffrey's Middle
	H	Ramshaw North	= Jeffrey's South or Sun
	I	Shilford - Haugh	
	J	Burntshield - Haugh	
	K	Florence	

On October 16th 1815, records of the duty ore from September 27th 1814 to March 25th 1815 due to the Dean and Chapter are also given:

					£	s	d
124 bings	*5 cwt of bouse ore*		*@£2 15s 0d/bing*		*486*	*01*	*03*
25	*0*	*Cutting ore*	*@£1 12s 6d*		*49*	*19*	*04½*
				TOTAL	*536*	*00*	*07½*

	£	s	d
Duty at one-sixth to Dean and Chapter	*89*	*06*	*00*
Property tax	*17*	*03*	*10*
TOTAL	*72*	*02*	*11*

Hopper, Monkhouse & Company

Whiteheaps Mines, on Capper property, was leased by Hopper, Monkhouse and Company. William Hopper was a Newcastle lead merchant with mines in Swaledale, and at Cockhill, near Pateley Bridge.[52] A Nicholas Hopper was amongst the lessees of Windy Brow Vein from August 13th 1779 to 1795. Hopper then appears to have held the lease alone until 1813. A Hopper family were living at Black Hedley in or around 1820.

Monkhouse was also a Newcastle merchant, dealing in wine and lead. He had mines in Swaledale and on Grassington Moor, in Yorkshire.[52] He leased Fletcheras Vein on June 20th 1772, and Fairbairn mentions that a Miles Monkhouse held interests in Grassfield Mine around 1820/21.[60]

As the Brownley Hill Company, Hopper and Monkhouse, leased Brownley Hill Vein on Alston Moor in 1795. The price of lead then was £14 per ton, but the wars with France caused a steady increase to around £36 in 1805. They gave up the lease soon after 1814, when the price fell to £18.[61]

Hopper & Monkhouse's lease of Whiteheaps ended in 1810 and was taken over by the Arkengarthdale and Derwent Mining Company. Messrs Hall & Puller then built crushing machines at Whiteheaps which "*consist*[ed] *of a waterwheel driving two, four and even sometimes eight pairs of cast metal rollers, so placed that a railway can be brought from the bouse heap to each set for charging them*". The ore went through a pairs of fluted rollers and then plain rollers, before being "*dressed in the customary manner*".

Hall and Puller

From January 7th 1815 to January 6th 1816, Whiteheaps made 799 bings of ore, and Ramshaw got a further 263 bings 6 cwt. At a duty of 1/7th, this made 151 bings 5 cwt and 3 qrs, for which £258 was paid.[51] A severe depression hit the lead trade in 1816, but as the Arkendale and Derwent Company's mines were well developed the company survived for a while. With lead selling at £16 5s 0d per ton, however, its capital was depleted by July 5th 1817, when the directors agreed, against Hall's wishes, to dissolve the company on September 1st. Its premises, leases and lead stocks were valued at £6,842 13s 10d, and the board accepted Walter Hall and Richard

Puller Jnr's offer to buy them, along with some Freehold and Copyhold land, for a total of £9,287 12s 5d. Hall and Puller's new company, often referred to as the Derwent Mines Company by 1820, worked the mines until 1821.

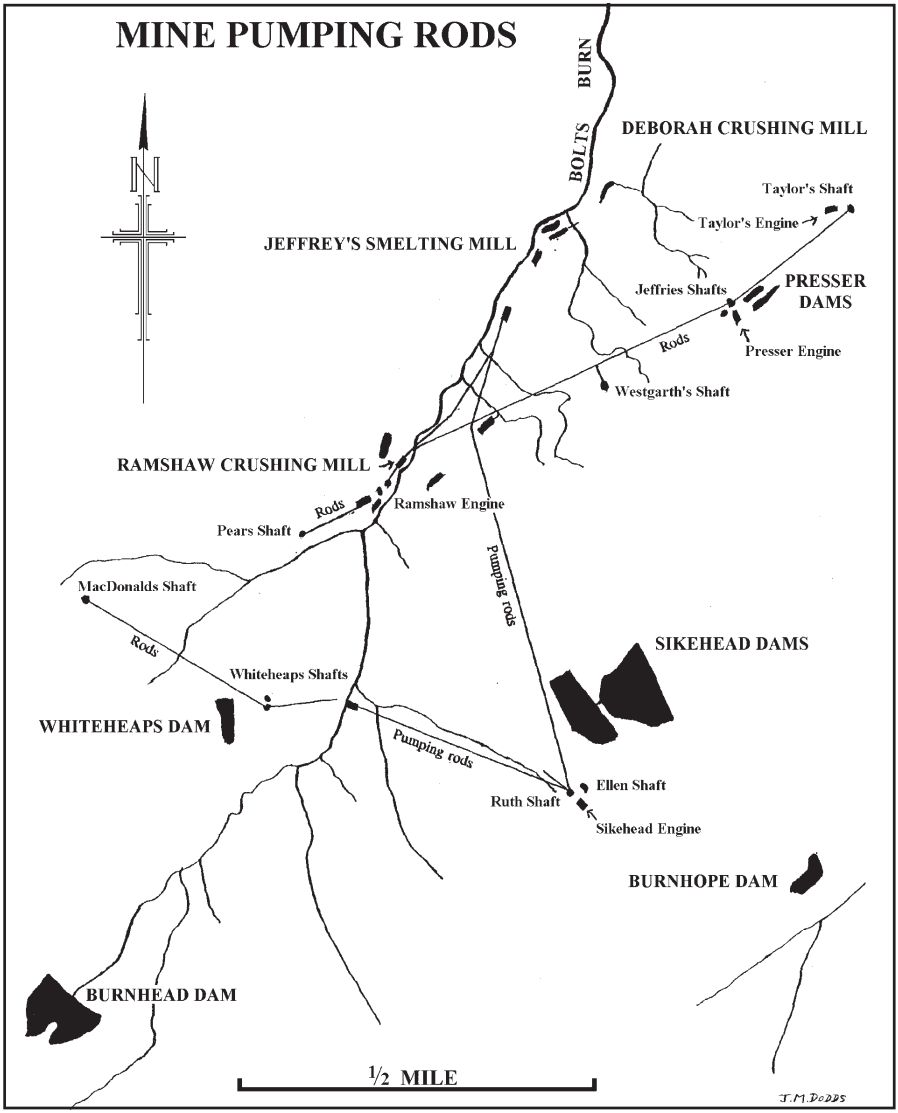

Fig 9. Arrangement of flat rods at Ramshaw, Jeffreys and Sikehead, Derwent.

In February 1821, in discussions with Mr Richardson about disputed payments for duty ore from the Newbiggin and Hunstanworth mines belonging to Robert Capper, Walter Hall mentioned account books for the lead ore raised at Hunstanworth.[51] Hall said that Mr Wheatley (or any other person

Mr Capper might appoint) could have seen the books or taken extracts from them at any time, but he thought this had seldom (if ever) been done and that agents in the north rarely examined books. The miners' wages were calculated from the weights entered in these books and Hall felt that the practice of weighing all the ore in the presence of those workmen who had won it was an effectual check upon the weigh-men and, therefore, the validity of the books. Each mine had its own book. Those belonging to Mr Capper were:

Bolt Shaw	*One book kept.*
Ramshaw & Ramshaw Syke	*Either 1 or 2 books kept*
Whiteheaps (2 veins)	*Either 1 or 2 books kept.*

The name of Mr Skottowe's mine was Jeffrey's, for which a distinct book was kept.

The inclusion of Bolts Shaw Vein suggests that the London Lead Company surrendered it between 1813 and 1820.

Richardson and Hall also discussed a claim for an additional rent of £100, for an outstroke made about 14 years earlier. Hall responded that no outstroke had been made under their lease, and that the existing one was in use when the lease was drawn up. This could be verified, he said, "*particularly by Mr Colepits, who would probably remember the time*". No such rent was payable, therefore, but Hall conceded that this clause for an additional outstroke and instroke rent would become negotiable when a new lease was applied for. It would, however, be contrary to sound policy as it restricted the miners' operations by preventing them "*from trying experiments and searching after new beds, which if successful would be more advantageous to the lessors than would be the additional rents gained*".

Regarding a claim for tithes, Hall felt that "*those due against lead were not payable of common right and that consequently an express grant must be produced and a regular tithe and unbroken wage under the same must be shown*." He would, however, "*not refuse the claim if a good tithe could be shown, but a question would almost certainly arise as to whether it would be advantageous to still work the mines, so encumbered with such demands*".

A fourth subject concerned the leases prepared for Mr Ord to sign "*if his health allowed*". Hall stated that two leases, one for land at Newbiggin and the other for land at Hunstanworth, had been prepared for tender. The Bolt's Shaw Mine was not included, but it was acquired by Hall, Puller and partners afterwards. The lessors had conceived that they had an equable right to renewal of the lease, from the time of the proposed tender.

A fifth subject raised concerned a covenant for perpetual renewal of the Hunstanworth lease, as Hall thought the security of a lengthy lease would encourage the partners to work the mines with spirit. This security was expected to be extended to perpetuity, and the proposed clause modifications were expected to be accepted when the new terms were discussed.

The 1821 account of the shares held in the Hunstanworth mines included a statement of the proportions held by each proprietor. At that time, Ord's estate was securing shares to get a larger income from the mines.

Also in 1821, Westgarth Forster recorded that Jeffrey's Rake carried lead ore, fluorspar and quartz spar, and was being worked in strata from the Slate Sills down to the Great Limestone.[14] The machinery included a steam engine, a waterwheel and a crushing machine. The veins at Old and New Shildon Mines, which carried lead ore with quartz and fluorspar, were being worked in strata from the Firestone Sill to the Great Limestone. There was one steam engine and a crushing machine. Mackenzie added that "*Shildon is now drained in the upper strata by a level* [Shildon Level – driven c1750]".[20] Beldon was suspended in 1824, but "*great expectations are anticipated, hopefully proving* [it] *to be rich and most productive in the district*". At Whiteheaps Mine there was lead ore and quartz, with fluorspar.

According to Forster, despite having increased the catchment by cutting long water races around the valley contours and into adjoining valleys, the power supplied by the wheels was poor at first. For maximum effect, the bigger wheels were put in the vallet bottoms and the power was transmitted across the fells by flat rods to the various shafts. By 1824, water drove a pressure engine at Whiteheaps, then a 44 foot wheel at Ramshaw and then a 48 foot wheel at Jeffreys, all for pumping. The supply also served several crushing wheels and the smelt mill.

The Shotley Bridge parish directory of the time listed the occupants of Shildon as:

Rd. Bell	*Agent of the Arkendale & Derwent Mining Co.*
William Deans	*Engineer*
Jeremiah Pedentary	*Overlooker*

The inclusion of William Deans is interesting, because Deans & Company of Hexham made mining machinery, one example of which was a 30 foot diameter waterwheel at the Tynehead Mining Company's Tynehead Mine. This was marked "Deans and Co." and "No 27", which was either the construction number or the pattern number of that piece of the casting.[62]

In their 1828 directory for Hunstanworth, Parson & Whyte list:

Hall, Puller & Co.	*Lead owners, Derwent Mines.*
Price, Wm.	*Agent at the smelt mill, Allenshields.*
Robinson, John	*Principal Mining Agent to Hall, Puller & Co.*

They state that the Derwent mines had a large smelting works at Shildon (Acton?), making up to 35,000 pieces of lead a year, which were "*sent to the Company's works at Bill Quay* [NZ292628] *for refining*". This was owned by "*Hall, Alfred, Sheet lead and red lead manufacturer*".

The directory also notes that "*At Shildon Mr Richard Bell, agent for the Derwent mines, invented machinery for shaking and trunking the ore, saving half the labour*", but some think Hall claimed most of the credit for this.

Lead Prices 1776 - 1828 (per fother of pig lead).[28]

	£	s	d		£	s	d
1776	12	0	0	1815	22	0	0
1782	17	5	0	1816	18	10	0
1788	23	10	0	1817	17	10	0
1789	16	10	0	1818	19	15	0
				1819	23	0	0
1805	40	0	0	1820	24	10	0
1809	40	0	0	1821	22	10	0
1810	31	10	0	1825	25	0	0
				1826	19	0	0
1813	25	0	0	1827	18	0	0
1814	18	10	0	1828	17	0	0

Overdue Lease

The company was notified on May 28th 1826 that its lease had expired on May 12th and, therefore, its renewal was overdue. This was not done, however, and, with no more demands from the mineral owners, the mines worked on. Eventually, the matter went to Court, where blame was apportioned to both parties as the confusion had arisen following John Ord's death and subsequent takeover of his property by Robert Capper. Once the issue was settled, Capper had to pay £144 16s 10d back royalties to a William Andrews, the executor of Maria and John Hayton of Newcastle.

On July 7th 1826 Robert Capper paid £103 16s 8d, plus a fee of 10s 0d each, for a 1/3rd part of the 1/4th share of the Hunstanworth shares held by William Andrews, John Hayton, John & Ellen Pain and Robert Capper.

On July 11th 1827 the rents for compensation due to Robert Capper for watercourses in use by Walter Hall and Richard Puller (both at this time of Sergeant's Inn, Fleet Street) were:[42]

£	*s*	*d*	
1	*0*	*0*	*For Middle Grindstone Cleugh watercourse.*
3	*16*	*0*	*For New Beldon Burn watercourse extending three miles or thereabouts from Smithy Cleugh through Bolts Burn Wood.*
1	*4*	*0*	*Grindstone Cleugh to Bolts Law watercourse constructed in 1826.*

In the same year, Boltshope (Ramshaw) Mill was leased at an annual rent of £70, and Capper gave permission for its enlargement and for the building of workmen's houses, dams and watercourses.[36] The Derwent Mining Company lease of the Lord Crewe Trustees property was also renewed.

Robert Capper agreed to let Hall & Puller mine in the Newbiggin area on July 12th 1827. This meant that, with the exception of the Haugh (bank between two converging streams) between Nookton Burn and Boltsburn, they had the right to mine lead in all of Capper's property. The rent was set at £30 with 1/7th duty on lead and 1/5th duty on other minerals. A sum of £50 became payable for outstroke and instroke at the start of mining.

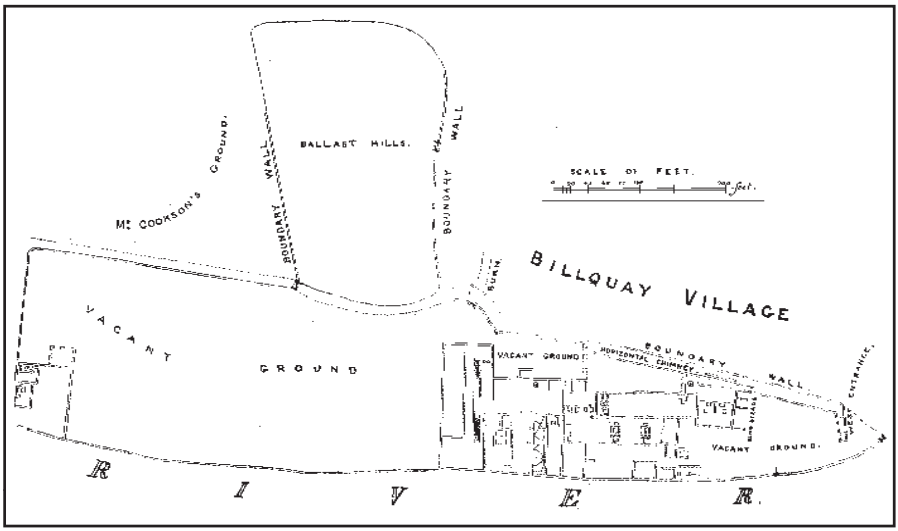

Fig 10. Surface plan of Bill Quay Works, owned by Hall.

Smiddum Ore Dispute

Lord Crewe Trustees' Estate was on the south side of Bolt's Burn and Capper's was on the north side, and in May 1828 a dispute arose over the dues payable on ore got from it. At issue was the amount of smiddum, or fine ore, entering the stream from mines on either side of it. It was considered that only one-quarter of this ore came from workings on Capper's land, but he claimed duty on half of that recovered. Capper was also proprietor of all the mines on the Trustees' unenclosed land, but he had no rights to the lead ore, which belonged to Hall of the Derwent Mining Company.

It was reported that ore won under Capper's land was taken to drawing shafts on Skottowe's land across the stream, where it was washed and dressed. The fines either settled in tanks on Skottowe's land, or flowed into the stream. Neither the Trustees nor Capper had claimed duty on ore recovered from the stream for "*a period of some 20 years*", but it was estimated that it could be worth around £10 per year to each proprietor. An explanatory sketch plan accompanied the dispute document (see Fig. 11).

Upon seeking legal advice the conclusion reached was:

a) the company did not have right-of-way over the Trustees' land.
b) the Trustees and Capper could only take lead from their own side of the stream.

It was, however, within the power of the mining company to claim back any ore that was recovered by the two parties on reimbursement of its recovery costs. Alternatively the two parties could charge way-leave for the company to pass over their land for the purpose of recovering the ore from the stream, this ore being rightfully owned by that company.[63]

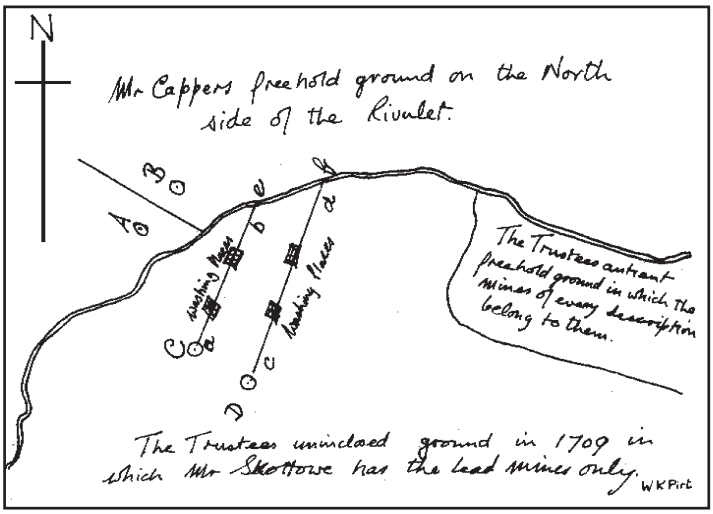

Fig 11. Surface plan – Smiddum ore dispute.
(Horizontal distance approx. 5 chains).

DERWENT MINING AND SMELTING COMPANY

Formed in 1832, the Derwent Mining Company became a cost book company, by the name of the Derwent Mining and Smelting Company, in 1834. It was split into 7200 shares, worth £10 (of which £8 was already paid up) each.

One of the company's founders was John Taylor, the internationally renowned mining engineer and entrepreneur from Norfolk.[69] One of his trademarks was the use of inclines in mining and it was probably through his influence that Cordner built the Sikehead to Bolts Burn incline. There is also evidence that the Taylor Company influenced the building of Deborah's Incline.

In 1823 John Taylor Snr inspected the Greenwich Hospital mines on Alston Moor and spent 12 days surveying the area's roads with Robert McAdam, but his son, John Taylor Jnr, managed the northern and Welsh mines.

The Derwent Mining Company was formed in 1832, when the Stanhope and Tyne Railway Company built a railway, to carry ironstone, limestone and lead from Weardale, from the top of Crawleyside incline, above Stanhope, to Parkhead Depot 4 miles south of Blanchland. Parkhead Depot became the junction of a rope-hauled spur serving the spathose (iron carbonate) iron ore mines and the lead mines of Rookhope, along with Lintzgarth smelt mill. A spur from this branch crossed Burnhopehead Fell to Sike Head on the eastern flank of Bolts Law. From here, a narrow gauge incline served the Sikehead, Whiteheaps and Derwent Mines. Where the line crossed the peat-moorland, its stone block sleepers were supported on heather rafts.

The incline from the Weardale Iron Company's railway at Sikehead, down to Whiteheaps Mine, was built by Richard Cordner.[64] He is also said to have built Slitt dam, which supplied water for the hydraulic engine at Slitt Mine.

Mining operations from 1807 to 1852 were carried out "*in a small portion of the district*". In the first year (1808) after the London Lead Company stopped mining at Bolts Head, 507 bings of ore were raised. Figures for the years 1809 to 1833 are given below.

Period	Bings	Cwt	Period	Bings	Cwt
1809-1813	5666	4	1824-1828	29793	4
1814-1818	13741	5	1829-1833	27761	4
1819-1823	13977	2			

There are indications that the previous companies working the Derwent mines dissipated much of their profits among their other operations in Yorkshire, Cumberland and Westmorland, and in smaller ventures throughout Northumberland. Only a few were profitable, which is probably why the lessees were eventually forced to make new financial arrangements.

The following machinery, said to be in perfect order, was used at the mines. Whiteheaps Shaft had a water-pressure pumping engine. In a wood across the road from the shafts at Ramshaw was waterwheel winder, while further down the valley a 44 foot wheel both drove a roller crusher and spear rods for pumping at Ramshaw. At Jeffrey's, the washing floor was to the south of Jamieson's Mill across the stream. There were two waterwheels at Jeffrey's, the largest being the 48-foot-diameter Jeffrey's Low Wheel which drove flat rods running to Sikehead. An overshot wheel at the smelt mill drove the bellows, and wheels at Deborah's Level drove the ore dressing machinery.

Enough ore ground had been laid open to afford profitable working without any outlay. Ore yields are given below.

Period	Bings	Cwt
1834-1838	20300	6
1839-1843	16648	2
1844-1848	18243	6
1849	3472	4

Output during 1850, 1851 and 1852 was believed to have averaged around 3000 bings per year. By 1851 from profits a further addition of 40s 0d per bing had been made to the working capital.

On May 12th 1840 a bill was issued to the company, here called The London Derwent Company, for payment of duty ore from June 30th 1839 and totalling £193 2s 8d. Other outgoings in 1840 included a regular compensation payment for damage to land at M. & J. Readshaw's, set at £4 per year.

A Parliamentary Commission, headed by James Mitchell, enquired into Children's Employment in 1842 and interviewed the agent, John Robinson, who said that 440 pickmen and labourers worked at the mines. This was a far cry from the 8 pickmen who worked there in 1807. By comparison, however, the London Lead Company employed about 1500 men in Weardale and Allendale, and the W.B. Mines employed about 2000 people in total.

Also in 1842 Samuel Ridley, company manager, leased 7933 acres of land from Capper and the Lord Crewe Trustees, and on July 20th John Dolphin, the cashier, paid £12 for that year's dues. Between July 1st and October 31st 1843 Robert Capper received dues from the Derwent Mines as follows:

	Bings		*s*	*d*	*£*	*s*	*d*
Ramshaw, bouse ore	*129*	*@*	*67*	*9¾*	*437*	*07*	*00*
Whiteheaps bouse ore	*18*	*@*	*67*	*9¾*	*61*	*00*	*06*
Cutting ore and washings	*6*	*@*	*47*	*9¾*	*14*	*06*	*10*
					512	*15*	*10*
To which add the above rents					*214*	*14*	*00*
				TOTAL	*727*	*09*	*10*

On September 15th 1843 John Randall MacDonnell and others of the Derwent Mining and Smelting Company took a lease from Robert Capper. Later taken over by John and Edward Joicey, it included the Hunstanworth and Newbiggin mines as well as the (old) smelt mill at Boltshope.

The company's 13th annual report, in 1845, shows that the mines had decidedly improved. An average price of £20 per ton had been received for the 1000 tons of lead sold, giving a return of £20,000 against which was an expenditure of £17,483 2s 6d and allowing a dividend of just over 6s 0d per share on the 7160 shares. There were problems, however, and the demand for labour elsewhere, stimulated by the high cost of iron and by the construction of many railways in the district, had caused half the labour force to leave. In order to keep the remainder, the company had to raise wages considerably. An increase of at least 150 tons was reported over 1844's output and the overall profits were estimated at between £2000 and £2500.[70]

In 1848, MacDonnell and Hall's lease of Grindstone Cleugh and Middle Grindstone Cleugh watercourses had a John Routh as lessee. Papers at Beamish Museum show that on September 15th 1848 Routh and MacDonnell leased all mines (other than coal) in Newbiggin, along with Boltshope Mill.

There is a Routh's (or Ruth's) Shaft at Sikehead Mine and a MacDonnell's Shaft at the head of Ramshaw Rake close to the Hunstanworth to Rookhope road. By August 1st 1850 these same men had also re-leased 5 acres at Bill Quay refinery from the Burnett family of Gateshead.[42]

Mr J. Hall, a well-known figure within local mining circles, died in 1841. In his latter years he had been Capt Blackett's mining agent, but before this he had been mining engineer for G. Dunn & Company (of rock drill fame).[21] Between 1820 and 1840 production gradually increased, as did the population of the area and by 1841 the population of the Blanchland area was 567, an increase of 137.7% over the 1821 figure.

In his 1851 report, John Taylor Jnr advised the directors to sink a new shaft (Taylor's) to the east of Deborah's Shaft (Jeffrey's pressure engine shaft) at the eastern extremities of the workings. He also proposed building a surface incline down to Deborah's dressing floor, to save the carriage of ore along "*the crooked* [Deborah] *level*". At Deborah's washing floor £700 was spent on a new waterwheel and crushing mill during 1850. Soon after, a second crushing mill, driven by the same wheel, was built. A sketch of the improvements proposed for the large crusher at Ramshaw has survived.

Powerful drawing machinery was being installed at Whiteheaps Mine and Jemmy's (Jamieson's) wheel was renewed, and its pit rebuilt, together with the housing over it. The wheel drove round, iron rods to Routh's Shaft, one mile away, and more rods were being extended to Deborah's Shaft. A new

wheel, fed by a large reservoir, was to wind the ore at Sikehead. This and an inclined railway would cost £400. He also recommended spending £600 on replacing the furnaces at Derwent Smelt Mill with reverberatory furnaces.

In a letter dated July 12th 1855, Samuel Rowlandson, the Lord Crewe Trustees' secretary, and Messrs W. & W. Dickson of Alnwick, their solicitors, state that by some default of lease renewal the mines were being held over in accordance with the Easterby, Hall 1805 lease terms.[25] The present tenants continued to pay the £100 rent, but, since the mines were idle (possibly temporarily through drought), this, plus the 1/7th lead ore dues, the 1/5th duty on other ores, and the coal rent had not been paid. However, £4 per annum was being paid for damaged ground at Jeffrey's Rake (Readshaw's), and £31 for damage at Shildon. Ground rents of 5s 0d were also being paid for cottages and land at Allergate and Midge Holm. Although mining permission had been given, the lessees had no rights to any smelt mills.

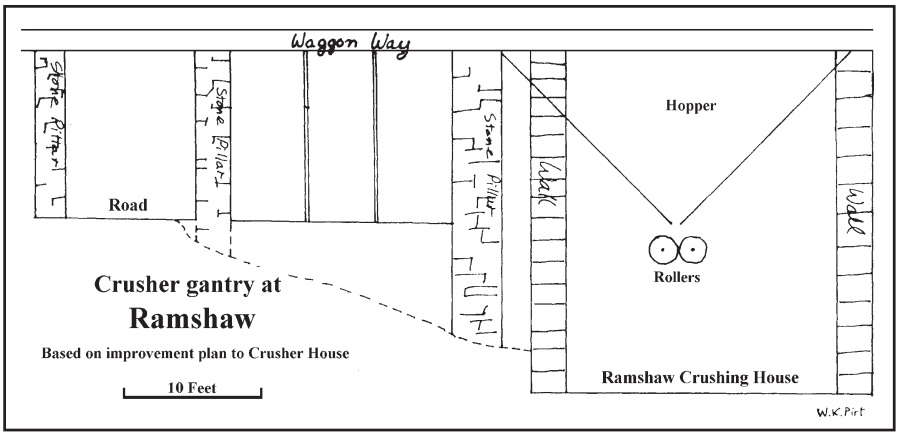

Fig 12. Plan for new crusher, Ramshaw.

Shildon (later documentation shows this to be the incorrect name for Acton Old Mill) and Acton Mills had long since been demolished and their sites cleared. The solicitors were concerned with how the tenants had acquired the smelt mill at Jeffrey's (Derwent Smelt Mill), since the 1805 lease had restricted any such erection.

Mr Harrison, the Trustees' agent at Blanchland, thought the lessees were paying sufficient rent and told the secretary that the operators had previously considered giving up their tenancy. As they were presently raising a considerable quantity of ore, however, they would be less likely to quit now. Mr Harrison also thought that, if they did quit, it would be difficult to re-lease the mines again at the present rental.

The solicitor's advised that the company should be given notice to quit the land, then be invited to enter into a new lease agreement, as, since all the

original tenants under the 1805 lease had died, it was considered not advisable to allow mineral property of potentially great value to be held by the new tenants without a regular lease. The solicitors suggested that the odd £17 10s 0d rent and damage should be incorporated into the new lease and that a reasonable rent should be fixed for the smelter, even though the ore came from Skottowe's royalty. A reminder was given that the Trustees' tenants were also Mr Skottowe's tenants by the deed of 1709 and, it was claimed, the Lord Crewe Trustees had the power to enclose any of the common land containing the mines. If these rights were exercised, the tenants would be entitled to compensation should the mines continue to be worked.[25]

When the new lease was drawn up, the new rents were as follows:

Blanchland, 3rd November 1855.

The Derwent Mining Company to my Lord Crewe's Trustees for rent due 13th May 1855

	£	s	d
To ½ a year's rent for Shildon and Acton Mill	*6*	*10*	*00*
To ½ a year's rent for Mines and Jeffrey's (Derwent) Smelter	*50*	*00*	*00*
To ½ a year's rent for Unenclosed and damaged ground	*2*	*00*	*00*
To rent for Mr Roope's house at Christmas		*13*	*04*
	59	*3*	*04*

1856. November 21st, received the above;

Michael Harrison - Agent.

