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The Decline and End of the Lead Mining Industry
in the Northern Pennines 1865 - 1914:
A Socio-Economic Comparison Between
Wensleydale, Swaledale and Teesdale.

Colin George Flynn, Graduate Society,
University of Durham.

Thesis for an MA, University of Durham,
Department of History, 1999.

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(2)
Teesdale

Colin George Flynn

The Decline and End of the Lead Mining Industry in the Northern Pennines
1865 - 1914: A Socio-Economic Comparison Between Wensleydale, Swaledale
and Teesdale. MA, 1999.

In 1865, the United Kingdom began importing more lead metal than it exported and by 1885 the domestic lead mining industry had halved. This industry had been in the vanguard of the Industrial Revolution but was also at the forefront of industrial decline. Lead was cheaper as a foreign import, with the supply easily outstripped the rising demand, forcing the price of lead to fall and contributing to the fall of the industry.

This thesis examines and contrasts the contributing factors that caused the decline and end of the industry in the three valleys and the effects this had on the local community. The lead mines in Wensleydale and Swaledale had already exhausted the lead deposits. The mines in Wensleydale closed down but Swaledale was under the control of a local landowner and mining company entrepreneur, Sir George Denys, who wasted money on ventures. Lead mining dominated Swaledale and the fall of the industry decimated the valley causing a large drop in population. Wensleydale had an agricultural economic base, with smaller industries providing employment, so the end of the mining industry had less effect.

Teesdale was also dominated by lead mining. The main employer was the London (Quaker) Lead Company. There were still mineral resources to be exploited and the company made efforts to improve efficiency before finally being liquidated in 1905. The company invested in mining and improvements, trained its staff, provided career opportunities and had a social policy for the well being of the community, all contrasting strongly with Swaledale. In 1865, there was no alternative employment to lead mining but, when the company folded, other minerals were being extracted, quarrying and the building of reservoirs provided other sources of employment in the locality, so there was less effect than in Swaledale.

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Colin George Flynn, Graduate Society,
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17 JAN 2001

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1. Introduction

In 1865, the United Kingdom began importing more metallic lead than it exported, probably for the first time since the official government mining statistics were begun in 1845.¹ Imports overtook domestic production in 1871, by 1880 imports were double the domestic output and at the onset of World War One in 1914 there was little left of what was once a thriving, successful and dominant industry.

The lead mining industry increased noticeably in the seventeenth and eighteenth century, at the forefront of the Industrial Revolution, and continued to rise in the nineteenth century, peaking in recorded output in 1856.² The industry then steadily declined with the downward trend increasing in the 1880's.³ Lead mining was in the vanguard of the Industrial Revolution but it was also at the front of the industrial decline of the United Kingdom. This decline is very similar yet earlier than those of other mining and manufacturing industries and had a great effect on the communities in the lead orefields. "The Industry usually imposed a distinctive pattern on the economic and social life of lead mining areas, influencing more than the working conditions and living standards of the miners...lead mining was part of the broad stream of British economical development".⁴

Lead was, and still is to a lesser extent, an important economic commodity. In the nineteenth century, lead was required by numerous trades and industries. It was used in the manufacturing of pottery, pewter, salt pans, plumbing, acid vessels, roofing, window frames, solder and type-metal. Its uses as a covering for the keels and hulls of ships and in the making of armaments and munitions meant that it was in keen demand during times of conflict, the boom years for the industry often coinciding with wars, such as the Napoleonic and the Crimean. Oxides of lead were also ingredients for paint and glass manufacture, carbonates for cosmetics and paint and acetates for dyeing and the adulteration of wine. As a result of its uses the supply of lead is closely associated with

¹ *The Mineral Statistics of the United Kingdom.*

² *ibid.*

³ *ibid.*

⁴ B Jennings, *The Lead Mining Industry of Swaledale*, (MA Thesis, unpublished, University of Leeds, 1959), p. 2.

the rate of growth in industrial output, being a raw material for a wide variety of industries.

During the eighteenth and nineteenth centuries, lead mining had replaced agriculture as the primary industry of Swaledale and in parts of Wensleydale. Although separated by only five miles of moorland, the lead industry dominated Swaledale considerably more than Wensleydale. This was due to several contributing factors. The ore field in Wensleydale was only an extension of the main veins in Swaledale, with the exception of the small Bishopdale mine which was an isolated outcrop of Nidderdale's ore bearing rock. Wensleydale, a wide open valley which provided a cross-country route into north Lancashire and Cumberland, could support both arable crops and a healthy pastoral farming industry on the large alluvial plain. By contrast, lead mining became the principal source of employment in Swaledale, a narrow and closed valley with little passing trade and a more restricted farming industry with less fertile soil for arable crops and wide expanses of moorland used as poor quality grazing land. Similarly, in Teesdale where the land was so barren and high above sea-level that agriculture was fundamentally confined to subsistence farming alone, lead mining was the only means of employment.⁵ The thesis is to examine the differing and contrasting reasons for and the effects of the decline and end of this industry in these valleys in the northern Pennines.

⁵ C J Hunt, *The Lead Miners of the Northern Pennines in the Eighteenth and Nineteenth Centuries*, (Manchester, 1970), p. 4.

2. Geology

The lead mining fields situated in the Pennines have been divided into three distinct regions; the northern Pennines, the Yorkshire Dales and the Derbyshire Peak. The first two concern this thesis; with the northern Pennines sub-divided into the valleys of the rivers Tyne, Wear and Tees; and the Yorkshire Dales into Swale, Ure (Wensleydale) and Nidd.⁶

The mineral sources for these two areas are very similar. The lead ore is found in the Upper Palaeozoic Carboniferous strata rocks, chiefly in the limestone, and is predominantly a lead sulphide, galena, with smaller traces of cerussite, a lead carbonate.⁷ Lead was the main mineral resource exploited in the northern Pennines until the industry's decline. Other minerals, some of which had already been previously used for economic gain, replaced lead to a certain extent, with the notable exception of Swaledale.

In Teesdale, the zinc ores calamine (zinc carbonate) and hemimorphite (zinc silicate) were obtained, traces of iron were found and utilised but the proximity of the prolific Cleveland iron field may have dampened down the enthusiasm for any expansion. Barytes (barium sulphate) was mined extensively up to the closure of Close House mine in 1997 and was also taken from lead mine spoil heaps to be used as high density fillers in the paint, paper and barium industries.⁸ A galena associated spar, fluorspar (calcium fluorine), was also both mined and obtained from spoil heaps in Teesdale. Fluorspar is still used in the manufacture of hydrofluoric acid and its composites form a flux in the steel making process. It is also more commonly known as a semi-precious polished stone, Derbyshire Blue John, which is not limited to Castleton in Derbyshire.

Limestone is one of the most important bulk materials in the region and is still quarried in both Teesdale and Wensleydale. It is an important component for cement and lime production, railway ballast, road stone, agricultural materials and, if chemically pure, as a flux in iron and steel manufacture. Teesdale has outcrops of dolomite in the Great Whin

⁶ R Burt, *The British Lead Mining Industry*, (Redruth, 1984), pp. 18-19.

⁷ W Edwards & F M Trotter, *British Regional Geology, The Pennines and Adjacent Areas*, (3rd edition, London, 1954), p. 80.

⁸ B J Taylor, I C Burgess, D W Land, D B Smith & P T Warren, *British Regional Geology, Northern England*, (4th edition, London, 1971), p. 95.

Sill (whinstone), a volcanically formed calcium magnesium carbonate rock. It is a very hard, tough rock and of great importance to road building, the iron and steel industries as a furnace and converter lining and also used in the pharmaceutical, glass, tanning and textile industries.⁹ Quarrying did take place in Arkengarthdale, a tributary valley of Swaledale, for chert, a silica rock used as a crushing material in the manufacture of porcelain and pottery, but this was not established until the 1920's.¹⁰ However, it must not be overlooked that the naturally occurring stones, including sandstone, formed the major building materials of all three valleys.

⁹ B J Taylor, I C Burgess, D W Land, D B Smith & P T Warren, *British Regional Geology, Northern England*, pp. 92-94.

¹⁰ L O Tyson *The Arkengarthdale Mines, British Mining No. 53*, (Keighley, 1995), p. 88.

3. Extraction and Preparation of Lead

The greatest challenge for the lead mining industry is the actual detection of the ore deposits and the evaluation of the commercial value of the available mineral. As Burt has pointed out, mineralisation does not follow any predictable pattern and is completely random in structure.¹¹ Surface outcrops obviously signify the location of a lode of lead ore which is easily obtained by using an opencast trench to extract the bluish grey or black coloured ore-bearing material. The detection of underground veins are obviously more difficult and requires an understanding of favourable strata, the discolouration of plants and evidence of more lead tolerant plants, such as spring sandwort.

Bell pits were an early development in mining, with these pits following the route of a vein in succession. The erosion of the top soil and loose debris caused by a stream had assisted prospectors and this was adapted to become one of the main techniques used to find lead ore, hushing. The temporary damming of a stream produced a sufficient surge of water to strip away plants, top soils and debris from the hillside to reveal the mineral bearing rocks beneath. This method was also used to clear the debris after rocks had been stripped away manually. Hushing was largely confined to the steep-sided valleys of the northern Pennines.¹² There are excellent remains in Teesdale, Swaledale and Arkengarthdale, such as Moor Hush near Langthwaite which is 60 feet deep and 440 yards long, but not in Wensleydale as it is a wider and less steep sided valley.¹³

Due to the nature of the valleys, the veins could be reached by driving a tunnel horizontally into the hillside, called a level or adit, which also drained water from the mine if it was driven in at a slight upward angle. The entrance to the mine was usually a level and near to the portal would have been a number of buildings, including a blacksmith's smithy and, in Teesdale, the miners' "shop" or lodging house as most of the mines were a considerable distance from areas of settlement. As near to the mine as possible and with a plentiful supply of water would have been the dressing floor where the ore was prepared for the smelting process. The levels and adits would have been supported by stone and/or timber arching. Shafts might have been sunk or bored to aid

¹¹ R Burt, *The British Lead Mining Industry*, p. 14.

¹² D Cranstone, "To hush or not to hush: where, when and how?", *Men, Mines and Minerals of the North Pennines*, edited by B Chambers, (Killhope, 1992), p. 42.

¹³ J R Foster-Smith, "Among Old Mines", *Men, Mines and Minerals of the North Pennines*, p. 7.

ventilation or to obtain the ore when it was located deeper down and inaccessible by driving a level, such as at the Hurst and Kisdon mines in Swaledale. When the vein had been reached, the work to extract the mineral would spread along it, removing the ore or "bouse".

Most of the veins in the orefields concerned are predominantly vertical in structure. If the ore was below the adit, a sump was sunk and, if above, the stoping process was used in which timber flooring replaced the extracted ore, enabling the miners to work upwards through the vein. Waste rock or "deads" would have been mainly left inside the mine, often piled onto the timber flooring making entering or re-opening disused lead mines a hazardous venture. Lateral extensions of lead veins called "flats" regularly appeared in the northern Pennine orefield. Some were of considerable width and area but there was a wide variation between them, often entailing the need to remove large amounts of barren rock to gain a limited amount of ore.

Before the invention of gunpowder, a lead miner's tools were limited to a pick, hammer, plug and feathers (tools used to split rock), a crowbar and a candle for lighting, either fixed to the hat or in a simple lamp. Gunpowder was first used in the seventeenth century, high explosives came later with nitro-glycerine and gun cotton and electrical detonation made the task easier and safer in the 1870's.¹⁴ The most prevalent disabilities miners suffered were chest problems. This was a result of dust, damp, explosive fumes and foul air aggravated by poor ventilation. To improve the air supply bellows were used in short levels, often powered by water, but, more commonly, a "windy billie", a small hand blower (often operated by a boy) was employed but this merely stirred the stale air around. As noted above, shafts were sunk for ventilation and it was also found that pumping water around the mine forced air along too.

The greatest change in underground working methods was the introduction of explosives to break the rock. This involved drilling more holes into the rock, thus increasing the dust, and the change from gunpowder to dynamite in the 1870's increased the toxicity of the fumes in the mines. The invention of compressed air drills reduced the labour need,

¹⁴ R Burt, *A Short History of British Metal Mining Techniques in the Eighteenth and Nineteenth Centuries*, (Lelielann, 1982), pp. 35-39.

introduced additional air to the workings but resulted in an increase in dust emission which was only reduced if a water jet was directed onto the drill bit during operation.

In smaller levels the tubs carrying or "drawing" the bouse out to the dressing floor on wooden or iron rails would have been pushed by a man or a boy. In larger mines horses would have been used. If a shaft had been sunk the ore could be wound up out of the mine with a gin powered by a horse, by water or, more unusually due to the fuel costs, by a steam engine. These powered engines also provided a convenient but risky mode of transport for the miners travelling in the ore containers.

Bouse was the raw material for the dressing floor, an area where the ore was prepared for the smelt mill. Teams used spall hammers to knock obvious pieces of rock off the ore and a bucker was used to break it down to gravel-size pieces. Stamps, rollers and trommels (a rolling cylinder), usually powered by water, were also employed to reduce the bouse to a uniform size. Once this had been achieved the bouse was subject to several processes of washing, all designed to get rid of spars and pieces of stone, and resulting in the bouse to be as pure a lead ore as practicable. The basis for the washing process was the specific gravity of the ore compared to the spars and stone; galena is 7.75, barytes 4.5, fluorspar 3.2, calcite 2.6 and limestone around 2.6 depending on the exact chemical make up. A stream of water strong enough to take away the waste but not the lead ore would be arranged. Hotching tubs and jigs were also employed, with finely crushed bouse being jerked up and down to agitate the heavier ore to the bottom, either manually or powered by water. Small pieces of galena would evade this process so "buddles", inclined settling tanks with a stream of water, were used. A mechanical adaptation of this was the circular buddle into which the slime containing the small particles of galena was fed and distributed evenly by two revolving arms. Heavier ore dropped first in the centre, then increasingly less pure grades of ore were then evenly distributed according to their lead content until only waste was collected at the very rim. For efficiency, only the very pure ore, around 70 per cent lead, was sent to the smelt mill, the rest being put through parts of the dressing process again for further treatment.

Separate from the mine was the smelt mill, the position of which was determined by the local topography, roads from the mines it served for economic and effective transportation of the ore and roads to the markets for the sale of the pigs of lead. Reliable power was

imperative, with a strong stream necessary to power the bellows and fuel for the furnace itself (such as coal, coke, peat or wood). Often a hillside flue was used so that lead carried away by the fumes could be recovered by scraping the inside of the chimney, this resulted in many smelt mills being situated in the lower part of a valley. As will be noted later, a long flue also brought the advantage of dispersing the toxic sulphur dioxide fumes more efficiently than from a standard chimney. Early smelting was effected in a simple open, wind-blown fire known as a bole or bail and over 70 such sites have been identified in Swaledale and Arkengarthdale.¹⁵ Blast furnaces were developed with deep hearths to collect the molten lead in a sumpter pot, keeping the metal hot before casting it into pigs. The quality of the lead could be affected by other substances that were present in the ore. Antimony makes it brittle and unsuitable for sheet or pipe work. All lead ores contain a small quantity of silver, which makes the lead harder, although it may be worth extracting for its own value. Most lead was refined to make it a "merchantable" quality. This was done in a refining or "reverberatory" furnace to remove the impurities and special apparatus was used to recover the silver. Slag from the hearth was also re-smelted as it would also have contained recoverable elements of lead.

Silver was usually extracted by cupellation. The lead was re-melted in a blast of air, oxidising the lead into litharge but not oxidising the silver. This was done on a bed of bone ash which absorbed the litharge, leaving a small cake of silver on the surface. A revolutionary change was made in 1833, by Hugh Lee Pattinson of Alston. He melted the lead in a series of set pans, each kept at a critical temperature on a small fire. Upon cooling slowly, crystals of lead formed in the liquid metal which was then scrapped off. By repeating this process several times, a silver-rich lead alloy was left for full separation in the refining furnace. The London Lead Company, who dominated the industry in Teesdale, purchased this patent in 1836 and adopted it at all its smelt mills, including Egglestone in Teesdale. This was a distinct advance, as cupellation meant that the litharge remains had to be re-smelted to obtain the lead, whilst the Pattinson process resulted in lead metal, only requiring purification in a reverberatory furnace, and the silver-rich alloy similarly needed only a minimal amount of refining. To improve the Pattinson process, the London Lead Company later adopted the Rozan method, patented in 1870. Jets of steam were used to stir molten lead in the pots, which could hold up to 30 tons, allowing the de-silvered lead to be drained away and saving on labour costs with

¹⁵ R White, *Book of the Yorkshire Dales, Landscapes Through Time*, (London, 1997), p. 67-

mechanisation. Unfortunately, no photographs or archaeological evidence has been discovered of the use of this process in Teesdale.

The health risks to the smelters were also high. To allow the lead fumes to escape, smelt mills were deliberately airy subjecting the smelters to the intense heat of the hearth on their faces and cold draughts down their necks. The fumes also caused undesirable damage to vegetation in the area which, in turn, could poison sheep and cattle with the high content of sulphur dioxide as well as traces of lead in the fumes. Long flues were introduced to allow the fumes to condense, making the smoke largely innocuous and to save money by recovering valuable lead from the flue walls. If a long flue was impractical or there was a need to avoid the expense of constructing a large chimney, condenser chambers were also developed. Any waste that was left over was placed on to a spoil heap and often used as an aggregate in the construction of local roads.¹⁶

However, searching for lead-bearing rocks was a slow and capital consuming process, as will later be shown by the investments that were required. That there was lead there to be obtained in the first place was a gamble. In an ideal situation, as demonstrated by the London Lead Company in Teesdale, the profits gained from the extracted and smelted lead would be used to finance exploration for further lodes and invested in improvements in the mining, dressing, smelting and transportation processes and to offset any losses thus caused. Unfortunately, this rarely occurred outside Teesdale, with companies often seeking quick profit with no provision for development, which was usually financed by speculative capital or the enterprise of a separate company. This was reflected in the intermittent working of many of the mines, more especially the smaller ones. Leases were taken up, a small company formed and work pursued on a short-term basis. If viable lodes were discovered they would be worked out immediately for instant profit, irrespective of the market price of lead at that time. The majority of the profit would be then distributed in dividends. Upon the exhaustion of that particular lode, further exploration would then take place but would be rapidly abandoned if success was not swiftly achieved. At a later date, often when the lead price was high enough to engender interest, another company would then be formed to continue the mining operation for more lead extraction and the possibility of instant profit.

¹⁶ W Forster, *A Treatise on a Section of the Strata From Newcastle-upon-Tyne to Cross Fell*, (3rd edition, revised by W Nall, Newcastle-upon-Tyne and London, 1883), p. 183.

The lead mining industry was thus renowned for being highly speculative. The chance of sudden riches or total debilitating losses were unparalleled in post-Industrial Revolution Britain. Coal and iron were far more constant and consistent for successful mineral investment and, as a result, the government recognised the distinction by giving lead mines exemption from poor, highway and other rating burdens until the end of the nineteenth century.¹⁷

Unlike most of continental Europe, where minerals were generally regarded as the property of the Crown or nation, in Britain there was a common law right that private citizens owning freehold surface rights also had prima facie absolute right to the subsoil and minerals underneath their land. On the whole, direct enterprise by the landowner was uncommon, with owners of the mineral rights finding it more convenient to lease the property to speculators, referred to as adventures, in return for a small annual rent and a royalty of a set proportion of the ore raised, thus receiving a steady income with no capital cost and minimal risk. Some property owners did take shares and others (most notably Sir George Denys in Swaledale) were actively involved in the operating company but, with the advanced technology and increasing costs, direct enterprise became increasingly less attractive. Mineral owners left the management of the mines to their agents, often “good practical men but poor strategists”.¹⁸

The lease drawn up between the landowner and the lead mining company were for a set period of time, usually twenty-one years. A practice that Jennings quite rightly argued was too short a time scale for mining development and a major disincentive for long-term investment.¹⁹ The mineral owner could stipulate conditions for the lease to encourage the subscription of capital; such as the driving of a new level, putting a lower limit to the amount of miners or men working on “deads” at the mine, and placing a time limit onto how many days could pass with no productive work taking place. Incentives included lowering the royalty rate for a set period of time and refunding the ground rent if a certain level of productivity was attained. However, if the company found the going too hard or the returns from the mine were not as high as expected, the lease would simply be surrendered or the mine was just abandoned.

¹⁷ A Moil, *Mining and Mining Investments*, (London, 1904), pp. v-vi.

¹⁸ B Jennings, *The Lead Mining Industry of Swaledale*, p. 70.

The organisation of the labour force was also different from other mining industries. Coal and iron miners were usually employed on a simple piece rate system, paid according to the amount of tonnage or footage they had quarried. Lead mining adopted a Cornish "tribute" system which entailed sub-contracting. Miners worked in gangs, whose leader had to negotiate a contract or "bargain" with the mining company's agent at an "auction", usually held in a public house. Bargains were gained by gangs who offered the cheapest price and the length of the contract could be anything between one to six months. At the end of the contract, the leader would be reimbursed for the prearranged value of the ore which the gang had extracted. Deductions were made for dressing the ore prior to smelting, if not undertaken by the gang, transport costs to the smelt mill and even candles were purchased from the company. The leader would then distribute these earnings accordingly amongst the gang members. Miners also had to purchase their own tools.

This meant that each gang had to make certain that their produce was kept separate from that of other gangs. The bargaining system should have ensured great attention to quality and the minimising of waste with the added benefit of integrating underground and surface operations. It could be construed as reward to the miner for personal skill and experience and, conveniently, removed the need for a large amount of supervision from the mine company, who only had to employ an agent to direct and oversee the operation. The miners saw themselves not as employed labourers but as sub-contracted, skilled, independent business men.

There were, however, possible drawbacks for both sides. If the agent believed the ore quality of the area of the mine for the contract was poor, the price per ton of ore agreed in the bargain would be higher than for a lead-rich part of the mine. This was to encourage the gangs to obtain as much ore as possible. This could benefit the gang, as if the content of lead in the ore they were mining increased, they could earn more money as they were often contracted to be paid per ton of lead not per ton of ore. Unfortunately, if there was any deterioration in the lead content of the ore or the rock through which they were driving hardened, slowing their progress, the miners lost money. The company was accordingly protected from the effects of short-term fluctuations by ensuring that the bargains were always agreed at a price considerably lower than the market value of a ton

¹⁹ *ibid.*, p. 169.

of lead, while there was a constant incentive for the miners to find an lead-rich lode. Fluctuations in the lead price affected the mining companies involved; if the lead price soared a higher profit was made without passing this down to the mining gangs, and if the price dropped significantly the costs of extracting the ore outweighed the sale price. The mining company, however, could always cancel existing contracts. The bargained contracts spread the risk of mining equally between the owners and the miners but not the reward. "The lottery of the mine, like every other lottery, has a strong influence upon the mind...the large gains of the miners who are fortunate in falling in with the rich ore in no way benefit the other miners, except as affording them hope that one day it may happen to them".²⁰

²⁰ BPP, *Children's Employment (Mines)*. Royal Commission Report; 1842 (382) XVII, quoted by L. Turnbull, *The History of Lead Mining in the North East of England*, (Newcastle-upon-Tyne, 1975), p. 21.

4. Lead Mining Before 1865

There is a tradition that lead mining in the Yorkshire Dales can be traced back to the Iron Age. Indeed, archaeologist Sir Mortimer Wheeler stated that the Briganti tribe of northern England were skilled metal workers.²¹ In Swaledale, a tradition has grown that there was a Roman penal colony at Hurst using slave labour to work for lead. The basis for this was the apparent discovery of a pig of lead found at Hurst before 1859 inscribed with the Emperor Hadrian's initials, thus dating the pig to be between 117 to 138. The first known record of this discovery was by H Speight in 1897.²² Neither the artefact, supposedly stored at the British Museum, nor any other record of it have been located, despite the strenuous efforts of authors Hartley and Pontefract in the 1940's. With no archaeological evidence of any Roman activity between the forts at Bainbridge and Bowes, no evidence of the lead ingot ever being in existence and, finally, the large time span between the alleged discovery and Speight's report it is probable that the tale of the Hadrian pig is entirely apocryphal. The first known record confirming that there was lead mining activity in Swaledale is from the twelfth century when, according to the Pipe Rolls of Henry II, 700 tons were extracted between 1179 to 1184.²³ In Wensleydale, Jervaulx Abbey was given the right to dig for lead and iron ore.²⁴ Whilst in Teesdale, the earliest surviving mining record is 1550, when Flakebrigg mine was noted to be neglected but formerly productive and leased to the Bowes family.²⁵

According to Burt, the organisation and finance of the British lead mining industry passed through three stages closely linked with improvements in mining technology: the first stage was the traditional small scale, locally financed system of small parties of working miners; the second was the expansion in the seventeenth century when the miners, unable to meet the rising capital costs, were replaced by the mineral owner or a group of mineral owners and wealthy speculators, usually from outside the local area; and the third stage in

²¹ Sir R E M Wheeler, *The Stanwick Fortifications*, (1954), pp. 29-30, quoted by B Jennings, *The Lead Mining Industry of Swaledale*, p. 17.

²² H Speight, *Romantic Richmondshire*, (London, 1897), p. 207.

²³ R Fieldhouse & B Jennings, *A History of Richmond and Swaledale*, (London & Chichester, 1978), pp. 62-63.

²⁴ A Raistrick, *The Lead Industry of Wensleydale and Swaledale; Volume 1 The Mines*, (Buxton, 1975), p. 18.

²⁵ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, (London, 1965), p. 152.

the early nineteenth century was the beginning of a nationally financed, large scale mining industry.²⁶

As Jennings noted, Swaledale with the ambitious and exploitative landlords, the Bathursts of Arkengarthdale and the Whartons of Healaugh, did progress to Burt's second stage with a resultant rise in population.²⁷ This expansion was intensive and it became the practice for each company to have its own smelt mill near to the mines, fuelled often with peat as the coal from the nearby Tan Hill pits in Arkengarthdale was of an inferior quality and the fuel supplied from the Durham coalfield was increased in price threefold by the transport costs.²⁸

However, Swaledale did not follow Burt's staged process to become a nationally financed organisation with funding from adventurers from outside of the area in the early nineteenth century. From the late 1820's up to the 1870's, the controlling interests of the mines were held by a group of local professional families who invested in them: the Jacques from Easby, who had made their fortune in foreign trade; Tomlins, the solicitors of Richmond; the Bradleys of Richmond; the Robinsons from Richmond and Reeth (including a medical practitioner); and the Knowles from Low Row, who also ran a worsted spinning mill there until 1870.²⁹ Fieldhouse and Jennings have reported that Dr Robinson uttered the immortal phrase, "mining was likely to pay better than physic".³⁰

Hallas believed that mine management in Swaledale had been poor and that the above local families took over as external adventurers found the costs too high and the returns too low after the Napoleonic Wars.³¹ It was believed that local investors were less likely to withdraw from an enterprise than an absentee interest and that these local partnerships, which held regular meetings at the mines and placed less reliance upon a mining agent for the operation of the mine, generated more confidence in the area. With their local connections, they were also seen as a powerful means of ironing out potential problems between the mineral owners, the companies and the workforce. Their investments and

²⁶ R Burt, *The British Lead Mining Industry*, p. 57.

²⁷ B Jennings, *The Lead Mining Industry of Swaledale*, p. 26.

²⁸ *ibid.*, p. 55 and p. 68.

²⁹ J Hardy, *Swaledale, Portrait of a North Yorkshire Mining Community*, (Kendal, 1998), p. 15.

³⁰ R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, p. 220.

³¹ C S Hallas, *Economic and Social Change in Wensleydale and Swaledale in the Nineteenth Century*, (PhD thesis, unpublished, Open University, 1987), p. 288.

efforts were rewarded with profits, between 1830 and 1860 the profits from the Old Gang mine alone amount to an estimated £100,000.³²

As a result of the 1844 Registration Act, 1855 Limited Liability Act and the 1856 Joint Stock Companies Act, which overhauled the entire system of company registration and limited liability (laying the foundations to current business organisation), from the 1860's onwards, these private partnerships began to be replaced by joint stock and limited liability companies. Investment could now be raised on a nominal share capital, with the opportunity of calls for further capital from shareholders and the issue of debenture bonds, with the distribution of profits as dividends. External capital returned to the dale but it brought with it fear that the capital might be withdrawn at the first indication of economic depression. However, by this time, Swaledale was already in decline as a lead mining centre and, as a result, these joint stock and limited companies had very limited life spans and did not bring any improvements to the industry.

Hallas correctly pointed out that the lead mining industry of Wensleydale was considerably smaller and less well documented than Swaledale, while Raistrick virtually wrote off the valley, "it is perhaps a fair summary to say that Wensleydale had little mining history of any importance before the nineteenth century developments, when it took a very important position in the techniques of smelting".³³ Only separated by five miles of moorland Wensleydale's lead mining operations were very similar to those of Swaledale and on extensions of the same, veins with most of the business capital coming from a local family, the Chaytors of Spennithorne.³⁴

Teesdale completely by-passed stage two of Burt's progress. In 1692, the "Governor and Company for Smelting down Lead with Pit Coal and Sea Coal", better known as the London Lead (Quaker) Company, was formed. As it was established before the South Sea crisis and the 1720 Bubble Act, it was one of only two joint stock lead mining companies operating in the eighteenth and early to mid-nineteenth centuries. The company held mining interests in the Isle of Man, Ireland, Wales, Derbyshire and the

³² R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, p. 222.

³³ C S Hallas, *Economic and Social Change*, p.301 and A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 163.

³⁴ A Raistrick, *The Lead Industry of Wensleydale and Swaledale; Volume One The Mines*, p. 44.

northern Pennines.³⁵ According to Raistrick, the first lease the company took in Teesdale was in 1753 for a small group of mines in the Newbiggin area, followed in 1771 by a lease for the mines and smelt mill at Egglestone and Middleton-in-Teesdale.³⁶ The company concentrated its resources in the Teesdale, Weardale and Alston Moor area in the 1790's and consistently contributed over ten per cent of the United Kingdom's lead ore production.³⁷ Although the London Lead Company dominated lead ore production in Teesdale, there were a handful of smaller mines in the private ownership of small companies or individuals: the Greenhurth Lead Mining Company (three separate companies of the same name between 1821 to 1909); North Greenhurth Mining Company; John Church Backhouse; John Harper Robinson, Mark Sherlock and Company; Dubby Sike Mining Company; Grasshill Mining Company; Wiregill Deep Company; the Shields family; the Lunehead Lead and Barytes Mining Company to name a few.³⁸

³⁵ R Burt, *The British Lead Mining Industry*, pp. 62-65.

³⁶ A Raistrick, *Two Centuries of Industrial Welfare, The London (Quaker) Lead Company 1692-1905*, (second edition, London, 1977), pp. 13-14.

³⁷ A Raistrick, *Two Centuries of Industrial Welfare*, pp. 12-13, R Burt, *The British Lead Mining Industry*, pp. 64-65 and *The Mineral Statistics of the United Kingdom*.

³⁸ *The Mineral Statistics of the United Kingdom* and H L Beadle, *Mining and Smelting in Teesdale*, (Guisborough, 1980), p. 4.

5. Output and Changes in the Lead Market 1865 to 1914

In the mid 1850's, the price of lead per ton was consistently above £24 per ton. Apart from the early 1870's, this price was not achieved from then on until the beginning of World War One. The price remained relatively stable until the late 1870's, when increasing lead imports resulted in a depression which remained in the lead mining industry until the build up in armaments prior to World War One, with a temporary rise in prices in 1899 and 1900, coinciding with the Boer War.³⁹

Between 1865 and 1877, the average price for one ton of metallic lead was £20.43, the highest recorded price was £24.13 in both 1873 and 1874 and the lowest was £18.00 which occurred in both 1870 and 1871.⁴⁰ This represents a boom period for the domestic lead mining industry. However, the lead mines in Swaledale and Wensleydale were already in decline by the beginning of the 1870's. Teesdale should have been buoyant but, as will be shown later, the London Lead Company was already concerned about the state of the lead market as early as 1868; "(the court) regret the state of the Lead Market should be so adverse to the prosperity of the Company".⁴¹

The overall lead output for Swaledale had peaked in 1869, with 5,693 tons of lead ore. In 1873 and 1874, when the price of lead was at its highest, 3,866 and 4,125 tons were produced respectively. For the final full year of high prices, 1877, the output of ore was 3,568 tons.⁴² The actual fall in the output in the main mines in Swaledale was also partly hidden by the rise in output from Arkengarthdale. Similarly, the high price in lead was not benefiting Denys' AD Company's investment in the Sir Francis Level as the first call recorded made for additional capital from the shareholders was made in 1875.⁴³ From 1870 to 1873, Arkengarthdale produced an average of 734 tons of ore per annum. The annual output average for 1874 to 1877 rose to 1,495 tons.⁴⁴

Wensleydale was already deep in decline. In 1865, the output was 1,420 tons of ore, 1866 was the last year the dale produced over 1,000 tons and the output had dropped to 224.4

³⁹ *The Mineral Statistics of the United Kingdom.*

⁴⁰ *ibid.*

⁴¹ Northumberland County Record Office, *LLC 31 28/07/1868.*

⁴² *The Mineral Statistics of the United Kingdom.*

⁴³ North Yorkshire County Record Office, *ZLB 3/14.*

⁴⁴ *The Mineral Statistics of the United Kingdom.*

tons in 1873.⁴⁵ The production figures for Teesdale, between 1865 and 1877, averaged 5,173 tons of ore per annum. The highest annual output was in 1871, with 5,944.5 tons, and it is of note that in 1885, 5,989 tons of ore, and, in 1888, 5,913 tons were produced, demonstrating that Teesdale was not mirroring the decline in production of Swaledale and Wensleydale at that time.⁴⁶ As will be noted later, mines were being abandoned in Swaledale and Wensleydale during the 1860's and 1870's, even though the price of lead remained high. The first major fall in the price of lead occurred in 1878, when the average for the year was £16.70 with the lowest price at £14.63. The price steadily declined to an average of £11.30 in 1884 and £11.50 in 1885, with lows of £10.25 and £10.63 respectively, a halving of the price from ten years earlier. The late 1880's saw a small and brief recovery in price with an average of £13.39 in 1890, but the bottom of the downward trend was not reached until the early 1890's. The lowest annual average price was achieved in 1894, with £9.59, and there was no recovery until the onset of the Boer War in 1899.⁴⁷ The falls in the price of lead are amply demonstrated by the income figures from the London Lead Company. In 1877, the company earned £1,172,488.51, in 1878, £111,088.36, but in 1879, this had dropped to £78,257.81.⁴⁸ After 1878, the company failed to generate over £100,000 in lead sales. The lowest two years were 1883 with £20,12.69 and 1894 with £20,730.⁴⁹ The average lead price for both these years was low but the years preceding these two years also saw dips in lead production for the company.

⁴⁵ *The Mineral Statistics of the United Kingdom.*

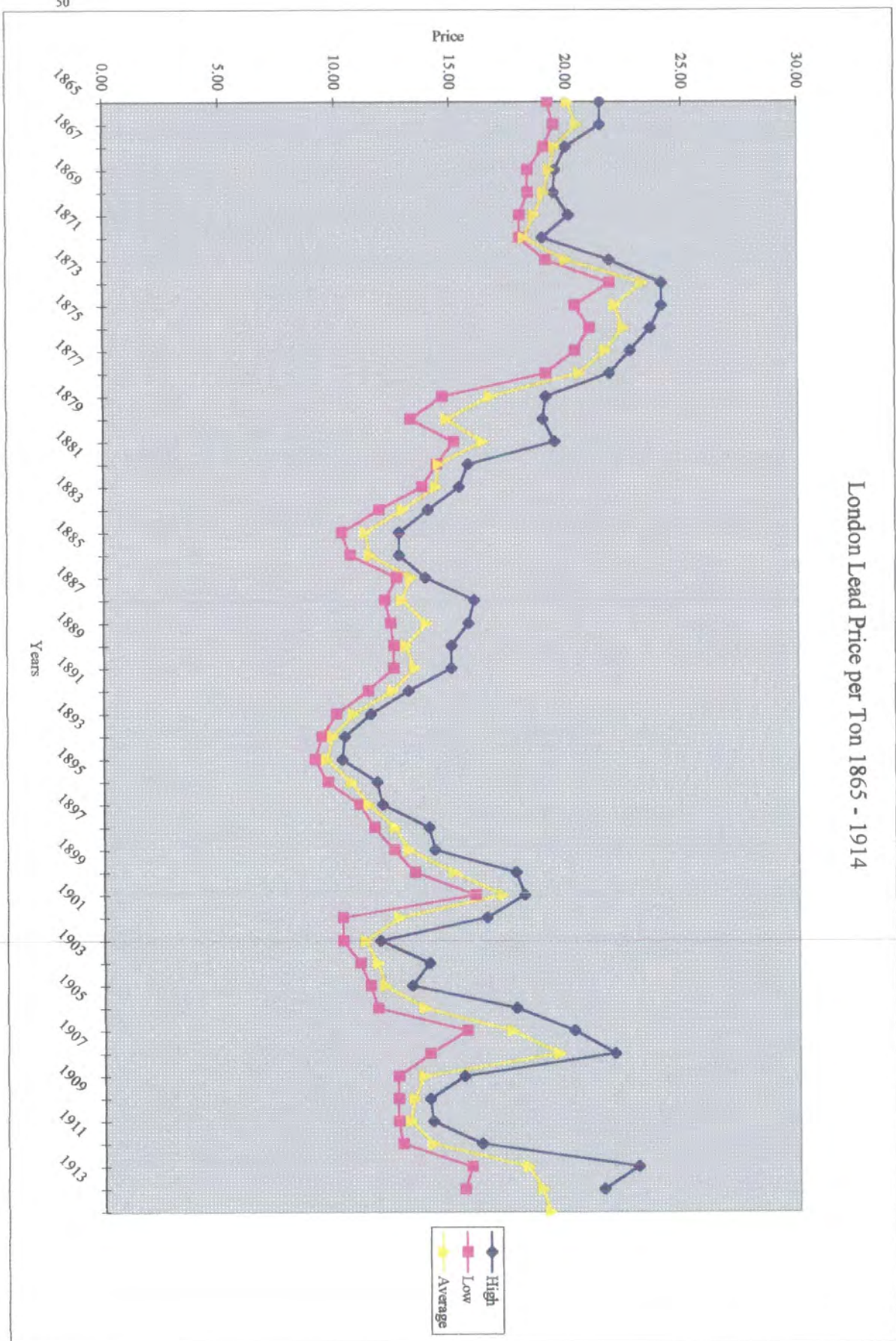
⁴⁶ *ibid.*

⁴⁷ *ibid.*

⁴⁸ NCRO, *LLC 33.*

⁴⁹ NCRO, *LLC 34, 36 and 37.*

London Lead Price per Ton 1865 - 1914



⁵⁰ *The Mineral Statistics of the United Kingdom.*

As noted previously, Swaledale was already in decline before the first drop in lead price. This is shown in both the production figures and the royalties paid to the Denys family from the Old Gang mine: 1870, £ £3,209; 1871, £2,329; 1872, £2,630; 1873, £3,524; 1874, £2,550; 1875, £1,918; 1876, £1,024; 1877, £1,062; 1878, £930; 1879, £1,834.55; 1880, £1,040.94; 1881, £826.15; 1882, £1,020.59; 1883, £416.54; 1884, £351.09; 1885, £562.68; 1886, £603.13; 1887, £194.01.⁵¹ Between 1875 and 1883, silver was extracted from the lead, using the slower and less efficient cupellation process; 60 per cent of the silver was produced in Arkengarthdale, which was also producing 55 per cent of the lead ore at that time. Although, lead mining continued in Swaledale up to the beginning of the First World War, the output was insignificant from 1892 onwards, when the valley's production fell to less than two per cent of the United Kingdom's lead ore output.⁵²

Wensleydale had already failed as a lead producing area. The last year that the valley produced over 500 tons of ore was 1876, before the major price fall, and from 1884 no more than 160 tons of ore were produced annually with the final recorded output of lead occurring in 1896.⁵³

Teesdale, on the other hand, increased the proportion of lead it contributed to the domestic output. In 1865, Teesdale produced just over six per cent of the United Kingdom's lead ore output. By 1885, this had risen to nearly twelve per cent and peaked briefly above twelve per cent in 1894.⁵⁴ The increase in proportion does not signify an increase in production but a decrease in the United Kingdom's overall output and this, as shown, did not bring any increase in profits. The London Lead Company court minutes show, as will be noted later, the cost of production per ton of lead metal from October 1886 to December 1894.⁵⁵ The highest cost was in April 1889, at £22.52 per ton, the lowest £5.39, in January 1893, coinciding with the industrial action by the miners over the times of work. The highest annual mean for production cost was in 1891, at £16.86 per ton of lead produced, and the lowest £8.93, in 1893.⁵⁶ When compared to the standard lead price the improvements in productivity did not bring such a large improvement as the company probably desired. In 1891, the average cost for one ton of metallic lead was

⁵¹ NYCRO, *ZLB 2/279*.

⁵² *The Mineral Statistics of the United Kingdom*.

⁵³ *ibid.*

⁵⁴ *ibid.*

⁵⁵ NYCRO, *LLC 35, 36 and 37*.

⁵⁶ *ibid.*

£12.44, indicating a loss of £4.42 for every ton of the 2,050 tons of metallic lead the company produced. In other words a deficit of £9,061. In 1893, the average lead price was £9.84, a profit of 91p for each ton of the 2,507 tons of metallic lead the company produced during that year, generating a profit from lead of £2,281.37. Silver would have contributed towards the final balance of the company but production costs for this mineral are not available. By 1900, however, when the price of lead had experienced a brief recovery, the percentage of lead ore produced by Teesdale had dropped to under three per cent of the country's total, and, by 1903, it was only one half of one per cent.⁵⁷

It is of note that the London Lead Company did make strong efforts to reduce its production costs to combat the fall in the price of lead, unlike the mining companies of Swaledale and Wensleydale. In 1932 the Mines Department suggested a formula for calculating the value of lead ore per ton which clearly indicates the determinants.

$$\frac{L(P - 4) - R/C + S}{100^{58}}$$

L = London lead price.

P = percentage of lead in the ore, minus four per cent to cover losses in manufacture.

