

The Trevithick Society

2015 AGM

Programme Notes



Compiled by

Pete Joseph



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for the study of Cornish industrial archaeology and history

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Front cover illustration: West Basset Stamps below the Basset Memorial on Carn Brea.

AGM 2015 Programme

Levant, the Great Flat Lode and Narrow Gauge Museum

- 1. Friday May 15th afternoon 2pm**
Levant Mine
- 2. Friday May 15th 7.30pm**
Talk: Topic, speaker and location TBA
- 3. Saturday May 16th morning**
West Basset Stamps
- 4. Saturday May 16th afternoon**
Marriott's Shaft - Wheal Grenville
- 5. Saturday May 16th afternoon and evening**
King Edward Mine: 4.30 for 5.00 AGM
Lowenac Hotel: 7.00 for 7.30 Annual Dinner
- 6. Sunday May 17th morning**
King Edward Mine
- 7. Sunday May 17th afternoon**
Moseley Industrial Narrow Gauge Tramway and Toy Museum

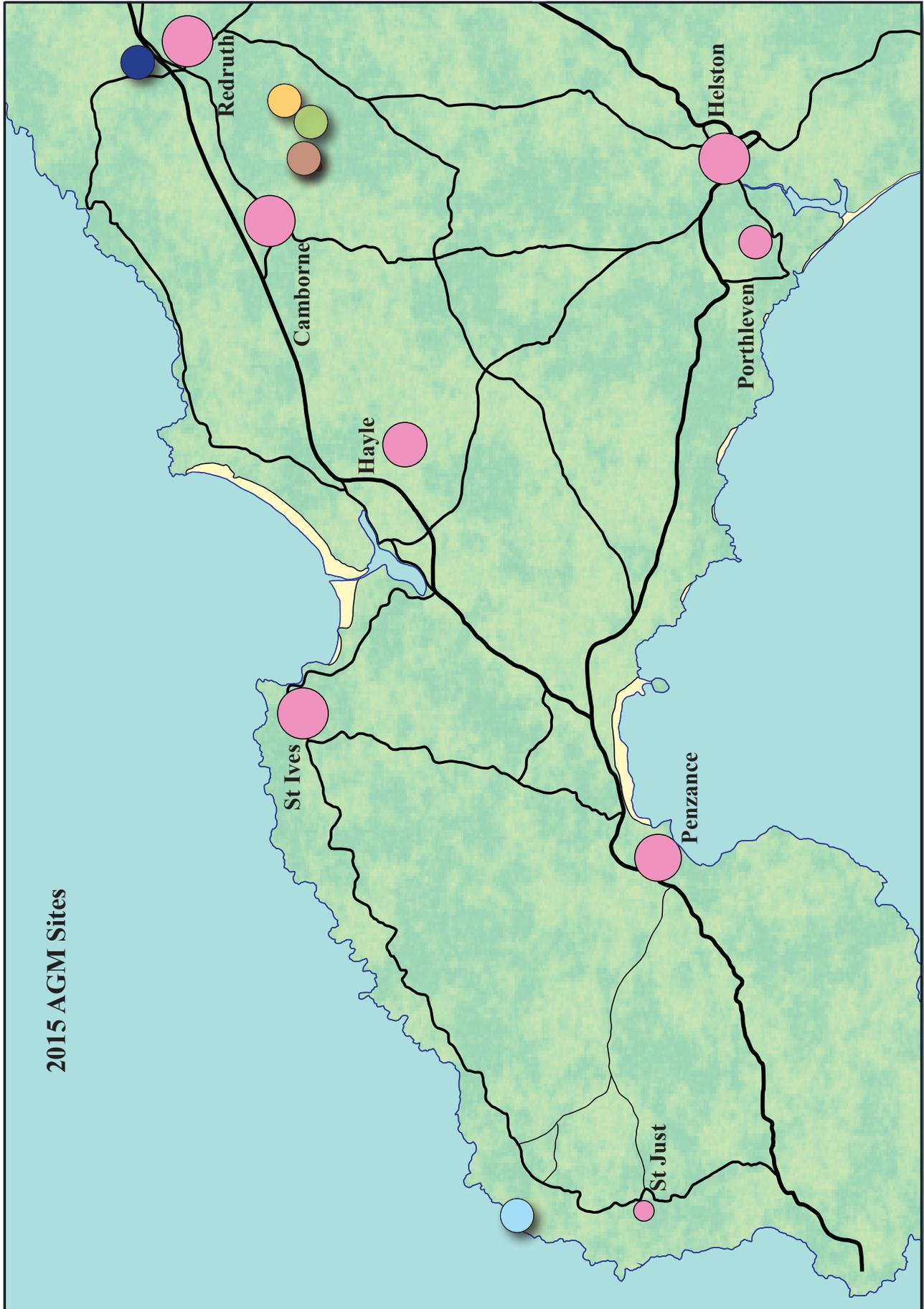
Acknowledgements

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Programme locations, May 2015



2015 AGM Sites

Friday May 15th afternoon

Levant Mine

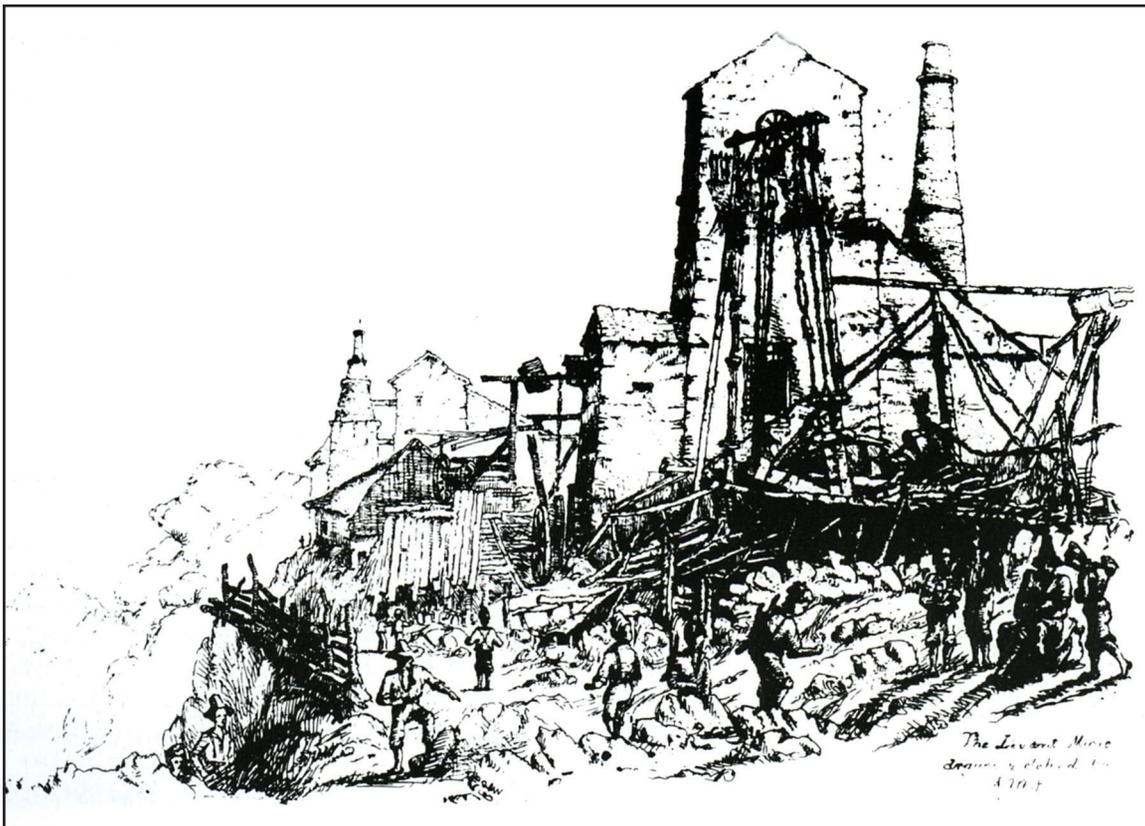
Levant mine was working in 1793 when the first record of copper production took place, demonstrating that the old setts of Wheal Unity, Boscregan and Zawn Brinney had been amalgamated. However this was not a good period for Cornish copper mines because of competition from Anglesey, North Wales; the two mines here were producing almost as much copper as the total output of Cornwall at this time. Joseph Carne's 1822 geological map of the St Just district shows only Levant and "Zawnbrinny".