Also:

Blanchland, 3rd November 1855.

The Derwent Mining Company to Sundry Tenants of My Lord Crewe's Trustees for Damage.

	£	s	d
To ½ a year's damage to Ann Vannan at 10/- per an.		*05*	*00*
To ½ a year's damage to Thos Bell at 45/- per an.	*1*	*02*	*06*
To ½ a year's damage to Robt Johnson at 10/- per an.		*05*	*00*
To ½ a year's damage to Shildon Pasture at 42/6 per an.	*1*	*01*	*03*
	2	*13*	*09*

The solicitors also noted that the description of the rents payable might be incorrect. For example, in the case for damage to unenclosed land, if the land was truly unenclosed, nothing should have been payable. Also the description for the £50 sum was simply for the mines from 1807 to Martinmas 1841, after which it becomes mines and mills until Martinmas 1847, when it is as shown above. Further information suggests that the last agent's papers had been dispersed and that Messrs Robinson and Barlow (solicitors for the mines) held the Trustees in their power because of the Trustees' agents' neglect of retaining the evidence.

It also appears that the company had made various trespasses onto the Trustees' land. The smelter chimney had been lengthened and two smoke

condensers added. As Capper's ore was brought to Deborah's, then returned to Jeffrey's for smelting at the new mill, the road to Jeffrey's and Ramshaw had often been altered and widened. Several bridges had been built over the burn for the waggon ways leading from Whiteheaps to the smelter, and two cottages had been built above Jeffrey's.

The burn had been culverted at Ramshaw and then infilled. The arching began some 4 to 5 yards inside the Trustees' property. The burn at Deborah's had also been culverted and covered with mine spoil, with disregard of the freehold boundary. At Ramshaw House a garden for the use of Mr Capper's agent had been attached to the house by walling in. At Hodgson's Sike, troughs took water onto Capper's land, and Capper's ore was worked on his side, but washed on Trustees' property. There was also a double waggon way here, from Sike Head down to the burn (the incline from the railhead). Mr Skottowe claimed all these as easements for which nothing was paid. Some of these liberties had been enjoyed for about 20 years and most from between 3 and 10 years. It was asked if he should acquire freehold status because of this and also if Mr Capper had acquired a similar right.

It was claimed that Jeffrey's Mill belonged to the Trustees and, at the same time, confirmed that the old mill at Jeffrey's, on the Lord Crewe side of the Burn, belonged to Mr Skottowe. The latter mill was described as "*a shell of a building, partly demolished and almost buried by mine waste* ."

Mr Manisty suggested that Skottowe did not demise more than he should have done by the 1800 lease. The old mill was built before enclosure, and the new mill, several yards away, was built c1845 and smelting had only begun 2 or 3 years ago (1852). Since Mr Skottowe had no right to add to the old mill or to build a new mill, it must be concluded that he had no right to the present furnaces either.

The solicitors recommended that the Trustees remove any new water-courses, restore the water to its original course, and remove the waggon ways built for the purpose of moving Capper's ore. They also suggested that the Trustees take possession of Jeffrey's old mill, level the refuse as an act of ownership, and leave Skottowe to take such action as he thought fit. Mr Manisty further suggested that any compensation accepted in lieu of the previous actions might jeopardize later proceedings.

Skottowe's Shildon cottages were recorded as having been rented to the poor at £33 11s 6d, but the Company received double that for rental. At that time there were 13 cottages "*at Jeffrey's*".

The following stipulations were added to the new lease - no new level should be made at Shildon without consulting the Trustees, and the Company now had no right of easement at Acton, where both High and Low Mills had been

levelled. An affirmation was also made that the lessees did not now have any right to smelt Capper's ore.

On October 23rd 1856 a special general meeting agreed that the Derwent Mining and Smelting Company should become a Limited Company, called the Derwent Mines Company Ltd, under the provision of the Joint Stock Act of 1856. The was done on June 8th 1857.[65]

Kelly's *Post Office Directory of Northumberland and Durham* for 1858 recorded that the Derwent Mines employed 300 to 400 men. Two of the shafts were 120 and 100 fathoms deep respectively. There was a waterwheel over 40 feet in diameter with horizontal rods nearly a mile long, and extensive smelt mills. The directory names John Curry and Thomas Curry as mining agents at Ramshaw; Jonathan Eddie, master washer at the Derwent Mines; Peter Pears*, grocer, at Jeffrey's Rake; William Rule, master blacksmith at the Derwent mines; John Scadden, chief engineer at the mines. The Derwent Company's office was at Ramshaw and Josiah Remfry was the company agent. John Littlejohn was master washer at the Ramshaw mines, and the cashier (later manager) was John Morpeth. Mr William Robinson was the draughtsman, and William Price was the smelt mill agent. (*The 1891 edition of the directory shows William Pears, a grocer, farmer and assistant overseer at the mines, living at Ramshaw House.[66])

The following information on Skottowe's unauthorised erection of a smelt mill, and the complications this trespass caused with rents is given in a report dated August 27th 1859:

> *"The matter stands thus at present. The premises occupied by the Company including also those where they have undoubted right of access and also those where such occupation is in nature of a trespass, have been surveyed and accurately laid down... A draft lease has been prepared by us which is intended to comprise all the above at a rent of £35 to include the smelt mills as, although Mr Skottowe has no right to them... it would be imprudent after the great expense he must have incurred in building these smelt mills to attempt to dispossess him of them entirely. If the lessees agree to accept them as tenants, thereby acknowledging the title of the Trustees thereto, then at the end of the first lease, the rent may be increased to a more substantial sum. In this lease are also contained the mines of the Trustees which are at present let to the said Company at an annual rent of £100. The lessees do not work these mines, but they have the power to do so. They hold them to prevent other parties taking them. In this lease they are forbidden to erect smelt mills and hence arose the discussion as to which of those Mr Skottowe has built. His explanation is that he has built them for his own mines, and not under the Trustees lease to him, which forbids him to do so.*
>
> *The Solicitors for the Mines Co. we are told are very respectable parties and will not take any unfair advantage. At the same time we cannot tell what Mr Skottowe as their landlord may do with regard to these mills. It was assumed that Mr Dickinson had seen these solicitors and discussed the matter fully with them. They promised to examine the lease and to get the agent of the mines to examine the plans. If he agreed that the plans were correct then nothing remained to be discussed except the principle on which the lease was framed.*

Another half-years rent will fall due at Martinmas next. The sum which ought to be paid will be £67 10s 0d. If the lease is not by that time agreed to or the lessees refuse to take it as framed; and only agree to pay the old rent, that old rent should not be taken as a matter of course because such a proceeding would have the effect of cancelling the notice to quit which was given at last Martinmas, in fact Counsel says the old rent must not be accepted upon this point. Therefore we must write to Mr Harrison, who received the rent, further instructions, at Martinmas accordingly to what may have taken place, as to the new lease, between the present time and half-years days - if further proceedings such as ejectment should be deemed advisable, it may be a fie [contempt] *to such proceedings to accept the old rent, but it is a matter which must be considered when the point arises*".

A Commission, headed by Lord Kinnaird, into conditions in British mines, took evidence at Hexham on October 7th 1862.[67] It interviewed Josiah Remfry, agent at the Derwent mines, Thomas Morpeth the sub-agent, John Madigan Fairbridge the doctor, George Dent a miner and Thomas Bell the woodman. Their evidence shows that of the 265 men working underground in the Derwent mines, 8 were at Shildon mine. The youngest men employed as pickmen were 17 to 18 years of age. No women were employed in any part of the works, but 108 people, mostly boys, worked on the washing floors. Many of the surface workers worked under cover, but those who did not were found other work, sometimes underground, in inclement weather.

Josiah Remfry came from Tavistock in Devon and around 1842 had been an agent at the Duke of Devonshire's Cononley Mine, near Skipton in Yorkshire. His move to the much larger Derwent Mines in 1853 was probably instigated by John Taylor, who was also the Duke's Mineral Agent.[52, 53]

The Derwent mines were divided into different parts, these being Shildon in Northumberland, and Jeffrey's, Ramshaw, East and West Whiteheaps, Smithy Cleugh and Grindstone Cleugh, all of which were in Durham. The ore was smelted at the works below Ramshaw "*following its removal from the mine in buckets by a water engine*". It was also taken out through the horse level to Deborah's. The deepest part of the mine from adit was the 95 Fathom Level, whilst the furthest level from the day was around 300 fathoms long. These deeper workings were in the eastern part of the mine which was ventilated by several shafts. The easternmost shaft was Taylor's, and Jeffrey's Shaft, the main pumping shaft, was 375 yards away.

The majority of men entered the mine via the adit level to reduce the distance climbed down ladders in the shafts. These ladder-ways in shafts, as opposed to sumps or rises, were partly bratticed off and, when the Kinnaird Commission visited, fresh bratticing was being added to a new section of shaft. The men tended not to use the engine shaft ladder-ways, preferring instead to climb man-ways within the stopes and get their breath back as they walked the level to the next section. Ladders were not put in drawing shafts, where falling objects were more likely.

Thomas Morpeth was in charge of Deborah's Adit Level around Taylor's and Jeffrey's Shafts, from bank down to the 95 Fathom Level, in which 2 men were working. The forehead of the latter level was some 65 to 70 fathoms from Jeffrey's shaft. Another level directly above it was not working as no ore had been found. A crosscut had been driven 18 fathoms south from this level and a sump had been sunk at its forehead and a level driven back some 60 to 70 fathoms to communicate with the 95 for ventilation. There were two 40 Fathom Levels west of Jeffrey's Shaft, but neither was being worked. The only places where any ore was being won above the 40 and east of Jeffrey's was in the 30 Fathom Level, east of Taylor's. Two men were also working in Taylor's 40 and 50 Fathom Levels east. Of 4 men working in the 30 Fathom Level, 2 were sinking and 2 rising. The shifts worked in these levels were 6 am to 2 pm and 2 pm to 10 pm.

The mines had many rises, sumps, shafts and levels, for ventilation as well as proving new ground in advance. Like his father, John Taylor Jnr believed good ventilation made the men more productive and he added between 6 and 12 inches to the sizes of the levels, and made rises closer together. The mine was ventilated naturally, because Taylor's Shaft was 34 yards higher than Jeffrey's, but the direction of the air flow depended on the weather. Until new levels could be linked to other workings, blind ends were ventilated by 6 inch diameter air pipes, running from a fan. Over short distances these would be turned by a boy, but lengths up to 300 fathoms had been ventilated using a waterwheel-driven fan.

Before Taylor's improvements, candles burned poorly, but afterwards there was no place where a candle would not burn well without tilting. Shot smoke, which had taken several hours to clear, now took an average of half an hour throughout the mine, and only 5 or 6 minutes on the 30 Fathom Level.

In the early 1860s, the average age of the Derwent miners was 28 years, and some of them lived as far away as Allendale. At a trial for wastes at Durham Assizes in 1864 the Derwent Company agents used an argument used by the Beaumont agents, claiming that illness amongst the men was caused by bad housing, bad cleanliness and stupidity rather than bad working conditions. The agents even brought 2 miners to the hearing as witnesses that there was no one under the age of 50 with breathing difficulties caused by their work (note the average age at the mine). No Friendly Societies existed at the Derwent Mines until this year.

Between 1863 and 1864 Beldon Mine produced 1348 tons of concentrates, yielding 18 ounces of silver per ton of metal. Also around that time:[21]

> *"...at Jeffrey's Mine, a wonderful discovery was made according to a statement by John Robinson, 46 years resident mining agent for the Derwent Mines...About 300ft from the surface in driving a waggate drift in the vein the miners came to a number of trees - seven in all. The largest...was about six feet in circumference; their branches and leaves were bedded in the high waggate drift, and were of necessity cut out... A*

part of one of the trees [that] was left standing in the mine, guarded with rails, to preserve it as a memento of the discovery".

An interesting event, passed down by my father, is revealed in a script given to him many years ago. The notes record that at 6 pm on November 17th 1866, 27 Cornish miners employed at the Derwent Mines came "*to vent wrath upon the landlord*" (George Mawson) of the Miners Arms public house at Bay Bridge. They thought he had shown more favour towards the local men than he did to them, and both her and his property suffered as a result.

Appearing at Hexham police court in connection with the incident were Joseph Tretheway, James Husband, John Braven, Thomas Curtis, John Squire, William Trewartha, Walter Arsatt and Bennett Toy. All were charged with "*having riotous assembly with persons unknown on November 17th 1866 so as to disturb the peace*". They were further charged with injuring, and for "*damage to the Miners Arms public house at Baybridge*". Witnesses were George Mawson, PC Beattie of Blanchland, George Wilkinson, lead smelter of Ramshaw, and Joseph Murray, lead miner of Jeffrey's Rake. Both Wilkinson and Murray had been struck on the head before they could escape to Blanchland, from where they fetched reinforcements. The landlord had also managed to escape, only returning when he saw the constable arrive with a strong local force. The constable ordered a charge that routed the Cornishmen, two of whom were left injured on the pile of stones they had gathered for ammunition.

The same source recalls that some miners, having been sent from the mine to collect a shipment of gunpowder, called at the Miners Arms at the north end of Baybridge bridge with their delivery and became the worse for drink. During their revelling, one of the men threw a small keg of powder onto the tap room fire, unseen by the others. When it started to smoulder, he called to the rest of the company, saying, "*Gather round, lads, and we'll all gan to hell together*". Everyone fled, except for one man who had the presence of mind to pick up the smouldering keg, run to the nearby bridge with it, and throw it into the river Derwent.

PLATE 13. Deborah Level portal (1998).

In 1852, the price of lead was around £24 per ton. Later in the 1850s this fell to around £21 per ton, largely because of imports of cheaper foreign ores. The vicinity of Townfield around 1850 when owned by Daniel Capper was a tithe-free parish except for compensation in lieu of tithe (a modus) paid by the Lord Crewe Trustees to Capper. Throughout this time the Derwent Mines records indicate they were steadily producing ore:-

Year	Ore(tons)	Lead(tons)	Yield(%)
1845	1626	988	60.8
1846	1470	997	61.3
1847	1674	1033	61.7

In 1852 Mr Fred Roope, the mine agent, lived in Blanchland. The rent for his house was £7 per annum. The price of lead in 1852 was £24 per ton.

John Routh died on March 18th 1853. Alfred Hall died on December 31st 1853. March 10th 1865 saw the death of John MacDonnell who probably lends his name to MacDonnell's Shaft at the western extremity of the Whiteheaps workings.

On April 25th 1868 the Derwent Mining and Smelting Company leased Sandyford Mine for 21 years at £1 rent. The company secretary at the time was Mr Harvey. (*See Edmondbyers*)

Nathaniel Clark arranged for Thomas J. Bewick to inspect the Derwent Mines between August 31st and September 2nd 1869 and his report describes the geology of the strata and states that the area covered was around 3534 acres.[3] Several veins were proved and had been worked for a great length of time. These consisted of two series, which were the Ramshaw Veins, bearing north-east to south-west, and the Red and White Veins and their strings, bearing west-north-west to east-south-east. Both groups of veins had been extensively worked and had yielded much ore in this and the more easterly adjoining royalty leased by the Derwent Company from Mr Skottowe. Both Company's and Farneygill Veins were worked to a limited extent at Whiteheaps Mine. They had also been proven by the Smiddycleugh and Grindstone Levels, but not developed there. Other veins were also present of which little was known. It was not certain that the veins were the same as those at Rookhope and Allenheads, as none of them ranged in that direction. However, it was observed that the bearing and line of the Ramshaw Veins here were identical to those of Burtree Pasture Vein in Weardale.

Geologically, the property was considered "*most favorably circumstanced*". Much of the best ore-bearing strata could be freely drained and none of the known productive beds were beyond the limits of water or moderate steam power. The prospects in general were not thought hopeful, however, as it had been mainly the eastern margin of the property which had produced lead

ore, and the veins now being wrought were in a central position. Bewick also described the underground workings which he had either examined or for which information was available.

At East Whiteheaps, the Red and White Veins and Red Vein String seem to have united into a large, powerful lode, over 30 feet wide. The deepest level here was in the Coal Sills horizon above the Great Limestone, 79 fathoms below Skottowe's Adit or 126 fathoms from surface. The pumping shaft was sunk into the strata 7¼ fathoms north of the vein. Here Routh's Shaft was used for pumping and Ellen's Shaft for winding. The vein was extensively wrought from levels communicating with these shafts. Of these, the 30, 40 and 50 Fathom Levels were exhausted and abandoned and were either entirely closed or in a dilapidated state. The 62, 70 and 79 Fathom Levels were accessible to their western foreheads, but were not being worked.

The 62 Fathom Level forehead was about 14 fathoms west of the crosscut from Ellen's Shaft. The 70 Fathom Level was 22 fathoms long and the 79 Fathom Level a few fathoms longer, both in the south part of the vein. The two deepest drives were in the Coal Sills. The uppermost drive lay approximately at the horizon of the Little Limestone. In all these foreheads the vein was broad, but had only occasional specks of ore.

Ore was being got 2 to 3 fathoms above the roof of the 62 Fathom Level, and near the boundary at small, but good, ore working on the south of the vein. In the 70 Fathom Level a few fathoms from the crosscut from the winding shaft, the vein contained a good proportion of ore in a hard, compact sparry matrix. Beneath the 79 Fathom Level, near the boundary but within Skottowe's liberty, two sumps were sunk on the vein, with a short cross cut driven south from each to prove the ground. The sump in the south part of the vein was 2 fathoms deep, with a crosscut 7½ feet to the south. The other was 3 fathoms deep, with a crosscut heading south for 10 feet.

Considering the dip of the beds and the offset caused by the throw of the vein, Bewick could not understand why sinking the shafts to drain the Great Limestone had been delayed. He thought the vein should have been proved in the Great Limestone, and the 79, 70 and 62 Fathom Levels should have been continued westwards. He noted that Bolts Head Level, a branch of Skottowe's Level, had been driven a fair distance south in this ground, but was closed after about 15 fathoms.

West Whiteheaps Mine was almost abandoned, but pumping continued and 2 men were sometimes employed repairing the shafts and levels, in accordance with the terms of the lease. Access to these shafts and workings was by adit, below which lay the 30, 40, 50, 60, 70 and 80 Fathom Levels. In each level, the veins were mostly productive in the High and Low Grit Sills and in the Pattinson and Crag Sills. All the shafts connected with the 80 Fathom Level, but about 14 fathoms of the deepest workings were under water, making the

70 and 80 Fathom Levels inaccessible since 1878.

The 30 Fathom Level westwards had been worked to Easter Shaft, but the vein here was variable. Sometimes it was very rich, but in other places it was unworkable. Westwards, the Red Vein and Red Vein Strings dwindled to joints and were abandoned. Falls prevented access to the foremost workings, but White Vein was followed for many fathoms. The 40, 50 and 60 Fathom Levels were mostly filled with deads in the area of the shafts. The three veins had all reached the Great Limestone with unsatisfactory results and been abandoned. From the adit east of West Whiteheaps Shaft, a south crosscut intersected Company's and Fernygill Veins, which were both worked a little in the High Grit Sills. East of the crosscut, Company's Vein lay open for only 2 or 3 fathoms. Westwards, it was open for 19 or 20 fathoms, but the vein was poor. Fernygill Vein workings were inaccessible.

Ramshaw Vein had produced a lot of ore in each lead bearing stratum above the Great Limestone and the workings on it were very extensive, but were mostly either inaccessible or not examined. The principal named shafts were Ramshaw, Pears, Green's and MacDonnell's. At the latter, the Deep Adit and the 13, 24, 32, 70 and 80 Fathom Levels were in use. The west foreheads in the Sun, Middle and North Veins, and a few of the ore workings, were visited, but there were no signs of further discoveries or continuous returns.

The forehead of the 80 Fathom Level West in the Ramshaw Sun Vein had been abandoned about 6 years before, when the vein reduced to a string. Eastwards, the Sun Vein was being extensively wrought in the Low Coal Sill, and to a lesser extent in the Great Limestone, but little ore was being got. Until 3 or 4 years before, the 80 Fathom Level in the North or Middle Vein had been driven a considerable distance west of the Cross Vein. In the level immediately above the Great Limestone the vein's maximum width was about 5 feet, but the average was much less. It had occasionally yielded pockets of ore, but in general it was hard and contained only spots of ore.

Two men and two boys raising ore near the foreheads in the Ramshaw North and Middle Veins were the only workmen employed here. The 70 Fathom Level in the same vein was in a plate between the High and Low Coal Sills and had not been worked for 2 years. At this forehead the vein was weak.

Around the 70 Fathom Level two partnerships were working tribute bargains in the White Sill. Here the vein was good, being over 2 feet wide and with a fair proportion of ore, but neither working was expected to last. Other workings in the vein, up to and including the 32 and the 24 Fathom Levels, were examined, but were considered impossible to describe without a plan.

Around the 24 Fathom Level and above and below the 13 Fathom Level there were partnerships of miners raising ore on tribute. The workings were mostly in old ground and, although sometimes rich, they were considered

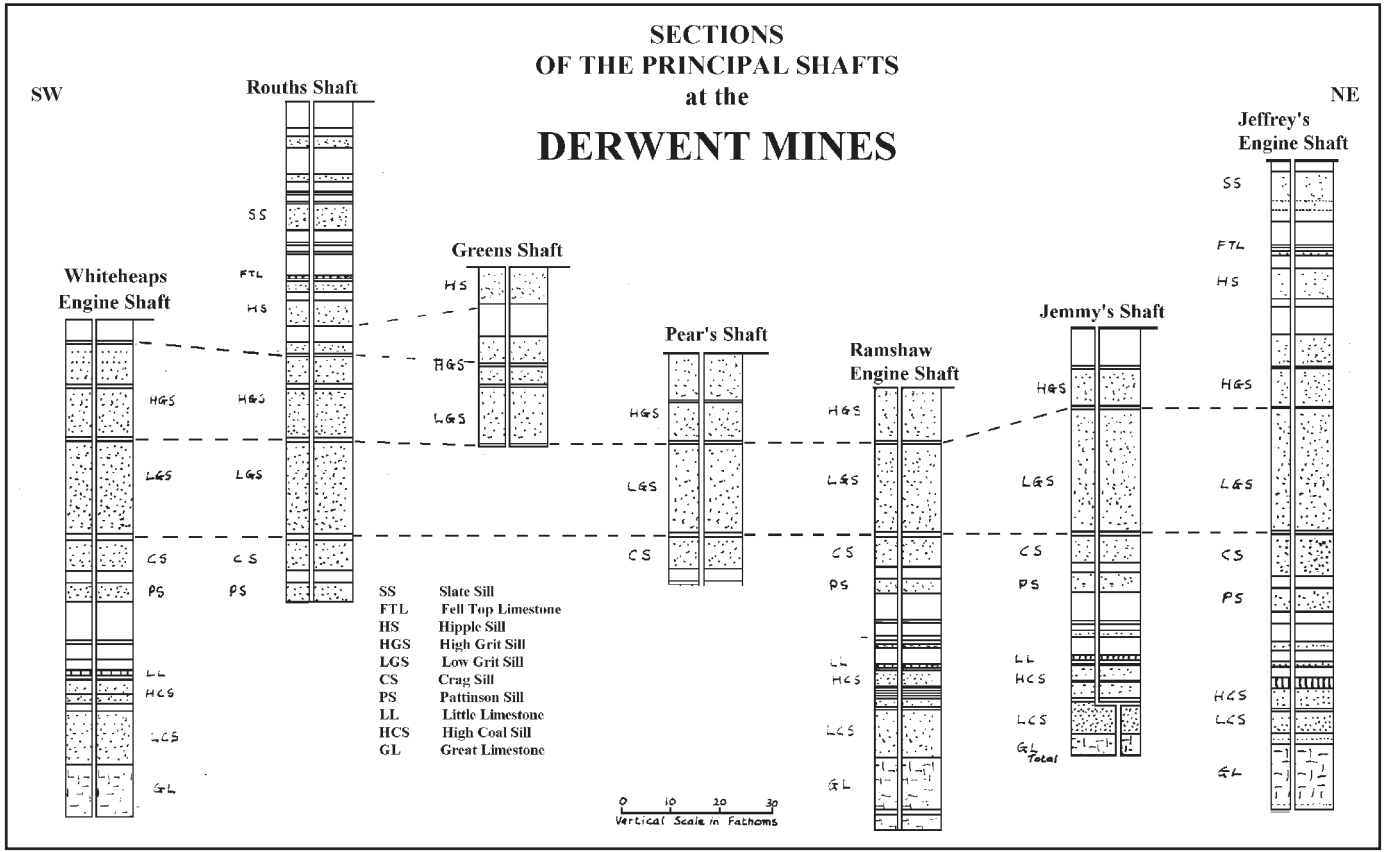

Fig 13. Vertical sections of the principal shafts at the Derwent Mines.

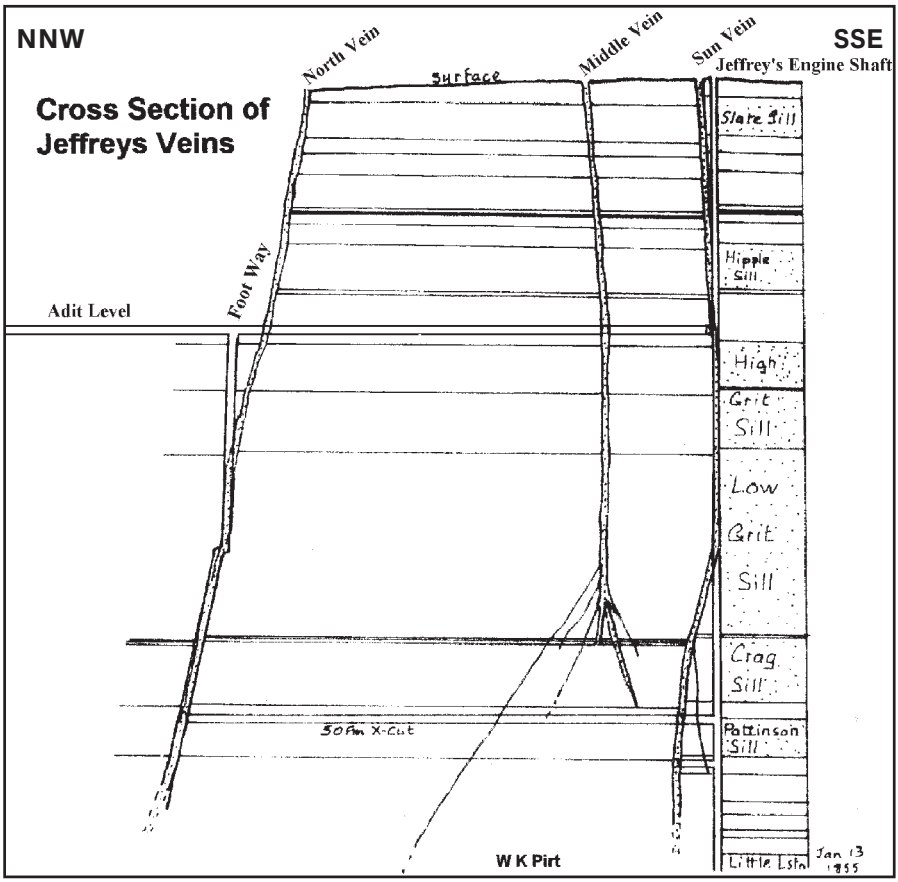

Fig 14. Vertical cross section of the Jeffreys Veins.

unlikely to last or to lead to any further discoveries.

The 32 Fathom Level was driven west in the North Vein, between the Crag and the Pattinson Sill, to intersect White Vein. Several strings crossed the vein, but it was generally poor, though it sometimes yielded a little ore. The forehead of the 32 Fathom Level had been driven to the west cheek of White Vein, then discontinued, but the vein was open northwards for a few fathoms and 4 men driving in it had found it strong and coarse, with a few small pieces of ore. The south side of the 32 Fathom Level, on the junction of the North and White Veins, was estimated at from 4 to 6 cwt of ore per fathom.

The deep adit had been driven west in North Vein to its junction with White Vein near MacDonnell's Shaft, then north for a considerable distance. In this level 4 men, on tribute, were getting ore in the High Grit Sill above the north end of the adit. The vein here was very variable in size and richness.

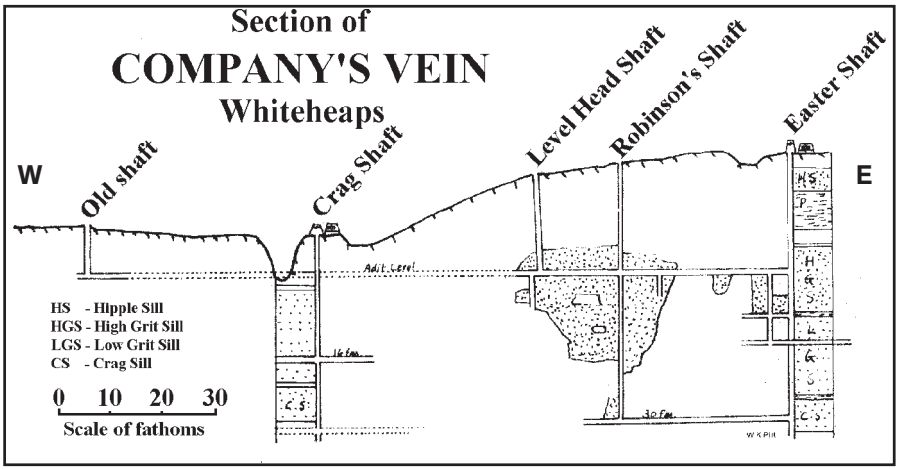

Fig 15. Longitudinal section of Companys Vein, Whiteheaps.

