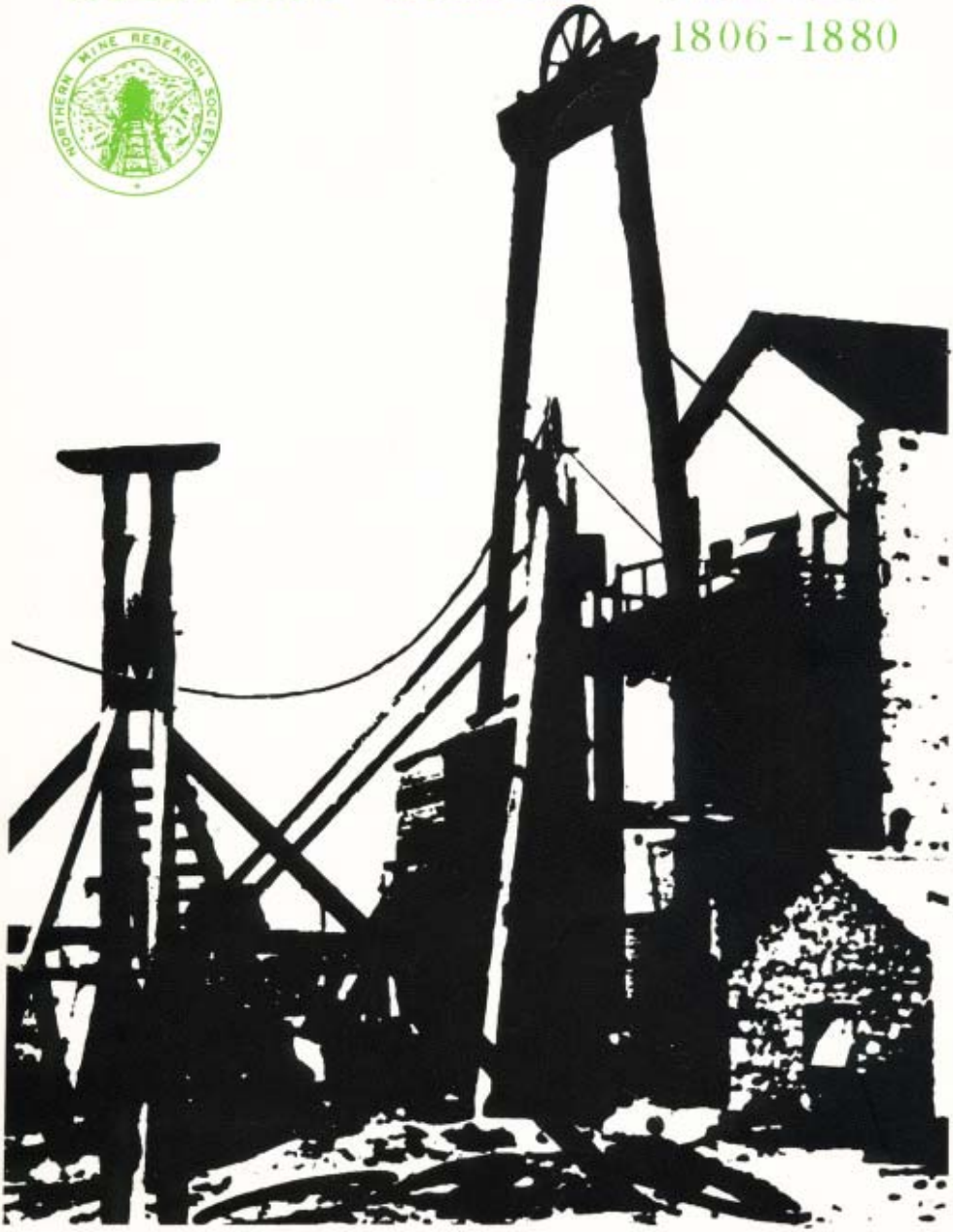
British Mining No. 15.

THE TEIGN VALLEY SILVER–LEAD MINES

1806-1880



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(All photographs taken by author in 1971-72)

PREFACE TO THE SECOND EDITION

Metal mining in the county of Devonshire is an industry with a history which stretches back as far as that in perhaps any area of Britain. Its heyday came in the early and mid-nineteenth century, with upwards of two hundred mines producing ores of copper, lead, silver, zinc, tin, tungsten, arsenic, iron and manganese, but the origins of the industry can be traced back long before then. Together with the neighbouring county of Cornwall, Devon produced the bulk of Europe's tin supplies until the seventeenth century, from its alluvial workings and shallow mines on Dartmoor. During the reign of Edward I the silver mines of Combe Martin and Beer Alston provided large amounts of bullion for the Royal purse. Once again these mines became an important source of Royal finance when, during the English Civil War, Charles I received silver from the Devon mines. By the twentieth century most mining activity had come to an end in the county; the only working mines surviving into the second half of the century being the Bridford barytes mine (ceased operations 1958) and the Great Rock iron mine at Hennock (closed 1969). Currently, it seems that there are plans to re-work the old Hemerdon tin-tungsten-kaolin deposit, to the north-east of Plymouth, so there may once again be a working mine in the county. In addition, in recent years, there has been sporadic, small-scale activity in the vicinity of Ashburton, on the south-eastern fringe of Dartmoor, where streaming operations have apparently yielded some 20 or 30 tons of tin concentrates a year. Overall however, the recent scale of mining activity can in no way be compared with that of the mid-nineteenth century when (according to the 1861 census) a total of 2,831 persons (male and female) were employed in copper, tin, lead and iron mining. Such activity, with individual mines of different sizes and types being scattered virtually the length and breadth of Devonshire, surely deserves some written history. Yet, when I first approached the subject of Devon mining ten years ago I discovered that with the exception of some work on the copper mining district of Tavistock-Gunnislake, in the west of the county,[1] little had been written of any substance.

This interest in Devon mining grew out of a longer established one in Cornish mining and blossomed after taking up residence in Exeter in 1968. My specific interest in the mines of the Teign Valley, to the east of Dartmoor, arose during late 1969 when it became apparent that I would require a subject for an undergraduate dissertation in the Department of Economic History at the University of Exeter. The first edition of this volume was the outcome of that dissertation research. The Teign Valley was only a short journey from Exeter and there was the added attraction that I could discover little or nothing that had been published on what was once obviously a thriving lead and silver mining area. Field work was difficult, due to loss of much of

the physical remains under the plough. Often entire afternoons were spent following clues to the whereabouts of an old engine-house (probably well documented in the contemporary literature) only to discover a low, crumbling wall almost obliterated by a century's growth of brambles. Nevertheless, after long research in the Exeter City and Devon County Records Offices and even longer searches (aided by numerous friends) in the undergrowth of the Teign Valley, it seemed possible to construct some kind of a picture of the development and decline of the mining industry in this corner of Devon.

In the six years since the first edition of this book was published (and the eight since I wrote the manuscript) there has a been an encouraging flow of published work on the subject. As I noted in a 1975 article: 'There has recently been an upsurge of interest in the history of Devon mining, illustrated not only by a spate of publications on the subject but also by the increasing number of visitors to the mine sites themselves.'[2] There have been numerous articles on Dartmoor tin mining, a short book on the tin and iron mines of the Dartmoor granite area, articles on manganese and barytes mining, together with the first part of a promised two-volume account of the *Mines of Devon*, by A.K. Hamilton-Jenkin, doyen of Cornish mining historians, although unfortunately it is not certain that the second volume will ever be published.[3] This second edition consists of a thorough revision of the original volume, with the addition of new material not available eight years ago. It also corrects some errors that crept into the first edition and includes some new and redrawn maps.

Since writing the original edition I have had a chance to mull over some of the issues which it raised but which were not fully discussed there due to the essentially descriptive nature of the account. The strongest impression was of the fragile nature of mining enterprises in the valley. The life expectancy of mining companies was extremely limited; the most successful, Frank Mills, was in production a mere 24 years and 12 of those were spent in clear decline. Other mines had an even more precarious and ephemeral existence; South Exmouth rose and fell within six years while the impoverished Hennock mine had a succession of short bursts of mining activity, none lasting more than six years. However, this could be said of much mining activity, an industry where the very act of extracting the minerals hastens the inevitable end of a company's life. In the Teign Valley the process of closing one mine to open another was ameliorated to a certain extent due to the interlocking structure of most of the companies. It seems that the major shareholders in Wheal Adams subsequently took interests in Wheal Exmouth, as the latter developed the southerly extension of the Adams lodes, and in turn the Exmouth shareholders (or 'adventurers') took the major interest in Frank Mills, which developed the southern extension of the Exmouth lodes at a time when Adams had passed from the mining scene and Exmouth was heading towards decline. Management from one mine often supervised the newer operations; J.O. Harris was purser at Wheal Exmouth, South Exmouth and Frank Mills in the period 1867-80, while J.P. Nicholls was mine 'captain' (manager) at Wheal Exmouth, South Exmouth and Frank Mills in the period 1857 or 1858 to 1868. In addition, it is almost certain that miners and

surface workers would have moved from mine to mine. Thus there would have been a continuity of operations not at first suggested by the short lives of individual mines.

Another point which emerges from the study is the influence that price changes for refined metals can have on mining operations. In at least two cases, that is in 1806 and 1836, unusually high prices for pig lead in national markets stimulated, respectively, what was probably the first serious attempt to mine lead in the Teign Valley, and a spirited revival of mining activity throughout the parishes of Hennock, Christow and Bridford. In later years unusually high prices in the early 1870s (associated with a general trade boom) probably helped keep Frank Mills in operation longer than it might otherwise have done, with its clearly failing ore deposits in depth. Then, just as surely, the catastrophic collapse in lead prices (together with other metal prices) which lasted from 1878 until the mid 1890s, helped ensure the final closure of Frank Mills and with it the end of silver-lead mining in the Teign Valley. A further point about the importance of metal prices to the profitability of the Teign Valley mines relates to the production of silver. At a fairly steady five shillings an ounce, or thereabouts, it contributed in no small way to the viability of mining throughout the period. Frank Mills at times received as much as 30 percent of its entire revenue from sales of the precious metal.

It is now unlikely that there will ever again be any mining in the Teign Valley. Greater awareness about the vulnerability of our environment now, rightly, ensures that any mining proposal is scrutinised closely. More significantly, the economics of the world mining industry now demands large-scale, low-grade ore deposits that can be exploited using capital-intensive technology. In this context the relatively small but high-grade mineral deposits that abounded in nineteenth-century Britain, which required what was then cheap, skilled labour in abundance, can be seen as providing only limited scope for development by today's mining corporations. Nevertheless, the shades of the past often return for a brief moment. During the winter and spring of 1973-74, shortly after the first edition of this book was published, there seemed a possibility that an international mining company was interested in prospecting for barytes deposits in the Teign Valley, particularly around Wheal Exmouth. Barytes is much in demand as the base for a high-density mud used in oil and gas drilling operations and as such demand for this mineral was rising in the early 1970s with the North Sea exploration programme. The Wheal Exmouth proposal came to nothing, however, despite some exploratory prospecting which clearly revealed the existence of some large quantities of barytes.

As in the first edition, I have a debt of gratitude to pay to a number of persons and institutions for aid in the research and writing of this study. These include: Viscount Exmouth of Canonteign, who allowed me to visit his estate and photograph his house (under which the main lodes run), the staffs of the Exeter City and Devon County Records Offices, Professor Walter Minchinton, Dr Roger Burt, Michael Atkinson and Peter Waite, all of the University of Exeter, Robert Nunny, Richard Scrivenor, the late Lt-Col. J.V. Ramsden DSO, AMIMM, FGS, former manager of the

Bridford Barytes Mine, whose researches did much to document many facets of Devon mining history, Tom Greeves, who has been invaluable in pointing to some pieces of information I would otherwise surely have missed, and finally to my wife Janet, who has suffered my sometimes obsessional interest in mining with grace and understanding.

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November 1979

Footnotes:

(1) J.C. Goodridge, 'Devon Great Consols: a Study in Victorian Mining Enterprise' *Transactions of the Devonshire Association*, XCVI (1964) pp228-68 and F. Booker, *Industrial Archaeology of the Tamar Valley*, (Newton Abbot: 2nd. ed. 1971).

(2) M. Atkinson and C.J. Schmitz, 'Kelly Iron Mine, near Bovey Tracey' *Devon Historian*, XI (1975) p27.

(3) See, T.A.P. Greeves, 'A Mine in the Deancombe Valley' Trans. *Devon. Assoc.*, Cl (1969) pp197-201; R.M.L. Cook, T.A.P. Greeves and C.C. Kilvington, 'Eylesbarrow (1814-1852): a Study of a Dartmoor Tin Mine' *Trans. Devon. Assoc.*, CVI (1974) pp161-214; T.A.P. Greeves, 'Wheal Prosper: a little known Dartmoor Tin Mine' *Plymouth Mineral and Mining Club Journal*, VI (1975) pp6-7; M. Atkinson, R. Burt and P. Waite, *Dartmoor Mines: the Mines of the Granite Mass*, (Exeter: 1978); P.M.G. Russell, 'Manganese Mining in Devon' *Devon and Cornwall Notes and Queries*, XXXI (1970) pp205-13; C.J. Schmitz, 'The Early Growth of the Devon Barytes Industry 1835-1875' *Trans. Devon. Assoc.*, CVI (1974) pp59-76; C.J. Schmitz, 'The Development and Decline of the Devon Barytes Industry 1875-1958' *Trans. Devon. Assoc.*, CIX (1977) pp117-33; A.K. Hamilton-Jenkin, *Mines of Devon*, Part I, 'The Southern Area' (Newton Abbot: 1974).

INTRODUCTION

The rocks of the Teign Valley are of Culm Measure (carboniferous) age, consisting of shales and mudstones of varying hardness together with localised cherts and tuffs. These strata have been extensively faulted and folded and there are numerous basic volcanic intrusions (greenstone and elvan). The presence of the nearby Dartmoor granite has resulted in some degree of metamorphism in the Culm rocks. Three distinct types of mineral deposits have been exploited in the area; impregnations of manganese in the cherts (associated with the basic intrusions), east-west striking quartz-iron lodes, and north-south striking barytic-lead lodes. The first two have been of limited commercial importance in this area, the north-south lode system being regarded as the primary one in the district. As a result of this, and contrary to usual practice in South-West England, the east-west iron lodes have been termed caunter (or contrary) lodes.

The main barytic-lead lode system consists of a series of fissures, either parallel or interlacing, which developed in a belt of weakness, extensively faulted, which runs around the eastern margin of the Dartmoor granite. Most of these fissures are mineralised; at Bridford mine there were at least six branches of the lode system with workable widths of barytes. At Aller mine the deep adit cut four branches, running parallel to the main system, all containing barytes and calcite together with small quantities of galena. However, the bulk of the lead, silver and zinc minerals produced in the valley came from two large lodes, roughly parallel, which have been traced from Wheal Adams, in the north, through Wheal Exmouth, Frank Mills and Hennock mines, to South Exmouth mine, in the south, where the whole system seems to have been cut off by a large fault.

Although the character of these two main lodes, usually designated East and West lodes, varied from mine to mine, they were generally from two to four feet wide, and brecciated. They contained a wide variety of minerals characteristic of a barytic-lead type deposit: galena, cerussite, spalerite, silver (associated with the galena), malachite, chalcopyrite, tetrahedrite, stibnite, limonite, iron pyrite, barytes, calcite, fluorspar and quartz. In addition, nickel and cobalt minerals have been noted in the Wheal Adams lodes. Occasionally, minute particles of magnesite, hemimorphite and calamine have been discovered, especially at Frank Mills.

Despite the wide range of minerals found in these lodes only seven have been raised and sold in significant quantities: lead ore (galena), zinc ore (blende), silver, iron ores (limonite and haematite), barytes and fluorspar. During the period 1845 to 1880, in which production statistics are available, the Teign Valley as a whole is recorded as producing 28,529 tons of lead ore (with a recorded lead content of 18,743 tons), 387,748 ozs. of silver, 2,076 tons of zinc ore, 422 tons of iron ore and

176 tons of fluorspar. Production of barytes at Bridford mine continued after 1880, with an output of about 16,000 tons by 1900 and a total of around 420,000 tons by its closure in 1958. These figures of lead and silver production ignore that coming from Wheal Adams and Hennock mines before 1845, when the official collecting of output data commenced. Assuming Wheal Adams produced around 100 tons of ore a year in the period 1828-41 and in 1844, and that Hennock produced 20-30 tons a year, 1812-18 and 1836-40, this adds another 1,800 tons of lead ore to the Valley's total. An unusual sale was that of 17 tons of copper ore (probably tetrahedrite) from Wheal Exmouth in 1859.

In addition to the above, some quantities of manganese were raised from the locality, in the form of pyrolusite, psilomelane and dialogite. Its seems that manganese was being raised from pits near the site of South Exmouth in 1816 and 1817. From 1829 to 1841, a total 2,460 tons of manganese ore was produced at a mine on the Canonteign estate, near Aller farm. In 1838 a sale of 70-100 tons is recorded from Hennock mine and between 1845 and 1865 odd parcels totalling 230 tons came from Hennock and Wheal Adams. Finally, 118 tons of manganese was produced in 1875 from a site called Riley mine, to the south of South Exmouth.

The chief lodes worked in the Teign Valley were:

Wheal Anna Maria and Lawrence - at the northern extremity of the Teign Valley mineralized belt. There were said to be seven east-west copper lodes in Wheal Lawrence but the only mineral produced was some lead in 1851. The lodes that produced this consisted of several leaders with an overall width of from 20 to 30 feet, coursing about E.32.S and containing quartz with sporadic patches of barytes, zinc-blende and galena. In Wheal Anna Maria the lodes, also leaders and coursing about E.32.S, with an overall width of 10 to 15 feet, contained quartz and iron pyrite, but no visible lead.

Birch Ellers - Here one main lode was worked, coursing about E.45.S and containing calcite, blende, fluorspar, abundant barytes and sporadic amounts of lead. It is said to have varied in width from 2 to 8 feet, averaging just under 4. About 600 feet to the east was another parallel lode, East lode, which contained mostly barytes.

Bridford Consols (in its last period of working 1875-1958, known as the **Bridford Barytes Mine**) - Numerous veins here, all roughly parallel and coursing about E.50.S, contained large quantities of barytes together with small amounts of blende, tetrahedrite, iron pyrite, galena and quartz. Small quantities of lead were produced before 1871. The veins varied in width from a few inches to over 40 feet, but the average was about, 6 feet.

Bennah - the lodes here consisted almost entirely of numerous parallel stringers of quartz and barytes with minute particles of galena and iron pyrites. They coursed about E.85.S and covered a zone about 400 feet in width.

Aller - four lodes, all coursing E.80.S, were cut and a fifth which varied between E.75.S and E.85.S. These lodes were largely [2] quartz and barytes filled, containing little lead or zinc, and were spaced at the following intervals: 162 feet, 60 feet, 84 feet and 54 feet.

Wheal Adams North Shaft Workings (also known as Reed Mine?) – worked on two lodes, the beginning of the East and West lodes of Exmouth and Frank Mills mines. The lodes coursed almost due north-south and contained quartz, zinc blende, pure white barytes and a few scattered galena crystals. The size or distance apart of the two lodes is not known.

Wheal Adams – Two lodes, coursing roughly north-south. The larger, East lode, averaged about 4 feet in width and contained argentiferous galena and blende. The western lode carried less silver-lead but considerably more blende, averaging about 2 feet in width. There was also a reported copper lode, said to lie to the west of West lode, although its exact position is not certain. Wheal Adams appears to have made some small sales of copper ore between 1845 and 1855 .

Wheal Exmouth – Two main lodes, underlying about 12 degrees east and 90 feet apart in the adit level but converging by the 72 fathom (fm) level. They both coursed almost due north-south and consisted of calcite, barytes, fluorspar, argentiferous galena and blende together with sporadic amounts of cerussite, malachite, chalcopyrite and tetrahedrite. A branch lode, underlying parallel to the main lodes, was largely barren, containing large quantities of quartz and barytes. On the mine plans this latter lode is usually marked as a 'flookan' (the common Cornish term for a barren cross-course or lode). Of the two main lodes, East lode was the more productive.

Frank Mills – Exploited the same two north-south coursing lodes as in Wheal Exmouth. However this mine contained more workable branch lodes. The underlie of the two main lodes varied considerably at different depths. At the 30 fm level they were 138 feet apart, where East lode had an underlie of 20 degrees west and West lode was nearly vertical. By the 85 fm level they were 90 feet apart and both changed their underlie, East lode to nearly vertical and West lode to 10 degrees east. They continued like this to the 130 fm level where they were only 48 feet apart. Below this they both ran with an underlie of 10 degrees east. Of the two lodes, unlike in Wheal Exmouth, West lode was the more productive. The only other significant lode, No.1 Branch lode, lies between the two main lodes, with an underlie nearly parallel to that of West lode. Both East and West lodes averaged about 2 to 4 feet in width but in places there were swellings of up to 30 feet. They both contained argentiferous galena, blende, barytes, calcite, quartz and fluorspar, with cerussite, siderite and limonite. Small amounts of stibnite (antimony ore) were also reported in the Frank Mills lodes. In its deeper levels the Frank Mills lodes were cut by a number of east-west striking iron lodes, from which some parcels of ore were sold in the 1870s.

Hennock - Although both lodes seem to have been present, only one was developed to any significant extent, the other being largely barren in this mine. At various times between 1836 and 1855 the main lode was described as from 4 to 10 feet wide. It seems to have consisted largely of quartz with a maximum width of about 1 foot of slightly argentiferous galena. In addition, there were quantities of cerussite and siderite in places.

[3]

South Exmouth - Working on two lodes, coursing north-south and parallel to each other. East lode, however, was of limited value and thus little exploited. At Westcomb's Engine Shaft the two lodes were nearly vertical but to the north, West lode assumed a slight westerly underlie. West lode, about 2 to 8 feet wide, consisted of quartz and argentiferous galena, with patches of zinc blende (usually of the blood red variety), odd spots of iron pyrite and chalcopyrite in the upper levels and massive barytes in the lower levels. The highest concentrations of lead were found above the 60 fm level.

At the southern end of the South Exmouth sett (a Cornish mining term which is no doubt a corruption of 'site'), just to the east of Hennock village, the entire north-south coursing barytic-lead lode system is suddenly cut off, seemingly by a large fault. The only minerals found in the valley to the south of this point were the manganese ores at Riley, associated with a basic volcanic intrusion into some cherts.

CHAPTER ONE

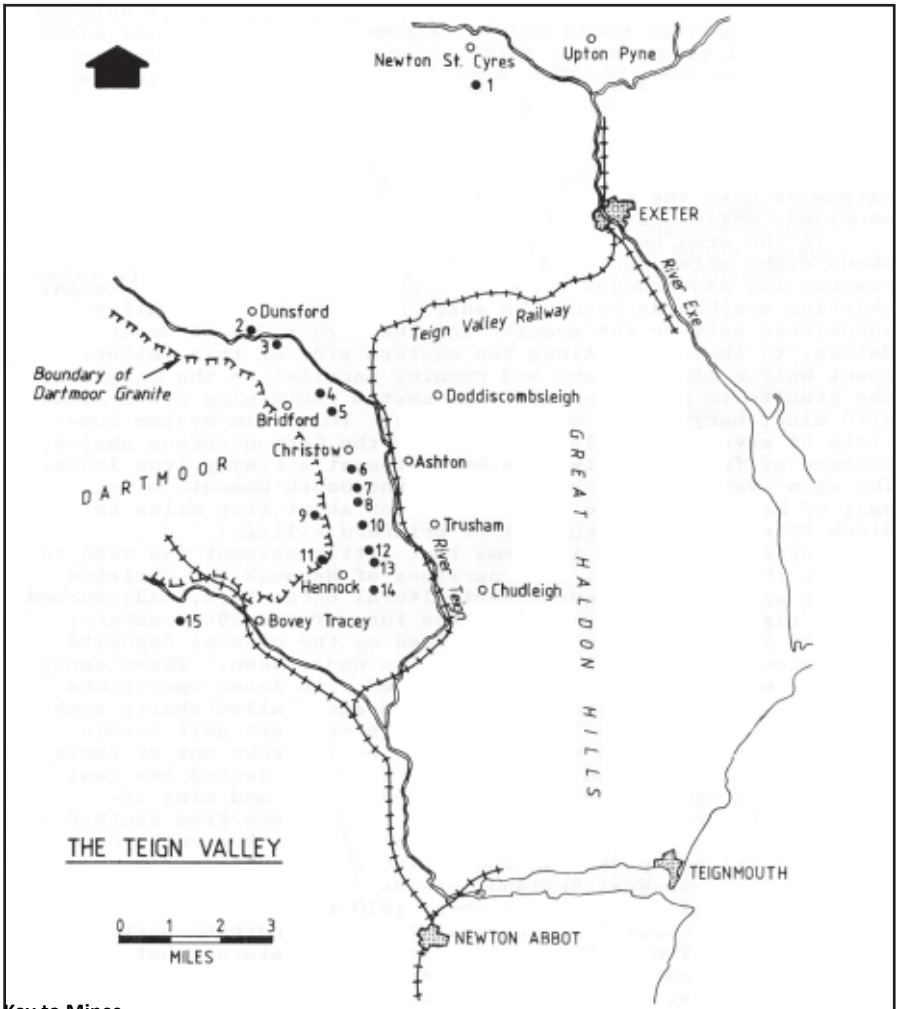
The Setting

Into the heart of Devon, two hundred and eighty million years ago, was intruded the huge semi-molten mass of the Dartmoor granite. Associated with this intrusion a belt of minerals was subsequently (and at different times) deposited around the margins of this mass - tin, copper, iron, zinc and lead – more extensive down the eastern and western flanks of the granite moorland, while sparser to the north and south.

In the area between the parishes of Hennock and Christow, about eight miles south-west of Exeter, the Dartmoor granite reaches its easternmost boundary. There flows the River Teign, skirting southwards round the edge of Dartmoor, in a valley sandwiched between the granite and the high ridge of Great Haldon, to the east. Along the western side of this valley, about half a mile distant and running parallel to the margin of the granite is a north-south vein system containing silver-lead with zinc, barytes and other minerals. This vein system consists of several parallel fissures in the Carboniferous shales, crossed at frequent intervals by east-west striking iron lodes. The main system is ore-bearing from the South Exmouth mine, east of Hennock village, northwards for about five miles to Birch Ellers mine, north-east of Bridford village.

Before about 1800 it seems that little attempt was made to exploit these deposits. The parishes of Hennock and Christow had the appearance of quiet agricultural backwaters, undisturbed by any sign of industry. After the turn of the 19th century, however, interest began to be aroused by the mineral deposits and various workings of the lodes were undertaken. These early workings were on a small scale compared with later operations and would have consisted of small pits and shallow shafts sunk on the outcrops of the lodes, with perhaps short ad it levels being driven along the veins, the ore being drawn out of these pits and shafts by hand windlasses. The area lacked any real tradition of mining and so any skilled miners and mine adventurers (shareholders) most likely had to come from another area. This would naturally be Cornwall where, however, there was a traditional pessimism about finding worthwhile mineral deposits in South-West England outside the major mining areas in west Cornwall. As late as about 1810 there was a popular saying amongst Cornish miners that there was nothing worth mining east of Truro Bridge.[1] So it was natural that in this, the most easterly mining area in Devon at the start of the 19th century, any exploratory activity would be very tentative.

These early attempts at mining were sporadic and had a minimal effect on the life of the parishes. Before 1836 there had been at least four small workings at different places in Hennock and Christow. The first attempt to work a mine on a larger scale came in 1836 at a site near the village of Hennock, although this only lasted a short time and some time after 1840,



Key to Mines

1 Gullett's Lead Mine	6 Bennah/Aller/N. Exmouth etc	11 Great Rock Iron Mine
2 Wheal Anna Maria	7 Wheal Adams	12 Hennock
3 Wheal Lawrence	8 Wheal Exmouth	13 South Exmouth
4 Birch Ellers	9 Shuttamoor Iron Mine	14 Riley Manganese Mine
5 Bridford Barytes Mine	10 Frank Mills	15 Yarner Copper Mine

gXs

when the Hennock tithe map[2] showed mine workings and a waterwheel near Hyner Bridge, this mine ceased operations. Before 1840 a mine was also being worked on a fairly substantial scale near the site of Wheal Adams, as shown on the tithe map of Christow.[3]

The main period of mining activity in the Teign Valley occurred after about 1850. The Hennock working of 1836 was re-opened with much larger capital resources in 1849 as the Hennock Silver-Lead Mining Company. The mine shown on the 1840 tithe map of Christow was taken over by a new company in 1844, which set about sinking new shafts and driving new levels. By 1850 this mine, Wheal Adams, had become the largest in the valley. Early in the 1850s Wheal Adams was extended southwards along its lodes into a new mine, Wheal Exmouth. By about 1855 this mine had superseded Wheal Adams as the most productive in the locality and the company which worked both these mines was looking further afield for workable deposits. Meanwhile the older Wheal Adams was becoming exhausted in depth and so operations there began to be run down in anticipation of eventual closure. At this time a new mine was being started to the south of Wheal Exmouth, on a continuation of the same lodes. Started by the Adams-Exmouth company, this mine, named Frank Mills, grew rapidly in size and by 1865, when the Adams-Exmouth section of the lode system was almost exhausted, it had taken over the position as the richest mine in the valley. It was the last Teign Valley mine to close and, when this happened, in 1880, its workings were the deepest and most extensive of all the mines in the area. Meanwhile, Hennock mine had encountered the same difficulties that faced Wheal Adams and in 1852 workings were extended to the south in an attempt to locate richer ore deposits. These operations, under the name of South Hennock mine, were not successful and this new mine soon closed, as did the impoverished Hennock mine, in 1855. The workings at South Hennock were, however, more successfully restarted in 1861 as the South Exmouth mine, when, financed by a group of Exmouth-Frank Mills shareholders, some initially high profits were made. With the exhaustion of the rich, shallow deposits that the new company had located, South Exmouth closed in 1867. With the final closure of Wheal Exmouth in 1874 and of Frank Mills in 1880, mining came to an end in the valley. Plans in the 1890s and again in 1921 to prospect in the old workings of Hennock and South Exmouth mines for iron ore seem to have come to nothing and since the closing decades of the 19th century the visible remains of the industry have decreased year by year.

To a certain extent the mining industry had a stimulating effect on the parishes of Hennock and Christow. They experienced quite rapid population growth in the years of the mining boom, with families moving into the area, most likely from Cornwall or west Devon. Between 1801 and 1831 the population of Christow increased from 442 to 601, while that of Hennock increased from 537 to 747. By 1861, at the peak of the mining industry's fortunes in the valley, Christow had 941 inhabitants and Hennock had 1,004. Thereafter, with decreasing mining activity the populations fell, as families drifted away.

By 1891, with mining virtually non-existant in the two parishes (there was a little iron mining at Great Rock, in Hennock), the population of Christow had fallen to 567 and that of Hennock to 685.[4]

Another way in which the mining industry had affected the life of the valley was that it helped bring closer contacts with the outside world. It did this in being one of the major factors in the decision to build the Teign Valley Railway, from Exeter to Newton Abbot. This was completed to Christow and opened for traffic in late 1877. In the days before the motor-bus, this new means of transport helped end the age-old isolation of this rural community.

Today the Teign Valley is once again a quiet agricultural area, with no real industry apart from a quarry near Trusham (in the basic volcanics) producing a stone-dust base for concrete sewer pipes. The remains of the mines can still be found, with some difficulty. Frank Mills and Wheal Exmouth are still quite prominent, mainly due to their size. Others, Hennock and South Exmouth among them, are much harder to find. Old engine-houses have been demolished for their building stone or have simply fallen down, old tips and shafts have been levelled and filled. In contrast to many of the mines of Wales, the Pennines or even parts of Cornwall, located on bleak moor-land, the Teign valley mining industry grew up alongside the activities of a thriving agricultural community and its remains have suffered accordingly. The Teign valley is now claiming back the land the miners took from it in the last century and in another hundred years perhaps little will remain on the surface to show the casual visitor that countless miners once toiled far beneath its lush green fields and woods.

Footnotes:

(1) D.B. Barton, *A History of Copper Mining in Cornwall and Devon*, (Truro: 2nd.ed. 1968 p57.
(2) In the Devon County Records Office (DCRO), South Street, Exeter, Devon.
(3) In DCRO.
(4) Population figures from Census Reports, 1851-1891.

CHAPTER TWO

The Early Period

Throughout most of the seventeenth and eighteenth centuries the mineral wealth of the Teign Valley lay undetected. Apart from one uncertain reference dating from the early 1600s, there is no indication that any mining activity took place in the area before the nineteenth century. In the Christow parish registers for 1625 there is an entry which reads, 'Augustine Simon found dead at Canontinge worke the 3rd of August, the coroner's inquest found it that he willfully sought his own death …' Commenting on this, in an article written in 1956, H. Parsons suggests that, 'Canontigne is, of course, Canonteign, and "worke" (work) is the invariable term for a mine. Thus mining in Christow parish ante-dates the manganese mining of the eighteen-thirties by over two centuries, and Exmouth Mine (properly "Wheal Exmouth") and Wheal Addems at Canonteign (which "went after silver-lead") by even longer.'[1] The entry in the register may indeed refer to mining but the site of this activity is in no way certain, and the reference is unsupported by any other. It thus offers few clues to the early history of the mining industry in the Teign Valley. Even by the end of the eighteenth century there is no clear indication of mining activity. Indeed, a 1785 inventory and valuation of an estate in Hennock, belonging to Mr Yarde, including Franklyn Farm and Hynormills, sites of later mining, mentions no such activity and presents a picture of a quiet agricultural community.[2]

In 1770 manganese had been discovered at Upton Pyne, to the north-west of Exeter, and some time afterwards it was found, in association with lead at Newton St Cyres, just to the west of Upton Pyne. This discovery was important because it focused attention on the mining potential of this area as a whole, stretching from eastern Dartmoor to Exeter. One of the early mine adventurers at Newton St Cyres was John Gullett of Exeter. He later turned his attention to some silver-lead mines at Beer Ferrers (in west Devon) in the period 1783-85,[3] and to the Teign Valley, a few miles to the south of his Newton St Cyres lead and manganese workings. He was almost certainly one of the pioneers in the Teign Valley mining industry.

In the closing years of the eighteenth century an increasing number of indications of potential mineral deposits were being found in the general area of eastern Dartmoor. In 1797, the local historian Polwhele noted that '… a shode of lead was found not long since, at Middlecombe, in Bovey Tracey'.[4] A factor which was stimulating the search for new deposits was the rising price of pig lead. In 1790 it had been £16 a ton but with the escalation of the Napoleonic Wars in the following two decades, the price of the metal rose as demand increased. By 1800 it was nearly £20 a ton, this rising trend continuing until 1809 when it reached £31 a ton. Thereafter prices tended to fall but still

maintained a higher level than pre 1790, the average price between 1810 and 1825 being about £23 a ton. (See statistical appendices) Evidence points towards the earliest lead working in the valley being near Franklyn or Franklands Farm, on the site of the Hennock mine of later years. This was probably worked between about 1806 and 1808. Ramsden.[5] believed that a working on the site of Wheal Adams was the earliest in the area but there is no real evidence to support this view.[6] Almost certainly, the first concrete reference to mining in the Teign Valley is contained in Webb's Weekly Prices of Mines for 16th June 1806, where it is stated that Wheal Prosperous, a silver-lead mine in the parish of 'Hinnick' (i.e. Hennock) had been commenced on 1st March 1806. The price of one 64th share was £31.10.0 (i.e. a total share capital of £2,016) and was ' .. under Mr Webb's own management and was put to work by himself'.[7] Tom Greeves, a historian of the Dartmoor mining industry, has suggested to the author that this Mr Webb may well be the same as a Mr John Webb who was interested in several Dartmoor tin mines in the first decade of the nineteenth century (including Whiteworks and Bachelors Hall) and who was said to be in prison in 1808. This interruption to John Webb's career may' account for the apparent closure of the Hennock working sometime after 1808. The mine remained closed for a while until John Gulletes interests had turned to the area and he became interested in the lead working which had been idle for three or four years.

On the 3rd June 1812, Sir Lawrence Palk of Haldon House, the owner of most of the parish of Hennock, leased to John Gullett ' .. that cottage and garden situate in the parish of Hennock in the said county of Devon lately occupied by John Webb, and also full and free liberty, license and authority to dig, work, open, mine, stream and search for tin, tin ore, copper ore, lead and lead ore, and all other minerals and metals whatsoever, in the parish of Hennock'.[8] Gullett was also given permission ' .. within the limits of the set hereby granted to dig, make and work such adits, shafts, pits, drifts, leats or watercourses, and to errect such necessary houses, sheds, engines, stamping mills and other buildings and conveniences as the said John Gullett … shall from time to time think necessary and convenient … together with liberty also to cut any leat or leats or channels for conducting or conveying any water or watercourses in, through or over any part of the lands belonging to him … and also liberty when and as soon as a load or ore shall be discovered to dig and sink pits within the limits of the set hereby granted of the same load – and to follow and work the said mine or stream such distance under ground as he or they shall think proper'. The lease was for a period of 21 years with an annual rent of '£6 of lawful British Money'. Gullett was also to render 'dish' (dues) of one tenth '… of all such mine tin, stream tin, tin ore, copper, copper ore, lead, lead ore, and all other metals and minerals as shall be gotten raised or produced under the lease'.