Not later than 1820 Richard Boyns formed a company which included bankers and tin smelters. The mine was in 20 shares, and a call was made of £20 per share. Before this £400 was used up, a rich bunch of grey copper ore was cut and dividends commenced at once, a success probably not equalled in the history of Cornish mining; up to 1872 the mine would raise over a million pounds' worth of copper and tin, giving about £200,000 profit to the adventurers, the greater part of which was made in the first twenty years.

By 1822 the mine was 42 fathoms deep, the first level 12 fathoms below adit and extending 40 fathoms beneath the sea; part of it was stoped to 5 fathoms above the level. Another level extended 28 fathoms under the sea.

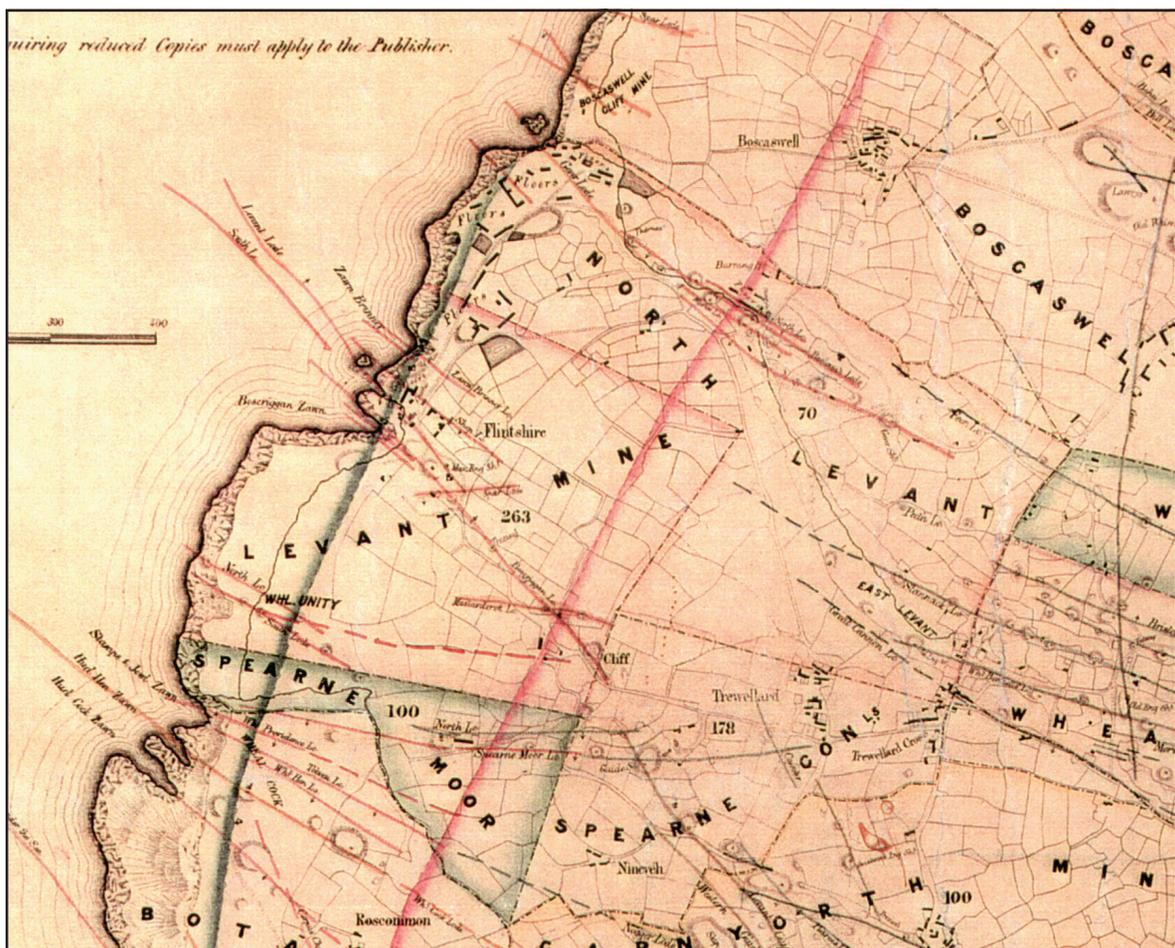
In 1835 the mine acquired a 40-inch pumping engine from Harvey and Co. and the following year a 26-inch whim was acquired for Batten's Shaft, on the cliff below the present engine houses. By that year the shares had been re-divided and the mine was in 160 shares; astonishingly the profits were averaging £1,100 per month, with an average profit of about £8,000 a year over the past 10 years; dividends were paid bi-monthly.