It was strong and powerful in some places, being up to 60 feet wide, but in others it was quite narrow and poor, being made up of spar and "*dowke*" (shale) mixed with varying amounts of ore.

A crosscut, from the north forehead of the Deep Adit in White Vein, was

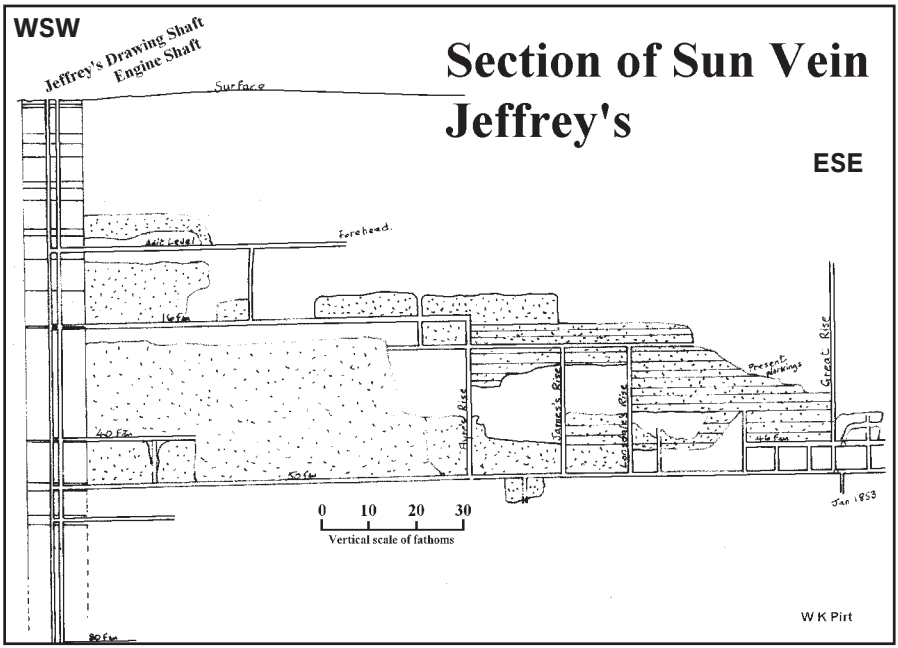

Fig 16. Longitudinal section of Jeffreys Sun Vein.

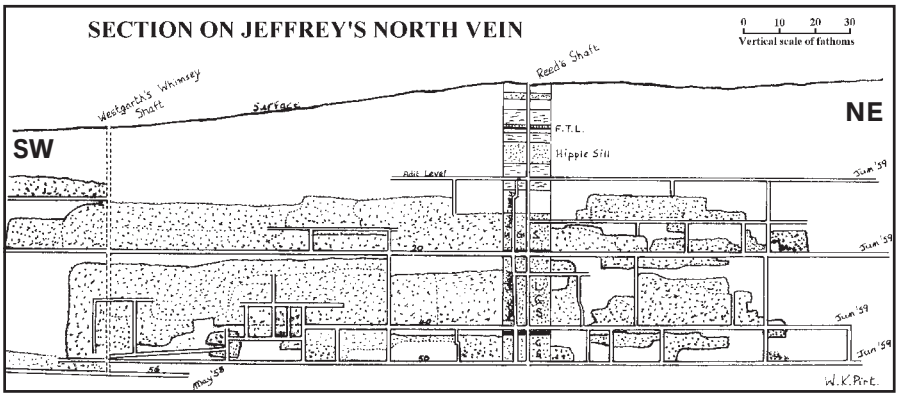

Fig 17. Longitudinal section of Jeffreys North Vein.

being driven north-east in the High Grit Sill by 2 pickmen to cut a branch of Ramshaw North Vein formerly worked from a shallow adit. On the west side of White Vein, Deep Adit had been continued as a long crosscut, first in grits and then in plate. This crosscut was driven almost in line with North Vein and then more southerly for many more fathoms, but found nothing. MacDonnell's Shaft, which went 11 fathoms below Deep Level Adit, had been idle for 3 or 4 years, and now held nearly 10 fathoms of water.

Around 1809 a 37-fathom-deep shaft had been sunk into the Coal Sill near Smithy Cleugh Foot on what is supposed to be White Vein. It was then closed and there was no more reliable information on it. At the same place, Smithy Cleugh Level (partly driven by the previous company) was extended between 1862 and 1867, but had since been abandoned. It cut White Vein, in one of the plates below the Crag Sill, a few fathoms from its mouth. The present company drifted down into the vein (1862-1867) for a considerable distance, but any returns were insufficient to pay for their efforts.

Further to the south-west, in Grindstone Cleugh, were two trial levels that had been idle since 1862. The first is Grindstone Cleugh Low Level, driven by the late lessees. After becoming dilapidated, the level was reopened by the present company, around 1856, but they did not extend the workings.

Grindstone Cleugh Level is higher up the stream and was driven south for 300 fathoms in a plate above the High Grit Sill. Grindstone Cleugh Vein was intersected after 116 fathoms and followed westwards for 68½ fathoms. Other weak veins or strings were cut at around 234 fathoms. A rise in the first vein was carried up into the Hipple Sill and some nice ore was obtained here and in the level driven on the vein, but the prospects were not sufficiently encouraging to follow the trial further. Work stopped in 1862 and in 1869 it was inaccessible owing to a roof-fall near the level mouth.

The stratigraphy of this area was considered unsuitable for ore production. Although the veins in the Crag Sill, the High and Low Grit Sills and the Hipple Sill had all yielded large quantities of ore at Whiteheaps and at Ramshaw, to the west the beds are much thinner and contain plates and other non-productive strata of increased thickness.

PLATE 14. General view of Sikehead Mine (1980).

Bewick did not examine less important adits and works, such as the Linn Bank and Park Syke Levels, which had not been recently worked

Bewick realised that, unless they had had the lessors' permission, the lessees had breached their lease by letting the lower levels at West Whiteheaps Mine flood, and the main levels become inaccessible, but, as the veins appeared exhausted, it was probably that there was no reason to keep them open.

The report also describes the machinery on the mines as follows. At East Whiteheaps was an excellent 40-inch cylinder steam engine, complete with boilers, connections and pumps, for raising water to Skottowe's Adit. There was a waterwheel driving flat rods for pumping at West Whiteheaps and MacDonnells Shaft's. At Ramshaw there were 2 waterwheels. One was used for winding at Pear's Shaft, the other for crushing. A line of flat rods from Jemmy's Wheel, on Mr Skottowe's royalty, drained Ramshaw Engine Shaft. In addition there were whimseys, dressing machinery, etc.

Bewick refers to a letter, dated August 12th 1869, from the secretary of the Derwent Mines to Mr Clark, agent for the Bishop of Durham. This stated that "*owing to a want of success at East Whiteheaps the company are about to suspend operations, and therefore express their willingness to enter into arrangements for giving up the East Whiteheaps* [Sikehead] *Mine*".

Both royalties had generally been worked irrespective of any differences in ownership. Skottowe's Adit began and ended in the adjoining royalty, whilst for part of its length it and one of its branches (Bolts Head Level) was driven for many fathoms under property belonging to the Lord Crewe Trust. Other levels similarly communicated between the two royalties, whilst East

Whiteheaps Shafts (served by Skottowe's Level) was sunk in the adjoining royalty, very close to the boundary.

The two royalties were also worked as one on the surface. Water collected in the Hunstanworth Estate was taken by races to reservoirs near East Whiteheaps Shaft, which also stored water from another catchment, and used for winding and dressing. From there the water went to Presser Shaft on Skottowe's royalty (Lord Crewe Trust) and then back to Craig and Ramshaw Shafts and the dressing floors on Mr Capper's property. It then went to Jemmy's pumping wheel, the smelting works, and finally Deborah's Level and washing floors, again within the adjoining (Skottowe/Lord Crewe) royalty. It was considered difficult to work the two properties separately with advantage, and in future leases this matter would need careful thought.

Production from the Derwent Mines was variable, but, if the two royalties were taken together, the fluctuations were less than expected, with only the Hunstanworth royalty showing great variations. At the end of one lease in 1848 and for the first 4 years of the next, the yield was very small, but from 1853 to 1863 a considrable quantity of ore was raised. However, the average

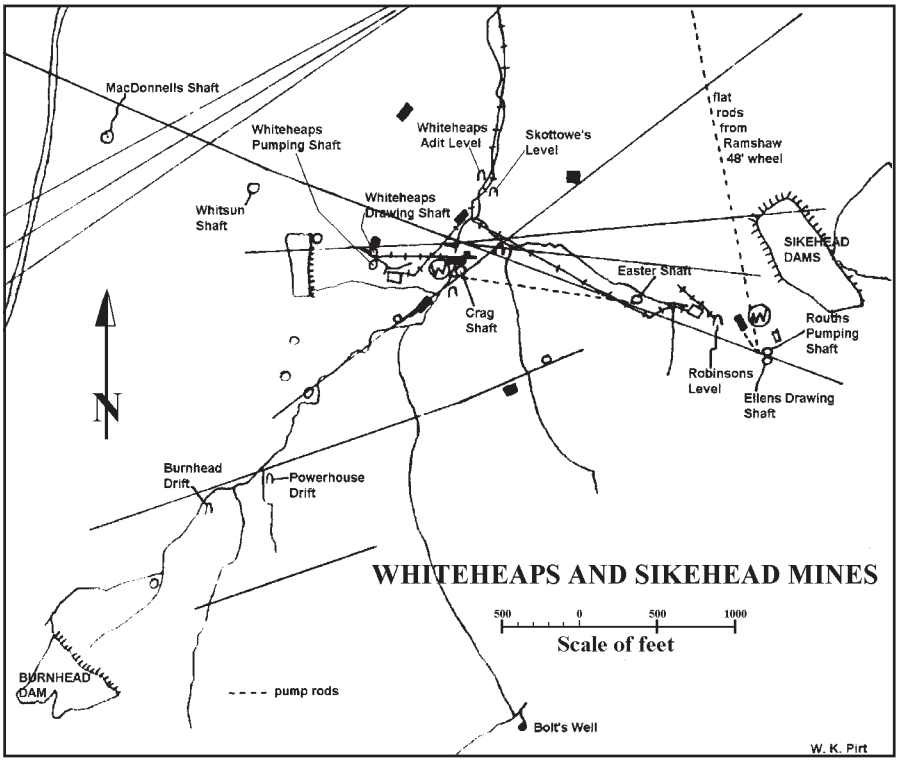

Fig 18. Principal shafts at the Whiteheaps and Sikehead mines.

production figures reveal a more permanent fall off in productivity, and the small number of miners employed between 1865 and 1868 was further reduced to just 28 men and eight boys in Capper's royalty, of whom six men were employed on dead work.

Bewick ended his report with the comment that, although failure was usually attributed to the high royalty rate, this was not the sole cause. For example, under the present lease, some 14,207½ bings of ore, worth £71,037 at an estimated £5 per bing, were raised to the end of 1868. This meant that the difference between the agreed duty at 1/7th and the 1/10th, temporarily agreed by the late lessor, was £3,044 9s 3d or £152 4s 5d per annum. In the eastern part of the royalty, where deep workings had high pumping and maintenance costs, and old workings had "*to be kept in good repair*", the dues were too high, while the poorer prospects of the western ground meant that it was also unlikely to be viable at the 1/7th duty being asked.[6]

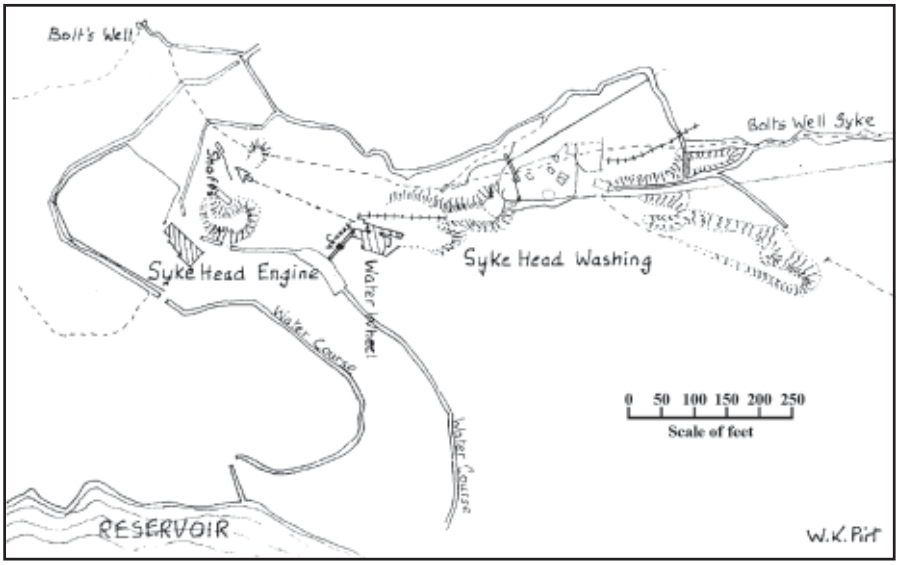

Fig 19. Detailed surface plan of Sikehead Mine, 1862.

By 1870 the Cornish method of bidding for sets, in which the men competed for the more favoured sets at a percentage of the value of the ore raised and the lowest percentage offered procured the set, was well established.

Men moved away as the poorer parts of the mine were closed and falling output was followed by a decline in financial support. For example, in 1872, Lord Rokeby sold his 6/16ths share in the Ramshaw, Whiteheaps and Bolts Head Rake Mines, to John and Edward Joicey for £600.[36]

Difficulties with renewing the leases of the Hunstanworth and Newbiggin Mines and Bolts Hope Smelt Mill led John Taylor Jnr to surrender his lease

on July 11th 1872. In consequence, he was also asked to forfeit £100 to the lessors, John and Edward Joicey, to be paid in six-monthly instalments. John Routh, John Randall MacDonnell and Alfred Hall held the lease from Robert Capper, but on August 21st 1872 MacDonnell surrendered his share to the Joiceys. In 1873 a draft document was drawn up for Taylor's surrender of the lease of Shildon and Jeffrey's Mine, to the Trustees. Under this, Taylor had to make a Declaration of Trust to John Murchison for the remainder of the lease's term. The lessees had also to hand over all the plant listed in an 1871 evaluation, along with the equipment at Boltshope. Possession was to start on July 11th 1873, with the parties concerned paying their own costs and any back rents due at the assigned date. Taylor agreed to sell his 1/64th share to Joicey for £30, and to forfeit his share of the rents due to that date.

As a result of the non-renewal (through default by the company) of a 21 year lease taken out in 1848 for the Hunstanworth royalty mines and for the smelter and refinery and Boltshope Mill, Taylor agreed with Joicey (the mineral landlord on the Lord Crewe Trust's unenclosed land) to pay £1000 to cover this lapse. For legal purposes the lease, held in John Randall MacDonnell's name, had to be lawfully surrendered on August 21st 1872. John Taylor then drew up a draft surrender lease in 1873 for Shildon and Jeffrey's mines in favour of the Lord Crewe Trustees. This new lease included a clause which said that a compromise had to be reached to settle the disputes, and

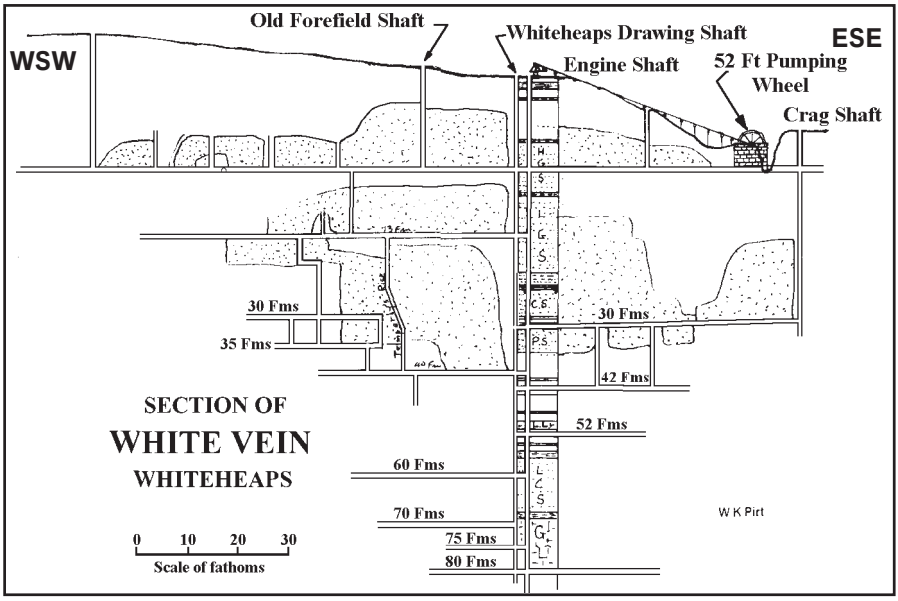

Fig 20. Longitudinal section of Whiteheaps White Vein.

one which said that all the plant and practiculery, as valued in 1871, had to be handed over, along with the fixed plant under the Boltshope lease. The lessees also had to give possession on July 11th next (1873?). They also

had to pay their own costs, and all rent arrears up to July 11th had to be paid in cash. The proper indentures and legal acquittals were to be prepared by the solicitors and mutual arrangements had to be made for the dressing floors, engine houses etc. The lessors were asked to accept £1500 in full settlement of all claims, and Messrs Bewick and Taylor (or their umpires) were to settle the details for carrying out these instructions.

PLATE 15. Robinsons Level, Sikehead with the late Trevor Morris (1979).

To try and cut costs, the last steam engine at the Derwent Mines was replaced with a water pressure engine in 1872.[60] As the remaining ore was mostly below the valley floor it had to be worked from shafts rather than levels. The agent reported that, in 1872, 2 men and 2 boys had declined an offer of work because of the long ladders at Jeffrey's Shaft, the only one without mechanized haulage. On January 29th that year 5 new bargains were refused.

By this time, the workings at Jeffrey's were said to be of "*every conceivable size and shape*", up to 20 feet wide and up to 60 feet high. Veins were worked by "*headings, roofs and soles*" (i.e. by driving along the vein, and underhand or overhand stoping). When roof workings became too high, timber floors, or bondings, were fixed across for the miners to stand on.

PLATE 16. Routh's-Ellen's Shafts, Sikehead (1980).

Some ore was found in flats, from 3 to 6 feet high and, in places, spreading up to 70 feet on both sides of the vein. An undated plan and section of Bolts Burn Mine shows flats "s*eventeen fathoms deep on Whiteheaps Gin Shaft, in the middle of the Low Grit Sill*". No confirmation of these or other flats has been found, however, and in 1917 T.W. Heatherington wrote of Derwent that "*no flats had been found in the workings but whereas extensive flats were found in adjoining royalties at Rookhope*".

The uncertainty of the work, possibly fuelled by the prospect of having to climb the long ladder-ways at Jeffrey's Shaft, led more miners to refuse the setts being offered at the biddings. By June 21st 1872 the take-up of setts was reported to be poor, because of the shortage of labour, and on September 30th 1872 a further 6 bargains were refused.

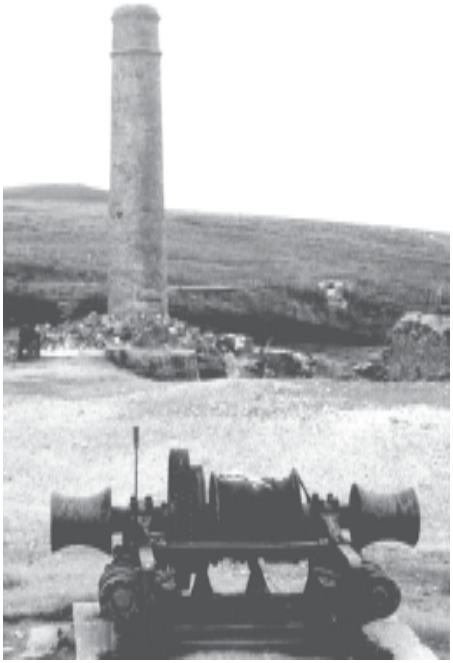

PLATE 17. Sikehead – steam hawser (1981).

The poor prospects and the restricted wages paid by the debt-encumbered company encouraged the men to seek the security of the neighbouring coalfield, as on January 13th 1873 when 4 of them moved to the coalworks at Consett after the mine captain had accused two of them of negligence.

The decline of the Derwent mines, therefore, was caused not only by depletion of the mineral in the veins, but also by the cost of working them at a time of rising labour costs and better prospects elsewhere for the workforce.

On January 9th 1873, an extraordinary general meeting of the Derwent Mines Company Ltd's shareholders appointed Robert Palmer Harding as liquidator to wind up the company, which was split into 12,000 shares, estimated at £4 each during trading. The works were valued at £12,500, along with outstanding arrears of £1709 10s 2d. A statement was issued claiming that "*the Company by reason of its liabilities cannot continue its business and therefore it is desirable to wind up the same*".

DERWENT LEAD MINING AND SMELTING COMPANY LTD

By 1876 the Derwent Mines Company Ltd had transferred its lease of the mining rights in Hunstanworth, Edmondbyers and Blanchland to John Murchison. He and some of the old shareholders floated a new company, called the Derwent Lead Mining and Smelting Company Ltd, which took over all plant, machinery and effects belonging to the business from September 29th 1876.[36] The lease, from the Lord Crewe Charity, was dated February 13th 1860 and gave mining and other rights in Hunstanworth, Blanchland and Edmondbyers. The new company included Robert Palmer Harding (liquidator), John Randall MacDonnell, and John Taylor Jnr, of John Taylor and Sons, Mining Engineers.

On December 30th 1873 the solicitors J.H. Murchison and Samuel York arranged a new lease for the Derwent Lead Mining and Smelting Company, to become effective from September 30th 1876. They were also granted licence to assign their interest in the lease to E.M. Bainbridge on February 10th 1875. York, of Shifnal in Shropshire, held 1400 shares in the Rookhope Valley Lead Mining Company, which was also in difficulty at this time. Murchison held 2825 shares in the same company and was one of its directors.[72] Both were on the board of Tankerville Roman Gravels Mine, in Shropshire, and this allowed them to call upon the experience of Captain Waters. Mr Blenkiron, of Arkengarthdale, managed the Rookhope Valley Lead Mining Company's works at Brandon Walls in May 1874 during a similar financial crisis, which ended in the reconstruction of that company in 1876 into a new company called the Rookhope Lead Mining Company.

Based on the wage book for the week ending June 21st 1874, the average wage at that time was £55 8s 0d per year. In that year, however, a clause was introduced into the bargain system to compel the men to work regular hours, an action which was at first resented.

John Morpeth wrote to the directors of the Derwent Lead Mining and Smelting Co. Ltd in London on September 20th 1879, describing the state of the mines up to the end of June that year. He stated that good ventilation was a high priority, as it was healthier and enabled ground to be let at a lower rate.

Expenditure was £2961 12s 7d, compared with £1650 14s 7d for the previous year, and the area stoped (by fathomtale, i.e., 36ft^2 of working face advanced by 6ft) was 433 fathoms 1 foot 2 inches. Working was restricted to six areas and the total reserves of ground opened up had increased to 1206 fathoms from 1080 fathoms the year before. Some 46 fathoms of unproductive ground had been worked at a cost to the company of around £9 per fathom, and 302 tons 5½ cwts ore had been dressed at £1 11s 6d per ton. This was 5s 9d per ton more than for the previous year, mainly because of bad weather.

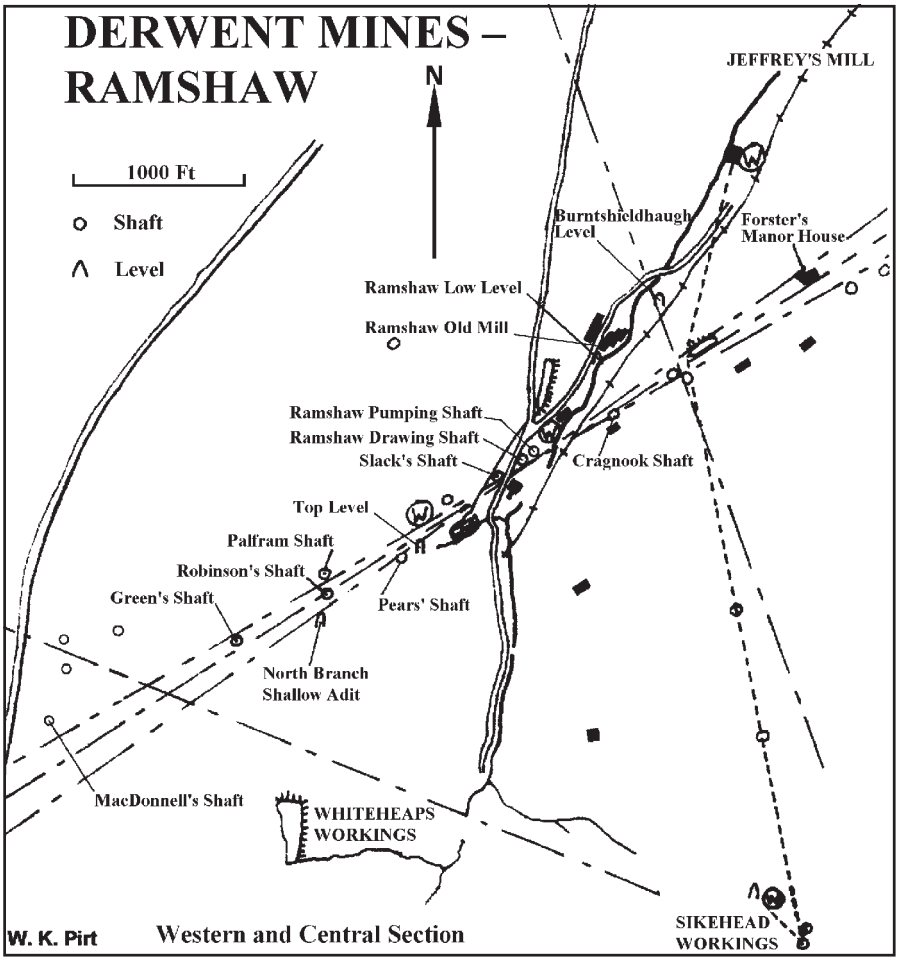

Fig 21. Principal shafts at the Ramshaw mines.

The ore had yielded:-

	Tons	cwt	qr	lb	
	190	4	0	16	rich lead,
	8	4	0	1	(liberated) fume and
	25	0	0	2	slag,
Total	223	8	0	19	

When refined, this had given:-

oz	dwt	gr	
2912	19	7	of silver, from which deduct -
1248	13	6	allowing for desilvering, and
1664	6	1	remain, which, with the lead, realise £3562 14s 0d nett.

The average cost of smelting was £1 3s 11d per ton.

In 1878 the average lead content was 70.21%
In 1879 the lead content was 73.91% (3.70% increase)

The current return of lead ore was around 12 tons per week, ie. nearly 50% up on the returns for the previous 2 years.

On September 24th 1879, the Secretary, Mr J.H.A. Smith, asked the shareholders at an Ordinary General Meeting at the Company's offices at 8 Austinfriars, London, to meet again on October 8th to propose a resolution to permit the Directors to borrow £10,000 upon debentures, at 6% interest per annum payable half yearly, to be secured by a deed assigning the leasehold, plant and machinery to the Trustees for the debenture holders. At the meeting it was announced that 223 tons 8 cwt 0 qrs 19 lbs of pig lead had been sold for £3,562 14s 0d. This gave an average price per ton of £14 14s 1d, against £18 10s 0d and £20 13s 0d in the previous 2 years. The returns for December and January had been spoilt as bad weather had disrupted dressing operations, while February had been ruined by a "*serious accident*" caused by heavy frost. This had laid off Jeffrey's Shaft for three months and caused a suspension of operations in the most productive parts of the mine. The shareholders were told that, as a result, the directors had to forfeit 3,125 shares on which £3,900 was unpaid. Included in these were 2,900 shares

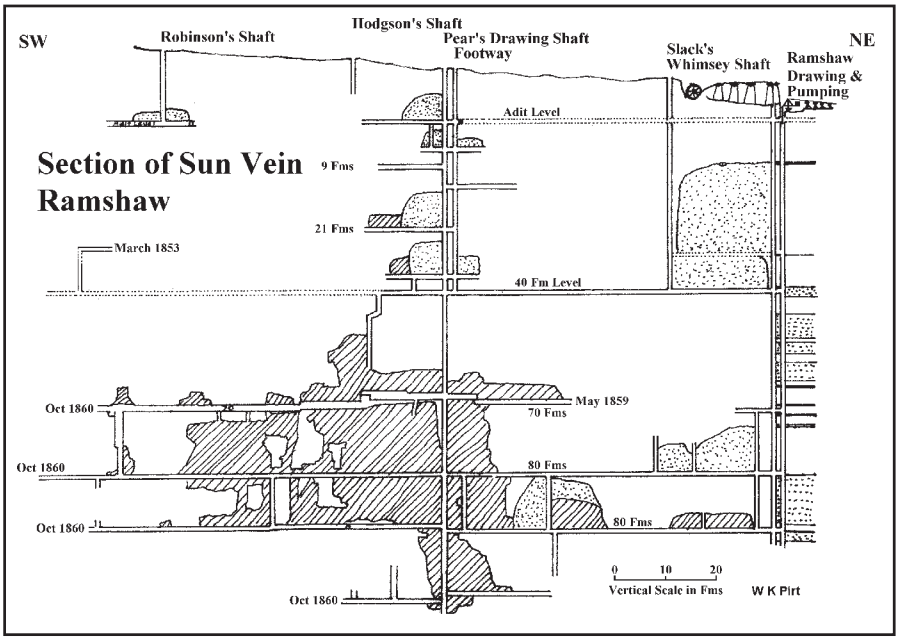

Fig 22. Longitudinal section of Ramshaw Sun Vein.

held by one shareholder who had become bankrupt in consequence. These forfeited shares were offered for sale to the remaining shareholders at £3 10s 0d for each of the £4 shares, before being placed on the outside market.[73]

In order to recoup losses and to cover the purchase of the Freehold at £8,000, it was put to the shareholders that the aforementioned sum was necessary and that many people still held great faith in the venture despite these problems. A report on the last year's work, a summary of which follows, by John Morpeth, the mine manager, was then read out.