By the date of this lease, Gullett's manganese workings at Newton St Cyres appeared to be nearing exhaustion[9] and so it was natural that he would wish to extend his interests. His mine in Hennock gave him this opportunity in the years after 1812. However, after 1815 and the end of the Napoleonic Wars a degree of uncertainty creeps in as to the fortunes of Gullett's lead mine. Lysons, visiting Devonshire in about 1817 noted

'Wheal Prosperous, in Hennock' being worked for lead.[10] It is not certain whether Gullett had adopted Webb's name for the mine or if Lysons was wrongly informed. Within a few years of taking the Hennock lease a legal dispute arose which suggests that Gullett failed to fulfill certain requirements contained within it. One of these was that ' .. if the said John Gullett … shall by the space of six months altogether in anyone year desist or discontinue working a mine or mines upon the said premises with four men at least unless prevented by water or some other inevitable accident, that from thenseforth, the lease is void'. It is almost certain that Gullett's operations had been rendered less profitable by the collapse in lead prices (together with prices in general) which came in the post-Napoleonic war depression of 1815-17. At the time of taking the lease, in 1812, pig lead sold for around £23 a ton. This rose to £26 in 1814 before falling to £20 in 1815 and £16 in 1816. By 1817 it had recovered to barely £18 a ton. Under these circumstances Gullett's would have been just one of many lead mines the length of Britain which were forced to suspend operations in hope of higher prices.

In June 1817 Sir Lawrence Palk attempted to cancel the lease with Gullett. Probably getting little response he wrote to a lawyer, Mr Chitty, on the 11th June of that year, setting out the facts of the case, as he saw them.[11] According to this document the only mine existing in the parish of Hennock at the time of granting the lease was a defunct lead mine, a reference to Webb's operation. During the five years between 1812 and 1817, while Gullett was supposedly doing little himself to develop the mineral resources of the sett, a. man called Berry was working manganese at a site somewhere to the south of the lead mine (probably in the locality of the South Exmouth site). According to the Palk-Chitty communication, Gullett heard about Berry's operations and on the 8th January 1817 sent some miners to throw back all the manganese into the pits out of which it had been dug. He then apparently employed the same miners ' .. to make other pits in the same field on his own account and Gullet has since proceeded to work the manganese discovered by Mr Berry and has brought about 50 tons thereof to grass without in any manner prosecuting the lead mine which was the only mine supposed to exist on the Hennock estate at the time of granting the lease in question'.

Following this skirmish, Berry complained to Palk who then, in March 1817, sent his land steward to see both Gullett and Berry. The latter was asked to desist from working the manganese until some proper arrangement could be made regarding the lease. At Gullett's mine the steward found a mine captain whom he informed that Sir Lawrence was determined to cancel the lease and to let the mine ' .. in a proper manner'. According to Palk, apart from breaking the terms of the lease regarding the requirement to work the mine, he had received no dues as yet, nor even the rent of 'lawful British money' since 1812. It is clear, looking back at this dispute, that Palk wished to be rid of Gullett and to conclude a new lease with Berry.

In retrospect, it seems that Gullett was faced not only by falling lead prices but also by a lack of capital. That he was

a capable miner was endorsed by his success at Newton St Cyres between 1783 and 1810.[12] His major problem at Hennock seems to have been that he had a number of doubtful financial backers. In his reply to Palk's charges he suggested that when his backers were in a better position to forward capital to his venture he would be able to resume operations as well as pay the dues and rent owing. In fairness to Gullett, some of the charges made by Palk must have rested on shaky foundations. The fact that Gullett had miners on hand to send to Berry's manganese pits indicates that he must have been engaged in mining work of some kind in the parish, while the presence of a mine captain at the lead mine, when it was visited by Palk's steward, also indicates that it was not entirely defunct. It is not too difficult to construct a picture of events at Hennock in 1817. John Gullet would have been aging then; he must have been at least in his early fifties if he had been opening mines at Newton St Cyres in 1783. The shallow lead working he had inherited from Webb probably only consisted of a short adit and a few pits in the quiet wooded valley at Hynor Bridge. Given a constant lack of capital Gullett could do little to develop the potential in the mine, while at the same time men like Berry came along and pirated the mineral deposits from within his sett, perhaps even with the implicit connivance of Palk, the mineral lord. Then, faced with of growing demands for back-rent and dues, he was told he must give up the lease.

Mr Chitty's opinion on the dispute is preserved in a statement attached to Lord Palk's document. Chitty recommended that Sir Lawrence should undertake a legal action against Gullett, if he could prove that he had not worked.any mine in the sett for any period of six consecutive months or more, in accordance with the terms of the lease. In this way, he could regain possession of the mine workings, the cottage and the land. As for the 50 tons of manganese taken by Gullett's men from Berry's pits, it would not so easily be regained as, strictly speaking, Gullett was well within his rights to mine it, even though the events which preceded its extraction were of a doubtful nature. There is no record of any legal action reaching the courts and so it is impossible to say how the problem was resolved. The only certainty is that mining operations seem to have come to a temporary end in Hennock - the next serious untertaking not coming until 1836 and the of establishment of the Hennock Silver, Lead, Copper and Manganese Mining Company. Perhaps Gullett died or simply gave up the attempt to mine in Hennock, whilst no more is heard of Mr Berry.

To the north of Gullett's mine there were some early the manganese workings in the parish of Christow. White, in his Directory of Devonshire (1850), states that a mine producing copper and manganese was working in 1810, in Christow, but this can hardly have been much more than a guess on his part. A record of 16 tons of manganese produced in Christow in the year 1821[13] is a much more likely one that White's estimates of about 10,000 tons a year. This figure for 1821 represents the first known record of manganese production in Christow.

It was probably produced by associates and contemporaries of John Gullett who, like the latter, had originally worked the manganese deposits at Upton Pyne and Newton St Cyres and had taken part in the general migration from that area in about 1810-15.[14] These miners then started to work deposits in the parishes bordering the Teign Valley to the east: Ashton, Trusham and Doddiscombsleigh. While working these deposits on the western flanks of the Haldon Hills, some of the more enterprising miners obviously realised that there might be worthwhile mineral deposits on the other side of the river, in the parish of Christow.

The exact site of the working which produced the manganese in 1821 is not certain, but it was probably just to the north of Aller Farm, on land belonging to Sir Lawrence Palk.[15] To the south of this site was another small working in this period, situated just to the south of Reed Farm, on land owned by Lord Exmouth of Canonteign House, the celebrated Admiral Edward Pellew of the Napoleonic Wars and the siege of Algiers. In his biography of the famous naval captain, C. Northcote Parkinson comments on the purchase of the Devon estate: 'The winter of 1811-12 brought Pellew … the estate of Canonteign in the parish of Christow, some ten miles south-west of Exeter. Reckoned in thousands of acres, the estate was impressive. Regarded as an investment, however, the purchase was not particularly fortunate. The estate was more picturesque than profitable. Most of the land was on, or beyond, the margin of cultivation … There had once been a certain amount of mining activity there, but this industry had died out … Financially, the estate was, and remained, a failure.' The reference to earlier mining activity perhaps relates to the seventeenth century (the 'Canontinge worke' where Augustine Simon had met his end). Parkinson's claim that no mining activity was in progress at the time of the purchase of the estate, in 1811-12, seems a fair one, but his suggestion that little was gained from later mining activity appears strange. Assuming silver at five shillings an ounce and lead ore at an average £12 a ton through the period to 1880, and taking total Wheal Adams, Wheal Exmouth and Frank Mills output of these two through their respective working lives, and, assuming average mineral lord's dues, or royalties, of 10 percent of the value of ores raised, then the estate must have received something in the region of £45,000 to £50,000 from the mining companies. This was a fair return to a mineral lord in any British mining region in the nineteenth century.

The mineral deposits on Lord Exmouth's land were discovered, according to later reports in the *Mining Journal*, by ' .. a well known experienced tributer, of the name of Barrett … (who) in the course of working for manganese ore at Ashton … imagined much more valuable lodes than manganese were to be found in the neighbourhood'. He was rewarded by ' .. having discovered lodes of lead and copper … ' The *Mining Journal* account concluded by stating that this working had subsequently produced ' .. large quantities of ore … particularly lead'.[16] Barrett, being a tributer and working miner, probably had little capital; his

only assets being skill and experience. His mine would have been a small scale affair. If he was one of the Newton St Cyres miners, as seems likely, he probably moved to Ashton in about 1815 and so would have begun prospecting on the Canonteign estate in about 1818 or 1819.

Both of these early small-scale workings, at Aller and Reed farms, probably continued in operation through at least the early 1820s, although no output figures have survived apart from that of 1821. Towards the end of the 1820s a new element of enterprise was introduced into the Teign Valley in the form of John Williams, a Cornishman, from Scorrier near Truro. His involvement in the area was to be of lasting importance in the development of the mining industry. How he became interested in this rather insignificant mining district in mid Devon is not certain, but that he did was not out of character with his family tradition. The Williams family were already involved in numerous copper mining ventures in their native parish of Gwennap, as well as a number of mining and smelting ventures throughout Cornwall.[17]

On the 4th October 1828, Sir Lawrence Palk granted John Williams a lease to dig for manganese in the parish of Christow for a term of 21 years.[18] The dues to be paid were to be one sixth of the value of minerals raised or ' .. the sum of one pound five shillings of lawful money of Great Britain for each and every ton weight of all manganese and so in proportion as the market price of the same shall advance and exceed seven pounds and ten shillings per ton at the Exe'. An interesting feature of the lease was this sliding scale of charges, which would rise with increases in the price of the ore. However, Williams stood to lose if prices fell below the point at which he would be stuck with the basic-rate due of one-sixth. Within a few years this was to cause problems.

The site of Williams' first attempt at mining was almost certainly at Aller, where existing operations had already produced small amounts of manganese. By 1828 it is likely that the original miners on the site had extracted most of the easily accessible ore and, hindered by lack of capital, had abandoned their excavations. Williams, in contrast, would have had no immediate lack of capital. This, combined with the accumulated technological knowledge and business contacts of his family, made for a spirited re-working of these and neighbouring deposits.

Production at the Christow manganese mine commenced in January 1829. Of this working, the *Mining Journal* in later years said: 'Manganese in considerable quantities had for many years been raised in the neighbourhood, and dues to no less than £60,000 paid to the land lord. Discoveries have from time to time been made in the course of working the manganese lodes, which had led to the prediction that the district would become one of considerable mining importance .. '.[19] The prediction had been an accurate one but, as usual, the *Mining Journal* erred on the generous side when assessing past production (and the lord's dues). The discovery of the company's account book, covering the period 1829-41, indicates that total production was 2,460 tons 13 cwt of manganese ore, on which dues of £2,964.4.10½ were paid to Palk.[20]

Operations at the mine got off to a good start; output in 1829 was over 636 tons of ore. However, this figure declined in subsequent years and so it seems likely that the deposits were only rich at a relatively short distance from surface. By 1836 Williams was experiencing both falling manganese prices and poorer deposits. He therefore pressed for, and obtained, a cancellation of his old lease, on the 24th June 1836, and on the same day took up a new one giving him more favourable terms. Under the terms of this new lease[21] the basic dues were reduced from one sixth to one seventh and the sliding scale was revised so that Williams paid ' .. the sum of one pound of lawful money of Great Britain … ' for each ton of ore produced and ' .. a further sum of two shillings and sixpence for each and every twenty shillings and so in proportion as the market price of the same shall advance beyond the sum of seven pounds at the Exe'. The effects of this lessening of the dues seem to have been felt almost immediately. With falling output, production from January to June 1836 was only 58 tons 12 cwt. After the new lease was granted, output rose again; production in the period July to December 1836 being 146 tons. This was, however, but a brief reversal in the falling trend of production. The deposits seem to have become progressively poorer at depth and so the final abandonment of the sett could not be long delayed. This came in October 1841, or shortly thereafter. This year also saw the death of John Williams and this, as much as poorer deposits, may have resulted in final closure. Under the terms of the lease, John Williams or his successors were required to adequately fill in such trenches and pits as had been made and adequately fence off any open shafts, and thus cover up most of the signs of their activity.[22]

This, however, was not the last of Williams' enterprises in the Teign Valley. During the last two or three years of his life he was developing what was to become his major operation in the district. This started in a fairly small way sometime between 1826 and 1828, at the same time that he was considering the mineral potential of Palk's land. His attention was then also turning to the small working that had been commenced by the tributer Barrett, sometime around 1819, on the Canonteign estate. This had obviously been abandoned by Barrett before the beginning of 1828 and by the end of that year Williams had acquired a lease on it, immediately setting about prospecting work in the area. He started sinking a shaft (shown on the 1840 tithe map of Christow as situated about 30 yards west of the present farmhouse at Reed.) From the outset, the Canonteign mine, as it seems to have been called, showed some signs of great potential.[23] Within a few years another shaft was sunk, to the 28 fm level. The original shaft was called Williams Shaft and the newer one later became known as Old Engine Shaft. By about 1840 there appear to have been workings from surface down to depth of 28 fms, with intermediate levels at 8 fms and 18 fms. There was no drainage adit until 1848, pumping apparently being effected from Old Engine Shaft by means of pumps driven by a water-wheel.

By about 1836 it seems that Williams realised that Old Engine Shaft was giving trouble to the miners, being sunk in rather soft ground and requiring extensive timbering (this was a problem which was continually recurring in the Teign Valley

mines throughout their working lives, being sunk in rather soft shales and slates). He therefore decided to sink a new engine shaft approximately half-way between Old Engine Shaft and Williams Shaft, in what was proving to be the richest part of the sett. By this time, the later 1830s, although output data is not available, it seems that this mine had opened up some rich pockets of silver-lead, at about 100 to 170 feet from surface, and was perhaps producing 100 to 150 tons of ore a year. Although still a small operation by later Teign Valley standards, it was the first significant development in deep silver-lead mining in the valley, apart from the rather abortive attempts at Hennock in 1806-08 and 1812-17, which appear to have produced little. The New Engine Shaft was probably being sunk by the early 1840s (it is not shown on the 1840 tithe map, whereas Old Engine Shaft is) and by 1846 had reached a depth of 50 fms from surface, when the mine was taken over by a new company, and called Wheal Adams.[24] The lack of detail about the early working of this mine means that little more can be said about its operations. Ramsden, in examining such plans and other indications that. existed of this early working, concluded that it was almost certainly the largest and most profitable mine in the valley to that date.[25] The *Mining Journal* merely noted that ' .. large returns have been realised by the Messrs. Williams from this mine, which is situated on Lord Exmouth's property'.[26] One thing is certain; this mine would have produced most, if not all, of the silver and lead coming from the Teign Valley in the period 1829-41.

During the late 1820s and early 1830s, the price of pig lead tended to fall. It declined in price from £25 a ton in 1825 to £12 a ton in 1830. This decline continued until 1832 before prices started to rise again, reaching £24 a ton in 1836. The low prices would have had a dampening effect on the fortunes of the mining industry while at the same time the recovery of prices in 1836 saw a renewal of activity in many areas. Writing in 1837, the Rector of Bridford, in the north of the Teign Valley, noted increased mining activity in his parish. The Rev. Carrington mentions prospecting by miners, looking for lead and other minerals, particularly near Stone and Venn farms.[27] It was also from that year onwards that Williams started to expand the scale of operations at the Canonteign mine. Eighteen thirty-six had also witnessed the resuscitation of the old Hennock mine, which had lain idle since it had been abandoned by John Gullett eighteen years before.

In the *Mining Journal* of October 1st 1836, there was a share issue advertisement for the 'Wheal Hennock Silver, Lead, Copper and Manganese Mining Company'. A capital of £15,000 was to be raised, in 1,000 scrips of 4 shares each, payable in three instalments of 25 shillings. This advertisement was followed, on the 15th October, by the first report of the new company:[28]

HENNOCK MINING COMPANY. Oct.6. - I beg to lay before you my report for September. We have sunk about three fathoms on the course of the lode, where we find it to be about eight feet big, made up with gozzan, spar, and lead of a good quality. We are also driving a new adit home to the lode: as the 'old men's' adit is run together, we deem it the cheapest and best way to drive a new one. We have about nineteen fathoms to drive to get to the lode. The ground in the adit is a blue soft killas, which is congenial to lead ore. We have cut some branches or droppers in the adit, dropping into the lode, made with lead and spar. The 'old men' have driven by the side of the lode for about 300 fathoms. The adit will take the lode about nine fathoms deep. There is an engine-shaft sunk to the adit level by the 'old men' in a good condition, and with a little expense will be well calculated for an engine-shaft for the present working of the mine. There is also a wheel-pit complete for taking a wheel 36' diameter, and 3½' breast, which will put the mine from thirty to fourty fathoms under the adit level. There is also a leat or watercourse brought home to the mine, where the water can be brought to work the wheel with a very trifling outlay.
- H. James.

It is not clear whether the 'old men' (former miners) referred to in the report are Webb's or Gullett's. However, it does indicate that some considerable work must have been done by these earlier generations of miners and again casts doubt on Palk's suggestion that Gullett had done no work on the mine.

The new company, under the direction of Captain James, set about clearing the old levels left by Gullett nearly twenty years before. According to J.H. Collins,. writing in 1912, the new company did install a 36 foot water-wheel and had it at work, draining the mine, in 1836.[29] Operations continued throughout the rest of 1836 and through 1837. On the 7th April 1838, the *Mining Journal* advertised the sale of ' .. between 70 and 100 tons of, manganese; the produce of Hennock and Christowe Mines, near Chudleigh Devon'. As the production of manganese was, by this time, subsidiary to the production of lead in this area it is probable that this represented the combined output of the Canonteign and Hennock mines, for perhaps the first quarter of 1838. In the same edition of the *Mining Journal* there appeared another report by Captain James.[30]

April 3. - Everything here is proceeding with great spirit; on the surface a number of persons are employed cleaning and dressing the ores, and the number will be increased as the dressing floors are extended, in doing which no time will be lost, as there are several parcels of rich lead ore ready for dressing. The lode in the adit is very large, and producing lead ore throughout. In the 10 fm level the tributers have a noble pile of excellent 'stuff', and they are working with great spirit. The lode averages from eight to ten

feet big, and is exceedingly productive. The engine shaft is now down about eight fathoms under the ten fathom level, and will be completed to the 20 fm level in about five weeks, when we shall commence working in that level also.

On the 5th May 1838 the *Mining Journal* reported that the Engine Shaft had reached the 20 fm level and that a cross-cut was being driven at that level to cut the lode. On the 10 fm level, in a lode reported to be 4 feet wide, a rich bunch of silver-lead ore with a payable width of 2 feet had been found. The dressing floors had also been completed. The *Mining Journal* reports of the following months continued in the same optimistic vein. On the 16th June, for example, the lode was reported to be 10 feet wide. This may have been an exaggeration but what is certain is that most of the ore bodies that the company Was encountering consisted largely of quartz and other gangue minerals (that is, waste). There are no positive indications that the company encountered any real deposits during this period and so most of the *Mining Journal* reports must be put down to an attempt to bolster share prices, sadly a common practice in the nineteenth-century metal mining industry. Nevertheless, despite [not] producing any significant quantities of lead or silver, the company continued in operation, probably exhausting the subscribed capital. By mid June the Engine Shaft was down to the 24 fm level, where a drive had been put out 10 fms south. At the same time the task of unwatering the old workings appears to have been completed, and as a result the pumps were slacked off, from 11 strokes to 4 strokes a minute.[31]

On Thursday 19th July 1838, the Annual General Meeting of the company was held on the mine, with J.G. Maxwell in the chair. At this meeting a comprehensive report on the state of the mine was presented by Captain James. In it he stated that South Whim Shaft, which had been sunk on the lode by the old adventurers, had been cleared by the new company and that they were sinking to connect it with the adit level, which they had also cleared to this point, about 236" fathoms south of the adit portal. The Engine Shaft was sunk to a depth of 271 fms and Captain James expected to cut the 30 fm level in a few weeks. An interesting point which emerged in the report was the indication of several distinct lodes of manganese on the sett. It was also reported, in this connection, that 40 tons of the mineral was at surface, and had an assayed value of £8 a ton. This item was perhaps intended as a fillip to the clearly sagging fortunes of the company. The true state of affairs was revealed, not by the glowing reports, but by the cold statistics of incomings and outgoings presented by Captain James at the end of his report. In nearly two years of production, Hennock mine had not been able to show one real ray of hope to the adventurers. The accounts given in the company report were:[32]

Expenditure, including purchase of mine,			
from Sept. 1836 to June 1838:	£4,148	7	8.
Shares disposed of, 3318 @ 25s each:	£4,147	10	0.
Balance against company:	£	17	8.

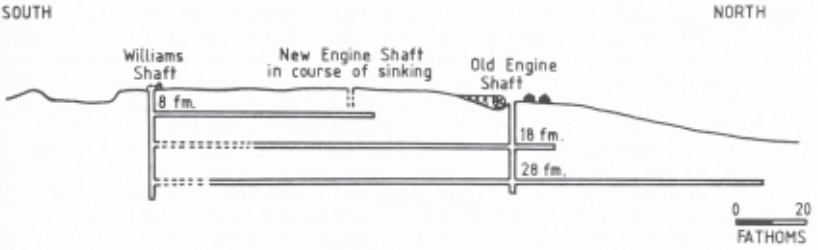


FIG. 2 – CANONTEIGN MINE (WHEAL ADAMS) CIRCA 1840

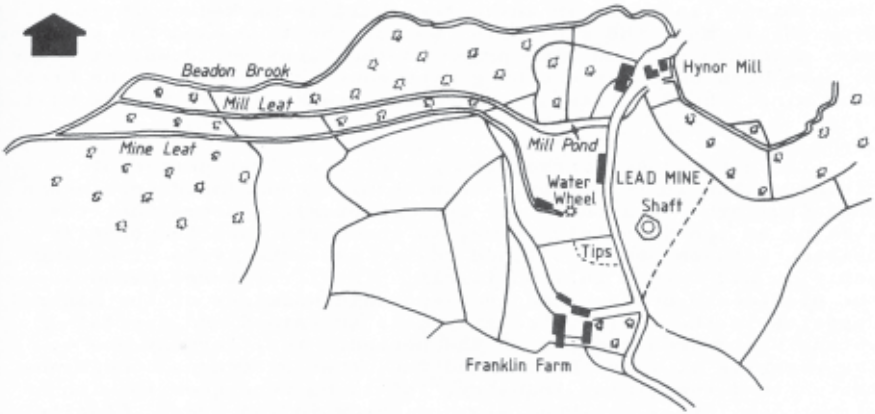


FIG 3 – HENNOCK MINE, AS SHOWN ON THE HENNOCK TITHE MAP, 1840.

gXs

The small size of the deficit, less than a pound, did not disguise the fact that the company had entirely consumed the subscribed capital without making any returns from ore sales. The manganese ore which lay at surface had, according to Captain James, an assayed value of about £320. If this represented the sole return from the mine to that date, it is not difficult to imagine the growing impatience of the shareholders, anxious also not to incur further losses.

During 1839 there were two more reports on Hennock mine in the *Mining Journal*.[33] Each gave the impression of slow progress. The Engine Shaft reached the 30 fm level at the end of 1839 but got no further. Generally, it seems that there was a gradual run-down of operations at this time. Perhaps some of the adventurers started defaulting on calls (demands for extra money which could be made to each shareholder under the costbook system of management). Despite these setbacks, the mine managed to struggle on into 1840. The last report on the company to appear in the *Mining Journal*, during January 1840,[34] gave the impression that work was continuing on a small scale but a noticeable lack of the spirit which accompanied the early reports of 1836 and 1837. Faced by lack of worthwhile deposits and falling lead prices (down from £24 a ton in 1836 to £17 in 1839) the company probably ceased operations soon after this last report appeared.

The 1840 tithe map of Hennock shows the mine as it was at the end of operations. A leat, water-wheel and shaft are shown, while in the tithe apportionments accompanying the map, one of the portions of land belonging to Franklin Farm is marked as a 'Lead Mine' (in field in which the shaft is marked on the map).[35] Hynor Mill, near the mine site, was at the time used for grinding corn although at some time prior to the First World War it seems to have been used for crushing micaceous iron ore from the Great Rock mine, about a mile up the Beadon Brook Valley, to the west.

The early 1840s marked the end of the first period of mining in the Teign Valley. Hennockmine had closed once again and, from other evidence (see next chapter), it seems that the working of the Canonteign mine, to the north, was temporarily halted, between about 184l and 1844. Thus the cycle of mining activity had turned full on itself. The first three decades of the nineteenth century had seen sporadic workings of the mineral deposits in the valley, becoming more sustained and capital intensive towards the end of the period. Yet, largely due to the vagaries of metal prices and the other exogenous conditions that attend the mining industry, the 1840s were seen in with an almost completely moribund mining sector in the area. Despite this, the later 1840s were to witness an altogether greater expansion in lead mining. Both the Canonteign and Hennock mines were to be reworked on a larger scale, while newer, even larger mines were to be developed, ushering in the most prosperous age of mining in the valley.

Footnotes:

(1) H. Parsons, 'The Dartmoor Blowing House: Some Recent Investigations' *Trans. Devon. Assoc*., LXXXVIII (1956), p196.
(2) Exeter City Record Office, Little Castle Street, Exeter (ECRO) Z10/11/1.
(3) S. Lysons, *Magna Britannia*, VI, 'Devonshire' (1822), p.cclxxxvi.
(4) R. Polwhele, *History of Devonshire*, (Exeter: 1793), p56. 'Shode' refers to a loose stone, or loose stones, of lead ore found perhaps in ploughing operations, or digging ditches.
(5) J.V. Ramsden, MS in ECRO, 'The Mineral Deposits and Mines of the Teign Valley, Devonshire' (c1917). Ramsden was manager of the Bridford Barytes mine, c1927-51.
(6) The main evidence to support this theory lies in Whites *Directory of Devonshire* (1850) p188, where it states that a mine at Christow, opened about 1810 for copper and manganese (an unlikely combination), produced an output (p802) of 10,000 tons a year. Whether this was copper or manganese, or both, is not stated, and altogether one must doubt the accuracy of this source.
(7) In the Duchy of Cornwall Office, London. I am grateful to Mr Tom Greeves for this reference and for comments on the character of John Webb.
(8) ECRO Z10/11/14.
(9) Lysons, *Magna Britannia*, p.ccxc.
(10) Lysons, *Magna Britannia*, p.cclxxxviii, footnote x.
(11) 'Additional case for Mr Chitty's opinion, in the matter of the attempted cancellation of Mr Gullett's lease' 11th June 1817, ECRO Z10/11/15.
(12) R. Polwhele, *History of Devonshire*, p56.
(13) R. Moore, *History of Devonshire*, (1845), p373. Also, Lysons, *Magna Britannia*, p.ccxc, notes that: 'The mines, or pits, at Newton St Cyres, failed in about the year 1810, and since that period, the mine at Upton Pyne has been exhausted. New discoveries of manganese, however, were made in the parishes of Doddescombleigh, Ashton, Christow etc., seven miles west of Exeter, which are said to have produced from ten to 1500 tons per annum. They are still worked, but the produce of last year did not much exceed 450 tons. It is shipped at Exeter.' In a footnote on the same page Lysons notes 1821 manganese production as: Upton Pyne 30 tons, Ashton 130 tons, Doddescombleigh 280 tons, Christow 16 tons, with total Devon production of 1,911 tons.
(14) P.M.G. Russell, 'Manganese Mining in Devon' *Devon and Cornwall Notes and Queries*, XXXI (1970), pp205-13.
(15) Ramsden MSS, ECRO, gives the grid ref. for 'an old manganese mine' at Aller, at SX8J48.842J, where he records the former existence of three shafts.
(16) *Mining Journal* (London), (MJ) 1844, p311.
(17) C.C. James, *History of Gwennap*, (1952), pp90-5.
(18) ECRO Z3/Box 7.
(19) *MJ* 1844, p389.
(20) ECRO 58/9 Box 140/5 (see statistical appendices).
(21) ECRO Z3/Box 7.

(22) This section of the Teign Valley lode system was worked by various groups between 1844 and 1860, under such names as Aller, Bennah, Christow Consols, East Wheal Friendship, North Exmouth, and Reed, but never with any real success. The only recorded output is 16 tons of lead ore produced in 1860 under the name North Exmouth (*Mineral Statistics*).
(23) Ramsden MSS, ECRO.
(24) *MJ* 1846, p446.
(25) Ramsden MSS, ECRO.
(26) *MJ* 1844, p311.
(27) MS diary of Rev. Carrington, in ECRO.
(28) *MJ* 1836, 15th October.
(29) J.H. Collins, *Observations on the West of England Mining Region*, (Plymouth: 1912), p507.
(30) *MJ* 1838, 7th April.
(31) *MJ* 1838, 16th June.
(32) *MJ* 1838, 28th July.
(33) *MJ* 1839, vol.8 p196; vol,9 p33.
(34) *MJ* 1840, p52.
(35) DCRO.

CHAPTER THREE

Expansion

A visitor to the Teign Valley in 1842 would have commented on the quiet agricultural life of the parishes of Hennock and Christow but would also have noted the presence of some small lead mines, worked a few years previously, but presently idle. Between 1840 and 1845 there was a minor setback in the price of pig lead; it fell from just under £19 a ton in 1841 to little more than £16 a ton in 1843. Another factor which may have contributed to the temporary recession in the mining industry in the valley was that, in 1841, John Williams of Scorrier died, at Calstock in Cornwall. Williams' close involvement in the Canonteign mining company had led to its rapid expansion in the later 1830s and no doubt his untimely death, coupled with the recession in metal prices, led to the mine being closed. It is also possible that the original lease on the site, taken out for a term of 21 years in 1820 or thereabouts, by the tributer Barrett, had not been renewed by Williams, and had expired. In any event it seems that after 1841 the surviving members of the Williams family took little interest in the Teign Valley. Thereafter, capital for the mines would have come from a wider field, including the expanding London-based mining share market.

The only spark of activity apparent during this period was in 1842 when the *Mining Journal*[1] mentioned a trial being made for lead near Hyner Farm. This is interesting because it is the first mention of any activity on the site of the future Frank Mills mine, which later became the deepest and most productive in the valley. On this occasion, however, nothing seems to have resulted from the prospecting activity.

In 1841 the owner of Reed Farm, on which was situated the Williams lead mine, was Nathaniel Addems.[2] Soon after the mining company suspended operations, it seems that Addems died. His widow, Ann Addems probably deciding that she was unable to maintain the farm on her own, decided to sell it. Accordingly, the following advertisement appeared in the *Mining Journal* of the 1st July 1844:

TO MINERS AND OTHERS – Auction at the Clifford Arms, Chudleigh, Thursday 13th July of the Estate or Farm called Rood or Reed, in the parish of Christow, owned by Mrs. Ann Addems. Lead Ore of a superior quality has lately been found on the estate, and there is every prospect of the capability of Mines being worked thereon with great pecuniary advantage.

The purchasers were John and James Hamlyn of Bennah Farm, to the north of Reed. Once in ownership they lost no time in arranging

leases with prospective mining companies. One company was formed to work the old Canonteign mine under the name of Wheal Adams, most likely taking its title from the original owner of the land. Another enterprise, taking the name East Wheal Friendship, set out to work the area to the north of Wheal Adams, on the land abandoned by John Williams' mining company in 1841. In later years the *Mining Journal* complained about the circumstances which surrounded the establishment of the Wheal Adams company.[3] At first the *Mining Journal* maintained that 'Wheal Adams shares were offered to several parties in Exeter for a mere trifle, but no purchasers were found, consequently, the Londoners hold the chief part of the mine .. ' Subsequently the paper attempted to explain the manner in which the company had been established and perhaps counter feelings in Exeter and district that a cloak of secrecy had surrounded these events: 'There were no advertisements of (this company) .. and every share was taken and subscribed for almost before the plans were matured and the leases signed. This speaks volumes for a district comparatively new.' By the time this piece appeared (1852) Wheal Adams had certainly established itself as a profitable mine and so it was perhaps simple for the *Mining Journal* correspondent to read a little too much significance into the speed with which shares were taken up in what was still, then, a largely unproved mining district.

Meanwhile work was proceeding on the task of putting the mine back into running order after it had lain idle for the previous three years. The new company, with its London-based shareholders, seems to have had no lack of finance for the task. This was in contrast to most other earlier workings in the valley. So, given the fortune of good mineral deposits, from the outset Wheal Adams proved a first-class investment. The activity and optimism of the early days of the company were summed up by the *Mining Journal*: 'Strong expectations are entertained in the neighbourhood as to the results of the recent discoveries of mineral wealth, in the parish of Christow, whence great additional employment is anticipated for the labourer, and a handsome return to the adventurers with proportionate dues to the lord of the soil'.[4] So, nobody was being forgotten in the anticipated share-out of the mineral wealth that lay under the fields of the Teign Valley. The general optimism of the moment spread to the company working the sett to the north, East Wheal Friendship and, to start with, the level of activity seems to have been similar to that at Wheal Adams. The *Mining Journal* commented on these operations on the northern extension of the Adams lodes:

Sets have also been recently taken on property situated in the parish of Christow belonging to Messrs. Hamlyn, on the most liberal terms. Every disposition to meet the views of the adventurers has been shown by the owners of the ground; a lease of 21 years has been granted, and every possible facility has been granted to the lessees since the commencement of operations. Several experienced tributers, who have been engaged in some of the best mining speculations in Cornwall have for

reported that they have the fullest confidence in the successful results of the labours already commenced. East Wheal Friendship is the name of the new set. Miners have been employed since the granting of the set, who have worked on the back of the lode and are now in course of bringing up a new adit. – PLYMOUTH JOURNAL.[5]

A further optimistic report appeared in the *Mining Journal* in November 1844: 'On a continuation of the same lode (as Wheal Adams), a sett, named East Wheal Friendship has been taken up by some spirited adventurers, who have driven an adit and cut a lode from 5 to 6 feet wide, and sufficiently promising to warrant arrangements being made to erect a 40 inch cylinder engine, to prove the lodes, which will meet at a certain depth.' The general optimism of the mine adventurers in the district was then summed up: 'Experienced miners who have been engaged on the several workings declare, that on capitalists becoming acquainted with this district, this part of Devonshire will soon display as active mining operations as the county of Cornwall.'[6] The early optimism concerning East Wheal Friendship seems to have been ill-founded. The lodes there were clearly never as productive as those directly to the south, at Wheal Adams and Exmouth, and there is no evidence that the 40 inch steam engine was ever erected.

Having commenced operations in 1844, Wheal Adams' first recorded output, of 59 tons of lead ore in 1845, was published in the *Mineral Statistics* for that year.[7] From 1845 onwards, allowing for some of the inevitable deficiencies in the data published (in the early years mining companies provided output statistics on a voluntary basis) the *Mineral Statistics* do give a much better indication of the growth of mining activity and mineral production in the valley. Wheal Adams' lead output of 59 tons in 1845 probably represented the total amount produced in the valley (as it was until 1851). East Wheal Friendship remained absent from the list of lead producers in Devon and, with no mention of the company in the *Mining Journal* after November 1844, it is clear that the adventurers were finally discovering the poverty of the lodes there. In contrast, with a steadily increasing level of activity, regular reports on Wheal Adams commenced in the *Mining Journal* from October 1846 onwards.

In these reports the manager, Captain James Moyle, gives a clear picture of the condition that the old mine was in when his company took over in 1844. The new engine shaft had already been sunk to a depth of 50 fathoms, replacing the old engine shaft. The method of working the old mine, already deep by Teign Valley standards of that time, was nevertheless rudimentary. There had been no rails, or tramways, laid in the underground levels; all carting of ore below surface was done with antiquated hand-barrows. There was also no winding engine beyond a rather inefficient horse-whim which hoisted the ore to grass. Despite these initial difficulties work seems to have proceeded at a fair pace and in the *Mining Journal* of October 1846 Captain Moyle made the following report:

WHEAL ADAMS. I beg to hand you my report of the above mine; the 50 fm level, driving south, is much the same as last reported. We have not cut the lead lode yet, but we have a lot of water coming from the end, which is very strong. This is a very good sign that the lode is before us. In the 40 fm level, driving south, the lode is 4 ft. wide, with good stones of lead in it - all saving work. The rise in the back of the 40 fm level, on the silver-lead lode, is much the same as when last reported, say, worth £15 per fm. The winze sinking under the 28 fm level, much the same as last reported, worth £10. We do expect to get this winze through this week, if all be well. The tributers, I think, most of them, are getting wages. I set another tribute pitch today, on the eastern lead lode, of 12s. in the £. - J. Moyle, Christow, Oct. 19.'[8]

Two or three points in this report might be explained. The term 'saving work' means covering costs. The fact that the tributers, working for a previously-agreed proportion of the value of the ores raised by them, were 'getting wages' suggests that Captain Moyle considered that the value of the ore being worked had been maintained since the last setting day, at which the proportion had been fixed. The tribute pitch set at 12 shillings in the pound (value of ore raised) would seem to indicate a rather middling to poor value of ore; a richer lode would have produced a tributer's 'bargain' of perhaps 6 or 7 shillings in the pound, or even as low as 3 or 4 shillings.