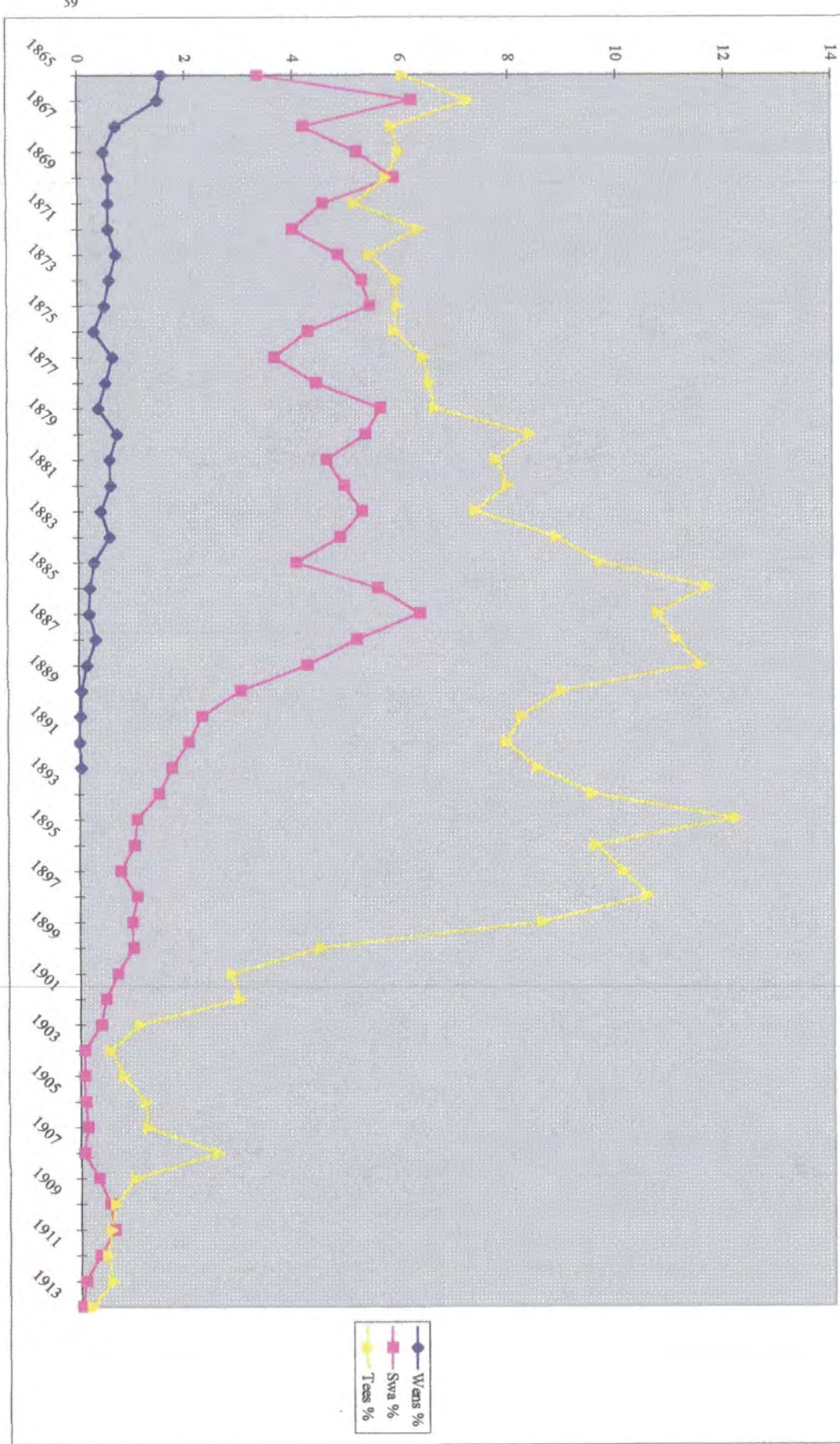
R/C = Returning charges of cost of carriage, fuel, labour, wear and tear, interest on capital et cetera.

S = value of silver in the ore.

⁵⁷ *The Mineral Statistics of the United Kingdom.*

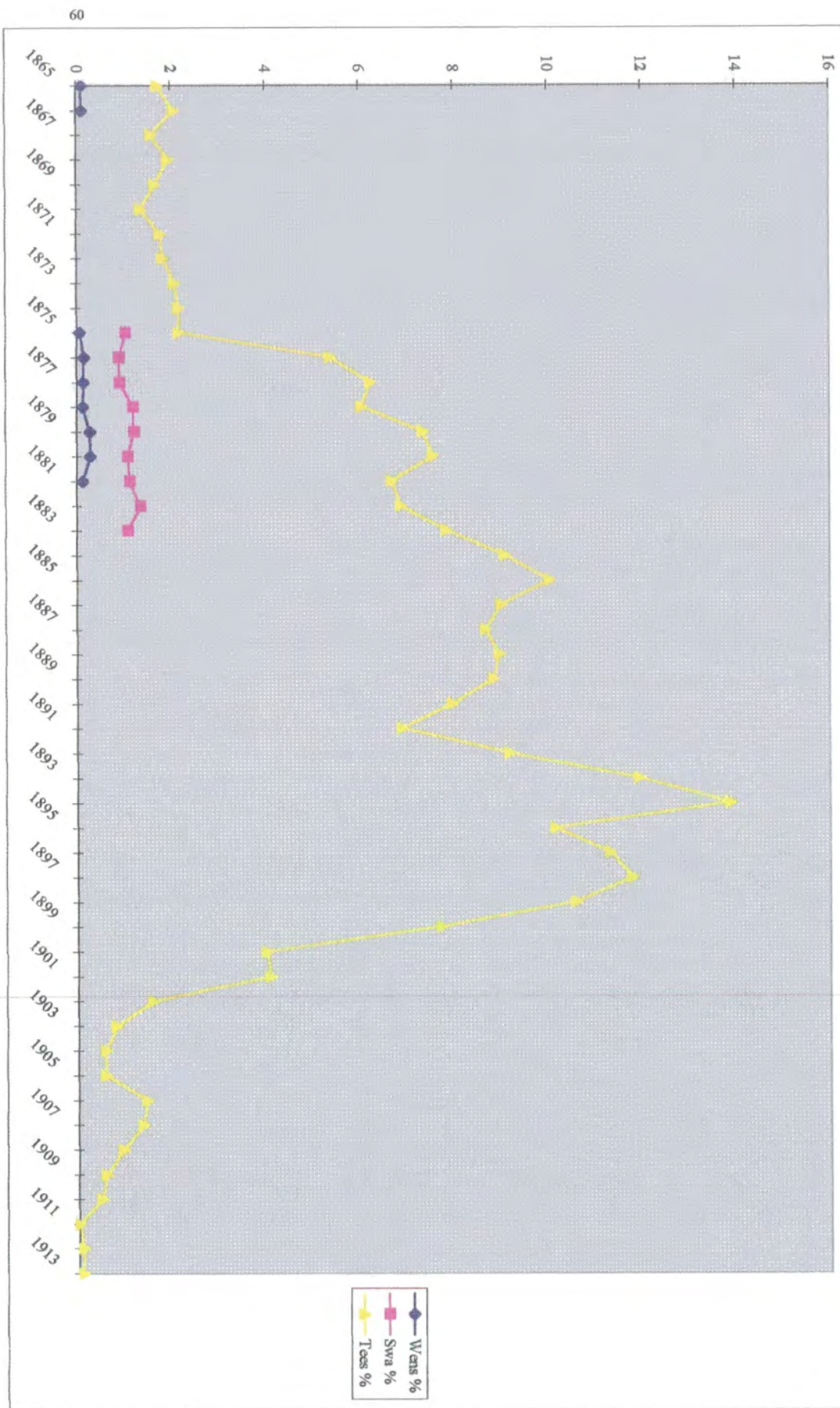
⁵⁸ Mines Department, *Report by the Advisory Committee for the Metalliferous Mining and Quarrying Industry in the Possibilities of Developing or of Reviving the Work of Metalliferous and Associated Deposits in Great Britain*, (London, 1932) quoted by R Burt, *The British Lead Mining Industry*, p. 206.

Wensleydale, Swaledale & Teesdale Lead Ore Production as a Percentage of UK Lead Ore Output 1865 - 1913



⁵⁹ *The Mineral Statistics of the United Kingdom.*

Wensleydale, Swaledale Teesdale Silver Production as a Percentage of UK Silver Output 1865 - 1913



⁶⁰ *The Mineral Statistics of the United Kingdom.*

The London Lead Company did exploit the ore field in a planned and more defined manner. The Swaledale companies made no attempt to stabilise output by slowing down the exploitation of rich ore lodes and shoots. They were cleaned out as soon as possible which goes some way to explaining the erratic production figures for each of the mines and the area as a whole. As will be shown with Arkengarthdale, the actual price of lead bears no bearing on the output figures from the Swaledale mines, where the bulk of the ore had been extracted before there was any drop in price. The profits made by the Arkengarthdale Mining Company during the period of steep decline in the lead price shows that a good mine could still make a profit when the price of lead was low. Similarly, the figures for Swaledale demonstrate that even when the price of lead is high, a mine that has been worked out would not make a profit.

The rapid fall in price was due to several factors. In the United Kingdom, the domestic supply of lead ore was obviously declining. There was no fundamental growth in technology to improve the industry, only improvements on existing practices used in the lead mines. In the older domestic mines it became more difficult and more expensive to obtain the lead. At the same time, there was an increase in competition from the new, shallow and rich mines of the United States of America, South America, Africa, Australia, the Middle East and Europe. In Spain, there were cheaper labour costs, lower royalties, considerably easier access to the ore which also had a higher silver content. The trans-continental railways of America opened up the mineral fields of Nevada, Utah and Colorado. Lead ore was discovered at Broken Hill in New South Wales, Australia, in 1883. By 1886, this mine was producing 50,000 tons of lead ore per annum.⁶¹ The United Kingdom produced 53,420 tons overall in the same year.⁶² From 1860 to 1870 the lead ore output of Germany also increased by 100 per cent.⁶³ Lead consumption continued to rise but the supply of lead outstripped the demand.

The relaxation of import duties in 1826 and their total abolition in 1845, encouraged the importation of lead.⁶⁴ The import increase curve became steeper in the 1850's, from 1865 onwards imports exceeded the United Kingdom's export of lead and by the 1880's,

⁶¹ L Turnbull, *The History of Lead Mining in the North East of England*, p. 13.

⁶² *The Mineral Statistics of the United Kingdom*.

⁶³ B Jennings, *The Lead Mining Industry of Swaledale*, p. 183.

⁶⁴ R Burt, *The British Lead Mining Industry*, p. 226 and p. 235.

imports were double the domestic lead output.⁶⁵ Foreign lead was cheaper and the ore was often imported for smelting at British ports. At Newcastle-upon-Tyne, smelt mills ran for twenty four hours of the day throughout the year and enabled imported lead ore to be re-exported as refined metal.⁶⁶ The influx of cheap imports was noticed in 1886 by William Wallace, who had retired from the London Lead Company in 1869.⁶⁷ “At the present time the low price of lead entirely prevents any hope of raising lead ore from old workings profitably...The Spanish mines are not deep, and the best workmen are paid low wages...It is impossible to obtain lead from greatly exhausted mines in Alston Moor to compete in price with the Spanish lead raised from rich mines at much less cost of labour”.⁶⁸

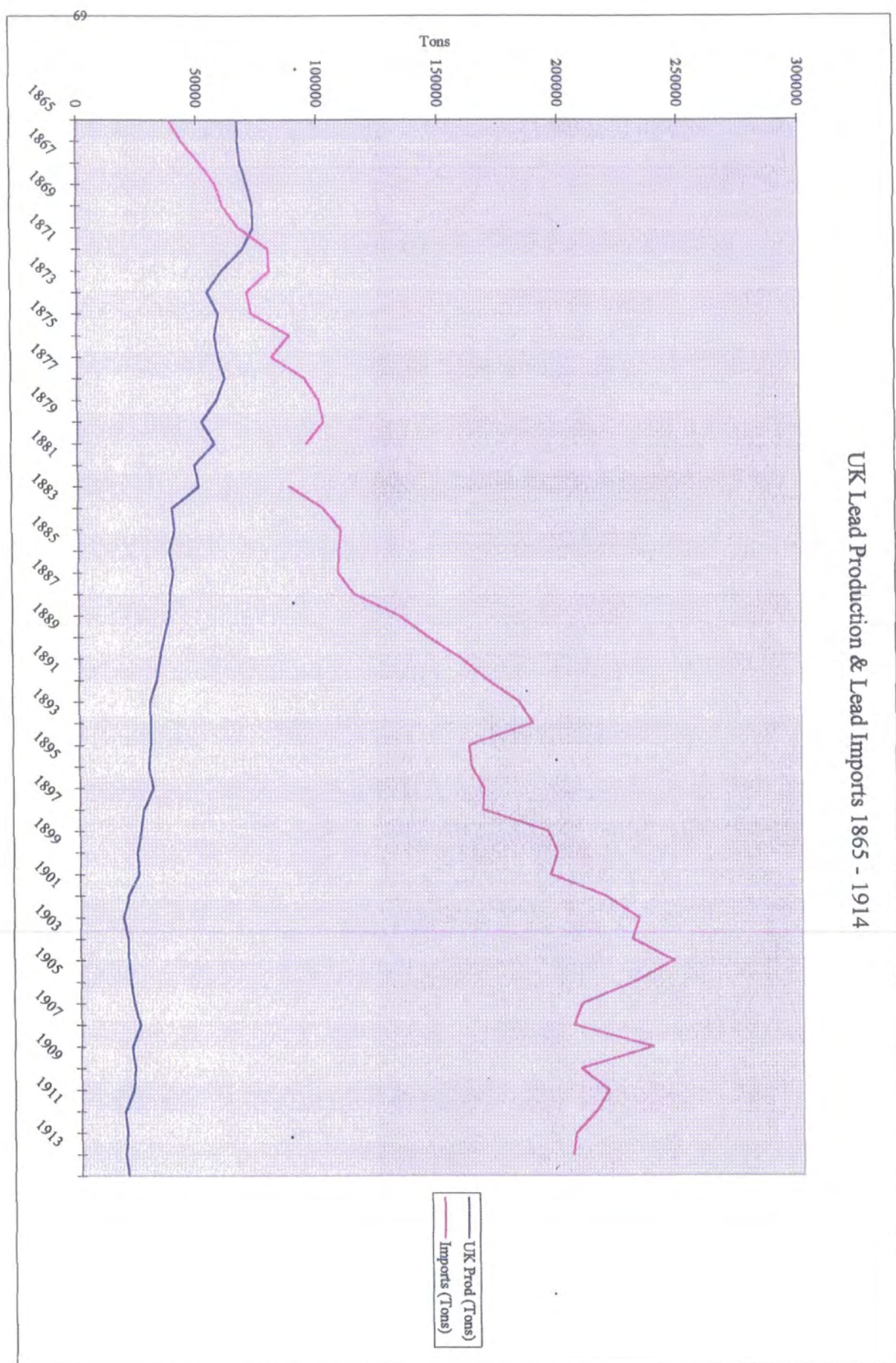
⁶⁵ *The Mineral Statistics of the United Kingdom.*

⁶⁶ L Turnbull, *The History of Lead Mining in the North East of England*, p. 47.

⁶⁷ NCRO, *LLC 31 28/09/1869*.

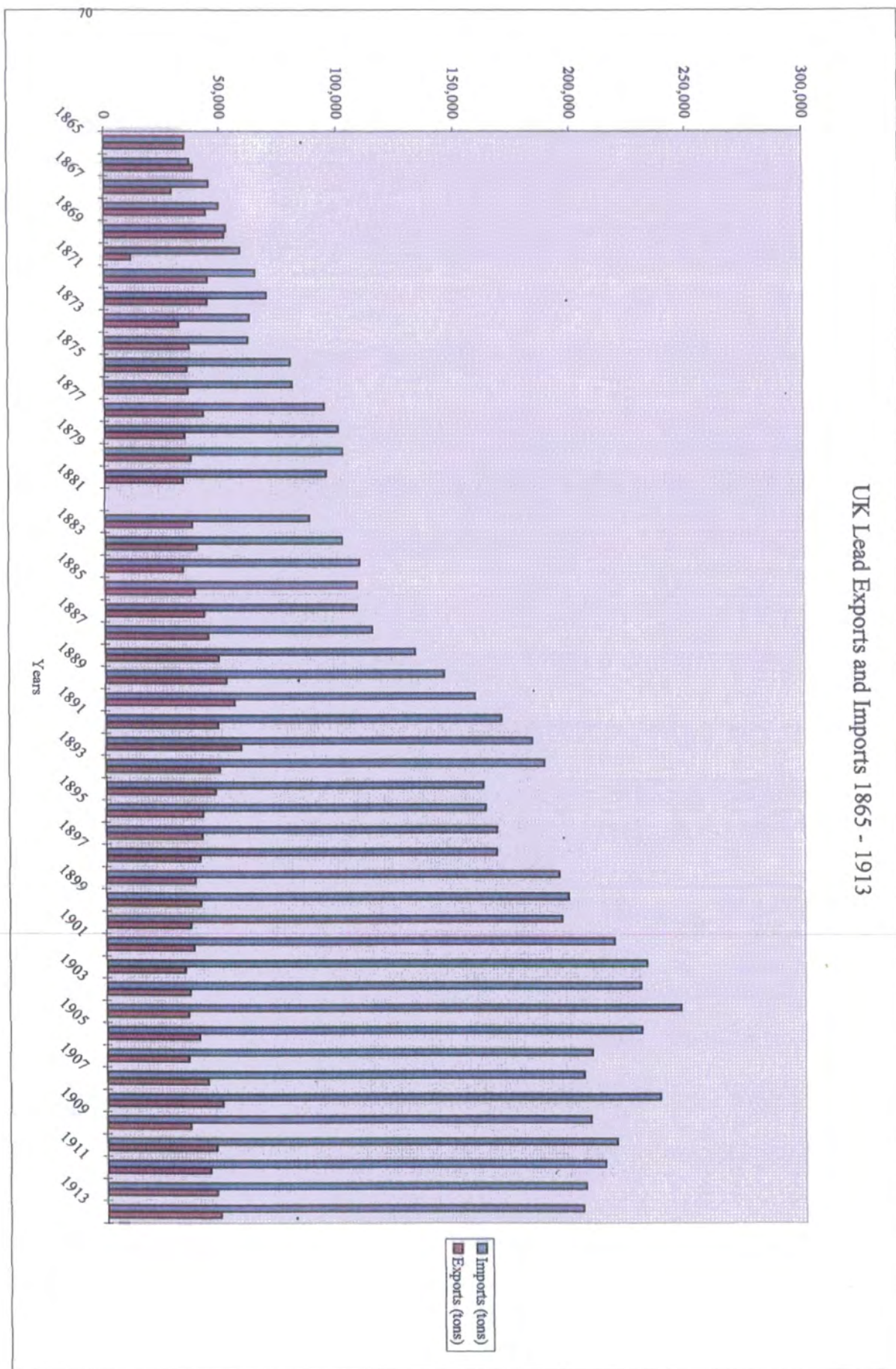
⁶⁸ W Wallace, *Alston Moor: Its Pastoral People: Its Mines and Miners From the Earliest Periods to Recent Times*, (Appleby 1890), p. 189.

UK Lead Production & Lead Imports 1865 - 1914



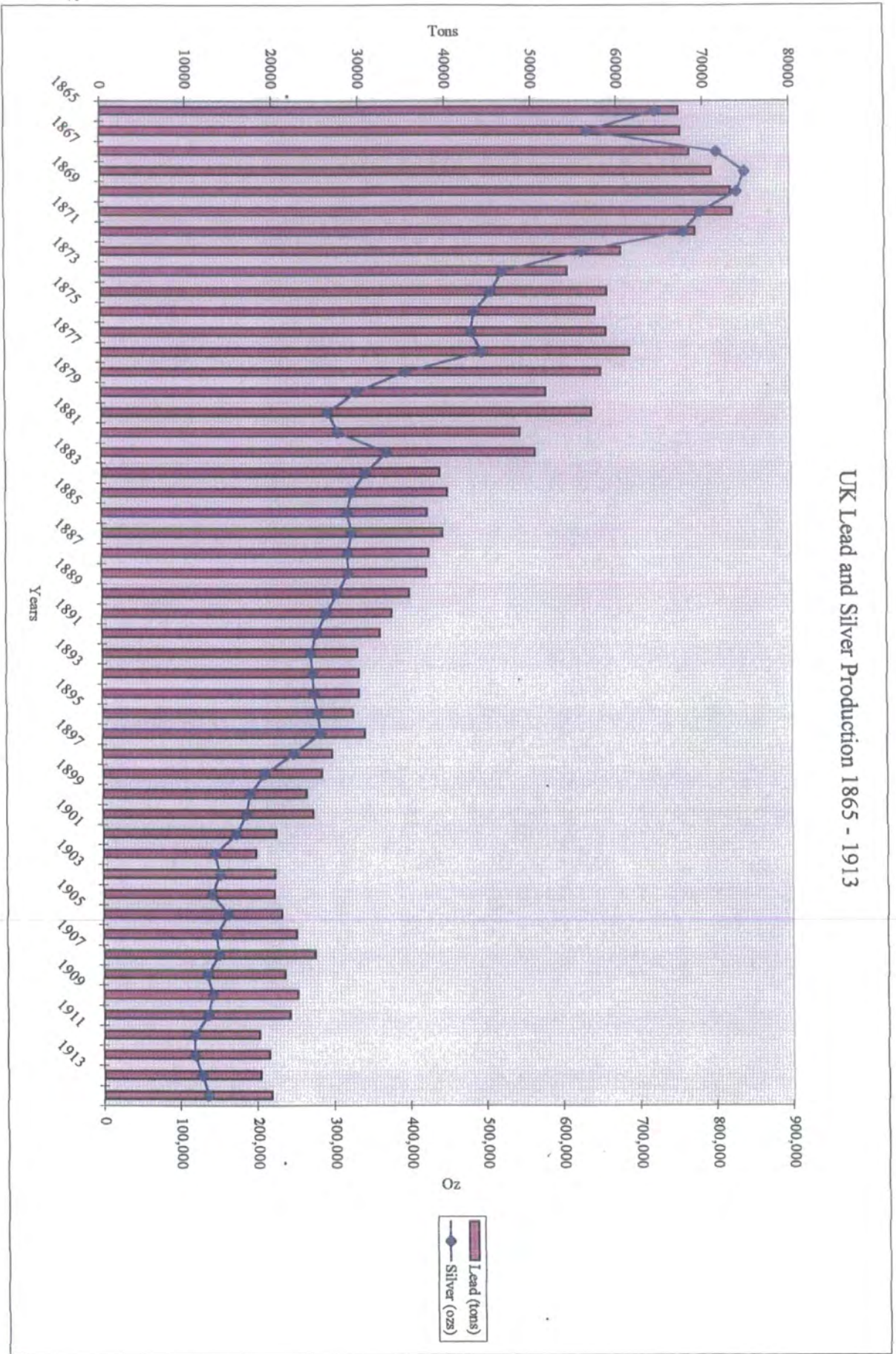
⁶⁹ *The Mineral Statistics of the United Kingdom.*

UK Lead Exports and Imports 1865 - 1913



⁷⁰ *The Mineral Statistics of the United Kingdom.*

UK Lead and Silver Production 1865 - 1913



⁷¹ *The Mineral Statistics of the United Kingdom.*

The rapid expansion in supply completely outstripped the rising demand of industrialisation. World lead production increased by four times between 1870 and 1909, from 300,000 to 1,200,000 tons of metallic lead per annum.⁷² As a result of this over expansion, the price of lead per ton halved. In the first half of the nineteenth century, the United Kingdom had produced over 50 per cent of the world's lead but by 1900 domestic production had dropped to only six per cent.⁷³ This proves that the decline of the domestic lead industry was both a relative and absolute decline in output.

⁷² R Burt, *The British Lead Mining Industry*, p. 279.

⁷³ *ibid.*

6. Mineral Ownership and the Mining Companies

In the eighteenth century, the vast majority of the lead mining area of Swaledale was owned by the Earls of Pomfret. At the beginning of the nineteenth century, there was a division of ownership ably described by one of their descendants, Sir Francis Charles Edward Denys-Burton, in 1908 (in 1906 he had stated that he wished to be known as Denys-Burton rather than simply Denys and to avoid any confusion between him and his father, Sir George Denys, he shall be addressed by the surname he adopted in 1906 throughout this thesis).⁷⁴ He noted that in 1797, Peter Denys, a lead merchant of doubtful parentage, had eloped with Charlotte, only daughter of Earl Pomfret. He was accepted, made a baronet in 1813 and the marriage produced two children, George William and Anna Marie Draycott, who married Sir Francis Shuckburgh Bart. The succeeding Earl Pomfret had no children and his next of kin was Denys but a large amount of the property went to his mother, Charlotte. Subsequently, the son of George William, Sir George, inherited a large part of the estate and lived at AD Hall (renaming it Draycott Hall), Fremington in Swaledale from 1851 to 1881.⁷⁵

It was this Sir George Denys who dominated the lead mining industry in Swaledale as both a major land-owner (co-owning the ore-bearing land with the Shuckburghs and their descendants and the widow of the last Earl Pomfret, Countess Elizabeth), and controlling the mining companies as managing director. In 1857, he inherited control of the AD Mining Company, an unusual position at that time of being both a lessor and a lessee of the same property, an example of direct enterprise. According to his son, Sir Francis Denys-Burton, he was "ill supported by his co-lessors, who took all they could get out of the Mines, but put nothing back. He died a poorer man in consequence".⁷⁶

Smaller and less significant lead mining areas of Swaledale were owned by other individuals and families. Hurst, situated on moorland to the north of the valley, was owned by the Morley family.⁷⁷ Grinton, formerly the property of Bridlington Priory, had been seized by the Crown during the Reformation and belonged to the Crown Estate until 1877, when Joseph Charlesworth Dodgson Charlesworth purchased first the manor, in

⁷⁴ NYCRO, ZLB 16/1/48.

⁷⁵ NYCRO, ZLB 13/6.

⁷⁶ *ibid.*

⁷⁷ NYCRO, ZHP and ZPL.

1855, and later the surrounding land.⁷⁸ Arkengarthdale, with Arkle Beck a tributary of the River Swale, was under the ownership of Reverend John Gilpin, who died in 1851. His only son, George, inherited the estate in 1854 when he came of age and on condition that he assumed the surname Brown.⁷⁹

Landownership in both Teesdale and Wensleydale was less complicated. In Wensleydale, most of the mining operations took place on the north side of the valley on the property of the Bolton Estate.⁸⁰ Whilst in Teesdale, the area south of the river was under the ownership of the Bowes family, now owned by the Earls of Strathmore. The majority of the land to the north of the river was the property of the Vane family as Dukes of Cleveland and Lord Barnard.⁸¹ Egglestone Common in Teesdale, where the smelt mill and Sharnberry mine were situated, was leased by the London Lead Company from the Hutchinson family of Egglestone Hall.⁸²

In 1865, the following leases were in operation at the mines in Swaledale. Blakethwaite, Gunnerside and Swinnergill (this covers the main mines of Surrender and Swinnergill and the smaller mines of Blakethwaite and Lownathwaite) had been leased by Sir George Denys, Sir Francis Shuckburgh and Elizabeth, Countess Pomfret to Sir George Denys, Richard Machell Jacques, Roper Stote Donnison Rowe Roper, Thomas Smurthwaite, James Robinson and Edward Jacques. This lease for the standard 21 years starting on 10 July 1862. It permitted the extraction of only lead and the royalty of one-sixth of the sale price was to be paid in metallic lead.⁸³ Reeth Moor and parts of Barras End (Old Gang mine) had been leased by Denys, Shuckburgh, Pomfret and the Reverend William Thorpe to R M Jacques, Leonard Jacques, T Smurthwaite, John Tomlin, R Roper and John and James Knowles. This lease was dated 15 July 1863 and had the same conditions as the one mentioned above.⁸⁴ In 1869, the Old Gang lease was revised due to the death of Reverend Thorpe. It was granted to the same lessees with the replacement of John Knowles with Edward Alderson Knowles and the inclusion of Simpson Hutton, Richard Bowes and the widow of John Brown. The lease stipulated that there were to be 24

⁷⁸ Public Record Office *CRES 34/213*.

⁷⁹ L O Tyson, *British Mining No. 53*, (Keighley, 1995), p. 68.

⁸⁰ NYCRO, *ZBO*.

⁸¹ Durham County Record Office, *D/Bo and D/St* and Raby Castle, *Raby Archive*.

⁸² DCRO, *D/Bo/B/104*.

⁸³ NYCRO, *ZLK 3/1/7*.

⁸⁴ NYCRO, *ZLK 3/1/8*.

miners, eight of which seconded onto the Sir Francis Level development (increasing to twelve when driving the level had been completed). This development will be discussed later. The royalty remained at one-sixth and was to be paid in smelted lead.⁸⁵ All the above lessees were local men.

Leases for the smaller mines included Stonesdale and Black Moor from Denys, Shuckburgh and Pomfret to Christopher Lonsdale Bradley in 1858 for 21 years.⁸⁶ However, this venture was not a success as, in July 1868, the South Swaledale Mines Company agent, Ralph Place, informed Denys that Bradley had abandoned Stonesdale in 1861 to join the Hurst Mining Company as a partner and that the mine was in a poor state of repair, even though Denys had dropped the royalty rate down to one-twelfth to encourage development.⁸⁷ Bradley and his partners; George Leeman, Member of Parliament for York; William Fox Clarke, also from York; Thomas Jackson, senior and junior; and James Gow, all from Kent, had obtained a 21 year lease commencing 1 January 1861 for Hurst from Lieutenant Francis Morley. The lessees provided £1,000 worth of goodwill payment in the first year and a minimum annual rent of £200 with additional royalty payments at one-twentieth to be paid if totalling above the £200 rent and this was to be paid in lead.⁸⁸ The Lane End and Keld Side area was leased in 1864, to John Edmond Hovell Thurlow and Joseph Holdsworth, both of London. The lessors were again Denys, Shuckburgh and Pomfret and the royalty was set at one-seventh.⁸⁹ Although, there was still activity at the Grinton, Ellerton and Summer Lodge mines, all leased from the Commissioners of Land Revenue in 1855 by the same families who leased most of the others in Swaledale, these mines were already close to exhaustion.⁹⁰ In 1858, the Commissioners had ordered annual surveys to be completed and the report of 1861 stated that the "old man", a lead mining term for earlier and unrecorded workings, had, "ransacked the ground".⁹¹ The 1864 report even proposed the closure of the mines but the Commissioners failed to act, probably not wishing to lose the income of the rents

⁸⁵ NYCRO, ZLK 3/1/11.

⁸⁶ NYCRO, ZLK 3/1/5.

⁸⁷ NYCRO, ZLB 2/280.

⁸⁸ NYCRO, ZPL 10/1757.

⁸⁹ NYCRO, ZLK 3/1/10.

⁹⁰ DCRO, D/HH/6/4/7.

⁹¹ PRO, CRES 34/213.

and royalties or prejudice the possibility of selling the land as a viable mining investment in the future.⁹²

Arkengarthdale was also held by lease by the usual families; R M Jacques, R Roper, J R Tomlin, John James and George Robinson, E A Knowles, John and James Knowles, William Close, Robert Jacques and Henry Alderson Simpson. The lease, granted on 20 December 1848 for 22 years, only allowed the mining of lead and at a royalty of one-sixth. Hushing was forbidden.⁹³ The lease also confirmed an agreement made in 1841 between the Arkengarthdale and Surrender mines. A wayleave agreement had been taken up by the two groups of lessees in April 1841 allowing Surrender ore to be trammed out through Moulds Level, which constituted a six mile set of mine tunnels connecting Arkengarthdale and Swaledale.⁹⁴ As will be discussed later, this agreement was withdrawn in the 1870's, causing considerable ill-feeling.

Although the majority of the mines in Swaledale were leased by the same families each mine was operated by a different private company, namely: the Blakethwaite Company; the Surrender Mining Company; the Old Gang Company; the Grinton Moor Company; the Whiteside Mines Company; the Summerlodge Mines Company; and the Arkendale Company.⁹⁵ The Hurst Company and the South Swaledale Mines Company were the only two concerns that had the bulk of their capital provided by speculators from outside the region.

There are considerably less surviving records concerning the Wensleydale mining industry. The principal lead mines in Wensleydale were situated to the north side of the valley on the Bolton Estate. The Bolton Archive names its mines as Apedale, Keld Heads, Virgin and Wetgroves.⁹⁶ Robert Hunt's *Mineral Statistics of the United Kingdom of Great Britain and Ireland for the Year 1865*, states that the lessees of these respectively were; John Tattershall and Willis and Company; and the Keld Heads Company, who also leased Virgin. The Wetgroves mine was standing idle and not producing any ore.⁹⁷ Hunt also names other Wensleydale mines as: Askrigg Moor, leased by Thomas Mason from

⁹² *ibid.*

⁹³ DCRO, *D/HH/6/4/477*.

⁹⁴ NYCRO, *ZLB 6/4, 7/20, 41/3 and 3/5*.

⁹⁵ *The Mineral Statistics of the United Kingdom*.

⁹⁶ NYCRO, *ZBO (M) 13/6, ZBO (L) 11, 12, 13, 14, 17, 18, 19, 20, 21 and 25*.

⁹⁷ *The Mineral Statistics of the United Kingdom*.

the Crown; Bishopdale, leased by Ralph Lodge; Bolton Park, operated by Storey and Company; Braithwaite, producing small amounts of ore but with no lessee stated; West Burton, John Tattershall; and Sargill, leased by the Sargill Mines Company from Lord Wharnccliffe.⁹⁸ However, with the exception of Keld Heads, the amount of lead ore produced from these mines was negligible.

The leases for the London Lead Company in Teesdale are notably different from the other two valleys. Those from the Duke of Cleveland involving the land to the north of the River Tees were for double the standard 21 years period. These mine leases covered four specific areas and were not for specified mines, as in Swaledale and Wensleydale. The first area was based at Middleton, using Stanhope Head, Long Man Carrock and Bleagill Bridge as the boundaries. The second area was Newbiggin, defined by Stony Syke, Flakebrigg and Long Man Carrock. The third was from Middleton to the Egglestone boundary, being between Flakebrigg and Stony Syke. The fourth (past Newbiggin) was detailed as being within Dirt Pit, Fenreth Hill, Flushiemere Beck and Newbiggin. These 42 year leases permitted the extraction of any mineral and commenced on 31 October 1869. The date of these lease renewals is significant as they were transacted less than one year after the opening of the Tees Valley Railway which made the possibility of exploitation of other available minerals, especially iron ore, feasible. This will be discussed later. Conditions and royalties did vary between each area. In Area One, the royalty was 48p per bing when a fother was £20, with a plus or minus of 3p per pound to allow for variations in price (one bing was eight hundredweight, a fother was 21 hundredweight and one ton being 20 hundredweight). In Area Two, the royalty was 71p per bing at £20 per fother with the variation of 4p per pound for price fluctuation. The conditions in the lease for Area Two stipulated that 50 men were to develop Little Egglestone Mine, whilst for Area Three it was stated that it would be preferable that the company employed the tenants and farmers of the Duke of Cleveland, unless the staff used were already engaged by the company. The royalties were to be paid in cash and not in lead.⁹⁹

Similarly, the surviving leases from John Bowes to the London Lead Company for mineral extraction south of the River Tees cover a considerably wider area than those

⁹⁸ *The Mineral Statistics of the United Kingdom.*

⁹⁹ DCRO, *D/Bo/110, 111 and 112.*

granted in Swaledale and for a longer period of time. In 1855, he agreed that the company had the mining rights in the Lune, Holwick, Mickleton, Hunderthwaite and Cotherstone manors for 31 years. The royalty was on a sliding scale of one-eighteenth to one-tenth, depending on the lead sale price at the time and this was to be paid in legal tender.¹⁰⁰ In 1862, Timothy Hutchinson of Egglestone Hall granted the company a lease of 21 years for Egglestone Common, the royalty being 53p per bing at £20 per fother with a 3p deviation per pound, which was also to be paid in cash. This lease stipulated that the company had to use Egglestone smelt mill, preventing the company from considering transferring its smelting operations to either of its other smelt mills at Nenthead and Gaunless in Weardale. The lease allowed the company free use of peat, stone and buildings, as long as they were maintained and repaired. The company also had to employ four miners and have no break in production of more than two months.¹⁰¹

The differences in the leases and company organisation above may appear to be slight but gave the London Lead Company several advantages over its Yorkshire competitors. As noted previously, 21 years is a relatively short period of time in the speculative lead mining industry. This encouraged lessees to strip a mine of all the readily available ore rather than invest time and capital in prospecting for potentially rich and profitable ore veins which might not be reached before the end of the lease. It was not an unknown practice to run a mine down in the last few years of a lease in an attempt to persuade the landowner that the mine was approaching exhaustion and to provide the lessee with a more favourable lease with financial inducements, such as a lower royalty or the abolition of an annual rent. The 31 and 42 year long leases granted to the London Lead Company provided more stability and security to allow the financing of more long term projects, from which the company could enjoy the benefits. The royalty rates charged in Teesdale were significantly lower than those in Swaledale. The payment of royalties in cash was also preferable. These payments could easily be checked against the annual accounts of the London Lead Company as a proportion of the lead sold, purchasers ensured that the lead was not under-weighed. Royalty paid in lead was open to abuse by various techniques. The company could provide the lessor with poorer quality lead than sold to the market for profit or simply deliberately under-weigh the amount of lead for royalty

¹⁰⁰ DCRO, D/St/B2/67, 68 and 69.

¹⁰¹ DCRO, D/Bo/B/103.

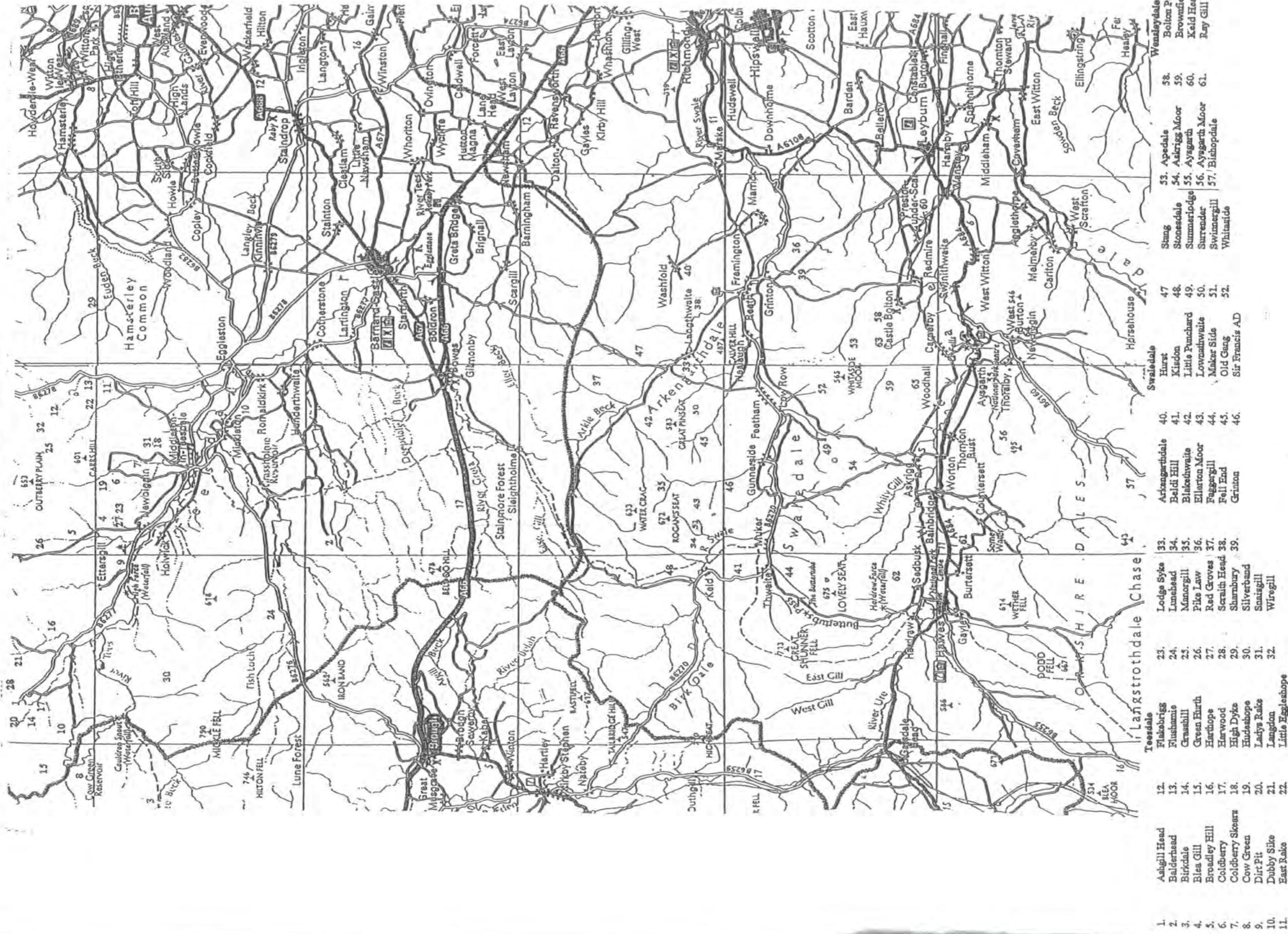
payment. It also provided inconvenience to the mineral owner who had to sell the lead he had received as a royalty payment to generate income.

Similarly, although the main lead mining companies in Swaledale (and to a lesser extent Wensleydale) were run by the same local families, each mine they controlled was run as a separate company. Whilst a major piece of development was occurring at any one mine, it reduced the output of ore significantly and the mine could often consequently run at a loss. If several mines were operated by the same company, profits from other mines could be used to offset any such losses and also pay for the expense of development work. Having a separate company for each single mine removed that possibility. Each Swaledale company also had its own smelt mill. Jennings noted that there were eight in operation for the period being considered; at Keldside, Beldi Hill, Blakethwaite, Old Gang, Surrender, Arken New Mill, Marrick and Grinton.¹⁰² These smelt mills were, on the whole, adjacent to the mine that used them, with the exceptions of Surrender and Marrick, the latter being over three miles away from the mine at Hurst which it served. The London Lead Company, on the other hand, used only one smelt mill at Egglestone for a considerably higher number of mines in Teesdale (as shown on the following map), fuelled by the free peat obtained from the surrounding moorland.¹⁰³ This lowered production costs, employing fewer smelters for a comparable amount of work in a more efficient smelt mill. It also improved the relationship between the lead company and the lead merchants, who were buying the metal, by providing a single point of contact, as opposed to the seven separate mine addresses in Swaledale, even though the same people were running most of those mining companies.

¹⁰² B Jennings, *The Lead Mining Industry of Swaledale*, p. 151.

¹⁰³ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 241.