The new drives completed beneath the 93 Fathom Level east and west of Westgarth's and Jeffrey's Shafts had opened up large tracts of ore ground which were now available for stoping. The loan would enable the 95 Fathom Level to be driven another 30 fathoms to intersect North Vein, giving access to an anticipated 18,000 cubic fathoms in the Great Limestone alone. With the new Dunn's rock drill, this task was expected to take 3 to 4 months.

Taylor's Shaft workings were drained by a 50 inch Cornish engine at Jeffrey's, and a 12 inch diameter high pressure engine was in place (along with a currently unused 40 inch condensing engine) should it be required.[36]

A letter in the *Mining Journal Supplement* from J.H.A. Smith, on March 6th 1880, pointed out that the value of £100,000 given for lead sold since 1834 was wrong and the correct figure was £1,000,000. On the same day, one of the Company's original shareholders said he thought its shares were very cheap at £4 each, considering that only 12,000 existed. Capt Waters of Roman Gravels, Tankerville, and other important lead mines, had given a good report on the mines, as had Mr John Taylor of J. Taylor & Company, Mining Engineers. The Dunn's rock drill had been used since 1878 and the company was about to buy the freehold to its mineral rights freehold, thus saving on rent. The freehold was described as 2500 acres of land containing almost 1800 fathoms of vein courses. The present work included a 95 fathom long rosscut to intersect the North Lode in the Great Limestone, which should be completed within the next three months. Another drive, to the Burntshield Haugh Vein, was almost completed.

On November 6th 1880 the *Mining Journal* reported on the previous week's annual (ordinary) general meeting in London, chaired by Mr William Edwards. Mr Morpeth, the manager, submitted the previous year's accounts, which were better than of late, especially considering the price of lead at the time. The report to the meeting detailed the number of men employed, as well as mining costs, ore yields, and the amount of new ground opened up.

Description	*Account*
Total expenditure underground (less haulage)	*£3882*
Increase on last year	*£920 7s 6d*
Quantity of ground removed	*821 fm 1 ft 7 in*
Ground ready for stoping	*800 fm*
Productive ground explored	*763 fm 3 ft 3 in*
Yield from exploration	*1453 shifts of bouse*
Worth of ore from this	*532 t 3 cwt 2 qr*
Average yield from this	*13 cwt 3 qr 21 lbs/fm*
Percentage yield	*4.88%*
Average cost per fathom	*£4 2s 9d per fm*
Unproductive ground explored	*64 fm 4 ft 4 in*
Average cost of this	*£5 5s 2d per fm*
Ore dressed and sent to mill	*535 t 15 cwt*
Average cost for dressing	*£1 3s 2d per ton*
Waste ore dressed from burn	*6 t 8 cwt 2 qr*
Average cost for dressing	*£5 per ton*
Ore smelted	*532 t 3 cwt 2 qr*
Yield of metallic lead	*368 t 15 cwt*
Silver yield	*3112oz*
Total sale return from lead and silver	*£6446 16s 3d*
Average smelting cost	*£1 1s 5d per ton*
Percentage metal from ore (less fume)	*69.3%*

Eighty-seven men were employed underground, with 35 men and 33 boys employed on other duties. Owing to the cost, the smelt mill flue was only cleaned every 2 years.

The chairman commented on the manager's report, adding that the figures showed that production was up 50% on the previous year, mainly because the completion of the two 93 Fathom Levels had considerably reduced drawing costs. He said that lead prices in general had been sadly against them and, because of the cost of exploration in the past year, he could not permit a declaration of profits. However, no call was necessary, as the exploration work had put them in a good position for the forthcoming year. Improvements were expected once the 68 Fathom Level crosscut, being driven in the Little Limestone, reached the North Vein. If the vein, which had recently been found to be large and profitable in the Great Limestone, was as rich here, the value of the property would be greatly enhanced.

Morpeth was highly regarded as a manager and his successful wiping off of the previous year's debits had placed the mine in a reasonable position even with the current price of lead. He had also conducted a substantial and successful programme of exploration work with money made available from selling forfeited shares at a good price. Mr Kerley, the company's solicitor, was negotiating for the right of freehold from the lessor of the land.

The North Lode crosscut had found ore at values of 1½ to 2 tons/fathom and the Little Limestone crosscut was almost complete. Although no one could tell what the vein would be like at depth, it had all the characteristics of being a good one. Assays had returned better silver contents than ore from Middle Vein, which was

also working and giving returns at this time. In the two sills the stopes were expected to have a total length of 4 miles and, if these expectations were met, 50 tons of ore per month could be raised.

The 95 Fathom Level East was producing 22 cwt/fathom, but, based on values in the level above, this was expected to increase to around 60 cwt. The Dunn rock drill was being used in the crosscut and 51 fathoms had been driven in 17 weeks. After deduction of underground expenses, coal at surface and the engineman's expenses, costs were little below those of hand prices.

At the end of the meeting Mr Edwards was re-elected Chairman. The auditors were Stansfield and Company. A Mr Lamb filled the late Mr Daukes' place on the Board, and Mr York was also named as a director.

In 1880, wage costs formed 75% of the price of lead and, as Spanish lead could be purchased more cheaply, the Hunstanworth Mines were forced to close in 1882 or 1883. Although their ore content was poor, the wide, sparry nature of the veins allowed them to be easily worked. In the 1880s there had been a world glut of lead as a result of prices being forced down by cheaper Spanish ore, falling from £22 4s 0d per ton in 1874 to £9 2s 3d per ton in 1894. By 1883, over 80% of the world's lead imports were of Spanish origin.

Smith calculated that the Derwent Mines produced 28,885 tons of lead between 1845 and 1883, while Dunham suggested that the total output from 1666 to their closures was 51,429 tons.[1] Shildon had declined by the late 18th century and never recovered. The Ramshaw Group had its heyday in the early 19th century, while mines in the Healeyfield and Edmondbyers areas were mainly exploited during the latter half of the 19th century.

Despite the optimism of the 1880 meeting, however, things did not go well, and on November 6th 1883, a notice by W. Edwards and C. Huribell, Solicitors, from The Derwent Mines Co. Ltd (in liquidation), announced that they intended to quit the "*assignment to the Derwent Mining and Smelting Co Ltd, of leasehold mining and other rights and hereditaments in Hunstanworth, Blanchland and Edmondbyers … held from the Lord Crewe Charity by lease of February 13th 1860, and also plant and machinery and effects*" when the lease expired.

On May 2nd 1884, Robert Clark wrote to N. Rowlandson "*With reference to the Derwent Mines, the lease expired some years ago but an arrangement was made for the Derwent Mines to continue as yearly tenants…notice was given last November to terminate this May Day so it is led to be understood. My principles are pressing me to get the question of rent for land occupied as early as possible*".

By May 19th 1884 a further letter from Clark to Rowlandson says: "*We agree to pay the Lord Crewe Trustees £20 per year for land reoccupied without*

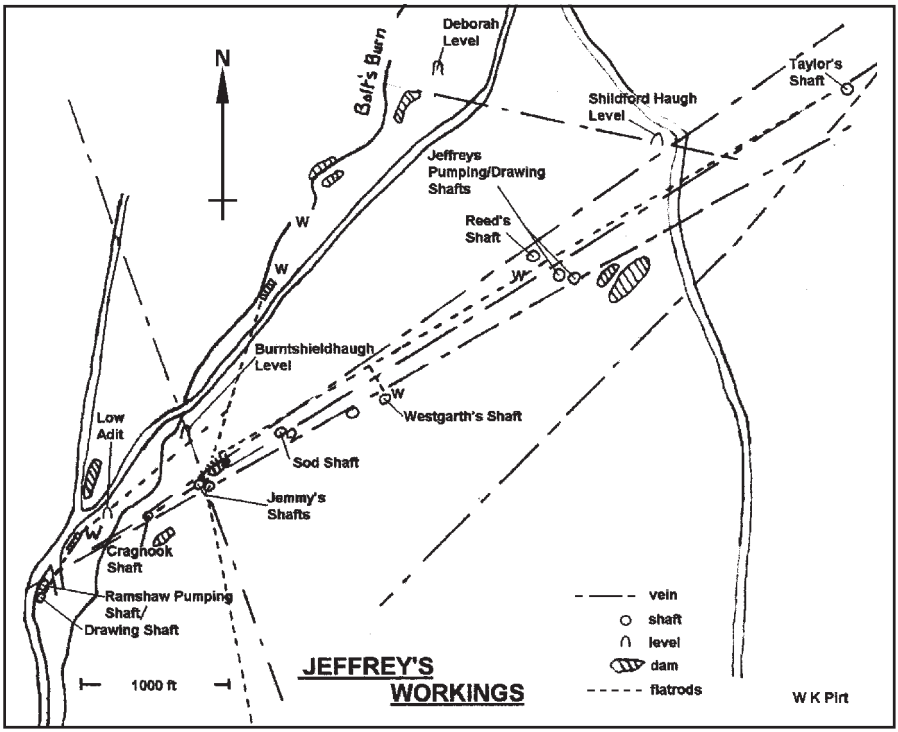

Fig 23. Principal shafts at the Ramshaw and Jeffreys workings.

prejudice to our contention … that we as owners of the minerals have a right to use any land for the working, etc of the mines without payment. I shall therefore collect all rents as before, May Day 1884".

On July 10th and 11th 1884, the fixed and loose plant of the Derwent Lead Mining and Smelting Company's works were auctioned by Richard S. Benson at the instruction of James Joicey. The selling began at noon each day. A selection of the sale contents has been listed below as these give a good idea of the material in use at the site prior to abandonment. A note of the sale price is made alongside each item number.

	Item Description	Sale Price £	s	d
Jeffreys Mine - Taylor's Shaft				
1	*A 12" high pressure engine and single flue boiler complete with drum and drawing cage.*	*10*	*00*	*00*
3	*Balance bob and angle bob, with bishop's heads, metal gudgeon and metal saddle, along with 740 yds of 1¾in wrought iron round rod and 71 cast iron pulleys and stands.*	*11*	*00*	*00*

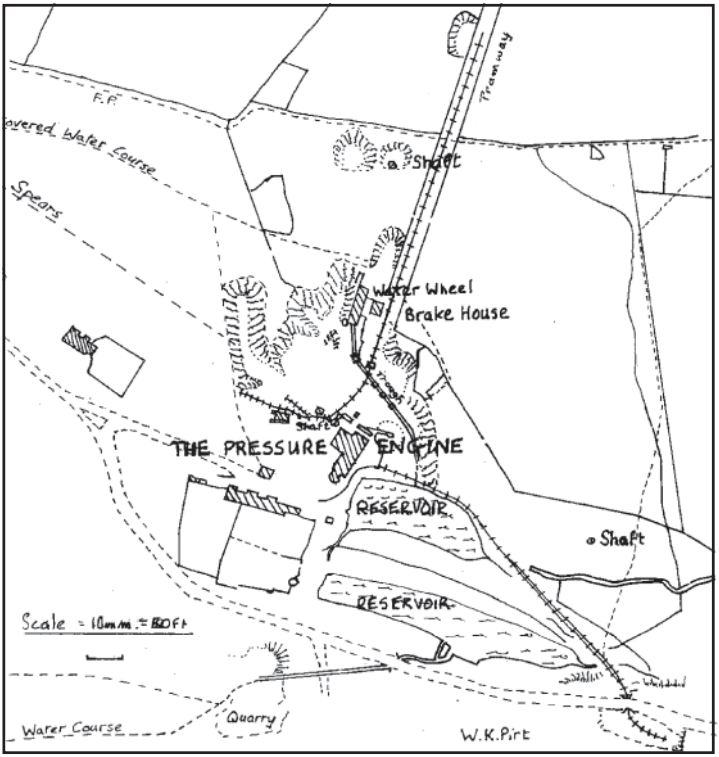

Fig 24. Surface plan of Jeffreys Shaft, showing the pressure engine (c. 1875).

Jeffrey's Shaft

11 A	*50" condensing pumping engine with pumping beam and everything complete, and in first class order, made at Mold Foundry by The Sandycroft Engineering Co, 1857.*	*44*	*00*	*00*
29	*7ft drum, with framing and brake.*		*6*	*00*
32	*1760 yds tram rails from shaft to bottom of incline, with two 2½ cast iron sheaves and 121 rollers.*	*20*	*00*	*00*
33	*Large balance bob.*	*4*	*00*	*00*
37	*72yds wood water boxes, 20" x 17", with straps and bolts.*		*11*	*00*
42	*31ft diameter waterwheel 2ft 9in. Breast with cast iron segments, cast iron shaft and large spur wheel.*	*6*	*15*	*00*
42a	*Also winding cage with 16ft cast iron shafting, 5 spur and pinion wheels, three bearings, powerful brake, with lever and rack for reversing gear.*	*5*	*10*	*00*
46	*Angle bob and 500yds of 1 iron rods, with 50 pulleys and stands.*	*9*	*10*	*00*
53	*10hp portable engine with 16" cylinder, 14" stroke, with multi tubular boiler, by Richard Hornsby, Grantham.*	*24*	*00*	*00*
64	*Screw Jack and Jim Crow.*		*13*	*00*

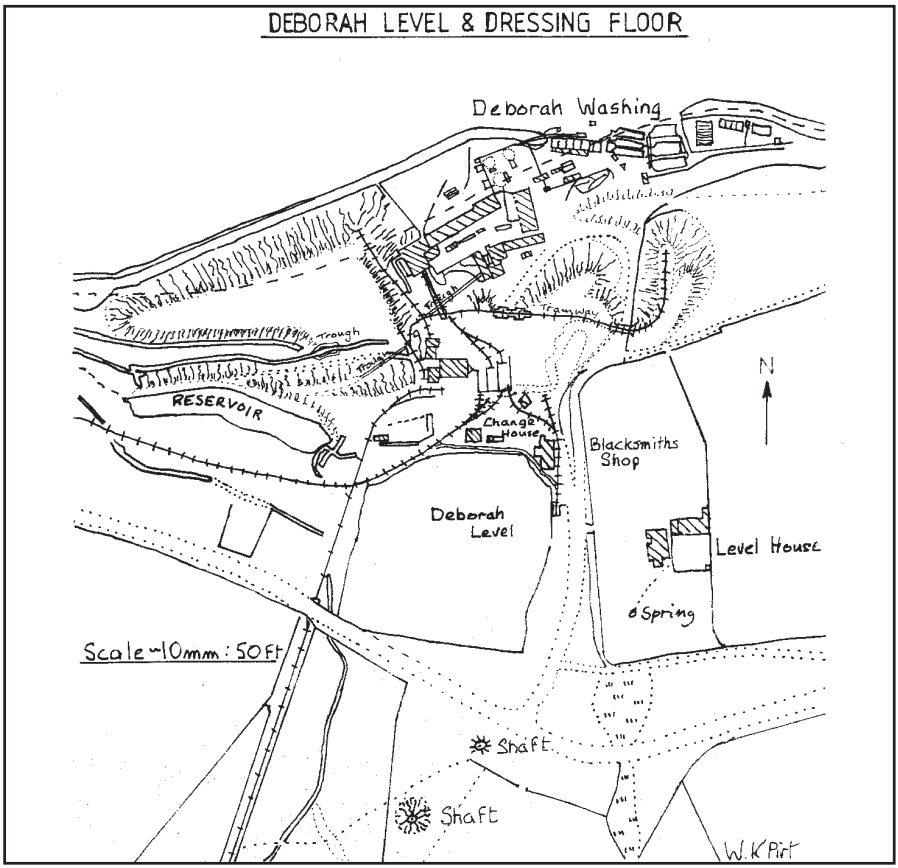

Fig 25. Surface plan of Deborah Level dressing floor (c.1875).

Westgarth's Shaft

83	*Balance bob with wrought iron straps, gudgeon and bishop head.*		*11*	*00*
89a	*Sturgeons patent air compressor, with receiver and piping connected.*	*23*	*00*	*00*
102	*28 cast iron pulleys and 14 wooden stands, with wire rope stays from water wheel to shaft.*	*2*	*12*	*00*
103	*A 21ft waterwheel 2ft 7in breast, cast iron shaft and large spur wheel.*	*2*	*5*	*00*
104	*Winding cage with powerful brake wheel, 2 cast iron shafts, 4 spur and pinion wheels and 5 bearings, lever and rack, knocker and knocker line.*	*4*	*10*	*00*
106	*60yds wood water boxes, 13" x 13", with drop water box.*		*7*	*00*

East Whiteheaps

108	*Old vertical engine and fly wheel, and length of steam pipe.*	*3*	*00*	*00*
110	*A 40" cylindered condensing pumping engine complete with beam built by the Sandycroft Engineering Co.*	*41*	*00*	*00*

115	*Balance bob with 58yds of 2" iron rods, 5 cast iron pulleys 2ft in diameter, and metal scrap in balance box.*	*6*	*05*	*00*
120	*Iron bound wood waterwheel, 42ft diameter and 2ft 4in breast, wrought iron axles 7ft (long), square section with cast iron sockets and winding cage with brake, iron lever, 2 clutches, and carriages.*	*5*	*10*	*00*
122	*2 sweep rods, with large balance bob and travelling bob.*	*1*	*6*	*00*
125	*42ft wood water boxes, 18" x 14", with 2 valves and iron hoops.*		*1*	*06*

Jemmy's Wheel

146	*36yds of 2¼ wrought iron rods with cheeks and eyes, one carriage and 2 wrought iron strapping plates*	*2*	*00*	*00*
147	*A 48ft waterwheel, 48in breast with cast iron shaft and crank and bearings, and bound with cast iron segments.*	*6*	*10*	*00*
148	*592yds of 2¼ wrought iron rods, with 2 travelling bobs, connecting rod, and a number of cast iron sheaves.*	*18*	*10*	*0*
150	*Balance bob, with one iron strap and bishop head, and shaft and bearings*		*4*	*06*
151	*Wood water boxes and wood supports.*		*8*	*00*

Smelt Mill Fan House

172	*Schiele and Co's patent fan.*	*8*	*00*	*00*
178	*18ft diameter waterwheel, 4ft breast, with a host of spur wheels attached, shafting, carriages etc.*	*3*	*00*	*00*

Smelt Mill House

196	*Slag hearth, with 2 metal pans and other ironwork and blast pipes in connection.*		*12*	*00*
197	*Cast iron smelting hearth.*	*1*	*15*	*00*
198	*No 1 Smelting furnace with wrought iron binder and straps, damper, chains and weights, etc.*	*20*	*00*	*00*
199	*No 2 ditto.*	*15*	*00*	*00*
200	*Wooden gangway over furnaces.*		*2*	*00*

Deborah's Dressing Floor

253	*Blakes patent stone breaker with 16" x 12" jaws, with flywheel, belt sheave and belt.*	*20*	*00*	*00*
254	*A 21ft diameter waterwheel, of 36" breast, cast iron segments, with spur and pinion and flywheel, 2 shafts and 4 bearings.*	*7*	*15*	*00*
255	*Wooden hopper, metal grate and picking table, in a shed.*		*2*	*06*
257	*30yds wood water boxes, 32" x 12", with valve.*		*6*	*00*
259	*Revolving riddle, with shafting, pulley and I R belt.*		*2*	*00*
260	*Wrought iron ore wagon*		*3*	*06*
263	*Raff wheel, waterwheel 6ft diameter, 18" breast with horizontal shaft and pinion wheels and bearings.*		*15*	*00*
267	*111ft wood water boxes, 15" x 9" with supports.*		*5*	*00*
274	*Crushing mill, with raff wheel, 14½ diameter and cylindrical riddle below, two 27" cast iron rollers, with wrought iron shaft, 2 slides complete with double purchase crab and chain.*	*4*	*00*	*00*
276	*A 30ft waterwheel, of 4ft breast, with cast iron segments, shaft, 2 bearings, and one spur wheel.*	*6*	*10*	*00*
280	*Propelling buddle, 12ft long, with 2 lengths of shafting, pinion wheels and bearing.*	*6*	*10*	*00*
285	*Waterwheel, 8ft diameter, with riddle, cone separator, wheels, shafts, bearing, and 6ft Archimedean screw.*		*6*	*00*
287	*Eight jigging tubs, with sieves and stands complete and 2 ditto incomplete, with all wood framings, eccentrics, spur and pinion and flywheels, weights, chains etc.*		*4*	*06*

90	*A 9ft diameter waterwheel, of 3ft 3in breast, with length of shafting, spur and pinion wheels.*		*4*	*06*
294	*A 28ft waterwheel, of 22in breast, with 2 cast iron shafts length wrought iron ditto, crown and pinion wheels, and 6 bearings and wood house.*	*2*	*10*	*00*
295	*3 crown wheels, 2 cast iron shafts, 4 bearings, chain mill, and large raff wheel complete.*	*1*	*11*	*00*
301	*A propelling buddle, 12ft long, with small waterwheel, shaft and pinion wheel for driving same. Complete.*	*2*	*15*	*00*
312	*Three round buddles of 8ft diameter, waterwheel, the whole of the shafting, pinion wheels, bearings etc. connected therewith three riddles and one Archimedean screw.*	*1*	*06*	*00*
315	*2 round buddles and a waterwheel for driving, 5 riddles, shafting etc on second floor.*		*10*	*00*
317	*One wooden shed and 3 square buddles, a 9ft waterwheel with 26ft splashing shaft.*		*5*	*00*
319	*Eight wood pits, a 9ft waterwheel, agitators, paddles, shafting and wheel*		*2*	*00*
320	*Six square buddles, with splashing shat 37½ ft long, 6 pit, water box, wheels, bearings etc.*		*2*	*06*

The total of the two day sale amounted to:- ***£836 16s 05d***.

Plant and equipment at Ramshaw, Ramshaw Rake and West Whiteheaps Mines, in the adjoining Capper royalty, were not included in the sale, but a breakdown of the complete list reveals the following:

Location	***Engines***	***Wheels***	***Balance Bobs***	***Travelling Bobs***	***Angle Bobs***
Taylors	*1 (12")*		*1*		*1*
Jeffreys	*1(50")*	*1 (31ft)*	*1*		*1*
	1(16")	*+spur wheel*			
Westgarths		*1 (21ft)*	*1*		
		+spur wheel			
East Whiteheaps	*1 (40")*	*1 (42ft)*	*2*	*1*	
	1 (16")				
Jemmys		*1 (48ft)*	*1*	*2*	
Smelter Fan House		*1 (18ft)*			
		+ spur wheel			
Deborah's dressing floor		*1 (21ft)*			
		1 (30ft)			
		1 (28ft)			
		1 6ft raff wheel			
		1 14½ft raff wheel crushing mill			
		2 (8ft),			
		1 (9ft).			
		1 (?), 1 (?).			

Total	***Engines***	***Wheels***	***Balance Bobs***	***Travelling Bobs***	***Angle Bobs***
	5	*12 Wheels*	*6*	*3*	*2*
		3+ Spur Wheels			
		2+ Raff Wheels			

Correspondence after this date includes:

July 30th 1884, (Clark) "*Have received the Derwent Mines Co's lease but if £35 is a fair rent in anticipation of the mines working, I think half of it might suffice under present circumstances.*"

August 20th 1884. *"Any houses built belong to the Lord Crewe Trustees, are subject to Mr Joicey's right of the use of them whilst the mines are being worked by him.*"

On October 2nd 1884, the mines paid £5 5s 0d rent for the railway (tramway) and land.

The findings of an inspection of the Hunstanworth, Shildon and other royalties by J. Pears Walton on January 8th 1890 were reported to Edward Joicey of Blenkinsop Hall, owner of the mining royalties. By this time the mines had all closed and Mr Nathaniel Clark was the land Agent.

Fig 26. Seal of the Derwent Lead Mining and Smelting Company Ltd.

Derwent Mines

According to reports by J. Pears Walton, the workings extended 2000 yards east and 1000 yards west of Bolt's Burn. East of Bolt's Burn the principal entrances were by the following shafts:

Jemmy's	83 fms into the Great Limestone.
Westgarth's	110 fms into the Great Limestone.
Jeffrey's	127½ fms to the bottom of the Great Limestone.
Taylor's	140 fms to the top of the Great Limestone.

West of Bolts Burn

Ramshaw	86 fms to the bottom of the Great Limestone.
Pears'	135 fms through the Great Limestone to the Quarry Hazle.

Adits at the mine were-:

Deborah's	35 fms deep at Jeffreys Shaft and 52½ fms at Taylor's Shaft.
Jamieson's Mill	From Westgarth's Shaft.
Ramshaw	10 fms deep at Ramshaw Shaft.

The east to west striking North, Middle and South Veins, and the branches between them all produced lead ore in the High and Low Grit Sills, the Craig (Crag?) and Pattinson Sills, the Little Limestone and the High and Low Coal Sills. The North and South Veins crossed at Ramshaw Shaft. North Vein was worked for 135 fathoms east of Jeffrey's Shaft and tried for a further 105

PLATE 18. Taylor's Shaft chimney 1975, after being struck by lightening in 1974 (1980).

fathoms in barren ground. A crosscut from Taylor's Shaft also proved it to be barren. South Vein was worked for 40 fathoms east of Taylor's Shaft, then tried for 55 fathoms in barren ground. Middle Vein and its branches were extensively worked and were followed further east than the North and South Veins. This vein was productive for 100 fathoms east of Taylor's Shaft, but the next 80 fathoms were barren, leaving around 1200 yards of untried ground. It was suggested that the ore was not tried below the Great Limestone, owing to the high cost of raising it.

Whiteheaps Mine
This mine extended for 1000 yards east and 1000 yards west of Bolts Burn. The principal entrances were:

East of Bolts Burn.
1. Crag Shaft 40 fms deep.
2. Ruth Shaft 100 fms deep to the Pattinson Sill.
3. Ellen Shaft 100 fms deep to the Pattinson Sill.

West of Bolts Burn
1. Whiteheaps 98 fms through the Great Limestone and Tuft.
2. Whitsun 30 fms deep to adit.
3. MacDonnells 50 fms deep to the plate beneath the High Grit Sill.

Skottowe's Adit entered the mine just below Crag Shaft, and was about 40 fathoms deep at the Ruth and Ellen Shafts. Red and White Veins, both running from east to west, were worked from this level. It was said that at Crag Shaft the bottom drift was lost and good ore left in the soles. Most of the workings were centered around the Ruth and Ellen Shafts, and the twin Whiteheaps Shafts. From the Ruth and Ellen Shafts, the veins were followed for about 190 fathoms east, where the strata dipped rapidly, causing the work

PLATE 19. Taylor's Shaft angle bob pit (1980).

to be left short. MacDonnell's Shaft, at the far west of the workings, was the most recent, but the vein there only averaged 10 to 12 cwt of ore per fathom. The best ore was raised from the High Grit Sills.

Pears' advice was to drive towards the Ramshaw North and South Vein - Red and White Vein intersections, where the quality of the veins would be expected to improve. Dunham says the poor mineralisation, despite the proximity of its intersection with the Ramshaw Veins, is owing to the presence of "*substantial shale beds between the Low and the High Grit Sills*".

Shildon Mine Shafts

1. Gin o' the Woods
2. Engine — 105 fms through the Great Limestone
3. New Shildon — On New Shildon Vein
4. Fellgrove — On Fellgrove Vein

Shildon Burn Adit entered Engine Shaft at 10 fathoms. From here Old Shildon Vein was worked for 250 fathoms east in the Grit Sills. Fellgrove Vein was worked for 210 fathoms east and 60 fathoms west.

Linnbank Vein was worked from an adit driven from the south side of Nookton Burn. The vein was also worked on the opposite side of the burn by a level and some shafts, where some good ore was found.

Other adits driven in the western portion of the district were:

1. Yawd Sike Level, driven south for 225 fathoms from the confluence of Yawd Sike with Little Nookton Burn. At 110 fathoms a shaft was sunk from the surface. The vein was cut at 165 fathoms, but no work was done.

Derwent Lead Mines and Smelting Works,

IN THE PARISH OF MUNSTANWORTH,

COUNTY OF DURHAM, AND NEAR BLANCHLAND.

CATALOGUE

OF THE VALUABLE

FIXED AND LOOSE PLANT,

ENGINES, BOILERS,

WATER WHEELS,

150 Tons of Bridge, Tram, and other Rails;

ORE WAGONS; LARGE QUANTITY OF C. I. AND W. I. SCRAP;

Old Lead, Brass and Copper;

BORING MACHINES; AIR COMPRESSOR;

Together with all the Machinery required in the Lead Smelting business.

RICHARD S. BENSON

Has received instructions from JAMES JOUSY, Esq., to Sell the above,

BY AUCTION,

ON THE PREMISES, ON

THURSDAY & FRIDAY, the 10th & 11th days of July, 1884.

SALE AT TWELVE O'CLOCK EACH DAY.