Later reports during 1846 indicated that the 50 fm Level was continued, driving south, and that the 40 fm level was continued driving on the western silver-lead lode. At the time these two levels seem to have been the main working ones; work at higher levels, in the 8 fm., 18 fm and 28 fm, was eventually abandoned. During November and December 1846 there were numerous reports which seem to indicate that some good mineral deposits had been located. In one, heavy zinc blende deposits were reported in the 50 fm drive south.[9] A short while later it was reported that a cross-cut was being driven west on the 28 fm level to intersect a copper lode, supposed to lie 30 fms west of the starting point.[10] There was, however, no further report of this copper lode. The rich nature of the lodes at Wheal Adams was illustrated by another report, in December 1846. In this the 50 fm level was reported as worth £7 a fathom driving south on the east lode, and worth £5 a fathom driving south on the west silver-lead lode. The reported output for 1846, 33 tons of lead ore,[11] was probably less than for 1845 due to greater effort being put into exploration and development activity underground. At the end of December James Moyle was replaced as mine captain by John Prince. Moyle then appears to have been connected with a number of unsuccessful mining enterprises near Okehampton and Drewsteignton[12] and according to Ramsden, seems to have been something of an opportunist.[13] This, however, is a label that might be fixed to the majority of nineteenth-century mining men, successful or unsuccessful. After Moyle's departure, Wheal Adams appears to have been very competently managed by Prince.

Early in January 1847, 10 tons of lead ore and 60 tons of zinc blende were ready for sale. By early February a further 90 tons of blende was ready for dispatch. At this time it seems that zinc ore was more abundant in the mine than lead. However, there were occasional rich patches of lead found in the lodes and during 1847 the reported values per fathom ranged from £5 to £12, averaging about £8 per fathom. At the drive headings there were constant, heavy streams of water being emitted and these were held by the miners to indicate good deposits ahead – this spurring them on in their efforts. By the end of February it was reported that some tributers were sinking a shaft in the lower orchard at Reed Farm and were already 6 fms from surface, and had found lead and zinc. This later became known as Adams North Shaft (among other names). However, the deposits in this part of the sett were never as rich as to the south and so the workings from this shaft were not developed to any great extent, although some time subsequently the shaft appears to have been deepened, with unknown results, to make a further trial of the lodes at this point.

At the end of March the general mood at Wheal Adams was very optimistic. New Engine Shaft had been sunk a further 10 fathoms and drives commenced at the 60 fm level. The water in the 50 fm end, south, was increasing and with it the hopes of the miners and adventurers. The 60 fm was being driven southwards, hurriedly, in order to facilitate the unwatering of the 50 fm., above. It was noted, in passing, that the ground in the 60 was rather soft. As it happened, this was to be a portent of troubles to come. This great activity continued into April; the 28 north of Old Engine Shaft was being cleared and a larger pump being installed in order to deal with the greater volumes of water in the deeper levels.

Suddenly, amidst all this activity, a minor disaster struck the company. On the 27th April, there was a heavy fall of ground between the 40 fm and 60 fm levels, in the vicinity of New Engine Shaft.[14] This collapse ruined the new pumps which had just been installed and rendered the shaft temporarily useless. New Engine Shaft had been first sunk in the late 1830s, primarily to by-pass Old Engine Shaft, which had presented problems of running ground, and had required constant, heavy timbering. So, after New Engine Shaft collapsed in the spring of 1847 the company had to resign itself to the fact that this shaft would also require timbering. They also had to purchase another set of pumps to replace those lost in the accident. All this unforeseen expense and delay must have sorely tried the company and the fact that these problems were weathered stands as testimony to the fairly secure position of the mine. However, since the miners had been unsuccessful in yet locating the expected large lode, despite the strong streams of water in the ends, the news of the accident helped depress the value of the company's shares for a brief period; they fell from £30 quoted for a £40-paid share, to £10. All in all, the costs of the fall had been slight - there was no loss of life since the collapse apparently took place at night, when few men were underground. Within a few months the shaft was secured and in use again.

By the 1st August 1847, a winding engine had been purchased and erected on New Engine Shaft and the timbering was nearing

October 1847. At this time the lode in the 18 fm level was reported to be between 2 and 4 feet wide, containing lead, barytes and some traces of copper. The gossan (quartz-iron oxides zone) in the 18 fm north, quite near the surface, was reported to contain silver but little, if any, appears to have been produced from this level. In all, during 1847, 250 tons of lead ore was produced, not a mean output considering the many difficulties the company had faced that year.

It is clear that at the beginning of 1848 the Wheal Adams adventurers made an attempt to re-assess their position. They decided to draw up new plans of the mine and conduct careful assays of all the developed lodes. By the end of January some of the results of the latter were made known and pointed to the deposits becoming richer in depth. The value of silver in the lead ore was given for different levels in the mine: in the 18 fm level it averaged 9 oz. per ton, in the 28 fm level it was 16 oz. per ton, in the 40 fm level it was 21 oz., while between the 40 fm and 50 fm levels it rose to around 26 oz. per ton.[15] This encouraged the company to concentrate on the lower levels from this time onwards, as silver made a welcome addition to the mine's income, although no data of the value of output of the precious metal is available before 1852, when 680 ozs. was sold.

The news of the silver assay appears to have been the major item in the reports for early 1848. In February it was stated that the 50 fm drive south was in a lode ten inches wide, consisting mainly of quartz. In March a report stated that there was nothing significant to report! Further notices in April and May only mentioned that the lode was generally quartzy with much water still issuing from the ends. A share quotation later in 1848 reflected the quieter state of affairs at the mine. By this time £30 was being quoted for a £70-paid share. At the previous quotation, in 1847, only £40 had been paid-up by each shareholder. Thus, £30 had been called on each share (under the cost-book system) in the interim period, illustrating the heavy costs that had been incurred. At the same time, output seems to have been falling, perhaps due mainly to a temporary drying-up in the discovery of new pockets of rich ore; in 1848 only 56 tons of lead ore was produced, far less than in 1847.

The Wheal Adams company seems to have gone through a crisis in 1848 and early 1849, with an apparent. lack of capital, perhaps brought on by the heavy expenditure in securing the soft ground in the mine. In the early part of 1849 there was little activity to report in the columns of the *Mining Journal*, except the sale of occasional parcels of lead ore. However, by the summer of 1849, probably encouraged by the report of good silver values in the lodes and the improving market price for lead, and perhaps by an improvement in the financial position of the company, operations resumed at a higher level than previously. By the end of the year the mine was back to a very healthy state; output in 1849 of 382 tons of lead ore was the highest recorded by the company since it had started work in 1844.

The improved position of the company was probably linked to a restructuring of its affairs sometime during 1849, when it seems a number of shares changed hands, Captain Prince being retained as mine manager. By January 1850, as a result of the improved position of the company and of higher lead prices (around £17.10.0. a ton compared with £15.19.0. a ton during 1849) the price of Wheal Adams shares rose, being quoted as £150 for a £130-paid share. This also illustrates the large amount of capital that had been called up, £60 a share since the end of 1848, most likely one of the factors precipitating the crisis of early 1849. That such an amount could be called up and yet the mine survived was one more testimony to the genuine belief that must have been held in the mineral potential of the sett (and particularly its southerly extension). By the spring of 1850 the *Mining Journal* felt able to comment on the new-found prosperity of the company: 'Wheal Adams, we understand, had been abandoned by the party who first took her up, after the expenditure of a considerable sum, and is now the most productive lead mine in the county of Devon, with every probability of its increasing its returns.'[16]

To the south of Wheal Adams, interest was once again being aroused in the Hennock Mine, during early 1849. In July of that year advertisements were placed in the *Mining Journal* for shares in the 'Hennock Silver-Lead Mining Company', a somewhat less pretentious title than that of its predecessor. Prior to unwatering operations being commenced a meeting was held at the company's offices in Exeter.[17] Captain James, of the old company, who had been appointed mine manager for the new company, read out his report. In it he took the unusual course of condemning the mine ' .. on account of the leanness of the lode .. ' and he went on to warn the adventurers that there was no chance of its ever producing ore in any quantity. This condemnation of the mine's prospects not surprisingly caused an uproar at the meeting and among the hubbub someone eventually proposed a vote of censure on Captain James. Before this could be passed, however, one of the more level-headed adventurers, described by the *Mining Journal* correspondent as 'a highly respectable broker of Old Broad Street', gained the attention of the meeting and put forward a proposal. He suggested that 'There is no lane without a turning; and as we have gone so far bad, there is a chance of getting better.' He then proposed that the mine be inspected by Evan Hopkins Esq. and Professor Adam Murray, both well known mining experts of the time, often featuring in the columns of the *Mining Journal*. The account of the meeting ended on an optimistic note, stating that ' .. the lode in Hennock is large gossan, fine, with sufficient water for dressing the ore, and all other mining purposes.'

While waiting for the two mining experts to visit the mine, the Hennock adventurers set about the business of getting into production again. Captain James seemed quite content to act as manager, despite his apparent lack of faith in the lode and, rather more surprisingly, the adventurers were content to retain him in his position. He supposedly had a reputation as a 'first rate judge in mining matters, and one whom it was thought understood his business well .. '[18] In August 1849 the *Mining Journal* reported that the old workings had been unwatered, re-opened and

an assay taken of the silver content of the gossan, which revealed nothing of value. Later, in September, it was reported that 'stones of lead' had been found near the shaft as the cleaning-up operations took place.

In January 1850 the company reported that they were cutting white lead (cerussite) in the lode and were raising argentiferous gossan. A couple of weeks after this report the company held its annual meeting, on Tuesday the 22nd January, with James Forsyth Esq. in the chair. Opening the meeting, he gave a brief account of the present working from the commencement of operations in July 1849. Since then, £400 had been received in calls on shares and £382.1.6½ had been expended, leaving the company £17.18.5½ in credit. Then Captain James read his report, not as spectacular as on the previous occasion, and it passed without comment. In it he stated that the re-working was being hindered by excessive water in the workings and so sinking below the adit would have ID be suspended until better pumps were installed. At the end of the meeting a call of ten shillings a share was declared, after which forecasts of bringing 5,000 tons of lead ore onto the market soon, were made. On such a wildly optimistic note the meeting ended.

Within one month a new water-wheel and pumps were being installed and during the excavation of the pit for the water-wheel deposits of silver-lead were supposedly found.[19] In an optimistic mood the company set about sinking a new shaft to exploit the deposits at depth. While sinking this shaft they announced that quantities of copper were being raised, although it is almost certain that this was information merely designed to raise the morale of the shareholders.

At first sight, the numerous mentions of copper in the mines of the Teign Valley seem slightly anomalous. The area is one where only very small traces of the red metal have been located. There were isolated occurrences, such as that which produced 17 tons of ore in 1859 from Wheal Exmouth, but by and large reports of anything more than traces of copper were probably wishful thinking on the part of Teign Valley mining companies. The nearest true copper-producing mines were in the vicinity of Ashburton, a few miles to the south-west, while Yarner mine, in the nearby parish of Bovey Tracey, also produced some copper ore at around this time. To the north, the copper lodes reported at Wheal Lawrence and Wheal Anna Maria, near Bridford, were never productive and in fact the former mine produced lead rather then copper ores.[20] One powerful reason for mentioning copper deposits in their mines, as far as any Devon mine managers of the 1840s and 1850s were concerned was that after 1844 the fabulously rich Devon Great Consols mine had opened up what turned out to be the richest copper lodes in Europe. By the early 1850s this mine, on the banks of the River Tamar in the far west of Devon, was probably the most profitable metal mine in Britain and it was natural for mention of copper to initiate images of wealth and prosperity in the sometimes too-gullible minds of mine adventurers.

At Hennock the new shaft had reached the 10 fm level below adit and the lode in the drive north at that level reported as worth £10 per fathom, by the end of April 1850. The normal activity at the mine was disrupted for a couple of days in early May, when the notable mining experts descended on the property to consider its development potential. Evan Hopkins and Adam Murray

were accompanied on this occasion by Captain James Lean, a well respected figure in Cornish mining circles and one of the authors of Lean's Engine Reporter. Their report appeared in the *Mining Journal* in due course; they agreed that the mine had good prospects and appeared to be working as efficiently as could be expected.[21]

The 10 fm level continued to be developed through the following months and a crosscut driven 12 fms to the east of the main lode was reported to have proved a second lode, running parallel to it. This lode contained zinc blende with some lead and there were hopes of it becoming very productive. At about the same time, a meeting of the shareholders decided on a policy of sinking the new shaft to the 20 fm level. This task was completed by November 1850. At a meeting during this month it was stated that the new pumps had been installed and were now working satisfactorily, and that a new crusher was to be erected in order to cope with the larger quantities of ore that were anticipated being raised to grass. The mood of all these reports suggests that the Hennock adventurers were quite satisfied with the progress being made in the small valley beneath Franklyn farm.

At the northern end of the Canonteign Estate, the work at Wheal Adams was also proceeding with great spirit. Early in 1850 the company managed at last to obtain an extension of their sett, to the south. Previously, it appears that Lord Exmouth had objected to any extension since it would have entailed sinking shafts and leaving waste tips in part of the parkland surrounding his house. However, for one reason or another, he seems to have changed his mind and so permitted mining operations under his lawns provided that certain conditions were met by the Wheal Adams company. There were to be no waste tips within the park and such ventilation shafts as were necessary were to be guarded by ornamental iron railings.[22] After his change of heart about the new lease in early 1850, Lord Exmouth seems to have enjoyed a reputation as a most cooperative mineral lord. Perhaps in honour of this gesture, the new sett was called Wheal Exmouth. Almost immediately a shaft was set sinking on what was then virgin ground. No doubt hopes ran high that summer as the handful of miners spared from Wheal Adams toiled under their small windlass, surrounded by idyllic parkland.

Activity at Wheal Adams had been concentrated largely on sinking the engine shaft to the 72 fm level, a task completed by September 1850, when a crosscut was commenced at that level to cut the lode. In November came the long-awaited news from the shaft at Wheal Exmouth. At about 30 fms from surface the team of miners had cut an ore-body which appeared to contain some very rich deposits. A hasty assay at the bottom of the shaft revealed that it would be worth nearly £100 per fathom if it continued with the same richness for any distance.[23] This news spurred the company to further hasty development of this lode and probably the hope that the Adams-Exmouth company was to enter into a period of great prosperity.

On the 7th December 1850 the new stamps at Wheal Adams were reported as nearly ready for use in crushing the ore that was expected to flow from the Adams and Exmouth mines. A few days later there was a more sobering item of news; it was revealed that the preliminary assay of the lode at Wheal Exmouth had exaggerated the true value of the ore body. Unfortunately (or perhaps fortunately) the shaft had come down exactly on a rich but localised bunch in the lode. However, the lode was still showing signs of moderately good ore, being worth about £20 to £30 per fathom over a large part of its developed length. At the same time it was revealed that at Wheal Adams the new 72 fm level, driving south, had proved a rich shoot of ore at the southern boundary of the sett, which "appeared to extend from the 50 fm level downwards. In all, 1850 must have been a generally satisfying year for the Wheal Adams and Exmouth adventurers.

Encouraged by the successes in the previous year, 1851 was ushered in with almost frantic activity in both the mines on the Canonteign Estate. One indication of this was that there were reports on the company virtually every week in the *Mining Journal*. Early in the year the output for 1850 was made known, 395 tons of lead, the highest yet recorded.

During 1851, Captain Prince's reports in the *Mining Journal* gave a clear picture of activity at Wheal Adams. During the month of January he reported that he had completed his dialling (surveying) of the underground levels as early as 27th December of the previous year and had decided, on the basis of that survey, what future underground development he was going to undertake. By the end of January he had set the men driving in the western part of the lode, where ' .. the ground is much harder than any we have seen in the mine'. To concentrate on the western part of the lode, Captain Prince had to suspend driving on the eastern part. The hardness of the ground was not the only problem facing the Wheal Adams miners at this time. According to Captain Prince, 'In the 50 north, the timbering has taken up more time than we anticipated, but we are doing everything in our power to reach the end for the purpose of driving north. The 40 fm level north, cross-cut from the western silver-lead lode, has reached the jack (i.e. zinc blende) lode, which is 2 feet wide, in crushed ground, near old workings'.[24]

Water was another problem, especially in the 60 fm level and so it was necessary for the pumping engine to work at 10 strokes a minute to cope with it effectively. Despite this, work in the 50 fm level north was completed by mid February. The 40 was still being timbered; this was to render it safer as it was needed for access to stopes between the 28 and 40 fm levels, which were being reworked. Captain Prince reported, 'The stopes between the 28 and 40 have resumed working and will produce about 10 cwts. of lead per ton'.[25] During the next few weeks the water in the 60 abated somewhat and it was possible to make an assessment of the lode in that level. As in 1848, it was reported as very 'quartzy', about 15 feet wide, and still making large quantities of water in the ends. However, part of this lode yielded a small parcel of copper ore during April. This consisted of grey and black ore, assaying 32 percent pure copper.

Activity was not confined to the underground workings. On the surface Captain Prince reported that ' .. the boiler is fixed, and the stack nearly raised, and the engine erected for the stamps. We have set the stamps' work to competent carpenters, and have employed additional smiths to work with the greatest expedition'.[26] The anticipated increase in the amount of ore to be milled was making the task more urgent. Finally, it was announced, 'The stamping engine we expect will be at work on Saturday next for trial; the other apparatus will be got in order for proper working in the course of a fortnight. We propose to sample a parcel of lead, computed at 50 tons, in the course of the week'.[27] However, there was a further delay and the following week it was stated that ' .. the stamping engine would have been set to work on Saturday, but the iron founders failed to send us two connecting pipes for the boiler, which boiler is repaired, fixed and complete for working, with the exception of the pipes in question'.[28] The week after, the *Mining Journal* stated, 'Stamping engine set at work Thursday last'; the delay was over and Wheal Adams was now ready to deal with the expected increase in output.[29]

In the 60 fm level, throughout the summer and early autumn, there was not much evidence of the lode increasing greatly in value or size. During June about half a ton of copper ore was taken from one pitch and in the process it was discovered that directly over it lead once again made an appearance. Tributers were then set to work on it and were soon reported as ' .. raising some good work'. Towards the end of the autumn, a rich ore shoot was found in a winze below the 60 and nine tributers were set to work on it, while at the same time sinking the winze to connect with the 72 fm level below. Captain Prince had no doubt gained the impression that the ground between the 60 and 72 was of great potential. There was still the problem of the incessant water, however, and in addition several men had complained of bad air in the ends of these two levels. Some tributers working in one rise (Wood's) in the 72 fm level had had to suspend work until the air had cleared. Making a connection between the two levels, to create a through-flow of air, was therefore of the utmost importance. This task was completed by early October. During November, Prince reported that the 72 fm level had been driven to the south. boundary, adjoining the Wheal Exmouth sett. Preparations were then made for men from the latter mine to commence driving from there and continuing southwards along the lodes. This task was commenced on the 9th November. The final report of the year, in December, summed up the difficulties that the company had faced in the previous twelve months when it stated that the timbermen were still engaged in securing the 40 north, before driving that level could be resumed.[30] The ground in this level had been troublesome throughout the previous couple of years; generally the ground in Wheal Adams was rather unstable apart from where there were elvan dykes, where, if anything, the miners had difficulty in cutting through the hard rock. The over-riding problem, that of soft ground, was never overcome and throughout its life, timber for roof supports was always a costly item in the Wheal Adams' accounts.

The Wheal Adams output for 1851 was down on the figure for the previous year, at 230 tons of lead ore. This was partly the result of the hold-up in the erection of the new stamps, but more fundamentally due to the increasing problems of unstable ground and erratic deposits in the mine. These two problems were, indeed, to cause the closure of the Adams sett within two years. Fortunately, however, the new Wheal Exmouth sett, on the southern extension of the Wheal Adams lodes, was just beginning to prove its worth and in 1851 recorded its first output, 230 tons of lead ore, a figure identical to that of its parent. The total output of the Adams-Exmouth group for 1851, 460 tons, represented just about all the lead ore being produced in the Teign Valley at the time. As far as the Hennock mine was concerned, although there are no records of output except for 1853, it is obvious from the reports in the *Mining Journal* that there was no significant production; the mine still seemed to be in the exploratory stage.

At Hennock there had been a small amount of development on the 20 fm level by the beginning of January 1851. About this time the adventurers decided to sink the new shaft still further, to the 30 fm level. This task was commenced immediately, it being calculated that it should be completed within three months and cost £120 in terms of labour. It was also announced that there had been a slight improvement in the lode in the 20 fm level. The drive north at this level appears to have been just about the only part of the mine working on a serious basis at this time; it was certainly the only part producing any lead. The rest of the mine was characterised in the reports by such terms as 'spots of lead' and 'strings of mundic (pyrites) with some lead', all sure signs of poverty in the ore bodies.

The idea of sinking the shaft deeper seems to have obsessed the company more and more at each meeting. At one such gathering, at the company's offices in Exeter early in the year, it had hardly been announced that the shaft was down to 30 fms under adit and development started at that level, than it was proposed that the shaft be sunk to the 50 fm level.

By mid-summer the mine appears to have been generally unchanged in its prospects. The only improvement had been in the 20 fm level, where the lode was said to be worth about £12 to £15 a fathom. Some indication of the antiquated way in which the Hennock company carried out its operations is contained in the terms commonly employed in its reports. For instance, in another report of this period the lode in the 20 fm level was estimated to be worth about 30 cwts. of lead for each 100 kibbles of ground. A kibble, or iron ore-bucket, was a rather ancient measure, representing perhaps a quarter of a ton. The use of this term, rather than the more conventional quantities of tons per fathom along the lode, suggests that perhaps the managers of the Hennock mine were not entirely up-to-date in the technology of the metal mining industry. Indeed, tucked away in its deep wooded valley, even today imbued with an undefinable sleepiness, it is possible that the ageing Captain James would have felt no sense of urgency in getting the mine into a productive state, even if he had been successful in

locating paying ore deposits. The company delayed his retirement until 1853 and so were probably equally to blame for the lack of vitality in the management of their mine.

By September work had begun on sinking the shaft below the 30 fm level and almost immediately some 'good stones of lead' were reported as being found at the bottom of the excavation. This gave the adventurers an incentive to continue sinking in search of rich deposits. At the last meeting of the year, in December, a summary of progress in the new shaft was given and it was announced that the cost of sinking from the 30 to the 40 would be £13 per fathom. At the time of the meeting the shaft was vertical from surface for 15 fms and thence to the 30 fm level it was on the underlie of the lode.[31]

Early in 1852 there was a report which seemed to confirm the wisdom of the policy of sinking deeper; lead ore was cut in the 30 fm level and was said to assay 2 tons per fathom.[32] Later in January a share quotation in the *Mining Journal* gave an indication of the limited amount of capital that had been invested at Hennock, in contrast to Wheal Adams. At Hennock, the number of shares issued was 1500, worth £3.5.0. for a £3.10.0. paid share. In contrast, as early as 1847, £40 had been paid up on each Wheal Adams share.[33] The low level of investment at Hennock did not reflect a high return from ore sales being ploughed back into the mine. Instead it indicates a very low level of activity, with a very cautious policy of exploration and investment being brought about, probably because of too conservative shareholders. However, they were perhaps correct in their caution since there turned out, in the final account, to be little or no ore of any value in the Hennock sett.

With the lode in the 20 and 30 fm levels being worth an estimated £18 per fathom, a company meeting on the 9th February 1852 decided that the best potential lay in the deeper levels. In order to work these properly the problem of drainage had to be more efficiently tackled. The old water-wheel was no longer capable of forking (draining) the mine except in relatively dry weather. So, the adventurers decided to purchase a steam engine[34] 'and an order was subsequently placed with Messrs. Nicholls Williams Foundry, of Tavistock, for a 50 inch cylinder (10' equal-beam stroke) Cornish engine. This was completed and ready for transit to the mine by August but the journey from Tavistock to Hennock presented some difficulties. Not being able to come overland (across the wild hills of Dartmoor) it was shipped via the Tavistock Canal to Morwellham and thence down the River Tamar and around the south coast of Devon to Teignmouth and up the estuary to Newton Abbot, where it was taken off the ship and hauled to the mine on a waggon.[35] It was put to work soon after its arrival, at the end of August. This was not long after the engine shaft had reached the 40 fm level.[36]

In the early months of 1852 the Hennock adventurers had turned their interest towards the mineral potential of the ground to their south. In May, two Hennock adventurers, John Daw and Henry Vatcher, both of the city of Exeter, acquired a lease from Sir Lawrence Palk for a sett on the southward continuation of the Hennock lodes. The dues were to be 1/15th

except on manganese, on which £1 of 'lawful British Money for each ton weight made ready for sale' was due.[37] The new working was called South Hennock and it was hoped that it would prove to be as rich as Wheal Exmouth was proving to the Adams adventurers. Work was started in June and by mid July the *Mining Journal* reported that the shaft had been sunk 4 fms on the lode. At this shallow depth an exploratory drive was put out two fathoms west to cut the lode. However, no sooner had these trials been made than the timber in the shaft gave way and fell in. The miners then had to sink a new shaft four fathoms further west, In the sinking of this shaft some good stones of lead were reported to have been found.[38] By the end of the month the second shaft had reached the same depth as the original, and in a drive west from the bottom more stones of lead, together with barytes, were found.[39] By August the adventurers seem to have become disheartened and, after a further report that the shaft was sinking again[40] there is no news of this site until it was revived as South Exmouth mine in 1861.

The principal effort continued at Hennock mine and by the end of October the engine shaft was down 50 fms. The 40 had been driven 6 fms north and the same distance south from the shaft, in a lode with ' .. good lead 6 inches wide',[41] At about the same time the adventurers decided to stop driving in the higher levels, that is, above the 20. They would, instead, sink the shaft further, to the 60 fm level and concentrate on the lower levels. All hope was thus put in the deposits increasing in value at depth. Early in November the 50 fm level had proved the lode to consist of quartz and white iron, with some lead, assaying 1 ton per fathom. In the level above, the 40, the lode was said to be worth £20 per fathom in the drive south. By the end of the month work was well under way in sinking the shaft below the 50. Men were also at work clearing the old adit as far as the Old Whim shaft, since it was hoped to develop the lodes in this direction.

In January 1853 the *Mining Journal* reported that the shaft was sinking in difficult ground below the 50. The old problem of very soft ground was once again being felt. The continued sinking then required extensive timbering, which was a further drain on the company's meagre resources. Consequently, at the first meeting of the new year a call of ten shillings was made on each share. At the same meeting Captain James reported that the engine shaft was down 52 fms and that he had ' .. set the engine-shaft to sink by 6 miners and 6 labourers, 10 fathoms, at £9 per fathom'.[42] This report highlights one of the principal labour problems that would have been encountered by the mines in the Teign Valley district. The area would not have had a very large indigenous population of trained miners so the companies would, in times of labour shortage, have to resort to hiring 'labourers' (perhaps of agricultural origin) who would work under the supervision of 'miners'.

At the same time the Hennock company was running into problems of another sort, legal ones. On the 13th of January 1853, Sir Lawrence Palk's Exeter solicitor, Mark Kennaway, of the firm of Kennaway and Buckingham, wrote a letter to George

Pye, the Hennock purser. It read:[43]

Exeter, 13th January
1853

Hennock Mine

Sir,
Your letter dated the 11 December was delivered at our office only this morning,

You give us notice that you will present to sample 15 tons of lead ore the produce of the above mine tomorrow morning at 10 o'clock by the canal at Kingsteignton.

We feel it is our duty to Sir L.V. Palk to protest altogether against the irregularity of this proceeding and we beg to call your attention to clauses pertinent and conditions under which your company holds this mine.

Mark Kennaway,
Kennaway and Buckingham.

One of the conditions of the lease, apparently, was that the agents of Sir Lawrence Palk should be given a period of notice of any sale of ore and this the company failed to do on this occasion. The letter is also interesting in that it gives one of the few insights into how the ores from the mines were sold. They would appear to have been dispatched, probably by waggon, to the canal port of Kingsteignton, near Newton Abbot, where they would be sampled by agents of the smelting companies. After a price was fixed for each batch, or 'parcel', of ore, according to its valuation, then it would be shipped in small sailing vessels, down the estuary of the Teign, round into the English Channel, around Land's End and up the Bristol Channel to one of the South Wales ports, like Swansea or Llanelli, where the smelting firms were located.

At Hennock the sinking of the engine shaft continued at a painfully slow rate and by February 7th it was only down 53 fms. Problems of all kinds seemed to be mounting up against the adventurers and by the beginning of March Captain James reported that severe frost and snow had seriously hindered dressing operations at surface. At the same time, it had been necessary to put in new pitwork in the shaft (to improve the pumping operations) and so little other work had been done underground. The situation in general failed to improve during the rest of March, with the exceptionally bad weather retarding the milling operations. The engine shaft was now sinking in hard elvan and down 54½ fms.

A quite comprehensive report on the mine appeared in the *Mining Journal* a few weeks later.[44] The engine shaft was

down 56 fms and the lode in the 40 was reported as five feet wide, although there was no indication of its composition. All the difficulties in the mine culminated in the breaking of the crown wheel of the drawing machine on the Monday before the report appeared. As this effectively stopped the whole work of the mine, the Captain immediately rushed off to Tavistock to order another from Messrs. Nicholls Williams, who had supplied most of the mine's machinery. It was hoped that a strong replacement would be supplied, as the old one had been threatening to break for some time. While the drawing engine was out of action the men sinking the engine shaft had been using the now abandoned 50 fm drive north to dump the waste they were taking from their excavation; no delay was going to be tolerated in reaching the 60 fm level.

With the coming of spring the situation in general seemed to improve. By April 25th the engine shaft was finally down 60 fms and driving had commenced at that level by six tributers. According to the *Mining Journal* all hopes were pinned on this level proving some good deposits. Despite this progress, various small problems continued to hinder the miners; at the beginning of May the *Mining Journal* reported that the men were having difficulties with foul air in a winze under the 40 fm south, which had to be abandoned temporarily as a result. Also, Captain James reported, 'In consequence of so many men having left, we are at present several short in the different bargains'.[45] So, Hennock mine was now experiencing a labour shortage, and the recruitment of unskilled 'labourers' could do little to effectively bridge the gap.

The mood of a meeting held at the mine, in June, was that progress had been unsatisfactory. As a result there was a proposal that Captain James be retired and a new mine agent engaged immediately. This motion was passed and so the aged Captain, long associated with the mine, at last passed from the scene. At the same meeting it was considered necessary to make a further call of five shillings per share. It was reported that the total calls to date had been £8817.15.0. and the cash expenditure £8312.10.1. The sale of lead ore since operations had commenced had realised £232, leaving £737.4.11. to the credit of the company.[46] This output of lead ore appears minimal; something less than 20 tons at prevailing prices for ore. The surprising thing is that the Hennock adventurers wished to continue operations given their singular lack of success. However, there was a slight improvement in the price of pig lead in 1853; from £17.15.0. a ton in 1852, it rose to an average £23.8.0, a ton in the following year. Also, the Hennock adventurers could see to the north, at Wheal Adams and Wheal Exmouth, that other sections of the Teign Valley lode system were proving rich at depth. Encouraged by such persistently optimistic thoughts, they continued to pay the calls on their shares, hoping for better things.

On the 20th April George Pye, the Hennock purser, received another letter from the solicitor Mark Kennaway. This time, the mine had apparently diverted a water-course supplying Franklyn farm, and the tenant had complained to Sir Lawrence Palk. In his letter Kennaway suggested that the company should replace

the water supply, a task which would cost about £50.[47]

Soon after the company meeting at the end of April a new mine captain was engaged, Henry Rickard. His first report appeared in the *Mining Journal* the following month. In it he stated that the lode was hard in the 60 fm level and that he had six men driving on it at each end, north and south. He continued by complaining about the continuing shortage of labour: 'We could at present employ 20 men more to carry out the necessary operations of the mine, but not a man is to be had anywhere.'[48] Two weeks later he was complaining again, this time of the foul air in the 40 which was once again causing the suspension of working in most of that level. On 22nd August Captain Rickard reported that he was making preparations for placing an air-machine in the 40 to help with ventilation. This attempt to improve the underground air-flow was badly needed; by August 29th the bad air had spread to the 50 fm level, where it was holding up work such that only four men could work there at anyone time.

At the next meeting, held on September 12th, Captain Rickard was able to report that 'our air-machine is made complete, and we are in a position to put it in, and to commence the driving of the 40, if we can get men'. However, this better news was somewhat dulled by the announcement of a further call of 6s. per share. Despite the greater spirit with which the mine appeared to be working after the arrival of Captain Rickard, the costs were still mounting. On November 28th 1853, Rickard reported that the South Whim Shaft was idle for want of horses to draw the whim, although he hoped to obtain some animals by the end of the week. The last report of the year ended on an optimistic note; the lode in the 60 was said to be considerably improved, consisting of ' .. soft strings of mundic and prian, with spots of lead'.[49] However, the official returns of output, recorded in the *Mineral Statistics* of the United Kingdom for 1853, show sales of only 29 tons of lead ore and 36 oz. of silver.

In contrast to the mixed fortunes of the Hennock company during 1852 and 1853, this period saw the confirmation of Wheal Exmouth as a profitable mine. Early in the year it was reported that the lode in Wheal Adams had cut rich in both the 60 and 72 fm. levels.[50] This followed, later in the spring of 1852, by the news that Wheal Exmouth and Wheal Adams were to be amalgamated. Until then the two mines had been worked as one in all but name, having the same management and all the Exmouth ores being concentrated at the Wheal Adams mill. The following week came the announcement that the lode at Wheal Exmouth was worth £70 per fathom. One week after that came the news that 150 tons of ore had been sampled from the new mine.

Drainage had always been a problem at Wheal Adams and now, with the workings spreading out rapidly to the south, the difficulties were becoming greater. However, back in 1848 the company had been foresighted enough to commence driving an adit from the banks of the River Teign up to the workings. Driving through soft ground, this difficult task took until mid-1852 to complete. When finished, this 1,662 foot long adit made a considerable difference to drainage, connecting to the Wheal Adams workings below the 50 fm level and to the

Exmouth workings at about 25 fms from surface.

In 1852 output of lead ore from Wheal Exmouth was 634 tons together with 2,500 oz. of silver, while that at Wheal Adams was clearly declining, down to 70 tons of lead ore, with 680 oz. of silver. Despite the growing poverty of the deposits in the older of the two mines the adventurers were encouraged by the reports from Wheal Exmouth which indicated good lead and silver. During 1852 two unusual minerals were reported in the Wheal Adams lodes, cobalt and nickel, although neither proved of any economic significance.

Eighteen fifty-two was generally a year of great activity and optimism in the mines of the Teign Valley. Describing this area, the *Mining Journal* said: 'This district becomes more important daily. Six steam engines are now at work upon the same lode, and the buildings for the seventh commenced. From south to north, for an extent of five miles, active operations are going on upon the great lead course, and all the mines held by wealthy companies. The Exmouth and Adams are turning out good quantities of lead ore; and as these mines have been purchased by the present companies of wealthy individuals, who worked them as private concerns, little is known of them; but it is to be hoped the sales of ore will be made public in future. This is certainly most desirable, as information to those who wish to invest capital, as well as to give a fair opportunity to anyone who may, from time to time, desire to realise … The practice on the part of some landlords of demanding considerable premiums to setts upon this lode (and which was assented to in some cases) we are happy to add, is discontinued, now that they find "bona fide" mining is the rule of the neighbourhood.'[51]

Eighteen fifty-three saw a sudden increase in the price of lead and with it a great increase in mining activity, overtaking the previous year in terms of the mining speculators' optimism. The early months of the year saw an attempt by the Exmouth-Adams adventurers to re-open the old lead mine at Newton St Cyres. This mine, located to the south of the manganese workings in Newton St Cyres, was first worked by John Gullett in about 1787, according to Lysons in his Magna Britannia, but was ' .. abandoned after a trial of five or six years.' It had been reworked in a small way between 1823 and 1824. The Wheal Exmouth shareholders, encouraged by the rising price of lead and the success of their own mine, were persuaded to finance the re-working of 1853. Thus the circle of mining activity had turned full back upon itself; the mines in the Newton St Cyres area had expanded and provided the stimulus for the spread of mining to the Teign Valley at the beginning. of the nineteenth century – now the offspring was promoting the revival of the moribund parent. Two new shafts sunk at Newton St Cyres were named after May and Bidwell, the purser and secretary of the Exmouth company, and joint promoters of the scheme. The mine captain of the new working was W.P. Nicholls, perhaps a relative of J.P. Nicholls who worked later as captain of Frank Mills and of South Exmouth. Lead deposits at Newton St Cyres appear to have been sporadic, however. Apart from the news that Captain W.P. Nicholls had fallen down a shaft

and killed himself[52] there is little further information on progress at this mine to the north of the Teign Valley. According to Dines[53] it is doubtful whether it ever came into production, although it was still possible as late as about 1972 to find small pieces of silver-bearing lead in the dumps around this site.

At about the same time that Messrs. May and Bidwell were interesting themselves with defunct lead mines to the north, other Wheal Exmouth shareholders were looking at the possibilities within the Teign Valley for opening a new mine. Their suggestion was that they obtain a lease for a sett to the south of the Wheal Exmouth workings. In due course they applied to Lord Exmouth and during the year obtained a sett running along the strike of the lodes, north from Hyner Bridge to the southern boundary of the Wheal Exmouth sett.[54] The lease was for 21 years from 1853 and the dues were to be 1/13th on all ores raised.[55] The new working was to be called Frank Mills, according to the Post Office Directory of Devon for 1866, in honour of one of the leading Wheal Exmouth adventurers, Mr Frank Mills.

Work started during the summer of 1853 sinking a shaft next to the road beyond Hyner Farm. There had been a small trial somewhere in this vicinity about ten years previously (see p2.) but little had apparently become of this. For this reason the new sett was still in essence virgin ground. The following two years of development at Frank Mills saw few dramatic discoveries; as became clear in subsequent years, there were few ore deposits of value less than about 40 fms from surface where the original shaft was sunk. However, by 1856, the persistence of the company was rewarded and the original decision to take up the new sett was vindicated.