Principal Mine Locations



104 Map reproduced with permission from the Automobile Association, © The Automobile Association (1994) LIC080/99. Ordnance Survey Grid References from R Burt, P Waite, M Atkinson and R Burnley, *The Yorkshire Mineral Statistics: Metalliferous and Associated Minerals 1845 - 1913*, (Exeter, 1982) and R Burt, P Waite and R Burnley *The Durham and Northumberland Mineral Statistics: Metalliferous and Associated Minerals 1845 - 1913*, (Exeter, 1983).

7. Operation and Investment, Swaledale

As Denys dominated the larger Swaledale mines during his lifetime and Arkengarthdale outlived the industry in Swaledale I shall discuss these later and first concentrate on the smaller mines in the valley; Hurst, Summer Lodge, Grinton, Whitaside, Ellerton and Fremington Edge.

The landowner at Hurst was Francis Morley, a commissioned officer in the first battalion of the third regiment of foot in the army, the Royal East Kent regiment. He had entrusted Christopher Lonsdale Bradley, who published an authoritative work on the lead resources of Swaledale, with the management of the mine and his estate.¹⁰⁵ Morley spent the majority of his career away from Swaledale but returned briefly in April 1866 and expressed dissatisfaction with Bradley's running of the mine. A list of discrepancies was drawn up: which included authorising repairs without Morley's knowledge; Bradley not recording his own pay in the relevant account book; infringing a lease condition by charging the lessor for the smelting of the lead used for royalty payments; and a litany of missing receipts.¹⁰⁶ As a result, a new lease was drawn up and Bradley was replaced as the estate's land agent by Robinsons, solicitors of Leyburn, and by William Anthony Waggett as his mine agent. Morley noted, "I am afraid C L Bradley's star is on the wane".¹⁰⁷ Bradley caused further problems by refusing to hand over documents to the estate and to pass on the proposals of the new lease to the partners of the mining company.¹⁰⁸

The new lease was to commence on 1 January 1867, for 21 years and at a royalty of one-tenth. The conditions, which included the need for 80 pickmen, an increase in 30 from the previous lease, permitted the lessees to sell unsmelted lead but the lessor must receive his duty in lead metal, free of all charges, whether the lead sold by the mine was smelted or not. The Hurst Company could also lease buildings and land at Hurst for up to 21 years, with the exception of the public house, gamekeeper's house and Middleton Farm. Unfortunately, the company objected to the one-tenth royalty duty on the new lease and

¹⁰⁵ C L Bradley, *An Inquiry into the Deposition of Lead Ore in the Mineral Veins of Swaledale, Yorkshire*, (London, 1862).

¹⁰⁶ NYCRO, *ZPL 10/643 and 644*.

¹⁰⁷ NYCRO, *ZPL 10/1788, 637 and 662*.

¹⁰⁸ NYCRO, *ZPL 10/644 and 655*.

actually preferred to pay duty in cash. Further negotiations took place but it was finally signed on 26 February 1868, with minimal amendments.¹⁰⁹ The main lessor was George Leeman, a York solicitor and Member of Parliament. The others included William Fox Clarke also of York, C L Bradley, Thomas Jackson, his son Thomas Jackson, Alfred William Bean and James Gow, the last four being all from Kent.¹¹⁰ Bradley was persuaded to retire as the company mine manager on 6 June 1868 and was replaced by Ralph Metcalfe.¹¹¹ Although Bradley moved immediately to London and later to manage an estate in the midlands, he continued to request information as though he was still the mine manager, Waggett noted "they are well rid of Lonsdale Bradley".¹¹²

The production of the mine during this period was satisfactory with a steady annual increase. In 1865, the mine had produced a poor 137.2 tons of lead ore but in 1867 this had risen to 1,171 and from 1866 to 1877 the average was 550.6 tons per annum.¹¹³ This rise in production compares to the amount of royalty received by Morley. From 1860 to 1865, the minimum annual payment of £200 had only been exceeded once in 1860 with a payment of £232.37.¹¹⁴ In 1867, Morley received £1,012.13 and the average annual royalty payment between 1866 to 1877 was £549.18.¹¹⁵ It is of note that the improved performance of the mine coincided with the replacement of Bradley as agent. In the three years prior to his retirement the mine had run up a loss of £1985.39 but in the year following his departure the company made a profit of £2,809.27.¹¹⁶ However, the output then drastically declined, with the royalty dropping below £200 in 1879 and only 55.4 tons of ore being raised in 1880.¹¹⁷ The company, renamed Hurst Mining Company in 1874, had been constantly in debt to Morley and were breaking the condition in the lease regarding workforce by only employing a total of 26, which included only 21 miners, considerably less than the 80 stipulated.¹¹⁸ Operation at this mine had been reduced significantly and it was being worked on a very small scale.

¹⁰⁹ NYCRO, ZPL 10/736.

¹¹⁰ NYCRO, ZPL 10/740.

¹¹¹ NYCRO, ZPL 10/1940.

¹¹² NYCRO, ZPL 10/780.

¹¹³ The Mineral Statistics of the United Kingdom.

¹¹⁴ NYCRO, ZPL 10/1849.

¹¹⁵ NYCRO, ZPL 10/1816 to 1934.

¹¹⁶ NYCRO, ZPL 10/1975.

¹¹⁷ NYCRO, ZPL 10/1833 and 1836 and The Mineral Statistics of the United Kingdom.

¹¹⁸ The Mineral Statistics of the United Kingdom.

In May 1881, Faithfull Cookson of London inspected the mine and on 6 October of the same year signed a new lease for 21 years with the royalty payments divided into three seven year parts. The first seven years one-twentieth, the second one-sixteenth and the third one-fourteenth. The lease also stipulated an annual dead rent of £100 and a yearly payment of £5 for coal.¹¹⁹ In 1882, Cookson transferred his rights to the lease to a newly-formed limited liability company, the Yorkshire Lead Mines Limited with a declared share capital of £65,000. The directors were predominately from London. A mining engineer, William Henry Hosking, was appointed to survey the mine and John Retallick became the company agent.¹²⁰

Retallick provided the *Mining Journal* with a regular report, claiming progress was being made at the mine. Unfortunately, progress was proved to be very limited in production terms, as no ore dressing machinery was purchased until 1884, making the Hurst mine produce no saleable lead in ore or smelted form between 1881 and 1885.¹²¹ By 1886, no dividends had been paid to the shareholders who had been required to provide a further 50p per share in 1885.¹²² The share price continued to fall until a report appeared in the *Mining Journal* stating that large quantities of high grade ore, rich in silver, had been located, upon which the share price immediately recovered.¹²³ At the Annual General Meeting in April 1887, a profit of £2,170.45 was declared, sufficient to pay a dividend of nine per cent.¹²⁴ The output of the mine had also improved; in 1886 798 tons, in 1887 1,003 tons, and in 1888 925 tons of ore were raised but there had been no silver produced since 1880, despite the reported discovery of silver rich ore.¹²⁵ Tyson estimated that the mine was running at a profit of around £4,800 per annum which was used to provide capital for further investment.¹²⁶ Further dressing machinery was bought and it was decided to sink a new shaft, Brown's New Engine Shaft, east of the Cat Shaft, which had been providing the ore.¹²⁷ A new steam engine was purchased to drive the winding gear, rare in Swaledale as free water power was preferred to purchasing fuel. The boiler was so

¹¹⁹ NYCRO, *ZPL 10/2154 and 2215*.

¹²⁰ *The Mineral Statistics of the United Kingdom* and L O Tyson, *A History of the Manor and Lead Mines of Marrick, Swaledale, British Mining No. 38*, (Sheffield, 1989), pp. 57-58.

¹²¹ *Mining Journal 24/01/1885* and *The Mineral Statistics of the United Kingdom*.

¹²² L O Tyson, *British Mining No. 38*, p. 59.

¹²³ *Mining Journal 12/12/1886*.

¹²⁴ *ibid. 09/04/1887*.

¹²⁵ *The Mineral Statistics of the United Kingdom*.

¹²⁶ L O Tyson, *British Mining No. 38*, p. 61.

¹²⁷ *Mining Journal 04/06/1887 and 27/08/1887*.

heavy that it needed the strength of eighteen horses to pull it from Richmond railway station.¹²⁸

The cost of the development work proved too much for the company which ceased trading in December 1888. A new company, the Hurst Lead Mines Limited, sprang up immediately, under Cookson's supervision, allowing a straight exchange of shares and debentures from the previous company.¹²⁹ This company did not last long. Morley complained that Hurst Lead Mines Limited paid the royalty in undressed lead ore, contrary to the lease. He instigated winding-up proceedings during which it was discovered that the new company had altered the conditions of the 1881 lease.¹³⁰ Unfortunately, for Morley, although the decision of the Court of Chancery on 13 February 1890 was in his favour, costs were not awarded and he was saddled with a legal fee of £739.67.¹³¹ Mining at Hurst ceased. The Hurst Lead Mines Limited was liquidated and, in April 1891, found to be in contempt of court after failing to send a representative to the County Court for non-payment of rates.¹³² It had proved to be unprofitable for the companies involved and the landlords. Major General Francis Morley died in 1892, after a successful career in the army, and the Morley family sold the land in 1895.¹³³

As noted previously, the mines in the Grinton area were predominantly worked out and Summer Lodge mine was abandoned in 1867.¹³⁴ In January 1876, the Crown lease was due to expire. In November 1875, J R Tomlin wrote to the Commissioners regarding his wish to renew the lease but in the following month Joseph Charlesworth Dodgson Charlesworth, owner of Grinton manor, offered to purchase the land for £4,000.¹³⁵ The Commissioners agreed to the sale, provided that the mining lease was renewed to the surviving partners of the 1855 lease; Thomas Smurthwaite, James Robinson Tomlin, Ralph Milner and George Alderson Robinson.¹³⁶ However, the lessees delayed their response to the Commissioners' proposal for too long and, in May 1877, the land was

¹²⁸ *Craven Herald* 03/09/1887.

¹²⁹ L O Tyson, *British Mining No. 38*, p. 62.

¹³⁰ NYCRO, *ZPL 10 2030 to 2083* and *Craven Herald* 03/12/1889 and 13/12/1889.

¹³¹ NYCRO, *ZPL 10/2373*.

¹³² *The Northern Echo* 03/04/1891.

¹³³ DCRO, *D/HH/6/4/121*.

¹³⁴ *The Mineral Statistics of the United Kingdom*.

¹³⁵ PRO, *CRES 34/214*.

¹³⁶ *ibid.*

sold to Charlesworth without any stipulation regarding the renewal of the lease.¹³⁷ With no lease, lead mining was halted at Grinton and Whitaside.

There was a renewal of interest in the Grinton mines when Whitaside was inspected in 1887 by W H Hosking, John Retallick and John Ascough Rodwell, manager of Keld Heads mine in Wensleydale.¹³⁸ Hosking and Retallick were involved in the company at the Hurst mine, which, as mentioned above, had ceased trading that year. It is significant that Hosking and Cookson, also involved with the Yorkshire Lead Mines Limited at Hurst, had also been involved in the promotion of a failed iron mining enterprise at Eskdale, Cumbria, in 1866 and owned some iron mines in Devon and Cornwall which ended in disputable circumstances.¹³⁹ Whether their intentions were honest is very doubtful but in October 1887, the Swaledale Mining Association Limited was established bearing a remarkable resemblance to the failed Hurst concern, with the same company directors and secretary. Colonel Albany Hawke Charlesworth, the new landowner (his father had died in 1880), gave permission for exploration.¹⁴⁰

Hosking made a positive report to the Association, probably in order to raise more capital, and a new company was formed on 25 April 1888, the Grinton Mining and Smelting Company Limited. It declared a nominal capital of £50,000 with shares of £1 each. In exchange for the mining rights held by Hosking and the Swaledale Mining Association, the new company would grant 10,000 shares to the Association and 20,000 to Hosking, a familiar and regular ploy Hosking and Cookson used with the other companies they formed. Colonel Charlesworth granted a 42 year lease with royalty on a sliding scale.¹⁴¹

Following Retallick's example at Hurst, the agent, Rodwell, produced favourable and frequent reports for the *Mining Journal*. Glowing articles were also sent to the *Craven Herald*, including the reporting of a solid piece of ore weighing two hundredweight being discovered at the mine.¹⁴² *The Mineral Statistics of the United Kingdom* tell a very different story. Only 193 tons of ore were raised at Grinton and only three at Whitaside

¹³⁷ *ibid.*

¹³⁸ *Craven Herald* 03/08/1887.

¹³⁹ A Austin, *The Mines of Eskdale*, *British Mining No 43*, quoted by L O Tyson, I M Spensley and R F White, *The Grinton Mines (including Fremington and Ellerton)*, *British Mining No 51*, (Keighley, 1995), p. 55.

¹⁴⁰ PRO [BT31/3957/25100](#).

¹⁴¹ PRO [BT31/26497/4119](#).

during the company's ownership.¹⁴³ The Grinton Mining and Smelting Company was officially dissolved on 31 December 1895.¹⁴⁴

It is of note that Raistrick has claimed that the London Lead Company bought the lease of the Grinton mines and developed them in the eighteenth and nineteenth centuries.¹⁴⁵ He also stated, "all these shafts and levels were developed by the London Lead Company in the early nineteenth century".¹⁴⁶ This is plainly incorrect as the Minute Books of the London Lead Company clearly show. The last entry in the London Lead Company records regarding the Grinton mines is dated 18 September 1733, when the company set up a committee to consider the potential purchase.¹⁴⁷ As the lease was being offered by the lease holder, Hugh Marriott, and the lessor was the Crown, Marriott had no right to sell, a fact which should have been realised very quickly by the company. Certainly there are no more further entries in its records concerning the Grinton mines.¹⁴⁸

The events that took place at Hurst and Grinton mines demonstrate that limited liability companies could be set up purely for speculation and as a means of raising capital. It is open to debate as to whether the likes of Hoskin and Cookson were mining entrepreneurs or were deliberately floating companies for their own financial gains, rewarding themselves with large shareholdings and allowing the companies to become insolvent and dissolved. Considering the fact that the Hurst lease was deliberately altered it appears more likely that they were fraudulent speculators.

Documentation for Fremington Fell End mine, near Grinton, is scarce. According to *The Mineral Statistics*, the mine was operated by Owen Clough between 1862 and 1863 and the Arkendale Company from 1866 to 1868.¹⁴⁹ This company and the succeeding one, the Fell End Mining Company, were in the hands of representatives of the usual Swaledale mining families; George Roper, J Tomlin, Halton Simpson, R Bowes, J and E A Knowles,

¹⁴² *Craven Herald* 16/09/1892.

¹⁴³ *The Mineral Statistics of the United Kingdom*.

¹⁴⁴ PRO BT31/26497/4119.

¹⁴⁵ A Raistrick, *Two Centuries of Industrial Welfare; the London (Quaker) Lead Company, 1692-1905*, p. 125, A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 124 and A Raistrick, *Mines and Miners of Swaledale*, (Clapham, 1955), p. 69.

¹⁴⁶ A Raistrick, *Mines and Miners of Swaledale*, p. 69.

¹⁴⁷ NCRO, *LLC 7 18/09/1773*.

¹⁴⁸ L O Tyson and M C Gill, *The London Lead Company's Yorkshire Mines: A New Assessment*, *British Mining No. 45*, (Keighley, 1992), pp. 151-161 and R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, p. 202.

J R Tomlin and J Brown. In 1871, the Fell End Company gained a lease for 21 years from the landowners, the Swann family of Askham Hall and York and William Clough, also of York. The royalty was one-sixth and there were stipulations for development, with a level to be driven and at least six men to be employed on dead work.¹⁵⁰ This development failed to deliver any satisfactory results. Between 1871 and 1881, only 30.9 tons of ore were obtained and the mine was then abandoned.¹⁵¹

The last lease for Fremington was obtained from the Swann family, who had gained the ownership of the land in 1796, when Francis Wharton mortgaged some of his estates.¹⁵² However, there had been a long standing dispute between the Whartons and the Crown Commissioners as to who actually owned the manor, the Commissioners not withdrawing their claim until 1834.¹⁵³ In November 1938, Frennie Hutchinson enquired on who actually owned the mineral rights of his home, Storthwaite Hall. The Office of the Commissioners for Crown Lands replied that there was still confusion as the property had been sold subject to clauses in the 1771 Enclosure Act which reserved the minerals to the Crown. The response continued, "I suggest the answer...might be simply that many years ago the lead mines of Fremington were included in leases of lead mines in Yorkshire supplied by the Crown but Crown claims to Fremington were abandoned in 1834 in favour of a claim by the Lord of the Manor and we have no information as to who is the present owner", thus making any future mineral rights uncertain.¹⁵⁴

After considering the smaller and less significant mines of Swaledale, the actions of Sir George Denys can now be discussed. He seemed to have wished to return the valley to its peak as a major leading lead-producing area, possibly wishing to follow and better the returns his father, George William, had attained. Receptive to new ideas, he was convinced, without any concrete evidence, that there were vast quantities of good quality ore to be found in the lower beds of the limestone. However, these lower bands were separated by sheets of sandstone and shale of a greater thickness than those above and the lower limestone beds proved to be thinner and considerably less productive in lead ore than the higher beds. Despite this, Denys carried on with his mining ventures despite

¹⁴⁹ *The Mineral Statistics of the United Kingdom.*

¹⁵⁰ DCRO, *D/HH/6/4/102.*

¹⁵¹ *The Mineral Statistics of the United Kingdom* and DCRO *D/HH/6/4/108.*

¹⁵² PRO *CRES 2/1390.*

¹⁵³ *ibid.*

¹⁵⁴ PRO *CRES 1441/3.*

many costly failures, more at the expense of the investors rather than himself, and he never admitted that the Swaledale mineral field may have been exhausted. Denys was completely obsessed.

As previously noted, Denys was one of the principal landowners of the dale. He wanted every mine to be open, producing ore, and kept those which had been abandoned by their companies running on a small scale to avoid the costs of re-opening and to make any mining investment look more favourable. He persuaded Joseph Holdsworth of London to set up two limited liability companies, the West Swaledale and the South Swaledale Mines Companies. By 1865, the South Swaledale Mines Company held the lease for Muker Side mine. The company's office was in King William Street, London, and the mines were managed for the company by John Ralph Place who was also Denys's agent and similarly employed by him for his own lead mining firm, the AD Company.¹⁵⁵ Place's loyalties were firmly attached to Denys and not to the company who employed him as mine manager. The output of this mine was sporadic. In 1867 and 1868, 228.4 and 233.9 tons of ore was produced respectively, no ore was recorded to have been mined in either 1869 or 1870 and in 1871, only 50.8 tons were obtained.¹⁵⁶

In September 1871, the company secretary, Gibson, informed Denys that there were several items that Place had failed to record in the cash book.¹⁵⁷ In August 1872, Place wrote to Denys, informing him that work at the mine had been suspended and in November 1872, the lease was forfeited.¹⁵⁸ Denys believed that the company owed him royalties and, in 1873, the Yorkshire County Court in the Manor of Richmond ordered the company to pay him £64.92.¹⁵⁹ It is of note that the disused mine at Muker attracted the interest of the speculator Faithfull Cookson who wrote to Denys on 5 October 1881, after Denys had advertised its availability in the *Mining Journal*, although nothing came from his enquiry.¹⁶⁰ In 1883, Denys ran a trial at this mine but his agent reported that they had found no ore. No costs were disclosed for this exploration.¹⁶¹

¹⁵⁵ NYCRO, ZLB 3/23.

¹⁵⁶ The Mineral Statistics of the United Kingdom.

¹⁵⁷ NYCRO, ZLB 3/23.

¹⁵⁸ NYCRO, ZLB 3/34.

¹⁵⁹ NYCRO, ZLB 3/23.

¹⁶⁰ *ibid.*

¹⁶¹ NYCRO, ZLB 3/22.

The West Swaledale Mining Company failed miserably to get off the ground despite three separate attempts. This included twice renaming the company as the Lane End, Keldside and Littlemoor Mining Company and then the Keldside Mining Company Limited, with claims that the latter firm held up to £50,000 of capital.¹⁶² The prospectus issued around 1864 for the Lane End, Keldside and Littlemoor Mining Company, declared a capital of £30,000, stating that its company office was at the same address as AD's head office at Fremington. In this prospectus, a mining report by Captain Rowe, who had been an inspector for the Parliamentary Report of the Commissioners Appointed to Inquire into the Conditions of all Mines in Great Britain of 1864 (often referred to as the Kinnaird Commission), was included for all the mines covered, with the notable exception of Littlemore which brings into question the state of this mine. Denys, as landowner and the sole director of the company, wanted £4,000 for the lease and to be the manager of the mine. Attached to the prospectus was an "independent" mining report from John Ralph Place stating that, "it can scarcely fail, if carefully and economically managed, of being a safe and profitable investment".¹⁶³ On 15 June 1865, adverts costing a total of £120.53 were placed with *The Leeds Mercury*, *The Ripon and Richmond Chronicle*, *The Investors Guardian*, *Money Market Review*, *Mining Journal*, *The Times*, *The Telegraph*, *The Star* and *The Manchester Guardian*. At least one response was generated by this expensive advertising campaign. Thomas W Emerson of Leeds informed Denys that, upon visiting the mines, he had found several items on the inventory to be missing and that the equipment on offer was old and vastly overvalued, a complaint that was repeated throughout Denys's ownership and management of the mines.¹⁶⁴ The mines of west Swaledale remained undeveloped by an outside interest.

On 6 August 1866, Denys, Shuckburgh and Pomfret leased Kisdon mine to the Kisdon Mining Company.¹⁶⁵ The company declared a capital of £15,000 and appointed Denys as the managing director with a holding of 200 shares.¹⁶⁶ In 1864, under Denys's instruction, work on a level under the Catrake Force waterfall in the River Swale had already been started. The Kisdon Mining Company continued with this venture.¹⁶⁷ On 1 May 1867, Denys reported that the expenditure at Kisdon had been £1,436.38 and the value of ore

¹⁶² NYCRO, *ZLB 3/2*.

¹⁶³ NYCRO, *ZLB 3/20*.

¹⁶⁴ *ibid.*

¹⁶⁵ NYCRO, *ZLB 1/22*.

¹⁶⁶ NYCRO, *ZLB 3/19*.

¹⁶⁷ B Jennings, *The Lead Mining Industry of Swaledale*, p. 141.

sold was £219.62. He claimed that there was ore worth £126.50 in hand stored at the mine and that the overall loss was £1,090.26, with the company being £785.57 overdrawn at the bank as well.¹⁶⁸ In May the following year, Denys' report as managing director showed that the mine was just as unprofitable; expenditure £933.85, ore sold £300.36 with only £40 in hand. He stated that, "nearly all our trials have been unremunerative" and a call was made on the shareholders for a further 50p per each share held.¹⁶⁹

Denys' adventures with Kisdon continued. At an Extraordinary General Meeting on 17 August 1868, he invited subscriptions to the East and West Arngill, the Swinnergill and Lownathwaite mines, all of which had been abandoned, the Arngill mines as long ago as the 1820's.¹⁷⁰ Denys offered to provide a 21 year lease with a royalty of one-sixth, on condition that he was provided with an additional 400 shares in the company. He estimated the improvements required to the disused mines would cost £8,400. Regarding Kisdon, he recommended that the company purchase the land from him for £3,000 (offering to pay one-fifth himself), although he would continue to claim the full royalty until the sale of the property was completed. Instead, the shareholders voted for the company to wind-up and the Sir George Level under Catrake Force was abandoned after 115 fathoms had been driven.¹⁷¹

In his final report as managing director of the Kisdon firm, dated 28 February 1870, Denys reported that it was "a complete failure...I regret extremely that our adventures has not been successful. The uniform barrenness of the veins cut and proved in a rich mineral district like this, was and is, a mystery of the most baffling kind". All the men were dismissed but he still maintained that investing in Arngill was a good financial move.¹⁷² Kisdon mine had been abandoned on 4 February 1870.¹⁷³ In March 1870, Ralph Metcalfe, manager of Hurst mine, valued the Kisdon to be worth £300.35 but in a valuation dated January 1876, six years after the mine had been abandoned, Denys placed a value of £1,729.69 on the mine.¹⁷⁴ This apparent enormous overvaluation of a dilapidated disused mine suggests that he was trying to tempt another gullible investor to reopen the mine or

¹⁶⁸ NYCRO, *ZLB 3/19*.

¹⁶⁹ NYCRO, *ZLB 3/19*.

¹⁷⁰ B Jennings, *The Lead Mining Industry of Swaledale*, pp. 146-150.

¹⁷¹ NYCRO, *ZLB 3/19*.

¹⁷² *ibid.*

¹⁷³ NYCRO, *ZLB 2/280*.

¹⁷⁴ NYCRO, *ZLB 2/273*.

to purchase the disused mining equipment, the former being the most likely. In May 1871, Denys received a letter from Harrison Hodgson of Workington, Cumberland, stating that, "so many ventures have failed, I doubt ours would not be more fortunate".¹⁷⁵ There is no reference to which venture Hodgson is referring to but it seems likely that he had also been duped by Denys into parting with his money for a fruitless investment in lead mining in Swaledale.

The larger Swaledale mines were Surrender, Swinnergill and Old Gang. Old Gang was leased and controlled by the group of Swaledale professional families between 1828 and 1886.¹⁷⁶ Although not for renewal in 1870, a new lease was granted in 1863 and bound the company to develop Gunnerside Gill in joint venture with another of their own companies, the Blakethwaite Company.¹⁷⁷ This development was the Sir Francis Level (one of Denys' pipedreams named after his son) and was, according to him, "a feast of fat things to come".¹⁷⁸ The level was designed to reach the well known Friarfold Vein but in the lower beds of limestone. It was started in 1864 but the Blakethwaite Company surrendered its lease in 1866, leaving Denys and the Old Gang Company to continue with the venture. On 1 January 1867, Shuckburgh, Pomfret and Denys as the mineral owner agreed that Denys was the sole owner of Blakethwaite that mine and they would forego any royalty from the mine for five years.¹⁷⁹

Surrender mine had rich ore which proved difficult to exploit, due to the increasing depth of the mine and previous unmapped workings. The "old man" had been hard at work again. In 1868, the Surrender Company surrendered its lease, the previous year's output having been only 57.2 tons of ore.¹⁸⁰ Once again Denys took over the running of the mine and, between 1869 and 1873, 280.8 tons of lead ore were produced.¹⁸¹ In February and November 1871, Place reported that Surrender mine was unproductive, "producing little but scarcely sufficient to cover the looking expenses" and, "continues to be poor in the extreme, and not raising sufficient to pay working expenses".¹⁸² However, in 1873, Denys had Surrender valued by Thomas Raw at £2,230.87. In 1868, Denys had appointed Raw,

¹⁷⁵ NYCRO, *ZLB 8*.

¹⁷⁶ B Jennings, *The Lead Mining Industry of Swaledale*, p. 118.

¹⁷⁷ NYCRO, *ZLK 3/1/9*.

¹⁷⁸ B Jennings, *The Lead Mining Industry of Swaledale*, p. 165.

¹⁷⁹ NYCRO, *ZLB 2/155*.

¹⁸⁰ *The Mineral Statistics of the United Kingdom*.

¹⁸¹ *ibid.*.

who had previously worked as a miner, manager and agent in Arkengarthdale, as a deputy to Place.¹⁸³ In 1865, he had joined Greenside Mine at Glenridding, Cumberland, but was dismissed three years later.¹⁸⁴ In August 1871, Place wrote to Denys questioning Raw's appointment, especially as he had been sacked from his previous position, but Raw replaced Place as Denys' chief agent in 1873.¹⁸⁵

In his report on Surrender Raw stated, "(I) have a very high opinion...and I do confidently recommend to all mining gentlemen as a promising and hopeful investment without taking the risk of any great outlay of Capital". Raw predicted a return of between 300 and 400 per cent, a very different opinion to that of Place.¹⁸⁶ In April 1874, Denys wrote to the various Swaledale lead mining investing families, suggesting that a limited company should be set up to run the available mines. In his letter to Knowles he wrote, "we cannot afford to have a good horse in the stable they must all help us pull the coach" but Knowles was not persuaded that this would be a profitable venture.¹⁸⁷ On 8 August 1873, an agreement was reached between Denys and John Tomlin, as solicitor, and Denys, Shuckburgh and Pomfret, that the mines at Swinnergill, Lownathwaite, Surrender, Blakethwaite and Stonesdale were all currently occupied and operated by Denys himself. Denys was granted a lease of 21 years at one-sixth royalty, after a six per cent dividend on the capital invested was returned. At Blakethwaite and Stonesdale the royalty was at one-twelfth. A new company was established, the AD Lead Mining Company, with Denys as managing director, and a declared capital of £10,000. His main reason for the formation of this company appears to have been the completion of the Sir Francis Level trial.¹⁸⁸ In October 1874, Denys and Tomlin disagreed, Tomlin argued that the lessees should get a seven per cent return before royalties were due, a suggestion which Denys received with "unspeakable annoyance".¹⁸⁹ The AD Company did retain some local interest on the board of directors with Roper, Priestman and Tomlin as well as Denys. However, all the other major shareholders were from outside the area, most notably the Huntsman family from Retford, Nottinghamshire.¹⁹⁰

¹⁸² NYCRO, ZLB 3/34.

¹⁸³ NYCRO, ZLB 2/280.

¹⁸⁴ NYCRO, CRONT 4 and The Mineral Statistics of the United Kingdom.

¹⁸⁵ NYCRO, ZLB 9/1 and ZLB 2/280.

¹⁸⁶ NYCRO, ZLB 3/27.

¹⁸⁷ NYCRO, ZLB 2/280.

¹⁸⁸ *ibid.*

¹⁸⁹ *ibid.*

¹⁹⁰ NYCRO, ZLB 2/250.

Four days after the agreement to set up the AD Lead Mining Company had been reached, a respected mining engineer, Thomas Bewick, produced a report on the Blakethwaite, Lownathwaite and Stonesdale mines, criticising the valuation of the mines that had been taken over by the AD Company. Bewick found that the mine machinery had been overvalued, the inventories were inaccurate, that there was no value whatsoever in the plant at Blakethwaite and a royalty of one-sixth was so high, "as such I cannot recommend". Bewick's opinion of the Sir Francis Level was just as awe inspiring, "what may be termed a grand scheme...full of scribble".¹⁹¹ Bewick produced another report on the AD Company's mines in the November of the same year and overvaluation was noted yet again, this time to the value of £10,000. In the valuation, a smithy had been included even though it was not part of the mining complex. Over estimates were legion, "the valuation put upon it, which in my opinion is under the circumstances excessive" and "Blakethwaite Smelt Mills, the value put upon the machinery and plant at this place is manifestly too much and the same remark applies to the crushing mill hotching tubs at Surrender, and latter especially being for the most part in a dilapidated condition". The valuations at the Sir Francis Level were also "in excess" to the value of £1,772, particularly £600 for used air cylinders and £120 for "almost valueless" used borers. Bewick also noted that old rails should be valued at scrap price and not at the cost of new ones.¹⁹²

The Sir Francis Level and Denys' dream of lead-based riches were to dominate the Swaledale mines for the rest of the century. Unfortunately, a simple miscalculation had been made and the level was being driven above and not into the lower limestone beds and through the very hard sandstone rock instead.¹⁹³ By 1869, only 202 fathoms had been completed, a progression of ten feet per month for a four-man team, at a cost of £10.50 per fathom. Denys estimated that the vein would not be reached for approximately 25 years or, if he introduced 24-hour working with eight-men teams, eighteen.¹⁹⁴ Both of these would finish well after the end of the lease.

¹⁹¹ NYCRO, *ZLB 2/279*.

¹⁹² NYCRO, *ZLB 2/273 and 274*.

¹⁹³ NYCRO, *ZLB 3/14*.

¹⁹⁴ Sir G W Denys: *Machine versus Hand Labour in Mining*, (Richmond, 1872), p. 7. —

After studying a report by mining engineer, Thomas Sopwith, on the use of compressed air drills at Mount Cenis Tunnel, Denys suggested that he and the Old Gang Company should invest in power tools to increase the rate of progression in the level, estimating that the level could be completed by 1874 if one Haupt drill was purchased at a cost of £650. The Old Gang Company declined to join him in this venture, Denys offered to drive it himself at a charge of £9.00 per fathom for the first 200 fathoms and £8 for the remaining 300. On 5 March 1870, an agreement was made between Denys, Appleton Chaytor of Ripon and Ralph Place (the contractors) and J R Tomlin, R M Jacques, L Jacques, J Knowles, E A Knowles, H Simpson, J Brown and R Bowes (the Old Gang lessees) for 560 fathoms to be cut at £8.50 per fathom using compressed air-powered drills. The cost of the drills were estimated to be £420 each.¹⁹⁵

The compressed air drills had already been purchased in January, prior to the agreement, and drilling had begun on 26 January 1870 under the direction of Appleton Chaytor. However, Denys soon dismissed him as he believed that although he was a good engineer he was not a good miner, upon which Chaytor replied, according to Denys, "you think that I know nothing about mining, because I was not born with a pick in my mouth".¹⁹⁶ He was replaced by John Calvert, a blacksmith from Gunnerside.¹⁹⁷ Place rightly noted that, "the expense of driving Sir Francis Level forms an additional item of dead work which will have to be sustained for some years to come".¹⁹⁸ At first the drills did not perform satisfactorily, a total of 64 letters between Thomas Raw and the manufacturers, McKean of London, and the Glasgow hardware merchants, MacLellan, having survived.¹⁹⁹ Despite these problems, in February 1873, Denys paid another £200 for two more McKean borers and air compressors, which were dispatched in April.²⁰⁰ These borers failed immediately due to valve problems for which McKean apologised, "the machine was sent to you without being tried, which was of course a blunder".²⁰¹

In spite of these mechanical problems Denys had published a booklet *Machine versus Hand Labour in Mining* in 1872, singing his own praises as a progressive, initiating

¹⁹⁵ NYCRO, *ZLB 3/32*.

¹⁹⁶ Sir G W Denys: *Machine versus Hand Labour in Mining*, pp. 8-10.

¹⁹⁷ *ibid.*, p. 10.

¹⁹⁸ NYCRO *ZLB 2/280*.

¹⁹⁹ NYCRO, *ZLB 10/1*.

²⁰⁰ *ibid.*

²⁰¹ NYCRO, *ZLB 3/32*.

businessman, encouraging other mine owners and mining companies to follow his technological example and promoting investment in his mines for financial and philanthropic reasons. "Not only taking part in good speculation, but...would be helping to do good in a district where employment is much wanted,...stop the tide of constant emigration to America of a race of miners...whom we can ill afford to lose...If once we lose our population we may shut up our mines forever".²⁰² Bewick wrote to him, "no one is likely to follow your example unless it be that they are similarly situated as regards ownership of the minerals".²⁰³

Non-mechanical problems regarding the Sir Francis Level were also brought to Denys' attention. Tomlin had picked up Bewick's reservations about the trial. Not only had Bewick questioned the "scribble" of poor planning but he had also thought it unfair that Denys, who had been seeking lessees for the lead mines on his land for many years, should get the lessees to pay for improvements initiated solely by himself. Tomlin now questioned this as well.²⁰⁴ A London solicitor, John L Fowler, also wrote to Denys in 1873, regarding his liability as being landowner, lessor, lessee and contractor for the same property and mining business.²⁰⁵

With the drill difficulties overcome by McKean and the other potential problems simply ignored by Denys, he offered a bonus incentive for the vein to be reached by 1878, not the predicted 1874. On 18 March 1877, the Sir Francis Level reached the Friarfold Vein at a cost of £5.50 per fathom, producing a nice profit for Denys from which he suitably rewarded the miners involved at a Gunnerside public house.²⁰⁶ However, the celebration was premature as Thomas Raw immediately reported that the ore discovered in the vein was of poor quality.²⁰⁷

The failure to reach a top quality lode of lead triggered further expenditure to reach the hidden treasure that Denys was so sure existed. He decided that a sump should be sunk through the poor quality ore, in the hope that it improved. To power the winding and pumping of this shaft Denys sought a quote from the engineering firm Hathorne Davy of

²⁰² Sir G W Denys, *Machine versus Hand Labour in Mining*, p. 16.

²⁰³ NYCRO, *ZLB 3/32*.

²⁰⁴ NYCRO, *ZLB 10/1* and *ZLB 2/279*.

²⁰⁵ NYCRO, *ZLB 2/280*.

²⁰⁶ *ibid.*

²⁰⁷ *ibid.*

Leeds for the supply of a hydraulic engine. Hathorne Davy estimated the cost on 20 April 1879, for this and the installation of the engine to be £1,259.²⁰⁸ However, the list of bills from the company add up to £2,155.08 and the final cost for the supply and installation was £4,500.²⁰⁹ This expenditure provided further difficulty for the company. When, in July 1881, Hathorne Davy requested immediate payment, Tomlin replied on behalf of the company (due to Denys's recent death), that the engine had not yet been fully installed, justifying the delay in payment. Hathorne Davy's reply in the following month was to demand £600, "this matter is very much overdue...it is not our fault that your work is not yet started and we do not think payment should be delayed any longer". The situation worsened and by July 1882 Hathorne Davy had placed the matter into the hands of its solicitor.²¹⁰

Throughout the driving of the Sir Francis Level, the relationship between the Old Gang Company and Denys became more strained. Denys believed that the Swaledale mining families and their private company should contribute more towards the cost of the level, even though his own AD Company only contributed one-fifth of the costs. An undated progress report by Denys, probably around 1877, stated that the capital of £25,000 had been exhausted and that, in his opinion, the Old Gang Company should offer more investment.²¹¹ In 1874, Old Gang began charging AD £107 per annum for the use of its wagons, repair facilities and crushing mill, which Denys considered "exorbitant".²¹² Similarly, in April 1878, the Old Gang Company demanded £296.04 for supplying air and water pipes for the Sir Francis Level.²¹³ Denys, however, had more power as the lessor and, in June 1875, threatened revoking the lease as a result of alleged poor building maintenance at the Old Gang mine.²¹⁴

The reports and general minutes produced by the AD Company provide some interesting reading, especially regarding Denys. At the General Meeting held on 6 October 1874, "cordial thanks of the Company was given to Sir G W Denys for the able and careful and economical manner in which he has conducted the affairs of the Company", even though

²⁰⁸ NYCRO, ZLB 3/31.

²⁰⁹ *ibid.*

²¹⁰ NYCRO, ZLB 10/3.

²¹¹ NYCRO, ZLB 2/279.

²¹² NYCRO, ZLB 3/15 and ZLB 2/280.

²¹³ NYCRO, ZLB 2/274.

²¹⁴ NYCRO, ZLB 2/280.

the Company declared a loss of £2,193 at the same meeting.²¹⁵ In September 1875, Denys reported, “so far disappointing our expectations a call for One Pound per share will be necessary...we have been both disappointed and baffled...I have only to ask the Directors to have patience and faith, and in good time they will have no reason to regret their expenditure”. In this report, Denys claimed that the company had made a profit of £11.56, but, calculating the figures given on the balance sheet, there had been an actual loss of £1,241.01. The company also had an overdraft of £1,245.92.²¹⁶ However, creative or incompetent accountancy, plus vast overvaluations, seem to have been trademarks of Denys’ control over the Swaledale mines. Share calls were frequent to the holders of the 1,670 shares; in 1875 there were calls for 50p and £1 per share, £1 in 1876 and 50p in 1877.²¹⁷ Despite the obvious financial hardships of the company, it was agreed by the directors in October 1876, that the company buy the Blakethwaite mine from Denys for £1,000 and, in April 1877, a further £1,000 was given to him to purchase the plant there.²¹⁸ This appears to have been another example of immense overvaluation and caused a reaction from one of the directors, William Benson, in the General Meeting on 24 August 1877.

An Extraordinary Annual General Meeting was held on 1 August 1877; “it has been proved to the satisfaction of this Company that it cannot by reason of its liabilities continue its business and that it is expedient to wind up the same voluntarily”.²¹⁹ The proposed liquidation did not take place, Denys having written to Shuckburgh in April of that year regarding the possible collapse of the AD Company, “if you desert me in the twitch I shall be completely nonplussed”.²²⁰ Another General Meeting took place on 24 August 1877, when a letter from William Benson was presented, “as regards the value of the Plant and the amount paid to Sir G W Denys Bart for such plant are entirely erroneous and calculated to mislead the public. I have no alternative to resign”. Denys also stood accused of charging dead work to the capital account, a method which allowed a profit to be shown when the company was actually running at a loss. Denys’ response was to add

²¹⁵ NYCRO, ZLB 2/250.

²¹⁶ NYCRO, ZLB 3/14.

²¹⁷ NYCRO, ZLB 2/250.

²¹⁸ *ibid.*

²¹⁹ *ibid.*

²²⁰ NYCRO, ZLB 10/1.

to the minutes, "Directors regret that he has founded his resignation upon a statement of facts which do not exist".²²¹

More shares were sold in 1877 to potentially misled investors and, in 1878, more calls for £2 and £1 for each share were made and all unclaimed shares were given to Denys at no charge.²²² Denys calmed the 1877 dissent by reporting "prosperity in view" in September of that year but the company issued a £2,860 debenture in May 1879 and another one for £2,000 three months later.²²³ His reports became increasingly dismal. In August 1878, he blamed the poor state of the lead market for the loss of £10,489.83 (including £1061.93 bank interest) for the previous financial year. His 1879 report and balance sheet failed to record the £1,411.45 expenditure at Sir Francis Level and declared a profit of 9p, but this included the valuation of ore in hand to be worth £2,282. The overdraft had risen to £5,190.95 but Denys was unrepentant; "Surely if ever there was a Mine worthy of development in a proper miner-like manner this is the one".²²⁴ In the 1880 report, Denys declared a loss of £842.75 and insisted that, "the mine never looked better than it does at present". However, he continued; "on reflection the accounts of the past year you will observe in the Profit and Loss account that there has been...an excess of revenue over expenditure...At the close of last year we were nearly at the end of our capital and with a heavy debt at the Bank. Until these circumstances change the Directors decided to raise...£3,500 by the issue of Debentures", which according to Denys, would somehow double the value of the mine.²²⁵ The debentures were only bought by existing shareholders; Roper and Priestman (Richmond bankers) £2,000, George Roper £1,000, Demps £300, Huntsman £300, J L Tomlin £300 and Hilliar £300.²²⁶ Denys did not contribute.

After Sir George Denys's death in 1881, Benjamin Huntsman took over as managing director. Denys' son, Sir Francis Denys-Burton, worked for the Diplomatic Service and was stationed abroad for the majority of his career. In 1881, after another debenture had been issued raising £6,200, a profit of £1,297.08 was declared but, once again, the expenditure at the Sir Francis Level was omitted from the accounts which, if included,

²²¹ NYCRO, ZLB 2/250.

²²² *ibid.*

²²³ NYCRO, ZLB 3/14 and ZLB 2/250.

²²⁴ NYCRO, ZLB 3/14.