It was in 1840 that Harvey and Co. built and supplied the 24-inch all-indoor beam winding



Engraving of the erection of the house for the new Harvey-built whim in 1840.

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Levant and surrounding mines as depicted on Symons' 1857 map of the St Just mining district.

engine that draws so many visitors to the site, as well as the stunning scenery, of course. This engine was hoisting from Skip Shaft, to the rear of the engine house. Skip Shaft is separated from Engine Shaft by just a few metres of rock but despite this the two are quite distinct.

By 1842 the mine had already acquired its reputation as a tough place to work; in the Children's Employment Commission's report it was stated that "In Levant they work six-hour cores (shifts). The mine is hot and deep, and it is considered that six hours will work a man down" The cores worked were forenoon (6am-noon), afternoon (noon-6pm), first core by night (6pm-midnight) and last core by night (midnight-6am).

The year 1850 saw the mine acquire a 32-inch engine for stamping the increasing amounts of tin ore that the mine was raising. As before, it came from Harvey & Co. The following year the mine was being worked 240 fathoms "below the sea level" (*i.e.* 265 fathoms from surface) and a considerable way out from shore, "so that in rough weather the breaking of the waves upon the beach is distinctively heard by the labourers."

In 1853 the workforce comprised 600 men, boys and girls. It was from about this time that the cost to those working underground, in getting to and from their places of work, was beginning to tell. Apart from the heat, there was a climb of 240 fathoms—1,440 feet—each day from the bottom of the mine, to say nothing of a fairly lengthy walk from the furthestmost submarine ends back to the shaft before the ascent could even begin. Following this the men, boys and girls often had to walk several miles to get to and from the mine from their homes.

The machinery then consisted of a 40" pumping engine; a 32" stamping engine, with 64 head of stamps; and two whim engines, one a 20" and the other a 24". Levant was now entering upon

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a period of renewed prosperity. In 1854 and 1855 dividends totalling £6 per share were distributed; in 1856 this was increased to £8 whilst by 1859 the annual distribution of profits had risen to £3,200.

At a meeting in 1855 the adventurers made the historic decision to acquire a 'man-engine'. Without this invaluable machine to carry the men to and from their labours, the riches of Levant, lying at depths of up to 100 fathoms and more beneath the then bottom of the mine, could never have been reached, and its career would inevitably have come to a premature end. The man-engine was finally installed in 1857, working to a depth of 170 fathoms from surface; it was powered by a single-acting Cornish beam engine.

