The Duke of Cornwall Mine, Fryerstown, Victoria

THE DUKE OF CORNWALL COMPANY

Alluvial gold was discovered along the water-courses and tributaries of Fryers Creek and the Loddon River in the latter part of 1851. The washdirt was initially rich but, as the best alluvial deposits were exhausted, the mining population dwindled and the remaining miners increasingly turned their attention to extracting gold from the quartz reefs.

In 1864, the Mining Surveyor and Registrar for the Fryers Creek Subdivision, Mr. R.L.M. Kitto, reported that

A company named the Duke of Cornwall is being formed for working a lease of twelve acres applied for by Stoneman and others, on Cattle's Reef. The proprietors have good prospects, but not sufficient capital to work the mine properly, the water at thirty feet from the surface being considerably beyond the power of hand baling.

Locality Map
The company's claim straddled the Fryerstown to Chewton Road approximately one kilometre north of Fryerstown. At this time the adjoining claims were yielding considerable quantities of rich stone; Cattle and Company had recently extracted 60 oz (2.25kg) of gold in six days with the labour of only one man while, immediately to the south, the Rowe Brothers were obtaining 1 oz to the ton (40g to the tonne) at a depth of 110 feet (33 metres).

The new company deepened the shaft and installed a crusher but the results were disappointing. Although small crushings reached 10 dwt of gold to the ton (20g to the tonne), the normal return was less than 5 dwt (10g). By March 1868 the company had been compelled to suspend operations.

THE AUSTRALIAN UNITED GOLD MINING COMPANY

Richard Luke Middleton Kitto was born in Cornwall on 18 July 1836. He gained experience as a miner before settling in Victoria during the mid 1850s and was appointed Government Mining Surveyor and Registrar for the Fryers Creek Subdivision in 1860. Early in 1867 Kitto returned to England to seek capital to invest in mining ventures in Victoria. That he was successful in his aim was evidenced by the formation of the Australian United Gold Mining Company.

The prospectus of the new company was published in the Mining Journal on 8 February 1868 with a capital of £50,000 in 20,000 shares of £2 10s each. The Company was formed '... for the purpose of purchasing and working the Central and Duke of Cornwall Gold Mines situate (sic) in the colony of Victoria.' The provisional directors had previously concluded a contract with the Mining Association Ltd., dated 27 January 1868, to purchase the properties for £12,000 and 5,200 fully paid up shares. This contract was signed by H.W. Lamb and Matthew Loam as trustees on behalf of the Company and was duly effected by April 1868.
The company was established with six directors: S.W. Daukes, H.J. Sharp, J.W. Williamson, E.W. Wingrove, H.W. Lamb and H.W.W. Sharp. Kitto resigned his position as a Mining Surveyor with the Government of Victoria and was appointed as managing director, with a salary of £1,000 per annum and a bonus of three per cent on the profits of the company '... applicable to dividends.' By the end of April, Kitto and Lamb had embarked on a voyage back to Australia and machinery had been purchased '... on advantageous terms and was expected to be ready for shipment in a few weeks.'

The whole process of establishing the company had been accompanied by some enthusiastic articles in the press. To quote from the Mining Journal of 8 February 1868:

Attention is called to the prospectus of the above company, which appears in another column of this day's Journal. Statistics have from time to time been given, showing the wonderful and almost fabulous results of gold mining in Port Phillip, or, more properly speaking, Victoria; but the list of dividend-paying mines given in 'Dicker's Mining Record' of Nov. 28, from which the few given below are selected, is simply astounding; it throws any other list of dividend mines completely in the shade. The Australian United Gold Mining Company is, it may be hoped, not only the forerunner of many that must follow, but takes the initiative in opening a new, vast, and profitable field for the safe investment of some of our unused and at present commercially worthless capital ... The Australian United Gold Mining Company certainly deserves complete success.

At this time, the investment of English capital in Australian gold mining ventures was extremely rare, only the Port Phillip Mining Company having previously attracted much attention from the British public. The Australian United Gold Mining Company was therefore a forerunner of the massive British investments which increased rapidly during the 1870s and 1880s.

DEVELOPMENT OF THE DUKE OF CORNWALL MINE, 1868-71

Kitto and Lamb arrived in Fryerstown on 9 June 1868 and rapidly finalised the transfer of titles from the original shareholders. In a report dated 16 August,
Kitto advised the directors of the work being undertaken at the Duke of Cornwall mine.