Parkhead Depôt, on the Blackhill & Darlington Section of the North-Eastern Railway, is about 6½ Miles from the Mines.

[illegible] and Consett Railway Stations are each about 8 Miles from the Mines, and from which places Drays will convey Purchasers, on arrival by the first trains, Free of Charge to the Sale and Back.

Refreshments will be provided each day for Purchasers.

Bailey, Printer, 7 & 8, Horse Market, Darlington.

Fig 27. Frontispiece of sale catalogue of fixed and loose plant, 1884.

2. Smithy Cleugh Level, driven west from Smithy Cleugh for 220 fathoms and crossing Whiteheaps Vein at 40 fathoms, Red Vein at 82 fathoms and New Vein at 114 fathoms. No trials were made on any of these veins. A 50 fathom deep engine shaft, near the adit entrance, was sunk to cut White Vein and a drive was made 40 fathoms west on the vein. No records exist of work done "*at so remote a date*".

3. Park Sike Level, driven north from the side of the burn for 132 fathoms on Whiteheaps White Vein.

4. Grindstone Cleugh Level, driven south for 286 fathoms to cut Grindstone Cleugh Vein at 130 fathoms from portal. Here a shaft was sunk from the surface.

5. Grindstone Cleugh Low Level, driven 50 fms west from Grindstone Cleugh, but cutting no veins.

The report recommended that:

1. Yawd Sike Level should be cleared out and continued south to cut Ramshaw Sun (South) Vein at 25 fathoms and Boltslaw Vein at about 100 fathoms. The veins already cut should also be thoroughly examined.

2. Grindstone Cleugh Level should be cleared and continued south where Kittle Stirrups Vein, Rookhope Vein and Allenheads Old Vein should be cut after about 170 fathoms of driving. Further trials should also be made on a vein already cut that showed samples of galena and black jack (sphalerite, ZnS) at the level mouth.

3. Park Sike Level should be continued north on Whiteheaps Vein, eventually to intersect the Shildon Veins and also some veins from Allenheads, where Henry's Vein points this way.

The conclusion was that a concentration of effort was required in the western end of the area, where costs would be lower.

The Consett Water Company's Bill, 1902

The preparation of a Bill to allow the Consett Water Company to take water from the disused Derwent Mines' workings, via the Presser Shaft at Jeffrey's Mine, refers to J. Pears Walton's report of January 8th 1890. Walton, whom Mr Joicey consulted between January 31st and April 4th 1902, was concerned that, if the mine was ever re-opened, not only would the water be polluted, but, in the inevitable event of sinking deeper, the supply might also be lost. To prevent this, he advised the Water Company either to buy Mr Joicey's mineral rights over a certain area, or to take out a lease from him at a fixed rental to prevent him letting the mine to anyone else. Joicey's Counsel advised that, as owner of the minerals, he had a full and exclusive right to the shaft water that the Water Company proposed using. This was disputed by the Lord Crewe Trustees, as surface owners, who claimed that the shaft water belonged to them unless used by Mr Joicey or his tenants for working the lead mines. The Lord Crewe Trustees further claimed that Joicey could not charge for the use of the shaft or for any water.

The Trustees sought a rent of £1 for every 1,000,000 gallons of water pumped by the Water Company. This sum would also cover the use of the shaft and all their claims except those arising from surface damage. The company offered the Trustees 10s 0d per 1,000,000 gallon, but finally settled on 12s 6d, with the expectation of pumping 500,000 gallons per day. It was suggested that "*failing an absolute certainty as to whom both the shaft and the water belonged, Mr Joicey and Lord Crewe's Trustees should divide this rent between them*". Eventually it was agreed that Joicey should grant the Water Company a lease of a ground to be set out by J.P. Walton. This could be either at a rental of £200 per annum to cover everything on Mr Joicey's part, or at £300 per annum if a proposed reservoir was built at Beldon Burn. All parties objected to the latter proposal, however, "*because of the injury it may cause to the game and shooting*".

In 1906, Joicey disputed the Trustees' right to sell material from spoil heaps on land held by grant since 1709. The Trustees had received £20 a year, but Joicey demanded compensation, claiming that the 1709 lease gave him sole rights to income from such sales since before 1884. He also claimed that the Trustees had demolished houses on commonable and leased lands for the erection of buildings on his estates. The outcome of this dispute is not known.

Hetherington's 1917 Report on Hunstanworth Mines

The Hunstanworth Mines Company was formed in 1916 and a report by J.W. Hetherington, dated November 21st 1917, outlines the relative state of the Derwent Mines and suggests explorations needed to return the mines to a workable state. The area under scrutiny is mainly that leased to the Consett

Water Company, where a pumping plant had recently been installed. This consisted of a new, stone-built engine house (still standing) and a caretaker's house, called Presser Villa. The plant at the Presser Shaft was capable of lifting water from a depth of about 35 fathoms. The Consett Water Company had fenced off all the old shafts and subsidences in the surrounding area of about 500 acres and the fencing was in excellent condition. According to Hetherington, no flats had been found in the workings, though extensive ones were found at Rookhope less than half a mile away. However, the early explorations at Hunstanworth had been hampered by the hardness of the rocks which made it difficult to explore those beds which were favourable for flats.

White Vein, a quarter-point vein on a bearing of about N 50° W, was from 30 and 40 feet wide at Whiteheaps Old Mine. The Derwent Mining Company Books show stoping on Burntshieldhaugh Vein where it intersected the Ramshaw Veins, and in 1847 Robert Smith paid dues of £19 on ore obtained from Burntshieldhaugh Level. The reopening of the walled MacDonnell's Shaft at the western limit of these workings was recommended.

The report made recommendations for other veins in the royalty and also suggested investigating the Little Limestone Coal as a possible source of fuel. Although its thickness ranged from three to four feet, locals had always considered the coal inferior because of its high sulphur content, but in the Alston district this seam is anthracitic.

With a market price of lead of between £29 and £30 per ton in 1917, rejuvenation of the mines became justifiable again. At the time of inspection,

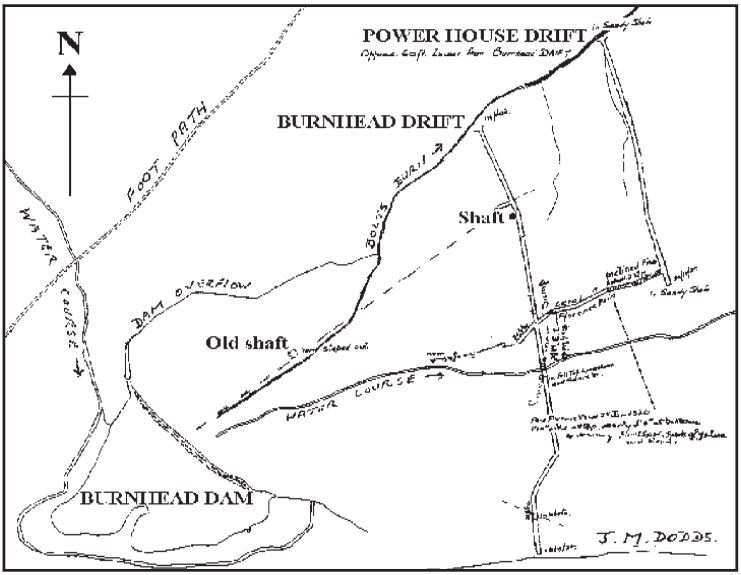

Fig 28. Plan of Burnhead and Powerhouse drifts, Whiteheaps.

however, the underground workings were inaccessible and much of the information is thought to have come from local residents and former miners.

In 1919 a 139-foot-deep lead trial shaft at Smith's Workings on Pennypie Vein was re-opened to 25 feet and a drift driven for 60 feet north-east. The vein was said to be 3½ feet wide in the Third Grit and to contain mainly barytes, of which about six tons was obtained.[1]

The Hunstanworth Mines Company began mining fluorspar in 1924, when it also made surface trials for fluorspar at Beldon Mine after reopening the shaft to the 43 Fathom Level.

PLATE 20. Mr Adamson, Whiteheaps (c.1950, courtesy Beamish Museum.)

PLATE 21. Prof. Potts (centre) at Whiteheaps with Mr Horrocks far left, and Mr Adamson (2nd left). (circa 1950, Courtesy Beamish Museum).

Grindstone Cleugh

On the western side of Grindstone Cleugh, near its junction with Nookton Burn, is some vitreous, light green to black, slag with globules of metallic lead. Some of it is scoriated and includes pieces of charcoal. T.C.S. Hull, of Huddersfield, analysed three samples of it with the following results:[9]

	Sample 1	Sample 2	Sample 3
SiO_2	25.64		
$Al_2O_3 + Fe_2O_3$	52.88		
CaO	Trace		
MgO	2.46		
PbS	4.21		
Pb	15.21	17.67	68.06

From 1925 to 1932, the Hunstanworth Company explored ground to the north east of Bolt's Burn Head via the Power House Drift, a level driven 730 feet south-east to Florence Vein. Burnhead Level was driven 60 feet higher and Florence Vein was explored over the 400 feet between the two adits.[1]

When the Hunstanworth Mines Company stopped work in 1932, its equipment was bought and dismantled by George Cohen, Sons and Co. Ltd. The mines then lay idle until 1938 when they were taken over by Blanchland Fluor Mines Ltd, which worked them for about two years, mainly for fluorspar which they sold to Messrs Colvilles (Steels) Ltd, for steel making.

PLATE 22. Exsud miners at Greens Shaft. September 1973. (Courtesy H.M. Parker ©).

Blanchland Fluor Mines Ltd.
This company leased 240 acres from Edward Joicey Esq of Blenkinsop Hall, Haltwhistle, and all the accessible working places were examined between December 18th and 21st, 1948. The principal shareholder, with 50% of the shares, was R.E. Horrocks. Of the 14 men employed by R.E. Adamson, the manager, 10 mined and hand picked around 40 tons of ore per week. The drawing shaft was one of the twin shafts at Whiteheaps Mine. The small colliery hoist was driven using a chain from the back axle of a 12 h.p. Austin car. Two 65 h.p. diesel lorry engines drove the compressors, which drove the pumps and two Holman S-9 jackhammer drills. Work mainly concentrated on robbing fluorspar, left by the lead miners, from the wide, quarter-point veins called White Vein, Red Vein and the Red Vein String. The company, which worked the same area as the Hunstanworth Mines Company from 1924, raised a total of about 22,500 tons of fluorspar.

According to a Blanchland Fluor Mines report from 1948, the companies that have worked the mines are:

London Lead Company	1725 – 1806
Easterby, Hall and Company	1807 – 1810
Derwent Mining Company	1810 – 1883#
Idle 1883 – 1916	
Hunstanworth Mines Ltd	1916 – 1932*
Idle 1932 – 1938	
Blanchland Fluor Mines Ltd	1938 – 1940
Idle 1940 – 1945	
Blanchland Fluor Mines Ltd	1945 – present

\# Plant and equipment auctioned by R.S. Benson.
* Equipment was bought and dismantled by George Cohen, Sons and Co Ltd.

Two annual dead rents were payable. These were £35 for minerals and £12 for land, while the royalties and duties to be paid were as follows:

Price of fluorspar per ton	**Royalties per ton**
When less than 18s 0d	4½d
When between 22s 0d and 23s 0d	9½d
When greater than 25s 0d	1/-

Price of lead per ton	**Duty %**
when lead ore is less than £15 per ton	5
Between £15 and £20	6
Between £20 and £25	7
Greater than £25	7½

PLATE 23. Tram road, Whiteheaps. (Courtesy H.M. Parker ©, 1973).

The company had no right to work the dumps as this had been assigned to a Mr Hinchcliff. In describing the workings at this time, Mr Richardson stated that, since 1924, the fluorspar had been mined for a limited distance either side of the drawing shaft in an area above the 30 Fathom Level.

The Hunstanworth Mines Company got 15,000 tons of fluorspar from 1924 to 1932, and Blanchland Fluor Mines Ltd got 5038 tons from 1938 to 1940, mainly from a 12-foot-wide pillar of solid fluorspar. From November 1945 to May 1946, levels and stopes were cleaned out, shafts repaired and the surface plant set up. During 1946 and 1947 a total of 264½ tons of fluorspar was raised. The report concluded that 100,000 tons of spar were available, and, if mined at 100 tons per week, it would last for about 20 years.

Between 1952 and 1955, Blanchland Fluor Mines Ltd sent fluorspar by rail from Rowley Station (NZ087479) to the melting shop at the Consett Iron Company. The typical chemical analyses of these deliveries was:

CaF_2	80.01%
SiO_2	13.36%
Loss on ignition	1.56%
H_2O	2.61%
Pb	0.59%

PLATE 24. Tipping trams, Whiteheaps Drift. (Courtesy H.M. Parker ©, 1973).

In 1957 J.E. Maddison of Stanhope sought permission to work the dead heaps at Sikehead, at a rate of 2s 6d per ton and £1 per annum ground rent. During 1958 Acmin reopened Whiteheaps Shaft to the 60 Fathom Level. The work

continued down to the Great Limestone, but the veins proved disappointing. In April 1973, Green Shaft at Blanchland, formerly worked by Fosters of Blanchland around 1968, was reopened for exploration by EXSUD.

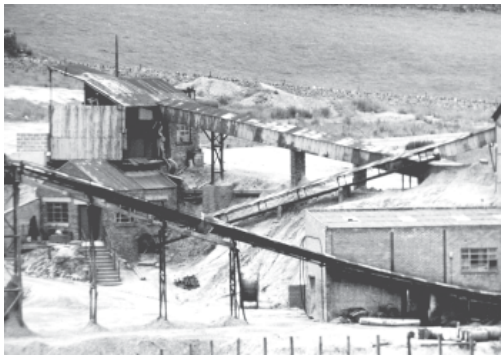

PLATE 25. Part of dressing plant, Whiteheaps Mine, pre-BSC (1981).

British Steel Corporation

In 1976 the British Steel Corporation took over the lease of Whiteheaps and Sikehead Mines and drove a new surface incline on the east side of Bolts Burn. This reached the 30 Fathom Level at Whiteheaps Mine and gave access to a small ore zone on Company's Vein in the Grit Sills. Sikehead was explored at the same horizon, but the great extent of the lead stopes in this area restricted fluorspar production. The incline was extended to the 50 Fathom Level where some fluorspar was obtained, then on to the 80 Fathom Level and again to the 95 Fathom Level, where the spar obtained was sent to Germany for propellant manufacture. On August 17th 1979 BSC announced the closure of Whiteheaps Mine on a care and maintenance basis, effective from October 1st 1979. This order was retracted on October 15th of that year, and the manpower was reduced from 79 to 58 men instead.

Weardale Mining & Processing

During 1986 Weardale Mining and Processing announced the closure of Whiteheaps Mine. The company donated a wooden wheel barrow, found in the workings in excellent condition, and a modern wooden mine tub, from the processing plant, to the Killhope Mining Museum.[75]

Finale

In July 1989 Whiteheaps Mine site was finally cleared. The headgear at West Whiteheaps Mine was cut up for scrap and most features on the site were levelled, including the sites of the twin shafts, Skottowe's Adit, and the sites of the Whiteheaps High and Low Levels. The winding engine house and its engine were transferred to Frazer's Hush incline in Rookhope Valley. Durham County Council repointed Jeffrey's smelt mill chimney in 1991, and fitted lightning conductors. Work was also done at Sikehead, including repointing the engine house chimney and repairing watercourses. Early in 1993, a major collapse of ground occurred at Whiteheaps Mine site, on the line of the new incline at its intersection with Fernygill Vein, removing forever any possibility of accessing the deeper underground workings. A second major run of ground occurred on Fernygill Vein, on the opposite bank of the stream, in 1995. The collapse of ground was backfilled in 1999 and the site relevelled.

Beldon Shield Mine

Beldon Shield Mine (NY928495), and Reeding Mine (NY943506) lie north of the River Derwent in the tributary valleys of the same names and are on a

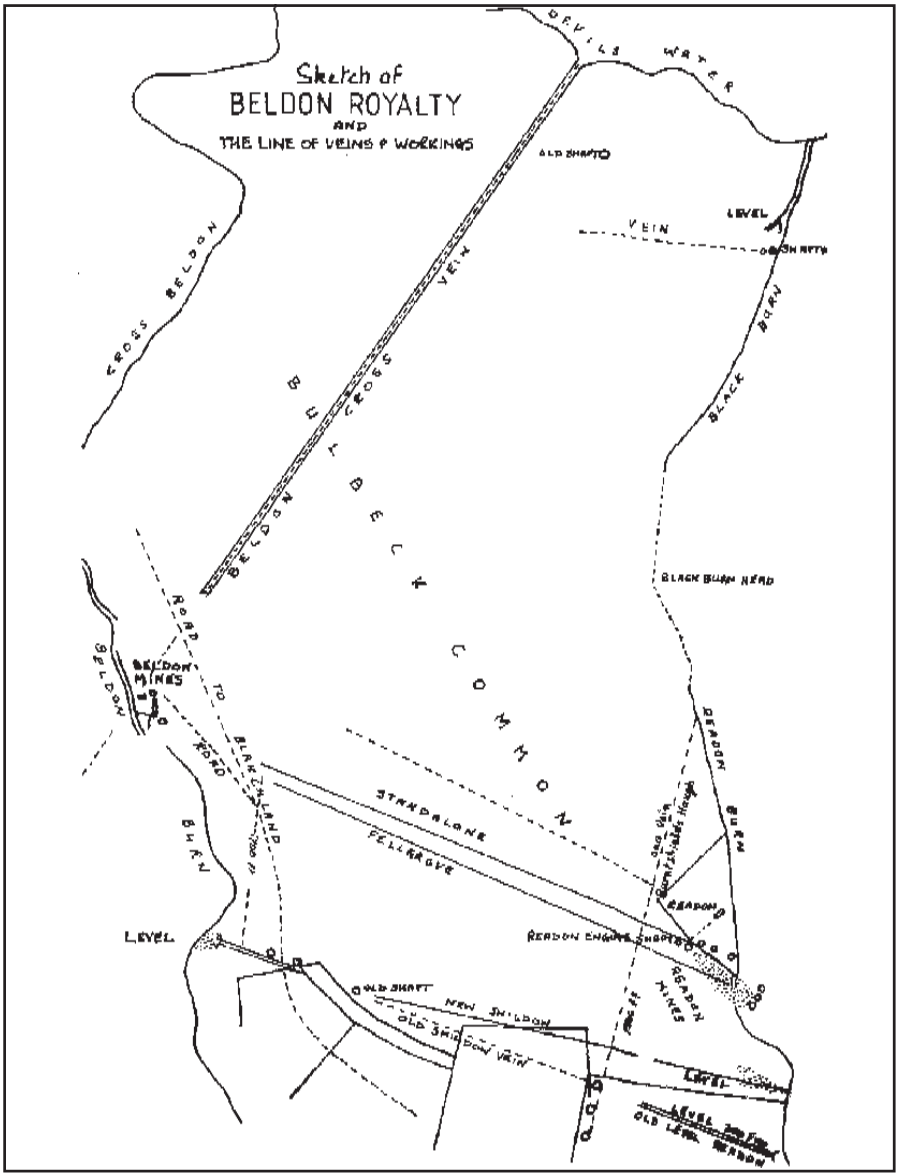

Fig 29. Sketch plan of Beldon Royalty.

belt of NE-SW veins extending westwards from Shildon Mine, about a mile north of Blanchland, and from there westwards through Reeding Burn to Beldon Burn. The vein belt converges in the westerly direction of Beldon Shield Mine where Standalone and Fellgrove Veins become the prominent members. The veins worked at Reeding Mine all lie on the course of the Shildon and Old Shildon Vein members of this NE-SW belt.

In 1625 Thomas Farror of Beldon, Curate of Hunstanworth, revised Thomas Surtees and Alexander Davison's lease of the tenure of Townfield for 30 years for farming, to include the rights of mining.[32]

Fig 30. Surface plan of Shildon Level (c1875).

By October 1745 Thomas Forster, engineer, had written to Thomas Skottowe about the area's mines. He wrote that "*... the Beldon Burn area Rough Bank Vein formerly tried by Mr Mowbray and partners was reported to have yielded very little ore*". Beldon Shield Vein was "*a strong vein – worked formerly with the other adjoining veins*". The Round Island Vein, a north-western extension of Whiteheaps Vein, "*had been tried only in places*". Called Johnson's Hole Vein in Ord's liberty, it had "*previously been wrought and got*". Linnbank Vein had been "*wrought at a good yield by Mr Stoddart* [London Lead Co.] *and was supposedly the same as Roughbank Vein*".

PLATE 26. Shildon Level from south (1980).

On September 29th 1747, Skottowe leased Linnbank, Nookton and Beldon Shield North and South Veins in the Nookton–Beldon Burn area (Lord Crewe West Boundary, i.e. Nookton) to the London Lead Company, at a duty rate of 1/7th. Silvertop, on his post-1754 acquisition of the Baker property, continued to lease mines on Beldon Moor (later Newbiggin property) to the London Lead Company's agents. This arrangement continued until 1801 when Easterby, Hall & Company took over the London Lead Company's lease of Beldon Shield (followed by Shildon and the eastern portion of the Ramshaw Mines two years later).

Beldon Engine

Hall felt "*compelled to install powerful steam engines to do the pumping and haulage work, in order to keep the mines operable*" because of the state of the waterwheel system at the Hunstanworth mines.[36] The refurbishment at Beldon Mine included an engine, to drain the workings 50 fathoms down to the top of the Great Limestone, and a new level from the engine shaft towards a point where the veins intersected. Around 1850 John Robinson, chief agent at the Derwent Mines, stated that the first steam engine in the district was laid down at Beldon Shield.[26] It was made in Birmingham in 1805 by Messrs Boulton and Watt and was a 40-inch cylinder parallel motion engine with a 25 foot beam. It had "*a 6 – 8 foot stroke and cost £1,400 at purchase*".

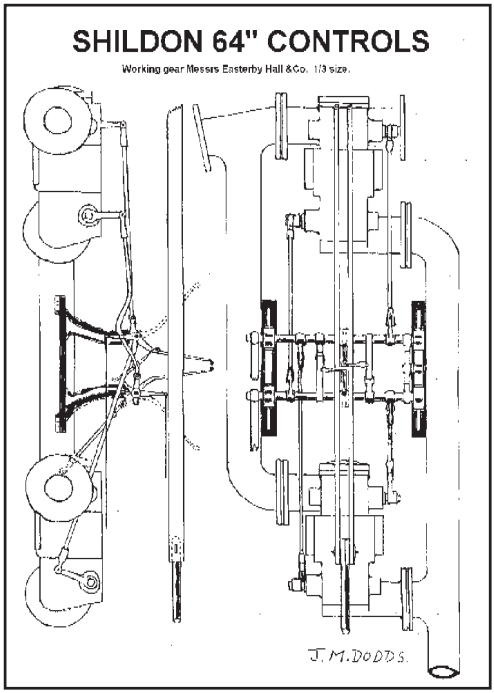

Fig 31. Arrangement of 64 inch engine controls, Shildon.

Mackenzie noted that, in 1811, Shildon and Beldon Mines were both in Northumberland, and that, whilst the others were in Durham, they were all "*so closely connected that it will be necessary to describe them all*".[52] The workings at Beldon were then suspended "*although great expectations are anticipated, hopefully proving to be rich and most productive in the district*".

Beldon Burn is the boundary of Skottowe's and Silvertop's property at Beldon Shield Mine. The mine is near the burn on Silvertop land, and so Easterby, Hall & Company had to get both owners's permission in order to work it

fully. This is common in the Derwent Valley, where many veins were in valley bottoms which were also boundaries. There is evidence that Capper and Skottowe changed boundaries to ease the complications of lead mining royalties.

PLATE 27. Shildon engine house, view looking west from Shildon Lane, (1980).

In 1810 the Beldon workings were said to be "*alongside a quantity of unexplored country which contained many valuable veins of lead ore*". Around 1833, however, Hodgson stated that the Derwent Mining Company had a steam engine at Beldon, "*near to the brook, so as to enable them to work the Great Limestone, but no ore was found*". John Dolphin, writing in 1853, records that Hall achieved many things on his arrival, including the leasing of Mr Silvertop's Beldon Mine in 1805 and the leasing of Ramshaw Rake in the same year.[57] Dolphin also noted that "*Upon erection of the Boulton and Watt engine at Beldon the pumping and drawing shafts were sunk an extra 50 fathoms down to 4 fathoms beneath the Great Limestone*". This "*opened up several veins and some quick strings*".

Ramshaw and Beldon Mines were leased until 1826 and both leases were "*renewable before the date of their termination*". In 1827 Beldon (owned by George Silvertop) "*consisted of two good veins called Beldon Shield and Fellgrove, with a variety of minor intersecting veins in Beldon Burn*".[29]

PLATE 28. Shildon dressing floor, viewed from the west (1980).

In July 1827 the rents due to Robert Capper for watercourses used by Hall and Puller (both then living in Fleet Street) show £1 for Middle Grindstone Cleugh watercourse, £3 16s

PLATE 29. General view of Beldon Shield Mine (1980).

0d for New Beldon Burn watercourse, which ran about three miles from Smithy Cleugh through Bolts Burn wood, and £1 4s 0d for a watercourse from Grindstone Cleugh to Bolts Law in 1826.[36] George Silvertop, owner of land in Beldon royalty, died in 1841.[42] Beldon Mine is said to have produced 1,348 tons of concentrates, yielding 18 oz silver per ton of metal between 1863 and 1864.

Beldon and North Derwent Mining Company Ltd

This company, which was registered in 1860, produced 72 tons of lead ore in 1863. This yielded 49 tons of lead (68%) and 900 ozs of silver (18.4oz/ton). In 1864, 70 tons of ore made 47 tons of lead (67.1%) and 850 ozs of silver (18.1oz/ton). Its first agent, H. Simpson (1862 to 1867), was followed by Joseph Barron of Blanchland (1868 to 1872). He had also been an agent between 1860 and 1863, when he was involved in the sinking of shafts and the installation of a waterwheel at Beldon.

New Beldon Lead Mining Company Ltd

Formed in 1868, this company's capital was £10,000 in £1 shares, five of which were held by Joseph Hewitson of Nookton. One director was George Demaine, a farmer from Bolton Abbey in Yorkshire, where he had shares in the nearby Burhill Mine from 1863 to 1874.[76] Another director was Pearson Longbottom and the company secretary

PLATE 30. Watercourse, Beldon Shield Mine (1980).

was John Hicks. The manager from 1872 to 1873 was Joseph Barron. In 1872 a total of 6.4 tons of galena was produced, yielding 4.8 tons of lead metal (75%) and 1.4oz of silver.[77]

In 1924, the Hunstanworth Mines Company reopened the Beldon shaft to the 43 fathom level, and made surface trials for fluorspar. Some lead trial shafts, at Smith's Workings (NY950522), were examined for barytes in 1929.

PLATE 31. Aerial view of Reeding Mine (T. Morris, 1979).

Reeding Mine

Reeding Mine's workings seem to date from around 1715 and in 1719 permission was sought from Mr Baker and Lady Clavering to extend a water leat from a point between Norham Burn and Beldon Cleugh "*and convey it to Reeding where no ore had been worked for seven months for lack of water*". It seems that this lack of water made the mine susceptible to flooding.

Early in 1747 Reeding Mine, on the same belt of veins as Beldon Shield Mine, was being developed by the London Lead Company under the supervision of their agent, Robert Allgood. On November 23rd 1748, Lancelot Allgood, William Errington and William Sophill leased mines in Newbiggin and Bulbeck (Reeding Mines) from George Baker Esq.

In January 1749 Allgood visited the workings with Mr Errington, Mr Sopill and Mr Baker, the landowner, to make the pay. The wage bill (according to a letter from Mr Allgood) was £238 18s 8½d. The letter also said that Errington and Sopill both wanted to stop work at Reeding and concentrate on driving a further three fathoms in a level at Beldon, at three guineas per fathom. The agent had already agreed a future plan for staying at Reeding, and would not change his mind, but Baker sided with Errington and Sopill.

A plan of Reeding Mine around 1750 accompanied the letter and showed that four veins had been tried. South Vein had been worked by the '*Old Man*' and was considered worthless. Allgood commented that more work should have been completed at Reeding before the new task was begun at Beldon. He also thought the North Vein Level should be continued, rather than bringing in extra men from Beldon to work towards the South Vein.

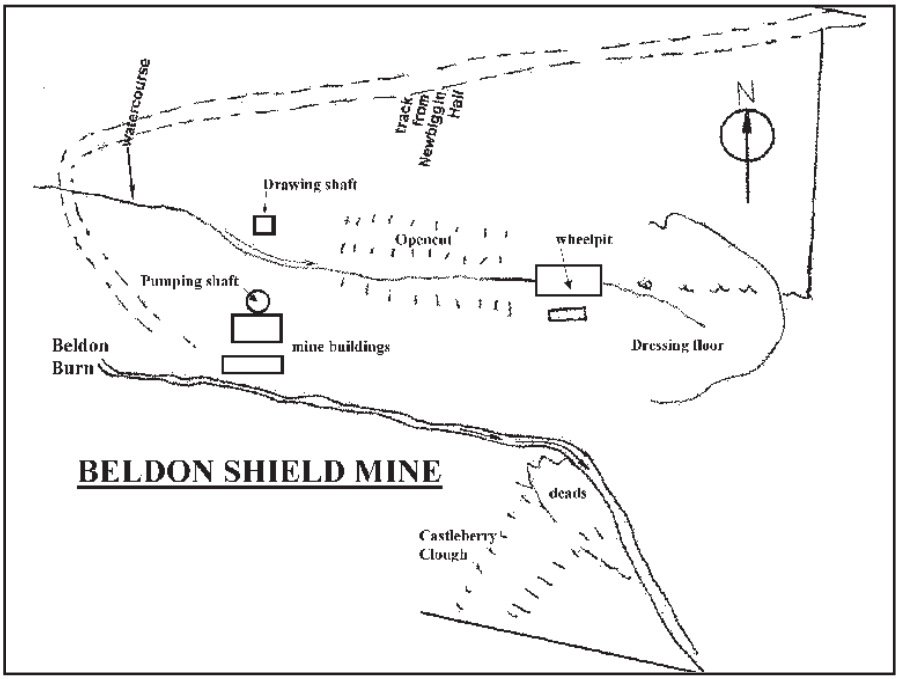

Fig 32. Sketch map Beldon Shield Mine.