In 1865 180 men, 17 females, 48 boys were employed, representing a big drop on previous years. The mine was 254 fathoms under adit (30 fathoms). Minerals to the value of £16,428 17s 9d had been raised in 1864, but dividends were then in abeyance; only a small rise in the price of tin would ensure their resumption.

Following the failure in 1869 of negotiations for a new lease, the "Old Company", as it later came to be called, continued to function. At the quarterly account held on the mine on March 24th 1870, the accounts for six months to the end of the previous December showed a further worsening of affairs, a total debit balance of £1,192 7s 2d having to be carried forward. At the meeting it was stated that the tin now on the mine was more than adequate to discharge the debt on the books.

By June 30th 1870, the debit balance had nearly halved to £667 3s, and it was reported that the 100 fathom level was driving at £5 per fathom for tin. In August the mine was employing 79 men and boys underground; men, boys and girls at surface, 97; total 176. The wage bill had risen from £1,400 to £1,500 monthly a few years earlier to an average of £600 to £700 monthly in 1869.

The final account meeting of the old Company took place in the Lecture Hall, Public Buildings, Penzance, on March 13th 1871, where a debit balance of £644 7s 9d was carried forward.



Levant in the 1930s. Note that the boiler house has been reduced - steam was taken from the pumping engine boiler in latter years. Copper picking sheds to the left, count house to right and launder in foreground.

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Proposals for a new company appeared in May 1871; the cost-book company was to be in 5,000 shares at £3 each. The lords promised a 21-year lease, with 1/20th dues on copper and 1/24th on tin. The old plant was to be taken over at a valuation and made thoroughly efficient by repairs and additional machinery. It was reported that more than a quarter of the shares had been immediately taken up locally, mostly by merchants such as Messrs. Bolitho, Messrs. Coulson & Co., Messrs. Holman & Sons, J. Batten and G. Bazeley. The mining interest was represented by S. H. James, E. and H. Davy, Messrs. White and Messrs. York and Son.



The Levant count house, actually at least three conjoined buildings.

One of the first tasks for the adventurers was that of replacing the old worn-out pumping engine. A new 45-inch cylinder machine was ordered from Harvey & Co and installed by Eustice & Son, the engineers. It was first set to work on 21st August 1872, and on the 24th all the workmen who had been involved with its erection, between 50 and 60, sat down to a celebration dinner, presided over by Richard White. Captain Henry Boyns proposed “Success to the New Engine,” and the “Health of the workpeople of Levant Mine”.

In 1880 the first compressed air drill had appeared, with a Harvey compressor at the rear of the pumping-engine house. The first compressed air drills were extremely expensive and their use was restricted to important areas of development. In October 1891 the decision was taken to acquire a small steam-locomotive to tram underground; it was thought that this would perform the job better than hand-tramming. The 278 was enlarged to 5ft by 5ft to take it.

The locomotive was a failure, however, partly because the slope in the level, which had not previously been considered for locomotive haulage, was too steep and partly because the wheel flanges also jammed on the rails in the 278. Just prior to this a pony had been acquired for tramming and more after the trial, the 278 subsequently being renamed the Pony Level. The ponies were taken underground in a sling with legs tied together and attached to the bottom of the skip. The RSPCA did not catch up with this.

In order to minimise the costs of carrying materials to and from Penzance, Levant Mine ac-

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quired a traction engine in 1883 with a second added in 1895. In 1898 the man-engine was extended down to the 266 fathom level. With more rock drills and a greater need for compressed air the management acquired a huge air compressor from Holman Brothers in Camborne. The new engine was a large horizontal triple-expansion model designed by George Eustice and Nicholas Trestrail. Its 18-foot diameter 20-ton flywheel must have been impressive in action. It supplied air to the drills under ground and also to the air hoist at New Submarine Shaft.