Some time towards the end of 1852 John Prince had been replaced as mine captain of Exmouth and Adams by Captain Martyn. However, Prince remained in the district and obtained a new post as Lord Exmouth's agent, utilising his extensive knowledge of the mines on the estate. At the beginning of 1853, in his new capacity, John Prince prepared a report on Wheal Adams for the mineral lord. This report was yet another indication of the declining fortunes of the old mine. It had now reached its greatest depth and virtually its greatest extent and, rather sadly perhaps, Prince had to conclude that its days were numbered. The centre of gravity had now shifted southwards to the newer Wheal Exmouth, now producing the bulk of the group's output of lead-silver ore. Prince's report, summing up the poor position of Wheal Adams, appeared subsequently in the *Mining Journal*:[56]

> 'Agreeably with your express demands, I have again inspected this mine (Wheal Adams), and regret to inform you that the principal operations are suspended, and the mine all but abandoned. There were but two persons working at surface, and only a small number underground, and these were confined to stoping the back of the 85 fm

level on a tribute of £5 per ton of dressed ore. No level is being driven or ground proved in any other part of the mine. I am at a loss to conceive why the workings at the north mine should be stopped (i.e. the Adams North Shaft workings), and the pumps drawn up, because the ground to prove, to which the horizontal rods were fixed, and the shaft sunk to the 40 fm. level has not been driven through, nor the shoot of ore gone down in the adit level reached, so that the cost of erecting the machinery, sinking the shaft, and merely cross-cutting the lode is entirely thrown away. Moreover, the little engine which would drain this part of the mine to a depth of 60 fms would evidently assist the, larger one, which is not of sufficient power to keep down the present coming water, the 85 fm level being inundated, and no ore can be brought to surface. To attempt to sink the engine shaft below the 85 would be preposterous, nor do I believe that the present company ever intended doing it. You may, therefore, calculate that as soon as the ore ground now standing between the 85 and 72 fm levels is taken away, the present company will cease to work Wheal Adams, for every practical man who has visited the district, and paid the least attention to the strata through which the lodes traverse, will agree with me, that unless the north part of the sett proves productive (and this cannot be known without a trial), it would be useless to prosecute the mine in any other part. In my last report, published in the *Mining Journal*, I called your attention to the nickel and cobalt existing in the 72 fm level, as also on the quantity of copper ores standing in the backs of the upper levels, on which I find no trials have been made. Since that time, however, the price of copper has risen very considerably, so has the price of spelter; and as considerable quantities of the oxide of copper and of the sulphuret of zinc, accompanied by each other, exist in the mine, both of which might now be profitably raised, I am not a little surprised that nothing whatever is being done in this department. The agent being engaged elsewhere during my last two visits to the mine, no one was present to afford me the least information respecting the abandonment of the north part of it, and the almost cessation of that of the south, nor anything touching the copper, blende, nickel or cobalt. Jan. 8th. 1853.'

During the first few weeks of 1853 the Exmouth-Adams group as a whole was experiencing difficulties in the form of unusually severe weather. Heavy rainfall lasting for a few weeks after Christmas 1852 led to several of the levels being flooded. On 15th January, Captain Martyn complained that '.. the extraordinary wet season has been much against us. We have a good lode in the 85, about the boundary winze, but we can do but little to it;

also, in our 20 end south we have a very promising lode, which we cannot touch, being now, and for some time past, under water.'[57] As late as 12th February, Martyn reported that ' .. in consequence of the continued floods of rain, from which nearly all mines have suffered, the best part of this mine, namely the 85 fm. level, the 20 under adit, or 50 fm level, and the adit end south, have not been seen since the last general meeting .. '[58]

With the general move in the centre of gravity southwards, with Wheal Exmouth superseding Wheal Adams, the adventurers decided at about this time to concentrate the major part of their development activity at the former mine. Towards the end of 1852 they decided to sink a new vertical shaft to open up the Wheal Exmouth workings, now rapidly spreading southwards. However, the main lode at the centre of the Exmouth workings passed through Lord Exmouth's estate only a matter of yards in front of the drawing room windows of Canonteign House. Lord Exmouth refused to permit a shaft to be sunk directly in front of his house. Instead, he offered a site just outside his parkland, the other side of the road, near the old Canonteign Barton (the original Tudor manor house). This offer provided a site that was as near as possible to the lode in the circumstances. In consideration of the proximity of Lord Exmouth's estate and house, the mine adventurers agreed to conditions that they build the engine-house, stack and other buildings in an ornamented style, with castellated turrets. In his report to the company meeting of 1st February 1853, Captain Martyn reported that 'Lord Exmouth has offered a most eligible site for the erection of an engine, and the sinking of a shaft; I strongly recommend your commencing this work as speedily as possible, as I have no doubt, when this is done, and the work referred to above[59] completed, your returns and profits will prove that you have one of the most valuable and permanent mines in the country'.[60] He went on to state that he thought that the lode would be found richer in depth and in going southwards, an opinion that was borne out by later experience. At the Exmouth and Adams quarterly meeting on 1st February, held at the mine, with W. Porter Esq. in the chair, a summary of the accounts was given:

	£.	s.	d.
Cash in hand at last meeting:	1070	0	0
Ore sold:	1364	5	0
	2434	5	0
By cost sheet:			
½ month to Nov. 13th:	254	12	10
½ month to Dec. 11th:	600	6	3
Coal and iron:	158	13	6
Rent and damage of land, paid to Ld. Exmouth:	55	13	11
Deposit on 47 yds paid to do:	35	5	0
Dues (1/13th on £1364.5.0.):	104	18	10
Leaving balance in favour of adventurers:	1224	14	8

The meeting approved Captain Martyn's report and the quarterly accounts and then moved on to a proposal that a special general meeting be convened at 12 noon on February 22nd to determine on the proprietary of at once sinking a shaft and erecting an engine in the spot of ground proposed to be granted by Lord Exmouth. This special meeting would also decide on the proprietary of issuing new shares, or of making a call, to pay for such work. Finally, Messrs. Porter, Woodman, Hartnell, Ware, Glover, Pearse and Head were appointed to committee of management for the next two months.[61]

At the special meeting on 22nd February the number of shares was increased from 4,280 to 5,136, of £5 each, to provide extra capital. It was also decided to purchase a pumping engine for the new shaft, an order being placed with Mare and Co. of Plymouth for a 70 inch, at an estimated cost of £2,552.[62]

The bad weather continued throughout February and on the 19th Captain Martyn reported that all the ores dressed had been weighed off, amounting to over 36 tons, but that ' .. many more tons would have been dressed but for the weather. At Wheal Adams .. the tributers' ores are covered with snow, and hard to estimate .. '.[63] However, by 5th March, Captain Martyn's report indicated a much improved situation: 'The dressing operations, which were checked by the frost, have been resumed, and we have now 60 tons of lead and 20 tons of copper dressed towards the next sampling, on the 22nd inst. We are making every preparation to have the launders and pipes to carry the water out at adit ready for fixing on the 12th inst., our setting-day; when this is completed, we hope, in addition to the gain of power for the engine, that the mine will always be dry, and enable us to work the lower levels. The new engine shaft is set to sink 10 fms at £5 per fm, to be completed by the second Saturday in April; it is now down 2 fms. The new shaft will be of immense benefit to the mine, and enable us to work the lower levels etc. at half the present price.'[64]

During March 1853 Captain Martyn resigned his post as mine-agent, to go to Bridford mine, and while waiting for the vacancy to be filled the job of issuing reports was undertaken jointly by Messrs. May and Bidwell. One of their reports appeared in the *Mining Journal* of 19th March, stating that ' .. considerable alterations have been made in the pitwork at the old engine shaft, by which the load on the engine is lessened, and she will be able to keep the lower levels dry, so that they may be worked; these levels are the most productive part of the mine, but have not been seen for the last four months'.[65] This same report then went on to describe the scene as the turf was cut in the traditional manner, on March 12th, at the top of the new engine shaft at Canonteign. It was christened Porter's Shaft, in honour of the company chairman.

The *Mining Journal* reported that the ceremony was attended by great festivities in all the neighbourhood, as the mines now no doubt represented a source of employment and prosperity to the general population in the area. All the merry-making culminated in the ceremony at the shaft-head. On that sunny Saturday morning, the 12th March 1853, the company chairman,

William Porter, in the presence of the committee and the whole of the men employed in the mines, to the number of about 150, were assembled on the piece of ground granted by Lord Exmouth for the new shaft. The chairman, before performing the usual ceremony of breaking a bottle of wine and letting it run over the shaft-head, addressed the assembled miners. He stressed the importance of taking advantage of the present opportunity, when wages were good, to lay a little by for the time of need, and informed them that while, on the one hand, it was the desire of the committee and managers that they should be treated fairly and liberally, it was their duty to attend to the interests of their employers by constant and steady attention to their work. More particularly, it was their duty to conduct themselves respectfully, and in order to do this he would strongly advise them to avoid frequenting the public house, where too often men wasted their substance and their energies, instead of providing for the wants of themselves or their families. The committee and a few friends thereupon retired to the King's Inn and dined there, while the men were ' .. regaled with bread and cheese and ale by the liberality of the chairman'.

By the beginning of April a new agent had been appointed, Captain James Hampton. His first report, on the 23rd April, stated that underground communication between Exmouth and Adams had been completed. The Wheal Exmouth workings were less extensive than the Adams ones at this stage, but he considered them more promising. Hampton's report even managed to sound more optimistic about the position at Wheal Adams than had that of Captain Prince earlier in the year.

The work at Porter's Shaft was proceeding at great speed and by the 14th May was down 16½ fms in good ground. The water and excavated rock was being drawn up by a whim, erected for the purpose, and said to be kept at work day and night. Building of the engine house had started, employing skilled stone-masons. The shaft continued sinking well during the following months, probably because it was situated well away from the weak ground around the lode. By the 25th June it was down 25 fms. Soon after a dividend of 2s.6d. per share was declared and all seemed to be going well for the adventurers. On the 10th September 1853 Captain Hampton reported ' .. some of the pitches are improved, and the average tribute next Saturday will be the least it has ever been before'.[66] This expected low tribute rate gave an indication that the ore was expected to be of very good quality.

At the next company meeting, held on 8th October, it was announced that the lodes had continued rich in Wheal Exmouth and a further dividend of 2s.6d. a share was declared. The sales of ore for the quarter had realised £2,085.0.0. By the 22nd October the cylinder and case for the new engine were reported as on their way to the mine from Plymouth. The walls of the engine house were nearing completion and the stack being built. The new shaft was now down 40 fms although the ground was proving somewhat harder, so progress was slower. In the rest of the mine, tributers were raising ore faster than could be

taken away or dressed, so a couple of pitches were temporarily stopped (ones on high tribute). Captain Hampton reported that it might be necessary to suspend one or two more before the next setting day. He also reported that, in general, the tributers were doing well, making wages of between 45s and 50s per ton.[67]

One problem was that the output of Wheal Exmouth had expanded more rapidly than was probably expected. The two major tasks of sinking Porter's Shaft, to provide access to the workings, and of expanding the dressing floors were made more urgent. It is likely that these bottlenecks in the production process led to a slower growth of sales that year. The 1853 output, 726 tons of lead ore, was only 22 tons more than the combined Adams-Exmouth output of the previous year, despite the lodes having improved dramatically. The new dressing floors were available by the following year and, with some of the bottlenecks eliminated, output rose to 1,140 tons.

The last meeting of 1853 was held on the mine on the 8th December. Porter's Shaft was reported as 44 fms from surface in very good ground. Also reported was a small patch of rich ore in the 85 fm. level, near Williams' Shaft in Wheal Adams, producing about 2½ tons of lead ore per fathom. This was then the only rich patch in Wheal Adams and was, in any event, nearly up to the boundary with Wheal Exmouth. The clear indication was that future developments should be to the south, in Wheal Exmouth. The accounts for the quarter were given, comparing very favourably with those for the beginning of the year:

	£.	s.	d.
Balance from last account:	1769	14	0
Ore sold:	2362	10	0
	4132	4	0
Mine costs for 3 months:	1165	6	3
Merchants' bills for 3 months:	249	4	1
Horse:	14	0	0
Banker's commission:	43	12	9
Dues:	177	11	6
Div. 2/6 per share:	535	0	0
Leaving balance:	1947	9	5

The item 'Horse' probably refers to the purchase of an animal to work one of the whims on the mine.

There is little information on the way in which the ores from Wheal Exmouth and the other Teign Valley mines were sold at this time, although it is certain that the greater part, if not all, would have been disposed of by the traditional method of 'ticketing', that is, an auction at which the lead-smelting companies would make offers for parcels of ore on the basis of sample assays. Records of some parcels of ore from Wheal Adams and Exmouth, and later from Frank Mills, which were sold by ticketing to smelters in South Wales have been preserved in the

ledgers of R.J. Nevill and Company of Llanelly.[68] These records show that R.J. Nevill purchased parcels of ore from Wheal Adams on 20th February 1852, from Wheal Exmouth between 19th January and 17th June 1852, and from 'Wheal Exmouth and Adams United Mines' between January 22nd and June 17th 1853. In 1856, the firm of R.J. Nevill made further purchases of Teign Valley ore for smelting; from Wheal Exmouth between 7th July and 8th December, and from 'Wheal Frank Mills Mine, Christow' between 6th August and 9th December 1856. J. Provis, writing on the silver-lead ores of Devon and Cornwall in 1874,[69] noted that Wheal Exmouth produced two grades of ore for sale: No.1, containing 82.5 percent lead and 11.75 oz. per ton of silver, and No.2, with 47 percent lead and 9 oz. per ton of silver. Most Teign Valley silver-lead ores appear to have been shipped to South Wales from the port of Teignmouth, about 14 miles by road from the mines.

Early in 1854 the new steam engine was put to work on Porter's Shaft, still sinking through good ground. This engine, a 70 inch cylinder, 12 foot (equal-beam) stroke model, designed by Hocking and Loam, was built by the J.E. Mare and Co. foundry of Plymouth and apparently had a reputation as an excellent piece of workmanship, destined for quite a long working life. At the same time the general layout at the shaft-head was being completed. In addition to the 70 inch pumping engine, there was a 22 inch (9 foot by 7 foot stroke) whim engine, built by the Perran Foundry of Cornwall, a 22 inch stamps and a 24 inch engine driving a crushing machine. The 22 inch stamps engine was purchased second-hand from the then defunct South Devon atmospheric railway. Until September 1847, when this experiment in pneumatic railways ceased operations, the 22 inch engine was one of a number operating in the pumping towers stretched along the coastal line between Exeter, Dawlish, Newton Abbot and Totnes. All of the engine houses at Wheal Exmouth were constructed in an ornamented style. Of the one housing the main engine, the 70 inch, the *Mining Journal* said that this ' .. castellated engine house probably is) the handsomest building of its kind in England'.[70]

In January 1854 a trial was made of a new type of rock-crusher, a Berdan machine, originating in the American gold fields after the 1848-49 rushes. One of these crushers, obviously seeking a market in British mines, was brought to Wheal Exmouth and attached to a drive from the 24 inch engine after which, according to the *Mining Journal* correspondent,[71] a rather surprising result was obtained. An assay of material produced from crushing some of the Wheal Exmouth gossan (waste quartz-iron rock) suggested a gold content of 1 oz. to the ton. Either the result was a fluke or was contrived since there is no further mention of either gold or the gold-producing machine in the *Mining Journal* or company reports.

Throughout 1854 there was a steady production of lead ore, mainly from Wheal Exmouth. The level of activity at Wheal Adams was very limited, consisting mainly of essential operations like pumping. Indeed, as a footnote to the figure of output from 'Huel Adams and Huel Exmouth United' for 1854, the *Mineral Statistics* states: 'Return exclusively from Huel Exmouth, Huel

Adams not having produced any in 1854.' At Wheal Exmouth, Porter's Shaft continued sinking, although at a slightly slower rate because of poorer ground. It was hoped that some communication could be made between it and the Exmouth workings as soon as possible, it proving very difficult and time-consuming to work the expanding levels to the south from Williams' Shaft. The year's output was one source of satisfaction to the shareholders; the other was the rising price of their shares, £9.5.0. for a £4.18.0. paid one.[72]

The story at Hennock mine was a very different one. The first *Mining Journal* of 1854 reported ' .. only spots of lead .. ' in the 60 fm. Level,[73] the level on which the shareholders' hopes were largely pinned. At the beginning of February it was reported that 6 tons of ore were dressed and ready for sale.[74] If this represented the mine's output for January 1854, as seems likely, then the annual production level of the time could not have exceeded about 70 tons. This compares very unfavourably with that of Wheal Exmouth, and could hardly have begun to meet the costs at the Hennock mine. Evidently the results in the 60 fm. level disheartened the adventurers and the engine shaft was not sunk any more. In April the *Mining Journal* reported that the pitwork was being taken up from the 60 to the 50 fm level, in preparation for abandoning the lower one.[75]

In May, it seems that there were rumours flying around about the possible closure of the mine. On the 11th of that month, the solicitor Mark Kennaway wrote to George Pye, the Hennock purser, expressing concern over these rumours. He said: 'I trust you will not take any steps in proceeding to the sale of the machinery belonging to this mine until the value of the land taken and injuries shall have been ascertained and paid for in accordance with the terms of the sett.'[76] The following month Kennaway again wrote to Pye and suggested a figure of £250 would be sufficient as compensation for damage. Payment of such a figure would have been a severe burden on the already strained finances of the Hennock company, but for one reason or another the mine did not close at this time, managing to struggle on through the rest of the year.

It seems the company had one last attempt to locate some worthwhile deposits, deciding to try the ground to the south of where operations had hitherto been conducted. They continued driving the adit south and by July the *Mining Journal* reported that they had cut 'barytes with stones of lead' in the end.[77] At about the same time it was decided to sink a completely new shaft, to the south of the engine shaft, near Franklands farmhouse. This was necessitated by the unstable condition of the old engine shaft, which required constant heavy timbering. In this new shaft, called Palk's Shaft perhaps in an attempt to appease their disgruntled landlord, the Hennock adventurers had the double-edged hope of locating some new, rich deposits and at the same time obtaining a more secure shaft. The need for a new shaft was underlined when, no sooner than the new one had reached 10 fms. from surface, the old one collapsed, rendering the lower levels completely inaccessible. The pumps and pitwork that could be salvaged were drawn up and work on Palk's Shaft received greater priority.[78] By December 1854

it was down 30 fms to adit level, but the two hopes had been largely shattered; the ground in the new shaft appeared to be hardly any more secure than in the old one and no new deposits had been located.

If this news was not enough on its own to dishearten the Hennock shareholders, there was also the growing tension between the mining company and the landowner, Lord Palk. This was expressed in the increasingly vitriolic correspondence from Palk's legal agent, Mark Kennaway. In particular, Kennaway had cause to complain about the sinking of the new shaft which, it seems, had caused some inconvenience to the tenants of Franklands farm. On the 18th August 1854, Kennaway wrote, what was for him, an unusually long letter to George Pye:[79]

Exeter, 18th August 1854

Dear Sir,
I lately visited Franklyn Farm where you are working the Hennock Mine in lands of Sir Lawrence Palk occupied by Mr Loveys and I assure you I never saw such unnecessary injury created in any case of mining in which I have been concerned.

The captain required to remove the surface soil for a building he wishes to erect and he has carted the same a considerable distance to an adjoining field where it is no use whatever to the tennent, instead of throwing it out in the field where he takes it up and close to the spot where he is excavating.

He has also thrown the soil from the adit he is driving in such a manner and at such a place as to block the already formed road of access to the other fields of the farm, and it will now be absolutely necessary to form a new roadway for a considerable distance in substitution of that which has been impeded and which might have been kept open without the least inconvenience to the mining.

The captain also allowed his men to use and divert the water stream (which flows through the same field and supplies the farmer's family and cattle) in such a manner as to render it useless to both. And I must require your company immediately to cover in the whole water stream to the house or I shall direct the same to be done and charge your company with the costs, as the continuing to render the water unusable would occasion the company very heavy damages indeed.

I beg immediately that you will enter into an arrangement with me for the damage already sustained and the costs to be incurred in drawing back the soil where the same can be used by the farmer and in making a new road and other damages for breaking down the hedges and not protecting the fields by gates.

I beg your early attention and remain
Dear Sir, yours faithfully,
Mark Kennaway.

To: George Pye Esq.

Faced by these problems, the Hennock adventurers grew more dispirited and the inevitable happened. The *Mining Journal* of January 13th 1855 reported that preparations for stopping the mine were in hand. The number of enginemen was reduced to two, saving about £3.3.0. a month. It seems that even at this late stage there were hopes of avoiding a complete stoppage, as often happened in mines on the verge of failure. Sale of the machinery had originally been planned for April but was postponed at the last moment, perhaps in a last-ditch attempt to revive the company or, as is more likely, to sell it as a going concern. However, the sale of the plant was re-advertised in June, the items offered including, amongst other things, a 50 inch cylinder engine, 38 foot and 18 foot water-wheels and a large quantity of timber and pit-work. With the disposal of these items the Hennock mining company passed into final obscurity. Indifferently managed and dogged by bad luck, it gradually passed from the memories of those in the valley, its workers perhaps being fortunate enough to obtain employment in Wheal Exmouth or Frank Mills. Captain Henry Rickard was later heard of, managing the New Wheal Martha mine, at Stoke Climsland in Cornwall, in 1864.[80]

Eighteen fifty-five marked something of a turning point in the history of metal mining in the Teign Valley. From that year the new Frank Mills mine expanded rapidly, just as Wheal Exmouth entered its period of greatest prosperity. Hennock mine had closed, not to reappear, but had shown little real promise at any stage in its uncertain life (or more accurately, lives). Overall, the stage could be said to be set for a period of relative prosperity, with output levels of silver-lead ore rising year after year to reach previously unattained peaks, with rising employment of miners and a general spirit of optimism amongst the investors and managers of the companies. For the years between 1855 and the late 1860s, it is particularly in this psychological sense that it is possible to use the label 'the period of prosperity', since ultimately all mining fields must die through the systematic exploitation of the finite mineral deposits with which they are endowed by nature.

Footnotes:

(1) *MJ* 1842, p204.
(2) Christow tithe apportionments, DCRO.
(3) *MJ* 1850, 27th July; 1852 p375.
(4) *MJ* 1844, 9th November.
(5) *MJ* 1844, 14th September.
(6) *MJ* 1844, 9th November.
(7) All figures of output taken from Robert Hunt (ed) *Mineral Statistics of the United Kingdom*. See statistical appendices.
(8) *MJ* 1846, p446.

(9) *MJ* 1846, p504.
(10) *MJ* 1846, p527.
(11) *MJ* 1846, p539 and *Mineral Statistics* (1846).
(12) Ramsden MSS. Also see H.G. Dines, *The Metalliferous Mining Region of South-West England* (1956), p754.
(13) Ramsden MSS.
(14) *MJ* 1847, p196.
(15) *MJ* 1848, p4.
(16) *MJ* 1850, 27th July.
(17) ibid.
(18) ibid.
(19) *MJ* 1850, p88.
(20) Dines (1956), p742.
(21) *MJ* 1850, p340.
(22) D.B. Barton, *The Cornish Beam Engine* (1966), p174. Such ornamental iron railings were visible around at least one open shaft into the Wheal Exmouth workings on the Canonteign estate, as recently as about 1973.
(23) *MJ* 1850, p486.
(24) *MJ* 1851, p5.
(25) *MJ* 1851, p17.
(26) *MJ* 185 1, p 29.
(27) *MJ* 1851, p41.
(28) *MJ* 185 1, p 5 2.
(29) *MJ* 1851, p64.
(30) *MJ* 1851, p309.
(31) *MJ* 1851, p602.
(32) *MJ* 1852, p7.
(33) See p27.
(34) *MJ* 1852, p74.
(35) Barton (1966), p124.
(36) *MJ* 1852, p307.
(37) DCRO.
(38) *MJ* 1852, p185.
(39) *MJ* 1852, p209.
(40) *MJ* 1852, p307.
(41) *MJ* 1852, p388.
(42) *MJ* 1853, p63.
(43) Mining Letter Book of Mark Kennaway, Solicitor, on behalf of Sir L.V. Palk, 1851-59, ECRO 58/9/Box 143.
(44) *MJ* 1853, p130.
(45) *MJ* 1853, p178.
(46) *MJ* 1853, p308.
(47) Mining Letter Book, ECRO.
(48) *MJ* 1853, p320.

(49) *MJ* 1853, p814.
(50) *MJ* 1852, p223.
(51) *MJ* 1852, p375.
(52) *MJ* 1853, p542.
(53) Dines (1956), p754.
(54) Ramsden MSS.
(55) *Post Office Directory of Devon* (1866), p695.
(56) *MJ* 185 3, p21.
(57) *MJ* 1853, p32.
(58) *MJ* 1853, p90.

(59) That is, sinking a shaft and proving the ground to the north of Wheal Adams. it seems that Martyn was a newcomer to the district and knew little of the previous attempts there.
(60) *MJ* 1853, p90.
(61) *MJ* 1853, p92.
(62) *MJ* 1853, p132.
(63) *MJ* 1853, p107.
(64) *MJ* 185 3, p131.
(65) *MJ* 1853, p163.
(66) *MJ* 1853, p559.
(67) *MJ* 1853, p662.
(68) Nevill Druce MSS, National Library of Wales, Aberystwyth; items 1311-15, 1469-77, 2187-90.
(69) J. Provis, 'On the Lead Ores of Cornwall' Reports of the Miners' *Assoc. of Cornwall and Devon*, (1874), p70.
(70) Cited by Barton (1966), p174.
(71) *MJ* 1854, p25. On the Berdan crusher, see J.B. Richardson, Metal Mining (1974), pp22-3.
(72) *MJ* 1854, p158.
(73) *MJ* 1854, p6.
(74) *MJ* 1854, p54.
(75) *MJ* 1854, p222.
(76) Mining Letter Book, ECRO.
(77) *MJ* 1854, p394.
(78) *MJ* 1854, p666.
(79) Mining Letter Book, ECRO.
(80) T. Spargo, *The Mines of Cornwall and Devon* (1868). Reprinted as The Mines of East Cornwall (Barton, 1961), p12. There is also a possibility that Rickard was engaged in prospecting for calamine (zinc carbonate) near Shipham, in the Mendip Hills of Somerset in 1870, when a visitor noted such a man, ' .. a native of Redruth .. ', at work. See C.J. Schmitz, 'An Account of Mendip Calamine Mining in the Early 1870s' *Proceedings of the Somerset*

Archaeological and Natural History Society CXX 1976, pp 81-3. Although Rickard was not an entirely uncommon name in Cornish and Devon mining circles in the 19th century, if the Mendip Rickard was the same as the Hennock manager, then in the 1860s he had had quite a varied career, apart from his period at New Wheal Martha; the 1870 visitor to the Mendip mines noted that his Captain Rickard had recently been working in the zinc mines of Sardinia.

CHAPTER FOUR

Prosperity

The age of prosperity was ushered in, rather oddly, with the failure of the ailing Hennock company. Also failing at the same time was the Birch Ellers mine, in the north of the Teign Valley, near the village of Bridford. Ramsden[1] believed that the two mines were under the same management. In addition to this possible connection, a writer in the *Mining Journal* commented that both workings were equally badly sited.[2] Birch Ellers was probably at a greater disadvantage, being about 11 miles from the nearest port, Newton Abbot, with a correspondingly higher cost for the haulage of materials.

The northernmost part of the Teign Valley lode system was never very productive of lead ore. The two most significant mines working on it, during the early 1850s, were Birch Ellers and Bridford Consols. There had been attempts to locate lead deposits in Bridford parish as early as 1835, when the local vicar, the Rev. Carrington, noted in his diary (now a MS in the Exeter City Records Office) that there was great activity by miners in the vicinity of Stone, Southwood and Venn farms, sites close to the later workings of Bridford mine. This search was, however, without any apparent success. In 1847 there was another short-lived attempt in the same locality, when the 'Wheal Ann Copper, Tin and Silver-Lead Mining Company' commenced operations. With hindsight this title suggests either great optimism or stupidity on the part of the promoters, since this combination of minerals is rarely, if ever, found in conjunction. After some months of spirited activity, according to the *Mining Journal*, looking for ' .. the great lead lode, which runs through this set about half a mile to the north of the great barytes lode .. ' operations seem to have ceased without locating the sought-for deposits. As with later attempts, the Wheal Ann adventurers had only succeeded in proving the presence of fairly abundant barytes in their lodes.

In September 1849 another company was registered, under the name 'Bridford Wheal Augusta', to take over more or less the same sett. By mid-1850 the name had been changed to 'Bridford Consols', with a controlling interest apparently being held by the proprietors of Wheal Adams. A further link with the latter company was developed, from June 1852, with the appointment of Captain Martyn (formerly of Wheal Adams and Exmouth) as agent, at a salary of £2.2s.0d. per month.

To the north of Bridford, operations at Birch Ellers mine had commenced in the autumn of 1850, although evidence in the *Mining Journal* suggests there was little achieved there until 1853. The agent at Birch Ellers was Captain George Odgers of Camborne who, in his native Cornwall, had worked in a number of

tin and copper mines including the celebrated Levant mine, at St Just. In the years 1851-54 there were numerous reports in the *Mining Journal* on the activities of both Bridford and Birch Ellers mines, suggesting great activity in the search for lead. The only mineral found in any quantity, however, was the ever present barytes, for which there was only a limited market at the time. Later in the nineteenth century it came to be used in a range of paints as a pigment and filler. At Bridford Consols, by 1855, a vein of barytes had been identified, nearly 300 feet in depth, about 600 feet long from north to south, and averaging about 40 feet in width. Due to limited demand, sales were minimal; in 1855 it is recorded that 35 tons was sold.

The lack of success in locating lead ore deposits of any significance resulted in the suspension of operations at both mines by the end of 1855. Reaching a maximum depth of 50 fms from surface, Birch Ellers managed a sale of 13t tons of lead ore and 126 oz. of silver in 1854, followed by 12 tons of lead ore in 1855 (the total value of sales in these two years being £370).[3] In the *Mining Journal* of 29th September 1855 a sale notice appeared in which the materials at Birch Ellers were offered, including a 30 inch cylinder (8 foot stroke) steam engine, a 30 foot waterwheel and an 8 ton boiler. At Bridford the desperate search had taken the main shaft down to 35 fms. below adit, drained by a 40 inch, Loam designed, engine, by the summer of 1855. This was in vain, however, and by early September 1855 operations there had also come to an end.[4] Bridford mine, unlike Birch Ellers, was destined to come back to life again and by 1875, with a growing industrial demand for barytes, operations recommenced and continued until the summer of 1958. By then, with workings up to 600 feet from surface, a total of around 420,000 tons of barytes had been produced in 83 years' continuous operation. (A fuller account of barytes production at Bridford mine is contained in two articles by the author; see footnote 3 to this chapter.)

Since 1853 there had been a steady level of activity at Frank Mills, sinking the shaft and making preparations for the installation of a pumping engine. By January 1855 the shaft had been sunk to the 30 fm. level and a 60 inch cylinder engine erected. At the 30 fm. level a cross-cut had been driven 16 fms west towards the lode. The signs appeared good; in the words of 'a miner', 'in a geological point of view, I consider this to be a most promising piece of mineral ground'.[5] The company must have been fairly confident of taking the shaft to some depth in order to erect a pumping engine as large as a 60 inch. At this time, with workings down to just 30 fms and of little lateral extent, there was no immediate justification for an engine of this size. The engine had been ordered from the Perran Foundry, in Cornwall, towards the end of 1854, while the building to house it was being constructed in the same ornamented style as that housing the 70 inch engine on Porter's Shaft of Wheal Exmouth.

From its commencement Frank Mills was worked in close conjunction with Wheal Exmouth. At first the new mine was managed by May and Bidwell, the Exmouth pursers, while the first

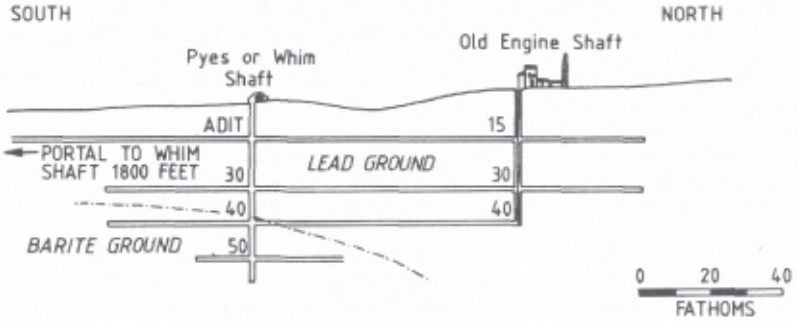


FIG 4 - SECTION OF BIRCH ELLERS MINE, c. 1855

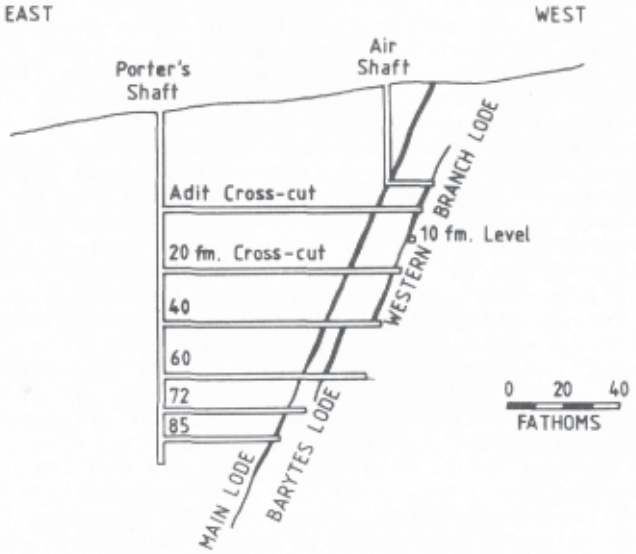


FIG 5 - CROSS SECTION OF WHEAL EXMOUTH, 1860

gXs

mine captain was J.P. Nicholls, who had for a short time been an underground captain at Wheal Exmouth. Also, until a mill could be constructed adjacent to the engine shaft at Frank Mills, all the ores produced were sent to Wheal Exmouth for crushing and concentration. This fact alone accounts for the lack of separate production figures for Frank Mills until 1857, although it seems certain that quantities of lead ore were being produced from at least the end of 1855.

By June 1855 the engine shaft was down 45 fms from surface. During the following months, while the engine shaft was still sinking, attempts were made at the 30 fm level to locate the lode. In a drive north on that level a lode was cut containing quartz, barytes and spots of lead. On the 1st September Captain Nicholls made a progress report:[6]

> **FRANK MILLS**:- The lode in the 45 end south has improved much since yesterday morning; there is now a branch near the footwall, containing good work, which we are saving. In the 45 north the lode is not so good as when reported on last, yet we are still getting some good work from this end. The engine shaft is sinking very favourably. The east lode is without any material alteration since last report. - J.P. Nicholls.

As this underground development was proceeding there was also an effort made to complete the construction of the major surface installations. With increasing output of lead ore, particularly from the 45 fm. level drives north and south on the west lode, there was pressing need for the completion of the mill at Frank Mills. The mill at Wheal Exmouth would obviously have been under some pressure, considering the rapid growth of lead ore output at the time from its own underground workings. On the 18th October 1855 Captain Nicholls reported that work was under way in constructing all the dressing floors and ponds that would be necessary for the anticipated growth of output in future years. These floors were to be set out to the west of the engine shaft, adjacent to the mine offices.

During October the 45 fm level was further developed to reveal some improved grades of ore, and Captain Nicholls felt justified in reporting that 'there are some more branches of the east lode come in the shaft from the east side, with some fine cubes of lead in them; this lode will, in my opinion, be found to open rich in the 60 fm. level'.[7] At the same time some difficulties were being experienced in sinking the shaft: 'the shaft is at present very troublesome for sinking, although the ground is not hard, it is very wet and bad for blasting'.[8] Notwithstanding these problems, by the beginning of December it was down 60 fms from surface, and by the new year drives had been commenced north and south from the shaft bottom. By January 1856 it was confirmed that the 60 fm level was cutting some rich ore-bodies. In the first *Mining Journal* of the year it was reported that the lode at the bottom of the shaft was worth 2½ tons per fathom in the drive south.[9] In response to these preliminary results the company set an extra 'pare' of tributers, driving at a fast rate, to further explore

this level.[10] Through the rest of the year this level probably produced most of the lead ore coming from Frank Mills. Although, as already stated, there are no separate production figures for Frank Mills in 1856, Ramsden estimated that this must have been of the order of 200-250 tons (and included in the Wheal Exmouth total for that year).[11]

By August, a water-wheel had started working, providing power for the first sections of the mill to come into operation. A couple of weeks later it was reported[12] that the engine shaft was completed to the 72 fm. level. It would therefore seem that the problems caused by wet ground inhibiting blasting had been overcome. Also completed, a short time later, was' an air shaft, just to the south of the pond on the Canonteign estate. Until this was completed, with only one shaft connecting to the underground workings, the mine had suffered from a lack of good ventilation. With the holing of this air shaft into the 45 drive north, a through draught was obtained and the mine never really suffered from the same problem again. By November the east lode had been cut in the 72 fm. level, from a crosscut. In the process, it was confirmed that this lode showed as much promise as it was in the 60 fm. level, above. The opening up of the Frank Mills lodes during 1856 certainly seemed to indicate a valuable mining property.

Eighteen fifty-five and six were also favourable years for the Wheal Exmouth adventurers. The following optimistic report appeared in the *Mining Journal* during January 1855:[13]

> At **WHEAL EXMOUTH & ADAMS**, operations are progressing most favourably. The whim-engine is nearly completed, and a communication from Porter's cross-cut to the adit level, which is a great boon for the working miner. New floors are, I hear, to be laid out at Porter's Shaft, and I have no doubt but that the mine will this year pay something good in the shape of dividends.
> - MINER. Exeter, January 9th.