Reeding Mine's pay bill from April 28th 1750 to November 28th 1751 was £353 5s 3d. From November 28th 1751 to August 13th 1752 it was £135 13s 1½d. Parker and partners, with other miners, made up the workforce and about 130 fathoms of ground was cut. Purchases included coat wood, iron bars, nail rods and 14lb hog's lard at 4d per pound. The coal was from Greymare Hill, the collieries of origin being Kirk's Pit, Hare's Pit and Lighton's Pit and haulage costs for 25 loads were to 18s 9d.

On May 24th 1788 a William Curry, tenant of Birk Side, a farm on the opposite bank of Reeding Burn from Reeding mine, asked for a lease of Birk Side mine at a duty of 1/7th as rent.

Newbigginhope

This property was in the Manor of Bulbeck and belonged to George Baker. A trial, lasting for 52 days, was made here during 1751 and on August 16th

PLATE 32. Square drawing shaft, Beldon (1980).

1753 the lease of Newbiggin or Newbigginhope Mine was read over.

Burntshieldhaugh

Hackford or Burntshieldhaugh Mine (NY925540) is at the northern end of the main group, on Devil's Water. Burntshieldhaugh Vein is thought to have been worked by the early Beaumont Company, via a level and by one of the largest of the district's rare hushes.

The hush gutter on Burntshieldhaugh Vein at the site of a mine south of Hackford on Devil's Water, is about 500 yards long. The outline of a small dam to control the water flow is at its head. A smaller hush, named on the 1/10560 Ordnance Survey map of 1872 as "*Hackford's Hush*", is located on the northern slope of Redburn Common.

On February 14th 1788, William Routlege wrote to Arthur Mowbray, the steward, asking for a Take Note for Mr Trenton and Company to start their trial at Burntshieldhaugh, and saying "*I do not fear of getting 20/- a bing more this year than the last, of which will be £4 14s 6d. I think we have around £30 worth of duty ore at Burntshieldhaugh*". Another letter in May 1788 told Mowbray that hunting and fence breaking had been going on and that the neighbours would not tolerate this any longer. The ringleader was named as George Beck "*who brought all the*

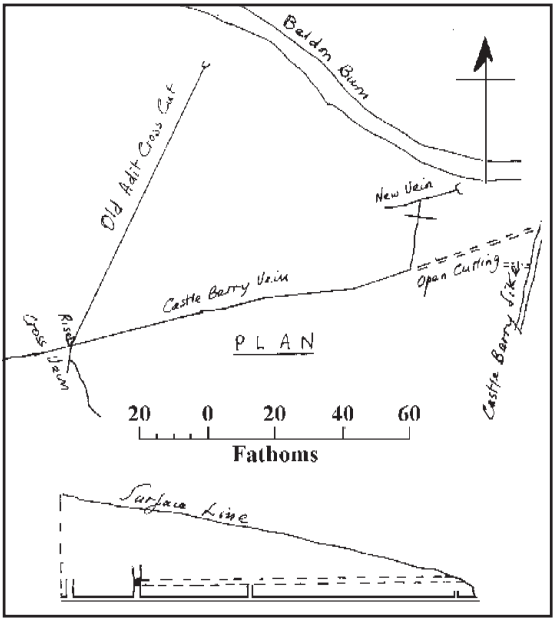

Fig 33. Plan of Castleberry Vein workings, Beldon Burn.

blackguards from Allenheads, and Rookhope Smelt Mills with him to hunt and he will not be stopped".[78]

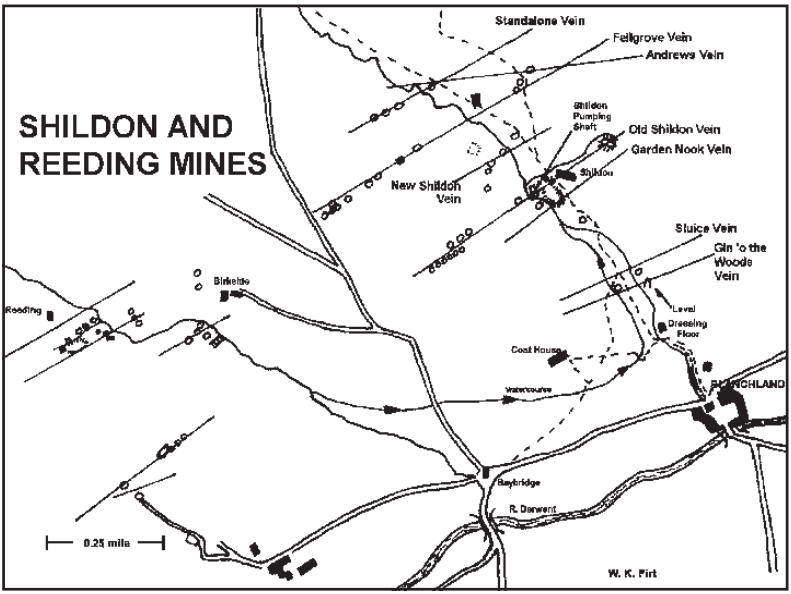

Fig 34. Shildon and Reeding Mine – position of veins.

PLATE 33. Round pumping shaft, Beldon (1980).

On Deceinber 27th 1788 Routledge told George Wood that the pays for Burntshieldhaugh would not be delivered to the miners until about January 20th, as the season had been harsh and the ore could not be washed because of the inclement weather. The duty was calculated to be around £47. It was also recorded that "*the widow's bill of £6 16s 6d had been settled*".

In 1801 Errington and Company, of Feldon Mill paid £4 3s 1ld duty on ore raised during 1800 at Burntshieldhaugh. (This may equally be Burntshieldhaugh Vein at Jeffrey's, which was worked at its intersection with the Jeffrey's Veins). On May Day 1819, duty ore from a mine at Burntshieldhaugh is recorded as 5½ bings at a rate of £4 per bing. In 1847 Robert Smith paid dues of £19 for ore

from Burntshieldhaugh Level. The Burntshieldhaugh Mining Company paid dues of £4 10s 0d for 1853, but no other reference to it working Burntshieldhaugh have been found.

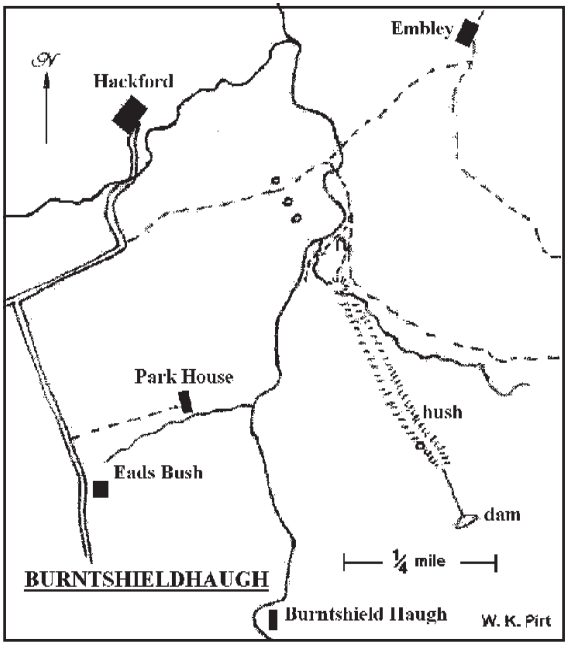

Fig. 35 Sketch map of Burntshieldhaugh.

EDMONDBYERS DISTRICT

The parish of Edmondbyers is bounded by the river Derwent to the north, Hunstanworth to the west and Muggleswick to the east and south. The landowner throughout has been the Dean and Chapter of Durham, with various tenants. There are three mines on Swandale Vein, the principal vein striking NW-SE, less than one mile west of the village. The workings were all in Upper Carboniferous strata and the vein width varied from a few inches to five feet. The principal gangue mineral was barytes, with calcite, iron and a little zinc blende. The mines were each worked by independent companies.

The southernmost mine on the vein is Harehope Gill Mine (NZ009485). Burnhope Mine lies around 1000 feet to the north-west (NZ005489) and Swandale Mine (NZ004492) a further 1500 feet away. All were tried during the 19th century. In the Burnhope Burn catchment, some smaller trials include Pedam's Oak (NY992483), Sandyford (NY968472) and Eudon Grove (NY982459). The ancient Feldon Smelt Mill (NZ002488) is at the confluence of Feldon and Burnhope Burns.

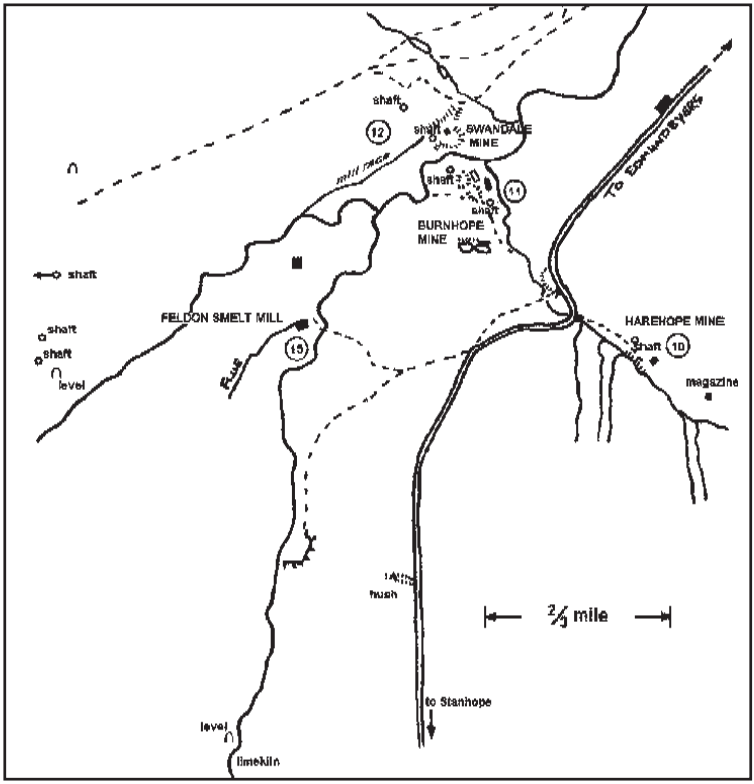

Fig 36. Map showing location of Edmondbyers group of mines.

The first mention of mining at Edmondbyers is made between 1612 and 1613, when the Dean & Chapter leased mines in Muggleswick and at Edmondbyers to Thomas Surtees at a way-leave rent of £12 per annum. No further reference to mining appears until October 15th 1801, when a subpoena was served to Thomas Dodd of the London Lead Company as a result of a bill filed in Chancery. This relates to the mines purchased by the company from Messrs Errington and Company and which were possibly Eudon Grove and Sandyford workings, both on the minor Burdenhope Vein.

On February 21st 1827, Thomas Fenwick wrote to the Dean and Chapter, saying that when the snow cleared, plans would be made for the opening of a mine at Edmondbyers Fell. The mine, whose location has not been found, had been agreed upon in principle with a Mr Thompson, but needed certain matters sorting out as the speculation was thought to be rather hazardous.

Harehope Gill Mine

The early history of this mine has apparently been confused with that of Harehope Gill Mine at Bollihope Burn in Weardale. For example, the mineral statistics suggest that it was opened around 1850 and worked until around 1870, but this does not agree with the 1861 geological map of the district.[79] In fact, the first permission to explore for minerals appears to have been given in 1884 and was followed by permission to open a mine.

Hexham and Edmondbyers Lead Mining Company

In a letter dated 28th May 1884 from the Ecclesiastical Comissioners for England to the Hexham and Edmondbyers Lead Mining Company Ltd (Rector of Edmondbyers and others) permission is given to make trials for a vein at Harehope Gill. At least two men were to be employed daily. Power was granted to use any means of discovery and working (other than hushing), in accordance with mining custom. The yearly rent was £10 and the duty was 1/12th. The trial lease had to be converted to a regular lease, or extended if the trial was unsuccessful. A. Featherstonehaugh and L. Leyburne signed the agreement. *"On 15th February 1886 the Ecclesiastical Commissioners for England grant unto you leave* [Burnhope Lead Mining Co. Ltd] *to make trials for a vein at Harehope Gill. The said boundary was to be within the boundary of Ecclesiastical Commissioners land, at or near to Harehope Gill*". This account does not give location.

The Harehope Gill Mining Company, of Newcastle, placed two orders with Messrs Hawthorn, Davey & Co. for delivery on November 11th 1882. The first (No.3522) was for a horizontal, condensing pumping engine with a 20-inch-diameter, high-pressure cylinder, and a 36-inch-diameter, low-pressure cylinder, both with a six-foot-stroke. The engine was fitted with Davey's patent differential valve gear. The second order (No.3523) was for an injection condenser and two quadrants. The engine and condenser cost £690, with the quadrants and connecting rods costing another £265. It is likely

that this engine went to Harehope Mine at Edmondbyers, and not to the one in Weardale, because it had no low adit and would have needed a pumping engine to drain it. The shaft was 348 feet deep, and the workings were mainly in the Pattinson Sill and a higher sandstone.

The mine seems to have been idle until March 4th 1926, when the Ecclesiastical Commissioners granted the lease of both Harehope and Burnhope Mines to T. Twynam of Teeswold, Redcar, and J.D. Beaston, a metallurgist and mining engineer of Crawleyside. Permission was given to obtain lead ore, iron ore, fluorspar and ganister for a period of seven years, at a rent of £25 for the first two years, and £50 thereafter and at a rate of 1/18th duty. The exceptions were ganister (silica rock) at 8d/ton, and fluorspar at 1s 6d/ton. The lessees were not allowed to sub-let without permission and, on surrender, they had to pay £30/acre for any land used. In 1929 this lease was extended to Swandale Mine and extended to 14 years based on an agreement made March 1st 1924. The rent (for Swandale?) was to be £5 for the first four years, followed by £10 for each subsequent year. The duty rate was 1/15th for lead ore, 1s 9d/ton for barytes, 2s 6d/ton for witherite, and 8d/ton for ganister. Ground rents varied, for example, being 10s 0d, £1 10s 0d and £2 10s 0d/acre/year respectively for certain leases identified only as Areas A, B, and C.

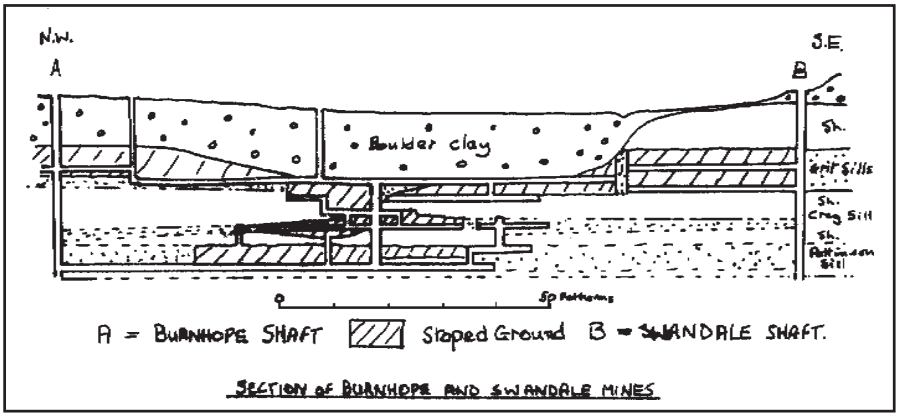

Fig 37. Longitudinal section of Burnhope and Swandale Mines.

Burnhope Mine

This mine was worked by the Burnhope Lead Mining Company Ltd from a 198 foot deep shaft, about 200 yards south of Burnhope Burn at NZ006487. The workings were deeper and more extensive than those of Swandale Mine as the vein was worked in all three sills. Burnhope began work a few years after Swandale, but survived it by only a few months as water entered the workings from the latter. The mineral statistics refer to Burnhope No.1 Mine and a No.2 mine at "Bentfieldside", but no more information has been found.[77]

On February 13th 1886 the Ecclesiastical Commissioners granted leave for the Burnhope Lead Mine Company Ltd to try for a vein of ore at Harehope Gill.[80] The conditions were that the trial remained within the boundaries of the landowners and had to work for ten months of the year for the first two years (weather permitting), after which a regular lease had to be applied for. Ore returns from 1880 to 1887 (1881 missing) amount to 1052.5 tons.[77] Lead metal returns from the ore, although incomplete, appear as 74%, whilst silver yields (quoted for 1887) are shown at 15ozs/ton.

Burnhope No.1 Mine:-

Date	Ore(tons)	Lead(tons)	Silver (oz)	Value(£)
1880	251.00	187.5		2761
1882	87	65.2		890
1883	136.5	102.3		1278
1884	63			490
1886	242	180		1573
1887	45	30	461	360

Mine Operators

1879 – 1886	Burnhope Lead Mining Co
1886	Standing
1879 – 1881	C. Hetherington
1882	C. Leybourne
1883 – 1886	S. Leybourne

Employment records

	Underground	Surface	Total
1880	4	10	14
1883			23

The mineral statistics also refer to a barytes trial further up the hillside. A "*heavy spar*" vein is marked on the 1869 OS map, but no other written reference has been found.

Swandale Mine

The shaft at Swandale Mine is about 180 feet north of Burnhope Burn, the south boundary of the property. It was sunk to a depth of 210 feet in 1875 and the workings, which ran south to the boundary, were confined to the Grit Sill. A level was reported to have broken into ancient workings, but this has not been verified. Notes on the mine, in the possession of relatives of the former manager, stated that the yield was £70 per fathom when the vein was first struck, but a lateral and vertical extension of the mine was not profitable.

Returns from 1876 to 1887 (1878 and 1881 are missing) were 288 tons and the lead content of the ore was 78% (lead content of galena is 82%). According to

Smith (1923), the amount of silver recovered from the ore ranged from 4.2 to 24.0 ozs/ton. In 1886, John Morpeth was manager of Swandale Mine. He is said to have lived at Shildon and may possibly have been related to the Derwent Mines manager, also called John Morpeth, who was killed in an accident at Jeffrey's Rake. At Swandale mine the strata comprised:-

		Feet
Boulder clay		12
Shale		50
Sandstone (Grit Sill)		50
Shale		15
Sandstone (Crag Sill)		24
Shale		18
Sandstone (Pattinson Sill)		29
Shale	to	12

Sandyford Mine

First leased by Thomas Errington in 1787, a new lease was made in 1842 by Errington, Muschamp & Company. This company also leased Deanhowl Mine, Eudon Grove and Feldon Mill (see Eudon Mine data, below) at one time. The lease area of Sandyford Mine was "*1 rod 22 perches*". On April 25th 1868 the lease was taken on by the Derwent Mines Company and it was described as being "*near to Jeffreys Rake in Edmondbyers*". The period was for 21 years at £1 rent. During this period the Derwent Mines Company sank a shaft to a depth of 140 feet, possibly to explore any eastwards mineralisation of the Jeffrey's North, Middle and Sun veins. No further information has been found from this trial, suggesting that nothing worthwhile was discovered. The secretary for the Derwent Mines in 1868 was Mr Harvey.

On April 1st 1925 Messrs Twynam (see p.128) was granted a lease to mine ganister, fluorspar, limestone and lead ore at Sandyford, although the Weardale Lead Company had also held these rights since 1918. The duty was set at 1/18th for lead ore, 7d/ton for ganister, 3d/ton for limestone and 1s 6d/ton for fluorspar. The surface rent was £1 10s 0d/acre. On surrender, £20 was payable for every acre of unrestored land. Dunham reports the reopening of this shaft in 1926 by G. Beeston.[1] The location of the ganister workings at Sandyford remain in view from the nearby road.

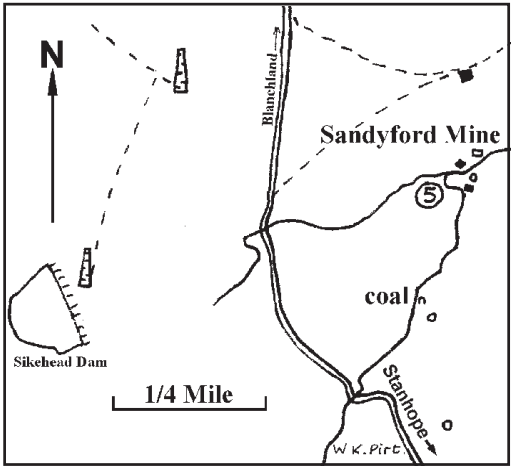

Fig 38. Sketch map, Sandyford Mine.

In the late 1970s, during British Steel Corporation's occupation of Whiteheaps Mine, a long exploratory

heading, driven towards the Sandyford workings from the Sikehead Shafts, was abandoned as a result of the increasingly disappointing nature of the ground.

Eudon Grove Mine

The lease for Eudon Grove (NY982459) passed to Thomas Errington on September 28th 1787. It also included Healeyfield (Dean Howl), Sandyford Mine and Feldon Smelter. One condition was that "*the works must not be idle for more than six months in the year; or for fourteen months in two years*". Eudon Grove may also be referred to in a subpoena served to Thomas Dodd of the London Lead Company on October 15th 1801. At a later date, Eudon Grove Mine was owned by Muschamp & Company, who in 1842 also held Sandyford Mine, Dean Howl Mine and Feldon Smelter. The area encompassing Eudon Grove Mine lease was four perches (see Sandyford Mine, Feldon Mill). Eudon Grove is a wild and foreboding site in a steep gully. The remains of a building, a shaft and a level are to be found there.

Lease areas held by Muschamp & Co., 1842

	Acres	Rods	Perches
1842 Muschamp & Co. Denehowl Lead Mine			
washings, shops dam, office and tramways	6	1	3
Level mouth, shop, washings and tramway	1	2	0
Total	7	3	3
Eudon Lead Mine and shaft			3
Old Shop			1
Feldon Smelt Mill (in ruins) Reserved rent 1842 of £12		1	8
Sandyford Lead Mine, washings, troughs etc.		1	22

Plate 34. *Slime pits at Burnhope Mine, Edmondbyers.*

MUGGLESWICK

Early History to 1700

Muggleswick was first granted to the 5th, 6th and 8th Prebendaries in the 12th century. In March 1545 the Dean and Chapter of Durham (hereafter D&C) leased mines in Muggleswick Park to Charles, Duke of Suffolk for 20 years at 1/9th duty or payment in lieu at 5s 6d per load. In return the D&C agreed to supply the mine with timber. From 1612 to 1613 the D&C leased the Muggleswick and Edmondbyers mines to Thomas Surtees and included a wayleave rent of £10. On December 9th 1623, the D&C leased mines in Muggleswick to Toby Cradocke for 21 years, at a rent of £1 and 1/5th duty.

In 1624 King James I granted George, Duke of Buckingham, "*all the Mines Royal of silver or of lead mixed with silver within 10 miles of Muggleswick, to be opened and worked at his own charge, with provision for giving one-tenth of the refined silver to the King and bringing the residue of silver to the mint*" for 21 years. Buckingham was subsequently murdered by Lord Felton in 1628.[33]

On October 4th 1662 the D&C leased lead mines in Muggleswick Park to George Wray for a rent of £1, and 1/5th of the ore raised. In 1663 references were made to lead mines at Healeyfield, on D&C property, and Thomas Locke applied for permission to search for minerals at Muggleswick. In 1677 the old leases were ended and a new one was drawn up. By April 25th 1677 William Wilson and William Ramsay leased all the lead mines in Muggleswick, except for those in the 6th Prebendary (Healeyfield).

Mines Royal

A meeting of the Society of Mines Royal in 1687 was told that 54 ozs of silver had been recovered from the Muggleswick mines, which were reported to "*contain a great quantity of silver ore*". On July 20th 1695 a Mr Sanderson took on the lease of lead mines in the 6th Prebendary of Muggleswick, but by June 7th 1711 an alteration to the lease included Carr & Oakes. By November 12th 1719 a W. Peart also appears on the lease.

London Lead Company

This company did not work in the Derwent Valley at the start of the 18th century, but possibly bought ores from the mines. It acquired the mines of the Blanchland district in 1729, but did not acquire the Muggleswick mines until 1741. The Ramshaw mines were acquired in 1740, Acton New Mill in 1765, and Newbiggin in 1793. Leases taken out from 1781 to 1786 included Jeffrey's Mine for £211, and Shildon for £2,333. The London Lead Company's late arrival possibly reflects the district's remoteness from its main centres of activity.

Joseph Liddell, John Dodd and Matthew Bowes leased all the lead mines in

Muggleswick manor on December 4th 1730 "*with room for a smelt mill and washing floors*" at £1 per annum and 1/4th duty for the dressed ore. Liddell renewed this lease on April 17th 1747 at the same rate. On November 2nd 1751 Mr Shirley, the London Lead Company's agent, renewed the lease of certain mines at a rent of £3 a year. On November 20th 1751, Shirley arranged a second lease for 21 years at £3 rent and 1/7th duty. This was countersigned by William Smith and William Ord. On February 9th 1760 it was extended to Mr Shirley of Healeyfield to include "*all the mines and a smelt mill in the Manor of Muggleswick, at that same rate*".

Receipts for lead rents due to the 6th Prebendary on Shirley's 1760 London Lead Company accounts show £17 1s 9½d on September 5th 1761, £1 17s 6d in 1762 and £4 in 1763. Shirley is not mentioned in the accounts after this date. A note in the accounts for 1773/4 describes Healeyfield as "*...a lead mine late of Mr Shirley*." Other yearly rents due at Michaelmas were:

		£	s	d	
1794	Dues of Healeyfield Lead Mine	71	15	8	
1797	Dues of Muggleswick Lead Mine	63	10	1	
1800	Dues of Healeyfield Lead Mine	131	1	5	etc, until:
1812	Messrs Little & Co dues for Healeyfield Lead Mill	64	7	10	
1816	Messrs Little & Co dues for Lead Ore at Healeyfield	no entry			
1817	Messrs Little & Co dues for lead ore at Healeyfield	75	1	10	

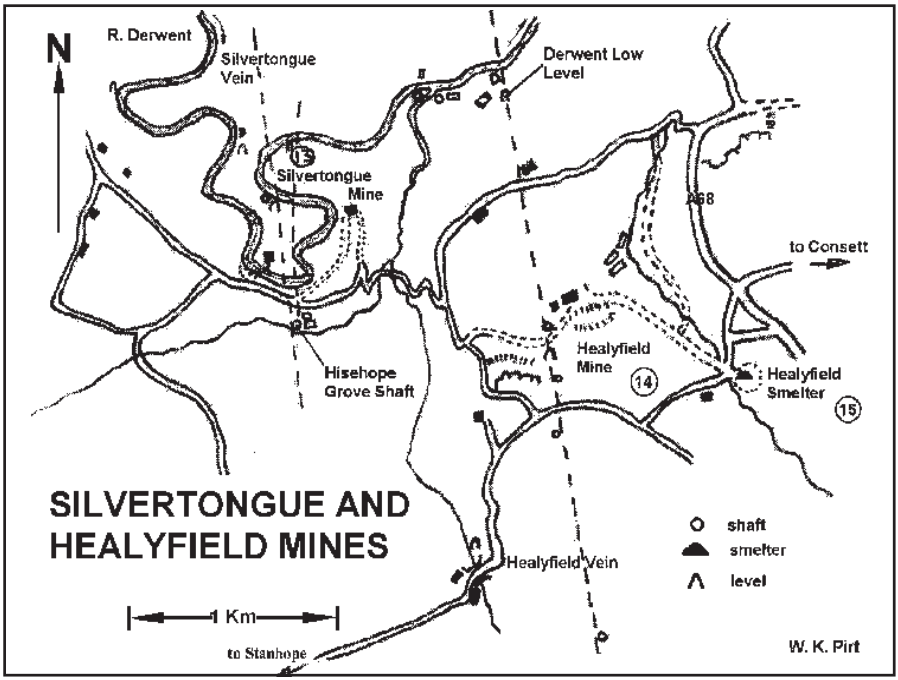

Fig 39. Map showing locations of the Muggleswick group of mines.

Errington, Muschamp & Company

The Healeyfield lease passed to Thomas Errington on September 28th 1787, with a condition that "*the works must not be idle for more than six months in the year; or for fourteen months in two years*". The lease included Dean Howl, Eudon Grove, Sandyford Mine and Feldon Smelter.

Elliott, Little & Company

On September 28th 1796, Thomas Elliott, John Elliott and Simon Elliott (senior) leased the lead mines in Muggleswick parish. Also involved were Thomas Moreland, Simon Elliott (junior), and Joseph Elliott of Eshgill Side, Cumberland, (lead miners); Joseph Little of Low Craig (miner), and Thomas Pearson. Permission was given to dig peats on Muggleswick Common for smelting the mine's ore and the lease was for 21years at £3 rent. For the first 12 years the duty was 1/7th, with the last 9 years at 1/6th. A written account had to be made to the D&C every three months, and the duty ore had to be paid within 20 days of this. If the mine should be claimed as a Royal Mine, the D&C still expected the duty ore. The D&C had to give 4 days' notice of intention to inspect the mines, but the mines had not to be idle for more than six months in any year or 14 months over two years. At surrender, the lessees would be allowed 6 months to remove equipment and 12 months to remove any banked ore. There was a duty of 1d per bing on any ore smelted at the mill from any mines not mentioned in the lease, and 6 months' notice of lease surrender was required.[80]

PLATE 35. Blacksmiths shop, Dean Howl Mine, Healeyfield (1980).