Engine House: This work is progressing rapidly, and the main buildings have reached to the level of the top of the 'loadings' so that in all probability I shall be waiting at least two months for the machinery. Old Engine Shaft: I have caused this to be repaired, and the little 10 horse engine is at work night and day pumping out the water, a work which materially assists the operations in Daukes' shaft, where water has been struck. I hope to drain the old working completely before the next mail leaves. Sharpes Shaft: The rock is rather hard, and a depth of only 45 feet has been reached; the men are sinking through fine mineral ground, charged with mundic. Daukes' Shaft: This has reached a depth of nearly 75 feet and would have been stopped by the influx of water had I not repaired the old engine shaft and kept the pumps at work. The rock in this shaft also contains large quantities of mundic. Reservoir: With a view to secure a sufficient supply of water, I am constructing a reservoir capable of holding 5,000,000 gallons of water. This, with the water from the same, will allow us to cause the tailings from the stampers to wash away, thus saving us at least £400 per annum. The cost of this work will not exceed £150. Boilers: I have accepted the lowest tender for the construction of the two boilers, as per plan supplied by Messrs. Loam and Son, with mountings complete, in the sum of £694 or £396 each. These boilers will be about 14 tons each.

By October the engine house had been completed, with the exception of the roof. Offices and other buildings including a store room, smithy and carpenter's shops had also been constructed and work had commenced on a cottage for Lamb. This expenditure was rationalised partly on the basis that '... the building will always be a valuable asset, and as in all probability the Duke of Cornwall Mine will not be exhausted in the present generation the house will be very useful...' While these buildings were being constructed on the surface, considerable work was also being undertaken to deepen and extend the underground workings although work was severely restricted by the inadequacy of the existing pumps.

The location of various features on the main lease was recorded by the Mining Warden, Mr. Mark Amos, in a survey carried out on 30 September 1868. The completed plan was reproduced in the Claims Register dated 16 October 1868.
On 9 January the Melbourne correspondent of the Mount Alexander Mail reported that '... the consignment of machinery for Mr. Kitto's mining works at Fryers-town has commenced to be landed from the "Southern Belle" and will be forwarded without loss of time.' The machinery was railed to Elphinstone railway station and transported by road from there to the mine. The engine was erected under the supervision of Mr. Rowe and was found to fit the building 'to a nicety', a particular source of gratification as none of the workmen engaged to construct the engine house had ever seen a Cornish engine house before. By early February the 'bob' and cylinder were in position and the engine was first operated on 24 March. Mr. Lamb reported to the directors.
On Wednesday last our engineer got steam into the boiler and the engine moved right off, and smoothly. The fly-wheel (60 ft. circumference) made twelve revolutions in a minute. This would give about 75 blows by each stamp-head, which, multiplied by 96, our presumed ultimate power, would produce 7200 blows per minute.

The extent of the company's workings and development was more fully described by the Mining Warden, Mr. Mark Amos

The Australian United Mining Company have succeeded in placing their plant upon the ground, but their large engine only is erected, the total value of the plant is about £8,500 consisting of a vertical double-acting engine, with a 9 foot stroke cylinder with a nominal horse power of 70, but can be worked to 200, with 24 head of stamps; one 25 horse-power horizontal engine for winding; one 1 horse-power portable engine for saving timber. The company have three working shafts, one 84 feet deep, one 145 feet and one 135 feet. It is proposed to sink the 145 foot shaft to a depth of 1,000 feet. A large quantity of quartz has already been raised, something like 1,500 tons, from the 135 foot level; the quality is of a highly auriferous character, and is estimated to yield from 8 to 10 dwts to the ton. The stamping machinery will be erected in the course of two months, and crushing operations commenced; but the claim will not be in full working order for nine or twelve months.

The engine was connected to the pumps and sinking recommenced in Daukes' shaft during May 1869. The new set of stamps was completed shortly thereafter and 80 tons (82 tonnes) of quartz were crushed to test the riffles and gold recovering apparatus. An assay of the tailings gave a yield of more than 2 oz to the ton (80g. to the tonne), a figure which was never subsequently approached. As the assay also indicated that 75 percent of the gold was being lost, crushing ceased forthwith and was not restarted until the pyrites, which was apparently causing the inefficiency, could be treated.