John Holman referred to the magnificent compressor house with its tiled floor and 100 foot ornate chimney with its Gothic concrete cupola. It was made from 2,000 tons of masonry which had cost a pound per ton, enraging many shareholders who resented this expensive 'elaborativeness'. Indeed, when Nicholas Trestrail submitted his bill for erecting the compressor, the Levant committee reduced it by £17 and dismissed him.

In November 1909 Major Richard White died at the age of 78, having remained vigorous to within two days of his death. He had begun his service with Levant in 1850 as a clerk with the old company, and on its reorganisation in 1870 he acted first as secretary to the provisional committee arranging the formation of the new company and then as purser to the new company, steering it through good times and bad.

A year after the Major's death there was labour trouble of a different kind. It was not militant strife but the effect of men voting with their feet against the low wage rates of the mine. They were emigrating in numbers to foreign mining fields and taking their mining skills with them. It reached the stage where the importation of foreign miners was suggested, though this did not come to pass at Levant, only at Geevor after the Second World War, when Poles and Italians joined the labour force.

The First World War brought another shortage of labour, with miners called up into the army and put on mining work of a highly destructive nature on the Western Front, that of laying huge



The four calciners at the north of the Levant site. To the left are the flues, now covered. When these were first covered over in 1995 the rock was grey, not being local; it then became known as Pendeen Airport by the locals.

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explosive charges under the enemy lines. In 1917 the first of a series of strikes took place; these would trouble the mine for a couple of years until Francis Freathy Oats gave the workers the ultimatum to cease or have the mine closed.

The summer of 1919 brought a re-run of the dispute. There was another rejected wage demand followed by another threat to close the mine. In July, in view of an impending coal strike, all surface machinery was stopped except the man-engine, whim-engine and pumping-engine. The previous strike had also led to the flooding of the lower levels, and the mine was obviously just staggering along. On October 20th of the same year the man-engine suffered a disastrous accident. Thirty-one men were killed, the second worst disaster in mining in Cornwall, eclipsed only by the 40 men who died in 1846 in the flooding of East Wheal Rose in Newlyn East by a sudden deluge. After the accident Levant entered into a period of terminal decline.



What looks to be an Inca temple is a 20th century stamping mill. In the foreground is a loading for a set of Californian stamps; the posts are supports for the roof. Geevor is in the background.

The death of 31 men and injury of many others affected the district deeply, and over seventy years later the memory lingers on. It was all too typical of Levant that it should still be operating a man-engine. The ride to the bottom of the shaft took half an hour, followed by a walk out under the sea, which could be a further mile. Such a loss of time added to the cost of distant undersea operations, already inflated by ore-handling costs, led to the consideration of straightening the Skip Shaft so that men could ride in it, but like other good ideas it came to nothing. Whether it could have served for hauling ore and men and sending town tools and timber is doubtful.

Apart from the occasional casualty the management was none too careful about the man-engine. When it was extended in 1888 no knocker or signalling line was provided, and the Inspector of Mines saw to it that two members of the committee, who were large shareholders, were sued. The man-engine was not without safety devices. The rod had wings, or catch-pieces, with cor-

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responding sills, stout pitch pine beams, in the shaft, so that when the rod was at the bottom of its stroke there was a small uniform space between wings and sills.

On the afternoon of October 20th, 1919, the safety devices failed in their function. A full shift of men was ascending, which would have weighed about 10 tons. Experienced men noticed a strange vibration in the machine and those fortunate enough to arrive at surface very soon noticed that they had not been followed. Someone went to look along the connecting tunnel to the shaft and found that the engine had gone. The rod had parted from the beam. In falling the rod got out of line, missing the upper sills and catches and destroying others, and broke in two at 60 fathoms below the cap, so that the upper part, with thirty men on it, fell 46 fathoms to the 70 fathom level, destroying platforms as it went. This caused most of the casualties. The scenes of carnage were something which those involved remembered until their dying day.