PLATE 36. Dean Howl Shaft, Healeyfield (c.1880's Courtesy, J. Raine).

Thomas Elliott of Dean Howl, John Elliott of Coalcleugh, Joshua Elliott of Castleside, Joseph Little of Coalcleugh, William Little of North Shields and John Maddison of Castle Hill, Newcastle, leased 1200 yards on Healeyfield Vein, with 50 yards on either side, on November 20th 1805. The lease was for 21 years at £3 per year rent and 1/6th duty. The workings were not to be idle for more than 3 months, or employ fewer than 4 pick-men.[80]

In 1808 Thomas Dodd reported from the London Lead Company Court to Mr Woodfield, the D&C agent, that the previous year's duty at Healeyfield Mine, being almost 100 bings, was unsold. He commented: "*With the lead price of £23 per fother as 22 common refined, I am afraid we shall have some difficulty in meeting a market for it*".

Accounts from the period from March 1806 to March 1808 were recorded as follows:-

		B	Cwts	Pieces	£	s	d
Duty at Healeyfield	Bouse ore	142	$3^{4}/_{7}$	80	569	15	8½
	Cutting ore	16	3	60	49	2	6
					618	18	2½
Mr Woodfield rec'd 23rd Sept 1808					400	00	00
			Balance Due		218	18	2½

Accounts from 23rd Sept 1809 show:

	B	Cwts	£	s	d
$^{1}/_{6}$th duty bouse ore at £5 14s 0d/bing	11	$3^{3}/_{6}$	64	16	9
$^{1}/_{6}$th duty cutting at £4 14s 0d/bing	13	$5^{5}/_{6}$	64	0	9
			128	17	6

Accounts from Sept 27th 1814 show:

	B	Cwts		£	s	d
Bouse ore at £3 10s 0d/bing	124	5		436	3	9
Cutting ore at £1 12s 6d/bing	30	0		59	7	6
			Total	495	11	3
Duty to Dean & Chapter				82	11	10½

On October 12th 1815, the accounts from Sept 27 1814 to March 25th 1815

	B	Cwts	£	s	d
Bouse ore at £2 15s 0d	170	0	486	1	3
Cutting ore at £1 12s 6d	30	0	49	19	4½
			536	0	7½
Duty to Dean & Chapter			89	6	9
Less Property Tax			17	3	10
			72	2	11

Featherstone & Company

Thomas Featherstone, Thomas Milner and Francis Ewart, all of Newcastle, with Jonathan Vickers and Thomas Pearson of Gateshead, leased the Healeyfield and Hisehope Veins on September 28th 1822 for 21 years. They were to sink to the bottom of the Hipple Sill and open up the vein to that depth. All shaft and buddle water had to be fenced off and compensation paid for any injured animals. On closure, they were allowed three months to remove their equipment. An annual rent of £3 and 1/7th duty was asked and no smelt mill could be built without permission.

By 1836, Healeyfield Mine was experiencing satisfactory returns, as the following account from October 12th 1835 to September 28th 1836 indicates.

Bings	*Rate per bing*	*£*	*s*	*d*
320	*£3 15s 0d*	*1200*	*00*	*00*
One-sixth duty to Dean and Chapter		*200*	*00*	*00*

On November 20th 1840 Thomas Featherstone, (then of Thetford in Norfolk), Isaak Earl Featherstone, doctor, and Charles Milner, ironmonger, of Newcastle were permitted to mine within 100 yards at either side of Healeyfield Vein at a rent of £20 per annum and 1/6th duty, on condition that, within one month of work starting, they also had to start on the Derwent (Low?) Level and begin ventilation shafts. Nine men had to be employed daily at the face and, if practical, a shaft had to be sunk to the same level at the other end, using a powerful pumping engine, so that both ends could be worked at once to sink to the bottom of the Hipple Sill. This lease was linked with one from 1822, when the dead rent was £3 per annum.

Lord Crewe Trustees' Comments

In 1852 the Lord Crewe Trustees recorded that, about 50 years earlier, William Little and Company had worked Healeyfield Mine at a profit. They are said to have exhausted the upper strata to the south, by a level at Dean Howl between the present farm and the shaft. They are then said to have begun the Low Level from the Derwent to drain the lower strata. This was abandoned when the company ceased operations for a time and the mine was idle for several years, following a slump in the national economy.

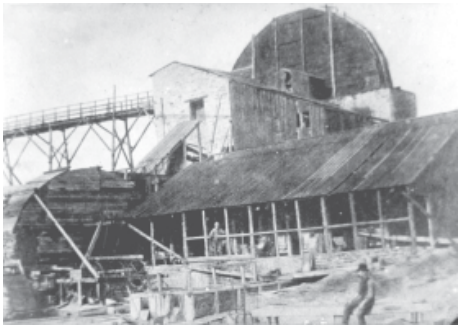

PLATE 37. Healeyfield Mine dressing floor (c.1880's, courtesy J. Raine).

Successive operators increased the mine's output by improving the crushing and washing machinery and other utensils, and by opening up new ground. The silver content was claimed to be 25ozs to the fodder of lead and this was expected to be higher with the application of improved refining using the Pattinson desilvering process.

REWORKING THE DEADS

Fordyce states that around 1850 the D&C's lead mining royalty in the Derwent Valley was about 8 miles from east to west and 5 miles from north to south.[15] It was borderd by the Weardale mining district to the south, and the Derwent Mines royalty to the north and west. Many of the lead-bearing veins of other districts passed into the royalty, but it had not then been adequately explored, as the ore-bearing strata were at a depth which needed expensive machinery.

On February 2nd 1853 a letter was sent from the Healeyfield Mines to Mr Muschamp of the D&C, complaining about duty rates when there was a lack of ore. Enclosed was a request to allow ore to be crushed next to the deads heaps at Dean Howl. This was agreed for Dean Howl only, and a scaled duty rate for this was set at 1/16th, payable on any lead sent in a refined state for smelting. The other scaled dues set for various levels of production from the mine are given below:-

If quantity produced was under	the duty rate was to be to be dropped to:
500 bings	one-ninth
500 - 700 bings	one-tenth
700 - 900 bings	one-eleventh
over 900 bings	one twelfth

Healeyfield Mining Company

On September 28th 1856 Thomas Featherstone renewed the lease of Healeyfield Mine at £20 rent and 1/7th duty, and took a second lease of Healeyfield and Hisehope Veins, "*extending in length from within 20yds south of the River Derwent to within 20yds of the southern boundary of the lands of the lessor*". The partnership could work up to 250 yards on each side of the vein, providing it did not intrude on the 20 yards (river) boundary. The lease was for 21 years at £50 rent, to be paid on March 25th and September 28th each year. At least 20 pickmen had to be employed for a minimum of 10 months each year. Duty ore dues were again at scaled rates, as follows:

Bings	***Rate***
0 - 200	*One-ninth of dressed ore*
200 - 600	*One-tenth of dressed ore*
600 - 1000	*One-twelfth of dressed ore*
1000+	*One-fourteenth of dressed ore.*

PLATE 38. Mine office, Dean Howl (1980).

William Watson, agent for the Healeyfield Mining Company, acted on behalf of Rev J.P. Dunn, a Roman Catholic priest, Samuel Leybourne, railway agent, Matthew Elliot, farmer, John Seymour, brewer, and John Calvert, grocer. On August 26th 1862 he proposed making a trial for 2 years at Wallish Walls and Mosswood, with the condition that an average of 2 pickmen were employed, per day per annum. The option to take on a 21 year lease at 1/16th duty was requested, if it were needed after the trial period.

On December 31st 1878 William Whitwell of Kendal, James Blenkiron of Richmond, Arkendale, agent, and Francis George Lane of Threadneedle Street, London, stock and share dealer, were permitted to work within 20 yards of the Derwent river boundary and at Whitehall (Moss) estate on The Sneep. Rent was £100 per annum and they were allowed 12 months at the end of the lease to remove any ore and to pay the first royalties. They also had to keep proper plans and employ at least 20 men at the face and 4 men in

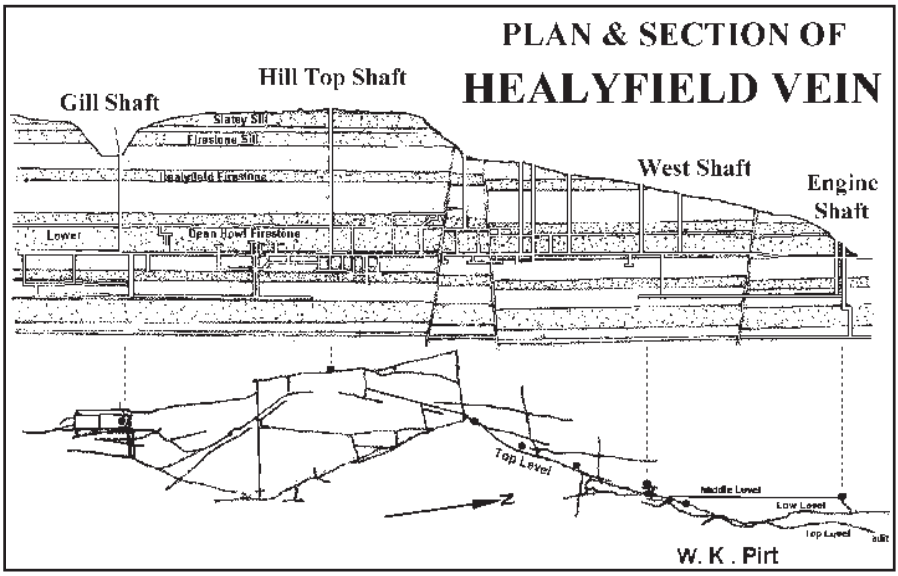

Fig 40. *Plan and section of Healeyfield Mine.*

the Derwent Low Adit. A further condition was that within 7 years they had to erect a pumping engine at Dean Howl that could pump water from the Lower Limestone Sills and discharge it at the Derwent Low Level.

Directors of the Healeyfield Mining Company Ltd from 1882 to 1889 were:[81]

Ald. Hindmarsh		Gateshead,
J.V. Walton		Witton le Wear,
Mr Reid	Goldsmith	Newcastle,
J.W. & W. Davison		Consett,
R. Davison		Castleside,
T.J. Muse		Castleside House,
C.W. Harrison (Secretary)		Newcastle.

Around May 23rd 1889, the directors attended a presentation ceremony for Captain John Trelease who had worked for them for 9 years, 7 of them as manager. His wife, Lavinia, had died three weeks previously and Trelease intended to move to Newfoundland and take on the management of the Le

Manche Mining Grant there. It is not known how successful this venture was, but a headstone in Castleside churchyard shows that he died on December 23rd 1894, at the age of 53, and was buried with his wife.

Smith's Comments

Smith gives a good account of the Healeyfield workings in *The Lead and Zinc Ores of Northumberland and Alston Moor* in 1923. He states that the Dean and Chapter of Durham owned the ground and "*according to Bailey*" the mines were active in 1810.[74] From 1853 to 1891, which was its most active period, the Healeyfield Lead Mining Company worked the mine and raised more than 10,000 tons of ore. The company also laid out extensive dressing floors and used steam for underground haulage at this time. The Derwent Low Adit eventually reached a length of 4,000 feet and had its own dressing floors and wheel pits near the level entrance.

Although Healeyfield Vein continues NNW-SSE across the Derwent, ore was only produced from a section extending to 1.5 miles south of the river. The throw on the vein is 21 fathoms to the east and the vein is crossed by a large number of strings. South of Dean Howl the vein has a number of branches,

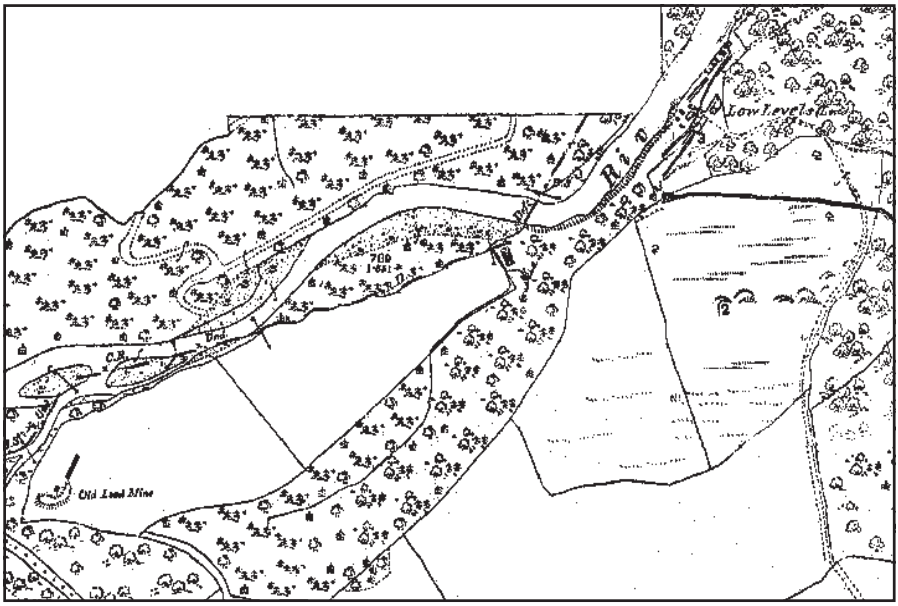

Fig 41. *Layout of Derwent Low Level (Reproduced from the 1861 Ordnance Survey Map).*

several of which seem to rejoin it. The chief workings were in the Millstone Grit, but some ore was obtained from the Great Limestone (*not according to plans*!). An old mine report says the ore was "*much brangled and intermixed with spar*", and this agrees with present surface findings.

The main engine shaft near Dean Howl is 60 fathoms deep and the three principal levels are the Top or Horse Level, the Derwent Level and the Bottom Level. There is also a long level above Top Level and a short intermediate level between the Top and Derwent Levels.

Top Level Adit, close to the engine shaft, was driven 4500 feet south to a forehead 300ft below surface. Derwent Level was started at the side of the vein at river level, meeting Healeyfield Vein 600 feet from the portal. This level is nearly one mile long with its forehead 192 feet below Top Level. It extends 1200 feet south of Dean Howl and still drains most of the workings. Some ore removed via the level was dressed on the nearby floors by the river. The Bottom Level was driven south from the foot of the engine shaft at a depth of 360 feet below the Top Level.[80]

The most extensive working was between Engine and Fell Shafts, 3240 feet to the south, from the surface to about 90 feet below Top Level. The vein was worked around the engine shaft, but to no great extent in any one place. Excavations from Top Level, both from rises and sumps, continued for 1200 feet south of Fell Shaft. Some work was done in Bottom Level, near its forehead which was 1800 feet south of the Dean Howl Engine Shaft. The section of the vein most vigorously worked was in the area where branching occurred. The workings in the lower level are 540 to 600 feet below surface.

PLATE 39. Derwent Low Level (1980).

Healeyfield Mine Cottages

On March 25th 1890 the Healeyfield Mining Co took out a 9½ year lease on land beyond the boundary of the previous lease. The rent for this land, on which they built some cottages, was £7 6s 3d a year, payable in equal amounts in March and September. A requirement was that all the buildings had to be insured against fire in the joint names of the Company and the Church Commissioners, by a reputable insurer.

A renewed lease signed December 1st 1878 was actuated on November 10th 1890, to William Whitwell and James Blenkiron, both of the Healeyfield Mining Company Ltd. W. White and W. Stephens were also directors. C.W. Harrison was company secretary.

Difficulties

A mortgage for £1,500 was taken out on November 11th 1890 against the lease of the Healeyfield Mining Company (registered office 25 Westgate Road, Newcastle Upon Tyne), with the Ecclesiastical Commissioners of England, to be paid back, in monthly instalments of £250, by September 28th 1891. The company put up the mine assets as security and the inventory gives a good picture of the equipment at the mine. It included two Cornish boilers for the pumping engine, a 25-foot quadrant with a 27-foot connecting rod, another Cornish boiler, a double cylinder winding engine with 2 x 12-inch cylinders and a 2-foot stroke. There was a 6-foot winding drum, a 2-foot crab drum and 3 double power winches, of which two are described: one for working the bank incline and one for working the bucket charging. There was also pit head gear with a 5-foot pulley, a 4-foot crab pulley and a 2-foot bottom winch pulley. A Cornish 44-inch pumping engine of 9-foot stroke had a wrought beam, air pump and feed pumps, 20 fms of 12-inch pitch pine spears, and 80 fms of 6-inch redwood spears. There were 2 pumps for each 40 fms of shaft depth, of 14-inch and 12-inch diameter, plus a fan and a fan engine (Guibals), cast iron air boxes 12" x 12" (40 fms), wood boxes 12" x 10" (300 fms), and 9 spare pumps. The 40-foot waterwheel had a 4 ft 6 ins breast, while the 18-foot-diameter waterwheel had a 3-foot breast. There were 4 jiggers and a classifier with chat mill combined, while the 7-foot diameter waterwheel had a 2 ft 6 ins breast. A circular buddle was combined with a knife buddle.

PLATE 40. Wheel pit, looking back towards Low Level (2000).

The main breaker (crusher) was geared off the waterwheel shaft and, after the stone was crushed, it passed through rollers, then was elevated, before passing through a second pair of rollers and then on to a series of classifiers and jiggers. The chats from the first three jiggers were returned to the chat mill and then elevated and sent back through the classifier again. Also listed is a Jenner buddle, a 12-foot diameter waterwheel with a 15-ins breast, and second Jenner buddle. Another buddle was being erected below the classifier.

Two ponies were stabled underground and one at bank. Other items included

2100 yards of flat bottomed rail, laid at bank from the shaft to the washing floors, along with bingsteads, shops etc, and a further 3500 yards of rail, in the "south end" and in Smithy Level and in Derwent White's Level.[80]

Silver Tongue Mine

Silver Tongue Mine is on an incised meander of the Derwent at a place known locally as "The Sneep", or Snape, and can be reached from the Healeyfield to Edmondbyers road at NZ054487, where a footbridge crosses the river to Lead Mill cottage, formerly a farm. Silver Tongue Mine is 800 yards down the gorge from the footbridge, on the Northumberland bank of the river.

PLATE 41. Wheel pit in wood, Hisehope Burn (2000).

Glass Manufacture

The glass industry of the early 19th century offered a steady income to anyone who could supply the lead oxide needed in its manufacturing process. With this in mind, Sir Charles Monck of Bedlsay Castle sent samples of galena from veins at Allensford to Thomas Teasdale of Corbridge, the manager of a plate glassworks at Forth Banks, Newcastle. Teasdale replied on July 20th 1822, asking to see the veins from which the ore had come.

Monck agreed to this and on August 31st 1822, following Teasdale's visit, an agreement was drawn up to allow him to work all the lead veins within Allensford Estate for 21 years, at 1/7th duty. This became effective from September 2nd 1822, but no permission was given for hush working or for the erection of a smelter.

On February 20th 1823 Teasdale reported to Monck that the first trial had been a miss. It had cut only two barren veins and the partners had lost £200 on the venture. Further consent was then given for a trial on the north side of the Derwent, at its intersection with the Hisehope Vein.

At the Silver Tongue Mine, worked by the Silver Tongue Lead Mining Company, the throw of the vein was 20 fathoms up the sill on the west side. Hisehope Burn Vein throws 12 fathoms and two veins west of them throw 1½ fathoms each, while a vein supposed to be "*well charged*" ran a few

fathoms east of Silver Tongue through his ground. He thought that an engine of 40 hp on the site would clear the water and allow them to go deeper. It was suggested to him that a drift at Cathaugh should be reopened and continued to the vein, where it might pay for itself if the vein contained metal. Its workings would also serve to drain the vein further westwards. Teasdale agreed to do this.[80]

Stone Requirements

Teasdale continued mining Silver Tongue Vein and in July 1824 he reported that the North Healeyfield (Hisehope?) shaft, then being sunk, needed some stone. The Understeward (Mr Leybourne) had turned down this request because Teasdale wanted to use it on the Dean and Chapter side of the workings, but Monck said they could use the stone, providing they asked permission when it was required. By this time, the mine was 25 fathoms deep, and it was planned to go to 30 fathoms on the royalty George Silvertop obtained in 1800 from George Baker. The north part of the vein was reported to have "*broken into three strings*". The intention was to drive a low water level and install a waterwheel, which would allow thw workings to be extended downwards. The cost of sinking at the shaft was averaging between £22 and £23 per fathom, while the cost of driving the level was estimated at 22s per fathom. As this was in good plate, very little timbering was expected.

Silver Tongue Mine Cottages

On March 15th 1830 it was proposed to built 10 cottages to accommodate the Silver Tongue miners, with Teasdale leasing the buildings at a rent of 5% of the construction cost. Teasdale also asked for a 10-year lease on an east to west vein, thought to continue from Mr Silvertop's adjoining estate.

Teasdale and his associates (James Baker, John Weir and Jane and Mathew Hall, all of Newcastle)also applied on May 12th 1830 for mining rights from the Crooked Oak area as far north as Greymare Hill. Their lease was at a cost of £20 per year, with 1/9th duty on any ore raised.[26]

On March 3rd 1838 a drift was proposed at Crooked Oak and, two days later, Monck asked his steward to inspect the ground where Teasdale intended to build a watercourse. After an inspection of Silvertongue Mine, Teasdale reported that he had "*found another place about 200 yds up from the entrance of Hisehope Burn … into the property, where a level could be started in the sand and gravel bed of the old river*". However, the full course of the level would be in the Dean and Chapter's property. Driving it would allow them to reduce the lift of their pumps by 5 fathoms, and enable them to install another waterwheel, of almost 30 hp, below the Derwent, 30 feet distant.

On May 12th 1838 Teasdale agreed to a lease for Crooked Oak lead mines on the property of George Silvertop of Minsteracres. His partners remained

the same and the lease encompassed "*The Manor of Bulbeck, boundered by Crooked Oak,.. along the Derwent to the Manor of Newlands, ... thence to Greymare Hill,.. then along the Coal Road to Barlow Hill, ... then along the parish road to Sir William's Lodge, and along the Corbridge turnpike road back to Crooked Oak*".

By 1840 a loss of £1,200 had been made on the previous lease at Silver Tongue, but Monck agreed to allow a watercourse to be cut through his property to drain the mine. He offered a new lease at a rate of 1/8th duty, but Teasdale said he would only accept if permission was given for an engine shaft and engine. When Monck refused, it became possible that no further lease would be granted, but in 1842-3 the Silver Tongue Lead Mining Company paid £3 rent for a watercourse through Combfield House farm.

A plate made by Messrs Reid and Sons of Newcastle (goldsmiths) was presented to Thomas Teasdale on August 24th 1843 by the miners and friends of Silver Tongue Mine. The only official production figures for Silvertongue Mine are from 1848 when 138 tons of lead ore was obtained. The silver content is recorded as being 30oz per ton of lead metal.

Silvertongue Mine is recorded as working from 1838 to 1850, but evidence suggests that it might have started in 1828. It worked three veins. These were Silver Tongue Vein, which was partially excavated for 380 fathoms, Middle Vein, which was worked for about 275 fathoms, and Providence Vein, which was worked for no more than 12 fathoms. Silver Tongue Mine eventually ceased working in 1850.[57]

In several years of production, large quantities of ore were raised. For example, in the 5 years ending May 1845 the average yield was 950 bings of lead ore, yielding 23 ozs silver per fodder of lead "*by the old method of desilvering*", while in the 3 years prior to surrender 500 bings per year were produced, with a reduced number of miners. The lowest level on the Middle Vein went under the Derwent into property owned by the Dean and Chapter.

Communication with the surface was made via a shaft in Hisehope Burn. This mine only worked for a short time, but 144 bings were raised from a small portion of the ground. The two mines were well suited for working together, because one pumping engine and shaft could unwater them both and one set of machinery, driven by a never-failing water supply from the Derwent, could prepare the ore. Silvertop claimed duty of 1/10th on ore from the Silver Tongue Mine, while the Dean and Chapter claimed duty of 1/9th on ore from Hisehope Mine, both of which were liberal amounts compared with other mines in the north.

Tragedy!
In the 1880s, a family called Snowdon lived at Silver Tongue, a farmstead 200 yards upstream from the mine. One very hot and sultry day, while her husband was driving cattle to Hexham, she sent one of her children for some cold water from the Silver Tongue mine entrance, to cool some butter she was making. When the first child did not return, she sent the next child to find it. When the second child failed to return, she went to the mine herself to find out what had happened. When her husband returned home, he found them all dead, apparently overcome by poisonous gases from the mine.[82]

PLATE 42. Hisehope shaft wheelpit and beam support pillar (1999).

Hisehope Mine
The *Mining Journal* of May 18th 1872 reports that the Hisehope Silver-Lead & Barytes Mining Company Ltd worked this mine for a time with a capital of £6,000 in 1,200 shares of £5 each. £1 per share was payable on allotment, £1 at the end of six months and the rest by payments of 10s 0d per share at intervals of not less than three months. The directors, who were Robert and William Reed Esq of Knitsley, and Thomas Richard Dolphin Esq of the Delves near Consett, could add to their numbers. The company's banker was the National Provincial Bank at Durham and the solicitor and secretary was John Porter Dolphin of Wolsingham.

The company was formed to work a vein of lead ore and barytes on the Dean and Chapter's estate near Castleside. The mining ground was bounded on the north by Hisehope Burn and the River Derwent, on the east by the Healeyfield Lead Mining Company's lease, and on the west also by Hisehope Burn, the course of which separated this royalty from the Silver Tongue Lead Mining Company's district.

A vein rich in lead ore and barytes had been proved, but the proprietors

required additional capital to develop it. They thought that the mine would more than repay the investment and decided to offer one half of the shares to the public to provide working capital, while retaining the other half for themselves as fully paid up shares. The same vein was being worked on the adjoining Silver Tongue royalty to within a few yards of the northern boundary of the Hisehope ground and "*large quantities of ore*" were being raised. Other lead veins were thought to exist within the lease area, but, if none were discovered, the vein already proven was expected to return a large profit to the shareholders in a very short time, especially as lead ore already produced in the district was rich in silver. Applications for shares were required on or before June 1st 1872.[83]

PLATE 43. Hisehope Shaft top (1999).

PLATE 44. Healeyfield Smelt Mill, Castleside. (c.1910, courtesy J. Raine).

Mosswood
In 1828 Thomas Teasdale and Co attempted to open a mine at Mosswood Green on Sir Charles Monck's 12,000 acre estate of Bulbeck Common. It was about a mile south of Greenhead, near to Mr George Silvertop's Crooked Oak Farm, and the level is thought to be in the east bank of the river directly below the farm.

Healeyfield Smelt Mill
Thomas Featherstone and Company of Newcastle owned the smelting mill near Healeyfield. It smelted around 2,000 bings per year, a portion of which was refined for silver. The works manager was William Little of Healeyfield. In partnership with a man called Milner, Featherstone had also opened a mine on Plashetts Farm (NY969813) at Great Bavington in Northumberland around 1810, but the venture had failed. A vein was tried at Throcklington (NY958790), but, despite a long period of development, it also failed.[28]


PLATE 45. Hairpin flues, Healeyfield (1980).

The Healeyfield Mine Company ran the Healeyfield Mill and had 1 roasting furnace, 2 ore hearths, 1 refining furnace and 1 reducing furnace.[4] By contrast, Blaydon Mill owned and occupied by Colonel and Mrs Beaumont contained 4 refining furnaces, 2 reducing furnaces and 1 slag hearth.

Other Prospects
In the seven miles between Silver Tongue and Blanchland, several veins cross the river in a north–south direction, upheaving the strata to the west. One in particular crosses the Derwent about 3 miles below Blanchland, running north by Wall House Colliery and throwing the beds up 15 fathoms to cut off the Brockwell Coal Seam. Other veins run east-west. Trials have been made in Muggleswick Park and at Eddy's Bridge, but no mines were worked nearer than at Blanchland. The level at Eddy's Bridge eventually became part of the Keilder - Tees water tunnel construction project.

SMELTING ON BOLT'S BURN

Ramshaw Smelt Mill

Several smelters around Ramshaw served the Bolts Burn area. Ramshaw Smelt Mill (NY952474) was so called in 1852, but is also called Jamieson's Mill and was earlier known as Boltshope Mill. Considered the first mill at Ramshaw, it was on Capper/Ord property and probably mostly smelted that royalty's ores. Many early leases stipulated that partnerships working Capper/Ord lands had to give Boltshope Mill first refusal of their ore.

On August 1st 1748 the London Lead Company renewed the lease for Ramshaw Vein and Whiteheaps (Boltswell Foot) Mine from Ord at £21 per year and £12 10s 0d consideration money. The duty was 1/14th for seven years, increasing to 1/12th for the rest of the term. Ramshaw Mill (Boltshope) was also leased in that year, along with the mining rights, until 1769.