During September, Kitto commenced crushing ore with the smallest proportion of pyrites to provide some income for the company. Crushing was interrupted on the second day by the axle fracturing although repairs were rapidly made and crushing recommenced. The remaining ore was stockpiled until the buddles, Chilian mills and roasting furnaces had been completed.
Despite encouraging reports to the directors, it soon became evident that the reefs were not as rich or as extensive as had been hoped. By March 1870 Kitto reported that only one drive and one stope were barely payable. Recent crushings had yielded only one and a half dwt per ton (3 g. per tonne) in contrast to the neighbouring Rowe's mine, where 200 oz (7.5 kg) of gold had recently been obtained from only 30 tons (31 tonnes) of stone. It was therefore decided to sink deeper in the hope of intersecting a richer lode.

The poor crushings and the high cost of extending the workings rapidly depleted the company's original capital. By May the company was in serious financial difficulties, Lamb and Kitto being jointly owed more than £5,000 by the company. A special meeting of shareholders was held in the company's London offices on 4 July 1870, with the purpose of increasing the company's capital. It was noted that Kitto had '... been rather too sanguine in expecting to realise important results at the present depth...' and it was now clear that they would have to go deeper. A letter from Lamb was read to the meeting, indicating the company's financial state and stressing the need to raise at least £10,000 in additional capital.

The directors were authorised to increase the capital of the company by a sum not exceeding £15,000 in shares of £2 10s each. Unfortunately the shareholders and public were reticent and by November only 1,583 shares had been subscribed for out of the 6,000 shares issued. With total liabilities of almost £10,000 reported by Kitto in his last dispatch from Fryerstown it was evident that the situation was becoming critical. A further meeting of shareholders was convened early in November where it was resolved to authorise the directors to increase the capital of the company by an issue '... not exceeding 30,000 new shares of £2 10s each.'
During the ensuing twelve months only £3,650 was raised, although more substantial returns from several crushings at the Duke of Cornwall yielded sufficient gold to offset most of the costs of working. Costs were further reduced by letting the company's other Australian operation, the Central Mine at Malmsbury, to tributers; this mine had also failed to live up to early expectations. These measures failed to restore the company's fortunes and by September 1871 the company's debts again amounted to approximately £10,000. An attempt was made to reconstruct the company but events in Australia moved too fast and while shareholders were meeting in London, Kitto was forced to negotiate the sale of the Duke of Cornwall. A local company purchased the mine for £14,000 and the Australian United Gold Mining Company's association with the mine ceased on 1 October 1871.

SUBSEQUENT HISTORY

The shareholders of the new company were predominantly Bendigo investors. Reports of the first meeting of the company indicated an optimism comparable with that exhibited by the Australian United's shareholders less than four years previously.

We have much pleasure in meeting the shareholders at this their first meeting, and have to congratulate them on being possessed of such a valuable mine as the Duke promises to be. There is no doubt but that we will very soon be on the same lode as that worked by the Rowe Brothers in their celebrated claim, and which has been struck by Cattle and Co. on our southern boundary. The recent grand find also in the Anglo Company on the north, places our mine in such a position that it becomes a matter almost of impossibility for us to miss obtaining the gold; and we trust when next we meet you to be able to congratulate you on having received good payable dividends.

The new company commenced working the mine vigorously, but crushings proved disappointing. After twelve months of work, the Mining Registrar's reports indicated the now familiar story: good prospects with optimism for better returns in the near future. The company continued to spend heavily on the mine, installing a new battery in 1873 but on 23 July 1875 the mine was auctioned.
The auction advertisement in the Mount Alexander Mail provides a detailed listing of the company's machinery and assets.

1 beam engine, 25-inch cylinder, 9 foot stroke with Cornish boiler 31 feet long, 7 feet diameter.
260 feet 6-inch pumps, with rods and all connections complete in the 260 foot level.
1 horizontal 10-inch cylinder winding engine, with winding gear complete, and 500 feet flat rope.
15 head battery, all complete, in excellent order, recently erected with all latest improvements, by Roberts and Sons, Sandhurst.
Retorting house, with iron roof, with smelting furnaces, retorts, copper-plates, etc.
Friction gear, with winding drums and plummer blocks.
150 ft. 12-in cast-iron pipes, with draw-lift and workings.
Pyrates furnaces.
200 ft heavy timbered double tramway laid with iron rails,
Weatherboard engine-house, 48 ft x 28 ft, corrugated iron roof.
Office and store houses, 33 ft x 24 ft, 11 ft walls, corrugated iron roof, lined inside with T and G boards.
Blacksmith's shop, with bellows, anvils, vices; mining tools, quantity round and flat iron, assorted cast and shear steel, crane, horse drays, wheel-barrows, carpenter's benches, tools, timber, etc.
Gold mining lease, in close proximity to the celebrated claim of Rowe Brothers, embracing an area of 34 acres, or on the line of reef 520 yards. Besides the above there will be submitted a large and miscellaneous assortment of tools and useful appurtenances always required in conducting mining pursuits.
The mine was acquired for £1,850 by the Rowe brothers, the owners of the adjoining mines which had proved to be so rich throughout the Duke of Cornwall's less inspiring history. The new owners initially worked the mine energetically but within twelve months the claim was being principally worked by tributors. This again proved unsuccessful and the Mining Registrar's report for the first quarter of 1889 indicates that operations had ceased. This report, indeed, provides a fitting epitaph for the mine.