²²⁵ *ibid.*

²²⁶ NYCRO, ZLB 2/250.

would have give the company a loss of £3,159.61.²²⁷ Huntsman declared in the 1882 report that he had been forced to pay for the company's dynamite out of his own pocket, a total of £142.42, and a loss of £21,236.35 was recorded for that year.²²⁸ According to the 1883 report, the company's finances had improved as the loss was only £675.20 but this was despite a £1,000 bond from Tomlin and Huntsman lending the company £513.39.²²⁹

The Sir Francis Level did not bring the riches of lead Denys expected and the state of affairs at the other AD mines were equally poor, despite Denys's constant encouraging remarks. In a managing director's report on the Surrender and Swinnergill mines dated 22 March 1875, Denys stated; "Investors to have patience and faith, and in good time they will have no reason to regret their expenditure", a much repeated and familiar statement.²³⁰ In March 1878, the Surrender mine was abandoned.²³¹ It is of note that the Swinnergill and Surrender mine pay book between 1873 and 1877, demonstrate that Swinnergill raised more ore but at a much greater expense.²³² The abandonment of Surrender did not stop Denys from trying to grant himself a new lease for the mine in July 1879 to protect himself against the possible winding up of the AD Company. "In the probable event of liquidation and sale I have been considering the question of value". He believed that, as managing director of the AD Company, he had the right to transfer capital of £5,000 plus accumulation, which AD had invested in the Surrender mine.²³³

Although the Surrender mine was abandoned, AD continued to use its smelt mill as it was closer to the Sir Francis Level and would reduce the transport costs. The smelt mill was antiquated and inefficient, with a short chimney and no condenser attached so the fumes produced were highly toxic in lead content and sulphur dioxide. B Blenkiron, secretary of the Reeth Moor Committee, complained to Denys about the damage caused by the toxic fumes. His reply, dated 11 September 1879, was terse; "(I) could do nothing in the matter. I have no power to do anything beyond what is ordered by the company directors...damage done...would be infinitesimally small when compared to the immense

²²⁷ NYCRO, ZLB 3/14.

²²⁸ *ibid.*

²²⁹ *ibid.*

²³⁰ NYCRO, ZLB 2/280.

²³¹ *ibid.*

²³² NYCRO, ZLB 2/157.

²³³ NYCRO, ZLB 2/280.

benefit conferred upon the inhabitants of the Dale by the large sums of money spent by the Mines...If the Mines were shut up where would the Miners be compelled to fly?"²³⁴

Blenkiron passed his complaint onto Tomlin, who was also Steward of the Manor of Healaugh, who then banned AD from using the Surrender smelt mill, due to the numerous complaints of the smoke damaging the pasture. Thomas Raw replied that the Lord of the Manor had consented to the pollution 150 years ago and if Tomlin disagreed he would see him in court. Tomlin replied on 26 September, giving legal notice that the Lady of the Manor of Healaugh and the copyholders of Reeth Moor were taking legal proceedings against Denys and the AD Company. However, William Williams, Denys' solicitors of Lincoln Inn Fields, London, wrote to Denys on 14 October stating that the smelting and the fumes produced were legal, as permitted in a conveyance of 1758 for the mines and minerals of Healaugh and Muker.²³⁵ In April 1880, Denys wrote to Tomlin; "the fact alleged by the copyholders of the Manor of Healaugh of damage being done to herbage of the moor by smoke from Surrender Mill Chimney is indisputable...It is highly desirable that something be done without delay". Denys suggested the installation of a £400 condenser, but this failed to materialise, and also that a new mill should be built at Gunnerside near to the Sir Francis Level (the costs to be met entirely by himself).²³⁶ It is worth noting that both the AD and the Old Gang companies invested in new dressing floors either side of Gunnerside Gill. However, the advantages of the new dressing floors were completely offset by the inconvenience and cost of transporting the dressed ore to the smelt mills, which for the AD Company was 70p per ton to get the ore to the antiquated Surrender mill.²³⁷ This is in marked contrast to the transportation and smelting investments made in Teesdale.

By September 1880, Tomlin had had enough of Denys. He informed Denys that he could not be impartial as both a lessor and managing director lessee and called for his immediate resignation. He also accused him of abusing his position regarding royalties and leases and that his dual roles also released him from any liabilities placing his co-lessors Shuckburgh and Pomfret in an awkward situation, as had been noted previously by

²³⁴ NYCRO, ZLB 3/33.

²³⁵ *ibid.*

²³⁶ NYCRO, ZLB 3/33.

²³⁷ NYCRO, ZLB 16/1.

John L Fowler in 1873. By December 1880, Tomlin was demanding an Extraordinary Annual General Meeting of the AD Company.²³⁸

Denys, on the other hand, blamed his co-lessees and exonerated himself from any blame whatsoever. He believed that an audit had been completed incorrectly, charging the revenue account with items that should have been charged to the capital account, thereby prejudicing the shareholders and threatening the “chance of Royalty being ever paid”.²³⁹ He claimed that he had sacrificed everything for the mines and for the locality. “In seven years the Company has spent £30,000 and not one farthing of dividend has been declared in spite of the Lessors having given up the royalty” and that Swaledale would die without the lead mines.²⁴⁰ It is of note that there no evidence of Denys actually contributing any capital to the mines or to the investing companies. Denys was still hopeful of promoting further investment by the AD Company, which he and Raw valued at £50,000, but proposals that the company should purchase Old Gang, described as badly run and “in a moribund state”, at their valuation of £2,000 fell on deaf ears.²⁴¹ In May 1881, Raw informed Denys that the further trials he had wanted could not be undertaken without an injection of over £50,000 of capital. Denys’s answer was to suggest another new lease and not to provide the finance required for the work himself.²⁴²

On the death of his father, in 1881, Sir Francis Denys-Burton inherited a shambolic collection of worked-out mines with the companies heavily in debt. In October 1881, Thomas Raw informed him of the position of the AD Company, with Huntsman as managing director, “the shareholders are without money, which renders them incapable of making any further trails.”²⁴³ Denys-Burton sought legal advice from Williams and, in June 1882, it was proposed that the lease should be revoked with compensation to be paid by Tomlin but this was not acted upon and the AD Company continued to operate at a loss.²⁴⁴ The situation continued to worsen. In June 1882, Dineen and Sons, Leeds, served a writ on the company and £13.30 was paid to the County Court.²⁴⁵ Dynamite suppliers I’Anson Armstrong and Company also took legal action the following year for unpaid

²³⁸ NYCRO, ZLB 2/280.

²³⁹ NYCRO, ZLB 15/1/12.

²⁴⁰ NYCRO, ZLB 15/1/40.

²⁴¹ NYCRO, ZLB 2/280.

²⁴² NYCRO, ZLB 2/280.

²⁴³ NYCRO, ZLB 13/1/6.

²⁴⁴ NYCRO, ZLB 5/1/21.

bills of £139.64 and the company openly declared that they would never do business with AD again.²⁴⁶

Mining continued but, in September 1882, Thomas Raw reported to Denys-Burton that, "it is quite evident that the old man had good ore", implying that the mines were worked-out.²⁴⁷ Raw was concerned that the debenture holders would close the mine down and objected to Denys-Burton's suggestion of suspending work as it would result in further dilapidation to the buildings and plant, the emigration of more workers, incur a greater cost for restarting the mine and risk forfeiting the lease altogether.²⁴⁸ However, Surrender mine was closed down in May 1883, with five men being allowed to pick over the waste heaps leaving the AD Company with only the Sir Francis Level as a going concern.²⁴⁹ On 21 June 1886, the mines covered by the AD Company were put up for sale but no takers were found.²⁵⁰ In 1887, a deed of covenant was signed releasing the lessees from their liability to satisfy the conditions of the leases and amendments of 1874, 1880 and 1881. It also released the company from debt to debenture holders and a new flexible royalty rate was introduced; one-fourteenth if the value of the lead was less than £12 per ton, one-twelfth if between £12 to £15, one-tenth if between £15 to £18 and one-ninth if above £18.²⁵¹ This did not encourage any further mining by the AD Company but released it from its creditors and its duty to maintain the mines, resulting in the end of all the mining operations of the company.

A prospectus for the Swaledale Lead Mining Company was issued in 1888, claiming to have capital of £20,000. The directors were Joseph Craddock, Francis Huntsman, J R Milner, G Roper and J L Tomlin. The company was formed to work the AD and Old Gang area, complete with the Blakethwaite and Surrender mines, an area of 12,639 acres.²⁵² This company failed to get off the ground but did nominally operate the mines for two years. In November 1888, Craddock wrote to Denys-Burton stating that the Sir Francis Level should be abandoned to which Denys-Burton replied; "to stultify the work of the last 20 years, and go against the opinion of the very connected with the mine living

²⁴⁵ NYCRO, ZLB 10/3.

²⁴⁶ *ibid.*

²⁴⁷ NYCRO, ZLB 2/279.

²⁴⁸ NYCRO, ZLB 13/1/24.

²⁴⁹ NYCRO, ZLB 11/29/11.

²⁵⁰ NYCRO, ZLB 15/1/35.

²⁵¹ NYCRO, ZLB 1/24.

or dead...To give up Sir Francis Level is like asking me to give up one of the tenets of my religion, I can't do it".²⁵³ In 1890, the Old Gang Mining Company Limited, which had been formed in the previous year, gained a lease for Surrender and Old Gang mines. The royalty was flexible at one-fifteenth if the lead was sold at over £16 to one-twentieth if the price was under £14. The 21 year lease stipulated that the cost of mining or dressing should be subtracted from the royalty but the price of carriage to Richmond could be deducted if the cost was under 42p per ton.²⁵⁴ The new company brought no change, with continued losses and no significant lead discoveries made. Surprisingly, this company lasted for seventeen years.

After examining the papers of the AD Company it is apparent that the services it provided and its administration were slipshod. Between 1874 and 1886, there were numerous complaints that the amount of lead delivered to the customer was less than had been agreed and paid for. Several of the companies involved withheld payment or demanded that the short fall be made up. Leeds Old Lead Works noted in July 1885 that, "your scales are evidently thoroughly out of order".²⁵⁵ J G East, representing the Leeds firm, was so disgruntled that he involved his company's solicitors in July 1886, "my past experience of Richmond weights do not lead me to have any faith in them...you should have the pleasure of a trip to Newcastle County Court to prove your weights or ours are the most correct (if you don't pay)".²⁵⁶ Denys-Burton's agent, Simon Cherry, responded with, "surprise at a respectable firm using such discourteous language" and insisted that the mining company's scales were accurate.²⁵⁷ East's reply was short, "I thank you for your complimentary remarks. If you send full weights as others do they would not be necessary".²⁵⁸ East disappears from the order books but, in December 1886, another customer, Heap, asks, "have you any other complaints?" and, "this is no fault of ours, your weights and scales want looking at".²⁵⁹ There were no similar complaints in the surviving Old Gang papers.

²⁵² NYCRO, ZLB 3/20.

²⁵³ NYCRO, ZLB 12/2/1 and ZLB 12/2/2.

²⁵⁴ NYCRO, ZLB 1/25.

²⁵⁵ NYCRO, ZLB 11/29/36.

²⁵⁶ NYCRO, ZLB 11/29/75.

²⁵⁷ NYCRO, ZLB 11/29/102.

²⁵⁸ NYCRO, ZLB 11/29/104.

²⁵⁹ NYCRO, ZLB 11/29/86 and ZLB 11/29/87.

To augment their own lead production the London Lead Company bought lead ore from other companies from as far away as Australia.²⁶⁰ They also purchased ore from AD. On 2 January 1885 the superintendent of the London Lead Company, C E Bainbridge, bought ore from AD at £7 per ton. Upon receiving the ore C E Bainbridge wrote to Simon Cherry that the ore was very poor, "short of our expectation", and goes on to suggest, "the question of a rebate".²⁶¹ When he had purchased ore from the Yorkshire Lead Mining Company at Hurst C E Bainbridge had not noted any poor quality.²⁶²

As well as the poor measurement and quality of their produce the Swinnergill Mine Pay Book 1878 to 1888 is unbelievably inaccurate. The monthly totals of wages paid between 19 June 1879 and 27 May 1882 are incorrectly calculated on thirteen occasions. On four occasions the total amount was in excess, to the value of £157.18, including the pay bill of 23 February 1882 which was exactly £100 over the true amount. For the nine other occasions the total was under calculated to a total of £412.44, including 21 July 1881 when the amount recorded was £119.96 less than the total of wages paid out and on 19 June 1879 and 15 December 1881 the totals were over £99 below the correct figure.²⁶³ It is of note that these miscalculations were then carried forward and on to the annual report balance sheet.

Although the wage books of the AD Company were inaccurate they were completed in formal ledgers. The accounts held by the Old Gang Company were on what amounts to scrap paper, mainly unused Arkendale valuation sheets. However, there were only two errors made in its surviving wage account books. In February 1884, the amount recorded was £10 over and, in November 1887, it was 25p under.²⁶⁴ Although this is considerably better than the AD wage records, in October 1874 Tomlin wrote to Denys questioning the accuracy of the Old Gang accounts which were completed by Denys's own agent, Raw. Denys actually admitted that there were inaccuracies but that the royalties he had been receiving were correct and satisfactory.²⁶⁵ It is to be regretted that these inaccuracies were not specified by either party.

²⁶⁰ NCRO, LLC 36 18/02/90.

²⁶¹ NYCRO, ZLB 11/29/11.

²⁶² NYCRO, ZPL 10/2162.

²⁶³ NYCRO, ZLB 3/16.

²⁶⁴ NYCRO, ZLB 3/18.

²⁶⁵ NYCRO, ZLB 2/280.

Sir Francis Denys-Burton kept a personal record of the royalties his family had received from the Old Gang mine. He recorded an average of £5,118 per annum in the 1830's; in the 1840's this had risen to £7,652, indicating the Swaledale's mining boom years. Between 1850 and 1856 the mean was £5,320 and for the next ten years it was £5,402. From 1866 to 1872 the average was £5,055. Denys-Burton then lists the annual revenue generated from royalties from Old Gang; 1870 £ 3,209, 1871 £2,329, 1872 £2,630, 1873 £3,524, 1874 £2,550, 1875 £1,918, 1876 £1,024, 1877 £1,062, 1878 £930, 1879 £1,834.55, 1880 £1,040.94, 1881 £826.15, 1882 £1,020.59, 1883 £416.54, 1884 £351.09, 1885 £562.68, 1886 £603.13, 1887 £194.01.²⁶⁶

A new lease was signed for Old Gang on 1 January 1878. It was for 21 years and had the same conditions and royalty rate as the previous lease of 1869. Apart from an extended the tenure, the lease was used by Denys to prevent Old Gang mine using water from the AD Blakethwaite High Dam, as this was needed for the Blakethwaite smelt mill. It also mentions, without prejudice, AD's rights to the Sir Francis Level.²⁶⁷

The new lease had no effect whatsoever on the declining productivity at the mine. In August 1879, Tomlin informed Denys that the mine had been running at a loss for the past four years and that the 24 dead workers stipulated in the lease were basically four times the number economically required. Denys chose to believe his agent, Raw, who categorically denied that the company was unprofitable.²⁶⁸ However, Raw did believe that the company was poorly run, as noted earlier, valuing the mine at £2,000 compared to his estimate of £50,000 for AD. Raw suggested that Denys should offer Old Gang £2,000 to purchase the mine and mining rights.²⁶⁹

Denys had proposed an amalgamation of the two companies before in October 1878, as the AD and Old Gang Consolidated Lead Mining Company Limited but the Old Gang Company rejected the idea.²⁷⁰ In October 1881, it was Tomlin who thought that the merger might be the best course of action for the continuation of the Swaledale lead mining industry as the Old Gang United Mining and Smelting Company Limited. The

²⁶⁶ NYCRO, ZLB 2/279.

²⁶⁷ NYCRO, ZLK 2/1/14.

²⁶⁸ NYCRO, ZLB 2/280.

²⁶⁹ *ibid.*

²⁷⁰ NYCRO, ZLB 2/279.

directors were to be the entire AD board with only Knowles from Old Gang, Huntsman to be the chairman. It might seem that Tomlin was suggesting an AD take-over. However, Tomlin emphasised that Old Gang, unlike AD, had actually been paying dividends. That Old Gang had no overdraft, unlike AD, and that they had considerably better ore beds than the AD. The argument for amalgamation was that it would be better for the Sir Francis Level to be operated by one company, avoiding the conflicts that had occurred before; that the Old Gang smelt mill was a reverberatory furnace and more efficient and economic as a consequence, considerably more up-to-date and closer than those owned by AD to reduce transport costs; and that the royalty would be reduced as a consequence.²⁷¹ Denys agreed, in principle, suggesting a 50 year lease.²⁷² Raw valued the two mines for the amalgamation at £4,000 for Old Gang and AD at £5,000, considerably different to his valuation of two years previously.²⁷³ However, Raw noted that, although he had actually suggested the merger, Tomlin became, "distant and cool re amalgamation".²⁷⁴ Another merger scheme that was unsuccessful was suggested by Sir Francis Denys-Burton in April 1887.²⁷⁵

Despite these proposals AD and Old Gang continued on their separate ways. Following AD's performance the production of the Old Gang Company fell. In 1869, the mine produced 3,328 tons of ore, by the mid 1870's the annual total was at just above 1,000 and then dropped alarmingly to 294.2 in 1881 to 117 in 1887.²⁷⁶ Denys-Burton allowed the royalty to be dropped to one-eighth starting on 1 May 1882 but, by October, Tomlin was asking for further reductions as he believed that the royalty payments diverted investment away from the mine. In February 1885, Jacques was requesting that the royalty rate should be lowered to one-twelfth.²⁷⁷

All attempts to save the Old Gang Company failed and on 3 September 1886 the lease was surrendered, finally ending the local professional families' ownership and management of the private Swaledale mining companies.²⁷⁸ According to Denys' agent, Simon Cherry, this "cast such a gloom over the whole neighbourhood", with some miners

²⁷¹ NYCRO, ZLB 16/1.

²⁷² NYCRO, ZLB 2/280.

²⁷³ NYCRO, ZLB 13/1/12.

²⁷⁴ NYCRO, ZLB 13/1/20.

²⁷⁵ NYCRO, ZLB 15/1/46 and ZLB 15/1/54.

²⁷⁶ The Mineral Statistics of the United Kingdom.

²⁷⁷ NYCRO, ZLB 16/1.

finding work at Hurst but many leaving for the coalfields of Durham and Lancashire.²⁷⁹ In September 1888, Denys-Burton tried to renew interest in the Old Gang mine, encouraging the other lessors to advertise and make concessions to encourage entrepreneurs, but Denys-Burton believed that one of them, Sir Thomas Hesketh of Rufford Hall, who had inherited upon Countess Pomfret's death, was "very hopeless in business matters".²⁸⁰

As noted earlier, a company prospectus for the proposed Swaledale Lead Mining Company Limited was released in 1888 for the mining of the AD and Old Gang fields but this company did not get off the ground.²⁸¹ On 22 February 1889, the Old Gang Mining Company Limited was founded and the following year obtained a lease for the Old Gang mine.²⁸² The directors were George Roper, Frank Huntsman, John L Tomlin, Joseph Craddock and John Ralph Milner. A report dated 27 August 1890, declared a loss of £2,252.76, the directors did "not consider the outlay excessive". The auditors, Browns of Stockton, noted that the total expenditure was declared at £3,041.85 but should have been £3,928.68, as an account named Development of Mines had not appeared on the balance sheet. This deceit was repeated in 1892 and 1893, when expenditures of £908.09 and £155.22 respectively were undeclared. In 1905, Browns noted £6,878.58 had been hidden in the same manner.²⁸³

The lack of royalty payments from Old Gang prompted Hesketh's estate manager, Ogilvy, to contact Edward Cherry, asking in 1895, "is there no prospect of these mines fielding a profit for the owners?", and the following year the question was, "do you see any prospects of the returns from these mines at least paying the expenses of the supervisor?".²⁸⁴ The quarterly expenditure and income report from Old Gang to Denys-Burton shows that Denys-Burton himself made an overall loss of £580.08 from 1890 to 1914, as the income he received from mining royalties did not cover the expenses of

²⁷⁸ *ibid.*

²⁷⁹ NYCRO, ZLB 16/1/32.

²⁸⁰ NYCRO, ZLB 12/1/32.

²⁸¹ NYCRO, ZLB 3/20.

²⁸² NYCRO, ZLB 11/9/33 and ZLB 1/25.

²⁸³ NYCRO, ZLB 3/18.

²⁸⁴ NYCRO, ZLB 11/10/64 and ZLB 11/10/69.

employing an agent, maintaining buildings on disused mines and keeping disused mining areas safe.²⁸⁵

The company's annual report in 1897 stated that that the prospects were, "very promising...heading into virgin ground".²⁸⁶ A valuation of the same year had AD (Sir Francis Level) worth £1118.68 and Old Gang £1892.95.²⁸⁷ However, a share call of £2 was made in 1899, followed by one of £4 in 1903 and debentures of £6,000 were issued in 1900.²⁸⁸ In 1902, £650 of capital was raised and used to drive the Reynoldson cross cut, which, unfortunately, brought no return, hence the further request for investment.²⁸⁹ The poor performance of the company and the resulting poor payment in the sub-contracted system on offer would have increased the likelihood of the miners leaving Swaledale to seek work elsewhere and, in April 1899, a notice was posted at both mines informing all Old Gang employees that if they were to leave the company without giving more than seven days notice one month's pay would be deducted.²⁹⁰ The income of the company was augmented by the sale of slates, scrap metal and old rails from the mines. In September 1902, a sale of materials from Surrender smelt mill and Barras End brought in £26.30 and rails were sold for £478.13.²⁹¹

On 12 December 1905 Joseph Craddock and Edward Cherry, the company secretary, informed shareholders, "referring to the Company's circular letters of October 9th last, asking shareholders to subscribe to £1,000 for the purpose of continuing the operations of the Company, I have to inform you that the response has been disappointing, only some £250 being promised".²⁹² Denys-Burton, in reply to Craddock's concern that he was "a very heavy loser by the investments I have made in the Mine", insisted that the key to success was still the Sir Francis Level.²⁹³

²⁸⁵ NYCRO, ZLB 2/248.

²⁸⁶ NYCRO, ZLB 3/18.

²⁸⁷ NYCRO, ZLB 3/27.

²⁸⁸ NYCRO, ZLB 3/18 and ZLB 3/2/6.

²⁸⁹ NYCRO, ZLB 3/27.

²⁹⁰ NYCRO, ZLB 3/33.

²⁹¹ NYCRO, ZLB 3/27.

²⁹² NYCRO, ZLB 16/1/5.

²⁹³ ibid.

For many years the Old Gang Company had been in breach of its lease which had stipulated that eight men were to drive Horse Level as this had been abandoned in 1895.²⁹⁴ In June 1905, the Sir Francis Level was flooded out and abandoned six months later, Cherry informed Denys-Burton that, "the output has not been sufficient to enable the Company to accomplish their objective".²⁹⁵ The Old Gang mine was finally abandoned on 2 June 1906. Craddock did negotiate with the bank to make an offer as a new private company but Denys-Burton noted on 9 July that, "no effort has been made by the Company to meet their debt" and that no rent had been paid since 1901.²⁹⁶ Denys-Burton believed that, "the Lessors have been far too indulgent throughout and they must now look to their own interests which will be best served by the prompt winding up of the Company".²⁹⁷ The company was liquidated on 26 October 1906 and Denys-Burton was dismayed to discover that debenture holders were not liable to meet any of his own costs.²⁹⁸ Denys-Burton noted that; "since 1886 the Mines have done little, the royalties received being insufficient to pay agency and other expenses. The Company which succeeded Old Gang Company in 1887 never prospered in consequence of having little Capital".²⁹⁹ When the mine was put up for sale, initial interest from Messrs Boundy, Krieger and Company of London rapidly evaporated upon receipt of a report concerning the state of the mine.³⁰⁰ By 1908, all the windows had been boarded up and, by 1914, the buildings had begun to be dismantled and the slates sold off.³⁰¹

Despite the end of the lead mining companies, men still picked over the spoil heaps and licences were granted for trials to be run. In August 1907, pottery merchants John Shatwell Wagstaffe and John Thomas Ward, both of Reeth, and Warren Swinley Taylor of Dieppe gained a one year licence for Great Sleddale.³⁰² The following year, Alfred Kempson from Spilsby, Lincolnshire, was granted a one year lease for the same area.³⁰³ In 1907, a lease was granted to Luther Broderick and James Platt for two years for Old Gang and, in 1909, Edward Fawcett of Burnley and John Pilkup of Nelson were granted a

²⁹⁴ NYCRO, ZLB 2276.

²⁹⁵ *ibid.*

²⁹⁶ NYCRO, ZLB 16/1/48.

²⁹⁷ NYCRO, ZLB 16/1/48/50.

²⁹⁸ NYCRO, ZLB 2276 and ZLB 16/1/48.

²⁹⁹ NYCRO, ZLB 13/6.

³⁰⁰ NYCRO, ZLB 2276.

³⁰¹ NYCRO, ZLB 3/14 and 2276.

³⁰² NYCRO, ZLB 3/12/9.

³⁰³ NYCRO, ZLB 3/12/15.

licence for Ivelet and Arngill.³⁰⁴ However, these trials were unsuccessful and Cherry had to chase up these prospective mine owners with letters to ensure that the mine workings were made safe.³⁰⁵

Although men continued to mine lead in Swaledale up to 1914, the companies ceased to operate in 1906. In a letter dated 16 March 1914, Edward Cherry informed Denys-Burton that, "most of the miners are working at Catterick camp making a lot of money".³⁰⁶

Edward Cherry himself had to broaden his career. In 1895, he had replaced his late father, Simon, as Denys' agent. From 1892, he had been an auctioneer, a valuer, an estate agent, the secretary for Old Gang and what was left of the AD Company and, in 1903, he began to further augment his income as an agent for Royal Life Insurance.³⁰⁷

The lead mining industry in Swaledale effectively ended in the early 1890's. 1886 and 1887 were the last years in which the valley produced more than 1,000 tons of lead ore in a year. By 1890, the total produced was down to 363 tons and 1891 was the last year in which over 200 tons of ore were obtained.³⁰⁸ Arkengarthdale survived as a lead producing area slightly longer and limped into the twentieth century. The side valley had three main mines and rarely produced more than 2,000 tons of ore in any one year but, "the fortunes of Arkengarthdale mines showed in a different way how unrelated movements of price and of output could be".³⁰⁹

It is difficult to evaluate the lead mining industry in Arkengarthdale before 1868, as there are no production statistics available. Furthermore, the surviving records are not as complete as those relating to Swaledale. There were three main mines in Arkengarthdale; Stang, Danby and Faggergill. On 20 December 1848, these mines were leased by the owner, Reverend John Gilpin, to Richard Machel Jaques, Roper Stote Donnison Roper, James Robinson Tomlin, John James Robinson, George Robinson, Edmund Alderson Knowles, John Knowles, James Knowles, William Close, Robert Jacques and Henry Alderson Simpson who formed the Arkendale Company. The lease was for 22 years, the

³⁰⁴ NYCRO, *ZLB 3/12/8* and *ZLB 3/12/18*.

³⁰⁵ NYCRO, *ZLB 3/12/12* and *ZLB 3/12/14*.

³⁰⁶ NYCRO, *ZLB 16/4*.

³⁰⁷ NYCRO, *ZLB 16/4, 19/1/2* and *19/1/3*.

³⁰⁸ *The Mineral Statistics of the United Kingdom*.

³⁰⁹ B Jennings, *The Lead Mining Industry of Swaledale*, p. 202.

royalty at one sixth and hushing was forbidden.³¹⁰ As noted previously, Reverend Gilpin's only son, George, inherited in 1854 and took the name George Gilpin Brown.

In March 1870, at a time when negotiations for renewal of the lease would normally have taken place J R Tomlin surrendered the wayleave of the 1848 lease.³¹¹ In the May of that year, Gilpin Brown noted that George Roper had declined his invitation to renew the lease.³¹² Thus the Swaledale lead mining private company, run by the local professional families, in this case the Arkendale Company, left Arkengarthdale. It was replaced by the Arkengarthdale Mining Company, formed in June 1870. The directors were: the Honourable Charles Wentworth Fitzwilliam of Alwalton, Northamptonshire; William Frogatt Bethel of Rise, Yorkshire; George Thomas Gilpin Brown, son of the lessor and his address was given as Magdalen College, Oxford; William Whitwell of Jolson Hall, Westmoreland; Thomas Whitwell and George Coates Whitwell, both of Stockton-on-Tees. A 22 year lease was provided with a royalty of one-sixth.³¹³

For the two years for which production statistics are available prior to the new company taking over, the Arkengarthdale mines had been relatively successful. In 1868, 1,596.2 tons and, in 1869, 1,617 tons of ore were produced respectively.³¹⁴ However, in 1870 production dropped to 935 tons, in 1871 800 tons and 601 tons of ore in both 1872 and 1873.³¹⁵ This decrease can be attributed to a number of factors. Firstly, the Arkendale Company would probably have stripped the readily available ore from the mine, prior to the end of its lease, and run the mine down in the months preceding the company change over. The company probably did not wish to renew its lease, as there was no sign of any further easily obtainable ore. This is backed up by the fact that the new company engaged in expensive trial works almost immediately upon gaining access to the mine.³¹⁶

The productivity of the mines was affected by another event, unique to Swaledale during this period, industrial action by the workers. The Arkengarthdale Mining Company attempted to force the miners to begin work at 7am, for an eight hour day, five days a

³¹⁰ DCRO, *D/HH/6/4/477*.

³¹¹ NYCRO, *ZOA I 6/6*.

³¹² NYCRO, *ZOA I 6/1/6*.

³¹³ NYCRO, *ZOX 2/1/10*.

³¹⁴ *The Mineral Statistics of the United Kingdom*.

³¹⁵ *ibid.*

³¹⁶ NYCRO, *ZOX 2/2/2/4* and L O Tyson, *British Mining No. 53*, pp. 72-74.

week. As noted previously, the miners were sub-contracted and believed that as they were paid for the ore they mined, they had the right to work when they wanted to. As will be discussed later, many miners also held small-holdings and wanted daylight hours to be available to them to tend to their land. As a result, Swaledale miners tended to work six hour shifts over a six day period.³¹⁷

In December 1870, the company began to fine miners for arriving after 7am and a strike ensued. The company informed the Chief Constable of the North Riding police of the affair.³¹⁸ The dispute lasted for eight weeks (not 22 as stated by Hartley and Ingilby) and the workforce was starved back to work.³¹⁹ A local newspaper reported that fifty families left the area to find employment elsewhere.³²⁰ One of these disenchanted men was Thomas Alderson who wrote to the company's solicitors, Newby, Richardson and Watson of Stockton-on-Tees to make his point. "I now feel very much on leaving my native place to seek work elsewhere... You will have to alter your present mode or plan of working the mine if not this valuable metal will have to lay unexplored".³²¹

Gilpin Brown appointed James Blenkiron as his agent on a salary of £150 per annum. Reporting on the mines in December 1870, Blenkiron noted that they were not being well maintained and that Faggegill was dilapidated.³²² This opinion was expressed again in January 1872 and Blenkiron accused the company of breaching the maintenance conditions of the lease.³²³ Gilpin Brown instructed mining engineer Ray Eddy of Skipton to examine the mines who reported back that the operation was "very incorrect and not in any way to be relied upon".³²⁴

Although the opinion of Blenkiron and Eddy was that the mines were being badly run and in a state of disrepair, investments were being made. The Old Smelt Mill Level was driven from below the Octagon Mill and the Harker's Level on Scar Top was extended.³²⁵ Jennings estimates that these new trials cost £6,700, causing the company to be in deficit

³¹⁷ NYCRO, ZLB 3/34

³¹⁸ NYCRO, ZQA I 6/1/6.

³¹⁹ M Hartley and J Ingilby, *The Yorkshire Dales*, (London, 1956), p. 273.

³²⁰ Darlington and Stockton Times 21/01/1871, 25/02/1871 and 25/03/1871.

³²¹ NYCRO, ZQA I 6/1/7.

³²² NYCRO, ZQA I 6/1/6.

³²³ NYCRO, ZQA I 6/1/7.

³²⁴ *ibid.*

³²⁵ NYCRO, ZOX 2/2/2/4.

for its first few years of operation. The production figures improved with the discovery of good lodes of ore. In 1878, 1882 and 1886, the annual amount of ore extracted exceeded 2,000 tons.³²⁶ By 1887, Jennings estimates that the company had made an overall profit of £45,500 since its inception and in 1878, the annual profit was declared at £11,390.³²⁷ In 1887, the annual profit was £5,343 and from then on the company went into decline with a steady fall in output, 1888 being the last year when over 1,000 tons of ore were produced in Arkengarthdale.³²⁸

The boom period of Arkengarthdale in the late 1870's and 1880's demonstrates that the price of lead and the output from lead mines are unrelated. As noted earlier, the price of lead per pig was very low in the early 1880's, bottoming in 1884 at around £10 per ton and recovering to up to £16 per ton in 1887. The Arkengarthdale mines produced good profits during the years when the price of lead was low but when the price began to recover the profits dropped as most of the available ore had been extracted. As Jennings pointed out, "a rich mine could yield a profit at a low price, and a high price would not stimulate a barren mine to produce as well".³²⁹ In 1875, the price of lead per ton was over £22 but that did not enable Denys's companies to make anything approaching a satisfactory return.

In 1889, George Gilpin Brown died and he was succeeded by his son George Thomas Gilpin Brown, a director of the company. The Arkengarthdale Mining Company folded in the next year but Gilpin Brown kept the mines operating on a small scale until 1907.³³⁰ However, the workforce had shrunk by alarming proportions. In 1880, a total of 300 had been employed, but only 57 in 1898, 30 in 1902 and four in 1907.³³¹ Blenkiron pointed out that, "the miners keep dropping off and leaving us for coal and iron districts where they hear higher wages".³³²

On 25 March 1907, James Backhouse, John Edmund Jones and Harold Mark Carter signed a taking note with a 21 year lease option with Gilpin Brown for the

³²⁶ *The Mineral Statistics of the United Kingdom.*

³²⁷ B Jennings, *The Lead Mining Industry of Swaledale*, p. 200.

³²⁸ B Jennings, *ibid.*, p. 201 and *The Mineral Statistics of the United Kingdom.*

³²⁹ B Jennings, *ibid.*, p. 202.

³³⁰ *The Victoria County History of the North Riding of Yorkshire, Wapentake of Gilling West, Volume I*, (London, 1914), p. 38 and *The Mineral Statistics of the United Kingdom.*

³³¹ *The Mineral Statistics of the United Kingdom.*

Arkengarthdale mines. In October, these men set up the CB Lead Mines Limited to mine south-west of Arkle Beck (which included Danby mine) and the Stang and Cleasby Lead Mines Limited for the north-east side of the stream (the Stang and Faggergill mines).³³³ CB prospected at Little Punchard, Routh and Agnes Levels but no ore was recorded as being obtained.³³⁴ According to the *Mineral Statistics*, no work was done by this company after 1909 and, in 1915, CB Lead Mines Limited was officially dissolved.³³⁵

The Stang and Cleasby Lead Mines Limited was a larger company with a higher capital, CB had declared £7,500, while Stang and Cleasby £20,000.³³⁶ Development work was definitely done at Number Three Level at Faggergill mine. In 1909, the level was inspected by mining engineers Lightfoot, from North Wales, and John Ashworth, president of the Manchester Geological and Mining Society. They recommended that the level was driven easterly to get under the work of Faggergill Number One Level.³³⁷ The output of the company was, however, not impressive. In 1910, 170 tons of ore by a workforce of 32 and, in 1912, only 12 tons were raised by 14 men.³³⁸ In February 1913, an Extraordinary Meeting of the company passed a resolution for a provisional agreement with Cookson and Company of Newcastle, a company which Raistrick stated was set up by Faithfull Cookson, to give it the prospecting rights for twelve months.³³⁹ Upon completion of successful trials a new company was to be formed, to acquire the interests of the Stang and Cleasby Company on the terms that its property should be worth 25 per cent of the new company.³⁴⁰ However, this did not come about as in September 1915, the company ceased trading and was officially dissolved on 31 October 1916.³⁴¹ This marks the end of the last mining company in the Swaledale area as a whole.

As noted earlier, in April 1841 an agreement had been made between the Arkengarthdale and the Surrender lessees, with Robert Jacques and George Robinson being directors of both these private companies, and John Gilpin that the miners at Surrender could use the

³³² NYCRO, *ZOA 16/1/7*.

³³³ PRO, *BT31/12159/109746*.

³³⁴ *The Mineral Statistics of the United Kingdom*.

³³⁵ PRO, *BT31/12159/109746*.

³³⁶ *ibid.*

³³⁷ K Wood, *Rich Seams, History of the Manchester Geological and Mining Society*, (Manchester, 1987), p. 124.

³³⁸ *The Mineral Statistics of the United Kingdom*.

³³⁹ A Raistrick, *The Lead Industry of Wensleydale and Swaledale, Volume 1 The Mines*, p. 78.

³⁴⁰ PRO, *BT31/12116/95419*.

³⁴¹ *ibid.*

Moulds Level in the Arkengarthdale mines to access their lead veins and also to drain their mine.³⁴² On 21 January 1873, a letter from Newby, Richardson and Watson, the solicitors of the Arkengarthdale Mining Company, noted that the application from Denys to continue with the wayleave was different from the wording of the 1841 agreement. Their letter stated that the use of this level was convenient yet dispensable for Surrender but did, “endanger profitable working and prospecting” for the Arkengarthdale Company, an “embarrassing proposition from Denys”.³⁴³ Denys’s agent, Thomas Raw, thought that the refusal to allow Surrender to use the Moulds Level would compel Denys to close the mine, wasting all the valuable equipment allegedly purchased by Denys and causing a loss of £300,000.³⁴⁴ This appears to be yet another example of Denys’ companies’ exaggerated overvaluation policy.

Gilpin Brown refused to renew the Moulds Level agreement and bitterness from Denys ensued. In October 1873, he wrote to Gilpin Brown about the “impetuous letter regarding Arkengarthdale’s request that Surrender return their wagons”. Denys was categorical that the wagons used at Moulds Level belonged to Surrender and loaned them with goodwill to Arkengarthdale, “one good thing deserves another...I should have been glad to have been allowed to go in peace from Moulds Level carrying away with me my goods and chattels without being accused of taking what does not belong to me”.³⁴⁵

Denys’s disgust and disappointment was further expressed in a small undated article he published regarding the affair, *A Chapter on Mining, Surrender Mine, Reeth High Moor*. “It is proposed in this paper to exemplify how a prosperous mine may be stopped in its tracks by the ignorance of agents on the one hand and the credulity of their employers on the other...The Art of Mining and the Art of War are near akin. In war, the greatest general is he who makes the fewest mistakes, in mining the same rule applies”. He wished to inform the “ignorant agent”, Blenkiron, and mine owners, the Arkengarthdale Mining Company, of, “the suicidal folly of this act...neither Mr Gilpin Brown nor his Stockton solicitor are practical miners. Thus Mr Whitwell (director of the Company), who was new to the district, Mr Blenkiron, a young man without much experience, and Mr Woodward (mine manager), an excellent woodsman but neither a miner or qualified to

³⁴² NYCRO, ZLB 6/4, ZLB 7/20, ZLB 41/3 and ZLB 3/5.

³⁴³ NYCRO, ZLB 2/280.

³⁴⁴ *ibid.*

³⁴⁵ *ibid.*

be an agent, became the masters of the situation...The Statements are not made out of spite or ill-will against any one of the parties named...It is invariably found that wherever there has been discord or mischief, it has arisen through jealousy and quarrelling of agents...The evil that men do lives after them". Denys goes on to compare the Moulds Level wayleave refusal to Parliament ordering the London Metropolitan Railway to stop building a central station in the capital and replace it with four suburban ones, thus resulting in confusion and loss. Denys ended his bitter piece with another advert for his own "saviour" of the Swaledale lead mining industry, the Sir Francis Level, reminding the reader that the venture was very similar to the Moulds Level agreement of 1841, as it needed the co-operation of two separate companies, ignoring the fact that the Arkengarthdale agreement had been signed by directors who sat on both boards.³⁴⁶ Not to be put off by such a rebuff, Denys reapplied in February 1881, to gain access to Surrender mine via Moulds Level.³⁴⁷ His request was again refused.

"It is clear that the fall in the price of lead was not the main cause of the decline and extinction of the Swaledale lead mining industry".³⁴⁸ The fall of the lead mining industry in Swaledale and Arkengarthdale was caused by one factor, exhaustion of the available minerals. The fall in the price of lead was not a significant contributing element, although a higher price might have delayed the final end by a few years. As discussed earlier, there is no correlation between the production figures and the price of lead. Unfortunately, Denys and others were convinced that there were riches to be found just around the corner, even though they were disappointed time after time with the costly, misjudged and poorly run mining investments they had continued to follow. The Sir Francis Level was an unmitigated disaster, a costly exercise, badly planned and administered that completely failed to deliver the "fat things" Denys promised. Carruther and Strahan describe Swaledale very well, "on every hand, repeated with monotonous insistence, one notices lodes, which, though very rich on high ground proves worthless when followed to the lower slopes...The number of veins which have been wrought at one time or another in Swaledale must total several hundred...no effort seems to have been made to keep working plans".³⁴⁹

³⁴⁶ NYCRO, *ZLB 3/34*.

³⁴⁷ NYCRO, *ZLB 2/280*.

³⁴⁸ R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, p. 227.

³⁴⁹ R G Carruther and Sir Aubrey Strahan, *Memoirs of the Geological Survey: Special Reports on the Mineral Resources of Great Britain, Volume XXVI Lead and Zinc Ores of Durham, Yorkshire and Derbyshire with notes on the Isle of Man*, (London, 1923), p. 26.

Jennings quoted W Wallace, who stated in 1861 that in Swaledale there was; “no suitable training for those whose province it is to investigate the most difficult problems of geology and mineralogy. While the art of mining has attained great perfection, the science of mining scarcely exists and the opinions of practical men on the subject are based upon empiricism of the lowest order”.³⁵⁰ The running of the Swaledale mines appears to have been based entirely on trial and error. Details of the mines were not recorded on charts and previous trials had been abandoned and unmapped. This meant that in later years another trial could be undertaken in the vicinity, only to find that the company was examining an area that had already been mined and the ore exploited. These are in striking contrast to the operations of the London Lead Company in Teesdale where the mining operations were carefully recorded and training provided for staff. This makes the claim made by Fieldhouse and Jennings, that the Swaledale lead mines were a marvellous success due to close supervision and intimate knowledge of the mining field, to be rather exaggerated.³⁵¹ It is more feasible to state that the local industry did well to survive in spite of the actions of many of the main figures involved.