The new floors were necessitated by the increasing output, which had reached 1,140 tons the previous year and was still rising. An interesting point about the above report is that it purported to be written by a 'miner'. It seems more likely, however, that the forecast of high profits came from a member, or members, of the committee of management, probably Messrs. May and Bidwell.

A more solid statement of the company's finances was given in a summary of the quarterly accounts, announced at a meeting held on the mine on the 9th August 1855, with Mr Porter in the chair:[14]

	£.	s.	d.
Balance last meeting:	1934	8	0
Less dividend:	427	10	0
Ore sold:	2524	7	6
Sundry expenses:	183	5	10
Balance after costs:	1168	12	11

Commenting on these figures, the chairman noted that the receipts from ores sold was the highest to date, and highly satisfying. Captain Hampton was then directed to prepare an inventory of the machinery and materials remaining at Wheal Adams, distinguishing between what might be usefully retained for the working of Wheal Exmouth and that which could be disposed of. The policy of abandoning the older mine was therefore drawing towards its conclusion. The Wheal Adams shafts, particularly Williams' Shaft, would be necessary for some time, for ventilation and access to the Exmouth levels and so some essential maintenance had to be continued for the time being. Eventually, the Exmouth shareholders hoped they would be able to close the Wheal Adams section completely, with the completion of Porter's Shaft to the deepest levels of their mine.

During August and September there were some favourable reports on deposits throughout the Wheal Exmouth sett; values of the lodes in the different levels varying between ¼ and 2½ tons per fathom. Porter's Shaft continued to sink in good ground and by November 10th was reported down 51 fms from the surface. During September it was stated that there was ' .. on the mine, undressed, from 80 tons to 90 tons (of lead ore) which would have been dressed but for lack of water'.[15] Soon after, a new pond was constructed to store water over dry periods for dressing purposes; on December 8th it was reported that ' .. we get a full supply of water from our pond every day'.[16] In conjunction with the expansion of the dressing floors, a new ore linhay (store) was erected near the 70 inch engine house and by December 15th it was stated that the overflow of ore from the floors had necessitated using it earlier than planned.[17]

One of the most interesting reports of the year came in September 1855, when it was estimated that there was a full 6,000 tons of lead ore available in the mine, equivalent to 3½ years' reserves for the mill at the current rate of production of 150 tons a month.[18] The years' output, when finally known, of 1,285 tons of lead ore and 18,630 oz. of silver, was equally satisfying to the shareholders.

Early in February 1856 preparations were being made to take up the pitwork from Wheal Adams engine shaft. It had already been decided that Williams' Shaft would be maintained in a working state for some time as it was still essential to the working of Wheal Exmouth. By the end of April the work of stripping the unwanted plant from Wheal Adams had been completed and such items as were required for Wheal Exmouth had been hauled over to Porter's Shaft. In the end it seems that little plant was actually sold off, most items being used by the company.

The speed of sinking Porter's Shaft had improved, meanwhile, and by mid-May it was announced that it was down 85 fms from surface (down to the 60 fm. level below adit). At the 20 fm level below adit a cross-cut had been driven 130 fms and at the 40, a cross-cut driven 60 fms, both levels making contact with the workings on the main lode. So, at last, full use could be made of Porter's Shaft in the working of the mine. From June 1856, as well as continuing to sink below the 60 fm level below adit, the shaft had to cope with hauling the ore to surface and

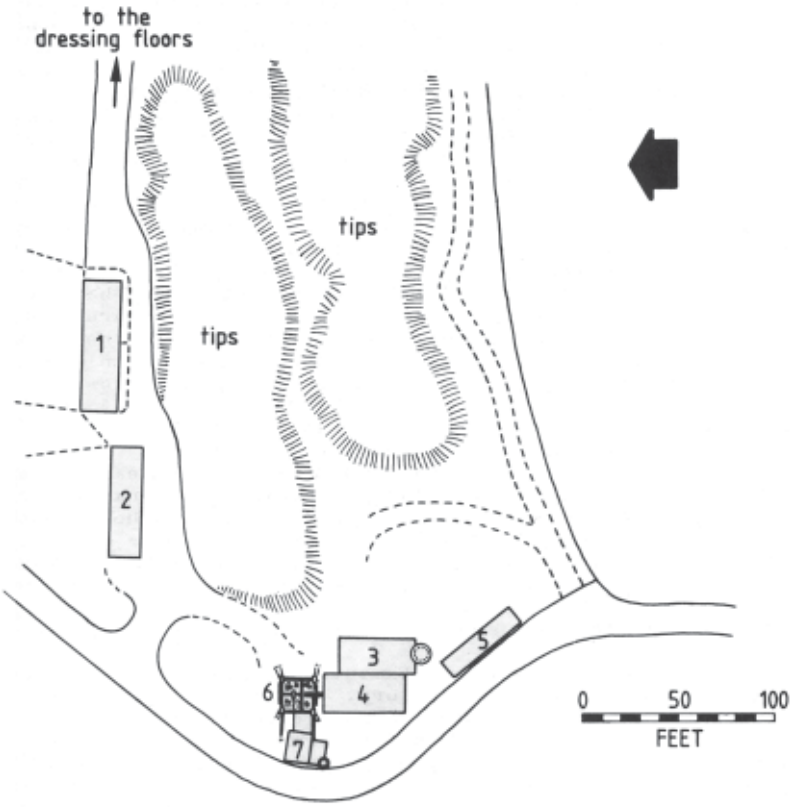


FIG 6 - THE SURFACE LAYOUT AT PORTER'S SHAFT, WHEAL EXMOUTH, c. 1855

(Reconstructed from the present remains, surveyed by C.J.Schmitz, 24/10/70)

Key to buildings

1 Exmouth Cottages, inc. mine office
2 Blacksmith's shop and mine stores
3 Boiler house for 70" engine
4 Pumping engine house (70")
5 Ore linhay
6 Porter's Shaft
7 22" whim engine house

with the pumping. The amounts of ore being sent to surface were increasing, as the values in the lodes improved. During July and August the lode in the end of the 10 fm. level was reported to be worth 2½ tons per fathom, while in a winze between the 20 and 30 it was reported to be worth 3 tons per fathom.[19] The deepest level at this time was the 60 where, by the end of 1856, only a small amount of development had been done. In the levels above this, the 30 and the 40, the stopes were said to be generally worth about t ton per fathom.

By January 1857 work had started cross-cutting to the lode on the 60 fm. level. However, at this time the mine suffered from some quite severe flooding, probably with extra heavy rainfall, and work was held up for a few weeks. This led to an extra burden on the pumps during the first weeks of the year. During this period, to his dismay, Captain Hampton discovered that some of the pitwork had been damaged by the extra workload, and the water, having gained some distance up the shaft, was pouring back down again. This indicated that there had been a minor fault in the pitwork before the break had occurred. Little could be done to effect repairs until the level of the water subsided, with improved weather, and so operations in the lower levels, and sinking the shaft, had to be suspended for about a fortnight. By February the damage had been repaired, the lower levels unwatered again, and work resumed. It was perhaps fortunate that the bad weather had not persisted.

The values in the lower levels were said to be improving at this time and this encouraged the company to sink deeper. The 30 north was reported as worth it tons per fathom and the 40 north 2½ tons per fathom. These last two values were reported at a meeting held on the mine during April, at which it was calculated that the company was making a profit of £200 a month. It was stated that the sales of ore in 1856 had been 1,447 tons, realizing £20,981.10.0. The total dividends declared were 18s. per share.

At about this time Wheal Exmouth started producing some significant quantities of zinc ore. Apart from North Exmouth in 1860, it was the only mine in the Teign Valley recorded as producing this ore, usually in the form of a reddish zinc blende (or sulphide). Its total output in the period 1857-74 is recorded as 1,853 tons, although this is almost certainly an understatement. The first sales noted in the company reports were in June 1857 (a sale of 80 tons) and in August of the same year (72 tons).[20] Following these reports there were others suggesting that large quantities of grey silver-copper ore had been located. An assay of this ore indicated it contained about 78 oz. of silver per ton and was worth about £35 a ton.[21] Apart from a record of 17 tons of copper ore sold from Wheal Exmouth in 1859, there are no further references to this rich and unusual ore; it is most likely that it was an isolated bunch in the lode. Overall, it seems that the lodes at Wheal Exmouth were amongst the most varied, mineralogically, in the Teign Valley, containing ores of lead, zinc, copper, silver, barytes, fluorspar and spathic iron (the last two in small quantities). The last report of the year 1857, in December,

stated that a leat 1,350 feet long was being constructed in order to bring an adequate supply of water to the newly constructed dressing floors.[22]

Production at Wheal Exmouth continued at a high rate during 1858 and 1859, more or less steady at about 100 tons a month. The level of dividends was also maintained during these years. At the annual meeting at the end of 1859 the following summary of the company's output and income was provided: sold in 1859, 1,345 tons of lead ore, 17 tons of copper ore and 275 tons of zinc blende, for £17,818. Dividends were £3,420, while £2,158 was transferred to the reserve fund. The figures for 1858 were also given: sold 1858, 1,115 tons of lead ore for £12,965; paid £1,567 in dividends.

During 1858 it had been realised that Porter's Shaft was going to require substantial timbering as several miners working in it at different depths, on the pumps and skip runners, had had the nasty experience of occasional falls of rock on their heads. Memories of the disastrous fall of ground at New Engine Shaft of Wheal Adams in 1847 must still have been strong in the minds of some of the miners working in Wheal Exmouth. With Porter's Shaft sinking deeper and deeper into the soft Carboniferous shales, work started on the timbering during the autumn of 1858 and was completed to shaft bottom by January 1859. The 60 north was showing signs of improvement by February, by which time it was reported[23] that 67 men were working 26 different pitches between the 20 and the 60. At about this time Porter's Shaft reached the 72 fm level below adit (about 550 feet from surface), and a drive commenced to connect it with the lode.

By the summer of 1859, dividends to the value of £1,424, or 5s. per share, were being distributed. There were notices of the sale of various quantities of zinc blende and copper ore, as well as reports of 'white iron' being located in the 40 north. In October it was stated that a new steam plant was nearly ready to deal with the milling of the expected continuing flow of ore from the deeper levels of the mine. At last, the shareholders must have hoped, their plant was adequate to deal with the anticipated continuing expansion in output. However, as they were to discover within the next couple of years, the basis of their optimism was ill-founded. When the 72 fm level cross-cut, and later the 84 fm cross-cut, intercepted the main lode, they came to realise that the ore-bodies did not continue in depth, but had 'pinched out' somewhere below the 60 fm level. So, in a sense, 1859 was the high summer of the Wheal Exmouth company; output was high, dividends full and the shaft sinking below the 72 in a spirit of confidence. Few would have predicted the sharp turn in the fortunes of the company that was about to occur, despite the notoriously uncertain nature of mining investment.

Eighteen fifty-nine, in retrospect, certainly seems to have been the high summer of myopia and unproductive speculation in the Teign Valley. That year saw an attempt to re-open Wheal Adams, abandoned three years previously by its former owners. This venture was, according to Ramsden, organised by a London

company in what he believed had been nothing less than a stock exchange gamble. The mine was apparently set to work on a small scale in its upper levels during January and February 1859. By April, the appointed agent, Captain Moore, reported that the old levels had been cleaned out down to the 40 fm level and that they had sold £1,500 worth of blende from a 20 fm. stretch of the old 28 fm. level. He also calculated that if they wished to sink deeper, the mine could be drained at no extra expense to a depth of 100 fms by the pumping at Wheal Exmouth, once the latter mine reached that depth. These optimistic reports may simply have been designed to encourage investment by unwary London speculators. However, it was later suggested that while Moore was captain, he made a habit of submitting unreliable reports and was said to be generally incapable of managing any mining venture.[24] According to the *Mining Journal*, by the end of April miners who had been working at the mine for anything up to three months had not yet received any wages.25 Later, it was revealed that in fact, only six men were employed. The lode was almost completely worked out above the 40 and Moore had obtained some small sales by recovering ore from old stopes in the shallow levels and by working over the dumps at surface. In the words of one old miner ' .. he got his ore by cleaning out the old burrows and stulls .. '.[26]

In May three eminent mine captains were appointed to inspect the sett at the request of some of the shareholders who were no doubt alarmed by such reports of Moore's conduct. These three were Captain Nicholls of Frank Mills, Captain Harvey of Liskeard and Captain Kneebone of Shropshire. Their report exposed the scandalous behaviour of Captain Moore who, despite an attempt to defend himself, was forced to resign. Captain Harvey then accepted the offer to replace him and immediately set about attempting to improve affairs at Wheal Adams. Appreciating that all the ground in the old workings would have been exhausted by the previous company, he decided to sink the engine shaft below the old 85 fm level and abandon all the levels above it. By September work had begun sinking below the 85 but before any great distance had been excavated the old spectre of loose ground made its presence felt when there was a serious collapse from the 60 fm level downwards. Within a week the seal of failure was put on Harvey's efforts when there was a general collapse of the ground from the 60 right up to the surface.

Although there was an attempt to re-open the workings the next year, by sinking a new shaft, the mine never really had a chance of recovering. The new shaft, called Hallett's, only got down to the 28 fm level and was constantly threatening to give way and bury all those in it. Dispirited, the unfortunate shareholders decided to cut their losses and, in the summer of 1860, Wheal Adams was once again abandoned. Soon after the closure it appears that Hallett's Shaft did indeed collapse, obliterating the remains of an attempt to re-open this once important mine.

The best prospects in the valley for discovering good deposits were still at Frank Mills. There, the new engine shaft had been sunk 84 fms. from surface by the autumn of 1857 and the driving of development levels proceeding rapidly. The *Mining Journal* reported that in one period of two months the distance driven in these levels was 346 feet (27). Development continued at a steady rate through 1857 and into 1858. In that year it was estimated that the average speed of driving new levels was about eight feet per day, that is over 400 feet per two month period. At the same time as the above estimate was made, it was reported that the total amount of ore sold since January 1856 was 762 tons, which had realised £8,640.[28] It seems that the Frank Mills dressing floors were completed and put into use by the end of 1856 as in the following year the mine made its first official return of ores sold: 311 tons of lead and 1,379 oz. of silver. Early in 1859 it was reported that the number of men employed was 129. This figure then fluctuated between 131 and 119 through the rest of the year.[29]

The new dressing floors at Frank Mills had been working well since their inauguration. However, by the beginning of 1859, Captain Nicholls was finding there was a shortage of water for dressing purposes. This problem became more acute in the spring, due to an unusual lack of rainfall. In looking for a more reliable source, he turned his attention to Lord Exmouth's ornamental waterfall, constructed when the parkland had originally been laid out, in about 1814-15. This fine waterfall is still visible today, its delicate, wispy cascade dropping from a great height, among the tree-covered slopes behind Canonteign House. It is fed by a leat running for a considerable distance in the valley above the estate. In that spring of 1859 Nicholls must have approached Lord Exmouth in a half-hearted manner, expecting a refusal, and must have been pleased and surprised when the mineral lord granted permission to the company to use water from the bottom of the fall. This was then led to the mine, via a leat, and helped the company cope with the abnormally dry weather conditions of that summer.[30]

It was at about this time that numerous reports of 'white iron' and 'spathose iron' began to appear in the Frank Mills reports. Twice during 1859[31] iron was reported, once in the 60 north on the west lode and once in a winze between the 60 and the 72, also on the west lode. These reports increased in their frequency·· in the ;following years and seemed to indicate that the Frank Mills lodes, running nearly north to south in direction, were crossed by a large number of east-west coursing lodes containing iron. The whole Teign Valley vein system, from Birch Ellers mine in the north down to South Exmouth, was crossed by these 'caunter' lodes but at Frank Mills and in the area around Hyner Bridge they seem to have been concentrated in a swarm. It is possible that this is linked to the concentration of iron lodes in the granite which lies adjacent, about a mile to the west. These iron lodes in the granite, also coursing approximately east-west, were composed largely of an unusual form of iron oxide called micaceous haematite (or locally,

'shiney ore') and were exploited in a number of mines operating between about 1790 and 1969. The two mines closest to Frank Mills were Great Rock, near the village of Hennock, and active between about 1860 and the autumn of 1969 (making it the last working metal mine in Devon), and Shuttamoor mine, further up the valley which was the source of Lord Exmouth's waterfall. This mine seems to have been working in a small way in the period from about 1890 to 1914.[32] It has been suggested that the iron lode swarm at Shuttamoor continues in an easterly direction, out of the granite, and is then represented by the iron lodes, coursing east-west, which are found near Hyner Bridge and in Hennock and Frank Mills mines.[33]

Until about 1860 the output of lead ore from Frank Mills had been growing steadily, rising to 547 tons in 1858 and to 737 tons in 1859. A turning point in the relative careers of Frank Mills and Wheal Exmouth was then met, in 1860. In that year the decline of the older of the two mines set in and from then onwards the newer mine's output expanded at such a rate as to generally compensate for the other's decline. In 1860 the output of Frank Mills, 767 tons, overtook that of Wheal Exmouth, at 629 tons, for the first time.

The new levels being driven at Frank Mills were opening up rich ore ground almost faster than could have been hoped for. By the end of 1859 Captain Nicholls had discovered that he had a rich ore shoot running from the 30 fm. level down to the 60 in the vicinity of the ornamental pond on the Canonteign estate. When the 72 fm. level was finally brought up to the lode in this spot, by June 1860, he could enthusiastically report that the lode was ' ,, wide and leady.'[34] For the next couple of years this particular ore shoot was to be the mainstay of the mine. In his reports, Nicholls concluded that the rest of the year was generally very satisfactory; there were no serious accidents and the labour force was constant at about 123. The year ended with a report that the lode in the 60 fm. level drive north was exceptionally rich, with values of about 3 tons per fathom. At this time it was decided to make the 60 the main haulage level of the mine. In order to better ventilate these lower workings and especially the main haulage level, the air shaft that had a1ready been sunk to the 45, near the pond, was to be connected to, by putting in a rise from the 60. Later, it was planned, this would be connected to the 72 and with any lower levels that were driven.[35]

At the beginning of 1861 the good luck that Frank Mills seems to have enjoyed until then ran out, but not with any lasting consequences. At a company meeting in June of that year it was reported that the pond had broken into the workings and had sent a flood of mud and water through the mine.[36] During the early 1930s, J.V. Ramsden, then newly appointed as manager of the Bridford barytes mine, had interviewed an old man in his eighties, who had been born at Canonteign Barton and who had worked on the Frank Mills dressing floors as a boy. This man, Mr Hall, remembered what had happened when the mine was flooded. He said that the stopes had been taken too far up underneath the pond by the miners, either in greed or by a miscalculation of their depth from surface. Fortunately however,

the thin layer of ground between the miners toiling below and the pond above held until night-time, the flood bursting through the workings when they were practically empty, and so there were no casualties. The pond must have drained within minutes, according to Ramsden, since it was not very deep and so contained relatively little water. Afterwards the effects of the inundation were hardly noticed and the shareholders could count themselves lucky that the only trouble they were put to was to pay for the repair of the breach in Lord Exmouth's pond, a task completed in a short space of time.[37]

By August 1861 the ore shoot running from the 30 down to the 72 had also been proved, although not quite as rich, in the 85 fm level. In that level it was estimated that the lode was worth about 1 ton per fathom.[38] It was still hoped that the shoot would continue down below the 85, even if slightly less valuable, and so plans were already being drawn up for the shaft to continue sinking, below the 85.

Two dividends, both of 3s. per share, were declared during the year. However, the year ended on a bad note, unlike 1860; during December Captain Nicholls had to report that there had been a heavy fall of ground from surface to the 45.[39] Like the pond incident, this fall had resulted from the miners venturing too close to the surface, tempted by a rich shoot of ore. As a result of both these incidents, the committee had to draw up a set of strict rules regarding the working of shallow levels and at the same time instructed Captain Nicholls to make an accurate survey of all the underground workings.[40]

At Wheal Exmouth the adventurers were having problems of another sort, and with more serious implications. The year 1860 had started well enough; at the first meeting of the year it was revealed that the previous year's output had been 1,345 tons of lead ore and 16,853 oz. of silver, which was highly satisfactory, as was the dividend declared, 12s. per share.[41] It was then announced that the task of sinking Porter's Shaft below the 72 to the 84 was nearly completed. During the spring and summer of 1860, while the shaft sinking and driving of the 72 cross-cut to the lode was being pushed ahead, output was maintained at only a slightly lower level than that in the previous year. At the end of June it was reported that the mine was improving.[42] However, this seems to have been more an expression of hope than of fact. At a meeting held a couple of weeks later any illusions that the shareholders might have harboured about the mine's prospects were shattered.[43] It was reported that apart from suffering from a shortage of labour, the mine was faced with the virtual exhaustion of its upper levels. All of the output up until about 1859 had come from three or four rich ore shoots between the 10 and the 60 fm. levels. Now that these had been worked out the only remaining ore in the mine above the 60 fm level was of a very low grade, not considered worth extracting before. The only potential future development had to lie below the 60 fm. level. The only relief to this picture of gloom was the hope that the miners now hacking and blasting their way towards the lode in the 72 and 84 fm levels would uncover some rich new ore shoots.

Through the rest of the summer a large number of people must have been waiting for news from these deep levels; the miners and their families anxious for their livelihoods, Captain Hampton and the other mine officials, William Porter, Messrs. May and Bidwell and the members of the committee of management, and the shareholders anxious for the value of their holdings. The gravity of the situation seemed more immediate as the exhaustion of the ore shoots in the upper levels led to a cut-back in production. During 1859 the monthly rate of output had been over 110 tons; already by the first couple of months in 1860 it had fallen to below 100 tons. By the beginning of August it was down to less than 50 tons a month. However, it is clear that the pressure on the mill was maintained during this period, indicating that the quality of the ore being brought to surface had deteriorated to a lower grade.

The tension was broken at the end of August when news finally came of progress in the 72 and 84 fm. levels. The shaft had finally reached the 84 fm. level and contact had been made with the lode. Seventy-two feet above, the 72 drive north had also cut the lode. Assays were hastily made at these points and the results must have confirmed the worst fears of all those concerned. The lode in the 72 fm. level assayed less than ½ ton per fathom on average, while that in the 84 fm level consisted mainly of quartz and white iron, with very low lead values.[44] About two weeks later, Captain Hampton at last managed to get an assay value from the lode in the 84; 0.4 ton per fathom – hardly worth mining.[45] With no new ore shoots to raise the quality of the lodes, the monthly output of dressed ore continued to decline through the rest of the year, until the mine was producing little more than 40 tons a month. At the last meeting of the year 1860 it was made known that the year's output was just under 630 tons, less than half that of the previous year.[46] Not surprisingly, it was also revealed that there had been a deficit on the year's working and that as a result a call on shares would be necessary.

The situation gradually worsened through 1861, with the monthly production level remaining at around 40 tons. To maintain this figure, increasing amounts of stuff were having to be raised and milled, adding to the already high cost of running the mine. Pumping was proving to be one of the largest expenses; originally the 70 inch engine had had two boilers, but these proved to be insufficient and some time before 1860 a third was added. The size of the pumps had also to be increased, finally being worked to a maximum pumping rate of over 300 gallons a minute, such was the normal level of water entering the Wheal Exmouth workings. The new pump rods, working five strokes a minute, were of 30 inch square Norwegian pine. Finally, due to the soft nature of the ground in much of Porter's Shaft, the cost of shaft lining and bratticing was inordinately high.[47] The high running costs manifested themselves at the first two company meetings of 1861, when debit balances were announced and the shareholders told that further calls would be necessary.[48] By mid-summer, Captain Hampton could announce that there had been an improvement in the 60 north, with the lode assaying 0.2 tons per fathom![49] The rest of the year produced little except two more calls and the search for more ore shoots.[50]

This energetic activity on the part of Captain Hampton was largely wasted. Early in 1862 he gave two reports of the results of further exploration and assay in the 60 and the 72. In the former level, the lode was worth about 0.3 of a ton per fathom and in the latter about 0.25 of a ton per fathom.[51] These two reports were the last submitted by the company, which must have decided soon after that the position was hopeless. In May there was a notice in the *Mining Journal* regarding the winding up of the Wheal Exmouth company.[52] This was soon followed by an announcement of the sale of the machinery and materials on the mine.

Only a few weeks passed and the remains of the once prosperous company were being dismantled and removed. In July 1862, the 70 inch engine was sold to Old Wheal Neptune at Perranuthnoe, in Cornwall, with two ten-ton boilers, for £1,255.[53] Apparently, the other boiler was in such a bad state of repair as to be unsaleable. The history of the 70 inch engine has been traced by D.B. Barton (54) after it left Wheal Exmouth and it seems to have had a relatively long and varied working career. From Old Wheal Neptune it moved, again with two boilers, to a South Wales purchaser in July 1876, sold for £780. According to Barton, it is then probable, although not completely certain, that it returned to Cornwall, as a 70 inch engine offered for sale at Phoenix United Mines, Liskeard, in November 1898.

Soon, all was silent at Canonteign, where once there had been the bustle and industry of a working mine. Some of the Exmouth miners would have been fortunate enough to find jobs at Frank Mills, although this could absorb few of them. More fortunate was the fact that at this time a new mine was opening in the valley, to the south of the old Hennock mine, on the site of the abortive South Hennock working of 1852. However, this mine, South Exmouth, was working on a smaller scale than that at which Wheal Exmouth had been working and had already acquired most of its labour force before the end of operations at the older mine. It could therefore only take up part of the pool of unemployed miners in the valley. With the closure of Wheal Exmouth a number of mining families seem to have drifted away from the area, perhaps returning to Cornwall or other parts of Devon, or even emigrating overseas; it is not easy to discover what happened to them. With this minor exodus from the valley the populations of Hennock and Christow parishes fell, from their nineteenth-century peaks in 1861 of 1,004 and 941 respectively, to 887 and 872 in 1871. One of those leaving was Captain Hampton who, without employment, probably returned to his native Perranporth.

The new South Exmouth mine had been started during 1861. A lease had been obtained for 21 years' working, on June 30th of that year, by Mr Westcomb, from Sir Lawrence Palk. The dues were to be 1/15th of the value of ores raised. The company was then floated, on the cost-book principle, with an issue of 5,000 shares. The purser was Mr Charles Westcomb, of 3 Gandy Street, Exeter; the managing agent was Captain Joseph P. Nicholls of Frank Mills and the underground captain, a man called Maunder. The company's offices were reported as at

3 Gandy street, Exeter.[55] From the outset there were close links between the South Exmouth and Frank Mills companies. This was demonstrated in a number of ways: the Frank Mills offices were also at 3 Gandy street, Exeter,[56] Captain Nicholls was involved in both mines, and finally Charles Westcomb, besides being a former purser and shareholder in Wheal Exmouth, was a large shareholder in Frank Mills. Overall, Westcomb appears to have been the leading shareholder in

South Exmouth and one of the prime movers in the new company. The South Exmouth sett was 600 fathoms long, running south from Hyner Bridge, including both the abandoned Hennock and South Hennock setts. It was apparently considered by the new adventurers from the outset that the old Hennock workings would not repay re-opening. It was instead decided that the best prospects lay in the relatively untouched ground to the south of the old mine. By late 1861 work had started in rehabilitating the shallow shaft that had been sunk nine years previously in the abortive South Hennock trial. This was situated close to the Teign Village - Hennock road and had been sunk to a depth of 16 fms. from surface by the previous company, but had obviously failed to locate any worthwhile deposits. By December, the South Exmouth miners had cleared this shaft down to its old bottom and had commenced sinking below that level. It was said to be in a good state of repair considering how long it had been abandoned; it seems that the ground in this part of the Teign Valley lode system was generally more secure and so had less tendency to 'run in'. By the end of 1861 the miners were down about 20 fms and were reported to have discovered ' .. some lead ore'.[57]

A fast rate of shaft-sinking was maintained during the first few weeks of the year and by the end of January 1862 the miners were down 33 fms. At first this shaft was simply designated 'Engine Shaft' in reports, but some time later became known as Westcomb's Shaft. When it reached down 35 fms a level was put out north and south at the 30 fm. level. Here the lode was said to be worth 1t tons per fathom in the drive south and 1t to 2 tons per fathom in the drive north, with the north end poor. (58) It seems fairly likely that the South Exmouth adventurers had been fortunate in hitting a fairly rich shoot of ore not far from surface. Their confidence in the mine confirmed, they purchased a 40 inch pumping engine which was then erected on Westcomb's Shaft. During the spring, a second shaft, called James' Shaft, was sunk to the 30, to provide through ventilation. The driving of new levels and the sinking of Westcomb's Shaft continued, which by May was down to the 45. By then it was estimated that the average value of the 30 stopes then at work was as high as 3 tons per fathom, indicating some very rich ore shoots.[59]

Encouraged by these results the company decided to layout a considerable sum of money, later estimated to be in the region of £3,000,[60] on new plant and dressing floors, to be located around the top of Westcomb's Shaft. As a result of this expenditure, in spite of ores to the value of £2,820 being sold in the first six months of working,[61] it was found necessary to make a call of 5s. a share in September.[62] At

the meeting at which this call was declared, a summary of the mine's position was given. The results in the 30 and 45 fm levels had been very promising. The 30 fm. level was being driven further to the north from James' Shaft. During the meeting, one shareholder asked what dues the company was paying to the mineral lord on ores raised, since it seemed to him to be unfair to pay these when the shareholders were being asked for calls. In reply, he was told that the dues were 1/15th on the value of ores raised, plus the dead rent of £60 a year. The purser, Mr Westcomb, tried to counter this argument by showing that expenditure on establishing the mine had been heavy; £3,000 for machinery and the new dressing floors, and an estimated £3,250 for labour and general operating costs from opening. He expected, from Captain Maunder's reports, that very soon sales of ore would be made that would start defraying the original costs as well as the current costs.

Charles Westcomb's forecast came to fruition within a short space of time. Once the dressing floors were completed and the stopes working at full pace, increasingly large consignments of ore were being raised, milled and sampled. By the late summer of 1862 the mine was operating at full pace. During the early autumn it was reported that production was running at the rate of 20 tons a week.[63] This was up to over 21 tons a week, a fortnight later.[64] At the final meeting of 1862 it was reported that the ore sold for the last quarter had been 260 tons, realising £3,308. A dividend of 5s. a share was then declared, the company's first. It was announced, further, that the ore sold since operations had commenced was 486 tons of lead with 1,800 oz. of silver, realising £6,129, an average of about £12.12.0. a ton. All agreed that this was highly satisfactory. Finally, it was stated that the engine shaft was sinking to the 60 fm. level and it was expected this would reveal yet more rich ore shoots.[65] The number of men employed on the mine during the year was reported as 122.[66]

Looking back at the South Exmouth adventurers with more than a century's hindsight, it is easy to condemn them as overconfident. Certainly, at the time, it would not have been difficult to expect that the lode would continue rich for at least another 30 or 40 fathoms below the 45. At Wheal Exmouth and Frank Mills, the richest ore shoots had gone down at least to the 60 fm. level. Another fact to encourage the South Exmouth adventurers was the rapid growth of output from their mine; within the first year of production they had achieved an output of nearly 500 tons, a figure which it had taken Wheal Exmouth eight years and Frank Mills five years to achieve. It is therefore not difficult to see that the least the shareholders could have hoped for was a mine as rich as Frank Mills; some of the more optimistic adventurers must have believed they had the makings of a much richer mine.

Early in 1863 Westcomb's Shaft reached the 60 fm. Level and drives were commenced to reach the lode. Almost immediately the shaft started sinking again, as if the shareholders were anxious to confirm their new-found wealth. However, as soon as the values in the 60 were reported, doubts must have crept into their minds. The lode in the 60 proved to be very poor in relation to that lying between surface and the 45. Its

average value was ½ ton per fathom or less. Because of the intensive mining of the rich, shallow deposits, largely in order to cover the heavy cost of establishing the mine, there was little in the way of reserves available to the company. So, it was not long before output was cut and by the end of the year the company was quite desperate to locate some new ore shoots. The production for 1863, when it became known, showed the changed fortunes of the company: 282 tons of lead ore and 1,010 oz. of silver. If 1863 was the year of truth for the South Exmouth adventurers, then 1864 was to be the year of waiting; waiting for Westcomb's Shaft to sink further and reveal what lay below the 60.

At Frank Mills there had also been a cut-back in output during 1862 and 1863. In a similar way to South Exmouth the miners at Frank Mills found that they had exhausted the more shallow ore shoots, those between the 30 and 60 fm. levels. During 1862 and 1863 most production came from the lodes between the 60 and the 85, where the ore values were lower and so total output of lead ore was necessarily lower. However, unlike South Exmouth, this downturn was only temporary and the growth in output recommenced in 1864, with the opening up of the deeper levels, with their equally rich ore shoots. Sales in 1861 had been 961 tons, falling to 630 tons in 1862 before recovering slightly to 726 tons in 1863.

During 1862 there was not much indication that significant new ore shoots would be found beneath the 85, since that level did not appear to hold much promise itself. One report during the year stated that the only notable thing about the 85 was that it had cut a lode of 'white iron'.[67] Captain Nicholls and the underground captains were generally of the opinion that the lodes would be found rich again under the 85 and as such urged the speedy sinking of the engine shaft to the 100 fm. level. It later became apparent that the region around the 85 in the mine had formed a relatively barren dividing layer between the rich ore shoots of the upper and lower levels. Following Nicholls' advice, the company commenced the sinking of the engine shaft towards the end of 1862.[68] In Ramsden's opinion, Frank Mills was just ' .. carrying on and paying costs' during this hiatus in the discovery of rich ore shoots.[69]

By about the end of March 1863 the Frank Mills engine shaft was down to the 100 fm. level. During the spring and early summer development levels were driven north and south from the bottom of the shaft, the one to the north being longer. It was not until nearly the end of the year that the 100 drive north reached the vicinity of the air shaft by the pond. This shaft, meanwhile, had been sinking past the 72 and down to the 85. With the completion of the 100 up to this point work was started again, sinking the air shaft below the 85, to connect with the 100. This was completed by the new year, 1864, when through ventilation could be carried down to the deepest levels. In driving just beyond the point where the air shaft was to connect with it, the 100 fm. level cut some rich ore shoots. These discoveries, in December 1863 and January 1864, subsequently proved to open out to a considerable extent, laterally

and in depth, so re-confirming the fortunes of the mine.

During 1862 and 1863 a team of Government commissioners, headed by Lord Kinnaird, was touring all the metalliferous mining districts in Britain, inquiring into the conditions of work of the miners. This official inquiry was intended to parallel the earlier Government commissions which had investigated the British coal mining industry. The results of the Kinnaird Commission were published as a Sessional Paper of the House of Commons in 1864,[70] and this provides a wealth of information about the mines working at the time. On Thursday the 28th May 1863 the Royal Commissioners visited Ashburton in Devon and among the people that appeared before them that day was Captain Joseph Phillips Nicholls of Frank Mills and South Exmouth mines. The inquiry was conducted in the form of question and answer and the results published verbatim. The evidence given by Captain Nicholls is of great interest as it provides a vivid snapshot of conditions at two Teign Valley mines, one of them the most important in the valley's history shortly before the peak of its career, the other a new mine destined for a short life but, at the time of the commission, believed to be destined for a prosperous future.

Captain Nicholls commenced by stating that there were about 70 underground workers at South Exmouth and between 70 and 80 at Frank Mills. Among the Frank Mills men there were 22 tributers, but none at South Exmouth, a fact which Nicholls explained in terms of the newness of operations at the latter mine. In the development stage of operations there was a greater need for contract or tut workers, rather than skilled, semi self-employed, tributers. Night shifts (or 'cores') were worked by a few men in some of the most important places, but not in all places.[71]

Nicholls then proceeded to answer the commissioners' inquiries about the ventilation of Frank Mills. The levels being worked were the 40, 60, 72, 85 and 100 fathom levels, with three shafts from surface. The greatest distance of any part of the workings from a shaft or winze was about 28 fathoms. When asked how he would judge the distance that could be driven from one of these he replied, 'That would depend entirely on the nature of the lode; if the lode is small and poor we can drive to a considerable distance, and the air will continue good, but in some places where the lode is large and rich we can scarcely go any distance without conveying air by some means, either by pipes or otherwise; where the lode is small and poor, you can, comparatively speaking, go as far as you like.'

Besides relying on the fact that of the three shafts, one was an upcast while two were downcast,[72] other methods of ensuring a through draught were sometimes used, if necessary. These included 'doors and pipes, or a machine to blow air'. The machine, explained Nicholls, consisted of 'a fan machine, worked by hand'. There was at that time only one place that required one of these fans, the 60 north. In this place no men were working night shifts, so the end was free of miners from ten at night until six in the morning.[73] This gave

the air in the confined space a chance to recover before the morning shift started work. Asked about the freshness of the air in the workings, Captain Nicholls stated that there was some carbonic acid gas (carbon dioxide) which he suggested came out of the lode, but there was no cold damp (carbon monoxide) in the mine. Later in the inquiry Nicholls described his own experiences of the effects of the two gases. 'In a cold damp you would begin to get sleepy directly, and feel your legs begin to tremble, but the carbonic acid will put out your candle; the cold damp would have an effect upon you as quickly as it would put out the candle, or rather sooner, but in the other, before you feel the effects of it your light is gone, and hence you retire.' Asked if cold damp could be seen, Nicholls replied, 'You would see it as a mist before your eyes, and your candle would be blue'.