...it may be stated that the large amount of capital expended on the surface in the first instance was considerably disproportionate to the requirements of the mine, in view of the small extent of prospecting which had been previously accomplished. The anticipations as to grand results, founded on the close proximity to the Mosquito claim, were never realized, and up to the present time it may be said the prospects are equally discouraging.

It appears that the mine never worked again; eventually the machinery was sold and removed, mostly for the scrap metal. The last piece to be removed was the flywheel, which was eventually dynamited from its foundations.

One graphic glimpse of the mine in its heyday, under the management of the Australian United Gold Mining Company, is provided by a reporter of the Castle-

31 maine Representative on 23 August 1870.

... on the top of a slight rise is No.11, or the well-known Duke of Cornwall, to which so much time, money and energy have been devoted. It is the property of an English corporation got together by Mr. Kitto, and though hitherto no fortunes have been made out of it, the share-

holders are not disheartened. The appliances for working are, of course, of a much advanced order than at the other claims, and the engine of 80 nominal horse-power but capable of working up to 200 at a very slight cost of fuel is what experts call 'a little beauty.' In this mine too, are Chilian mills - unpleasantly suggestive of ground bones - for working up pyrites, and huge furnaces for blowing the same. I looked in at the open door of one of these and saw the flames rushing onward and upward like a river of lava until the fumes of arsenic and sulphur made my head dizzy, and I was glad to have the door closed and get away from what looked very like a rehearsal for Hades...
THE EXISTING REMAINS

A considerable amount of physical evidence of the mine has survived. These elements, which are indicated on the site plan, include the engine house, the magazine and the manager's house and evidence of sites including the two main shafts, the offices and the reservoir. Other elements have entirely disappeared or else could only be identified by a thorough archeological investigation, which is outside the scope of this study. It is important that the relationship between the surviving relics is retained, as far as possible, so that the original functions of the engine house, as a part of the surface operations of the mine, can be understood.

Site Plan, 1981

The Engine House

The most obvious structure is the characteristic Cornish engine house, similar to those constructed in many parts of the world to a basic design which can be traced back to the earliest Newcomen engine of 1712. The building is
The Engine House, 1981

constructed predominantly of rough hewn local stone, although windows and other wall openings are dressed with brick, which was also used for the upper half of the chimney and at the corners of the building. Granite was used for the main 'loadings' on the 'bob wall'. Very little evidence remains of the timber parts of the structure such as roof trusses and internal floors. One unusual aspect of the engine house is the location of the chimney in a central position on the end wall, rather than in the more usual corner or free-standing positions. The foundations which supported the flywheel, axle and crank are evident and the probable location of the boiler house is marked by a low stone wall on the southern side of the engine house.

Although no parts of the engine are known to have survived, a reasonably clear picture can be assembled from contemporary accounts. The double-acting Cornish beam engine had a 25 inch (0.63 metre) diameter cylinder with a 9 foot (2.74 metre) stroke, connected to a beam or 'bob' which was 25 feet 6 inches (7.8 metres) long. It was a rotative engine, consequently a 'sweep rod' was pivoted
on the 'out-door' end of the 'bob' which was connected to a 7 foot (2.1 metre) crank which drove a fly-wheel of approximately 22 feet (6.7 metre) diameter.

There is evidence to suggest that the engine was designed by Loam and Son (Matthew Loam's brief connections with the Australian United Gold Mining Company has been previously noted) and was constructed by the St Blazey Foundry in Cornwall.

Steam was supplied by a Cornish-type boiler designed by Loam and Son but manufactured in Australia. The boiler was 31 feet (9.5 metres) long and 7 feet (2.1 metres) in diameter.