The actual running of the mining companies also appears to have been incompetent. Overvaluation, poor recording of wages paid and deliberate omissions of important figures from the annual balance sheets point to badly run companies, verging on dishonesty. The agents under Sir George Denys probably provided him with the information they believed he wanted to hear. They told him that his mines would provide a very good return, while portraying the companies he did not control as inefficient and failing to keep to the terms of the leases agreed. Jennings quoted a remark made by Lord Pomfret in January 1773, the main Swaledale landowner in the eighteenth century; “the only way to have a just account and make a full profit of the estates in Swaledale is not to employ anyone as a steward who is a Yorkshireman, and particularly of that neighbourhood”.³⁵² This is undoubtedly a over-generalisation, tarring the neighbourhood as a petty swindling area, just because of the actions of one or two individuals. However, judging by the performance of all the companies based in Swaledale on the records that have survived, the results do reflect very poorly run companies. Considering these factors and the obvious lack of any substantial lead ore reserves it is very surprising that the Old

³⁵⁰ B Jennings, *The Lead Mining Industry of Swaledale*, p. 71.

³⁵¹ R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, p. 221.

Gang Company Mining Company established in 1888 managed to last as long as it did.

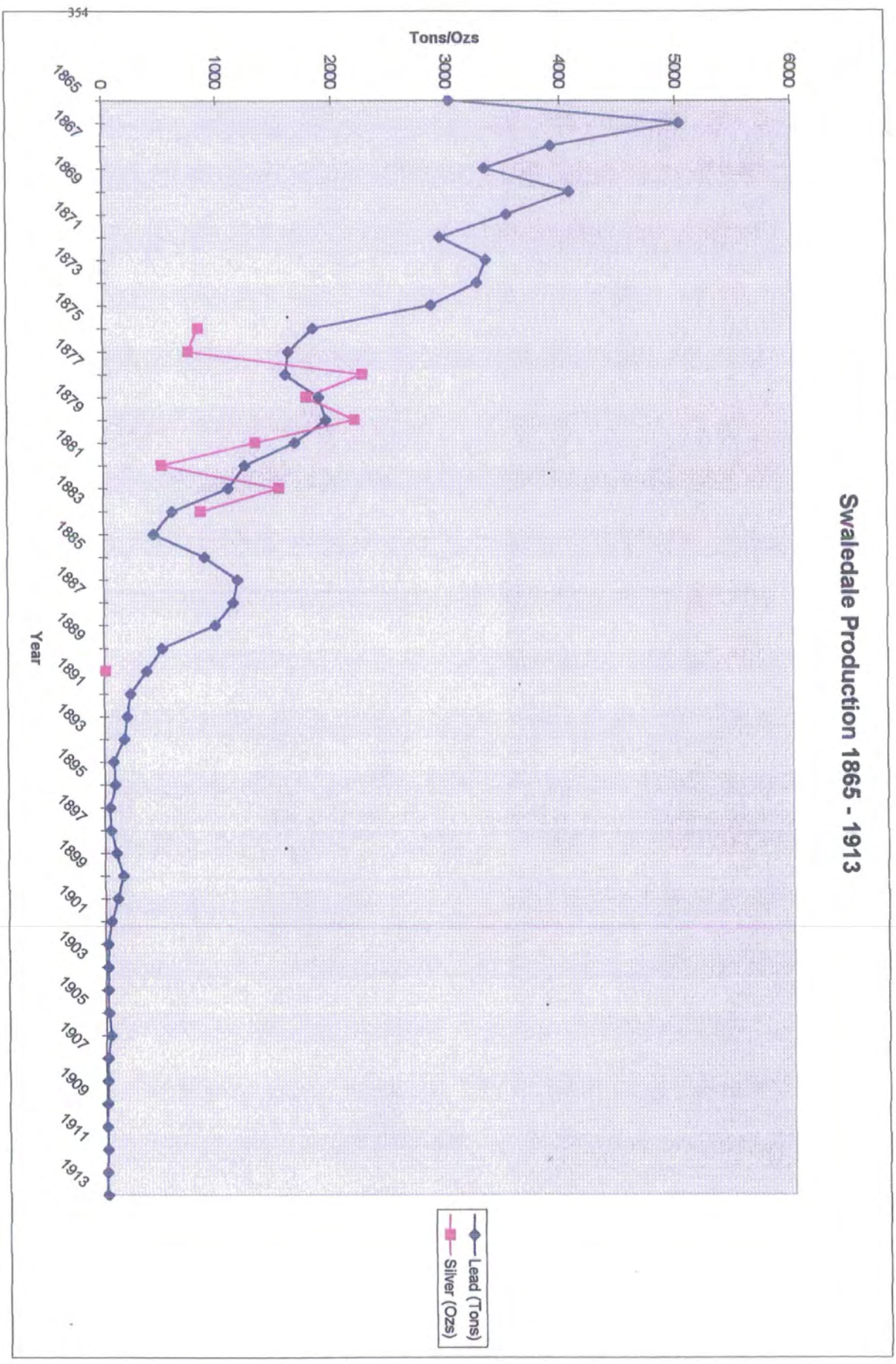
³⁵² B Jennings, *The Lead Mining Industry of Swaledale*, p. 72.

Table showing summary of ownership of lead mines in Swaledale and Arkengarthdale³⁵³

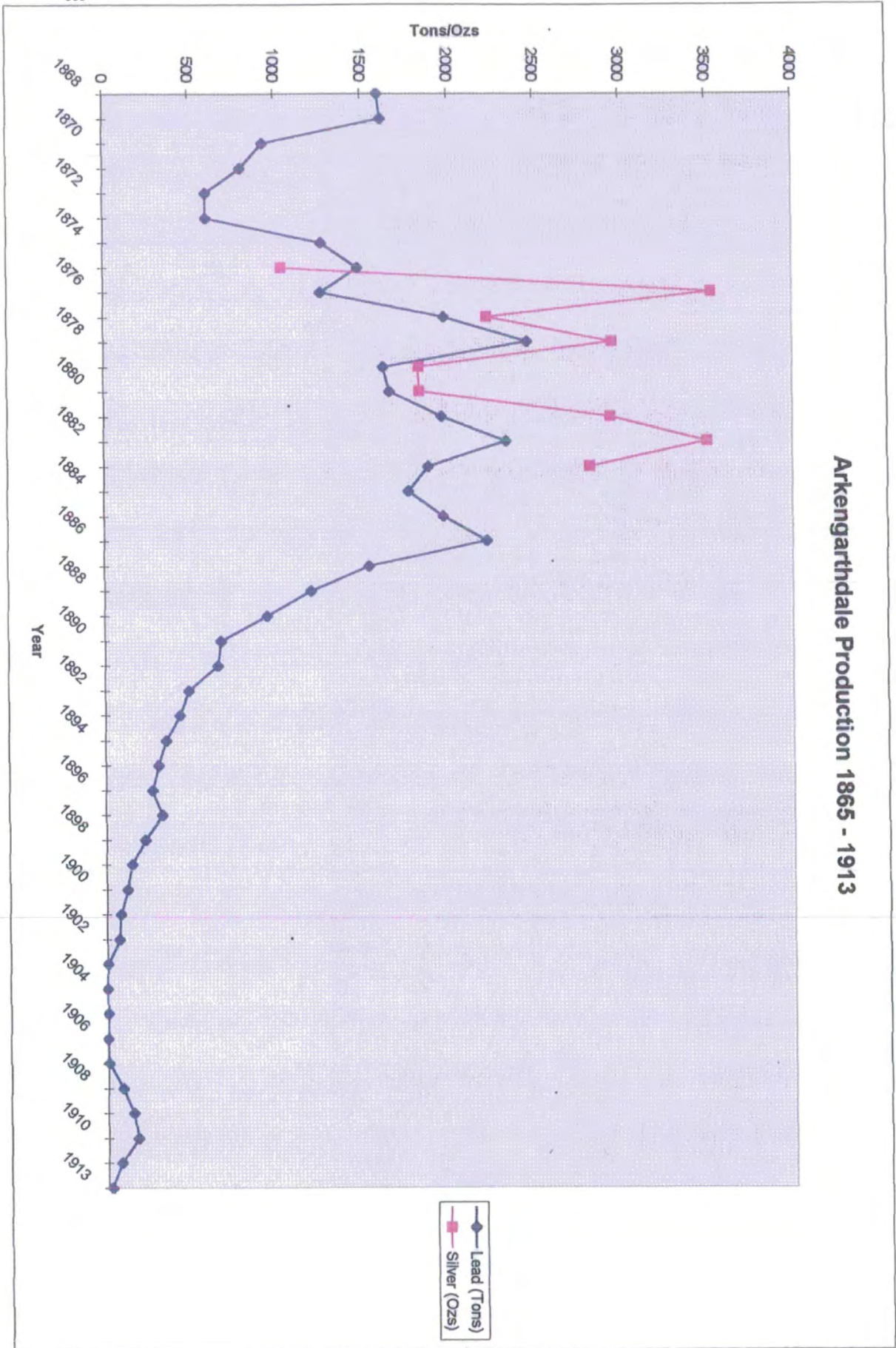
Hurst	1861 to 1880 leased by Hurst Company (Leeman, York). 1881-1891 leased by Yorkshire Lead Mines Ltd. then Hurst Lead Mines Ltd. both controlled by Cookson. 1891 abandoned.
Summer Lodge	Leased by the local Swaledale mining families, abandoned 1867.
Grinton & Whitaside	Leased by the Swaledale families to 1876, mining then ceased. 1887 - 1895 Grinton Mining and Smelting Co. Ltd under Hosking. 1895 company dissolved and mines abandoned.
Fremington Fell End	1866 to 1881 leased to local Swaledale families, mine then abandoned.
Muker Side	1865 - 1872 leased to South Swaledale Mines Co. (Holdsworth, London), lease forfeited 1872. 1883 Denys ran a trial but no other details of mining taking place.
Kisdon	1864 - 1866 Denys, 1866 - 1870 Kisdon Mining Company (Denys managing director). 1870 voluntary liquidation, mine abandoned.
Surrender	Leased to the Swaledale families to 1868. 1868 - 1874 Denys, then 1874 - 1887 the AD Company but abandoned in 1878. 1888 - 1906 Old Gang Mining Co. Ltd. 1910 abandoned.
Swinnergill	Leased by local families until 1868 when abandoned. Denys 1868 to 1873, then AD Company 1873 - 1887. 1888 - 1906 Old Gang Mining Co. Ltd. 1910 abandoned.
Blakethwaite	Leased by local families until 1866. Denys 1867 - 1875. 1888 - 1906 Old Gang Mining Co. Ltd. 1910 abandoned.
Old Gang	Leased by local families to 1887. 1888 - 1906 Old Gang Mining Co. Ltd. In use up to the beginning of First World War.
Sir Francis Level	AD Company 1879 - 1887, then Old Gang Mining Co. Ltd 1888 - 1906. Mine abandoned 1905.
Stang	Leased by local families until 1868. Arkengarthdale Mining Company 1870 - 1890, G T Gilpin-Brown 1891 - 1907 and C B Lead Mines Ltd 1907 - 1913. Mine abandoned 1909, company dissolved 1915.

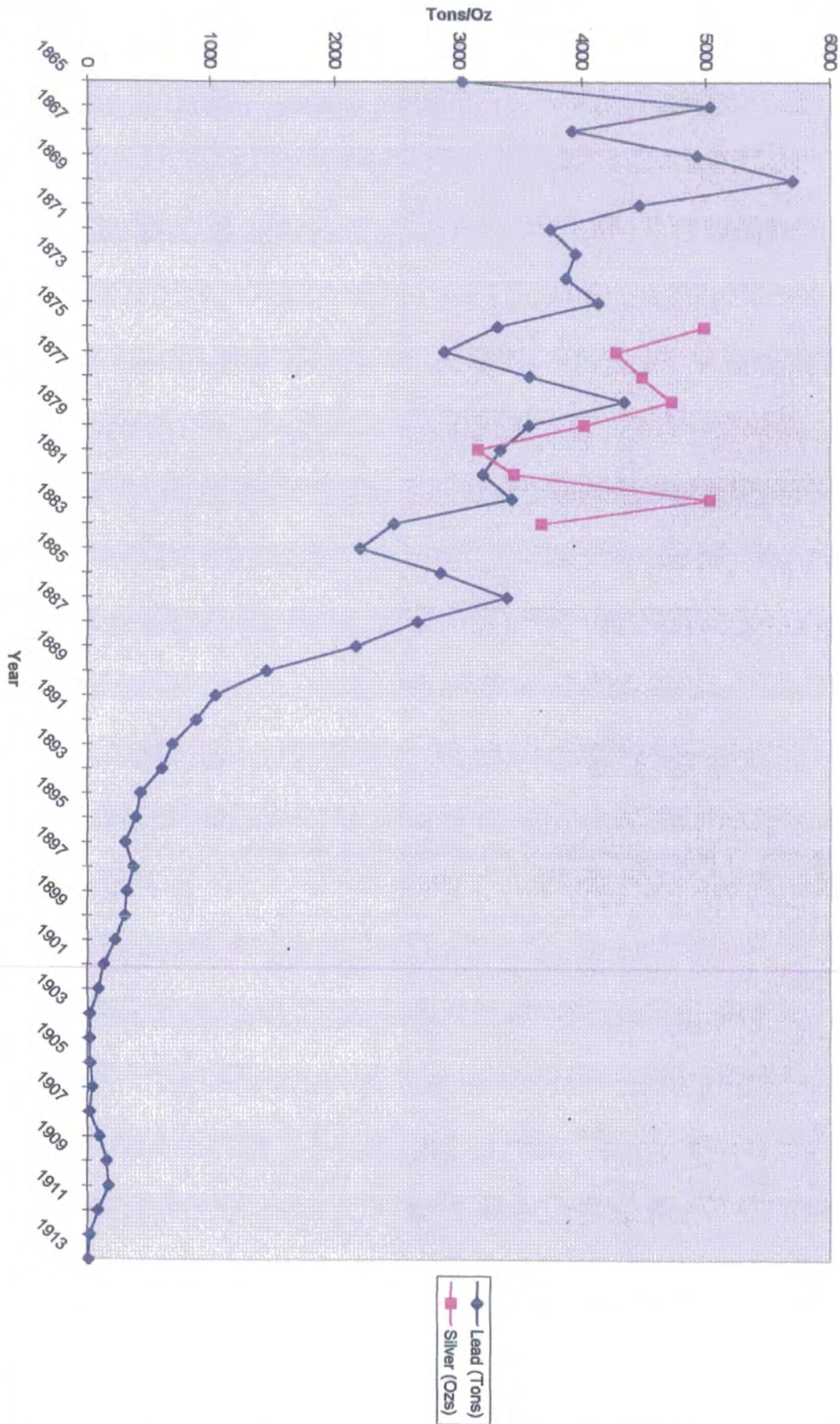
³⁵³ *The Mineral Statistics of the United Kingdom.*

Danby & Faggergill Leased by local families until 1868. Arkengarthdale Mining Company 1870 - 1890, G T Gilpin-Brown 1891 - 1907 and Stang & Cleasby Lead Mines Ltd. 1907 - 1913. Company dissolved 1916.



³⁵⁴ *The Mineral Statistics of the United Kingdom.*





Swaledale & Arkengarthdale Production 1865 - 1913

8. Operation and Investment, Wensleydale

The industry in Wensleydale, as noted previously, is considerably less well documented than Swaledale, especially prior to 1851, when lead mining in this dale was more buoyant. The highest recorded output was in 1860, with 2,815 tons of ore, 2.1 per cent of the United Kingdom's total output and not the five per cent Hallas claims, but the valley was already in a steep decline by the end of that decade.³⁵⁷ By the 1880's, the output was minimal, averaging 198 tons of ore per annum, 1880 the highest at 416.4 tons and 1889 the lowest with only 18 tons of ore being produced. Production completely ended in 1896.³⁵⁸

Wensleydale's lead mining industry was a collection of small mines scattered around the edge of the mineralised area with only large scale mining comparable to Swaledale occurring at Keld Heads, near Wensley, and Apedale, near Castle Bolton. In the *Mineral Statistics*, there are fifteen mines named producing lead in or after 1865 in Wensleydale, whilst Hartley and Ingilby have estimated that there were 50.³⁵⁹ In 1865, the output of the dale in tons of lead ore was 1,419.6. Of this figure Keld Heads mine produced 1,200 tons, clearly demonstrating that this was then the principal mine in the valley. Apedale, the other main mine, was in severe decline at this point. Between 1864 and 1896, its highest annual output was in 1877, with only 113 tons of lead ore.³⁶⁰ Hallas was clearly correct to state, "the lead mining industry in Wensleydale was a pale reflection of the Swaledale industry...shorter life span and its output was much lower".³⁶¹ For instance, when the mining industry was operating successfully Swaledale produced 3,024.2 tons of ore in 1865, over double the output of Wensleydale and in 1866, whilst Wensleydale's output was 1,213.5 tons, Swaledale achieved 5,030.8.³⁶²

The records of the Manor of Bainbridge, south of the River Ure, held at North Yorkshire County Records Office, give some insight into some of the smaller mines in the valley. In 1861, the Wensleydale Mining Company Limited, whose offices were in Leeds, raised £5,713 worth of ore but, in 1866, no lead had been obtained and its rent remained unpaid.

³⁵⁷ *The Mineral Statistics of the United Kingdom* and C S Hallas, *Economic and Social Change*, p. 305.

³⁵⁸ *The Mineral Statistics of the United Kingdom*.

³⁵⁹ M Hartley and J Ingilby, *The Yorkshire Dales*, p. 184.

³⁶⁰ *The Mineral Statistics of the United Kingdom*.

³⁶¹ C S Hallas, *Economic and Social Change*, p. 302.

³⁶² *The Mineral Statistics of the United Kingdom*.

Its interest switched to ironstone, with the company being renamed the Wensleydale Iron Company Limited in 1872.³⁶³ Its lease was surrendered in 1895.

In 1876, the Worton Mining Company (with John Tattershall as mine manager) was working Worton mine under a lease from N R King.³⁶⁴ The operation of this mine is confirmed in the *Mineral Statistics* recording lead production between 1875 and 1882 but this was a small mine, the highest production figure being 117.3 tons of ore in 1876.³⁶⁵ In 1880, Fred Handley complained that John Harker and Thomas Lambert were working for lead at Worton and, as a consequence, had damaged the road surface.³⁶⁶ The lessees of the Ray Gill mine, the Wensleydale Mining Company Limited, also in the manor of Bainbridge, were reprimanded by the manor in 1865 for weighing ore for royalty payment without being witnessed by a representative of the manor.³⁶⁷ The *Mineral Statistics* also record that there were mines at West Burton and Braithwaite whose final years of production were 1864 and 1866 respectively.³⁶⁸

The two principal mines of Keld Heads and Apedale in Wensleydale were both on the northern side of the valley on land owned by Lord Bolton. The Bolton Archive is not as comprehensive in content as the records that have survived for Swaledale and, to a lesser extent, Teesdale. The estate papers, regarding lead mining, are mainly restricted to field and rent books and a collection of surveys, with large gaps in the correspondence held. Using the available material, the Bolton Parks Mining Company was first mentioned in the 1865 rent book, paying on New Lady Day.³⁶⁹ This field book records the property rented by the Apedale Lead Mining Company: one house with a garden and convenience ten acres; another garden of fourteen acres; Scarth Pool Close meadow; one potato plot; two low gaits in Redmire High Pasture; and one stirk gait in Bolton Black Hill Park, at a total annual valuation of £17.13.³⁷⁰ This property, leased by the Apedale Mining Company was inspected and found to be in good repair in the autumns of 1876, 1878 and 1879.³⁷¹

³⁶³ NYCRO, *ZPG 1861*.

³⁶⁴ NYCRO, *ZPG 22/15*.

³⁶⁵ *The Mineral Statistics of the United Kingdom*.

³⁶⁶ NYCRO, *ZPG 1861*.

³⁶⁷ *ibid.*

³⁶⁸ *The Mineral Statistics of the United Kingdom*.

³⁶⁹ NYCRO, *ZBO IV 1/10/5*.

³⁷⁰ NYCRO, *ZBO IV 1/10/6*.

³⁷¹ NYCRO, *ZBO IV 8*.

The rent and field books also record the property rented by the Keld Heads Mining Company. In 1864, they were charged £5.85 for 2.27 acres and £19.25 for 22 acres.³⁷² In 1882, the company rented Mains Close, part of the ore dressing floor, two houses with gardens, the area of the smelt mill chimney and other surface work areas on the Preston and Wensley parish boundaries. The annual charge was £22.25.³⁷³ The bulk of the material held at the North Yorkshire County Record Office consists of maps and plans of the mines, a marked difference to the Swaledale mines material, which contains only five maps (Sir Francis Level 1880, Friarfold 1882 and three undated maps of Hurst).³⁷⁴ There are 27 surviving maps and plans of the Wensleydale mines including; 1866 Bolton Park mine: the Keld Heads mine in 1866 and 1878; land leased to the Bolton Parks, Virgin and Apedale Mining Companies; and maps showing the land purchased and alterations made by the North Eastern Railway Company between 1866 and 1870.³⁷⁵ This may indicate that the Wensleydale mining companies kept better records of their mines than those in Swaledale and were, therefore, less likely to invest capital into a major trial only to find that the "old man" had already mined the area and stripped away the available ore in the preceding years.

Raistrick has published some work regarding the lead mines of Wensleydale but fails to mention from where he obtained the information. He compared the Chaytors of Spennithorne in Wensleydale to the Swaledale group of professional families investing in mining.³⁷⁶ He states that the Chaytors were major shareholders in the Keld Heads mine and their name was used for the major trial of Chaytor Rake.³⁷⁷ Unfortunately, Raistrick merely provides what is a list of the mines and the years in which they were in production. His assertion that in 1870 Brownfield mine closed would seem to be erroneous as it is recorded that the Apedale Lead Mining Company leased this mine between 1873 to 1878.³⁷⁸ Raistrick also suggested that the Bolton Park mine was one of the newest and last worked mines in Wensleydale (finally closing in 1896) but there is no record of this mine producing lead after 1870, and only 20 tons of ore were obtained in

³⁷² NYCRO, ZBO IV 1/10/5.

³⁷³ NYCRO, ZBO IV 1/10/6.

³⁷⁴ NYCRO, ZLB 41/74, ZLB 41/74, ZHP 352, ZWX (M) 14 and ZLP 10/2380.

³⁷⁵ NYCRO, ZBO (M) 13/6, (M) 18, (M) (4) 1/3, (L) 2/9, (L) 9, (L) 11, (L) 12, (L) 13, (L) 14, (L) 17, (L) 18, (L) 19, (L) 20, (L) 21 and (L) 25.

³⁷⁶ A Raistrick, The Lead Industry of Wensleydale and Swaledale, Volume 1, p. 44.

³⁷⁷ ibid., p. 44 and NYCRO, ZBO (L) 25.

that year.³⁷⁹ Raistrick claims that the Apedale mine was more successful, citing the sinking of a shaft in 1868 and the lease not being surrendered until 1883.³⁸⁰ The *Mineral Statistics* tell a different story. As noted earlier, between 1865 and 1897, the mine averaged an annual output of 18 tons of lead ore, the highest being 113 tons in 1877. There was, however, an interesting deviation in the mine's actual product. Between 1881 and 1884, the mine obtained over 160 tons of zinc to the value of £620.80, whilst in the same period 162.8 tons of lead ore were produced, valued at £1,687.00.³⁸¹ According to the *Mineral Statistics*, the lease was surrendered by the Apedale Lead Mining Company in 1883 but was renewed by the Apedale Mining Company until 1897, when Joseph and Thomas Craddock, Joseph a lessee in Swaledale and a director of the Old Gang Mining Company Limited, took over the mine before it was finally abandoned in 1902. The last recorded output of lead ore was in 1896.³⁸² It is of note that Simon Cherry, Denys-Burton' agent in Swaledale and secretary of the Old Gang Mining Company, requested Thomas Craddock to inspect the Apedale mine for potential operation in April 1895. Craddock's report was favourable.³⁸³ This may indicate that there was some interest in Swaledale, either from Cherry himself or someone he was representing, in taking over the Apedale mine on a permanent basis. In June 1895, Cherry was requested to send over four good miners to help with flooding problems at Apedale. However, the resultant eight day strike over working in very wet conditions might have dampened any possible take-over plans.³⁸⁴

Raistrick's figures for Keld Heads, however, do correspond with the *Mineral Statistics*, confirming that the mine did function up to 1888.³⁸⁵ The lessees of the mine 1860 to 1875, is recorded as Keld Heads Company and the Keld Heads Mining Company from 1876 to 1879. Thomas Dymond was the registered lessee between 1880 and 1887 after which the landowner, Lord Bolton, could find no further lessees of the mine until its final abandonment in 1898, despite his wish to lease it.³⁸⁶ The smelt mill at Keld Heads was reputedly as good as that of the London Lead Company's at Egglestone in Teesdale.

³⁷⁸ *ibid.*, p. 86 and *The Mineral Statistics of the United Kingdom*.

³⁷⁹ *ibid.*, p. 89 and *ibid.*

³⁸⁰ A Raistrick, *The Lead Industry of Wensleydale and Swaledale, Volume 1*, p. 89.

³⁸¹ *The Mineral Statistics of the United Kingdom*.

³⁸² *ibid.*

³⁸³ NYCRO, *ZLB 11/6/12 and 11/6/18*.

³⁸⁴ NYCRO, *ZLB 11/6/36 and 11/6/48*.

³⁸⁵ A Raistrick, *The Lead Industry of Wensleydale and Swaledale, Volume 1*, p. 92 and *The Mineral Statistics of the United Kingdom*.

According to Raistrick, the example J Percy uses in his book of 1870, *The Metallurgy of Lead*, for an efficient reverberatory furnace is based entirely on the Keld Heads smelt mill, hence Raistrick's claim of Wensleydale's contribution to smelting techniques.³⁸⁷ The remains of this mill show that it had a two mile long flue, a condensing house and a large peat house to store the fuel.³⁸⁸

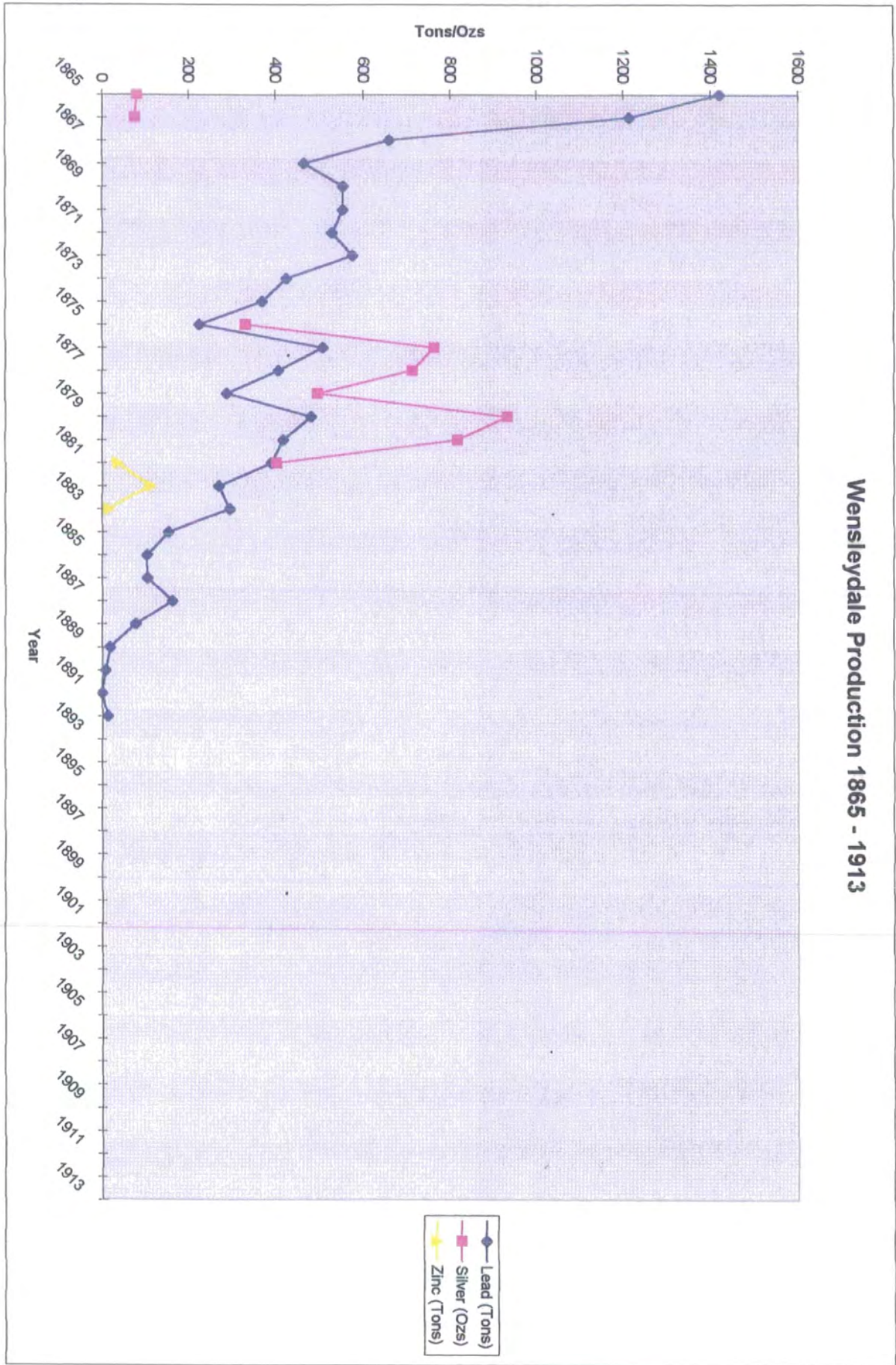
The lead mining industry in Wensleydale was smaller and had declined and died before Swaledale's. As the industry was not as dominant in the locality, its demise had a considerably less heavy impact upon the local economy and community than in Swaledale, as will be discussed later. The reason for the fall of the industry is probably the same as for Swaledale, the exhaustion of the mineral resources, totally unaffected by the dramatic fall in the price of lead. Wensleydale had several advantages over Swaledale. Other industries and better farming prospects are two examples, but the valley was also fortunate that it did not have a Denys-type figure who was obsessed to such an extent to campaign for the industry and waste hundreds of thousands of pounds of capital on worthless and misguided mining ventures.

³⁸⁶ *The Mineral Statistics of the United Kingdom* and NYCRO, *ZLB 11/8/47*.

³⁸⁷ A Raistrick, *The Lead Industry of Wensleydale and Swaledale, Volume 2 The Smelting Mills*, (Buxton, 1975), p. 13.

³⁸⁸ R T Clough, *Smelting Mills of the Yorkshire Dales*, (Leeds, 1962), pp. 97-101.

Wensleydale Production 1865 - 1913



9. Operation and Investment, Teesdale

While Denys had dominated Swaledale, Teesdale was under the control of the London Lead Company, with only a few smaller mines being run by private companies. A comparison must be made on the effects both parties had. The company, as noted earlier, was an early joint stock organisation. The executive decisions were taken by a court which consisted of the governor and 24 assistants who were elected annually and attended a meeting every Tuesday at the company's head office at 9 Martins Lane, Cannon Street, London. The numbers of assistants had been reduced to ten by 1865 and then to eight in 1883, when the company changed to become one of limited liability.³⁹⁰ The members of the court had to take an oath to act in the company's best interests. The assistants also sat on sub-committees for specified purposes, such as finance, and then reported back to the court. The governor and assistants regularly inspected the mining areas and each district, such as Teesdale, had a superintendent to manage the company's workforce and concerns. The minutes for the Court of Assistants have survived almost intact for the full existence of the company, 1692 to 1905. After the company's liquidation in 1905, the records became the property of R C Foskett, the son-in-law of the last governor who, sensibly, deposited them with Parker, Garrett and Company, solicitors, for safe keeping in 1943. Unfortunately, the solicitor's premises suffered bomb damage during World War II and the last minute book, 1899 to 1905, is now missing leaving an unfortunate gap in the records, especially for the period leading up to the company's demise.

The Bowes and Strathmore Archives held at Durham County Record Office contain copies of leases and agreements entered into by the London Lead Company. The Raby Estate Archive, currently still stored by its owner, Lord Barnard at Raby Castle, also has some useful material but, unfortunately, there was no archivist employed by Lord Barnard when these records were accessed and the index used at the castle consisted of a small note sellotaped onto the top of the storage boxes.

As noted earlier, the leases granted to the London Lead Company for their mining concerns were for longer periods of time and covered larger areas than those in Swaledale and Wensleydale. The company used only one smelt mill at Egglestone, not one for each mine, and by running up to 23 mines in Teesdale simultaneously they could fund

exploration in one mine from the profits made in another. As a result, no large profits were made as they were used to offset any losses.³⁹¹ Between 1865 and 1899, the company raised £2,479,649.08 from lead production and £410,794.35 from silver.³⁹²

However, the London Lead Company did not reinvest its profits as capital for investment solely in the lead mining industry. From 1865 to 1899, the company had many investments outside. These included a £20,000 debenture in the London and North Western Railway, which paid the company a return of three per cent per annum until the debenture was cashed in March 1869. Other outside investments included £157,000 in Consols, £110,000 in the City of London Corporate Bank with a return of two and one half per cent per annum, £18,000 in stocks and shares and £3,000 in a London bond. In total, the London Lead Company invested £308,000 in outside concerns. For the same period the company paid dividends of £134,853.75 to its 1,000 shareholders and also paid interest on loans (bank, private and consol) of £9,801.25. In the 1880's, £95,000 of capital was written off and over £14,625 was made by selling off property in the Teesdale area alone.³⁹³

The London Lead Company also differed from the Yorkshire mines in how they employed its miners and other staff. This will be studied more closely later, but from 1785 onwards, the company began to pay its workers a monthly subsistence wage, rather than one based purely on measured contractual work. From the 1840's, the bargaining independent contract found in other lead mining areas was still in existence in Teesdale but only in a nominally sense. The company agents had considerably more control over the miners with a regular shift pattern at specified work times and with the miners in receipt of a regular monthly income (disguised as a bargained system) with no deductions taken for the equipment they used at work.³⁹⁴

There was also a distinct career advancement avenue available to the workers. Miners appointed their own overman who was responsible for the work and safety at the mine

³⁹⁰ NCRO, *LLC 34 19/12/1883*.

³⁹¹ *The Mineral Statistics of the United Kingdom*.

³⁹² NCRO, *LLC 30 to 37*.

³⁹³ *ibid.*

³⁹⁴ NCRO, *LLC 29* and BPP, *Inquiry into the Conditions of all Mines in Great Britain to which the Provision of the Act 23 and 24 Vict c151 Do Not Apply, with Reference to the Health and Safety of Persons Employed*. Royal Commission Report; 1864 (3389) XXIV, Volume 1, p. 262.

and acted as the go-between the workmen and the court. There was promotion available to underground agents in the mines who conducted surveys, then to district agent who acted as the local manager and, finally, to general agent or superintendent who was responsible for all the mines in the district (in 1865, Robert Bainbridge was the superintendent for Teesdale). There were mill agents, in charge of smelting, and washing agents in charge of the ore dressing. Between 1865 and 1905, all the company's officials had been promoted from within the company, giving a remarkable unity and commitment to the company with a good understanding between the miners and the management as of each others' aims and objectives.

The mines were also run in a more professional and efficient manner, with detailed plans being kept. The company began employing surveyors in 1815 and established a system of recording all the underground workings.³⁹⁵ Over 100 carefully drawn and large-scale plans of the mines have survived and are kept at the Northumberland County Record Office at Gosforth. All horse levels were stone arched and ladders were used inside the mines instead of the less safe stemples, which were wooden crossbars keeping the side walls apart, similar to a horizontal pit-prop.³⁹⁶ Long and expensive drainage levels were driven which both ventilated and drained the mines, the water then being channelled to provide a free source of power for the hydraulic machinery throughout the mining area. The company planted its own forests to provide the timber for support props, as opposed to buying in the wood, and safety in the mines was encouraged by the use of only patented fuses for explosives, making the blasting safer.³⁹⁷ As a result, there were fewer mining accidents and each fatality had to be investigated and a report submitted to the court. Between 1800 and 1875, Raistrick reports that there were 25 fatalities from all of the company's mining districts, which at this time included Teesdale, Weardale and Alston Moor, and between 1875 and 1886 there were a further five fatal and eleven injury accidents reported in the court minutes.³⁹⁸

The company also actively promoted the concept of an educated workforce, many years before this was noted as a need to help ensure the proper regulation of the mines in the

³⁹⁵ NCRO, *LLC 1 to 37* and A Raistrick, *Two Centuries of Industrial Welfare*, p.55.

³⁹⁶ BPP, *Conditions of all Mines*. R.Comm.Rep.; 1864 (3389) XXIV Volume_2, pp. 374-375.

³⁹⁷ *ibid.*, p. 332.

³⁹⁸ A Raistrick, *Two Centuries of Industrial Welfare*, p. 53 and NCRO, *LLC 35 14/12/1886*.

Mining Act of 1860.³⁹⁹ Libraries were provided, as will be discussed later, which included books on mining and metallurgy. The company also invited Professor James Finley Weir Johnstone, Reader in Chemistry and Mineralogy at the University of Durham, to give courses on chemicals to all the company's agents and their assistants at Middleton in 1834 and 1835.⁴⁰⁰ This appeared to have been a success as clerks were later sent to the University for instruction in chemistry and metallurgical processes.⁴⁰¹ In 1856, a School of Mines was established at Durham University for engineering and mining science.⁴⁰² The company's efforts contrast strikingly with those of Swaledale.

Progress and technology were also welcomed and used by the London Lead Company. As noted earlier, the company bought the patent for the Pattinson process for extracting silver and introduced the Rozan method in 1870. The Rozan method vastly improved the efficiency of extracting silver from lead and reduced the costs. Between 1865 and 1875, the London Lead Company produced an average yearly output of 4,904.4 tons of lead ore, from which an average of 11,363 ounces of silver was obtained. Between 1876 and 1886, the average annual output was 4,298 tons of lead ore and 18,639.2 ounces of silver, an increase of 62.5 per cent in the production of silver per ton of lead ore raised.⁴⁰³

Unfortunately, the improvement in extracting silver from the lead ore was tempered by the significant drop in the price of silver from the mid 1880's.⁴⁰⁴ The company was also well in advance of other mining areas as, by 1833, they had established assay offices and laboratories at Middleton and at their other mining concerns to analyse the ore and all the processes in the smelt mills.⁴⁰⁵ Raistrick noted that practically all the improvements made in the northern mineral field originated from the London Lead Company".⁴⁰⁶

In 1869, John Bowes, the landowner of the Lunedale Mines, appointed mining engineer Thomas Sopwith, chief agent of the Beaumont mines in Allendale and Weardale (author of *An Account of the Mining District of Alston Moor, Weardale and Teesdale* (Alnwick, 1833) and the article on the use of compressed air drills at Mont Cenis which encouraged Denys to use power tools at the Sir Francis Level), to inspect the Lunedale mines and

³⁹⁹ A Raistrick, *ibid.*, p. 62.

⁴⁰⁰ A Raistrick, *Two Centuries of Industrial Welfare*, p. 69.

⁴⁰¹ *ibid.*, p. 69.

⁴⁰² R Burt, *The British Lead Mining Industry*, p. 126.

⁴⁰³ *The Mineral Statistics of the United Kingdom*.

⁴⁰⁴ *ibid.*

⁴⁰⁵ A Raistrick, *Two Centuries of Industrial Welfare*, pp. 66-69.

evaluate the London Lead Company's plans to extend them. The lease for the mines had been granted in 1855 for 31 years, with a sliding royalty of one-eighteenth to one-tenth.⁴⁰⁷ Sopwith inspected the mines at Lune Head, Baldersdale and Whiteforce and recommended that the royalty should be reduced. He noted that, "on present scale of operations I see little chance of improvement", with the mines running at an annual loss of over £2,000. Despite this loss, the London Lead Company had continually kept the number of men working at the mines consistently above the number stipulated in the lease. According to Sopwith, the London Lead Company investments, "would yield profits on a large scale" and that it appeared to have good plans; "I consider that the London Lead Company are by far the most likely parties to conduct such operation to a successful result...(Bainbridge, superintendent) friendly and unreserved expression of opinion which could not be expected in merely professional interest, the open and honourable manner in which the business of the Lead Company is conducted".⁴⁰⁸ These remarks contrast with those made by Bewick in his reports regarding Denys' mining operations in Swaledale.

Unfortunately, the results of the expansion cannot be fully assessed as the London Lead Company did not specify the output of each individual mine but produced mineral statistics in their district form; for Teesdale, Yorkshire for the mines south of the River Tees and in Lunedale or for Weardale. A memorandum dated 1870, stated that the improvements were, "inexhaustible".⁴⁰⁹ However, in 1877, Bainbridge sent a report to John Bowes, regarding the lack of royalties he had been receiving from the Lune Head and Silverband mines. Bainbridge stated, "I regret that I am still unable to report these mines profitable to the Company and the present aspects of the lead mining trade is far from encouraging".⁴¹⁰ The mines at Baldershead may have been more productive but all the Lunedale mines were put up for sale by the company in 1885 and purchased by the Shields family.⁴¹¹ It is of note that the reports were rather different from the style and content of Denys' reports as managing director of the AD company in Swaledale, there were no promised riches around the corner in Teesdale.

⁴⁰⁶ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 230.

⁴⁰⁷ DCRO, *D/Su/B2/67, 68 and 69*.

⁴⁰⁸ DCRO, *D/Su/B2/100*.

⁴⁰⁹ DCRO, *D/Su/B2/69*.

⁴¹⁰ DCRO, *D/Su/B2/87-88*.

⁴¹¹ NCRO, *LLC 34 30/06/1885* and *The Mineral Statistics of the United Kingdom*.

The company was aware of the state of the lead market and the falling prices but acted upon the effects of market forces and strove to reduce operating costs. In 1868, the minutes regretted, “the state of the Lead Market should be so adverse to the prosperity of the Company”.⁴¹² In the following year, the company informed Bainbridge about the, “necessary retrenchments in the expenditure of the Company”.⁴¹³ In August 1878, the committee of accounts called the attention of the court; “to the fact that the demands for money in the North up to the present time have been nearly equal to those of the corresponding period of last year, though no material increase has taken place in the quantity of lead revised. And the price of lead has fallen on average about £3 per ton. And top consequent necessity of reducing the Expenditure of the Company as much as possible”.⁴¹⁴ This resulted in reductions in pay and the governor visited Teesdale to explain the reasons to the workforce why this had to occur. It is of note the difference between the honesty of the London Lead Company’s business like statements and those of Sir George Denys preaching the mirage of fortune and the ethics of keeping lead mining active in Swaledale.