On January 2nd 1801 John Ord leased Boltshope Mill at Ramshaw to Anthony Hood, Alderman, of Newcastle, and Ralph Ramsey, agent, of Derwenthaugh, at £6 per year rent. They had been tenants for a long time and had rebuilt the mill and added to it. As well as the mill, the lease covered watercourses from Bolts Burn and other places, and allowed access through the Park to Cocklake Fell, along the new road from the mill to Townfield and High House, along The Deep and down to the river Derwent. From there ore was taken alongside Beldon Burn to the Alston road. The lease also granted the right to dig peat and permitted the removal of equipment, with John Ord to have first option of purchase, at the end of its 21-year term.

In 1827 Hall and Puller leased Boltshope Mill for £70 a year, and Capper permitted them to enlarge the mill (then called Ramshaw) and build dams, watercourses and workmen's houses.[36] The Derwent Mining Company's lease of the Lord Crewe Trustees' property was also renewed at this time.

On September 15th 1848 Routh and MacDonnell leasd Boltshope Mill, together with all the mines in Newbiggin other than those worked for coal.

In 1834 Jeffrey's washing floor was said to be to the south of Jamieson's Mill, but on the opposite side of the stream. Fine silt, a dam and the remains of a round buddle can presently be seen at this site.

Derwent (Jeffrey's) Smelt Mill

There were apparently two mills at this site. The earlier one was working from at least June 17th 1770, when one of the few records relating to it recommends that the £42 salary paid to Joseph Watson, agent at Jeffrey's Mill (and also at Acton Mill), "s*hould be raised a further £7*".[41]

The first Derwent (otherwise named Jeffrey's) Smelting Mill (NY955480)

was built downstream from Bolts Hope Mill and on the opposite (eastern) bank. It was rebuilt, probably around 1813 after the London Lead Company left the area, and became the main mill and mostly smelted the local ores.

Jeffrey's Smelter was within 400 yards of the road and, in 1842, the parliamentary commission on children's employment noted travellers had to pass through smoke and fume from its flues. These fumes had killed the ling in the area and only the more hardy heather survived. Any youngsters working at the smelt mills were employed on "*outside duties*". Inside the smelter, however, the roasting hearths employed 2 men, working 8-hour shifts with eight hours' rest. The men worked a 4-day week, but the hearths worked continuously. The smelting hearths employed 3 sets of 2 men each who worked 10-hour shifts, from Monday morning until early Saturday afternoon.

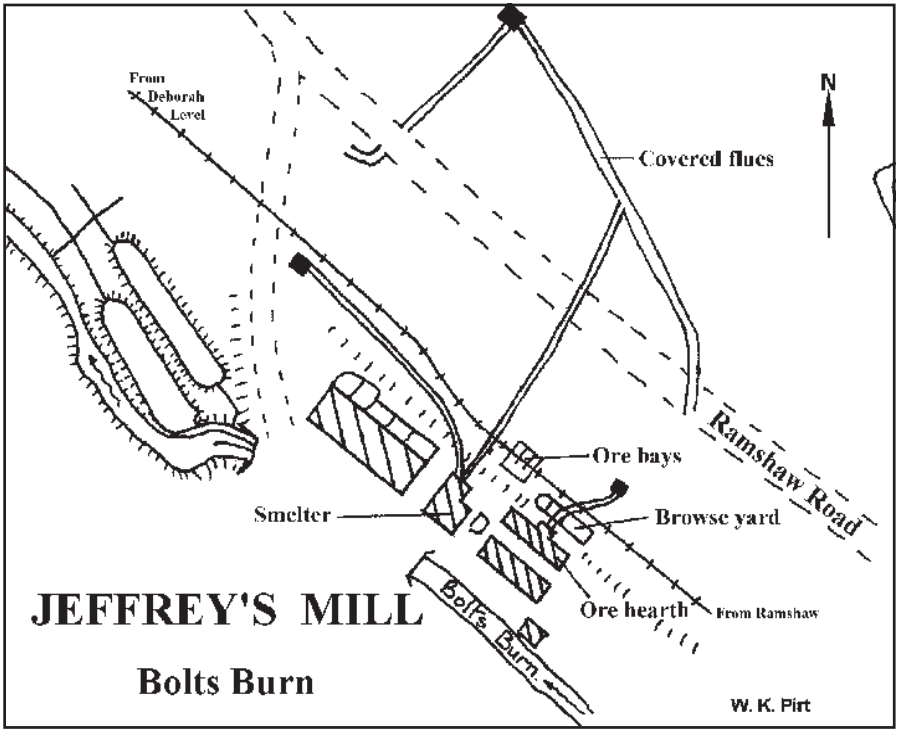

Fig 42. Sketch plan of Jeffreys Mill, Bolts Burn.

A Derwent Mines' report noted the use of a new desilvering process in which smelted lead was transferred to 3 pots and strirred. Any lead sticking to the stirrer was hammered off. A perforated ladle was then dipped into the first pot, lifted and left to drain, letting the lead "*crust, crisp and fourt*" in the ladle. This was then put in the second pot, and the action repeated to the third pot. This was the Pattinson, process devised at Blaydon Mill, as a result of which only 12 cwt out of 4 tons of pig lead was sent for refining.

In boundary disputes between the Lord Crewe Trustees and Ord in 1855, it emerged that permission had never been given for the erection of this mill on the Lord Crewe Trustees' land, or for the mill a few yards further downstream, which was built around 1845 and started work in 1852. (Also, as mentioned earlier, under the terms of an 1805 agreement, no smelting rights had ever been granted here.) The Lord Crewe Trustees' solicitors therefore suggested that the old mill be levelled by the landowner, and the costs of this charged to the Derwent Mining Company as an act of ownership. On Fig 42, a flue can be seen, to the east of the later smelter flue arrangement, going to to what is thought to have been the site of the earlier smelter, though whether this actually had horizontal flues remains questionable.

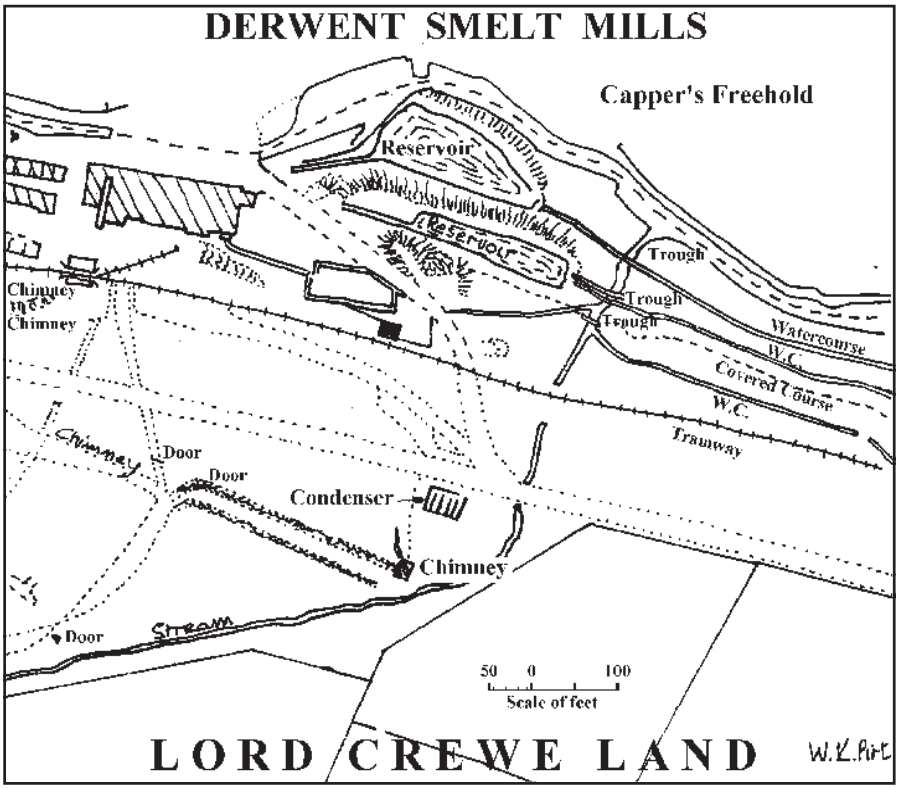

Fig 43. Plan of Derwent Smelt Mill, Bolts Burn.

This earlier mill apparently served the local mines on the Lord Crewe Trustees' property, and probably other London Lead Company ores and bought-in parcels were also smelted here. Extra business would also have been attracted on the demise of Acton's mills. Jeffrey's New Mill operated up to the closure of the mines around 1883.

Acton High and Low Smelt Mills

Between 1702 and 1704 London Lead Company agents probably visited Acton (High) Mill, as this was common Company practice at the time. These visits would have been on the directive of Wright, Floyd and Haddon, the company's leading technical experts, possibly to determine site capacities as part of their general evaluations of the northern mines and mills.

PLATE 46. Inside flue, Derwent Smelt Mill (1980).

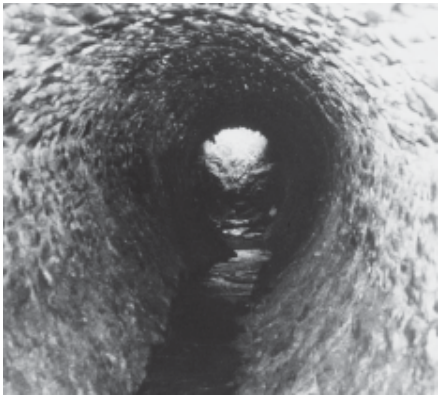

PLATE 47. Inside barrel flue, Derwent Smelt Mill (1980).

Acton High (Old) Smelt Mill

Before the London Lead Company acquired Acton High Mill, at the confluence of Potter Burn with Acton Burn, it was owned and run by the Blackett family. Duty ores from Lord Barnard's mines were also smelted in 500 bing lots, at a millage of 30s 0d per bing, plus 6d per bing extra for every 5s 0d rise in the price of a fodder of lead. There are indications that these parcels of ore subsidised the mill's early years. The ore yields from the Blanchland mines leased by the London Lead Company are recorded in the Company's Court Minutes Book for 1708 as "*having been directed to their newly acquired Acton Mill for smelting*".[41] The Company finalised the lease for this mill on February 8th 1709, possibly because of the increased output from the Blanchland mines. Before then, Acton High Mill is thought to have only used ore hearths in its smelting process.

PLATE 48. Looking down onto browse yard, Derwent Mill (1980).

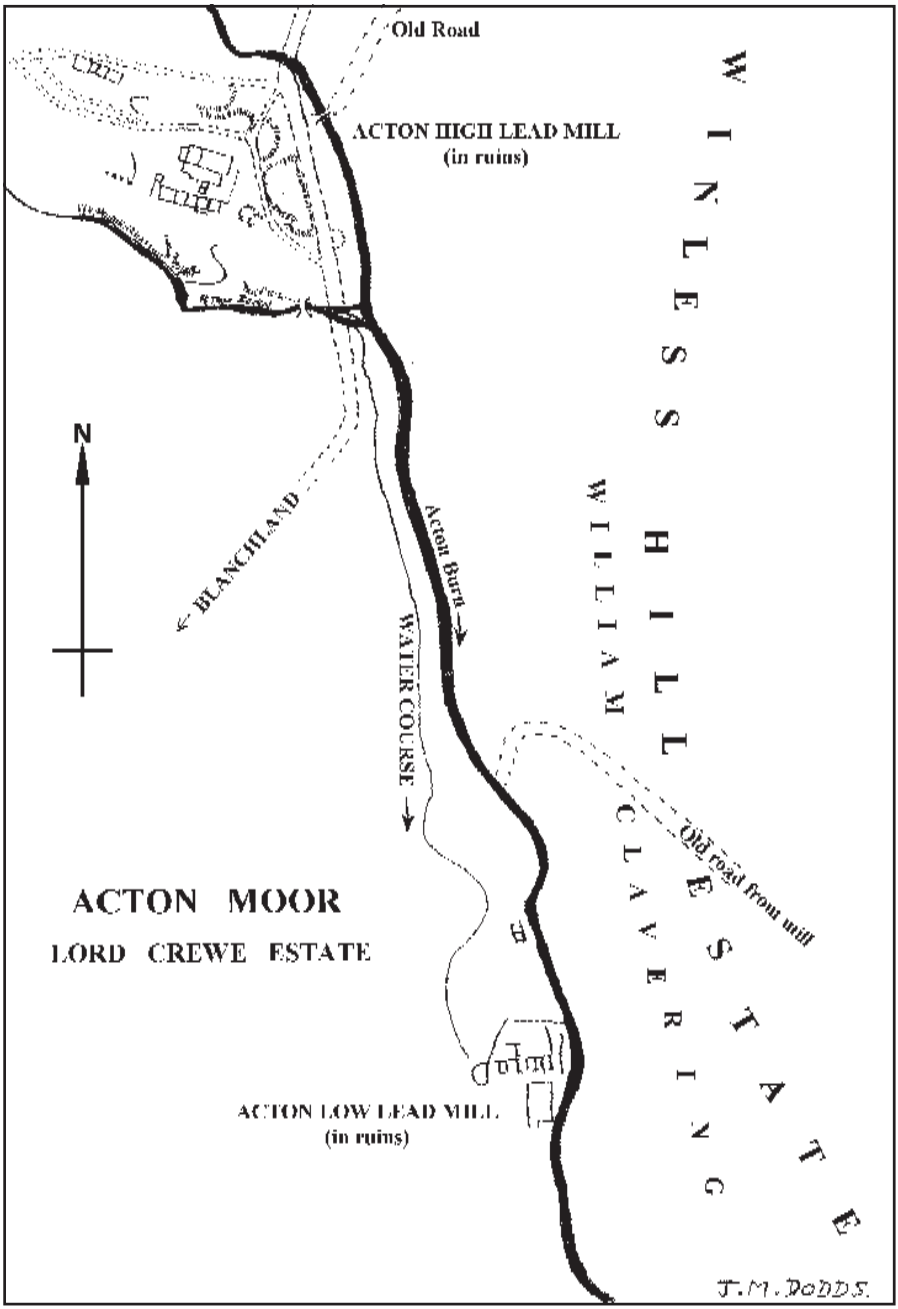

Fig 44. Plan of Acton Burn showing location of old and new mills.

The London Lead Company's Court Minutes Book records a visit to the area by Dr Wright, accompanied by John Haddon and Encoh Floyd, on August 11th 1713. They reported that Acton (Old) Mill was "*well fitted for smelting and refining by the help of water*". Fuel was cheap and a good stock of peat was laid in. The management was efficient and the ores were supplied from the Company's mine at Shildon and from others in the area. Greater yields were expected from the fresh ground then being mined at both ends of the Shildon workings. An entry in the Company's Minutes Book for July 11th 1713 states that the furnace at Acton Mill had been built by Thomas Pattinson, who also built the furnace at Wanlockhead.

PLATE 49. Outfall of Bolts Burn from below Deborah dressing floor (1999).

There is an unclear reference to Forster's owning a mill at Shildon around 1721, when it was forfeited as a result of his Jacobite activities. Although there is evidence of primitive smelting occurring here at an earlier date, this is not thought to be connected with Forster. The reference may mean Acton Mill, or possibly the previously noted corn mill on Shildon Burn at Blanchland.

W. Stoddart of South Shields renewed the Acton Mill lease and that of Shildon Mine, for the London Lead Company on June 27th 1722. Raistrick and Jennings state that in June 1738 the Company's Minutes Books recorded accounts for the erection of stamps at Acton Mill by Forster, possibly to recover extra metal returns from the slags. Flattened pieces of lead metal discovered at the High Mill site are possibly evidence of this.

PLATE 50. Stream channel protection, Bolt's Burn (1999).

Acton Low (New) Smelt Mill

This newer mill, further down Acton Burn, may have been built under the supervision of the London Lead Company. Accounts from around 1750 show that it had been in the possession of the Acton New Mill Company (comprising Cookson, Marshall, Skottowe, Blenkinsop, Radley and Wilkinson) since January 1st 1745. It was built on a two-acre site which Isaak Cookson leased from John Hood of Elswick for 14 years on August 20th 1742. The new mill had "*reverberatory furnaces of increased throughput and better efficiency*", but it is not clear whether it was built in direct competition with the older High Mill or as an improvement to cope with the ever-increasing amounts of ores and duty ores being predicted from the district.

In the 1760s, ore from the Fallowfield mines was sent to Acton Mill for smelting and in 1763 a total of 340 bings were carried at 3s 4d per bing. The metal output from Fallowfield ore smelted by Acton amounted to 71 tons of "bar lead" (pigs), which were "*carried first by pony to Blaydon and from thereon to Newcastle by keel boat*".[15]

On May 1st 1764 the Acton New Mill Company offered the lease of the Low Mill for sale. Also included was a lease for the refinery and shot-house at Meadowfoot in Elswick belonging to the Cookson family.[38, 39] On June 24th 1764 the London Lead Company paid £300 for this lease.

On June 17th 1765 Coulson Skottowe gave the London Lead Company the rights to work all the mines previously granted to William Stoddart in the 1722 lease. Acton (New) Mill was included, along with all Stoddart's mining liberties on the commons of Blanchland in both Northumberland and Durham. By January 24th 1765, Henry Wilkinson and partners, Thomas Skottowe, Esther Cookson and Thomas Marshall were the only surviving partners of the Acton Low Mill Smelting Company, which agreed that the London Lead Company could occupy the property at an annual rent of £1 0s 0d. This low rent does not suggest prosperity, although the silver returns records (see table), showing how outputs had improved in this period, suggest otherwise.

Year	Acton	Jeffreys
1738	2085	1998
1739	2282	1641
1745	3407	1851
1755	7041	1607
1765	6953	3412

In 1800, trials were carried out using the blast hearth at Acton and by 1801 the salary of Joshua Walton, the agent at Acton, had been raised by £20 per annum. In August 1804 Joseph Stagg was agent there at a salary of £60 per annum. The next reference in the LLCo. minutes books is the notice of Easterby, Hall and Company's takeover of the lease of Acton in 1807.

Technical Findings

The construction date of Acton High Mill has not been established, but there is evidence that it existed in the early 1600s when it may have been referred to as Shildon Mill. This was possibly because it smelted mostly ores from Shildon Mine. In contrast, Acton Low, or New, Mill can be fairly accurately dated to around 1745. The High Mill seems to have been more extensive than the Low Mill, though this may well be because the more modern mill was better organised and therefore more compact.

Finds at the Low Mill site include the remains of a bingstead, possibly three furnace rooms in line, and the outline of what was proably a bellows wheelpit. The size of the foundations may indicate cupolas, but this is uncertain, as written records suggest reverberatory furnaces were used.

Very little slag is evident at Low Mill, but occasional large pieces of a black, sintered clinker substance are found. This is intermixed with a small proportion of sandstone shards and is scattered around the Low Mill site and its approaches. Some pieces have been found buried in the bingstead. Analysis reveals that this is limonitic, i.e. a hydrated iron oxide. Its source is unknown, but possibilities include bog iron ore, leaching from the waste heaps, or material brought on site from elsewhere. Both coal and coke are present on the Low Mill site.

Coal and coke are both also present at the High Mill site, where part-burnt coke (or cinder) can be found embedded in slag. Also of note is the presence of numerous small pieces of flattened lead, which suggests that a slag recovery process involving crushing has taken place there. In a general search of the site, the following materials were also noted and in some instances samples were collected for more detailed examination.

- Pieces of browse, i.e. partly roasted (or part smelted) galena.
- Black, sintered orestuff (roasting).
- Coal clinker. (Mp. Start 1140°C, completed fusion 1250°C).
- Coke (free pieces and pieces embedded in slag).
- Egg sized pieces of a black, glassy slag, possibly from a slag hearth process. (Mp. Start 1105°C, completed fusion 1110°C).
- Lime-rich grey slag (ore-hearth or possibly cupola finishing slag) (Mp. Start 1120°C, completed fusion 1145°C).
- Dark grey slag, coarse, granular structured. Mp. Start 1070°C, completed fusion 1120°C).
- Dark grey slag, fine grained. Mp. Start 1040°C, complete fusion 1060°C).
- Pieces of partly calcined limestone.
- Numerous pieces of slag-coated semi-silica brick, along with some clinker-coated 2" “clod” clay bricks (rough textured and iron stained) possibly from the proximity of a fire-hole.
- Broken pieces of cast iron workstone.

Feldon Smelt Mill

This mill is in the Burnhope valley, about 1.5 miles south-west of Edmondbyers village (NZ004484). Built around 1680, it smelted Rookhope ore (British Lead Co., Rookhope Valley Lead Co.), London Lead Company ore and local parcels. Heaps of scoria on the hillside near the present Feldon Mill ruins possibly indicate the existence of ancient bales at this site.

PLATE 51. Acton Low Mill. Note bingstead on left (1999).

The Blacketts had a smelt mill on Feldon Beck by the 17th century. Two London Lead Company agents visited it in 1702 and by 1725 the company occupied the mill and had also obtained the right to make trials in its vicinity.

On May 9th 1761 William Errington renewed the lease of Feldon Smelt Mill at a yearly rent of £2 10s 0d, while in 1787 the mill's lease, with leases for "*lead mines in Muggleswick*", was renewed for 21 years at a rent of £3, plus 1/7th duty. Mackenzie says that in 1796 Feldon Mill was owned by, or leased to, John and Henry Errington of Messrs Beaufront Errington & Co. and the output needed 93 horse carriages to bring the lead down from the mill. Each carriage held 10 pieces, or pigs, each weighing 12 stones.

On May 9th 1796, fines of £80 were levied against Errington at Feldon Mill, possibly for poisoning the land with lead fume. In the same year, a lease was made over to Henry Errington of Sandhoe for the remaining 14 of its 21 years. The rent was £2 10s 0d, being £2 for the mill and 10s 0d for 20 acres of land, with permission to erect other smelt

PLATE 52. Feldon Smelt Mill site, with condenser in foreground (1980).

mills or buildings. Free wayleave, bailroom (workroom) and other entities connected with the washing, smelting and disposing of lead ore were also included.

Feldon Mill - Lead Prices

Month	Year	Refined Lead £	s	d	Slag Lead £	s	d
Oct	1795	18	0	0	17	3	0
May	1796	19	0	0	18	3	0
Sept	1796	17	0	0	17	0	0
Sept	1797	15	2	0	15	10	0
May	1798	14	2	0	14	2	0
May	1801	23	0	0	23	0	0
Oct	1801	24	0	0	23	2	0

Feldon Mill – Silver sold by London Lead Co.

Month	Year	Price/oz.	Oz	dwt
June	1795	5s 2¼	1982	15
August	1795	5s 4¾	1744	0
Sept	1795	5s 6¼	1828	5
June	1796	5s 6¼	1970	0
Sept	1796	5s 4¼	1624	15
March	1797	5s 7¾	717	10
Aug	1797	5s 1¾	1569	1

During 1801 Errington and Co paid a total of £4 3s 11d duty on ore obtained from Burntshieldhaugh in the previous year.

The London Lead Company's lease of Feldon Mill terminated in 1806. The mill was then occupied by Robert Jopling of Newcastle and Alexander Whaley of Sandhoe (see earlier) who renewed the lease for 14 years from May 9th 1810. Until they acquired the lease, Jopling and Whaley had to pay a rent of £22, at £2 10s 0d per annum for the first 7 years of the original 21 year (i.e. until November 20th 1810). This payment continued on renewal.

Forster wrote that, in 1821, Edmondbyers (Feldon) Mill was owned and occupied by John Creswell Jopling Esq of Newton Hall. At this time it had 2 ore hearths, a furnace, a

PLATE 53. Square chimney base, overlooking site (1980).

PLATE 54. Close view of condenser. Note horizontal flue track, and square chimney, top left, on horizon (1980).

slag hearth and a refinery. In contrast, Langley Mill had 5 roasting furnaces, 10 blast hearths for smelting ores and slags, 4 refining furnaces, 2 reducing furnaces, a zinc furnace and a laboratory.[4] It was the largest smelter in the area and was was owned by the Commissioners and Governors of Greenwich Hospital.[5] On May 9th 1822 Jopling renewed the lease for another 21yrs, at £12 per annum.[80]

British Lead Company

By 1825 Jopling had assigned the Feldon Mill lease to the directors of the British Lead Company, who owned mines in the Rookhope Valley (including Brandon Walls) of which Jopling was a director.

Accounts for 1826 show that this company built the condenser and horizontal flue at Feldon (see photograph). They also show smelting and roasting records, along with the cost of leading stone for a water race and for "*cutting 77 fathoms of foundations for a mill chimney*". The men working the mill at the time were John Hutchinson and Partners.[45]

In 1828 Parson and Whyte described the lead district of Derwent and listed the lead values from 1776 to 1828. They record that "*at Edmondbyers the London Lead Co had once operated a smelting mill*".

PLATE 55. Artifacts include a barrow wheel (1980).

The British Lead Company offered Feldon Mill, along with other properties in the Rookhope valley, for sale on October 23rd 1828.[84] Brandon Walls Mine and Feldon Mill together were expected to raise around £1500. In the previous year, a total of 218 bings 6 cwt of ore obtained from Brandon Walls mine had been smelted at Feldon. Blackburn says this ore was carried by George Rowell, John Wearmouth and Mary Featherstone. Ore roasting figures for 1829 at Feldon are given overleaf.

	Bings	Cwt	
British Lead Co.	160	7	
Mr Philpotts	280	7	
Mr Philpotts	175	0	
Park Co	18	6	(*Presumably Waskerly Park Mine.*)
J.C. Jobling	4	6	

Charge for roasting was 8d/bing

On June 28th 1830 the British Lead Company offered Feldon Mill for sale by auction at the Crown and Thistle Inn in the Groat Market, Newcastle. Lot 3 was described as "*A valuable smelting mill...and the dwelling houses and offices belonging thereto, together with 28 acres of land or thereabouts, held by lease of the Dean and Chapter of Durham*". It is not known if the sale was successful, as no new names appear immediately, and the mill seems to have been idle from 1830 to 1842. On May 31st that year, the lease was taken on by the Derwent Mines' agent, John Dolphin of Hunter House, and Joseph Roddam of Stanhope, gent, for 20 years at a rent of £12. This lease incorporated all buildings formerly used as a smelt mill, plus a farmhouse with outbuildings and 20 acres of land. It also gave permission to cut peat and build railways and limekilns. The wording suggests that the site was being used for purposes other than smelting and, in an 1842 inventory of land that included Healyfield Mining Company property, "*Feldon Smelt Mill (in ruins)*" is listed at a reserved rent of £12.

PLATE 56. Corner of cast iron workstone (1980).

On July 20th 1852 Mark Sherlock of Middleton in Teesdale took a lease of the mill, and on May 31st 1860 he extended it for 18 years, at a rent of £12. The mill was finally surrendered to the Dean and Chapter on November 3rd 1864, its purchase money being £55. The rent payable was £25 per year for 23 acres, for the 21 year lease. Leases were possibly taken out in the idle years to allow the reworking any slag residues, as a notable feature of the site today is the absence of any great volume of these. However, this is a common feature of many older smelting sites.

Slag recovery was the motive for a lease taken out on October 28th 1926 by T. Twynam of Teeswold, metallurgist, and J.D. Beaston of Crawleyside, mining engineer, who were involved in ganister quarrying for Consett Silica Brickworks at that time. The rent for working the refuse material at the mill was £5 per annum, plus a royalty of 3d per ton. There must have been little of value at the site by this time, but some of the waste could have been used for road making.

At the end of the lease, the fences had to be left in good repair, and all the workings filled in or sloped away to leave them secure.

PLATE 57. Double sided pipestone (1980).

In Conclusion

The mines of the Derwent Valley have had a checkered past. They were regarded as silver mines in the 15th century and at that time they were considered to be rich. The presence of extensive, silver-rich lead ore at shallow depths enabled the mines to be steadily developed and promised a guarantee of a long-term future. As the workings deepened, the cost of upkeep increased. The mines remained economically viable, however, even for partnerships with only limited resources.

In 1708 the London Lead Company was the first operator of the mines that had both the skill and the capital to extend the workings. It was also the first group to suffer erosion of profits due to the high cost of upkeep. In the hands of the LLCo., the mines were gradually neglected and were eventually left in a semi-derelict condition. Attempts by the Arkendale Company in 1802 to return them to profitability by going even deeper caused these new tenants to become over-stretched. Development was able to continue by the constant re-founding of the company under different guises at different periods, each with the purpose of establishing a firmer footing. Again, high costs lost the day and heavy financial loses caused the final collapse in 1883. Ironically, by 1893 a need had arisen for fluorspar, an abundant gangue mineral at the Derwent Mines, for use as a flux in steelmaking. After a barren period lasting until 1914, an increased demand for this mineral caused a resurgence of mining in the valley for a few short periods until the final closure in 1986.

During the lead mining period, the estimated yield of ore from the valley is perhaps 120,000 tons, representing a minimum value over one million pounds at 1883 ore prices. The slow rate of extraction and the costs of maintaining

the workings throughout that long period would have been immense by today's standards. Had this orebody been worked using modern mining methods, the cumulative maintenance costs would have been lower and the investors would have seen better returns.

Our legacy now is not so much the dereliction, but the curiosities left behind; the waste heaps, the ruins and the disturbed ground, the stillness where once there was bustle, a silence where there was once the clatter of machinery. Whilst many of the industrial marks have long been redressed by nature's blanket, there are corners of the valley where remnants of the past still peer through that cover.

There is more than just the legacy of past industrial activity to ponder because the presence of the mines brought other benefits to the area. At Hunstanworth, a whole village was built to house the increasing population. There were improvements to the road system, extra commerce in the vicinity of the mines, education of the children and a more prosperous way of life in general for those who were employed until the final closure. The impact upon the region, therefore, has not been entirely one of dereliction . Even in recent years, the Derwent valley has continued to benefit through the inclusion of the Hunstanworth Mines district within part of a signposted Local Heritage "Mines Trail".

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