Related Machinery

Pumps

The engine is stated to have operated pumps in addition to powering a crushing battery. This dual use of a single rotative beam engine was increasingly common in Cornwall after 1860 and it is likely that the techniques employed at the Duke of Cornwall mine were similar to those employed in Cornwall.

The engine was located some distance from the various shafts and to transmit the drive, it was normal to use wooden 'flat rods' carried either on swinging pendulum arms or on 'dolly' wheels, the transition from horizontal to vertical movement at the mouth of the shaft being accomplished by an angle crank. The pumps were apparently of the standard Cornish type, consisting of a number of 'lifts' from the sump at the bottom of the shaft to the surface. A bucket lift was normally used to raise water from the sump to the bottom cistern, followed by a series of plunger pumps displacing a column of water upwards from lift to lift. The plungers were operated by strong pump rods made of timber baulks strapped together at the ends by iron plates; indeed it was the weight of these
1. Cylinder  
2. Beam or "Bob"  
3. "Outdoor" End  
4. "Sweep Rod"  
5. Flywheel  
6. Crank  
7. Pendulum Arm  
8. Flat Rod  
9. Angle Crank  
10. Pump Rod  

Rotative Beam Engine applied to pumping rods on the downward stroke which activated the plungers, the engine being used to raise the rods for the next stroke.

In July 1869, the engine was stated to be working: '... one 6 in. lift, 133 ft; one five and a half in. lift about 30 feet one 12 in. plunger-lift; and is forcing water for stamps and conducting water.'

Crushing Battery

Little evidence remains of the battery which was apparently located on the northern side of the engine house, in an area which is now mostly overgrown with pepper trees. At the time of the auction of the mine's equipment in 1875, the machinery comprised a 15 head battery produced by Roberts and Sons, Sandhurst.
This replaced an earlier 24 head battery which was erected in 1869 by the Australian United Company.

Shafts

Daukes' Shaft was located on the eastern side of the Fryerstown to Chewton Road and the pumps in this shaft were operated by the beam engine. Some evidence of stonework associated with the shaft can be identified and most of the mullock heap remains. A short section of tramway rail, presumably from the overhead tramway connecting the shaft and the battery has been located. Lambs Shaft is marked by a mullock heap on the side of a gully approximately 150 metres to the northeast. Two other shafts have been identified but neither can be named with any degree of certainty.

Powder Magazine

Constructed of stone at a cost of £16 in 1865, this circular structure remains largely intact.

Managers House

The House constructed for H.W. Lamb survives although in a substantially altered condition.

Office Foundations

Foundations associated with the offices indicated on the 1868 plan can be identified.

Foundations of Engine House

On the eastern side of the road, substantial foundations of an additional engine house have survived in a very deteriorated condition. The exact purpose of the engine-house is unclear, but it may have been used for a winding engine, associated with a shaft between the foundations and the road.
The Dam

Evidence of the dam can be identified in the gully although most of the dam wall has disappeared.

ACKNOWLEDGEMENTS

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REFERENCES

1. Mines Department, Reports of the Mining Registrars, quarter ended 31 March 1887, p.69.
2. ibid., quarter ended 30 June 1864, p.62.
3. ibid., p.62.
4. ibid., quarter ended 31 March 1868.
7. ibid., vol. 38, 28 March 1868, p.228.
8. ibid., p.228.
10. ibid., vol. 38, 8 February 1868, p.105.
11. ibid., vol. 38, 10 October 1868, p.719.
12. ibid., vol. 38, 5 December 1868, p.877.
17. ibid., vol. 39, 22 May 1869, p.364.
18. Mines Department, Reports of the Mining Registrars, quarter ended 30 September 1869, p.36.
21. ibid., 6 November 1869, p.844.
23. ibid., 9 July 1870, p.571.
26. ibid., 7 September 1871, p.759.
27. ibid., 4 November 1871, p.982.
29. Mount Alexander Mail, 22 July 1875.
30. Mines Department, Reports of the Mining Registrars, quarter ended 31 March 1889, p.76
31. Verbal advice, Mr George Brown.
33. Mount Alexander Mail, 22 July 1875.
34. Reports of the Mining Registrars, quarter ended 30 September 1869, p.30.
35. Verbal advice, Mr George Brown.
37. Verbal advice, Mr George Brown.
41. Mount Alexander Mail, 22 July 1875.