All pay increase demands were rejected from 1875 through to October and November of 1878, when all wages were cut by ten per cent, with the exception of the court allowances, which were reduced by one half. In September 1890, the court recommended a reduction in wages and stock held.⁴¹⁵ In December 1890, another demand to increase pay was rejected, followed by pay cuts for all the agents in the following year and timber agent, Pattinson, was instructed to save at the timber yards and Millican, the superintendent, at the mines.⁴¹⁶ In 1892, more wage reductions followed.⁴¹⁷

In 1881, a report was presented to the court informing it that 1,700 tons of lead were lying unsold at the Romalldkirk yard and was subsequently used as security on a £20,000 bank loan.⁴¹⁸ Later in the same year, 850 tons of unsold lead were used as security for a further £10,000.⁴¹⁹ The company was running at a loss, unclaimed shares were cancelled and

⁴¹² NCRO, LLC 31 02/07/1868.

⁴¹³ NCRO, LLC 31 03/05/1870.

⁴¹⁴ NCRO, LLC 33 06/08/1878.

⁴¹⁵ NCRO, LLC 36 23/09/1890.

⁴¹⁶ NCRO, LLC 36 02/12/1890 and 23/02/1891.

⁴¹⁷ NCRO, LLC 36 05/01/1892.

⁴¹⁸ NCRO, LLC 34 12/04/1881.

⁴¹⁹ NCRO, LLC 34 21/06/1881.

unclaimed dividends were used to reduce the deficit.⁴²⁰ In 1882, the company sold all its interests in Alston Moor and Weardale, concentrating all their mining interests in Teesdale.⁴²¹ The rather old-fashioned format of the company with its charter and weekly court meeting was altered when, probably too late to make much difference, the joint stock company was converted into a limited liability company in December 1883, with the number of assistants, being company directors under a different name, reduced to eight. The company still maintained the practice of holding a weekly meeting in London which appears to have been a clumsy way to run a limited liability company operating in Teesdale.⁴²² In the same year, it was decided that the rules of the Workmen's Fund, a hardship fund set up by the company to provide relief for the less well off, were to be adjusted by, "steps with a view to modify the present liability of the Company in respect of the Workmen's Fund"⁴²³. The fund had been oversubscribed by claims and the company wanted to limit its losses.

In April 1884, the court received a report stating that no further economies were available to reduce the cost of production. There was a need for an improvement in the lead market or a major discovery of lead and silver was required. The decision was taken to sell the company's northern office, Middleton House (designed by Ignatius Bonami and built in 1815), for £12,000 and to retire the superintendent Robert Bainbridge and replace him with his son C E Bainbridge, who had been his deputy, on a reduced salary.⁴²⁴

Unfortunately, there were no buyers for the house, even when it was offered at an auction. The proposed sale failed to generate any finance for the company until it was rented to Frank Bowes Lyon for £157.50 per month and this was for only three months in 1891.⁴²⁵

In May 1884, C E Bainbridge met the Duke of Cleveland's land agent, Scarth, to ask him to persuade the Duke to suspend royalty payments for the foreseeable future.⁴²⁶ This was agreed in June, with the condition that the company use 30 men to explore further trials and that 220 miners continued to be employed by the company, who was to meet all the

⁴²⁰ NCRO, *LLC 34 21/03/1882*.

⁴²¹ NCRO, *LLC 34 15/08/1882*.

⁴²² NCRO, *LLC 34 19/12/1883*.

⁴²³ NCRO, *LLC 34 15/06/1883*.

⁴²⁴ NCRO, *LLC 34 10/04/1884*.

⁴²⁵ NCRO, *LLC 36 11/08/1891*.

⁴²⁶ NCRO, *LLC 34 13/05/1884* and Raby Castle, *Cash Book, 1884*.

costs incurred.⁴²⁷ In September 1884, C E Bainbridge was instructed to terminate all existing bargains, reduce work and cease all non-profit making workings to save on labour, equipment and fuel and, in November, he was told not to make any bargains lasting longer than one month.⁴²⁸ To keep a track of all expenditure, all requests for material and supplies were to be authorised by the court and all invoices had to be duplicated to them.⁴²⁹

In a court meeting in June 1885, after C E Bainbridge had been reprimanded for setting up a purchasing company and selling peat from the company to himself for resale, it was agreed that the company should sell the peat works they had operated to provide fuel for the Egglestone smelt mill.⁴³⁰ In 1886, an agreement was made between the London Lead Company and the North of England Peat Moss Litter Company Limited (a company set up by Mr London), for tenancy of peat moss, works, machinery and plant at Egglestone Moor. The lease was for three years at an annual rent of £75, with an option for purchase. An inventory of materials held included one shovel, one tube brush, one hose pipe, two oil tins, one chisel and 104 other articles within the large 200 feet by 100 feet peat sheds, an inventory considerably more detailed and accurate than any drawn up for Denys.⁴³¹

The company appeared to have had more severe problems for in 1886, as it refused to publish its accounts for that year, although 4,637 tons of lead ore and 23,180 ounces of silver were produced.⁴³² There was extra expenditure when the Egglestone smelt mill was repaired at an estimated cost of £440.50 and the Teesdale Highways Board was paid £25, after demanding £57.50 in compensation for clearing roads of snow that would normally have been cleared by the company.⁴³³

Despite what appears to have been financial problems, investments were made the following year, when permission for a new shop to be built at Ashgill Head, Lady's Rake, was given by the court.⁴³⁴ One year later the minutes record that a new lease had been

⁴²⁷ NCRO, LLC 34 17/06/1884.

⁴²⁸ NCRO, LLC 34 09/09/1884 and 25/11/1884.

⁴²⁹ NCRO, LLC 34 09/12/1884.

⁴³⁰ NCRO, LLC 34 30/06/1885.

⁴³¹ DCRO, D/Bo/B/113.

⁴³² The Mineral Statistics of the United Kingdom.

⁴³³ NCRO, LLC 34 14/07/1885, 35 11/05/1886, 16/03/1886 and 18/01/1887.

⁴³⁴ NCRO, LLC 35 21/04/1887.

obtained for this area.⁴³⁵ Unfortunately, as noted previously, the company did not issue operating statistics for each mine but only for the district. The company's production figures show a distinct decline, from a high in 1887 of 4,878 tons of lead ore to 2,726 tons in 1892. A recovery then took place, with 4,666 tons of ore being obtained in 1894, which may indicate that Ashgill Head was a successful mine at that time. However, the company was never able to produce a comparable amount of ore in the rest of its existence, output dropping sharply to 252 tons of ore in 1902, its final year as a lead producing company.⁴³⁶

Despite the recovery at the end of the 1880's, in 1889, Scarth wrote to the company complaining about unpaid royalty, threatening to, "enforce the meaning of the leases", if the payment was not made in a reasonable time.⁴³⁷ This suggests that the company may have not been employing the required amount of staff at the mines as specified in the leases as well as delaying in payment. The failure by the company to pay the Duke of Cleveland his royalties does bring into question the sale of the lead obtained.⁴³⁸ There is no mention in the minutes regarding problems with selling its produce. The average London lead price for 1888 was £13.91, the highest average price between 1882 and 1899, an actual peak in the lead price but over £6 less than the average price during the 1860's and early 1870's.⁴³⁹ However, in November 1889, C E Bainbridge was warned that he had, "misrepresented amount of ore to be dressed" in a report to the court and, as a result, he was not awarded the standard gratuity payment usually made to him and other company officials at Christmas.⁴⁴⁰ This might signify that Bainbridge, who had already set up a peat purchasing company and been reprimanded for selling the company's peat to himself, might have been creative for his own financial gains, lining his own pocket at the company's expenses.⁴⁴¹ On the other hand, it is of note that upon paying the Yorkshire Lead Mining Company for ore C E Bainbridge omitted to sign the cheque, which might indicate that C E Bainbridge was incompetent, especially when compared to his father.⁴⁴² At the beginning of 1891, he resigned from the company and was replaced as

⁴³⁵ NCRO, *LLC 35 03/06/1888*.

⁴³⁶ *The Mineral Statistics of the United Kingdom*.

⁴³⁷ NCRO, *LLC 35 12/02/1889*.

⁴³⁸ Raby Castle, *Cash Books 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888 and 1889*.

⁴³⁹ *The Mineral Statistics of the United Kingdom*.

⁴⁴⁰ NCRO, *LLC 35 12/11/1889 and 24/12/1889*.

⁴⁴¹ NCRO, *LLC 34 12/05/1885*.

⁴⁴² NYCRO, *ZPL 10/2162*.

superintendent by John J Millican, who had previously worked for the company at Alston Moor.⁴⁴³

The complaint from the Raby Estate was justified and it might be for that reason that from 1889 the London Lead Company began diversifying by buying lead from the Isle of Man, Spain, the privately owned Green Hurth mine in Teesdale, Swaledale and silver lead from Australia to sell at a higher price.⁴⁴⁴ This was a success for the company and the money gained from selling the lead was being invested into trials. However, possibly as a result of the various reductions in wages in November 1890, Bolton, the agent at the Egglestone mill, was warned for falsifying the accounts on fuel costs, so supplementing income with dishonesty may have been more prevalent than the court realised and had occurred during the years prior to the cuts.⁴⁴⁵ Pay continued to be an area the company used as a cost saving device. In February 1891, work at Cadgerwell, Flakebrigg and Coldberry mines was suspended whilst the bargaining pay system was analysed and, as noted earlier, salaries were reduced and agents instructed to save money at the yards and mines.⁴⁴⁶

The finances of the company continued to look shaky. In November 1884, the Middleton School Board's offered to buy the school (built and owned by the company), but this was refused by the court. In September 1891, the Board removed all its property from the school and the company lost the income from the rent.⁴⁴⁷ In April 1892, the company felt it necessary to obtain a £25,000 loan from Barclays Bank, at four per cent interest rate.⁴⁴⁸ This loan may have been for investment purposes but in June 1892, "the Governor was desired to write to Mr Millican representing him the great loss at which the work was being carried on and requested him to make a thorough investigation into the conditions".⁴⁴⁹

This resulted in Millican reporting to the court in July that; "the Court having taken into consideration the heavy loss to the Manager to further reduce the Establishment at Middleton and soon alter the system of working the Mines that each partnership shall

⁴⁴³ NCRO, LLC 36 02/01/1891 and 27/01/1891.

⁴⁴⁴ NCRO, LLC 35, 36 and 37.

⁴⁴⁵ NCRO, LLC 36 04/11/1890.

⁴⁴⁶ NCRO, LLC 36 10/02/1891 and 23/02/1891.

⁴⁴⁷ NCRO, LLC 34 11/11/1884 and 36 01/08/1891.

⁴⁴⁸ NCRO, LLC 36 26/01/1892.

⁴⁴⁹ NCRO, LLC 36 07/06/1892.

work eight hours at the face and that the miners are worked at full strength of men from Monday to Saturday afternoon continuously".⁴⁵⁰ Millican believed that this would bring in an extra 586 bings of lead ore in three months at no extra cost, for which he received an extra £40 per year.⁴⁵¹ However, the change in working patterns had a similar effect as that already noted in Arkengarthdale. On 1st November 1892, a deputation was received from the Teesdale miners who preferred working for nine hours on a Monday, eleven on Tuesday and Wednesday and nine on Thursday rather than an eight hour day five days a week. These hours are those worked when miners were living at the "shop" next to the mine entrance. The court refused both their request and suggestion that arbitration should be sought.⁴⁵² A strike ensued, totally omitted by Raistrick in all his publications, probably as it detracted from his portrayal of the London Lead Company as a philanthropic Quaker company. The miners offered to return to work at the end of the month on their own terms. This was refused outright.⁴⁵³ Finally, the miners returned to work on 20 December, agreeing to work eight hour days, although the company did permit a flexi-time type timesheet to be used.⁴⁵⁴ The company did display some philanthropy by agreeing to give the miners a pay advance of £2, with £1 added into the next two months pay, but also used the strike as a convenient way of reducing the number of smelters it employed.⁴⁵⁵

In January 1893, Lord Barnard, the successor to the Duke of Cleveland, took the company to the Court of Chancery over more unpaid royalty, which appears to have been settled by a private loan from one of the assistants to the company.⁴⁵⁶ Later in the same year Lord Barnard refused to allow the company a boundary extension on their lease at Ashgill Head which may be due to him no longer trusting the company.⁴⁵⁷

The company was plainly losing money. In July 1895, the court decided that the capital of the company should be reduced by £190,000, the profit for 1894 was declared at £204.49, unclaimed shares were used towards writing off the previous years loss of £19,294.49 and the estimated value of the leases were reduced from £20,000 to

⁴⁵⁰ NCRO, LLC 36 12/07/1892.

⁴⁵¹ NCRO, LLC 36 19/07/1892 and 02/08/1892.

⁴⁵² NCRO, LLC 36 01/11/1892.

⁴⁵³ NCRO, LLC 36 22/11/1892.

⁴⁵⁴ NCRO, LLC 36 20/12/1892.

⁴⁵⁵ NCRO, LLC 36 03/01/1893 and LLC 29/11/1892.

⁴⁵⁶ NCRO, LLC 36 17/01/1893 and LLC 02/08/1893.



£15,000.⁴⁵⁸ Despite these fiscal problems, the company declared a dividend of 25p in August 1895.⁴⁵⁹ Although, the company was failing, Raistrick suggests that closure was not considered and further trials were suggested.⁴⁶⁰ In 1899, estimates were made for trials at Hudeshope Low Level £603.26, Parkins Hush £814.40 and Knolls Quarry £337.21, a total of £1,754.87.⁴⁶¹

In June 1899, Henry S Willis was appointed as mine manager and he suggested savings could be made at Wiregill by installing a hydraulic cylinder and drum.⁴⁶² This suggestion may have been taken up, as in August he was requested to reorganise the staff at Wiregill and Little Egglestone dressing floors and to start trials at Hill End.⁴⁶³ These reforms were unpopular and, in September 1899, the washer boys at the dressing floors briefly went on strike, another dispute conveniently not mentioned by Raistrick.⁴⁶⁴ The apparent continued failure of the company is reflected when Lord Barnard refused permission for it to renew the lease for Harwood in September 1899.⁴⁶⁵

As noted previously, the last minute book of the court is missing and the demise of the London Lead Company is left in obscurity. The last entry for production in *The Mineral Statistics* is for the year 1902 and Raistrick firmly dates the winding up of the company to have taken place in March 1905.⁴⁶⁶ On 15 April 1903, an agreement was reached between the London Lead Company and Barnard Castle Rural District Council that the roads built and maintained by the company in Middleton and Egglestone were to become designated public roads and would be maintained by the Rural District Council, thus removing the company's responsibility and liability for maintaining the highways of the area, another attempt to avoid unnecessary expenditure.⁴⁶⁷

As discussed earlier, Teesdale suffered the rapidly shrinking market characteristic of all the domestic lead mining areas in the United Kingdom during the same period. The extra

⁴⁵⁷ NCRO, *LLC 36 12/09/1893*.

⁴⁵⁸ NCRO, *LLC 37 16/07/1895*.

⁴⁵⁹ NCRO, *LLC 37 20/08/1895*.

⁴⁶⁰ A Raistrick, *Two Centuries of Industrial Welfare*, p. 127.

⁴⁶¹ NCRO, *LLC 37 13/06/1899*.

⁴⁶² NCRO, *LLC 37 04/06/1899 and 10/08/1899*.

⁴⁶³ NCRO, *LLC 37 22/08/1899*.

⁴⁶⁴ NCRO, *LLC 37 17/09/1899*.

⁴⁶⁵ NCRO, *LLC 37 12/09/1899*.

⁴⁶⁶ *The Mineral Statistics of the United Kingdom* and A Raistrick, *Two Centuries of Industrial Welfare*, p. 128.

supply of the cheap foreign imports outstripping the rising demand and the resulting fall in the price of lead hit some areas harder than others. Teesdale lasted longer as a major lead producing district in this country and the mines were not totally exhausted of lead deposits, unlike Swaledale and Wensleydale. The court minutes show the cost of production per ton of lead metal from October 1886 to December 1894 and its efforts to reduce it.⁴⁶⁸ The highest cost was in April 1889 at £22.52 per ton of lead, the lowest £5.39 in January 1893, coinciding with the miners' strike. The highest annual mean for production cost was in 1891, at £16.86 per ton of lead produced and the lowest £8.93 in 1893, which demonstrates an excellent reduction in production costs, a result of reductions in both the wages and capacity as the company was operating fewer but the more productive of its mines.⁴⁶⁹

However, the drive for efficiency did not necessarily make the company more profitable. The average London lead price for the same period makes a stark reading. In 1886, the company would have been making a profit of £3.36 per ton of lead produced, in 1887, £2.81 and in 1888, £3.15. In 1889, an increase in production costs and a fairly steady lead price meant that the company lost 68p for every ton of lead produced, which in that year was 2,636; for the following year the loss was £1.57 per ton; and for 1891, with the lead price beginning to fall, the company would have lost £4.42 for each of the 2,050 tons of lead metal produced, a loss of £9,061 in total. The loss for 1892 totalled £8,417.70 and, even with a dramatic cut in production costs, the continuing fall of the London lead price resulted in little better than a break-even financial situation in 1894, when the production cost was at £9.20 per ton the London lead price was £9.59, generating a profit of 39p per ton or £1,331.07 in total profit for the year.⁴⁷⁰

These losses in lead mining must be offset by the income generated by the silver, which would have been produced at a considerably lesser cost, as the silver was already contained in the lead ore mined and only the refining charge of the Rozan method and transporting cost of the silver to the purchaser would have been subtracted from the following figures. In 1892, the London Lead Company produced 22,489 ounces of silver. The average price of silver per ounce in this year was 17p and the company recorded an

⁴⁶⁷ DCRO, *D/Bo/B/314*.

⁴⁶⁸ NCRO, *LLC 35, 36 and 37*.

⁴⁶⁹ NCRO, *LLC 36*.

⁴⁷⁰ NCRO, *LLC 36*.

income of £3,665.55 from silver sales for the corresponding period.⁴⁷¹ Obviously this is without taking the refining and transport costs into consideration and the above total still does not cover the large loss made on lead mining. The average silver price per ounce closely followed the average London lead price: in 1865, lead was £20.10 per ton and silver 28p per ounce; and, in 1894, lead was £9.59 and silver 12p. The price of silver failed to recover in the first decade of the twentieth century, remaining at around 11p per ounce whilst lead had recovered to an average of £14.30 per ton.⁴⁷²

The end of the London Lead Company was caused by economic grounds and conditions. It proved too costly to obtain the lead ore, the easily extracted lead had been attained and the low price of lead meant that the company could not afford further trials and investments. The lead mining industry in Teesdale did continue after the London Lead Company ceased to exist, although on a much reduced scale. This was almost exclusively at the mines the company had operated, Wiregill, for instance, remained a productive mine. In 1907, Teesdale produced 824 tons of lead ore and 2,075 ounces of silver. However, the main difference between Teesdale and the other two valleys is the 5,965 tons of barytes which was also mined during that year.⁴⁷³ The mining of barytes increased and replaced lead as the principle mineral extracted. The London Lead Company concentrated purely on lead and the associated silver as the resources they exploited from the same ore. If the company had broadened its operation and supplemented its income with mining the other minerals associated with lead available in Teesdale, such as barytes, fluorspar, zinc and iron, it might have survived.

As noted earlier, the London Lead Company was a joint stock company run by the Governor and his Court of Assistants. This was slightly altered to become a limited liability company with the court becoming a board of directors in all but name in 1883. This was a late development compared to Swaledale, as all the private companies there had already taken advantage of the changes allowed to alter their company structures. The personnel of the court, however, remained virtually the same. The change made to the company structure was minimal by retaining the court as the board of the organisation and took place too late to have any effect upon the decline the company was already experiencing with the closure of mines continuing. It could be argued that an introduction

⁴⁷¹ *ibid.*

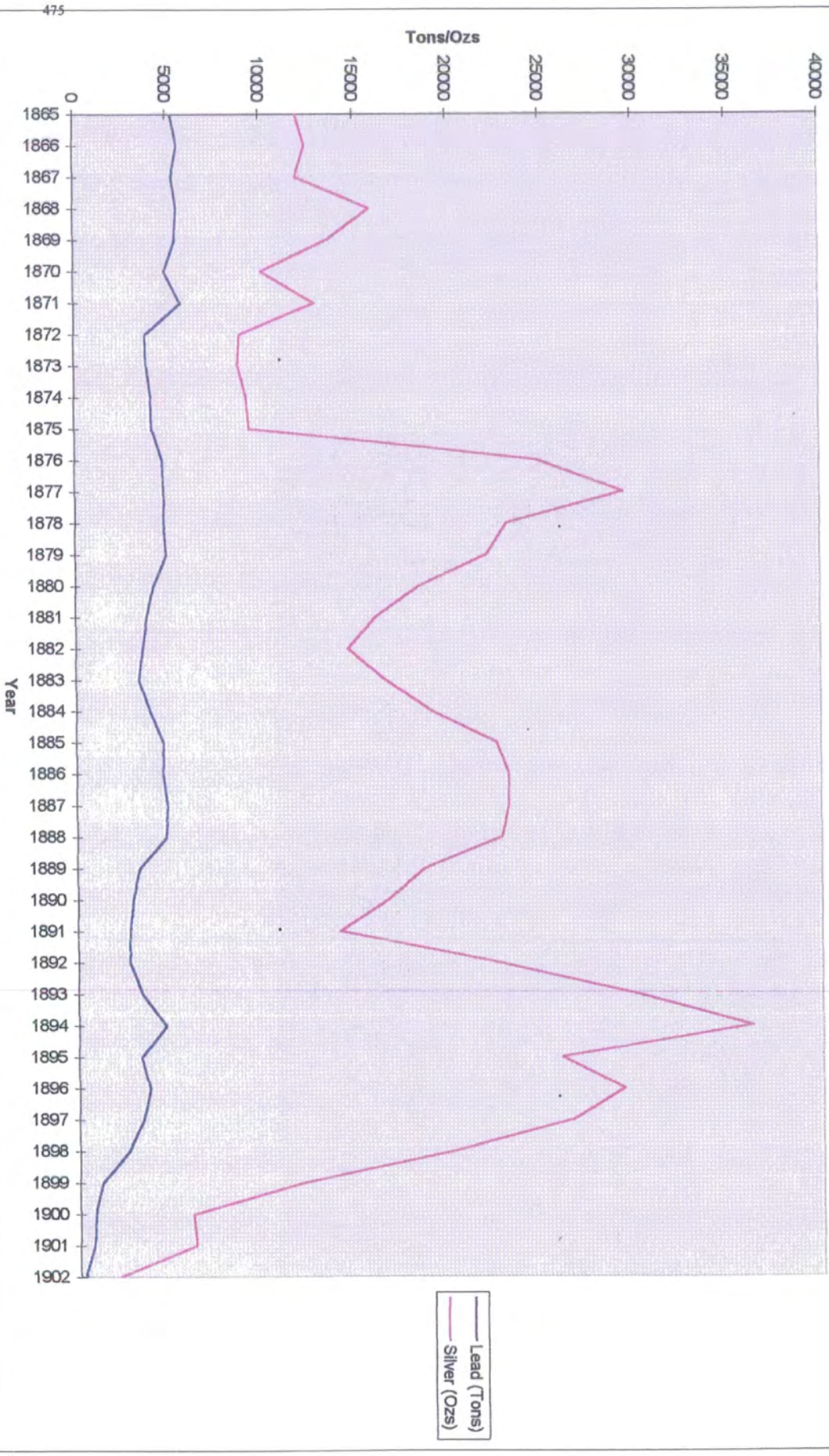
⁴⁷² *The Mineral Statistics of the United Kingdom.*

of new blood into the company might have brought some benefits to the company. Raistrick blames the demise of the London Lead Company on two factors: the rapidly shrinking market available to domestic lead producers, due to foreign imports; and the old and tired court members who were finding it difficult to continue with their style of management within the new limited liability company structure.⁴⁷⁴ This final part of his hypothesis is, however, pure conjecture. It is unfortunate that the final volume of the records of the meetings of the Court of Assistants has not survived.

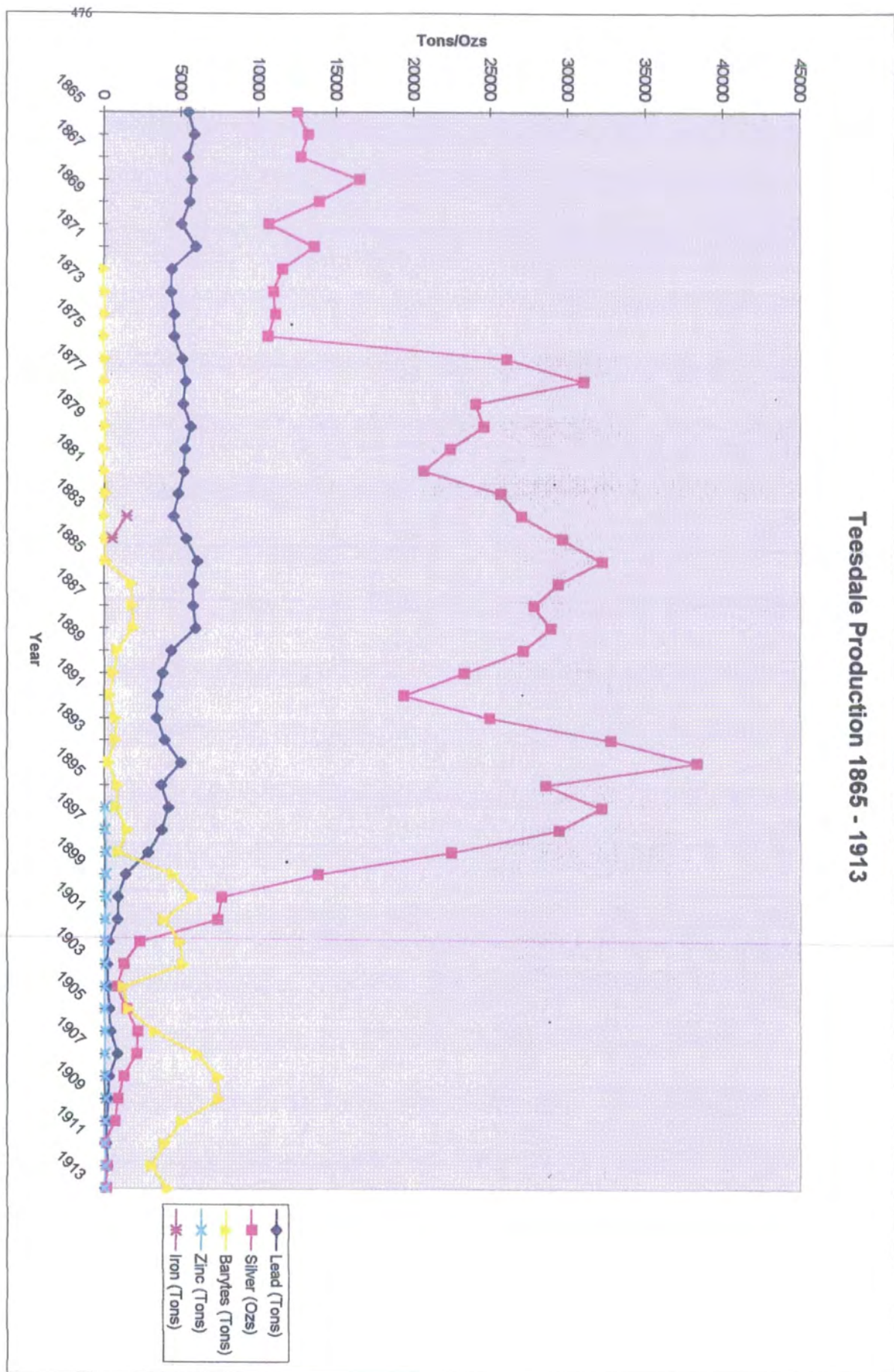
⁴⁷³ *The Mineral Statistics of the United Kingdom*.

⁴⁷⁴ A Raistrick, *Two Centuries of Industrial Welfare*, p. 127.

Teesdale London Lead Company Production 1865 - 1902



Teesdale Production 1865 - 1913



10. Transport

The road systems of Swaledale and Wensleydale had allowed the valleys to expand economically in the late eighteenth and early nineteenth centuries. Although considered in the early nineteenth century and rejected due to the cost, there was no need for development with canal and railway.⁴⁷⁷ The rapid expansion used existing transport arrangements, improved by turnpikes and later by railways. In 1836, Thomas Bradley, father of Christopher Lonsdale Bradley the manager of the Hurst mines, constructed a new road from Reeth to Richmond (tolled until 1880), which followed the valley floor rather than the old route which followed the hills to the north of Swaledale. This new road did encounter problems with landslip and the hairpin bend to accommodate the bridge over Gill Beck, is still known as Bradley's Folly.⁴⁷⁸ The trustees to this turnpike included members of the usual Swaledale mining investors. Lead was moved by horse from mine to smelt mill and from smelt mill to a distribution point. None of the horses used were owned by the lead mining companies, with the exception of the London Lead Company. The AD Company had a wharf at Stockton, whilst other companies in Swaledale used quays at Yarm or Boroughbridge.⁴⁷⁹

The Croft branch of the Stockton and Darlington Railway was completed in 1829. Proposals for an extension to Richmond had been considered in 1825 but to bridge the River Tees was thought to have been too expensive at that time.⁴⁸⁰ The proposal of a Darlington to York railway in 1835, reawakened the interest in a Richmond line and, in 1836, two companies were formed; the Swaledale and Wensleydale Railway and the Richmond and Cleveland Railway, which merged later in the year.⁴⁸¹ In January 1841, the Great North of England Railway opened the line between York and Darlington which included the Croft bridge over the River Tees. In 1844, a Richmond branch was proposed, leaving from what is now the East Coast Mainline at Eryholme and on 10 September 1846, this line was opened.⁴⁸² The opening was only weeks after the line had received authorisation from Parliament, where the bill had been skilfully steered to

⁴⁷⁷ W Hylton Longstaffe: *Richmondshire, Its Ancient Lords and Edifices*, (London and Richmond, 1852), p. 368.

⁴⁷⁸ R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, pp. 220-222.

⁴⁷⁹ *ibid.*, p. 211.

⁴⁸⁰ *ibid.*, p. 218 and R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, p. 460.

⁴⁸¹ *Yorkshire Gazette* 09/07/1836 and 03/09/1836.

⁴⁸² *ibid.* 26/10/1844, 14/10/1844 and 12/09/1846.

completion by George Hudson.⁴⁸³ Hudson was the Member of Parliament for Sunderland, the Mayor of York, chairman of the Great North of England Railway and member of the Newcastle and Darlington Junction Railway. He was better known as the "Railway King". Unfortunately, the link with Newcastle based Great North of England Railway and the Newcastle and Junction Railway may have caused Burt to make an error as he incorrectly stated that the Richmond branch line was part of the Newcastle and Carlisle Railway Company.⁴⁸⁴ Jennings estimated that the arrival of the Richmond railway reduced the cost of transporting the lead to Stockton considerably. By road, the companies were being charged between 50p to 57p per ton whilst the railway company charged 7p per ton.⁴⁸⁵ However, Jennings estimated that the overall transport costs had only been reduced by one-third due to the costs of transporting the ore to the smelt mill and from here to Richmond railway station.⁴⁸⁶ The charge for transporting the lead metal to Richmond railway station was 20p per ton in 1874 rose to £4 in 1904, increasing the costs of the failing industry.⁴⁸⁷

Railway development in Wensleydale arrived later than in Swaledale. In 1846, the Northallerton to Bedale branch was authorised by Parliament but the spectacular downfall of Hudson in 1849 led to many amalgamations and postponements. The Bedale line was fully opened in March 1848, an extension to Leyburn was authorised in 1853, opened in November 1855 and taken over by the North Eastern Railway Company on 1 January 1858.⁴⁸⁸ The railway did not reach Hawes until June 1878 because of the delay in building the Hawes Junction link between the North Eastern Railway and the Settle and Carlisle line of the Midland Railway.⁴⁸⁹ Unfortunately, the railway arrived too late to have any significant influence on the lead mining industry, although the Keld Heads mine gained the benefit of having a yard at Wensley station. It helped agriculture, quarrying and tourism but lead mining was already failing, due to exhaustion of the ore. If it had arrived earlier the resultant reduction to the costs of fuel and transport might have delayed the inevitable end of the industry but it is of note that the arrival of the railway in

⁴⁸³ W W Tomlinson, *North Eastern Railway, Its Rise and Development*, (Newcastle-upon-Tyne, 1915) p. 473.

⁴⁸⁴ R Burt, *The British Lead Mining Industry*, p. 212.

⁴⁸⁵ B Jennings, *The Lead Mining Industry of Swaledale*, p. 220.

⁴⁸⁶ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 274 and R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, p. 460.

⁴⁸⁷ NYCRO, *ZLB 2/150* and *ZLB 2276*.

⁴⁸⁸ W W Tomlinson, *North Eastern Railway*, pp. 473-582.

⁴⁸⁹ *ibid.*, pp. 632-637 and p. 683.

Wensleydale failed to save the textile industry and actually hastened its end by providing the workers with better transport and access to the conurbations of the mill towns of Lancashire and the West Riding of Yorkshire, to where many migrated.⁴⁹⁰

The railway mania of the 1840's had seen further proposals for other railway routes in the area, including the Manchester, Liverpool and Great North of England major cross country route which would have connected Wensleydale and Swaledale.⁴⁹¹ In 1868, James Tomlin, with others, formed the Richmond and Reeth Railway Company with the intent of extending the Richmond line through to Reeth. The estimated cost for this single track line was £60,000 and Tomlin noted that it was, "in a poor District, except in its mineral wealth", indicating that he envisaged the mine owners to provide the required capital.⁴⁹² The company failed as there was little local support and the North Eastern Railway Company also refused to back the proposal.⁴⁹³

In 1881, a Sunderland to Skipton link railway, proposed by the Skipton and Kettlewell Railway Company, was authorised by Parliament but failed due to non-compliance with standing orders. In 1883, the same company again proposed a route linking Swaledale and Wensleydale. A surviving plan shows that the 26 mile long track would have left the Wensleydale line at a junction between Hawes and Hawes Junction, crossed Abbotside Common to Thwaite with a tunnel to the west of Muker Common, following the south side of the River Swale to Crackpot with a bridge over the Swale at Healaugh, over Arkle Beck at Reeth and then onto Richmond via on the north side of the valley.⁴⁹⁴ However, the North Eastern Railway proposed an alternative scheme of their own between Scorton, near Richmond, and Spennithorne in Wensleydale to protect their interests and both plans were withdrawn.⁴⁹⁵ A similar line, suggested in 1892, failed with a lack of enthusiasm for the need to raise the required £11,750,000 of capital.⁴⁹⁶

In 1895, a light railway (built to a lower standard than a mainline and with restrictions to the speed and weight of locomotives and rolling stock for financial savings) was proposed

⁴⁹⁰ C S Hallas, *Road Transport in the Yorkshire Dales 1750 - 1900*, *The Journal of Transport History* 17, p. 37.

⁴⁹¹ W W Tomlinson, *North Eastern Railway*, p. 638.

⁴⁹² NYCRO, *ZPL 10/774*.

⁴⁹³ *Darlington and Stockton Times* 26/02/1870.

⁴⁹⁴ NYCRO, *ZCC*.

⁴⁹⁵ *Darlington and Stockton Times* 09/07/1881 and W W Tomlinson, *North Eastern Railway*, p. 690.

between Reeth and Richmond but the North Eastern Railway Company again blocked it. On the failure of a similar proposal in 1912, Denys-Burton attempted to claim compensation as the Treasury had promised to contribute £25,000 to the scheme if Reeth Rural District Council contributed £10,000 and the Yorkshire North Riding County Council also provided financial support. However, the North Eastern Railway Company demanded 60 per cent of the profits and would charge an annual rent of £300 year for the use of its station at Richmond.⁴⁹⁷ This ensured that the plan did not get off the ground.

It is doubtful whether a Swaledale railway line would have made a profit, even during the height of lead mining. Between 1865 and 1913, the highest annual amount of ore produced in Swaledale was 5,963 tons in 1869.⁴⁹⁸ If this ore was of high quality and smelted at an efficient mill, the lead metal obtained would have been around 73 per cent of the ore, approximately 4,353 tons of metallic lead. At 7p per ton the railway company would earn £304.71 per annum for transporting the lead metal from Swaledale, which was not a viable proposition and might explain why the North Eastern Railway Company ensured that the Richmond line was never extended.

In *Two Centuries of Industrial Welfare*, Raistrick estimated that between 1815 and 1865 the London Lead Company spent £12,500 on building and improving roads.⁴⁹⁹ However, he had doubled this figure to £25,000 in *A History of Lead Mining in the Pennines*.⁵⁰⁰ Certainly, the company did invest in roads, improving the Middleton to Alston road by Telford and MacAdam for instance. In 1816, the company ended its practice of contracting out the carriage of ore from the mines to the mill at Egglestone, buying all the carriers' horses they used and paying the carriers a regular wage as opposed to paying them carriage per ton of ore moved.⁵⁰¹ The London Lead Company continued to provide some funding for roads. In April 1865, £30 was donated to the Egglestone turnpike for improvements to be made to Blackton bridge.⁵⁰² The last recorded donation by the company to road building, with the exception of improvements required by the arrival of the Tees Valley Railway, was £5 to the Barnard Castle Highways Board for

⁴⁹⁶ W W Tomlinson, *ibid.*, p. 692.

⁴⁹⁷ *Darlington and Stockton Times* 06/06/1914 and *Yorkshire Post* 08/06/1914.

⁴⁹⁸ *The Mineral Statistics of the United Kingdom*.

⁴⁹⁹ A Raistrick, *Two Centuries of Industrial Welfare*, p. 90.

⁵⁰⁰ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 273.

⁵⁰¹ A Raistrick, *Two Centuries of Industrial Welfare*, p. 92.

⁵⁰² NCRO, *LLC* 30 11/04/1865.

improvements to Ashgill Head bridge in November 1868.⁵⁰³ Roads had improved but slowly. A generation which had discovered the possibilities of railway speed did not tolerate toll-gates and many turnpike trusts became bankrupt. In 1864, a Parliamentary committee was decided to hand over turnpike trusts to a public authority.⁵⁰⁴ After 1870, highways became progressively under the control of local government which might partly account for the company no longer contributing to road improvements as well as the decline in the income of turnpike trusts.⁵⁰⁵

The Newcastle and Carlisle Railway Company opened its Haltwhistle to Alston branch in November 1852 but quickly abandoned any plans to extend this line further up the South Tyne valley towards the lead mines at Nenthead and Alston Moor.⁵⁰⁶ In the same month, the Stockton and Darlington Railway Company issued a prospectus for the Darlington to Barnard Castle railway. Parliament approved this railway in 1854 and the line was opened in July 1856. In 1861, this line was extended over the Pennines to Tebay by the South Durham and Lancashire Union Railway, which merged with the Stockton and Darlington in 1863.⁵⁰⁷ None of these railways received any funding from the London Lead Company.

The Tees Valley Railway from Barnard Castle to Middleton, however, received £500 from the company which paid £80 for a station yard at Romaldkirk and £80 for road improvements between the smelt mill at Egglestone and Romaldkirk.⁵⁰⁸ The Tees Valley was an independent company, £66,000 capital was raised, which included £25,000 from the North Eastern Railway Company. The line was opened in May 1868 and suggestions were soon made that it should be extended to meet the Haltwhistle to Alston branch.⁵⁰⁹ This was surveyed in 1868, as the Cumberland and Cleveland Junction Railway but the venture failed as the required capital was not raised.⁵¹⁰ From 1874, the Tees Valley Railway began to try and persuade the North Eastern Railway to take it over, probably as

⁵⁰³ NCRO, *LLC 31 10/11/1868*.

⁵⁰⁴ Sir Llewellyn Woodward, *The Age of Reform 1815-1870*, (2nd edition, Oxford, 1962), p. 597.

⁵⁰⁵ Sir Robert Ensor, *England 1870-1914*, (Oxford, 1936), pp. 124-129.

⁵⁰⁶ W W Tomlinson, *North Eastern Railway*, p. 582.

⁵⁰⁷ *ibid.*, pp. 523-596.

⁵⁰⁸ NCRO, *LLC 31 17/12/1867, 23/02/1869 and 01/02/1870*.

⁵⁰⁹ W W Tomlinson, *North Eastern Railway*, p. 616.

⁵¹⁰ *Darlington and Stockton Times 23/12/1871 and 30/12/1871*.

a result of that company already holding nearly one half of its capital. The take-over merger was agreed in 1880 and implemented in 1882.⁵¹¹

It is of note that the new leases for the lead mining areas owned by the Raby Estate to the London Lead Company were all renewed in 1869.⁵¹² This was within one year of the Tees Valley Railway being opened. Certainly, the Duke of Cleveland may have used the arrival of the railway as an incentive to persuade the London Lead Company to continue to mine lead. However, the London Lead Company needed no such persuasion. The leases permitted the extraction of all minerals. Iron ore was found in geological faults in Teesdale and leases had been granted to smaller companies and individuals (such as John Church Backhouse for the mining rights of Langdon Fell and Common) to mine iron as well as lead.⁵¹³ Dirt Pit was a mine in Teesdale which only produced iron ore and was in production between 1879 and 1912. The mine was operated during this period by the Iron Mining Company until 1881, Alex Hope to 1887, Vielle Montagne Zinc Company (a large company based predominantly in Weardale) between 1889 and 1904 and the Teesdale Lead and Zinc Mines Limited from 1906 to 1912.⁵¹⁴

The arrival of the Tees Valley Railway encouraged iron mining hopes in Teesdale, explaining why the Duke of Cleveland drew up a new set of leases for the London Lead Company to encourage them to broaden their production by branching out into other minerals. It is of note that the London Lead Company did not expand into any other form of mineral extraction and it could be argued they would have remained in business longer if they had marketed barytes or fluorspar. Unfortunately, the iron ore reserves in Teesdale are relatively small when compared to the mineral field in the North Yorkshire Moors to the south of Teesside. As noted earlier, the proximity of the Cleveland iron mines probably did discourage any investments for iron mining in Teesdale.

Once again the London Lead Company was proactive with the use of their business acumen and invested in both road and rail throughout the nineteenth century. Although, the local private mining interests in Swaledale did support improved transport links they did not contribute to the Richmond railway line and their only success was the 1836

⁵¹¹ W W Tomlinson, *North Eastern Railway*, p. 694.

⁵¹² DCRO, *D/Bo/B108, 109, 110, 111 and 112*.

⁵¹³ NCRO, *725/85/16-22*.

⁵¹⁴ *The Mineral Statistics of the United Kingdom*.

turnpike road along Swaledale. Similarly, there is no record of any successful investment in transport from the Wensleydale lead mining industry.