The commissioners then turned their questions from ventilation to general conditions at Frank Mills. The men in that mine, Nicholls stated, were allowed two pounds of candles each a week. There was very little blasting done, most of the work being done by the pick. What blasting that was done raised little dust because of the damp nature of the ground. At the end of each day the men ascended by ladders and had changing facilities in '.. a very convenient dry' (or changing room). The ladder-way that the men descended and ascended was situated in the main pumping and drawing shaft, but was divided off by brattices. In case of accident the men could ascend through any of the mine's three shafts.

The inquiry then turned towards South Exmouth mine. This had only been working two years, Nicholls stated. There had been a previous working but little was done, the shaft being sunk about 16 fathoms. Nicholls confirmed that he had been the manager of South Exmouth since its commencement and of Frank Mills from six months after it had started work. He had been at Frank Mills between nine and ten years. Returning to the subject of South Exmouth, he stated that the greatest depth in that mine was the 60 fathom level. There was no adit, as at Frank Mills, and in both of these mines the depths were given from the surface.[74] At South Exmouth there were three shafts and the air in the mine was very good in general, considering that none of the shafts were regularly upcast or downcast. Nicholls explained that this was due to the collars of the shafts all standing nearly on a level; with a sudden change in .. the wind the air current could stop. To try and combat this problem, Nicholls stated, 'We have raised one shaft 30 feet, and that has made the ventilation better'. In fact, such had the ventilation been improved by this measure that ' .. sometimes there is so much air that you can hardly carry a candle'. He reported that the furthest distance of any part of the workings from a shaft or winze was about 25 fathoms. The men in South Exmouth had apparently never complained of bad air in the ends but Nicholls asserted that he had sometimes been in places where a candle wouldn't burn. such conditions, he remarked, there was a rule that the men should not remain there. If the bad air continued for any length of time the men would not be kept idle but would be set to other work.

Questions were then asked about working conditions in each mine. Captain Nicholls was asked if any men had suffered from working in foul air for too long. He replied, 'I do not know that they have. There is one class of our men that do not stand it long, that is the men brought up to agricultural labour until they come perhaps to years of maturity;[75] those men are the men who fall off quickly; but we have some men who have worked from boys who are very old; one was buried a few weeks since who worked in the mine till he was 75. There is another working on the mine, strong and healthy, 76. There is another regular miner in the neighbourhood, past 80, not working in our mine, but a regular miner.'

It was further stated that some of the miners were bringing up their sons in the mine, but with no apparent ill effects on the boys' health. At surface, there were women working on the dressing floors, under cover. The two mines had their own doctor, appointed by the purser, although the men were reported as having a voice in the affair. The underground miners paid 9d. a month for the doctor and 9d. a month for the sick club. Surface workers paid only for the doctor, not joining the club. Boys and girls paid 3d. a month for the doctor. Nicholls was questioned further on the subject of the doctor and the club. Asked if the club funds were paid out for 'a visible hurt' or sickness, he replied, 'For a visible hurt. A great many of the men are in the parish clubs, and if they are sick and receiving pay from both clubs they get more than if they are working. We are continually giving; in any case which we think deserving we help them.' He was then asked if separate accounts were kept of the club money. 'Yes. We give them gratuities; at the last pay day we paid £6 to the men that were sick; but they cannot claim it. The boys and girls have nothing to do with the club; the 3d. is for the doctor. The doctor attends them for everything and also the underground men.'

The commissioners then asked about safety precautions. Nicholls explained that there were two boilers at Frank Mills and one at South Exmouth. Only one of these was fitted with a pressure gauge; with the other two the pressure of the steam was merely ascertained by the cocks and the safety valve. There was one valve to each boiler but either one would apply to the other boiler, they being connected. Nicholls was asked if there had ever been any fatal accidents in either of the mines. He reported that there had been, but not many. The only ones to occur had been in Frank Mills, four in number. The most recent had been in the previous December or January as the result of a fall of ground. Nicholls was of the opinion that ' .. our accidents are very scarce'. However, it was subsequently stated that the ground in some parts of the two mines required a good deal of timbering.

During the course of the questioning a fair amount of Nicholls' personal background came to light, illustrating a working life of some considerable experience. He was born on the 23rd July 1815, and so at the time of the commission was 47 years old. He had started work in the Great Consolidated mines at Gwennap, in Cornwall, at the age of 12 (in 1827) and had remained there until he was 24. Then, in 1839, he had gone

to Mexico for nine years. Returning to England in 1848, he became manager of various mines in Devonshire. At the beginning of 1854 he became the manager of the new Frank Mills mine, at the age of 38.

In the appendix to the report of the commissioners was given a great deal of information about the working of the two Teign Valley mines in 1863. At South Exmouth mine the principle workings were from Westcomb's Engine Shaft, which was 60 fathoms deep, measuring 11½ feet by 6½ feet in section. This shaft was used for pumping and drawing; the latter was done in two skips, hoisted with flat hemp ropes. There was a footway (miners' ladder-way) in this shaft also, with ladders four fathoms in length. James' Shaft was a whim and footway shaft 60 fathoms to the north of Westcomb's Shaft and was sunk to the 30 fathom level. The commissioners inspected both shafts and reported that, 'The engine shaft is a large well secured shaft' but that ' .. the ladder road at James' is not so good; narrow, and the casing between it and the whim shaft broken, and for 10 or 12 fathoms at the bottom altogether gone'.

The temperature was taken in different parts of the South Exmouth workings and the average found to be between 64 and 68 degrees Fahrenheit. The highest temperature recorded in South Exmouth was 71 degrees, in a rise above the 45 north on west lode, but this was noted as exceptional. While examining the underground workings, the commissioners noted the method of producing a draught in some of the ends; '30 fm. level south, on east lode. Driving by 4 men, 15 fms. beyond a communication. The back of this level has been worked out, and the air is carried through there, there being a casing between'. Apparently, this was not a novel or a strictly local device, its use being noted by the commissioners at Levant mine, St Just, on their visit to the far west of Cornwall in 1862. There, these casings were called 'stools'.[76] In the report on South Exmouth the commissioners included a diagram of a 'stool', as used in the 30 south (see figure 7, p75). Before passing on to Frank Mills the commissioners noted that at the surface of South Exmouth the men coming up from underground changed over the boiler of the pumping engine. The number of persons' on the dressing floors was 40 and these were well provided with sheds. The number of underground employees was given as 59, and so the total labour force at the time was 99.

At Frank Mills the engine shaft, 100 fathoms deep, was similar in arrangement to that at South Exmouth. Its dimensions were 12 feet by 7 feet, containing the pumps, a drawing shaft and a 'divided cased ladderway'. The whole shaft was 'properly timbered'. Nothing was said about the condition of the other shafts on the mine. Generally, Frank Mills seems to have been a cooler mine than South Exmouth; the average temperature was between 62 and 64 degrees, while the highest recorded, in a rise above the 72 north, was only 65 degrees. During their underground visit, the commissioners noted the soft nature of the ground; 'In the 60, and some other parts, the timbering was giving way, but on the whole, considering the heavy nature of the ground, the mine is fairly secured in this respect'. At surface, 'there is a capital stone building for drying and changing. The men dry their clothes below, and

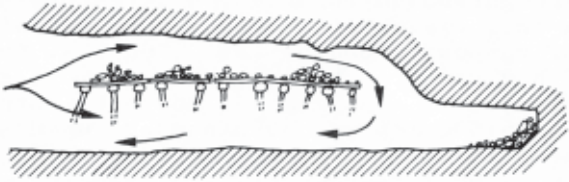


FIG 7 – SOUTH EXMOUTH : THE AIR-FLOW AT THE END, USING A 'STOOL'

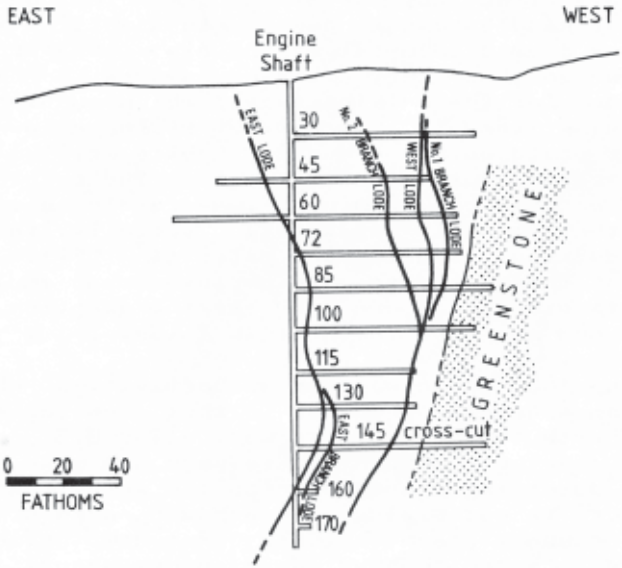


FIG 8 – SECTION OF FRANK MILLS, ENGINE SHAFT, 1877

change above. It only requires cleaning up.' The surface workers numbered about 50, and were reported to be well protected from the weather while working on the dressing floors. Together with the 89 underground employees, the total workforce of the mine was thus about 139.

The final point of interest in the report was a detailed return of the amount of candles and gunpowder consumed during the year 1863 by the two mines. In Frank Mills 9,000 lbs. of candles were purchased for £243.15.0. and sold to the miners for 10d. a lb., giving the company a profit of £131.5.0. The quantity of gunpowder bought was 2,780 lbs. for £69.10.0., which was then sold to the men at 8d. a lb., giving the company a profit of £23.3.4. At South Exmouth, £162.10.0. was spent on 6,000 lbs. of candles and, when sold to the miners at the same price as at Frank Mills, gave the company a profit of £87.10.0. The lesser quantity of candles consumed in the smaller mine simply reflected the scale of operations. In contrast, South Exmouth purchased a larger quantity of gunpowder than Frank Mills, 3,000 lbs, bought for £75.0.0. Sold to the miners for 8d. a lb., this realised a profit of £25.0.0. The larger purchase of powder by the smaller mine probably reflects the fact that it was still in the development stage and thus driving a larger number of development levels. There had also been the comment by Nicholls, during the questioning, that little blasting was done in Frank Mills, most of the work being done 'by the pick'.

The system whereby the mining companies bought bulk supplies of candles and gunpowder, then selling them to their miners, was common in metal mining districts throughout Britain in the nineteenth century. Its advantages were that a discount was obtained for the bulk purchase, which enabled the companies to sell these items to their tributers for a lower price than the latter could obtain generally, while still making a small profit to cover administrative costs. The cost of these items would not be paid by the miners immediately on receipt, but was added to their monthly pay sheet. Typically, this item would read: 'Deductions, candles and materials'.[77] The convenience of the system to both employers and employees helps explain its widespread and long-lasting adoption in the metalliferous mines of the British Isles.

During 1863 there was renewed activity at Wheal Exmouth. Captain James Hampton returned to the Teign Valley from Perranporth and with the help of two men called H.E. Croker and N. Faull, started a company to re-work the mine, while at the same time obtaining a new lease on the sett. What inspired this venture is not clear. There had been no dramatic rise in lead prices and it seems unlikely that Hampton, of all people, would have expected to find any rich ore shoots in the old workings. Perhaps he hoped to open some new ground. It also seems that he might have been talked into the enterprise by Croker and Faull who, according to Ramsden,[78] were engaged in a number of mine re-workings at this time.

The new lease was granted by Lord Exmouth in April 1863, for a term of 21 years, with dues of 1/15th on ores raised from above adit and 1/18th on ores from below. The company was

divided into 1,024 shares, Captain Hampton holding a large proportion of these. Croker was the purser and secretary while Faull was the agent at the company's offices, at 8 Franfort street, Plymouth.[79]

No steam machinery was erected and it appears that most of the work was done above the adit level. The scale of operations and the output were small from the outset, with no more than about 50 persons employed in all. There were occasional small sales of ore but before 1865 these were not recorded separately as they were probably sent to Frank Mills for dressing. During 1865 there were numerous reports on Wheal Exmouth in the *Mining Journal*. By the beginning of May it was reported that output was running at the rate of 20 tons a month.[80] By the end of the year this figure was up to 30 tons a month.[81] The total recorded output for 1865 was 144 tons of lead ore and 466 oz. of silver. This enabled the company to pay a dividend of 2s.6d. per share.[82] This may appear surprising with such a small output but can probably best be explained in terms of the small scale of operations and the low level of overheads. With no great capital investment in re-opening the mine, profits could be made in quite marginal conditions of, price and output, which would force a larger and more capital-intensive firm to cease operations, as had indeed happened three years previously at Wheal Exmouth.

At South Exmouth the scale of operations was subsiding to a lower level; by the first week of January 1864, the engine shaft was down 73 fms and still sinking, in the hope of locating some more rich ore shoots.[83] At the same time, the 60 south was turning in some unpromising reports, suggesting that the lode there contained nothing much more than ' .. white iron and quartz .. '[84] During the rest of the year, while Westcomb's Shaft continued sinking in search of lead, most of the dwindling production was coming from the upper levels. With falling ore grades, increasing quantities of stuff were being raised, but this could not prevent output falling. Under these pressing conditions the company was making a loss and so had to make two calls during the year, one of 5s. a share and one of 4s.[85] A report at the end of the year summed up the position of the mine when it stated that the situation, in general, was poor, with low ore values throughout the mine.[86]

The 90 fm. level was reached by the beginning of 1865 and drives were hurriedly started north and south. Throughout the spring and early summer the reports in the *Mining Journal* illustrated the problem of locating worthwhile deposits; the 60 north was driving along a lode described as yielding ' .. occasional stones of lead',[87] while the 75 north contained a ' .. small string of lead.'[88] The position was getting desperate; by midsummer the 75 had been driven 550 yards to the north without finding anything of note. In the autumn a further call of 6s. a share was necessitated. Soon after, it was dispiritedly announced that the lode in the 90 fm. level was all quartz.[89] It seemed that the company could not continue operations much longer. Output had fallen to 52 tons of lead ore, with 168 oz. of silver, the previous year. During 1865 the monthly rate of production was less than 2 tons of lead ore.

However, towards the end of the year a small, but fairly rich, ore shoot was located, in the 75 north. This assayed from ½ to l½ tons per fathom in a lode 3 feet wide.[90] This enabled the company to maintain their small output for about a year longer than they might have done otherwise, but only provided a temporary breathing space.

Quite surprisingly, the adventurers seem to have continued in a hopeful mood through 1866. At one meeting it was suggested that better results might be expected at even greater depth, and so it was urged that while the 90 fm level was continued driving in exploration, the company consider sinking below that level. However, the year saw another call, for 6s. a share. At the meeting that announced this call, it was also stated that 60 men were employed on the mine. This reduction in the workforce, by one-third since the time of the Royal Commission three years previously, gives another illustration of the decline in the mine's fortunes. The precarious confidence of the shareholders held until the autumn, when it was reported that the 60 north ' .. promises well for lead'.[91] However, by the end of 1866 the ore shoot in the 75 had been exhausted and nothing else remained in the mine except low grade ore in scattered pockets. After falling to a mere 18 tons of lead ore in 1865, output in 1866 fell even further, to 8 tons. With little hope of finding workable ore in the 90, it seemed that the company could not long continue functioning.

In contrast to all the other mining ventures in the area, Frank Mills was entering a new stage of prosperity. After an interim period, between 1861 and 1863, of declining ore values and output, new richer ore shoots had been located in the 100 fm. level at the beginning of 1864. These had an immediate effect on the optimism of the adventurers and at the January meeting of that year it was stated that ' .. the prospect is increased .. ' Then a dividend of 3s. per share was declared.[92] While the new ore ground, near the air shaft in the 100 fm level, was being opened up, the engine shaft continued to sink and by late autumn reached the 115 fm level. Meanwhile, the ore shoots in the 100 had been proving very productive and so monthly output increased to about 100 tons of lead ore, compared with an average 60 tons in the previous year. The increased production enabled the company to distribute two further dividends, each of 5s. per share, bringing the total for 1864 to 13s. a share. As well as selling larger quantities of ore, it seems that the quality of the Frank Mills ore was improving at this time. In the quarter ending June 30th 1864 the company sold 275 tons of lead ore for £4,317.10.0. or an average £15.14.0. a ton. This compares with an average lead ore price in 1864 that would have been in the region of £14.5.0. a ton.[93]

Towards the end of 1864 the drive north on the 115 fm level cut the same ore shoots that had been found in the level above. At the same time a crosscut on this level proved a branch lode to the east of the main workings, containing quartz, iron and some lead. Later in the life of the mine, some lead was indeed taken from this lode, although the values in it gen-

erally proved to be too low to make full exploitation worthwhile. In general, 1864 proved to be a very profitable year for the adventurers; the output soared to 1,209 tons of lead ore, together with 17,682 oz. of silver. These were the highest figures to date and reflected the good dividends that had been paid in the year. Share prices also reflected the state of the mine, standing at £6 for a £3.18.6. paid share by the end of 1864.

In the first few weeks of 1865 came even more exciting news. The 115 had been driven further north and had proved that the ore shoots were even more extensive than in the 100. Instead of pinching out at depth, as so often seemed to happen in the Teign Valley lodes, these ore shoots had opened out. At the first meeting of the year a dividend of 6s. a share was declared. Then the chairman gave a full report on the state of the mine; sales were running at the rate of 105 tons per month and the average selling price of the lead ore was £14.7.5. a ton. This gives another indication of the good quality of the Frank Mills lead sales at this time, comparing with general lead ore prices of around £12.14.0. during 1865 (see statistical appendices). The chairman, Mr J. Harris, then expressed the hope that since the east lode was underlying to the west and the west lode was underlying east, they would meet in depth, with some very rich shoots of ore. It was suggested that this would happen somewhere between 150 and 170 fms from surface.[94]

During February came the report that the engine shaft was sinking to the 130; during a period of high output and profits the shareholders were in the right mood to sanction a high level of development expenditure. Occasionally there were items of news which must have reinforced the atmosphere of optimism. For example, during March, it was reported that an assay of the west lode in the 100 north gave a silver content of 53 oz. per ton of lead ore. The silver content of the lodes seems to have increased at this time, such that between 1864 and 1865, while lead ore production increased by about 10 percent, silver production increased by around 80 percent. In 1864 an average 14½ oz. of silver was contained in each ton of lead ore sold; in 1865 this figure was 24 oz. per ton.

Output from the new ore ground below the 100 grew at a steady rate throughout the year and by April 1865 it was announced that production was running at the rate of 106 tons a month.[95] With this new ore ground being opened up so rapidly, the Frank Mills levels were gradually being driven further and further north. By the spring of 1865 they were already some distance beyond the pond air shaft and ventilation difficulties began to be experienced in the ends. To solve this problem, Captain Nicholls decided that a new air shaft was needed, to the north of the pond. However, this would have to be situated in the Canonteign estate. Despite the proposed position of the shaft being less than a couple of hundred yards from his house, Lord Exmouth granted permission for the work, provided that all waste rock from the excavation should be removed from the parkland. So, once again as in 1859 with the use of his waterfall, Lord Exmouth showed himself to be a co-operative landlord. Work on sinking this shaft was

started immediately and completed to the 72 fm. level by the end of the year, whereupon the ventilation of the northernmost levels was much improved. By this time, the end of 1865, the Frank Mills workings had reached their greatest lateral extent; the drives north on the 45, 60 and 72 fm. levels had reached the boundary with the Wheal Exmouth sett, while there was little real potential to the south of engine shaft. From this point in time onwards the Frank Mills company would have realised that all future developments would have to be at greater depths.

The year 1865 was a very good one for the shareholders. Two further dividends of 7*s.* were declared, bringing the year's total to £1 per share. The output, 1,337 tons of lead ore and 31,785 oz. of silver, constituted a new record. It is worth noting the relative contributions made to total revenue by lead ore and silver sales in Frank Mills and the other Teign Valley mines. In 1865, for instance, assuming silver to be 5s. an ounce,[96] the total value of Frank Mills output of the precious metal would have been about £7,950. Lead ores, selling at an average £14.0.0. a ton (according to *Mining Journal* estimates), would have raised about £18,700. Thus sales of silver contributed about 30 percent of total revenues from ore sales, an indispensable part of mine income. This proportion tended to decline in later years, so that in 1873, with Frank Mills lead ore sales of only 293 tons and silver sales of 5,125 oz., the respective revenues of £3,557.10.4. and around £1,280 (at 5s. oz.) give a 26 percent share of total income. Other mines tended to produce less silver, relatively speaking. In 1854, for example, Wheal Exmouth sold 1,140 tons of lead ore and a reported 15,000 oz. of silver; at an estimated £16.5.0. per ton and 5s. per oz. respectively, these would have raised about £18,500 and £3,750 (with silver contributing just 17 percent to the total). Overall, total recorded Teign Valley lead ore production (1845-1880) of 28,529 tons and silver production of 387,748 oz. would have raised (assuming lead ore at an average £12.17.6. and silver at 5s. an ounce) approximately £370,000 for the former and £97,000 for the latter. Thus silver would have raised about 21 percent of the total receipts of around £467,000.

At about the time that Frank Mills was enjoying its greatest period of prosperity, two interesting summaries of the mining industry in the Teign Valley were published. These appeared in E.R. Kelley's Post Office Directory of Somerset and Devon (published in 1866) and in Thomas Spargo's Mines of Cornwall and Devon (published in 1868). Of the two accounts, Spargo's is the more informative, the author being one of the leading mine share-brokers in the London and west-country markets in the 1860s, although he was often over-enthusiastic about the prospects of some mines.

Spargo described the revived Wheal Exmouth as a mine in clay-slate and elvan ground. The work-force included 30 men, 12 females and 10 boys. There was no steam machinery on the mine, all work being done by water power. What ore that was raised, came from above adit level and was said to consist of

copper and lead ores. Spargo, optimistic as usual, concluded by predicting that 'At present the returns will leave a profit of £2,000 a year', and, in support of this view, added that ' .. the late company divided about £25,000 profit'. Concerning two older mines, lying idle at the time, Spargo noted: 'Hannock: idle 12 years. Some lead returned here'. 'Birch Aller: idle 10 years. A lead mine, some returns. Captain George Odgers, Camborne, was the agent.' By the time that Spargo was writing the second edition of his book, in late 1867, South Exmouth was also idle and his report runs: 'South Exmouth: In Hennock, idle a few months. Depth 90 fms. Considerable returns of lead. There was a profit of £1,500 in 1 year. It worked 7 or 8 years. A loss on the whole working.' Spargo's estimate of £1,500 profit made in one year is rather odd; he must have been referring to the first year of operations, 1862, when 481 tons of lead ore was sold. This realised £6,129. However, during the first year, according to the purser, Mr Westcomb, about £6,250 was expended on plant, dressing floors, labour and the cost of opening the mine. Thus, on the basis of these figures, in the mine's most productive single year, a loss of £120 or thereabouts was made. It may be possible that in calculating the profit, Spar go was discounting the fixed costs. In any case, this estimate seems to be typical of the share-broker's over-enthusiastic appraisal of some mines' past performances.

Easy though it is to criticise his reports, Spargo does provide some invaluable information about the mines whose shares he dealt in. In the case of Frank Mills, he states: 'In Christow. Purser Mr J. Harris, Exeter. Manager, Captain J.P. Nicholls, Christow. Landowner, Lord Exmouth. Dues, 1-13th. Depth of mine, 140 fms. No adit. Pumping engine, 60 inch; crushing-engine 28 inch; winding engine 42 inch.' He goes on to say that the mine ' .. has been worked about 15 years. Amount paid up £3.18.6. per share; repaid out of profit, £3.5.6. per share. Last dividend, 5s. per share, in February 1866.' From these figures it is possible ~o see just how 'profitable' Frank Mills was. Even as the richest mine in the valley, it was only just approaching the point at which it had paid back all that had been called on each share. In the remaining working life of the mine, a further £1.7.6. a share was distributed in dividends.[97] Therefore, it would seem that the shareholders only made 14s.6d. profit on each share, over a period of about 25 years' working. Based on the amount paid up on each share, this represents. a return of 18t percent for the whole period, or a simple average of 0.76 percent per annum. This does not seem spectacular, but it must be remembered that this really represents what might be termed additional profits. The primary profits in the mine would have been made by the community of merchants and plant suppliers, who would also have been amongst the leading shareholders, as was common in the south-west of England. So, while nominally the mine was only making marginal profits, it was in the interest of a number of the leading shareholders to keep it operating. When looking at the profitability of nineteenth-century mining ventures, this situation must be kept in mind, and will directly bear on any assessment of the viability of individual companies.

During the second half of the 1860s there was a turning point in the history of the mining industry in the Teign Valley, although it is only possible to assign an approximate date to it. It seems that after about 1865 a decline set in which lasted for fifteen years, until the final end of mining in the valley. Soon after 1865 the ailing South Exmouth company found itself moving towards closure, as did the revived Wheal Exmouth. From that year onwards there was a decline in the fortunes of Frank Mills, with a downward trend in output. It is true there was a somewhat dramatic recovery in Frank Mills output in 1868, but this was largely the result of a policy of running down the ore reserves in the mine (or 'picking the eyes of the mine' as it was termed in the south-west of England). Also, this revival was a temporary one; within four years output at the valley's premier mine had slumped again. At the time, optimists probably only saw falling output figures and declining profits as part of a temporary recession, like so many in previous decades. Not until well into the final years of their existence did the companies realise that this recession was more serious. Not until the end, in 1880, could they possibly foresee that lead mining was passing away from the Teign Valley, probably for ever.

Footnotes:

(1) MSS, ECRO.
(2) *MJ* 1855, 9th January.
(3) Ramsden MSS, ECRO. A fuller account of Birch Ellers and Bridford mines is contained in two articles: C.J. Schmitz, 'The Early Growth of the Devon Barytes Industry, 1835-1875' *Trans. Devonshire Assoc.*, CVI (1974), 59-76, and 'The Development and Decline of the Devon Barytes Industry, 1875-1958' *Trans. Devonshire Assoc.*, CIX (1977), 117-33.
(4) Spargo, Mines of Cornwall and Devon, p167. This states that Bridford Consols produced no lead.
(5) *MJ* 1855, p19.
(6) *MJ* 1855, p554.
(7) *MJ* 1855, p654.
(8) ibid.
(9) *MJ* 1856, p6.
(10) X-'pare' of men numbered anything from 4 to 12 and really meant a working partnership of miners.
(11) MSS, ECRO.
(12) *MJ* 1856, p682.
(13) *MJ* 1855, p19.
(14) *MJ* 1855, p524.
(15) *MJ* 1855, p662.
(16) *MJ* 1855, p790.
(17) *MJ* 1855, p806.
(18) *MJ* 1855, p590.

(19) *MJ* 1856, pp219, 361.
(20) *MJ* 1857, p437. Although zinc sales are not recorded at any other Teign Valley mines, it is possible to find traces of reddish zinc blende, together with galena and barytes, in the dumps of South Exmouth mine.
(21) *MJ* 1857, p550.
(22) *MJ* 1857, p629.
(23) *MJ* 1859, p161.
(24) Ramsden MSS, ECRO.
(25) *MJ* 1859, p120.
(26) Ramsden MSS.
(27) *MJ* 1857, p497.
(28) *MJ* 1858, p599.
(29) *MJ* 1859, p29.
(30) *MJ* 1859, p74.
(31) *MJ* 1859, pp518, 603.
(32) Dines, p727 and R.S. Nunny, 'Any Old Iron' *Devon Life Magazine*, (August 1970). Also see, M. Atkinson and C.J. Schmitz, 'Kelly Iron Mine, near Bovey Tracey' *Devon Historian*, XI (October 1975), 27-34 and M, Atkinson, R. Burt and P. Waite, *Dartmoor Mines: the Mines of the Granite Mass*, (Exeter, 1978).
(33) Dines, p726.
(34) *MJ* 1860, p419.
(35) *MJ* 1860, p595.
(36) *MJ* 1861, p 321.
(37) Ramsden MSS, ECRO.
(38) *MJ* 1861, p409.
(39) *MJ* 1861, p68 2.
(40) Ramsden MSS.
(41) *MJ* 1860, p9.
(42) *MJ* 1860, p214.
(43) *MJ* 1860, p337.
(44) *MJ* 1860, p506.
(45) *MJ* 1860, p559.
(46) *MJ* 1860, p777.
(47) Ramsden MSS, ECRO.
(48) *MJ* 1861, pp321, 469.
(49) *MJ* 1861, p578.
(50) *MJ* 1861, p805.
(51) *MJ* 1862, pp64, 85.
(52) *MJ* 1862, p316.
(53) Barton, *Cornish Beam Engine*, p61.
(54) ibid. p62.
(55) E.R. Kelley, *Post Office Directory of Somerset and Devon*, (London, 1866), p695
(56) ibid.
(57) *MJ* 1861, p751.

(58) *MJ* 1862, p55.
(59) *MJ* 1862, p315.
(60) *MJ* 1862, p625.
(61) ibid.
(62) *MJ* 1862, p661.
(63) *MJ* 1862, p695.
(64) *MJ* 1862, p747.
(65) *MJ* 1862, p877. [83]
(66) The sudden influx of miners, and their families, into Hennock parish, until then outside the mainstream of Teign Valley mining, led to an increase in population from around 890 in the 1850s to over 1,000 (and probably nearer 1,100) in the early 1860s. This in turn led to the construction of temporary housing on the outskirts of the village; one old miner, Mr Samuel Bradford (of Great Rock mine) informed the author in an interview in 1970 of the former existence of these 'miners' shacks', of which all trace has now disappeared. These would have belonged to some of the 50 or 60 families representing the 122-strong workforce of South Exmouth mine at its peak.
(67) *MJ* 1862, p398.
(68) *MJ* 1862, p814.
(69) Ramsden MSS, ECRO.
(70) British Sessional Papers, House of Commons, (1864) vol. XXIV, part 2.
(71) The south-west England term 'cores' was replaced by the term 'corps' in the commissioners' report.
(72) Due to height differences between their collars, currents of air were forced through the mine, down the downcast and up the upcast.
(73) This means that there were three shifts a day: 06.00-14.00, 14.00-22.00 and 22.00-06.00 hrs.
(74) At the time of the commission there was no drainage adit at South Exmouth, but subsequently the 45 fm. level was driven north and connected with the old Hennock adit. This adit was open and emitting water in the mid 1970s.
(75) This re-emphasises the point that the Teign Valley mines had to employ agricultural labour, given the shortage of miners in the district. (See the case of Hennock mine, c1853, pp36, 38-9.)
(76) C. Noall, *Levant*, (Truro, 1971), pp21-2.
(77) For a typical tributer's paysheet of the 1860s, see plate p133, D.B. Barton, *Essays in Cornish Mining History*, vol. I (Truro, 1968).
(78) Ramsden MSS, ECRO.
(79) Spargo, p166 and Kelley, pp695-6.
(80) *MJ* 1865, p281.
(81) *MJ* 1865, p683.
(82) *MJ* 1865, p685.
(83) *MJ* 1864, p7.
(84) ibid.

(85) *MJ* 1864, p369.
(86) *MJ* 1864, p597.
(87) *MJ* 1865, p75.
(88) *MJ* 1865, pl06.
(89) *MJ* 1865, p587.
(90) *MJ* 1865, pp783, 815.
(91) *MJ* 1866, p442.
(92) *MJ* 1864, p81.
(93) See statistical appendices, table 9.
(94) *MJ* 1865, p87.
(95) *MJ* 1865, p254.
(96) All prices from *Mineral Statistics* of the United Kingdom.
(97) Calculated by author from reports in *MJ*, 1866-80.

CHAPTER FIVE

Decline

Wheal Exmouth continued working in a small way throughout 1866, 1867 and 1868. The output tended to be sporadic; 144 tons of lead ore in 1866, no recorded output the following year and 119 tons in 1868. Like Captain Moore's 1859 re-working of Wheal Adams, most of the lead ore was obtained by re-processing the dumps left by the earlier workers, as well as working the small amounts of the lode left in situ above adit level. Ramsden commented on the small scale of this venture and suggested that it was unlikely to meet with any real success since it was improbable that any rich orebodies would have been left in the existing workings by the previous company.[1]

During 1866 Captain Hampton's men commenced driving a new cross-cut east from the deep adit level, in an attempt to locate some new deposits. By late spring it would appear that they had been successful; the *Mining Journal* reported that a lode worth 1½ tons per fathom of silver-lead had been cut in this cross-cut.[2] However, nothing more was heard of this lode and there was no sudden increase in output so, once again, it seems that this was merely an attempt to boost the confidence of the shareholders.

Eighteen sixty-seven saw another attempt to paint a rosy picture of the deposits in the mine. Towards the end of that year the *Mining Journal* reported that ' .. a rich lode recently cut in Exmouth Consols .. passes for a considerable length through the south end of the Wheal Adams sett.'[3] It was stated that the company hoped to re-open the old Adams workings but it seems that due to the unstable state of the Exmouth company's finances, this scheme never got under way. In 1867 Wheal Exmouth produced, in addition to its 119 tons of lead ore, 966 oz. of silver. This represents a silver grade of only just over 8 oz. to the ton, quite low for the Teign Valley, and gives another indication of the poverty of the remaining ore shoots in the old mine.

By 1868 it must have been clear that there were no easily accessible sources of lead or silver remaining in the old workings. Some zinc blende was being encountered, but in relatively small quantities. In 1868, the *Mineral Statistics* recorded 10 tons of this mineral (value £25) shipped from the port of Teignmouth; this probably came from Wheal Exmouth. The overall prospects of the company remained dim. Any chance remaining of working the mine for lead and silver rested with the need to sink deeper, below the old workings. Yet, the capital necessary for this was not forthcoming and, with no visible ore in the accessible levels, the company was forced to cease operations during 1868. By the end of the spring of that

year, the *Mining Journal* was carrying an advertisement for the sale of the plant and materials.[4] Within a short space of time, Canonteign once again returned to state of rural peace and quiet, Captain Hampton once again returning to Cornwall.

The situation at South Exmouth was hardly any better. By 1866 output had declined to almost nothing, a mere 8 tons of lead ore and 28 oz. of silver. Hopes had been pinned on the new 90 fm. level but these faded fast. The first report of 1867 stated that the lode in the 90 north was poor. At this time the only level in the mine producing any lead was the 75 north, where it was reported that the lode consisted of iron and quartz with 'occasional lead'.[5]

During the first few months of 1867 it seemed that the situation might be improving. The 90 north was reported as carrying some zinc blende while the 75 north was improving, with ' .. some strings of lead on the west wall.'[6] Output rose slightly with these discoveries in the 75. However, by midsummer, any hopes of a revival were dashed when the lead in the 75 north failed completely and production slumped to an even lower level than previously. The company's last report appeared in the *Mining Journal* towards the end of the year. It stated that the 90 fm. level cross-cut had intersected a lode containing iron, quartz and some lead and blende.[7] Some time after this, operations were suspended. The year's output, 21 tons of lead ore was slightly higher than previous years, but only reflected the temporary improvement in the 75 early in 1867.

From Spargo's account it would appear that the date of closure was before the end of 1867 (see above, p81). There seem to have been hopes of re-starting the mine during 1868 and 1869, as the plant and materials were advertised for sale not until after then; in the late autumn of 1869 they were offered for sale by the manager of Frank Mills.[8] However, the market for second-hand mine materials does not appear to have been very buoyant at the time and some difficulty was clearly experienced in disposing of the South Exmouth equipment. Once again, in 1871, the plant was advertised for sale, including a 40 inch pumping engine (of 10' stroke) and 60 fms of 9, 11 and 12 inch pump pipes.[9] This time, it seems the items were sold fairly quickly and so, before long, the mine site was cleared and the buildings demolished. The sole remains of this once busy enterprise then consisted of a couple of acres of waste tips which soon disappeared under the encroaching vegetation.

Problems with ore deposits seemed to be proliferating in the valley after about 1865. At Frank Mills the rich ore shoot in the 100 and 115 fm. levels, under the pond, which had mainly been responsible for the high production' between 1863 and 1865, was now showing signs of becoming poorer. In what was most likely an attempt to conserve stocks of ore in the mine and allow time for further exploration, Captain Nicholls ordered a cut-back in production. With this, monthly output fell from

about 100 tons to less than 40 tons, taking effect from the beginning of 1866. This move probably enabled the mine to continue operations longer than it might otherwise have done.

Exploration in depth was now essential and by the spring of 1866 the engine shaft was reported down 130 fms. Immediately worked was commenced sinking it further, to the 145.[10] The company was now desperate to prove the hypothesised junction of east and west lodes at depth. At a meeting at the end of June it was announced that there had been a loss, due mainly to an accident with the pumping engine. It was proposed that an additional pumping engine be purchased but this was defeated on the grounds of cost.[11] However, towards the end of the year a new whim was erected on the engine shaft.[12] Perhaps the extra pump would have necessary with the mine sinking deeper, but the growing conservatism of the shareholders (caused largely, no doubt, by the failure of all the other mines in the area) had led to this move being overruled.

Driving in the underground levels was also causing some difficulties at this time. In the 130 fm. level and in the shaft sinking below that point, increasing quantities of hard elvan rock (dolerite) were being encountered.[13] In all levels below the 115, the miners were to encounter this rock in large quantities and, from what occurred later, it would appear that these intrusions, of possibly later origin than the lodes, cut out the latter and led to fewer rich ore shoots. In particular, all cross-cuts west from the deeper levels quickly ran into a solid mass of greenstone which contained no minerals of economic importance.[14]

By January 1867 the engine shaft was down to the 145 fm. level and a cross-cut west was commenced. During the spring and summer this drive cut, first, the east lode, and then the west lode. The results must have been extremely disappointing. The west lode was proved to consist almost totally of quartz, with no significant lead values. The east lode at first gave signs of very low lead values, but improved somewhat during the year, as driving continued along it. However, the most serious implication of the results at this level was that, far from almost joining at this point, the two lodes were no closer. While west lode continued to underlie east, below the 130 the east lode changed first to a vertical position and then turned back on itself, to underlie east. The result was that in the 145 the two lodes were no closer, and both underlying east, roughly parallel to each other. There then seemed little prospect that they would join, with the possibility of some rich ore shoots, at anything other than an impossible depth.

Output in 1866 and 1867 had fallen, respectively, to 452 and 428 tons of lead ore, with 10,750 oz. and 9,984 oz. of silver. As a result of this, and the losses that were being made, there was a fall in the price of the shares.[15] The prospects, as reported at each meeting, appeared increasingly gloomy. There were no new rich ore shoots in the mine and all production was coming from the blocked-out reserves.

There would appear to have been a change in company policy towards these reserves at the beginning of 1868. With falling production, falling share prices and increasing losses, there

would have been mounting pressure to reverse Nicholls' policy of cutting back production to conserve ore reserves underground. With the shareholders probably in a mood to gamble on finding more ore shoots in a short space of time, it was decided to step up production and end the losses (and calls). No doubt Nicholls would have protested at this short-sighted plan of action, but would have been over-ruled. The plan was put into immediate action and, during February and March, output was raised once again, to over 120 tons a month. The contemporary reports in the *Mining Journal*[16] underline the point that this increase was achieved by the more intensive working of the existing workings above the 115 fm level.

While this frantic exploitation of the mine's reserves was going on, exploration was continuing at depth. The adventurers still hoped to strike some new ore shoots below the 115, although by this time it seems Nicholls did not share their optimism. By the end of 1868 he had resigned as manager, perhaps irritated by the overthrow of his conservation policy. At only 53 years of age, it is unlikely that he was being forced to retire through old-age or ill-health. He was replaced by John Cornish, who had been an undermanager at Frank Mills since 1862.

In the late summer it was reported that the 145 had cut a small branch lode off the east lode. However, by the end of the year it was concluded that results on the 145 had been poor. Production in 1868 amounted to a record 1,520 tons of lead ore and 39,865 oz. of silver, but this was the last flash in the pan. The ailing state of the company can be fully appreciated when it is seen that even with this level of output, no dividends were paid in 1868; the receipts were swallowed by the growing costs of pumping from depth and in the rising cost of materials. So, the gamble of the shareholders had failed; they had not restored the mine to making a profit, or located new ore shoots, but had merely robbed it of its too-vulnerable reserves. From this point in time the full decline of the Frank Mills company can therefore be dated.

Despite the increasing poverty of the Frank Mills lodes, the miners still occasionally came upon some rich and unusual patches in the workings. During 1868, Mr T. Andrew, an amateur geologist, visited the mine and subsequently described one such occurrence: 'A working miner recently informed me that .. he was working in the Frank Mills mine in a "vug", or chamber, in connection with the lode, when he suddenly came upon a splendid show of white carbonate of lead, from ten to twelve feet square, the needles being suspended from the roof in just the same manner as stalactites are suspended from the roof in a limestone cavern.'[17] However, these discoveries were infrequent and could do little to revive the fortunes of the company. By 1869 the frequent reports in the *Mining Journal* giving the values of the stopes 'per fathom' indicated that the lodes were continuing poor, with those values seldom rising above ¾ ton per fathom, and frequently falling as low as ¼ ton per fathom. Often drives were merely described as 'saving work', presumably just offsetting the cost of driving them. Evidently there was no development of real ore shoots, but merely a series of small pockets containing small patches of galena.

Fortunately, the old workings continued productive and output was maintained at a rate of just under 90 tons a month during 1869. Two small dividends of 3s. a share were paid early in the year, followed by one of 4s., but there was still an absence of discoveries of new ore shoots in the deeper levels. The east lode in the 145 fm level had started to produce small parcels of ore but the west lode at that level remained barren.

Early in 1870 the 145 presented a bleaker prospect. The small ore shoot that had been located now showed signs of petering out, and increasing amounts of hard elvan were being run into in the drives. A company meeting in June was told that the 145 south was in a lode (i.e. east lode) four feet wide, consisting of quartz, mundic (iron pyrites) and 'spots of lead'. This was a bleak picture, only partially compensated by the announcement of a dividend of 2s.6d. a share. Although it was not realised at the time, this was the last dividend the company was to pay on its shares. Output the previous year had been 1,058 tons of lead ore and 27,437 oz. of silver, already down on the peak year of 1868. During 1870 it was apparent that this decline was continuing. In the first few months of the year lead ore output was running at the rate of about 85 tons a month; by November and December it was down to about 70 tons. A company meeting at the end of 1870 revealed that ore values were continuing to fall in the stopes, and that there was an increasing amount of iron (particularly mundic) in the deeper levels.[18] The year's output-, although lower than that for 1869, was not drastically lower; 957 tons of lead ore and 23,925 oz. of silver. It was not until the reserves were exhausted that a marked decline in output occurred, and that took about another year. It is worth noting that, from the length of time it took Frank Mills to exhaust its ore stocks underground, at 1868 it must have had about four years' reserves ahead of the mill, that is, about 4,500 tons of lead ore (with about 120,000 oz. of silver) held in situ underground.

Despite falling output and increasing losses, the general level of activity at the mine was not diminishing; if anything it was increasing, with the need to locate new ore bodies and the need to raise larger quantities of ore to compensate for falling grades. At the time of the Royal Commission in 1863, the number of employees at Frank Mills had been 139. By the beginning of 1871 this had increased to 190.[19] This testifies to the large scale that the mine was working on, by Teign Valley standards, and to the increasing amount of exploratory driving that was being done. It is also likely that a large number of former South Exmouth employees would have been taken on by Frank Mills after the closure of the former mine in late 1867. Another indicator of the high level of activity was the fact that reports on Frank Mills appeared in the *Mining Journal* virtually every fortnight during 1871. Through 1872 and 1873 these appeared sometimes as much as once a week. But, despite this volum-

inous literary outpouring concerning the mine, there was unfortunately a lack of a correspondingly high outpouring of lead and silver ores.

At a meeting held on the mine towards the end of 1871, it was suggested that, since the working was now being conducted at a loss, the company's reserve fund was being rapidly depleted. It was also reported that the quality of the ore raised was continuing to deteriorate. In 1865 the Frank Mills ore had sold for well above the general price level for lead ores. By the end of 1871, the meeting was told, Frank Mills ores were selling for less than the general level. In the quarter ending 18th October 1871, 182 tons of ore had been sold for £2,139, or about £11.15.0. a ton. The general level of lead ore prices was in the region of £12.6.0. a ton (see statistical appendices). By the early 1870s, the richer ores of the 1860s had been largely exhausted.

There was one minor consolation to the shareholders. Until about 1871 there had been numerous discoveries of 'white iron' in the deeper levels, but they had never been of much value and so these deposits were ignored. However, by 1871, the reports of these ore-bodies had grown in regularity and according to Ramsden[20] it seems that the iron deposits must have been quite large. Towards the end of the year a distinct lode of spathose iron was cut, in the 130 fm. level in the ground under the pond.[21] This lode, coursing roughly east-west, was described as about l½ feet wide and containing quartz with spathose or 'white' iron. The market price for iron ore of this type was minimal compared with that of lead. According to Meade[22] the value of Devonshire iron ores averaged 15s. a ton in 1874 and 1875. Returns from mining and raising the iron would have been low, but in the harsher climate of the 1870s even these ores were worth working. There was also the belief at the time that these east-west iron lodes, if followed west, towards the granite (less than a mile distant) would show some tin values. With tin ores then worth some £90-£100 a ton, this idea seemed well worth pursuing, although it has since been shown that these east-west lodes, even where they do enter the granite, contain little or no tin mineralisation.[23] Meanwhile, since the iron appeared readily accessible, some quantities were brought to surface and sold. The first sale, of 20 tons realising £13, was made during 1872. Thereafter the sales were small and sporadic, depending mainly on the accessibility of the ore from time to time. Total iron ore sales from Frank Mills, 1872-1880, were 422 tons for £292, or an average of just under 14s. a ton.

From early 1872 attempts were made to develop the higher levels and several old stopes were re-worked. A report at the beginning of the year summed up the mine's position:[24] the 115 fm. level was being driven north and on the 45 fm level, a new branch to the west lode had been located near the orchard air-shaft (situated about 165 yards W.N.W.

of Engine Shaft) ,and this was worth ½ ton per fathom. The iron lode in the 130 north was now about two feet wide. Later reports stated that the iron was being found in large quantities in the 100, 115 and 130 drives north.[25]

Despite the intensive development work in all levels, ore values in all the stopes continued to decline. Output in 1871 had fallen quite drastically, to 761 tons of lead ore and 13,300 oz. of silver. During 1872, monthly output continued to fall. By midsummer it was down to just over 50 tons. The attempts to find new ore-bodies in the old shallow levels had largely failed, yielding only ' .. wide barytes spotted with lead' in the 30 fm. level, for example.[26] Only from the 100 fm. level downwards were occasional patches of rich ore discovered. In the late summer of 1872, a cross-cut east from the 100 fm level cut a patch assayed at ¾ ton per fathom, but like the other rich patches this only lasted for a short distance.[27] By the end of the year the realisation probably dawned upon the sorely-tried Frank Mills shareholders that there was little of value left immediately accessible in their mine. Since the boundaries of the sett, north and south, had been reached long before, all development had to continue in depth. Some of the more optimistic shareholders obviously believed that east and west lodes might still unite not far below the 145, despite the previous disappointment about the change in the underlie of east lode. Therefore, the decision was taken, towards the end of 1872, to sink Engine Shaft further, initially to the 160 fm. level.[28] Work on this started by the new year. The much reduced output figures for 1872, 565 tons of lead ore and 9,887 oz. of silver, must have added a sense of urgency to the task.

The early 1870s witnessed another attempt to rework the Wheal Exmouth sett. In the autumn of 1869 a small group of local men, led by John Cock and including several miners,[29] formed a company to obtain a lease on the workings above adit. They then set about reopening the old deep adit and by the end of the year there were reported to be 19 tributers at work, cutting a lode said to be worth ¼ ton of lead and 2 tons of zinc blende per fathom.[30] At the end of 1869 it was reported that the lode in a rise over the deep adit was worth 2 tons per fathom of lead, but this subsequently proved to be a very isolated patch.[31] The work in the deep adit continued during 1870 and to provide power for dressing and hoisting, a water-wheel was installed.[32] By the end of 1870, the first sales had been made by the new company, 51 tons of lead ore, 165 oz. of silver, and 346 tons of zinc blende, the latter sold for £970.6.0. (In the previous year, 1869, the *Mineral Statistics* reported 20 tons of zinc ore, worth £50, shipped from Teignmouth. This most likely came from John Cock's venture at Wheal Exmouth.)

The work at Wheal Exmouth continued on a very small scale until 1874, with never more than about 20 men at work and without making any notable discoveries. During this

reworking a total 516 tons of lead ore and 1,465 oz. of silver was produced, together with 1,326 tons of zinc ore sold for £4,931. The frequent reports in the *Mining Journal* give the impression that little more than large quantities of zinc blende was encountered in the adit level. The last reports, in 187) and 1874, state typically, ' .. at work and producing', a non-committal way of saying that nothing much' was happening. Ramsden believes that returns fell off and the venture closed during 1874, the sett then being taken over, complete with water-wheel and dressing plant, by the Frank Mills company.[33] It then seems that little or nothing was done to the sett and thus the re-working of 1869-74 represented the last attempt to wrest any mineral wealth from this once productive section of the Teign Valley lodes.

This was not the only attempt to re-work one of the old mines in the Teign Valley at this time. The *Mineral Statistics* for the years 1876-79 also list a mine, 'Aller Silver-Lead Mine' as operating, with T.W. Duncan and J.O. Harris (of Frank Mills) as managers. There is no record of output, however, and so this must have been just a trial, probably on the site of one of the earlier mine workings to the north of Wheal Adams.

At Frank Mills, the difficulties caused by the deteriorating ore values were compounded in the early 1870s by a dramatic rise in the cost of raw materials and in particular of fuel for pumping and motive power in general. During the general trade boom of the early 1870s, the price of coal rose particularly rapidly, due partly to the high level of demand and partly to some restrictions on supply. Between 1867 and 1871 the average price of Welsh coal, at Cardiff, was just over 11s. a ton. In 1872 this rose to 16s. a ton, in 1873 to 20s. a ton, and in 1874 to a peak of 21s.3d. a ton. Thereafter there was a slow return to more normal prices; 20s. in 1875, 19s. in 1876, 13s.3d. in 1877, and 10s.11d. in 1878.[34] These grossly inflated prices hit Frank Mills, as they did all metal mines, and added significantly to the cost of pumping and winding. Ramsden has estimated that since by this time Frank Mills was having to pump water from the whole run of mines, from Wheal Adams in the north to Hyner Bridge in the south, it was probably using about 10 cwt. an hour for the 60 inch pumping engine, 24 hours a day.[35] In addition, the crushing engine and the whim engine would have used about 7-8 tons a day between them. This means that each week, Frank Mills would have consumed about 130-140 tons of coal. After the high cost of transport had been added,[36] this must have been a major burden on the company's finances, amounting to about £240 a week, or £12,500 a year, in 1874 and falling, with coal prices, to about £9,000 a year in 1878. The fact that the company was not forced to suspend operations in the face of such coal price increases indicates the willingness of the shareholders to continue and perhaps the extent of the mine's

financial reserves, although these were undoubtedly diminishing rapidly.

For a long time, the cost of transporting coal and other materials to the mine, and the cost of carrying the ore away, had been a source of concern to the company, as it had to other previous companies in the valley. Until the late 1870s, however, there was no alternative to the use of lumbering waggons on the bumpy roads between the valley and the port of Teignmouth, a distance of about 12 miles from Frank Mills. In the early 1870s there seemed a chance that the situation might change. A number of proposals were mooted during 1870 and 1871 to build a light railway from Newton Abbot, up the Teign Valley, to Christow or Ashton. An Act authorising the work was passed by Parliament and construction commenced. However, many problems beset its progress, mainly financial ones it seems, and by the time it was eventually completed to Ashton in October 1882 it had required a total of nine Acts to bring it to completion. Nevertheless, it was completed to Christow and open for goods traffic by October 1877 and so could be used by the Frank Mills company. However, it came too late to help the ailing mine. Also, there were problems in its use; until 1892 and the conversion of the Great Western Railway from broad gauge, it was an isolated stretch of standard gauge line. Any journeys would have to be broken at Newton Abbot with goods being trans-shipped from one train to another. This helped maintain high transport costs to and from Frank Mills until the end of its life.

The Engine Shaft at Frank Mills, which had begun sinking again below the 145, at the end of 1872, had meanwhile run into some difficulties. The ground was proving very hard owing to frequent occurrences of elvan in the slates, and by midsummer 1873 it was only down 149 fathoms. In the rest of the workings the values in the stopes had further declined. At the same time monthly output was falling, until by the end of 1873 it was barely over 20 tons a month. From this time onwards the frequent reports in the *Mining Journal* placed much emphasis on the large masses of spathose iron ore in the mine from the 85 fm. level downwards. In places in the caunter lode under the pond, it was reported that the white iron was fine enough to sell for paint, being almost as fine as the true micaceous haematite (see below) and at least one parcel was sold for this purpose in the Autumn of 1873.[37]

Engine Shaft continued sinking at a slow rate during 1874 and 1875, by the end of which year it finally reached the 160 fm. level. Output continued at a low level, 293 tons of lead ore and 5,125 oz. silver in 1873, and 237 tons of lead ore with 5,925 oz. of silver in 1874. The bulk of this continued to come from above the 115 fm level, despite all the exploration in depth. In 1874, 70 tons of spathose iron was also sold, for £105, although this was of little significance compared with the £3,252 received for the lead. Even faced with the prospects of falling output, the reports managed to sound optimistic; some of the stopes were stated

to be producing 'fair' quantities of lead, while prospects in the southern part of the mine were said to be improved. However, as Ramsden comments,[38] with the exception of a few minor discoveries in the upper levels in the final years, by this time Frank Mills was ' .. nearly worked out'.

With increasing quantities of iron being encountered in Frank Mills, and some of it being raised, during the early 1870s, memories must have been revived of the supposedly large quantities of spathose iron in the old Hennock mine. At one time during the 1850s a distinct east-west lode, about 10-12 feet wide and containing large quantities of iron, had been reported just to the north of the Engine Shaft.[39] By 1873 or 1874 it seems that a small attempt was made to re-open the Hennock workings and locate this lode, followed by the sale o£ some limited quantities of iron ore. However, the surviving evidence of this brief re-working of Hennock mine is incomplete and has led to some confusion among later writers on the subject.

According to the Geological Survey Memoir for the district,[40] Hennock mine is recorded as producing 181 tons of 'shining ore' (micaceous haematite) in 1872. J.H. Collins[41] has elaborated on this and states that in 1873 an iron lode was opened in Hennock mine by an adit, which was driven as a cross-cut for 80 fms and which then followed the course of the lode for 100 fms. However, a comparison with his own account of a micaceous haematite lode within the granite about a mile to the west,[42] shows that the site of the 'Hennock' iron mine that he is referring to is in fact the one in the granite, and not to the south of Hyner Bridge in the Teign Valley. As far as the Geological Survey memoir is concerned, it is almost certain that no true micaceous haematite was ever produced from mines outside the granite. In both cases, therefore, it seems that the mine referred to is either the Great Rock mine or possibly a smaller, late nineteenth-century, working near Great Rock, called Bowden Hill mine. Confusingly, the Great Rock mine, before its most recent working of 1902-69, was also known as the Hennock mine in the *Mining Journal*.[43]

The lodes at Great Rock, in Hennock parish, have been known if not actually exploited since about 1820. Lysons, writing in 1822, commented on a specular iron lode, two feet wide, in granite, in the parish of Hennock.[44] The next mention of this deposit was in 1839 when the geologist De la Beche stated that the shining ore of the area was used as 'writing sand' and had realised from £3.3.0. to £8.8.0. a ton, being sold under the name 'Devonshire Sand'.[45] The first record of a company being established to mine these peculiar iron lodes was in 1849, when the 'Hennock Iron-Steel and Tin Mining Co.' commenced operations. The sett was described as ' .. about a mile long from east to west and half a mile wide .. nearly the whole formation of which is in a decomposed granite, said to be highly productive in metalliferous deposits, particularly having an unlimited quantity of rich micaceous peroxide of iron .. '.[46] The lease was for

21 years, at a standard rent of £300 per annum, with no other dues. A strange point in the original report was the suggestion that ' ... tin has also been found in a distinct lode from the micaceous lode, and from the reports of several respectable agents attached to the prospectus, the mine appears to give promise of being highly valuable'. No tin was produced, not surprisingly, but the company seems to have been otherwise quite successful, continuing to produce the shining ore until just before 1890. In that year William White's Devonshire Directory stated that ' .. lead, copper and iron mines were formerly worked in this parish (ie Hennock) but they are now closed'. A new phase in the mining of these micaceous iron lodes commenced in 1902 when the Farabond Mining Company started operations at the Great Rock mine and, simultaneously, at the Shuttamoor mine, on the western extension of the Frank Mills caunter lodes.[47] Although Shuttamoor closed down in about 1914 or 1915, due to poor quality deposits, Great Rock continued working until July 1969. Thus this mine, in its deep, wooded valley to the north-west of Hennock village, as part of the Ferrubron Manufacturing Company of London, was the last working metal mine in Devon.

Meade[48] gives what is probably the only accurate account of the trial for iron ore in the old Hennock mine in 1873-74. He states: 'In the neighbouring lead mines (to Frank Mills), Exmouth and South Exmouth, in Christow near Exeter, the same change of the lode into spathose iron took place. At the latter mine, a few years since, preparations for working the iron ore were made, but after raising some fine samples from the mine, the adventure was abandoned.' Even though Meade only mentioned South Exmouth, not specifying the Hennock part of the sett, it is highly likely that this trial was made in the older workings. There had been little iron reported in the South Exmouth part of the sett. Also, entry to the Hennock workings at adit level at this date would have been relatively simple. Finally, the *Mineral Statistics* for 1872 lists the South Exmouth mine (for the above reasons probably referring to the Hennock section) as re-opened for 'silver-lead and iron' by the 'C.C. Iron Mines Company', under the management of S.O. Harris. (It could be that this is a misprint for J.O. Harris, the manager of Frank Mills.) No output from this company is recorded in the official statistics.

Further evidence to support the view that the workings at Hyner Bridge were the site of the trial of 1873-74 was obtained in an interview with Mr W. Wills of Christow in March 1970.[49] He stated that, 'unknown to many people', a small working called Franklands mine (sic) had been in operation at Hyner Bridge towards the end of the period of lead mining in the valley. This mine had been worked for iron from a small adit which was still visible by the river bank, a few yards downstream of the bridge. This clearly refers to Hennock mine, the workings of which were under Franklands Farm; the adit in question was the main Hennock South Exmouth drainage adit, still visible in 1977.

The Hennock iron working apparently did not last very long and so by 1875 Frank Mills was once again left as the only operating mine in the valley. There was little news from here apart from that of the engine shaft, still being sunk to the 160. Output had more or less levelled out at something under 300 tons of lead ore a year in the period 1873-75; in the last of those three years production was 250 tons of lead ore and 3,740 oz. of silver. Also, 100 tons of iron ore was sold, for just £55. One consolation to the shareholders was the steadily high price of lead ore, at around £15 between 1873 and 1876; indeed, it was probably only this that helped keep the mine open in this period.

Frank Mills had a succession of different managers in its closing years. Captain Nicholls had been replaced by John Cornish in 1868; Cornish was in turn replaced by S.J. Nicholls in 1870. Nicholls (it is not known if he was related to the other of his name) was replaced by Richard Southey in 1876, and Southey replaced by James Rowe in 1878. Finally, in 1879, Rowe was replaced by W.T. Bryant, who managed the mine in its last months until closure in 1880. This constant change of managers perhaps indicates the growing instability of the company.

By January 1876 Engine Shaft had reached the 160 fm. level, and the lode there was optimistically stated to be worth 1 ton per fathom.[50] Further development of the lode in the 160 soon proved its true value, when it was reported to contain ' .. a little lead' in both the drives north and south from the shaft. The highest assay, in the drive south on west lode, indicated a value of 0.4 ton of lead per fathom. Meanwhile, the task of sinking the shaft further was continued. By the end of April it was down 166 fms and by midsummer it had reached the 170 fm level. In the 160, assay results continued to be disappointing and by the time a full set of assays had been made in the 170, it became clear that here too the ore values were very low, averaging less than 0.3 ton per fathom. Faced with these bleak results, the company decided to stop sinking the shaft, a task which was a severe drain on the mines meagre finances, and concentrate instead on exploration work in the levels above the 145. There, the lodes still contained numerous small leaders of lead, averaging from 0.4 to 0.6 of a ton to the fathom. With this change in policy, from mid-1876, there was a reduction in the overall scale of operations at Frank Mills. The work force was reduced by about one-third between 1874 and 1876, and by a further third during that latter year alone,[51] so that by the end of 1876 it stood at just less than 90. By this time there were reported to be six tribute pitches in the mine, mainly on the 145 fm. level;[52] within a month or so this figure had fallen to five.[53]

Output in 1876 had recovered slightly on the previous three years, mainly due to the more intensive working of the numerous small leaders in the 145. It stood at 376 tons of lead ore and 5,640 oz. of silver, the lead selling for £4,070.16.5. However, the proceeds from these sales appear

to have been insufficient to cover the mine's running costs. According to a later account of events, 'On or about the 18th November 1876, at the urgent request of the purser (J.O. Harris) and Mr Harry Clarke, one of the Committee of Management of the mine, in order to enable them to meet the labour costs .. ' Mr B.C. Gidley, a solicitor of Exeter, ' .. advanced them £300 at 7½ per cent.'[54] This action was later to lead to a court case in which Gidley was to try and recover some of his advance (see end of this chapter). Overall, this seems symptomatic of the declining fortunes of the Frank Mills company.

In a further attempt to raise output, in February 1876 the decision had been taken to re-process some of the waste tips, which were estimated by one assay to contain as much as 15 percent zinc blende and 3-4 percent galena. Following this decision, early in 1877 some improved jigs were installed on the dressing floors,[55] followed, a couple of months later, by the installation of a new crushing engine which would treat the large volume of waste material.[56] It was obviously hoped that in the earlier working of the mine, inefficient dressing processes had let a significant quantity of ore remain in the tailings. However, in light of what happened later, it is surprising that a more thorough and representative assay of the tailings was not taken before work started on building the new crusher house.

This attempt to re-work the halvans (dumps) was characteristic of the shifting focus of operations in the mine in the later 1870s. With returns from lead declining and sales of iron ore hardly compensating for this,[57] all but the shallowest levels in the mine were progressively abandoned between early 1877 and the end of that year. At the same time pumping was cut back, so that by the end of 1877 all levels under the 100 were flooded. From then onwards all underground production came from five or six tribute pitches above that level.

On the 1st October 1877, the newly constructed section of the Teign Valley Railway was opened for goods traffic as far as Christow. If this seemed to be an omen of good luck to the Frank Mills' shareholders, they were sadly mistaken; the railway had arrived too late to save their mine.

Throughout the nineteenth century, world production of lead, like other metals, had been growing steadily. At first this did not influence metal prices much, since demand from Britain and the other industrializing nations also grew at a roughly similar rate. However, by the mid-1870s, the world was experiencing a rapid opening-up of new metal mining fields; vast new lead deposits were being developed in the United states, Spain, Australia and Mexico. In 1830, world production of lead-in-ores mined was about 90,000 tons. By 1850 this had risen to about 150,000 tons, by 1875 to about 350,000 tons, and in 1900 to around 850,000 tons.[58] The way in which the British market was affected was through a growing volume of imports, which became a flood in the 1870s and 1880s, and helped depress domestic prices for pig lead.

With British mine production of lead-in-ores declining from an average of around 65,000 tons a year in the period 1850-1875, to around 35,000 tons a year in the late 1880s and early 1890s, imports were steadily growing, as the table below illustrates:[59]

Imports of lead ore and lead into the,
United Kingdom and prices for lead, 1820-1909

annual averages:	imports of lead ore:	imports of pig, sheet & wrought lead:	average market prices:
	(thousands of tons)		£. s.
1820-29		0.2	20. 7.
1830-39		0.1	16. 3.
1840-49		0.8	17.13.
1850-59		12.5	21. 9.
1860-69	5.6	34.7	20.11.
1870-79	14.5	74.9	19.15.
1880-89	20.5	103.6	13. 6.
1890-99	26.0	160.2	11.15.
1900-09	21.0	207.8	14. 2.

The pressure on domestic lead prices was immense in the late 1870s and early 1880s; from a peak of just over £23 a ton in 1873, the price of pig lead fell slightly, to an average £20.11s. a ton in 1877. Thereafter the fall was more pronounced, to £14.5s. in 1879, with a slight recovery to just over £16 a ton in 1880, before heading downwards to £12.18s. in 1883 and £11.2s.6d. in 1884. Under the conditions of rapidly falling prices after 1877, Frank Mills, like so many other British lead mines, could not long continue working.

At first, these falling lead prices, starting in late 1877, were probably regarded as another temporary set-back, which might be weathered. Operations continued in the shallower levels and at surface, while the task of building the new crusher house continued during the autumn and winter of 1877. During the spring of 1878 it was reported that there were six tribute pitches working in the mine and in the 100 north on west lode there was a rise producing 'stones of lead'. [60] Output in 1877 had been 322 tons of lead ore and 4,900 oz. of silver, the lead being sold for £2,702.15.11. By the spring of 1878 it was also reported that the treatment of the halvans had commenced, with the newly-installed crushing engine starting its work. However, according to Ramsden, it seems from the appearance of the remains of this plant that little use was made of it.[61] What appears to have happened is that as soon as the crusher was put to work and the first parcels of the tailings processed, it was discovered that the original assay, giving zinc values of 15 per

cent and lead values of 3-4 percent, had been a gross overestimate. The tips were quickly discovered to be far poorer in un-recovered minerals, and thus not worth re-processing. The falling price of metals also underlined the un-economic nature of the exercise and so use of the crusher was soon suspended.[62]

With falling metal prices, declining ore grades and diminishing returns, the Frank Mills company continued to suffer from a shortage of working capital. Again, as in November 1876, J.O. Harris was finding difficulty in paying the mine's costs and, according to the subsequent account of Mr Gidley, the Exeter solicitor,[6] ' .. on the 4th May 1878, the purser (Harris) came to him (Gidley) in great anxiety, and said there were not funds enough in hand to pay the costs, and requesting the loan of £50.' Gidley handed over this sum and after the closure of the mine was still apparently trying to recover it (see below).

The financial situation deteriorated rapidly through the rest of the year and by November, with the price of lead ore down to about £10 a ton, and with a complete lack of funds, the company was seriously considering suspending all operations. Output in 1878 fell to 219 tons of lead ore, sold for" £2,628, and 3,246 oz. of silver. Pumping continued for a while, as the shareholders argued about the decision to close the mine, the last in the valley. No doubt, some of the adventurers. believed there might be a significant improvement in lead prices in a short space of time; it is unlikely that any were still looking to a dramatic improvement in the ore values in the mine. In this uncertain atmosphere, a limited amount of tribute work was continued in the mine, producing minimal amounts of lead. No further reports on Frank Mills appeared in the *Mining Journal* after mid-1878, although output continued into 1879; in that year just 120 tons of lead ore (value £1,440) was sold, together with 1,825 oz. of silver, a shadow of the former levels of production.

The end finally came after the winter of 1879-80, which was particularly wet, no doubt causing pumping difficulties and the flooding of a large part of the underground workings. After a spring ,and summer in which little could have materialised to solve the mine's problems, the plant of both Frank Mills and Wheal Exmouth was offered for sale in the *Mining Journal* of 21st August 1880. In the same year, the *Mineral Statistics* noted that Frank Mills had produced 15 tons of lead ore and 100 oz. of silver, ' .. sold in liquidation for £42.0.0.', together with 176 tons of fluorspar for £88.0.0. "The latter was probably produced in cleaning out some of the dumps at surface. Within a short space of time, the company was wound up, the engines and dressing plant dismantled and the shafts covered or filled. The Frank Mills company had finally floundered, a victim of the twin problems of poorer deposits in depth and a drastic decline in world lead prices.

As a brief epilogue to the closure of Frank Mills, there were several legal disputes in the following three years, con-

cerning the final disposition of assets and debts left by the company. First, there was the case of Mr Gidley, who had advanced the purser, John Oke Harris, a total of £350 between November 1876 and May 1878, and claimed he had not received interest or repayment of the capital. At a hearing of the court of the Vice-Warden of the Stannaries, Mr Herbert W. Fisher, in June 1881, it was ruled that part of the amount, £50 ' .. with simple interest at 5 percent, with costs .. ' should be paid by the liquidator of the company to Gidley, despite the usual rule that a mining company could not be held responsible for loans incurred by its purser. Passing judgement, Vice Warden Fisher stated that ' .. it might be very improper for a purser of a mine not to pay his own calls and to borrow money to liquidate the debts of the company. The adventurers of the Frank Mills Mining Company must have known that Mr Harris was largely in arrears with his calls; nevertheless, they, for reasons best known to themselves, continued him in their employment, and he (Fisher) did not see it was for them to complain if money was advanced to save their concern from ruin at the solicitation of their purser, if they were called upon to pay it.'[64]

The other litigation, two years later, concerned some of the shareholders who, it seems, had tried to dispose of their shares some time before the end of mining operations and were concerned to obtain settlement on the basis of taking the company as a going concern (as it presumably still was at the time of the sale). The company liquidator, however, had valued those shares merely in terms of the wind-up, or scrapping value, of the mine's assets. In the Stannary Vice-Warden's Court, Herbert Fisher ruled, in 1883, that the shareholders in question should have had their stock valued in terms of the company's assets as a going concern. Incidentally, as a general precedent, this ruling was overturned within four years by the Stannaries Act 1887, section 21. So, the closure of the last of the Teign Valley silver-lead mines was cloaked not so much in silence but in a heated bout of legal controversy.

Footnotes:

(1) Ramsden MSS, ECRO.
(2) *MJ* 1866, p120.
(3) *MJ* 1867, p617.
(4) *MJ* 1868, p278.
(5) *MJ* 1867, p7.
(6) *MJ* 1867, p135.
(7) *MJ* 1867, p24J.
(8) Ramsden MSS, ECRO.
(9) *MJ* 1871, p269.

(10) *MJ* 1866, p522.
(11) *MJ* 1866, pp541, 577.
(12) *MJ* 1866, p758.
(13) *MJ* 1866, p674.
(14) Ramsden MSS, ECRO.
(15) ibid.
(16) *MJ* 1868, pp78, 266.
(17) T. Andrew, *Geological and Archaeological Papers*, (London, 1875), pp52-3.
(18) *MJ* 1870, pp953, 1010.
(19) *MJ* 1871, pl09.
(20) MSS, ECRO.
(21) *MJ* 1871, ppl086 , 1134.
(22) Meade, *The Coal and Iron Industries of the United Kingdom*, pp691-2.
(23) Ramsden MSS, ECRO.
(24) *MJ* 1872, p5.
(25) *MJ* 1872, p54.
(26) *MJ* 1872, p478.
(27) *MJ* 1872, p510.
(28) *MJ* 1872, p866.
(29) Ramsden MSS, ECRO.
(30) *MJ* 1869, pp438, 653, 850.
(31) *MJ* 1869, p930.
(32) Ramsden MSS, ECRO.
(33) ibid.
(34) ibid.
(35) ibid.
(36) Ramsden MSS, estimates transport costs at about 16s. per ton of coal, c1873-75.
(37) *MJ* 1873, p718.
(38) Ramsden MSS, ECRO.
(39) ibid.
(40) W.A.E. Ussher, *Geology of the Country around Newton Abbot*, (London, 1913 , p132.
(41) Collins, *West of England Mining Region*, (1912), p507.
(42) ibid., p273.
(43) For example, in MJ 1849, p368.
(44) Lysons, Devonshire, (1822), p.cclxviii.
(45) H.T. De la Beche, *Report on the Geology of Cornwall, Devon and West Somerset*, (London, 1839), p617.
(46) *MJ* 1849, p368.
(47) Kelley, *Directory of Devonshire*, (1906), p325. See
(48) also M. Atkinson et.al., *Dartmoor Mines*, (1978), esp. pp24-30, 36-38, 41-44, 51.
(49) Meade, *Coal and Iron Industries*, p692. William Wills was mine agent at

Great Rock mine, where he had worked for 39 years until its closure in 1969. He professed to have known many of the old miners in the valley.

(50) *MJ* 1876, p34.

(51) Ramsden MSS, ECRO.

(52) *MJ* 1876, p1066.

(53) *MJ* 1876, p1178.

[101]

(54) *Royal Cornwall Gazette*, 3 June 1881, p7; 'The Frank Mills Mining Company'.

(55) *MJ* 1877, p114.

(56) *MJ* 1877, p334.

(57) In 1877 a total 12 tons of iron ore was sold for £9.

(58) World totals derived from series of lead production in C.J. Schmitz, *World Non-ferrous Metal Production and Prices, 1700-1976*, (London, 1979), pp94-99.

(59) Source of import data, B.R. Mitchell and P. Deane, *Abstract of British Historical Statistics*, (Cambridge, 1962), pp170-1. Source of market prices (in £ per ton), Schmitz, *World Non-ferrous Metal Production and Prices*. pp276-8. Estimates of British average mine production in period 1850-1890s, Schmitz, op.cit., pp94-99. On the impact of rising imports on British lead prices, see, Roger Burt, 'The Lead Industry of England and Wales, 1700-1880' (Unpublished Univ. London Ph.D. thesis, 1971) pp349-388, and esp. pp383-4.

(60) *MJ* 1878, p170.

(61) Hamsden MSS, ECHO.

(62) *MJ* 1878, p549.

(63) *Royal Cornwall Gazette*, 3 June 1881, p7; 'The Frank Mills Mining Company'.

(64) *Royal Cornwall Gazette*, op.cit. and 'Re Frank Mills Mining Co.' (1883), 23 Ch D 52 (Judgement of Vice Warden of the Stannaries). See also, H.R. Pennington, *Stannary Law: a History of the Mining Law of Cornwall and Devon*, Newton Abbot, 1973 , pp215, 219.

Plate I. South Exmouth & Hennock. Portal of the drainage adit, about 50 yards downstream of Hyner Bridge. Now partially choked, it nevertheless still emits a steady flow of water from the flooded workings of Hennock and South Exmouth mines.