Railways certainly cut the transportation costs of fuel to the smelt mills, cereals into the more barren areas of moorland in Swaledale and Teesdale and reduced the costs of moving the lead ingots to the buyers. However, it made no difference to the transport costs within the mines and to the smelt mill and, more significantly, it gave the workers better transport if they decided to leave the dale and seek employment elsewhere.

Although, as will be discussed later, it appears that many unemployed miners stayed close to the mines in the hope that they would resume employment, the arrival of the railways made migration to the coalfields of Durham and Lancashire and the cotton mills of the West Riding and Lancashire much easier, cheaper and more tempting.

Burt argued that investment in railways diverted capital away from the mines.⁵¹⁵ This is a fundamentally flawed statement and there is no evidence that may support this argument. The arrival of the railways probably prolonged the length of time the lead mines survived in Swaledale. The improved and cheaper delivery of fuel to the smelt mills and the considerable reduction of transport costs of metallic lead to the market helped the failing mines to operate at an improved rate. It is possible, if following Burt's argument, that virtually any industry could divert capital away from investment in lead mining which, as has been shown above, did not happen as there were still many people who were prepared to take the gamble of investing in lead mining when the lead price was low and the prospects of the mine very poor.

⁵¹⁵ R Burt, *The British Lead Mining Industry*, p. 92.

11. Workforce and the Community

As noted by Hallas, the economic base for Swaledale and Wensleydale was one of traditional agriculture, with lead mining dominating only in the eighteenth and nineteenth centuries.⁵¹⁶ Unfortunately, the lack of surviving records regarding Wensleydale make it difficult to fully evaluate lead mining and the workforce, so the comparisons and conclusions are based, almost entirely, on evidence from Swaledale. However, as the industry only affected the northern side of Wensleydale, the effects would have been to a lesser extent than Swaledale. Lead mining was the only alternative employment to farming but its domination completely dictated the life of Swaledale with livelihood directly or indirectly provided and affected by the industry. This development from typical rural industries to major mining employers relegated farming to times of convenience for the inhabitants.⁵¹⁷

This is reflected in the pay books of the Arkengarthdale Mining Company in the 1890's. The highest total for pay was the month of November 1892 with £463.07; the lowest was September 1894 with £53.26 and the mean for the period 1892 to 1896 was £245.82. However, using the mean for each separate year, the lowest total amount of wage paid by the company was consistently during harvest time. The mean for 1892 was £380.27 and the lowest pay total was September at £296; the mean for 1893 was £316.07 and the lowest month was October with £212.32; in 1894 the mean was £215.47 and the lowest month was, as noted above, September with £53.26; for 1895 the mean was £194.68 and September the lowest month with £118.73; and, finally, the mean for 1896 was £162.86 and September was again the lowest month with £124.64.⁵¹⁸ These figures also indicate the decline in the production of the Arkengarthdale mines as the reduction in wages does not reflect a reduction in staff, the number employed remaining constant but were extracting less ore.

A recent publication by Bagenal covers the dual role of the Swaledale lead miners who often kept a smallholding. According to Bagenal, a typical miner would have owned one or two cows with a number of cattle gaits for grazing and would make hay on common pastureland. The milk from the cows would be used predominantly for making cheese

⁵¹⁶ C S Hallas, *Economic and Social Change*, p. 281.

⁵¹⁷ *ibid.*, p. 310.

and butter.⁵¹⁹ As sub-contractors the lead miners in Swaledale worked when they wished to and, at times of harvest, they had their own smallholdings to attend. The farmers of the area also preferred the labour offered by the local lead miners, rather than employing those who were not from the locality. In 1897, Simon Cherry remarked that little ore had been raised during September, "owing to most of the men having outdoor employment".⁵²⁰ It is of note that in the census returns from 1861 to 1891 for both Swaledale and Wensleydale the maximum number of men who stated that their occupation was lead mining and any other profession, including agriculture, was ten, only one per cent of those employed at the lead mines at that time.⁵²¹ This probably indicates farmers who also worked at the lead mines, rather than lead miners who also held a smallholding.

Hallas mentioned that Denys encouraged his workers to take up a smallholding, perhaps as a means of persuading the miners to remain in Swaledale.⁵²² This is confirmed in Denys' *Chapter on Mining*, in which he stated; "it is a good policy on the part of the mining proprietors to let the miners have their bits of land and houses at easy rent; it makes them stick to their homes and to their work for less wage".⁵²³ The agricultural activity also explains why the Swaledale miners worked six six hour days in the week with Sunday off, as opposed to the five eight hour working days that were the norm in Teesdale, unless the miner was lodging at the "shop". As noted earlier, strong feeling was engendered by the Arkengarthdale Mining Company enforcing the adoption of an eight hour working day, beginning at 7am, which caused the strike between December 1870 and January 1871.⁵²⁴

Wages in lead mining had increased with the prosperity of the industry. Lead miners were earning more than an agricultural labourer but less than a coal or iron miner. The temptation to work in the nearby Durham or Lancashire coalfield was permanently there even before the decline of the industry. However, the sub-contracting nature of the work in Swaledale and Wensleydale when the miner was, in theory, his own supervisor and the

⁵¹⁸ NYCRO, ZOX 2/2/2/4.

⁵¹⁹ T Bagenal, *Miners and Farmers; The Agricultural Holdings of the Lead Miners at Heights, Gunnerside, in North Yorkshire*, *British Mining No. 62*, (Keighley, 1999), p. 48.

⁵²⁰ NYCRO, ZLB 2276.

⁵²¹ Northallerton Public Library, *Census Returns 1861, 1871, 1881 and 1891*.

⁵²² C S Hallas, *Economic and Social Change*, p. 331.

⁵²³ NYCRO, ZLB 3/34.

apparent philanthropic nature of the London Lead Company may have persuaded many lead miners to remain in the lead mining trade and, as will be discussed later, the unemployed lead miner tended to leave the area only when forced to by necessity.

The depression in the lead mining industry in the 1870's forced the wages to decline. This suggests that the wages were linked to market forces but, as noted earlier, the actual production at the mine or of a mining company was not. This explains why there was a recovery at some of the mines, Arkengarthdale for instance, which did not generate any comparative increase in pay, as the lead mining industry as a whole was in decline and the lead price remained low so the wages remained depressed. This indicates that the estimated annual earnings of the mine workers could assist the estimation of the outgoing of the lessees and how wages could be used to demonstrate the trade cycle.

Fieldhouse and Jennings estimated that the wages paid in the 1880's were half that of those paid in the 1860's.⁵²⁵ The highest wages paid in Swaledale were between 1870 and 1877, but this was due to the exceptional factor of the driving of the Sir Francis Level with Denys rewarding the miners involved with bonuses. After 1881, the poverty of the mines and resulting successive reductions in wages made the miners' income drop below subsistence level.⁵²⁶ In Swaledale, payment came at the end of a bargain and it depended on the length of that bargain as to when payment was due. Old Gang contracts were mostly for a period of six weeks, whilst AD's bargains were per calendar month. Variations in pay would also occur, due to the contractual nature of the work with the various influencing factors that were unknown at the time of the agreement having a bearing on the final amount of pay; such as quality of ore, hardness of rock, flooding problems in the mine delaying work and the deductions charged by the company.⁵²⁷ Surface workers were paid per day of employment.

The Swaledale mining company bargain books shows that the miners were literate, being able to write in their own contracts. In 1865, at the Old Gang mine the average bargains were £2.50 per fathom driving and £2 per bing of ore. In January 1872, Leonard Metcalfe expressed his displeasure; "I feel dissatisfied...I expect to have to open and drive 30

⁵²⁴ NYCRO, *ZQA 1 6/1/6 and 6/1/7*.

⁵²⁵ R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, p. 289.

⁵²⁶ *Darlington and Stockton Times 18/11/1881*.

⁵²⁷ NYCRO, *ZLB 2/5 and 2/157*.

fathoms and more before I get...to payable ground. I also wish to remember that five shillings a bing for dressing is a great reduction from the price asked".⁵²⁸ In the bargain book for Surrender in 1874, for driving a level miners were getting between 18p to £1 per fathom. Surface workers received 18p per day in the same year but this fell to 15p in 1878 and 13p by 1882.⁵²⁹ At Swinnergill mine, from 31 December 1879 to 31 January 1880, Thomas Harker and thirteen members of his gang were contracted to mine 30 bings of ore at £2 each. From this £60 contract, £2.10 was deducted for 72 candles, £2.85 for dynamite, £3.29 for drawing the ore from the mine, £3 for washing and dressing the ore and 40p was charged for the use of the company's kibbles (large ore carrying buckets).⁵³⁰ This reduced the amount earned to £48.36 or £3.45 for each miner for one month's work if, in the unlikely event, that the payment was divided equally. The Arkengarthdale bargain book between 1874 to 1882, also shows the decrease in payment the miners received. In 1874, £2 per bing for one calendar month was the average. In 1875, this had dropped to £1 but rose to £1.50 during the following year. Similarly, the price of driving also fluctuated from 50p to £3.50 per fathom dependant on the date of the contract and the mining conditions.⁵³¹

The Swaledale companies made profits from selling the equipment to the miners. In 1864, Old Gang bought 17,294 candles for £432.35 (2.5p each) and sold them onto the miners for £576.47 (3.3p each), thus gaining a profit of £144.12 from their workers. Surrender mine bought 9,404 candles in the same year for £233.10 (also 2.5p each) and sold them onto the miners for £343.47 (3.7p each), making a profit of £110.37.⁵³²

In Teesdale, there was no alternative employment to lead mining. In 1857, the district superintendent, Bainbridge, informed the Rating of Mines inspectors that over 90 per cent of the population in Teesdale was involved in mining and that most mining families occupied one quarter of an acre of land for subsistence purposes.⁵³³ As the London Lead Company was virtually the sole employer in the area the employees were dependant on the company for nearly everything; provisions, food and shelter.

⁵²⁸ NYCRO, *ZLB 2/5*.

⁵²⁹ NYCRO, *ZLB 2/6*.

⁵³⁰ NYCRO, *ZLB 3/16*.

⁵³¹ NYCRO, *ZOX 2/2/4/1*.

⁵³² NYCRO, *ZLB 3/34*.

⁵³³ BPP, *Rating of Mines*, Select Committee Report; 1857 (241) XI, pp. 26-29.

In 1869, a miner at Surrender was, on average, receiving £3 per month.⁵³⁴ As a comparison, in 1864, the London Lead Company was paying £2 per month if over the age of 21.⁵³⁵ The supervisory overman earned £100 per annum in 1865.⁵³⁶ The Court of Assistants of the London Lead Company declared that the subsistence pay for miners should be limited to £2.70 per month in 1872 and, in 1889, the average weekly wage for a miner in Teesdale was 80p, or £3.46 per calendar month.⁵³⁷ At this time the equivalent in Swaledale at Surrender was £4 per month.⁵³⁸ It is of note that the miners at the London Lead Company were getting paid less but it must be realised that there was no variance in the Teesdale wages as the average wage figure was consistently received each month by the average miner with no monthly fluctuations in earnings. The miners in Teesdale also benefited from the other services provided by the London Lead Company and were not charged for the equipment they used.

In Mitchell's Parliamentary Report of the Children's Employment Commission in 1842, it was noted in Swaledale that half of the workers were well above the minimum requirement for subsistence whilst the other half lived in poverty.⁵³⁹ For an example, in the Surrender mine account showing the wages paid in February 1869 the average wage was £3.01 but the difference between the highest and lowest earnings was immense, J Measley received £7.50 whilst Isaac Riddle was paid 15p.⁵⁴⁰ This may indicate that Riddle was a part-time worker and may have owned a larger small holding than many other miners. Equally, he may have been unlucky with the bargain and deducted a large proportion of his prospective earnings or he could have been ill for part of the month. Despite these possibilities, 15p was not a large monthly reward.

As noted earlier, the London Lead Company abolished the use of independent contracts in all but name and issued monthly subsistence payments. The company controlled the miners with regular shift patterns at specified work times, five eight hour shifts per week, unless the miner was lodging at a "shop", when there were usually four ten hour days and

⁵³⁴ NYCRO, *ZLB 3/15*.

⁵³⁵ BPP, *Conditions of all Mines*. R.Comm.Rep.; 1864 (3389) XXIV, Volume 2, appendix, p. 326.

⁵³⁶ NCRO, *LLC 31 05/09/1865*.

⁵³⁷ NCRO, *LLC 32 14/05/1872 and 35 18/06/1889*.

⁵³⁸ NYCRO, *ZLB 3/15*.

⁵³⁹ BPP, *Children's Employment (Mines)*. R.Comm.Rep.; 1842 (382) XVII, p. 745.

⁵⁴⁰ NYCRO, *ZLB 3/15*.

three rest days allowed at home.⁵⁴¹ The bargaining system was still in place to encourage initiative and hard work from the miners but the main proportion of their wage was a subsistence payment. “On the surface...the bargaining system changed little. In reality it changed so greatly as to convert the theoretical independent contractor partnerships into de facto earners. The impetus for the changes came from the mine owners, seeking higher productivity and greater managerial efficiency”.⁵⁴² The regular monthly wage was disguised as a subsistence payment and gave the company more control over its employees. Bargaining still took place but the payments were measured per fathom rather than for the amount and value of lead ore extracted.⁵⁴³ Raistrick believed that this was a combination of “Quaker philanthropy and sound business principles”.⁵⁴⁴

The Swaledale lead miners did work shorter hours than their Teesdale colleagues and appeared to have been paid at a higher rate. To some extent, they were also able to work more independently, choosing their own working time. However, as noted earlier, the London Lead Company did not just provide their employees with work and payment for it but more security and a form of social services, as will be discussed below. This did not prevent the following song from being written which is now recorded as a music hall-type ballad.

The ore's awaiting in the tubs, the snow's upon the fell,
Canny folk are sleeping yet but lead is right to sell,
Come my little washer lad, come, let's away,
We're bound down to slavery for fourpence a day.

Chorus. Fourpence a day, my lad, and very hard to work,
And never a pleasant word from a gruffy looking Turk. (supervisor)
His conscience it may fail and his heart it may give way,
Then he'll raise us our wages to ninepence a day.

⁵⁴¹ BPP, *Children's Employment (Mines)*. R.Comm.Rep.; 1842 (382) XVII, p. 756 and BPP, *Condition of all Mines*. R.Comm.Rep.; 1864 (3389) XXIV, appendix, p. 442.

⁵⁴² C J Hunt, *The Lead Miners of the Northern Pennines*, p. 54.

⁵⁴³ *ibid.*, p. 72.

⁵⁴⁴ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 292. —

It's early in the morning, we rise at five o' clock,
And the little slaves come to the floor to knock,
Come my little washer lad, come let's away,
It's very hard to work for fourpence a day.

My father was a miner, he lived down in the town,
Twas hard work and poverty that always kept him down.
He aimed for us to go to school, but brass he couldn't pay,
So we had to go to the washing rake for fourpence a day.⁵⁴⁵

The London Lead Company also paid gratuities for overtime and (for those not covered by the Workmen's Fund which is discussed below) retirement. In 1865, John Wright, the head horsekeeper, was awarded £20 for, "long, zealous and faithful service".⁵⁴⁶ In 1875, a gratuity payment of £60 per annum was made to John Hyslop, "in acknowledgement of his long and valued service as schoolmaster at Middleton-in-Teesdale extending over 39 years".⁵⁴⁷ His replacement, Mr Oddie, received a salary of £120 and when an education grant was received from the government it was decided that ten per cent of this should be used to augment his wages.⁵⁴⁸ Other workers received philanthropic help from the company. In May 1886, Pinkney received £50 to compensate for his failed local business, which he had set up after leaving the company, and he was later employed as the company's gardener.⁵⁴⁹ In 1896, two families received £10 each after two boys were killed at work on the Coldberry mine dressing floors.⁵⁵⁰

Throughout the region miners settled as close to the mines as possible. Teesdale provided an exception where the majority of the mines were at a remote location and the London Lead Company erected a "shop" to provide lodging for the miners. There were two "shops" in Swaledale, one at Punchedale in Arkengarthdale and the other at Bunting Level at the top of Gunnerside Gill, but none existed in Wensleydale. There was little problem with sanitation or overcrowding, mainly due to the small population and wide expanses of

⁵⁴⁵ H L Beadle, *Mining and Smelting in Teesdale*, p. 2.

⁵⁴⁶ NCRO, *LLC 31 21/11/1865*.

⁵⁴⁷ NCRO, *LLC 32 14/12/1875*.

⁵⁴⁸ NCRO, *LLC 32 22/06/1875 and 33 23/10/1877*.

⁵⁴⁹ NCRO, *LLC 35 25/05/1886 and 08/06/1886*.

⁵⁵⁰ NCRO, *LLC 37 25/02/1896*.

moorland. The company allowed miners to build their own houses on company land.⁵⁵¹ In 1857, most farms in Teesdale were possessed by lead mining families.⁵⁵² Leasing land to the miners also brought in additional income to the company for an area that would have otherwise remained uncultivated moorland. Smallholdings did give the miners some protection against the economic hazards of especially the 1870's and 1880's. Farming in Teesdale was not a viable alternative to mining so emigration or the search for other employment was required when the lead industry declined. It is of note, as Smailes showed, that in the 1930's there were small uneconomic farms still operating in Teesdale, probably as a result of the amalgamation of some of the miners' smallholdings.⁵⁵³ Miners without a smallholding had a garden or allotment provided for them by the company.⁵⁵⁴ An Agricultural Society was formed with prizes and awards provided by the company.⁵⁵⁵ In 1864, the subscription for this society was £3.15 per annum.⁵⁵⁶

The high altitude of the land made available to the miners in Teesdale made it impossible to grow cereal crops so they had to be brought in, Ashgill Low Shop, for instance, was situated at 1,900 feet above sea level. The arrival of the railways did reduce the cost for these foodstuffs. The 1864 Parliamentary report on mines reported that the appetite of miners was poor, which was often a symptom of poor ventilation in the mines.⁵⁵⁷ The main diet was cereal bread and an oatmeal porridge called crowdy. Potatoes, grown on the smallholdings, were an important part of the diet. Milk was the main drink and meat was a Sunday luxury.

The London Lead Company also encouraged the formation of corn associations from the 1840's and built a granary in 1846 to provide them with storage facilities.⁵⁵⁸ Ready money shops were established which provided no credit and in which cash payments only were accepted. The company bought the produce to be sold in bulk, stored it at its own

⁵⁵¹ BPP, *State of the Popular Education in England*. Royal Commission Report; 1861 (2794-11) XXI, Volume 2, p. 36.

⁵⁵² BPP, *Rating of Mines*. Sel.Cttee.Rep.; 1857 (241) XI, p. 26.

⁵⁵³ A E Smailes, *The Lead Dales of the Northern Pennines in Geography 21*, (London, 1936), pp. 120-129.

⁵⁵⁴ A Raistrick, *Two Centuries of Industrial Welfare*, pp. 31-32.

⁵⁵⁵ *ibid.*, p. 27.

⁵⁵⁶ NCRO, *LLC 30 13/09/1864*.

⁵⁵⁷ BPP, *Condition of all Mines*. R.Comm.Rep.; 1864 (3389) XXIV, Volume 1, p. 780.

⁵⁵⁸ A Raistrick, *Two Centuries of Industrial Welfare*, pp. 37-38 and A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 294.

warehouse and transported it to the shops which were leased out, in an attempt to stop credit traders and loan sharks operating in the area.⁵⁵⁹

The Poor Law Amendment Act of 1834 was inflexible and stimulated the setting up of friendly societies for protection against sickness and injury at work. In Swaledale, there was the Banks of Swale Court of Ancient Foresters which was established at Low Row in 1838, the Miners' Desire Lodge of Ancient Foresters at Gunnerside in 1844 and, also in 1844, the Oddfellows at Muker.⁵⁶⁰ Jennings also notes that there was the Swaledale Club based at Reeth.⁵⁶¹ Benefits included free medical attention, sick pay and financial grants. Subscriptions to these societies were around 1p per month. The Richmond Poor Law Union was established in 1837 and in 1840 Reeth was split from it and had its own workhouse. Various charities were also in operation in Swaledale which were subsequently overhauled by the Charity Commission in 1881.⁵⁶²

As noted above, in Teesdale the company had set up the Workmen's' Fund in 1813, contributions to the fund coming from its members with subscriptions of £1.50 per year. Raistrick stated that most workers joined the fund but officers of the company were ineligible, grants were provided from the company. It was run by a committee of workmen who were entirely responsible for the funds. The benefits provided were sick pay of between 30p to 40p per week for an indefinite period and a retirement pension of 25p per week for life for those over the age of 65.⁵⁶³ Due to over demand, the court agreed in 1879 that the debts incurred by this fund should be credited to the company's account and that the number of miners employed should not be increased.⁵⁶⁴ The liability the fund caused to the company was adjusted in 1883 due to many claims and the resulting expenditure involved.⁵⁶⁵ The fund then provided sick pay for any individual who was not at work for more than seven consecutive days.⁵⁶⁶

Before 1827, the fund also paid for its own medical officer but in that year the company decided that it should take over the responsibility of medical attention and appointed

⁵⁵⁹ A Raistrick, *Two Centuries of Industrial Welfare*, pp. 37-38.

⁵⁶⁰ *Wensleydale Advertiser* 02/07/1844, 16/07/1844 and 17/07/1846.

⁵⁶¹ B Jennings, *The History of the Lead Mining Industry of Swaledale*, p. 307.

⁵⁶² R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, pp. 308-319.

⁵⁶³ A Raistrick, *Two Centuries of Industrial Welfare*, p. 46 and p. 50.

⁵⁶⁴ NCRO, *LLC 33 04/09/1879*.

⁵⁶⁵ NCRO, *LLC 34 15/06/1883*.

doctors for all its workers and their families. In December 1873, the resident doctor, Dr Makens, who had been appointed in 1847, retired and he was replaced by Dr Arnold.⁵⁶⁷ In spite of the provisions of the Workmen's Fund, miners also formed their own friendly societies in Teesdale to cover the possibility of injury or being unable to work in a lead mine before the age of 65.⁵⁶⁸ The London Lead Company made frequent donations to these friendly societies, making membership compulsory to the workers in 1827.⁵⁶⁹ The company did donate funds to these societies and reported in 1885 that their contribution stood at £58,170.73.⁵⁷⁰

The paternalistic attitude of the London Lead Company did not encourage trade unions. The company probably did not want any threat to the relationship it had with the workers and the miners probably felt the same way as they believed they were selling their own produce as a sub-contractor to the company, rather than just their labour. There is also no evidence for trade unions operating in the lead mining industry in Swaledale, possibly because the miners preferred their own independence, and for similar reasons due to their bargaining pay method.

The Mines Act of 1842 ignored child labour at lead mines as, on the whole, child labour was not exploited, mainly due to economic rather than humanitarian reasons.⁵⁷¹ In 1864, the London Lead Company would not employ anyone under the age of eighteen to work underground and no child under eleven on the dressing floors.⁵⁷² In the 1864 report, the number and average age of the miners were given. In Teesdale, there were 151 miners at Coldberry at an average age of 35.04. In Swaledale, there were 18 miners at Ellerton Moor at an average age of 34.5; 229 miners at Old Gang with an average age of 29.84; at Summerlodge there were 7 miners and an average age of 27; and 99 miners at Surrender aged, on average, 29.2. In Wensleydale, Keld Heads had 91 miners with an average age of 35.28.⁵⁷³ Hallas pointed out that there was a considerably lower proportion of children

⁵⁶⁶ NCRO, *LLC 31 14/12/1866*.

⁵⁶⁷ NCRO, *LLC 32 23/12/1876 and 06/01/1874*.

⁵⁶⁸ C J Hunt, *The Lead Miners of the Northern Pennines*, p. 83 and A Raistrick, *Two Centuries of Industrial Welfare*, p. 45.

⁵⁶⁹ C J Hunt, *ibid.*, p. 83 and A Raistrick, *ibid.*, p. 83.

⁵⁷⁰ NCRO, *LLC 34 17/09/1885*.

⁵⁷¹ BPP, *Children's Employment (Mines)*. R.Comm.Rep.; 1842 (382) XVII, Volume 2, p. 756.

⁵⁷² BPP, *Condition of all Mines*. R.Comm.Rep; 1864 (3389), Volume 2, p.376.

⁵⁷³ *ibid.*, appendix, p. 12.

and women working at the Wensleydale mines, compared to those in Swaledale.⁵⁷⁴ This may suggest that there was a local tradition or a difference in supply and demand between the two valleys.

The health of those who worked in the lead mining industry was poorer and the life expectancy considerably shorter than that of the average man. In 1858, the General Board of Health compared Alston, Reeth, Haltwhistle and Liverpool and concluded that the standard of health was worse in Alston, the highest market town in England and centre of the Alston Moor lead mining area.⁵⁷⁵ In 1864, it was reported that the lead miners had a shorter lifespan than the average for Great Britain. On average, a man would live to be 60.79 years of age, whilst a lead miner would, on average, only live until the age of 46.67. A lead miner was also twice as likely to die between the ages of 45 and 65 than the average man. The statistics regarding death due to pulmonary disease were worse. A lead miner between the ages of 35 and 65 was three times as likely to die from a lung condition.⁵⁷⁶ To prevent such a high rate of premature death caused by lung disease, the report recommended that each mine should have a changing area so that the miners would not have to walk home in wet clothing, that all surface work should take place under a shelter and that lifts and not ladders were used for descending and ascending within the mines.⁵⁷⁷ None of these recommendations were made compulsory but the “shops” used in Teesdale would have prevented many miners walking home in wet clothing and the company did provide wind breaks at the dressing floors. It is of note that dust and fumes were not recognised as the causes of the high incidence of lung diseases in lead miners. Breathing problems were the main cause of disability to the lead miner. In the 1864 report, Dr W Ewart of Middleton-in-Teesdale noted that living in the confines of a “shop” was a problem for spreading lung disease but that “only the London Lead Company’s agents were completely honest about the mortality rate”.⁵⁷⁸

The Parliamentary education report of 1861 found that lead miners were literate and intelligent.⁵⁷⁹ It could be argued that they had to be intelligent to argue for and record their bargains at the contract auctions. In the eighteenth century Middleton had three

⁵⁷⁴ C S Hallas, *Economic and Social Changes*, p. 316.

⁵⁷⁵ C J Hunt, *The Lead Miners of the Northern Pennines*, p. 208.

⁵⁷⁶ BPP, *Condition of all Mines*. R.Comm.Rep.; 1864 (3389), Volume 2, appendix, p. 12.

⁵⁷⁷ *ibid.*

⁵⁷⁸ *ibid.*

⁵⁷⁹ BPP, *State of the Popular Education*. R.Comm.Rep.; 1861 (2794-11) XXI, Volume 2, p.323.

charity schools and, in 1818, Robert Stagg, the Teesdale superintendent, set up the company's school in Middleton.⁵⁸⁰ The company also set up schools at Harwood, Lunedale, Hilton, Ashgill, Holwick, Knock, Lunehead, Mickleton, Newbiggin and Egglestone.⁵⁸¹ Raistrick notes that the company paid the teachers an annual salary of £100, whilst the Brougham parliamentary committee on education in 1820 set it at £24.⁵⁸²

The 1864 report noted that the London Lead Company was a major contributor towards the education of the children in Teesdale.⁵⁸³ The company set up Sunday schools to which attendance was compulsory and the 1861 education report named Middleton as the best school in the north-east of England.⁵⁸⁴ The standards at the company school were higher than most others in the country and the literacy rate was also impressive.

Education in Swaledale was mainly reliant on endowed schools providing elementary education at Marske, Fremington, Crackpot, Arkle and Muker. The endowment school at Reeth had competition for places, the current building erected in 1862 is still used as the village school. Schools at Feetham and Keld failed, due to insufficient funding.⁵⁸⁵ At Gunnerside, there was a Methodist school and a National Society school was established there in 1855 but the drop in population caused by the shrinkage in the lead mining industry forced the National School to close in 1874. The Education Act 1870 filled in the gaps by establishing school boards at Marrick in 1878 and Hurst 1880, just in time for the population to fall further.⁵⁸⁶ The only recorded contribution from a lead mining organisation to a school in Swaledale was in February 1871, when Denys contributed £4 to the Muker School for unspecified reasons.⁵⁸⁷

Parallel to the schools was the London Lead Company's provision of free libraries. The company bought the books, including scientific books on mining, and lent them without charge.⁵⁸⁸ Reading rooms were social places and, according to Raistrick, the company had provided sixteen of them by 1860.⁵⁸⁹ In Swaledale, a literary institute was founded at

⁵⁸⁰ C J Hunt, *The Lead Miners of the Northern Pennines*, p. 232 and NCRO, *LLC 18 19/02/1818*.

⁵⁸¹ A Raistrick, *Two Centuries of Industrial Welfare*, p. 58.

⁵⁸² *ibid.*, p. 62 and Sir L Woodward, *The Age of Reform 1815 - 1870*, p. 478.

⁵⁸³ BPP, *Condition of all Mines*. R.Comm.Rep.; 1864 (3389), Volume 2, appendix, p. 18.

⁵⁸⁴ BPP, *State of the Popular Education*. R.Comm.Rep.; 1861 (2794-11) XXI, Volume 2, p. 370.

⁵⁸⁵ R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, pp. 366-379.

⁵⁸⁶ *ibid.*, pp. 384-385.

⁵⁸⁷ NYCRO, *ZLB 3/34*.

⁵⁸⁸ A Raistrick, *Two Centuries of Industrial Welfare*, pp. 70-71.

⁵⁸⁹ *ibid.*, p. 71 and A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 320.

Keld in 1862 and, slowly, Grinton, Reeth, Arken and Low Row followed suit and established their own, charging a membership subscription.⁵⁹⁰

Religion was an important factor in the dales. Although the London Lead Company was a Quaker organisation, Methodism filled the gap left by the Church of England in Teesdale. In 1757, the Dales circuit had been founded with Barnard Castle as the centre.⁵⁹¹ The London Lead Company did not proselytise employees but did insist on Sunday worship. Methodism was also popular in Swaledale and chapels were built at Low Row in 1769, Gunnerside 1789, Reeth 1796, Arkle Town 1798, Hurst 1815 and Healaugh 1821. A Primitive Methodist chapel was erected at Booze in 1826 and further chapels built at Reeth in 1840, Wham 1840, Low Row 1841, Marrick 1842, Healaugh 1843 and Muker 1845. In 1846, Reeth was established as a separate circuit, detached from Richmond, and the last chapel built in the valley was at Gunnerside in 1867.⁵⁹² The religious returns in the 1851 census demonstrate that 40 per cent of the population in Swaledale was Methodist and the decline in Methodism in the valley mirrors the decline in lead mining and population as a whole.⁵⁹³ Hartley and Ingilby stated that there were six nonconformist chapels in Arkengarthdale, five inns and four pubs.⁵⁹⁴ Wensleydale was a consolidated Church of England valley with established parishes with a fewer number of chapels and the census returns demonstrate that the majority of the population was conformist.⁵⁹⁵

According to Raistrick, the London Lead Company had a social policy as a result of three factors: the natural isolation of Teesdale; the value of a healthy and contented workforce; and the philanthropy of the Society of Friends.⁵⁹⁶ Raistrick believed that the company could afford the social policy and reap the benefits accrued. As the company certainly did invest in technological progress, there is no reason to doubt Raistrick's theory regarding the social policy. It appears to have been a mixture of philanthropy and self interest for the company. Swaledale, on the other hand, had no social service, no charities, no education facilities or medical aid provided by any of the lead mining companies. It was

⁵⁹⁰ NYCRO, *ZLB 32* and R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, pp. 381-397.

⁵⁹¹ C J Hunt, *The Lead Miners of the Northern Pennines*, p. 220.

⁵⁹² R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, pp. 330-349.

⁵⁹³ NYCRO, *Census Returns 1851*.

⁵⁹⁴ M Hartley and J Ingilby, *The Yorkshire Dales*, p. 273.

⁵⁹⁵ E R Humphrey-Smith (editor), *The Phillimore Atlas and Index of Parish Registers*, (Canterbury, 1995), pp. 275-278 and Northallerton Public Library, *Census Returns 1861, 1871, 1881 and 1891*.

entirely up to the miners themselves to set up their own friendly societies and literary institutes. Education was also provided either by the local rate payers or by a voluntary society, supported by Government grants and independent charity. Fortunately, the Education Act of 1870 brought the standard of education, already provided by the London Lead Company, since 1818 in Middleton, to areas where no board schools had been erected.

⁵⁹⁶ A Raistrick, *Two Centuries of Industrial Welfare*, pp. 94-95.

12. Responses to the Decline

The population figures which reflect the decline of the lead mining industry are not constant across the three valleys. Between 1861 and 1891, the population in Swaledale fell by 48.2 per cent; in Wensleydale the drop was 6.1 per cent; and in Teesdale 1.3 per cent.⁵⁹⁷ Moreover, the population of the three valleys continued to fall from 1891 to 1911; Swaledale 25.8 per cent; Wensleydale 11.4 per cent; and Teesdale 14 per cent.⁵⁹⁸ The figure for Teesdale demonstrates that the decline of the lead mining industry came later and the reduction in population was not as severe as for Swaledale. Between 1871 and 1881, the population of England and Wales grew by 16.9 per cent; 19.63 in the towns and 7.42 per cent in the country.⁵⁹⁹ Comparing these to the census returns of Swaledale, Wensleydale and Teesdale there is a marked discrepancy as the population dropped in these areas. Swaledale by 8.7 per cent, Wensleydale by 7.9 per cent and Teesdale by 0.1 per cent. This represents a decline in real terms of one-sixth in Swaledale and Wensleydale and one-thirteenth for Teesdale.

To ascertain the reasons for the drop in population the census returns for each of the registration district should be evaluated. Swaledale comprises of the townships; Muker, Reeth, Grinton, Arkengarthdale, Marrick, Hurst and Melbecks, which was sub-divided by Gunnerside and Low Row.⁶⁰⁰ For Wensleydale; Bainbridge, West Witton, Preston-under-Scar, High Abbotside, Low Abbotside, Castle Bolton, Thornton Rust, Aysgarth, Carperby, Wensley, Redmire, Thoraby, Burton-cum-Walden, Hawes and Askrigg.⁶⁰¹ Teesdale includes; Cotherstone (including Balderstone), Hunderthwaite, Romaldkirk, Mickleton, Lunedale, Holwick, Egglestone, Middleton, Newbiggin and Forest and Frith.⁶⁰² Raistrick and Jennings based their population statistics on the census returns for Middleton, Newbiggin and Forest and Frith for Teesdale; Muker, Melbecks, Reeth, Grinton, Arkengarthdale and Marrick for Swaledale; and Castle Bolton, Redmire and Preston for Wensleydale.⁶⁰³

⁵⁹⁷ Northallerton Public Library and DCRO, *Census Returns 1861, 1871, 1881 and 1891*.

⁵⁹⁸ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 324.

⁵⁹⁹ Sir Robert Ensor, *England 1870 - 1914*, p. 103.

⁶⁰⁰ Northallerton Public Library, *Census Returns 1861, 1871, 1881 and 1891*.

⁶⁰¹ *ibid.*

⁶⁰² DCRO, *Census Returns 1861, 1871, 1881 and 1891*.

⁶⁰³ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 324. —

The table Raistrick and Jennings published on the population figures in the northern Pennines is reproduced below for the three valleys concerned.

⁶⁰⁴	1851	1861	1871	1881	1891	1901	1911
Wensleydale	1,020	1,133	979	878	690	615	611
Swaledale	6,762	6,146	5,326	4,673	3,169	2,483	2,351
Teesdale	3,336	3,769	3,823	3,665	3,159	3,028	2,716

In Swaledale the greatest population falls were as follows. Between the 1851 and 1861 censuses, the number of adults in the parish of Muker dropped by 25 per cent and this coincides with the closure of the West and South Swaledale mines that Denys tried to revive in the 1860's. For Melbecks, between 1871 and 1891, the adult population dropped by 58 per cent when the Old Gang and AD Companies failed. The adult population decline came later for Arkengarthdale, between 1891 and 1901, when the drop was by 44 per cent, again coinciding with the end of the local mining company. In Wensleydale the largest population decline in adults that was recorded by the census was between 1861 and 1871, in Castle Bolton parish, where the Apedale and Virgin mines were situated when there was a 25 per cent fall, similarly coinciding with the demise of the industry.⁶⁰⁵

Census returns only deal with decades. Evidence for more significant falls in population can be gained from other sources. For Swaledale, in September 1878, the Gunnerside Wesleyan school lost 23 pupils and, in September 1882, the Reeth school register showed a reduction of 81, with twelve families informing the school of their destination; seven went to Lancashire and five to Keighley.⁶⁰⁶ This coincided with the rapid decline of the AD and Old Gang Companies. Migration brought problems for shopkeepers, innkeepers, school teachers and all those whose earnings were indirectly linked to the mines. In 1908, Bogg noted that, "the population of Grinton was greatly diminished when the lead mines of the northern ridge were closed...formerly several inns where there is now only one".⁶⁰⁷ Smallholdings became amalgamated into larger farms. Abandoned houses followed with the lost and deserted villages of Kearton, Blades and Hurst; "the population has

⁶⁰⁴ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 324.

⁶⁰⁵ Northallerton Public Library, *Census Returns 1861, 1871, 1881 and 1891*.

⁶⁰⁶ NYCRO, *ZLB 35*.

⁶⁰⁷ E Bogg, *Richmondshire*, (Leeds and London, 1908), pp. 200-201.

diminished and roofless or ruined cottages are to be seen".⁶⁰⁸ The derelict houses were pulled down at Arkle Town.

Teesdale was one of the later areas of the Pennine orefield to decline as a lead producing area. All mining concerns go through periods of expansion and contraction. The number of mines which the London Lead Company operated alleviated the blow of recession by spreading the consequences throughout the entire area. Even with such large changes as the abandonment of Alston Moor in 1882, the company transferred 220 miners from this area to Teesdale to cushion the blow.⁶⁰⁹ The population of Teesdale actually increased between 1861 and 1871, by just over one per cent. The population level remained virtually static between 1871 to 1881. There was a reduction in the population in Teesdale between 1881 and 1891, when the decline was by nearly fourteen per cent with further population losses of four and ten per cent shown by the respective censuses of 1901 and 1911.⁶¹⁰ The decline in population was not as spectacular as in Swaledale.

Narrowed down to parish level, the censuses show that the declines were mainly uniform throughout Teesdale. Between 1871 and 1881, there was a decline of fourteen per cent of the adult population in Hunderthwaite and Romalldkirk but this was completely offset by the next census as, in 1891, the Hury Reservoir was under construction and the number of labourers living in the parish doubled the population figure to 892. Newbiggen was only other parish which suffered a population decline of over ten per cent between 1881 and 1891, when the adult population fell by 25.3 per cent and the number of lead miners halved.⁶¹¹ In 1890, Wallace reported that the population of the lead mining areas was declining, due to the exhaustion of the mines.⁶¹²

Jennings correctly pointed out that, "there is a very close correlation between variations in output and the growth and decline of the population, both in general movements of the whole area and the experience of different parts of it".⁶¹³ The population figures closely follow the expansion and contraction of the industry in each of the areas covered but to different extents. In Wensleydale, only 7.7 per cent of the male population was employed

⁶⁰⁸ *ibid.*, p. 215.

⁶⁰⁹ NCRO, *LLC 34 17/06/1884*.

⁶¹⁰ DCRO, *Census Returns 1861, 1871, 1881 and 1891*.

⁶¹¹ DCRO, *Census Returns 1881 and 1891*.

⁶¹² W Wallace, *Alston Moor*, p. 46.

⁶¹³ B Jennings, *The Lead Mining Industry of Swaledale*, p. 324.

at the lead mines in 1861. This dropped to four per cent in both 1871 and 1881 and 0.5 in 1891, with only two people employed as lead miners in 1901.⁶¹⁴ In Teesdale, the figure was 30.5 per cent in 1861 and 29.1 per cent in 1871. In 1881, this had dropped to just above twenty per cent and in 1891 to 13.5. In 1901, there were 145 people employed at lead mines and 77 in 1911.⁶¹⁵ In Swaledale, the percentage of the male population employed in lead mining was higher. In 1861 and 1871, just under 38 per cent. By 1881, it had dropped to 25.4 and to 18.1 per cent in 1891.⁶¹⁶ In 1901, there were 77 people employed at lead mines and in 1911 only nineteen.⁶¹⁷

Using statistics from the adult population as a whole; in Swaledale the percentage of lead miners was 24 per cent for 1861 and 1871, 17 per cent in 1881 and 11 per cent in 1891. The percentage of people employed in agriculture rose during the same period. In 1861 it was 11 cent, 1871 13 per cent, 1881 17 per cent and in 1891 25 per cent. However, the number of people who declared that their profession was in agriculture remained constant at around 540 and it was the decline in population that has caused the proportional increase. In Wensleydale, the percentage of adults employed in farming was consistently over 20 per cent and just above the 1,000 in people. Lead mining occupations fell from five per cent of the adult population to under three per cent between 1861 and 1871. By 1881, there was under one half of one per cent employed in lead mining. The number of people employed in quarrying rose from 17 in 1861 to 118 in 1891, under one third of one per cent and three per cent respectively of the adult population.⁶¹⁸ The number of labourers was fairly constant at above 100. In Teesdale, the proportion of adults employed in lead mining was twenty per cent in both 1861 and 1871. In 1881, it had dropped to fourteen per cent and to nine per cent in 1891. The number of people employed at the quarries rose from eleven in 1861 to 231 in 1891. The total of labourers also increased from 53 in 1861 to 100 in 1881, and 291 in 1891. However, as noted previously, Hury Reservoir was under construction in 1891.⁶¹⁹

⁶¹⁴ Northallerton Public Library, *Census Returns 1861, 1871, 1881 and 1891* and *The Mineral Statistics for the United Kingdom*.