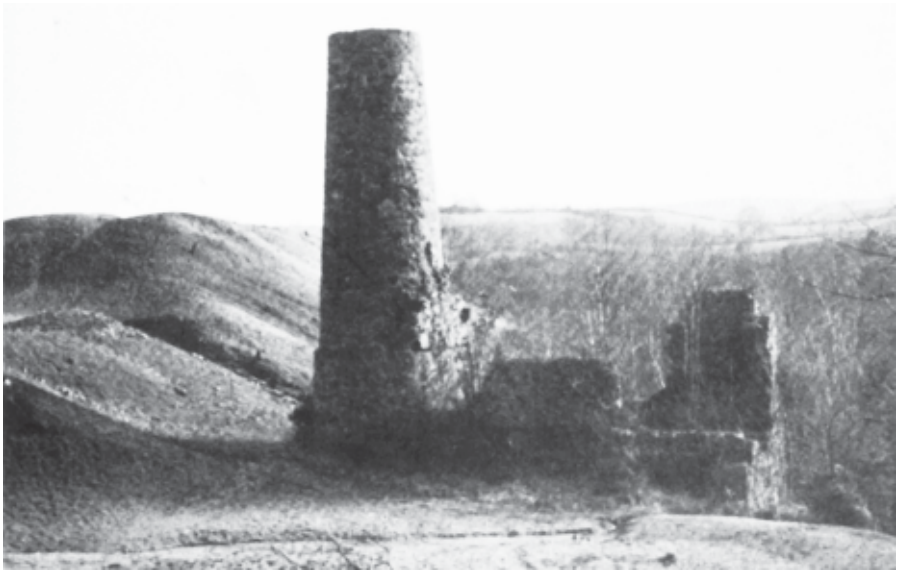


Plate II. Frank Mills. The relatively well preserved remains of the engine house which contained the abortive crushing engine, erected in 1877-8 to rework the extensive 'halvans' or dumps, which can be seen in the background.

Plate III. Frank Mills. The site of the dressing floors. The white building, Frankmills Cottages, was the mine's count house or office.

Plate IV. Wheal Exmouth. The gradually collapsing remains of what was once described as 'probably the handsomest building of the kind in England'. This decorated engine house contained the 70" Hocking & Loam engine, erected in 1853 to pump from the adjacent porter's shaft. If what is left of this magnificent structure is to be preserved, immediate steps must be taken to prevent it disintegrating further.

Plate V. Frank Mills. The ivy-encrusted chimney and engine house which stood at the collar of the main shaft and which contained the 60" engine erected in January 1855, sold for scrap in 1880. Like the engine house at Wheal Exmouth, on porter's shaft, this one was built in an ornamented style.

Plate VI. Wheal Exmouth. The extensive dumps situated just below the B3193 road. These tips consist mainly of the fine, quartzy and barytic tailings from the mill, the site of which is just out of sight among the trees to the left of the picture. The portal of the old Exmouth deep adit, now completely run in and difficult to find, is just behind the centre of the tip, in the trees.

Plate VII. Canonteign House. The seat of the Viscounts Exmouth, the foremost mineral lords of the Teign valley. The main lodes of Wheal Exmouth pass only a matter of yards in front of the drawing room windows.

Plate VIII. Wheal Adams. Remains of the buildings around New Engine shaft. The wall in the centre seems to have been an office or a blacksmith's shop. The taller wall, among the trees in the background was probably a whim engine house hoisting from the Engine Shaft situated just out of sight to the right and now hardly visible.

Plate IX. Wheal Adams. A closer view of the remains of the whim engine house. A section of hoisting chain was found by the author (February 1971) half buried in the grass adjacent to this building.

Plate X. Wheal Adams. A view north along the strike of the lodes, from New Engine shaft. The building to the right is reed farmhouse, just to the left of which is the site of old engine shaft, long filled in. In the distance are Aller and Bennah farms and the site of the sett abandoned by John Williams of Scorrier in 1836.

Plate XI. Birch Ellers. The only substantial remains, the stack of the engine House on engine shaft, still standing in the grounds of the cottage ‘Many waters’ near Bridford.

CHAPTER SIX

The Surface Remains

Considering how active the Teign Valley mines were during the last century, it may come as a surprise to the casual visitor how little physical evidence remains of the workings. Only in a few spots are the former buildings of the mines standing; only in a few remote spots have farmers allowed the waste tips to remain un-bulldozed. However, to an explorer with an eye for old mining remains, the valley is full of old leats and wheel-pits, collapsed adits and ochre-filled pits, and the crumbling ruins of engine-houses and miners' cottages. A tour of the mine sites will take the visitor far from the main road and he will at once appreciate the way in which lead mining in the area remained an essentially 'rural' industry, co-existing with farms and farmers (although there was occasionally friction between miners and farmers, as at Hennock mine in 1854).

The following account of the physical remains of the mining industry in the area, is arranged in the form of a tour, although it is obviously not necessary to use it as such. If each of the sites mentioned is visited on this 11 mile route, it is estimated that it will take about three to four hours, depending on the length of stay at each site. Grid references are given, taken from the Ordnance Survey 2½ inch to the mile sheet, SX88. Descriptions refer to 1972.

The most convenient starting point is about a mile and a quarter on the Plymouth side (west) of Chudleigh, on the A.38 road from Exeter. Where the main Plymouth-Exeter dual carriageway crosses the River Teign, is the junction with the B.3193, signposted 'Teign Valley'. Proceeding north along this road, by the banks of the Teign, within two miles the large Crockham Quarry and sewer-pipe works will be passed. Taking the first turning to the left after the quarry (signposted 'Hennock, Teign Village'), within half a mile going uphill, a fork in this narrow lane will be met. Bearing right, the hamlet of Teign Village (built about 1912 for the quarry workers) will be passed through. About a quarter of a mile beyond, the remains of South Exmouth are reached, (836808) lying just to the left of the road.

There is little to see here except some fairly extensive tips, now largely flattened. At the southern side of the low area of tailings is a higher ridge of mine waste, covered with some dense vegetation. At the western end of this ridge it is just possible to make out the outlines of the base of the 40 inch engine-house. Beyond this, in dense undergrowth, is a

large, rubbish-filled pit, all that remains visible of Westcomb's Engine Shaft. Large pieces of barytes litter the entire site, many pieces containing traces of galena and a distinctive blood-red form of zinc blende. Traces of chalcopyrite, not previously recorded at this site, have also been found.

Continuing up the road from Teign Village, within a quarter of a mile there is a very sharp turning to the left, at Brandiron Cross. Taking this turning, in less than half a mile Franklands Farm is reached. This was the site of Palk's Shaft, although nothing of it is now visible, some bungalows having been built over it. Continuing downhill past the farm, within about 150 yards, passing through some scrubby woodland, a small cart-track (not suitable for motor vehicles) will be seen leading off to the left. Here is the site of Hennock Engine Shaft, and the 50 inch engine house. (836815) This is little remaining here; within the main clearing in the trees, to the right of the track, is visible a largely filled-in pit, the remains of the shaft. Adjacent to this is the engine house, represented by the base of the walls, including the outline of the base of the stack, perfectly round and connected to the engine-house. Of any former dressing floors or buildings that must have once surrounded the shaft, nothing now is visible.

Back on the road, continuing downhill, the bottom of the valley is reached, at Hyner Bridge. A track leading off to the left goes up the valley to the site of Great Rock mine, and the head of the old Hennock mine leat. (832817) This leat was utilised, in its first section, by the Great Rock company and now contains a mass of pipes in various states of decay. The rest of the leat is less easy to follow, being covered by over a century's growth of nettles and brambles. Despite the 2½ inch map showing it as containing water, it is usually dry. (Please note: access to Great Rock via the track from Hyner Bridge requires permission from the owner of the bungalow by its entrance.)

Returning to Hyner Bridge, the ivy-covered walls of the old water-mill and wheel-pit can clearly be seen, by the road. Passing these and following the tree-covered banks of the Beadon Brook downstream, the low portal of the Hennock and South Exmouth adit can easily be found (837816). This is open and still emits a flow of water from the long abandoned workings to the south. In the densely wooded slopes above the adit can be found the remains of the Hennock wheel-pit and what appears to be the base of a former set of stamps, nearby. The mill at Hyner Bridge, although originally used only for milling corn was apparently used in the closing years of the nineteenth century for grinding micaceous iron ore, perhaps in connection with the working of the Hennock lodes, or of the Great Rock mine, half a mile up the valley to the west. Abundant traces of this 'shiney ore' can be found around the Hyner Bridge mill.

From the bridge, continuing along the road, the main B.3193 will be reached within half a mile, with a fine view up to the Frank Mills tips, and 1877 crushing-house, from

the part of the lane just above Hyner Bridge. At the B.3193 turning left, within half a mile a turn to the left, closely followed by a fork in the road, will be met. The lane to the immediate left, signposted Hyner Farm, will lead the visitor to the main site of Frank Mills mine. Along the lane, about 300 yards beyond the farmhouse, is the site of Frank Mills Engine Shaft, to the left of the track. (836821)

The ivy-encrusted stack and walls of the 60 inch engine house are prominent by the side of the road. The site of the shaft itself, the deepest in the valley, at 1,050 feet, is no longer visible. Behind the engine-house, to the south, lie the extensive tips of Frank Mills, covering a few acres. Further up the lane, to the left, are some white cottages; Frankmills Cottages, formerly the mine offices. To the immediate south of these buildings, through a gateway, is a flatter area, where the Frank Mills dressing floors were situated. Passing over these, further down the area of tailings, is the well-preserved crushing-house, with stack, erected in 1877, but hardly used. This is probably the best preserved engine-house in the area. Returning to the track, by the main engine-house, the visitor is standing directly over the strike of the main lode system in the Teign Valley. From this rise in the ground it is possible to look due north for some miles, to the Canonteign estate, along the line of the Frank Mills lodes to Wheal Exmouth. Canonteign House, directly over the lodes, will be visible in the distance, due north. The pond, which caused such trouble to the Frank Mills miners in 1861, is in the dip half-way between the viewpoint and Canonteign House.

Taking the lane back past Hyner Farm to the main road, turn left. At the fork, where the B.3193 bears to the right, take the left-hand fork, signposted Christow. While driving along this road, a fine view can be obtained, to the left, of the ornamental pond and waterfall, from which Captain Nicholls obtained a supply of water for the Frank Mills dressing floors in 1859. About half a mile from the fork, Porter's Shaft of Wheal Exmouth will be reached. This is situated on the right hand side of the lane, just before a sharp turn to the right. (837830)

Just before the prominent engine house on Porter's Shaft, is a long, low building, by the side of the road. This. is the ore-linhay (see figure 6, p59). Just past this, set back from the road, is the ruin of the once-proud engine house which held the 70 inch pumping engine on Porter's Shaft. This building is usually heavily obscured by growth of ivy, as is the adjacent duo-decahedral stack, which at first glance, can look rather like a tall tree! The original window-frames to the engine-house are still in place; the massive size of the walls, especially the bob-wall, is readily apparent. The site of the boiler-house, which would have been constructed of wood, is behind the stack. Continuing around the bend in the road, at the apex of the corner, is the stack and house of the whim-engine, also ivy-covered. In line with this, and below the pumping engine-house, is a

small ochre-coloured pit. This marks the site of the collar of Porter's Shaft, now long filled in.

Continuing past the bend in the road, a small track goes off to the right. Immediately to the left, off this track, which leads down to the site of the Exmouth dressing floors and the tips, are some old sheds and cottages. These cottages were the Wheal Exmouth offices and the sheds represent the mine's blacksmith shop and other workshops. Continuing down the track, over the Exmouth tips, which are extensive and largely devoid of vegetation, the main B.3193 is reached. Near here is the site of the portal of the Wheal Exmouth adit, (841831) now blocked. It is to be found in a marshy area behind some trees to the left of the main run of tips, approaching the main road.

Returning to Porter's Shaft, the lane is continued along northwards, passing the old Canonteign Barton to the right. Within half a mile a junction is met. Taking the small road coming in from the left, within 300 yards, where the road bends to the right slightly, is a small cart-track running off into the trees on the left. Among these trees to the left of the cart-track, is the site of Williams' Shaft of Wheal Adams, now only represented by a filled pit. Large quantities of waste rock, containing abundant galena and barytes, can be found in the undergrowth around here. Taking the cart-track for about 700 or 800 yards along a rising ridge, the Canonteign estate will soon be seen opening out below, to the left. Below this track, above the parkland, can be found some opencuts on the back of the barytes lode, indications of prospecting activity in the early 1970s. It is also possible (obtaining permission from the Canonteign estate) to find an open air-shaft, still protected by its ornamental iron railings, connecting with the shallow levels of Wheal Exmouth.

Back at the site of Williams' Shaft (836835), looking north through a gateway from the road, the site of Wheal Adams Engine Shaft can be seen, surrounded by some ruined engine-houses. Permission to visit this site should be sought from the nearby Reed Farm.

Going back down the road to the junction, the Christow road is re-joined and within just over a quarter of a mile, where there is a turning off to the left, between high banks, leading up to Reed Farm, can be seen some more tips, belonging to Wheal Adams.

The main run of the Teign Valley silver-lead mines has now been covered. The smaller workings at Aller and Bennah have little remaining to be seen, and so do not repay a visit. To reach the two more northerly mines, at Bridford and Birch Ellers, continue along the Christow road for about 300 yards to a junction. Bearing right here, proceeding downhill for about half a mile, the B.3193 is reached again. Turn left and drive along the main road for about two and a quarter miles. Take the turning left, signposted Bridford, about a quarter of a mile beyond the 'Trout Inn'. After proceeding uphill for about half a mile, a junction will be met.

Bearing left here, along this road in a short distance, on the right hand side, is a quarry. Looking downhill, to the left, from this point, can be seen the extensive remains of the Bridford Barytes mine, which closed in the summer of 1958. (830865) The site, of about nine acres, consists of a large, flat, barren area of ochre-coloured ponds and tailing heaps. Some huts remain on the site, although most of the dressing floors and buildings were dismantled soon after closure. The quarry on the other side of the road (containing a number of bee-hives in the early 1970s) was associated with an open-working of the main lode in the mine (no. 1 vein), which ceased in about 1930. The lode can still be traced in the high, northern face of this quarry.

Leaving this point, the visitor's footsteps are retraced for a few yards back to the junction. Turning left here, in just over 200 yards is a farm-track leading off to the right, signposted 'Shippen Farm'. This track, which is a public footpath, will lead, within a quarter of a mile, to the bottom of a valley in which is situated the cottage 'Many Waters', and the site of Birch Ellers mine. (826870) The most interesting feature is the stack of the former pumping engine-house, still preserved amongst the trees to the left of the cottage and track. Now incorporated into a rock garden in the cottage grounds, are the remains of the 30 inch engine-house and collar of the shaft, now filled in. Returning towards the Bridford mine, along the public footpath, about 150 yards south-east of 'Many Waters', is a fairly prominent tip, to the left of the path. This marks the site of Pye's or Whim Shaft.

Although strictly speaking outside the scope of this itinerary, the site of the lead mine at Newton St Cyres can also be visited, at (880967), by taking the A.377 Crediton road, for about five miles north-west out of Exeter. Turn left up a lane just before entering Newton St Cyres. The site of the mine is in a clump of trees, across the fields, to the left of the lane, about a mile from the main road. Some good samples of silver-lead have been found here.

Mining in the Teign Valley ended just a century ago and yet there are few remains left visible of this once important local industry. Quite understandably, farmers have filled shafts, levelled waste tips and used the stone from the old mine buildings to construct barns and farm walls. The natural vegetation has also reclaimed many of the smaller tips and crumbling buildings, rendering them invisible from the road. With the more prominent tips, those at Wheal Exmouth and Frank Mills, there is no doubt frequent talk of these being eyesores, and of the need to level them, or at least landscape them. This is understandable. What is unforgivable, is the long-standing neglect of once fine engine houses at Frank Mills and particularly at Wheal Exmouth. The castellated house which once contained the 70 inch pumping engine on Porter's Shaft,

massive though its walls may be, is suffering from the ravages of time. There was even, apparently, a misguided attempt by the Local Authority to demolish it, on the grounds that it was unstable, in the late 1950s. This failed since the contractor could make no inroads on the solid structure, but not before further damage had been done to this building. There will be few monuments to the Teign Valley miners in generations to come, and so it must be hoped that some attempt might be made to preserve, in an appropriate setting, these engine houses at Wheal Exmouth and Frank Mills.

STATISTICAL APPENDICES

1. Lead and silver production, Wheal Adams and Wheal Exmouth, 1845-1874.

	WHEAL ADAMS			WHEAL EXMOUTH		
	Lead Ore t. c.	lead content t. c.	silver oz.	lead Ore t. c.	lead content t. c.	silver oz.
1845	59. 0	29. 0				
1846	33. 0	16. 0				
1847	250. 0	150. 0				
1848	56. 0	30. 0				
1849	382. 0	210. 0				
1850	395. 0	217. 3				
1851	230. 0	126. 7		230. 0	141.19	
1852	70. 0	38.10	680	634.13	443.15	2500
1853				726. 0	472. 0	5980
1854				1140. 0	800. 0	15000
1855				1285. 0	810. 0	18630
1856				1447. 0	955. 0	19100
1857				1288. 3	745. 0	23090
1858				1115. 0	793. 0	18328
1859				1345. 0	887. 0	16853
1860				629.18	415. 2	7895
1861				553. 0	347. 0	3817
1862				130. 0	80. 0	1130
1863						
1864				144. 2	93.12	466
1865						
1866				119.11	83. 6	966
1867						
1868						
1869						
1870				50.18	37.10	165
1871				67.10	46.18	188
1872				88.12	61.12	242
1873				223. 1	156. 2	624
1874				86. 2	61.12	246

Source of data: *Mineral Statistics* of the United Kingdom. t. c. = tons and cwts. Mineral Statistics notes that receipts from lead ore sales at Wheal Exmouth in 1873 totalled £2,631.10.7. This source also mistakenly gives Wheal Exmouth lead ore output in 1858 as 1,45 tons, a figure corrected by the company accounts, reported in the MJ.

2. Lead and silver production, Frank Mills and South Exmouth, 1857-1880.

	FRANK MILLS			SOUTH EXMOUTH		
	Lead Ore	lead content	silver	lead Ore	lead content	silver
	t. c.	t. c.	oz.	t. c.	t. c.	oz.
1857	311.14	197. 0	1379			
1858	547. 0	350. 0	1890			
1859	737. 0	471. 9	3014			
1860	767.12	490.17	2945			
1861	961. 4	615. 0	3690			
1862	630. 0	396. 0	11830	486. 0	350. 0	1800
1863	726. 1	479. 0	8666	281.17	202. 6	1010
1864	1209. 1	785.17	17682	52. 0	33.16	168
1865	1337.18	815. 0	31785	18. 3	12. 0	60
1866	451.19	275.14	10750	7.17	5.17	28
1867	428.17	256. 0	9984	21. 1	12. 0	90
1868	1519.17	1139. 0	39865			
1869	1057.17	659.14	27437			
1870	957. 2	622. 0	23925			
1871	761. 0	532.14	13300			
1872	565. 0	395.10	9887			
1873	293. 0	205. 2	5125			
1874	237. 0	165.18	5925			
1875	250. 0	187.10	3740			
1876	376. 6	282. 5	5640			
1877	332.13	249. 7	4900			
1878	219.15	160. 0	3246			
1879	119.18	90. 0	1825			
1880	15. 0	10.17	100			

Source of data: *Mineral Statistics* of the United Kingdom. This source gives the following figures as receipts for lead ore sales at Frank Mills:

1873	£3,557.10. 4.
1874	£3,252. 5. 4.
1876	£4,070.16. 5.
1877	£2,702.15.11.
1878	£2,628. 0. 0.
1879	£1,440. 0. 0.
1880	£ 42. 0. 0. 'sold in liquidation'

3. Zinc ore production, Wheal Exmouth and North Exmouth, 1857-1873.

	WHEAL EXMOUTH		**NORTH EXMOUTH**	
	zinc ore	sold for	zinc ore	sold for
	t. c.	£ s d	t. c.	£ s d
1857	152. 0			
1859	275. 0	514. 6. 3		
1860	40.18	121.14. 9	73. 0	219. 0. 0
1863	49. 0	147. 0. 0		
1868	10. 0	25. 0. 0		
1869	20. 0	50. 0. 0		
1870	346. 3	970. 6. 0		
1871	570.11	1562.10.10		
1872	266. 7	1607.13.10		
1873	123.10	741. 0. 0		

Source of data: 1857-59, *Mining Journal*. 1860-73,
Mineral Statistics of the United kingdom.
The *Mining Journal* also records sales of 150 tons
of zinc ore from Wheal Adams, January-February 1847.

4. Iron ore production, Frank Mills, 1872-1880.

	FRANK MILLS	
	iron ore	sold for
	t.	£
1872	20	13
1873		
1874	70	105
1875	100	55
1876		
1877	12	9
1878		
1879	30	15
1880	190	95

Source of data: R. Meade, The Coal and Iron Industries of the United Kingdom,
(1882), pp691-2.

5. Manganese production and accounts, Canonteign mine, 1829-1841.

		Manganese ore: t.	c.
1829	from Jan. 14th	636	11
1830		314	19
1831		338	4½
1832	(entry 1)	229	11
1833	Jan. 25th - Nov. 11th	57	0
1834	Apr. 21st - Dec. 30th	15	0
1835		55	12
1836		204	12
1837	(entry 2)	228	10
1838	(entry 3)	130	17
1839	May 7th - Jun. 27th	35	19
1840	Mar. 21st - Sep. 28th	100	2½
1841	Mar. 1st - Oct. 2nd	113	15
	Total:	2460	13

Entries in accounts:

1	Capt. Williams' Rent	£15. 0. 0
	Poles and Timber	31.12. 9
2	Timber Acct.	17. 3· 6
	Poles	9.15. 3
	Rent due at March last	15. 0. 0
3	Rent of the house etc.	15. 0. 0
	Timber bill	3· 5.10
	Bill for tools	1.12. 0
	Bill for slate	3· 2. 1
	Mason's bill	3· 7.11
	Carpenter's do.	1.17. 0
	Feb. 1st Recd. of Capt. Williams on Acct.	100. 0. 0

Source: Manganese Acct. 1829-41. Messrs. Williams, Scorrier House, Truro, in Account with Sir L.V. Palk, Bart. Exeter City Record Office, 58/9 Box 140/5.

6. Total Teign Valley lead and silver production and lead ore shipped from Teignmouth, 1845-1880.

	TEIGN VALLEY			TEIGNMOUTH
	lead ore	lead content	Silver	lead ore shipped
	t. c.	t. c.	oz.	t. c.
1845	59. 0	29. 0		
1846	33. 0	16. 0		
1847	250. 0	150. 0		
1848	56. 0	30. 0		
1849	382. 0	210. 0		
1850	395. 0	217. 3		
1851	460. 0	268. 6		
1852	704.13	482. 5	3180	
1853	755. 0	493. 0	6016	
1854	1153.10	809. 0	15126	
1855	1297. 0	817. 0	18630	
1856	1447. 0	955. 0	19100	
1857	1599.17	942. 0	24469	
1858	1662. 0	1143. 0	20218	1816.10
1859	2082. 0	1358. 9	19867	2293.10
1860	1414. 0	917. 3	10840	1641. 0
1861	1514. 4	962. 0	7507	1668. 0
1862	1246. 0	826. 0	14760	
1863	1007.18	681. 6	9676	
1864	1261. 1	819.13	17850	1109. 0
1865	1500. 3	920.12	32311	1378. 0
1866	459.16	281.11	10778	
1867	569. 9	351. 6	11040	858. 0
1868	1519.17	1139. 0	39865	985. 0
1869	1057.17	659.14	27437	
1870	1008. 0	659.10	24090	1357. 0
1871	828.10	579. 3	13488	1284. 0
1872	653.12	457. 2	10129	828. 0
1873	516. 1	361. 4	5749	621. 0
1874	323. 2	227.10	6171	334. 0
1875	250. 0	187.10	3740	
1876	376. 6	282. 5	5640	
1877	332.13	249. 7	4900	60. 0
1878	219.15	160. 0	3246	71. 0
1879	119.18	90. 0	1825	123. 0
1880	15. 0	10.17	100	

Source of data: *Mineral Statistics* of the United Kingdom. The above totals include output from smaller mines as follows: Hennock 1853, 29 tons lead ore (21 tons lead content) 36 oz. silver; Birch Ellers 1854, 13½ tons lead ore (9 tons lead) 126 oz. silver, 1855, 12 tons lead ore (7 tons lead); North Exmouth 1860, 16½ tons lead ore (11 tons 4 cwt. lead content).

For the 1867 shipment of lead ore from Teignmouth, *Mineral Statistics* notes, 'partly the produce of 1866'.
Shipment of 126 tons of copper ore from Teignmouth in 1859 is also noted by Mineral Statistics. At least 17 tons of this is known to have originated from Wheal Exmouth. In a recent article, Peter Stanier gives some further figures for copper ore exports (to Neath in South Wales) from Teignmouth:

1862	258 tons	(2 shipments)
1863	50	(1)
1864	185	(2)
1865	107	(1)
1867	130	(1) half-year only

(P.H. Stanier, 'The Copper Ore Trade of South-West England in the Nineteenth Century' *Journal of Transport History*, V (1979), 21, 23.)

Most, if not all, of this ore would have originated in the mines around Ashburton and Buckfastleigh (Whiddon, Druids, Owlacombe and Stormsdown, Emma and Brookwood mines) rather than the Teign Valley.

7. Total production of lead, silver and zinc, by mine, 1845-1880.

	Lead ore	lead content	silver	zinc ore
	t. c.	t. c.	oz.	t. c.
Wheal Adams	1475. 0	817. 0	680	150. 0
Wheal Exmouth	11303.10	7430. 8	135220	1853. 9
Frank Mills	14812.14	9831.14	248530	
South Exmouth	866.18	615.19	3156	
Hennock	29. 0	21. 0	36	
Birch Ellers	25.10	16. 0	126	
North Exmouth	16.10	11. 4		73· 0
TEIGN VALLEY	28529. 2	18743. 5	387748	2076. 9

Source of data: *Mineral Statistics of the United Kingdom*.

8. Price of refined pig lead in British markets, 1790-1894. (per ton)

	£ s d		£ s d		£ s d
1790	16. 2. 0	1825	25. 6. 0	1860	22. 6. 0
1791	18. 3. 0	1826	19. 0. 0	1861	21. 9. 0
1792	19. 8. 0	1827	18. 7. 0	1862	20.17. 6
1793	19. 3. 0	1828	17. 0. 0	1863	20.16. 0
1794	14.10. 0	1829	14. 5. 0	1864	21.12. 0
1795	16.15. 0	1830	12. 3. 0	1865	20. 2. 6
1796	18. 6. 0	1831	12. 4. 0	1866	20.12. 6
1797	16.17. 0	1832	11.13. 0	1867	19.11. 0
1798	15. 8. 0	1833	12.12. 0	1868	19. 6. 0
1799	16. 4. 0	1834	16.12. 0	1869	19. 1. 6
1800	19. 3. 0	1835	17.10. 0	1870	18.13. 0
1801	22. 9. 0	1836	24. 3. 0	1871	18. 2. 6
1802	24.17. 0	1837	19. 4. 0	1872	20. 3. 0
1803	27.16. 0	1838	18.10. 0	1873	23· 2. 6
1804	28. 0. 0	1839	17. 3. 0	1874	22. 0. 0
1805	27.11. 0	1840	18. 6. 0	1875	22.10. 0
1806	35.13. 0	1841	18.15. 0	1876	21.13. 0
1807	30. 4. 0	1842	16.10. 0	1877	20.11. 3
1808	30. 1. 0	1843	16. 5. 0	1878	16.14. 0
1809	31. 3. 0	1844	17.10. 0	1879	14. 5. 0
1810	28.16. 0	1845	19.10. 0	1880	16. 6. 0
1811	24. 1. 0	1846	18.10. 0	1881	14.19. 3
1812	23. 4. 0	1847	18.15. 0	1882	14. 7. 3
1813	25. 3. 0	1848	16.15. 0	1883	12.18. 0
1814	26.11. 0	1849	15.19. 0	1884	11. 2. 6
1815	20.16. 0	1850	17.10. 0	1885	11.10. 0
1816	16. 5. 0	1851	17. 3. 0	1886	13. 4. 3
1817	18. 5. 0	1852	17.15. 0	1887	12.10. 9
1818	27. 6. 0	1853	23. 8. 0	1888	13.11. 3
1819	22.11. 0	1854	23.13· 0	1889	12. 6. 6
1820	21.10. 0	1855	23. 3· 0	1890	13· 4. 0
1821	22.10. 0	1856	24. 0. 0	1891	12. 6. 0
1822	22. 7. 0	1857	23.17. 0	1892	10. 9. 6
1823	22. 5. 0	1858	21.11. 0	1893	9.14. 0
1824	21. 0. 0	1859	22. 6. 0	1894	9. 9. 3

Source: C.J. Schmitz, *World Non-ferrous Metal Production and Prices, 1700-1976*, (1979), pp276-8.

9. Price of lead ore at Welsh sales and at the Teign Valley mines, 1855-1881. (per ton)

	WELSH SALES	**TEIGN VALLEY MINES**	
		Frank Hills	Exmouth/South Exmouth
	£ s d	£ s d	£ s d
1855	14. 4. 6		
1856	14. 8. 0		
1857	14.15. 0		
1858	14. 6. 0		11.12. 6[1]
1859	13.16. 0		
1860	13.17. 8		
1861	12.10. 7		
1862	12.10. 0		
1863	13· 1. 6		12.12. 0[2]
1864	14. 5.10	15.14. 0[3]	
1865	12.14. 7	14. 7. 5[4]	
1866	12.15. 1		
1867	12.17. 6		
1868	12. 1. 8		
1869	12. 5. 6		
1870	12. 4. 6		
1871	12. 6. 0	11.15. 0[5]	
1872	13.13· 0		
1873	15. 8. 0	12. 2. 9	11.14.11[1]
1874	14.13. 6	13.14. 6	
1875	15. 9. 3		
1876	15. 8. 0	10.16. 4	
1877	13.19. 0	8. 2. 6	
1878	10.11. 6	11.19. 1	
1879	10. 6. 0	12. 0. 2	
1880	11. 6. 0		
1881	10. 3. 0		

Source: Frank Mills 1864-5, 1871, Wheal Exmouth 1858 and South Exmouth 1862, the *Mining Journal*. Remainder, *Mineral Statistics of the United Kingdom*.

Welsh prices refer to the mean of monthly average prices at Holywell sales 1855-73, and at Holywell and Aberystwyth 1874-81. Notes: (1) Wheal Exmouth, average for year (2) South Exmouth, average for year (3) average for April-June (4) average for January-March (5) average for July-September.

10. Population change in Christow and Hennock parishes, 1801-1891.

	CHRISTOW		HENNOCK	
	no.	change	no.	change
1801	442		537	
1811	460	+ 4.1 %	575	+ 7.1 %
1821	531	+ 15.4 %	678	+ 17.9 %
1831	601	+ 13.2 %	747	+ 10.2 %
1841	624	+ 3.8 %	828	+ 10.8 %
1851	863	+ 38.3 %	894	+ 8.0 %
1861	941	+ 9.0 %	1004	+ 12.3 %
1871	872	- 7.3 %	887	- 11.7 %
1881	588	- 32.6 %	769	- 13.3 %
1891	567	- 3.6 %	685	- 10.9 %

Source: Census returns for Devonshire, 1851-91.

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THE TEIGN VALLEY SILVER-LEAD MINES
Compiled and drawn by J.V. Ramsden, 1949-50


Stopes

Crosscuts

1.5 Value of Lead Ore in Tons per Cubic Fathom.

F Fluorspar

B Barytes

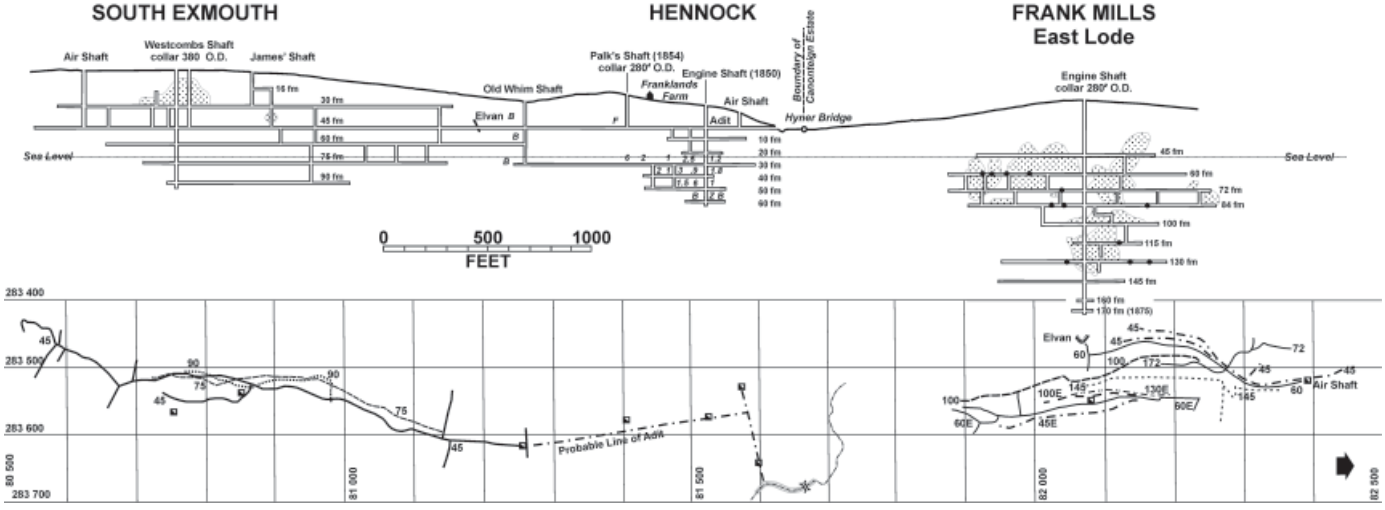
Z Blende

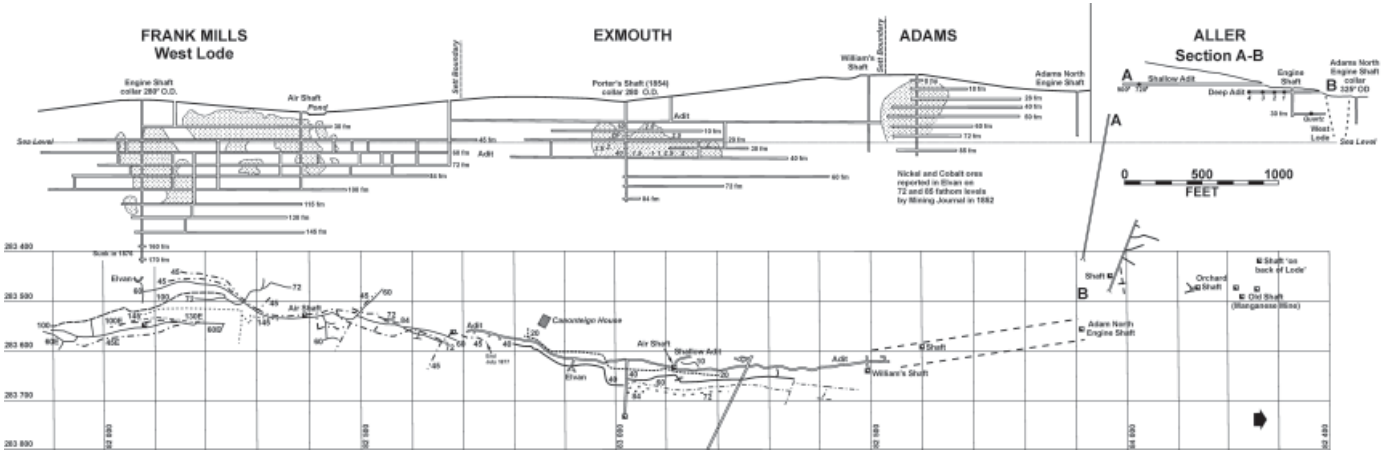
Shaft

South Exmouth section & plan reduced from R220A in Mining Record Office.
Hennock section compiled from Mining Journal weekly reports, 1836-55.
Frank Mills sections & plans compiled from R220B in Mining Record Office from section lent by Geo. Survey & from Mining Journal weekly reports, 1855-80
Exmouth section & plan reduced from R220B in Mining Record Office.
Adams section compiled from Mining Journal Weekly reports, 1846-59.
Aller section & plans reduced from R308C in Mining Record Office (amended to 1879 by W.H. Hosking)

This key and the following plans and sections were reproduced on a single, folded sheet in the original version. They have been redrawn and are produced here separately in order to preserve legibility.

gXs


SOUTH EXMOUTH
HENNOCK
FRANK MILLS
East Lode
Air Shaft
Westcombs Shaft
collar 380 O.D.
James' Shaft
Old Whim Shaft
Palk's Shaft (1854)
collar 280' O.D.
Engine Shaft (1850)
Franklands Farm
Air Shaft
Adit
Elvan
Hyner Bridge
Boundary of Canonteign Estate
Engine Shaft
collar 280' O.D.
Sea Level
Sea Level
16 fm
30 fm
45 fm
60 fm
75 fm
90 fm
10 fm
20 fm
30 fm
40 fm
50 fm
60 fm
45 fm
60 fm
72 fm
84 fm
100 fm
115 fm
130 fm
145 fm
160 fm
170 fm (1875)
0
500
1000
FEET
283 400
283 500
283 600
283 700
80 500
81 000
81 500
82 000
82 500
Probable Line of Adit
Elvan
Air Shaft


FRANK MILLS
West Lode
EXMOUTH
ADAMS
ALLER
Section A-B
Engine Shaft collar 289' O.D.
Air Shaft
Pond
Sett Boundary
Porter's Shaft (1854) collar 268' O.D.
Adit
William's Shaft
Adams North Engine Shaft
Sea Level
Shallow Adit
Deep Adit
Quartz
Wood's Lode
Sea Level
Nickel and Cobalt ores reported in Bivan on 72 and 65 fathom levels by Mining Journal in 1882
0
500
1000
FEET
Bivan
Caxonteign House
Orchard Shaft
Old Shaft (Manganese Mine)
Shaft 'on back of Lode'