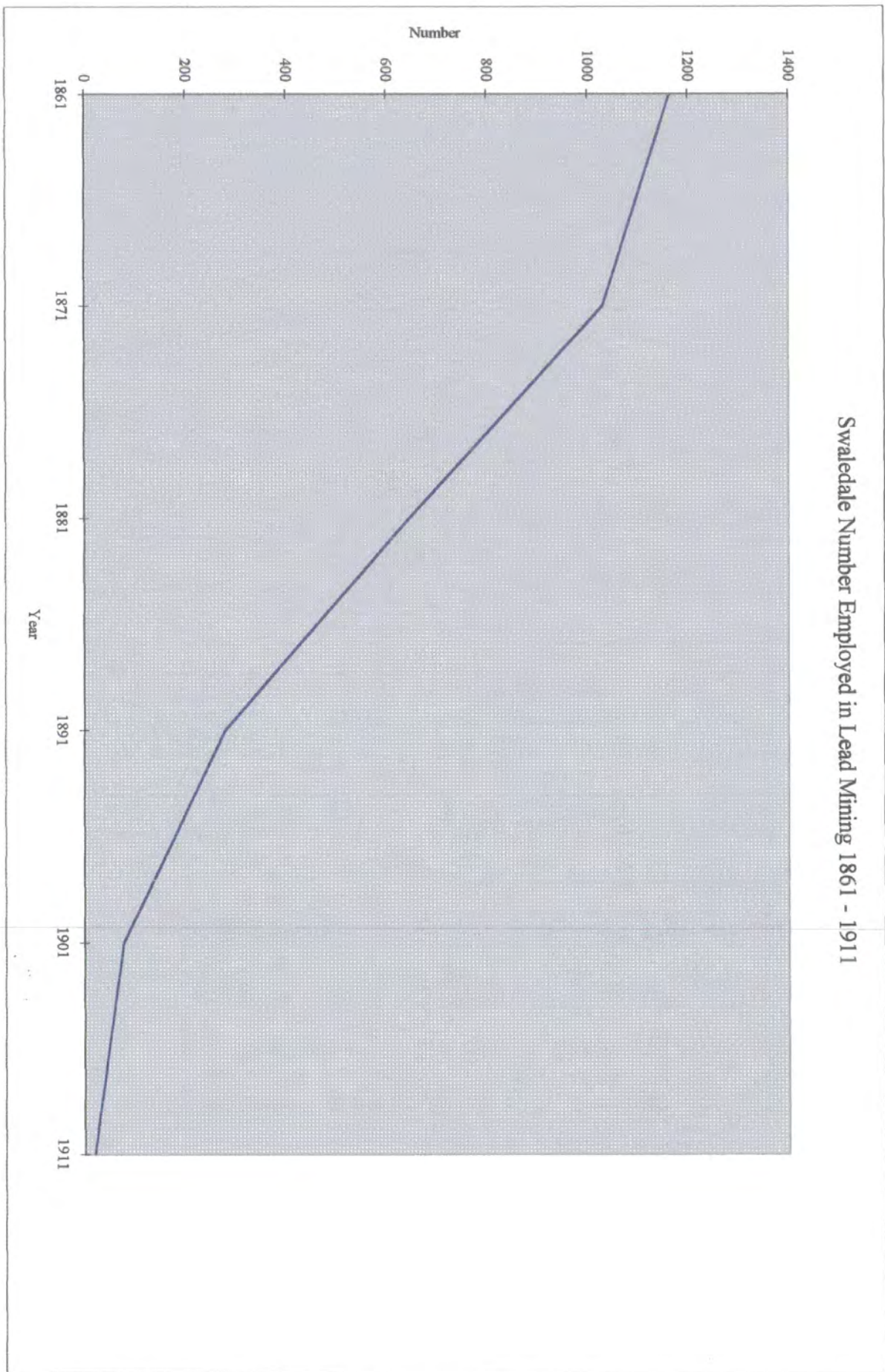
⁶¹⁵ DCRO, *Census Returns 1861, 1871, 1881 and 1891* and *The Mineral Statistics for the United Kingdom*.

⁶¹⁶ Northallerton Public Library, *Census Returns 1861, 1871, 1881 and 1891*.

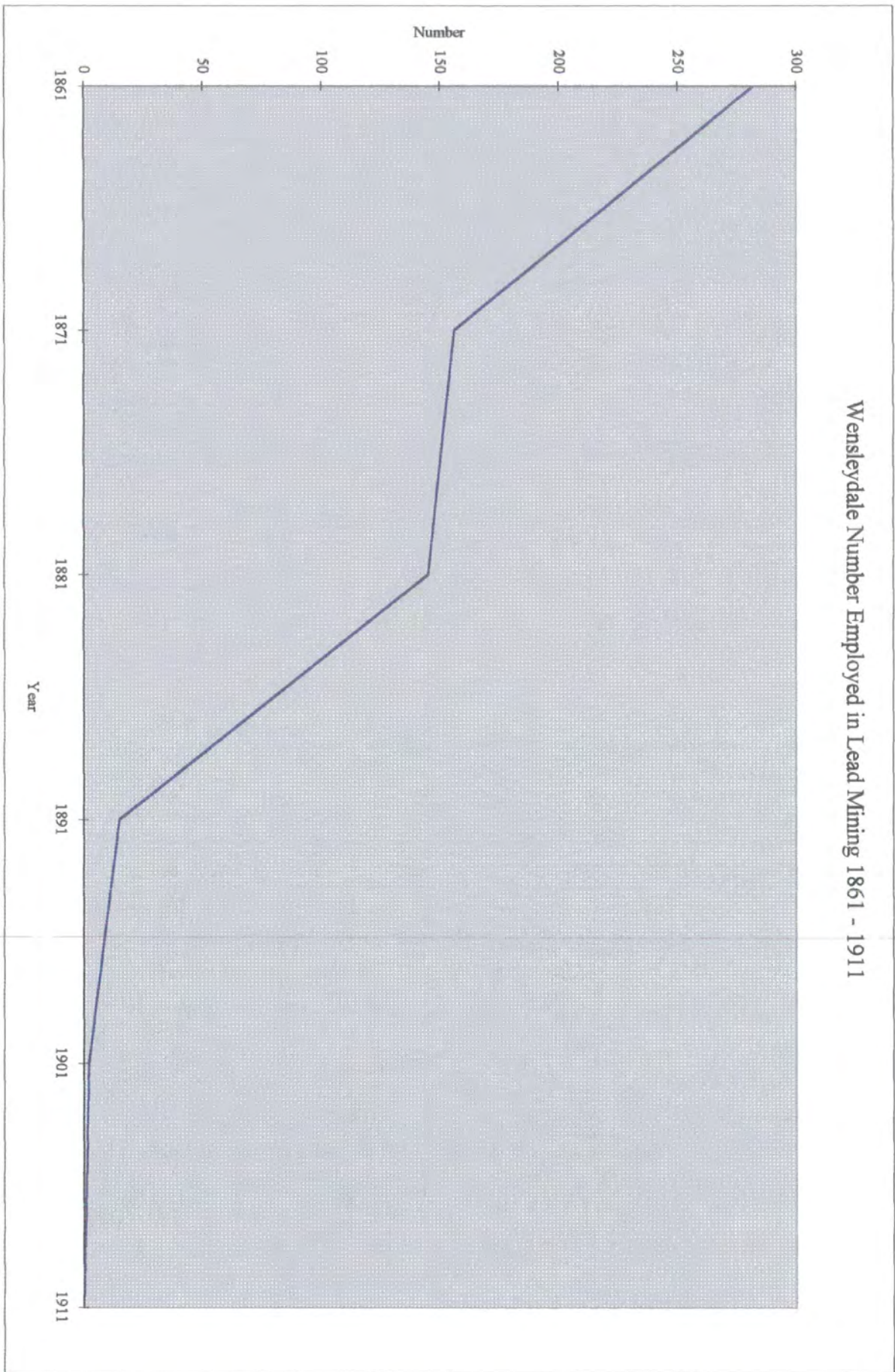
⁶¹⁷ *The Mineral Statistics for the United Kingdom*.

⁶¹⁸ Northallerton Public Library, *Census Returns 1861, 1871, 1881 and 1891*.

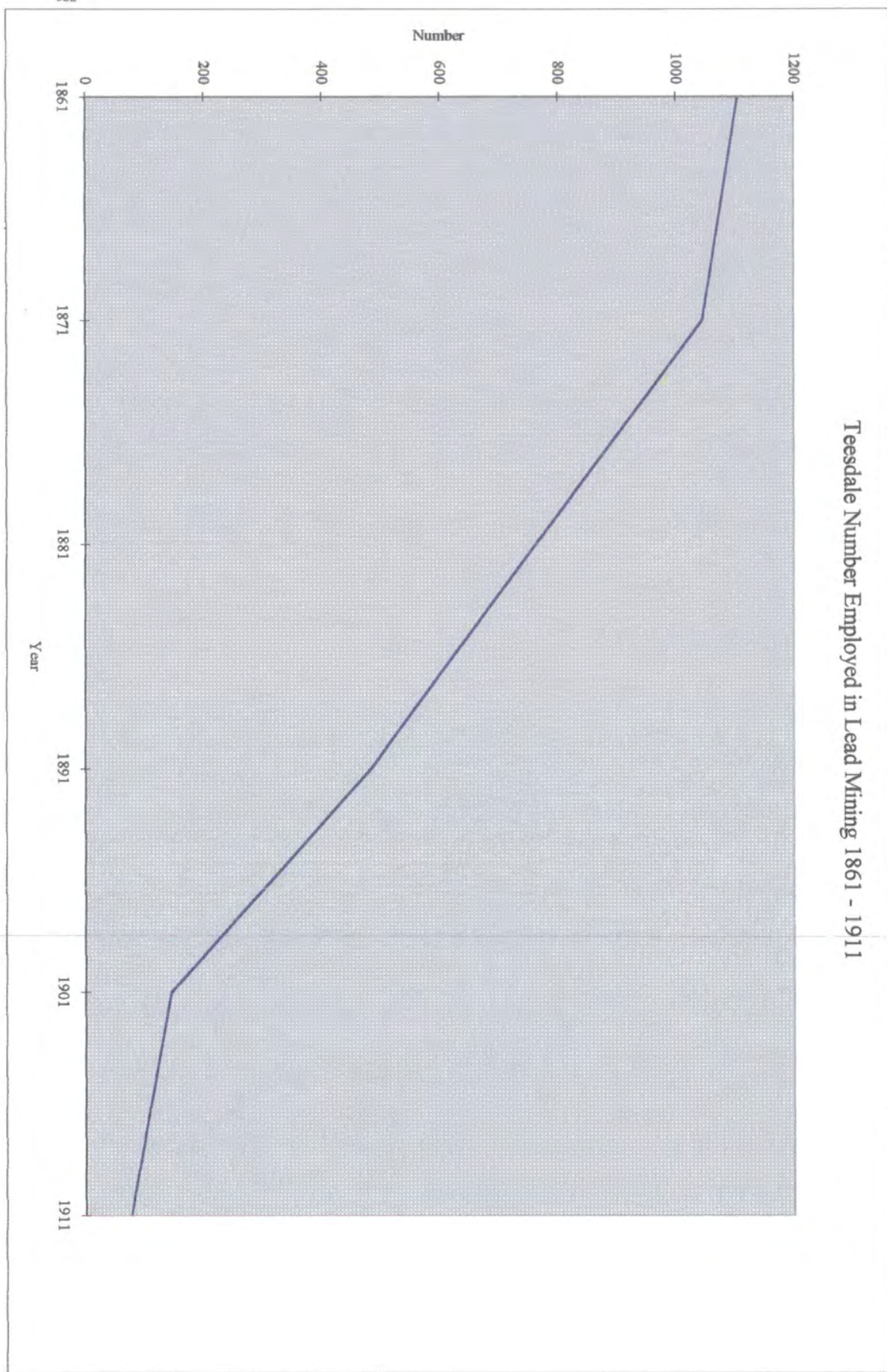
⁶¹⁹ DCRO, *Census Returns 1861, 1871, 1881 and 1891*.



⁶²⁰ Northallerton Public Library, *Census Returns 1861, 1871, 1881 and 1891* and *The Mineral Statistics for the United Kingdom*.

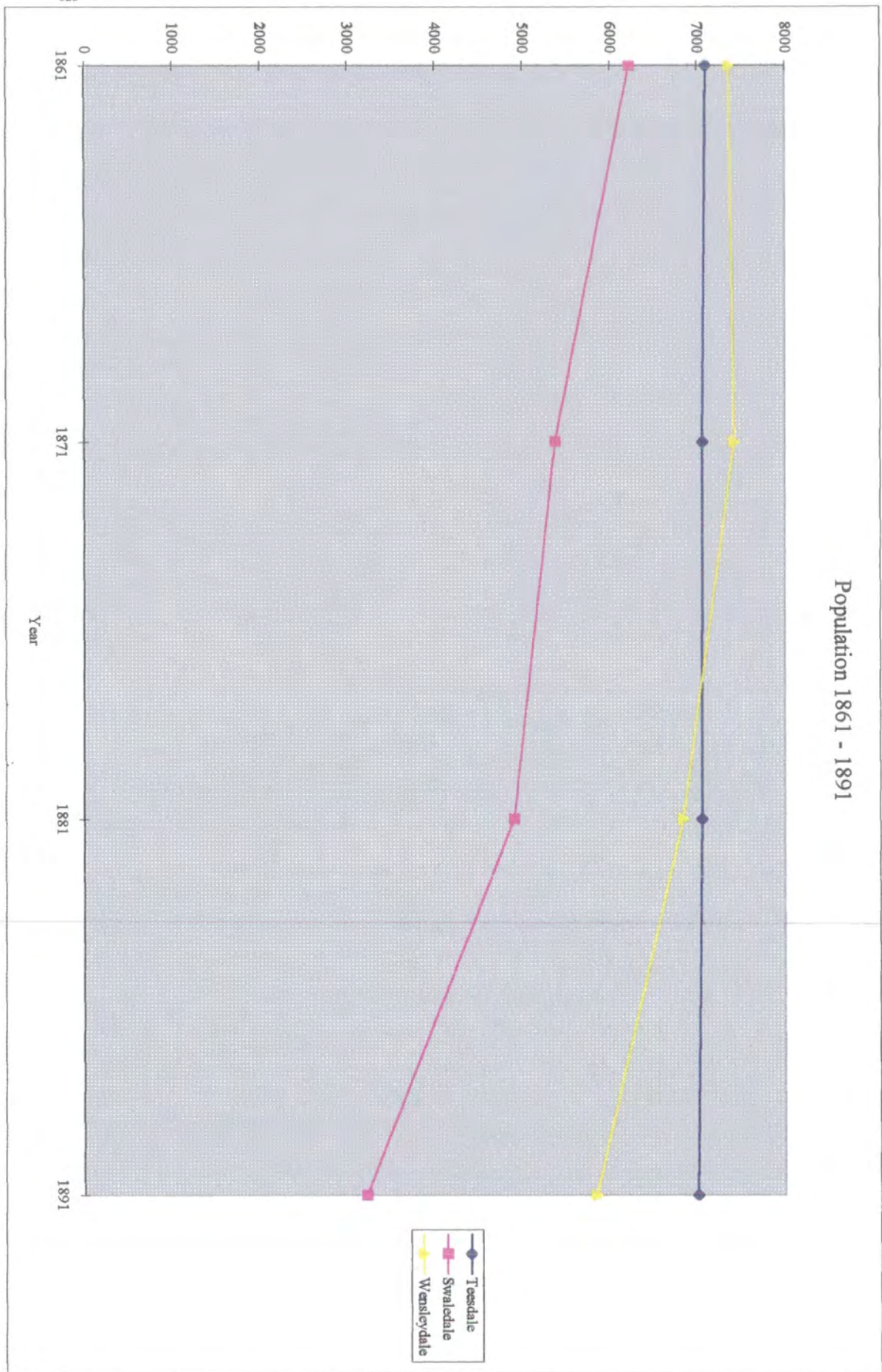


⁶²¹ Northallerton Public Library, *Census Returns 1861, 1871, 1881 and 1891* and *The Mineral Statistics for the United Kingdom*.



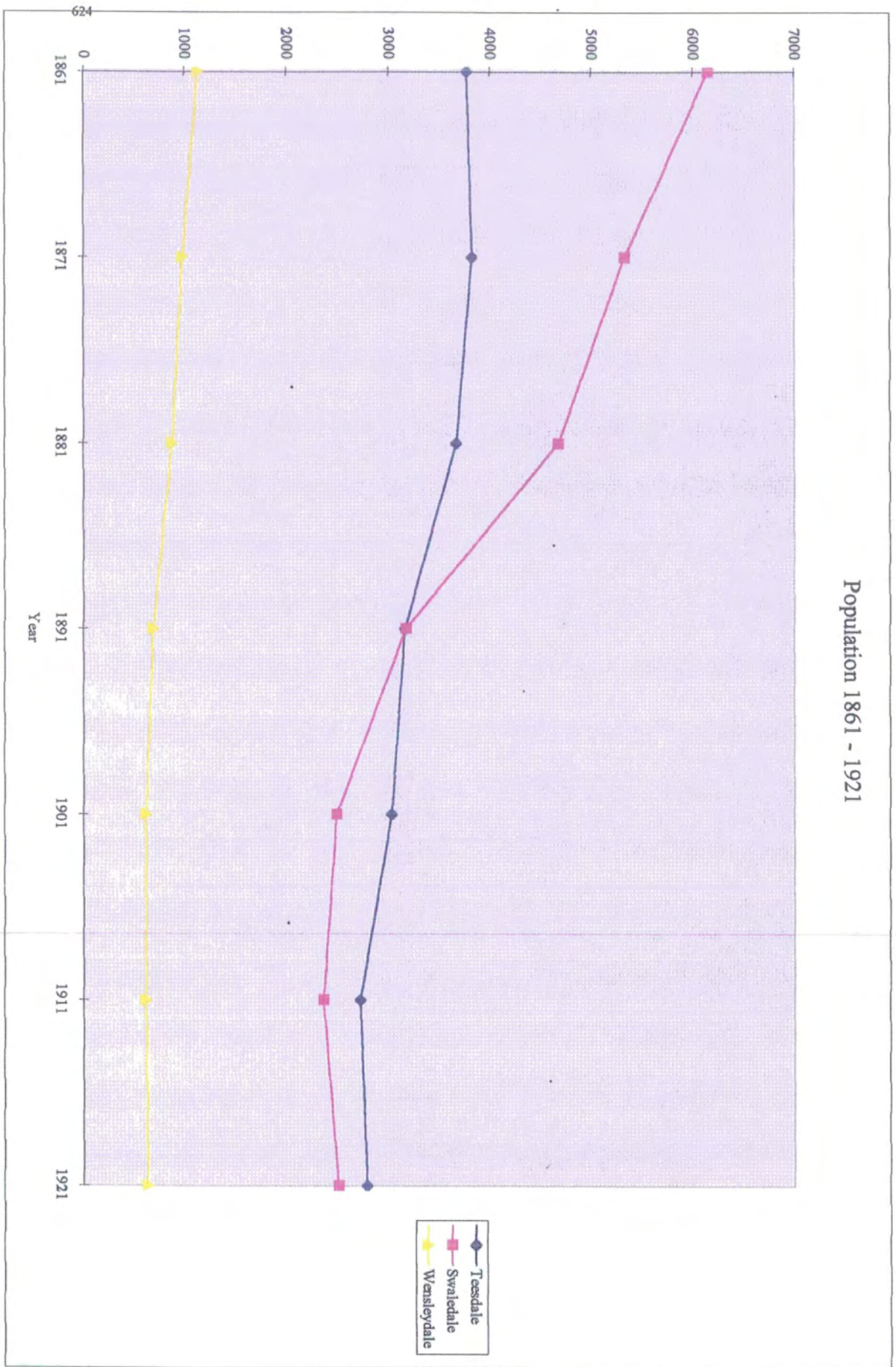
Teesdale Number Employed in Lead Mining 1861 - 1911

⁶²² DCRO, *Census Returns 1861, 1871, 1881 and 1891* and *The Mineral Statistics for the United Kingdom*.



⁶²³ Northallerton Public Library and DCRO, *Census Returns 1861, 1871, 1881 and 1891*.

Population 1861 - 1921



⁶²⁴ A Raistrick and B Jennings, *A History of Lead Mining in the Pennines*, p. 324.

One of the factors that influenced the changes in the population statistics was the possibility of other employment within the area. As noted earlier, Swaledale was dominated by lead mining and, apart from farming, there was no other industry which could employ the miners after the mines had closed down. In Wensleydale, there were other industries; quarrying, building railways (both the Wensleydale line and the Settle and Carlisle were under construction in the latter half of the century) and, to a lesser extent, the knitting industry but this was also in decline. In 1865, there were no other industries in Teesdale and farming was restricted to subsistence farming and was not a viable option for employment. However, after the demise of the London Lead Company some of the Teesdale mines remained open, with fluorspar and barytes replacing lead as the principal mineral extracted and quarrying also increased as an industry, replacing mining as the principal employer.

As Hallas noted, Swaledale produced more lead than any other commodity and the value of goods exported from the valley amply shows the decline; in 1850 £158,000, in 1880 £60,000. The value of Wensleydale produce dropped from £158,000 to £128,000 over the same period but Wensleydale was, overall, predominantly an agricultural valley and a high milk producer, which explains the smaller decrease. Hallas concluded that the economic peaks were in the 1820's for Swaledale and 1850's for Wensleydale with the population peaks being 1821 and 1961 respectively.⁶²⁵ The main products of Wensleydale were wool, cheese and butter. For 1871, Hallas estimated that Wensleydale produced over 681 tons of butter and 97 tons of cheese.⁶²⁶ This compares to the lead ore output of 527.3 tons for the same year.⁶²⁷ Hartley and Ingilby agreed; "even in the heyday of mining it used to be said that the weight of butter, cheese and bacon exported from Wensleydale was greater than the lead".⁶²⁸

In Swaledale the colliery at Tan Hill in Arkengarthdale produced coal of poor quality which was sold almost exclusively as domestic fuel.⁶²⁹ It is of note that the custom rent for the colliery was £70. In 1846, the mine was in profit but by 1867, significant losses were being recorded.⁶³⁰ This decline in revenue coincided with the arrival of the railway

⁶²⁵ C S Hallas, *The Journal of Transport History* 17, p.22.

⁶²⁶ *ibid.*, p. 35.

⁶²⁷ *The Mineral Statistics for the United Kingdom.*

⁶²⁸ M Hartley and J Ingilby, *The Yorkshire Dales*, p. 184.

⁶²⁹ R Fieldhouse and B Jennings, *A History of Richmond and Swaledale*, p. 205.

⁶³⁰ NYCRO, *ZAW 112, 113, 114, 115 and 116.*

at Richmond and the import of cheaper and better coal but the pit remained operational until after the First World War. This decline is mirrored by a small colliery at Hurst and Morley ensured that this pit was kept open by making the use of its coal compulsory for the lessee of the Hurst mine.⁶³¹

Knitting was a major Yorkshire Dales industry up to the eighteenth century. Most of this had been overtaken in the final half of the eighteenth century by frame knitting and the hand knitters could not compete with the knitting machines of the great hosiery manufacturers of the Midlands, Scotland and southern England. Despite this, the knitting industry had survived in Wensleydale and, to a lesser extent, in Swaledale. Men, women and children knitted for additional income and for a degree of independence. Caps, mittens, gloves and jerseys were the most common articles produced. The hosiery factory, owned by the Knowles family at Low Row, was closed in 1870. Knitting did continue in Swaledale but this closure meant that the wool used was now most likely to have been carded at Askrigg (before 1873) or at Kendal. Aysgarth mill became a woollen mill in 1853 and became famous for producing red jerseys for Garibaldi and balaclava helmets for the Crimean War. However, in 1870 this mill was converted into a flour mill.⁶³²

Hand knitting had declined before the demise of the lead mining industry and remained merely an additional form of income rather than a premier occupation. However, Hawes did have a hosiery business, James Smith and Sons, which closed in 1904. Hartley and Ingilby stated that, although in 1890, only 20 people were employed to work at the mill over 400 were employed knitting at home, but in the 1891 census only 90 people gave that their occupation as knitting in the relevant areas.⁶³³ There was a notable decline in the woollen industry, influenced by the influx of Australian wool. In 1875, one pound of wool cost 3p but by 1901 it was half this price.⁶³⁴

As noted in the census returns and population figures, quarrying did increase as an occupation in both Wensleydale and Teesdale but not in Swaledale. Between 1861 and

⁶³¹ NYCRO, *ZPL 10/2154*.

⁶³² M Hartley and J Ingilby, *The Yorkshire Dales*, p. 206. and M Hartley and J Ingilby, *The Old Hand Knitters of the Dales*, (Clapham, 1951), pp. 24-46.

⁶³³ M Hartley and J Ingilby, *The Old Hand Knitters*, pp. 54-57 and Northallerton Public Library, *Census Returns 1891*.

⁶³⁴ J Hardy, *Swaledale, Portrait of a North Yorkshire Mining Community*, p. 45.

1891, the number employed at quarries increased sevenfold in Wensleydale and by 21 times in Teesdale.⁶³⁵ The increase in iron production caused an increase in the demand for limestone.⁶³⁶ The limestone quarries at Redmire, Preston-under-Scar and Leyburn provided limestone for the blast furnaces at Teesside, transported there by rail until the 1980's.

Leases for quarries have survived. In June 1879, Redhead quarry in Wensleydale was leased for 21 years to John Smith of Hawes and John Cain of Sedbusk, highest bidders.⁶³⁷ Wensleydale quarry owners also investigated expanding into Swaledale. In May 1896, G S Bennett, manager of the Wetherfell Chert Quarry, Hawes, made enquires to Simon Cherry about the quarrying industry in Swaledale, which, at this point in time, was minimal.⁶³⁸ There was a chert quarry at Fremington but in 1904 only two people were employed there.⁶³⁹ The only other quarry in Swaledale was at Moulds Side, Arkengarthdale, and this was not opened until 1922.⁶⁴⁰

In Teesdale, John Robert Ord and Henry Maddison of Darlington leased the Holwick quarry in 1860 at a rent of £30 per annum, with a royalty of 1p for every ton of whinstone produced over 3,600 tons. They also began to lease the Park End Quarry at Middleton in 1869 and employed 131 workers.⁶⁴¹ Ord and Maddison continued to lease quarries on the Strathmore estate until after the advent of the First World War.⁶⁴² Others leased quarries in Teesdale. A twenty one year lease was granted to James Tait of Coxhoe for extracting limestone from Lunedale in March 1879. The rental was £30 per year and the royalty was 1p for every ton produced over 3,600.⁶⁴³ By 1897, Tait was no longer using these quarries, as a lease for 30 years was granted to Kinghorne and Hodsman of York, representatives of the Lunedale Whinstone Company, allowing the extraction of whinstone and limestone at £90 per annum with additional payments for the tonnage of stone removed.⁶⁴⁴

⁶³⁵ Northallerton Public Library and DCRO, *Census Returns 1861 and 1891*.

⁶³⁶ A Raistrick, *The Pennine Dales*, (London, 1968), p. 125.

⁶³⁷ NYCRO, *ZPG 7/1*.

⁶³⁸ NYCRO, *ZLB 11/7/34*.

⁶³⁹ L O Tyson, I M Spensley and R F White, *British Mining No 51*, p.99.

⁶⁴⁰ L O Tyson, *British Mining No 53*, p. 88.

⁶⁴¹ DCRO, *D/St/B4/29*.

⁶⁴² DCRO, *D/St/B4/32, 35 and 36*.

⁶⁴³ DCRO, *D/St/B4/31*.

In Teesdale, quarrying replaced the mining of any mineral as the principle industry. Using the Strathmore estate receipts and cash books, the income received by the estate for mining and quarrying over the period 1865 to 1914 demonstrates the change. Between 1865 and 1871, the London Lead Company paid £821.20 in royalties and rent, whilst income generated from quarrying was £90. In 1872, £48.65 was paid by the London Lead Company and £352.64 received from the quarries. 1880 was the last year the London Lead Company leased mines on the land owned by the Strathmores, having contributed £1,381.58 to the estate, an average of £86.35 per annum. From 1881 to 1914, lead and barytes mining royalties produced a further £566.69, at an average of £16.67 per year. In total from 1865 to 1914, mining royalties and rents brought an income of £1,948.27 to the estate or £38.97 per annum. Quarrying had brought no income to the estate until 1869 when £30 was collected, compared to £94.55 from the London Lead Company for the same year. However, the total income generated by quarrying from 1865 to 1914 was £84,699.47 at an average of £1,693.99 per annum or for the period of production, 1869 to 1914, £1,841.29. The highest annual amount generated by mining was £258.76 in 1865, against £3,563.33 for quarrying in 1890.⁶⁴⁵

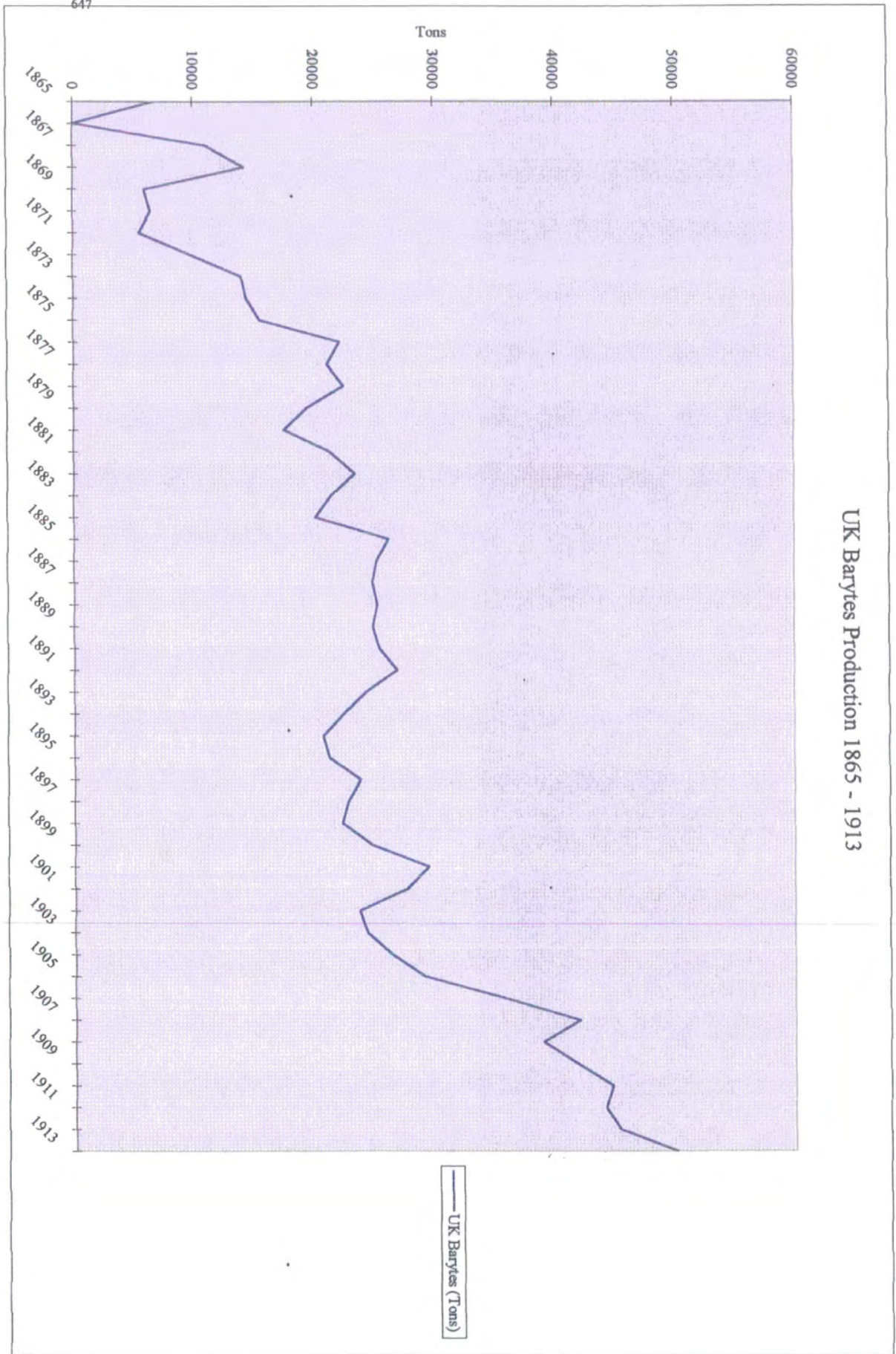
⁶⁴⁴ DCRO, *D/St/B4/33 and 37*.

⁶⁴⁵ DCRO, *D/St/E3/5/74, 84, 85, 86, 87, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128 and 129*.

Strathmore Estate Receipts for Mining and Quarrying 1865 - 1904



⁶⁴⁶ DCRO, *D/Su/E3/5/74*, 84, 85, 86, 87, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128 and 129.



Teesdale Barytes Production 1865 - 1913



As noted earlier, the population of Teesdale fell less than the other areas due to quarrying, the continued mining of fluorspar and barytes and the construction of reservoirs, which included the building of Baldersdale Tunnel connecting Grassholme and Hury Reservoirs. This tunnel is two miles long, six feet high and three feet eight inches wide, the same measurement as the levels in lead mines. Unemployment certainly did cause migration as the alternative employment was limited. In 1861, there were nearly 1,000 people employed in the lead mining industry and, in 1891, there were 231 quarrymen in Teesdale, not a viable alternative for every unemployed lead miner.⁶⁴⁹ Unemployment was cushioned by variable factors of lead mining and the price, there remained a temptation to stay in the area with hope. It appears that it was often those who had been unemployed for a considerable period who were forced to seek work elsewhere and migration was certainly aided by the arrival of railways. The most common destination on migrations from Teesdale were either the Durham coalmines or the Cumbrian orefield, with a minimal few seeking their fortunes in North America or Australia.⁶⁵⁰ Evidence of poor relief is sparse.

A similar situation existed in Wensleydale. Quarrying provided an alternative career for some, statistically for up to half of the former lead miners. The local economy in Wensleydale was primarily agricultural, as shown in the censuses, with a large section of the population working on the land. There was some migration, again aided by the railways, often to the mills of the industrial towns of the West Riding of Yorkshire.

In Swaledale, where lead mining had been the principal industry, there were no other sources of income available to the former lead miners who were forced to seek employment elsewhere, often in the coalfields, such as Durham and Lancashire, or the mills of the West Riding, as shown by the Reeth families who informed the school of their destinations. Some even left for the Spanish lead mines and those remaining had no choice but to adapt to farming.

The lead mining industry had a substantial multiplier effect on the overall economy of Swaledale. Tradesmen were supplying the mines and accustomed credit. Farmers had a ready market for their produce and let fields to the miners as smallholdings. This brought

⁶⁴⁹ DCRO, *Census Returns 1861 and 1891*.

⁶⁵⁰ C J Hunt, *The Lead Miners of the Northern Pennines*, p. 198.

industrialisation to a rural community with a rapid increase in population and wealth and the attendant problems of the inadequate number of dwellings. The demise of the industry thus affected the Swaledale economy considerably more than the other two valleys, especially as Swaledale did not have any other industry that could fill the void left by the fall of the mines.

13. Conclusion

The lead mining industry was in the forefront of the Industrial Revolution but it was similarly positioned for the industrial decline of the United Kingdom; “no other sector in the economy fared so badly during the few decades preceding the First World War; none declined so fast, so far, and so irretrievably”.⁶⁵¹ Lead was used more than any other non-ferrous metal but a wider distribution with the rise in imports meant lower prices; “the story of lead may also, by analogy, be taken to be that of the non-ferrous sector as a whole”.⁶⁵²

Between 1867 and 1871, the domestic lead mining industry was buoyant but from 1871 there was a severe economic depression, despite the constant high price of the metal. In 1878, the large price fall increased the severity of the decline and triggered the long-term depression and final end of the domestic industry. By 1885, the lead mining industry of the United Kingdom had halved. Price alone was not the principal cause of the decline and end of the lead mining industry in the northern Pennines, only a contributing factor. The fall in prices certainly hastened the end of the smaller and older mines and the companies which, in better circumstances, might have continued for another few years on reworking areas and exploiting minor vein off-shoots. However, as shown at Arkengarthdale and Teesdale, production was less affected by price than by local factors, such as the richness of veins, and it was a combination of these local factors and the competition from imported lead that killed off the domestic industry.

The other major lead mining areas in the northern Pennines; Nidderdale, Weardale and Alston Moor also underwent the same decline as Swaledale, Wensleydale and Teesdale. The mines at Nidderdale were operated similarly to Swaledale and Wensleydale with local private companies being replaced by joint stock and limited liability companies. These mines began to be closed from the 1870's onwards and the last mine was abandoned in 1910. Jennings noted that in Nidderdale, “the companies appear to have failed because of inadequate capitalisation, mismanagement or very low prices”, which does bear some resemblance to Swaledale.⁶⁵³

⁶⁵¹ R Burt, *The British Lead Mining Industry*, p. 279.

⁶⁵² *ibid.*, p. 2.

During the late nineteenth and early twentieth centuries, the areas of Alston Moor, Weardale and Teesdale made up the most important lead producing region in the United Kingdom. Between 1845 and 1913, this area produced one quarter of the UK's lead ore and over three times as much as Yorkshire.⁶⁵⁴ The period for its greatest relative contribution was in the late 1880's, when Wensleydale, Swaledale and Nidderdale were all but finished as lead mining areas, and Durham and Northumberland contributed around one-third of the United Kingdom's lead ore and one-fifth of the silver. However, these contributions are relative, as the lead mining industry across the country was being eroded and the overall output waning. The Alston Moor mines were sold by the London Lead Company in 1882 to the Nenthead and Tynedale Lead and Zinc Company Limited who, in turn, sold the mines to the Vielle Montagne Zinc Company in 1896.⁶⁵⁵ As suggested by the company's title, zinc was the main commodity extracted from their mines. In Weardale, the Beaumont group gave up the Weardale leases in 1883 and the London Lead Company had, as noted earlier, contracted to operate only in Teesdale in 1882.⁶⁵⁶ The Weardale Lead Company, which took over the Weardale leases, was formed in June 1883. It was a joint stock company with a declared capital of £200,000 and lasted into the 1970's, mainly mining fluorspar.⁶⁵⁷

The end of the lead mining industry in Swaledale was caused by only one single factor, the exhaustion of the available mineral resources. The fall in the price of lead was not a significant contributing element, as there was no correlation between the production figures and the price of lead. Both Swaledale and Wensleydale's output were declining in the 1860's, before the depression caused by the rapid growth in imports set in.

Unfortunately, Denys was convinced that there were riches to be found just around the corner and even though trials brought disappointment time after time with costly, badly planned and poorly run mining investments, they were continued. Surprisingly, this belief still lingers in Swaledale. In 1908, Bogg stated that there was still a fortune to be made by mining lead in Swaledale with the bounty as high as £60,000, in 1908 terms a large amount of money.⁶⁵⁸ In 1998, Fremont (Fremmie) Hutchinson, reputedly the last

⁶⁵³ B Jennings (edited by), *A History of Nidderdale*, (Huddersfield, 1967), p. 325.

⁶⁵⁴ *The Mineral Statistics for the United Kingdom*.

⁶⁵⁵ R A Fairburn, *The Mines of Alston Moor*, *British Mining No. 47*, (Keighley, 1993), pp. 26-27.

⁶⁵⁶ R A Fairburn, *The Weardale Mines*, *British Mining No. 56*, (Keighley, 1996), pp. 36-37 and NCRO, *LLC 34 15/08/1882*.

⁶⁵⁷ *ibid.*, p. 39 and *The Mineral Statistics of the United Kingdom*.

⁶⁵⁸ E Bogg, *Richmondshire*, p. 351.

surviving lead miner in Swaledale, was quoted as saying, "there's as much lead left in Swaledale as ever came out if you know where to look".⁶⁵⁹

As lead mining had replaced agriculture as the economic base in Swaledale, the effects of the decline of the industry were severe with a considerably higher loss of population, due to the absence of alternative work being available. In Wensleydale, agriculture had remained as the traditional economic base with the lead mines only affecting the northern side of the valley. The lead mining industry in Wensleydale was smaller and had finished before Swaledale's. As the industry was not as dominant, its demise had a much less severe impact upon the local economy and community. Wensleydale had several advantages over Swaledale, having other alternative industries for employment, although small, and noticeably better farming prospects. The reason for the fall of the industry is probably the same as for Swaledale, the exhaustion of the mineral stock.

The running of the Swaledale mines appears to have been based almost entirely on trial and error, in striking contrast to the operations of the London Lead Company in Teesdale. The London Lead Company trained its managers whilst those in Swaledale often seemed unequal to the task. The records kept by the London Lead Company were exemplary, while Swaledale's were casually kept and inaccurate, resulting in wasted time, effort and money on developments. Due to the lack of evidence, it is difficult to evaluate the efficiency of the lead mining companies of Wensleydale.

In the 1860's, there was no other industry in Teesdale and its boom years as a lead producing area were later than those of Swaledale and Wensleydale. The London Lead Company was the most efficient of employers, introducing technological change earlier than the other companies (who then often followed suit) and investing in outside concerns and transport improvements. Alongside these technological advances, the company made a larger contribution to the community as a whole. However, Teesdale was affected by the rapidly shrinking market characteristics caused by the influx of cheap imports. The fall in the price and the increase in production costs made the lead mining unprofitable against the competition of the cheaper foreign imports but Teesdale still had ore to be mined. The London Lead Company went out of existence when it could not compete against the cheaper imports despite the introduction of cost cutting measures.

⁶⁵⁹ *The Yorkshire Post 27/08/1998.*

By the 1880's, Teesdale's lead mining might have appeared more secure and better regulated than those of Swaledale and Wensleydale but the change from joint stock to limited liability company made by the London Lead Company came probably too late to have any significant impact. The companies of all three valleys were too slow to realise the potential allowed by the limited liability legislation of 1855 and 1862; "when the Pennine mines were finally opened to public speculation in the last quarter of the century, the mines were already long past their best and the outside capital required and returns offered were declining rapidly".⁶⁶⁰

The London Lead Company might have survived if it had branched out into extracting other minerals, similar to the Weardale mines. The mines which survived did so by extracting all available minerals; such as barytes, fluorspar, zinc and, to a lesser extent, iron. In 1886, Wallace had suggested that the only way the mines at Alston Moor could survive was by looking for another product to sell, which he recommended to be zinc.⁶⁶¹ In 1937, Poole stated that most of the barytes in the northern Pennines was found at the Lune Head mines but that little lead remained. However, he did believe that there was lead available, possibly worth mining, at Coldberry, Newbiggin Common and Greenhurth despite the drainage problems as a result of years of abandonment.⁶⁶² The effects of the end of the lead mining industry in Teesdale were less severe than in Swaledale. The extraction of other minerals, the quarrying of whinstone and limestone and the construction of large reservoirs in Lunedale and Baldersdale cushioned the blow of the end of the industry. The valley of Swaledale was largely abandoned. The decline of the lead mining industry in the northern Pennines was steep and rapid and the industry had been obliterated by 1913. The economies and communities of Wensleydale and Teesdale survived but Swaledale is still haunted by its deserted villages.

⁶⁶⁰ R Burt, *The British Lead Mining Industry*, p. 223.

⁶⁶¹ W Wallace, *Alston Moor*, p. 190.

⁶⁶² G Poole, *The Barytes, Fluorspar and Lead Resources in Upper Teesdale and Weardale*, (Newcastle-upon-Tyne, 1937), p. 2 and pp. 7-9.

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