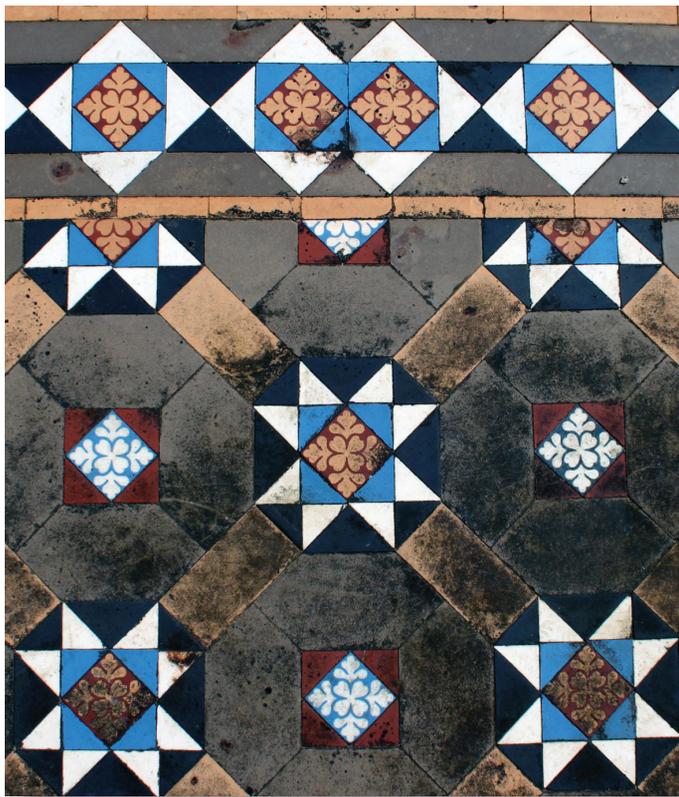
The Inquest Jury's verdict was "accidental death". Such a disaster would no doubt bring more legal consequences today. A fund was set up for the dependants of the dead men. The last living link with the disaster was Mrs. Anita Murley, "Granny Murley" as she was affectionately known in the district. Three years before Mrs. Murley's death subscriptions were raised from private individuals and a memorial tablet listing the names of those killed in the disaster was placed in Trewellard Chapel at the top of Levant Road. It was duly unveiled by The Viscount Falmouth, Lord Lieutenant of the County. On the closure of Trewellard Chapel the memorial tablet was removed to Geevor Mine, where it can now be seen in the Hard Rock Museum of Cornish Mining.

An almost immediate result of the disaster was that at long last the only surviving cost-book company admitted it needed new capital. It had no reserves under its antiquated system of book-keeping and the result was that, just before Christmas 1919, shareholders were informed



The still imposing remains of the compressor house. Stamps engine stack to left and calciner stack to far left.

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Some of the remaining rather grubby tiles in the vestibule of the count house.

that agreement had been reached with Geevor. A new limited company was to be formed to take over the working of Levant, with an authorised capital of £160,000 in 10s shares, of which 40,000 would be allotted to the existing shareholders in Levant in exchange for their shares, 200,000 would be allotted to Geevor for cash, and 80,000 would be held in reserve. The new company, Levant Tin Mines Ltd., was registered in February 1920 in 320,000 10s shares.

In the meantime there was the pressing problem of working the mine without the man-engine. Operations were suspended after the accident and were not resumed until the formation of the limited company. The captains suggested clearing the Man-Engine Shaft and putting in a gig, with a new wind-

ing engine. If only the Skip Shaft had been straightened as suggested in 1895, at least a temporary solution for winding men could have been achieved. A third of the men's time was lost in going to and coming from the submarine section, implying a loss of £6,000 a year. But when the cost was estimated at £30,000 the adventurers rejected the idea. It is said that Frank Oats then offered to sink the shaft at his own expense, if he could have all the ore met with on the way. It would have been a fair gamble, as the shaft would not by definition, have followed the lode down.

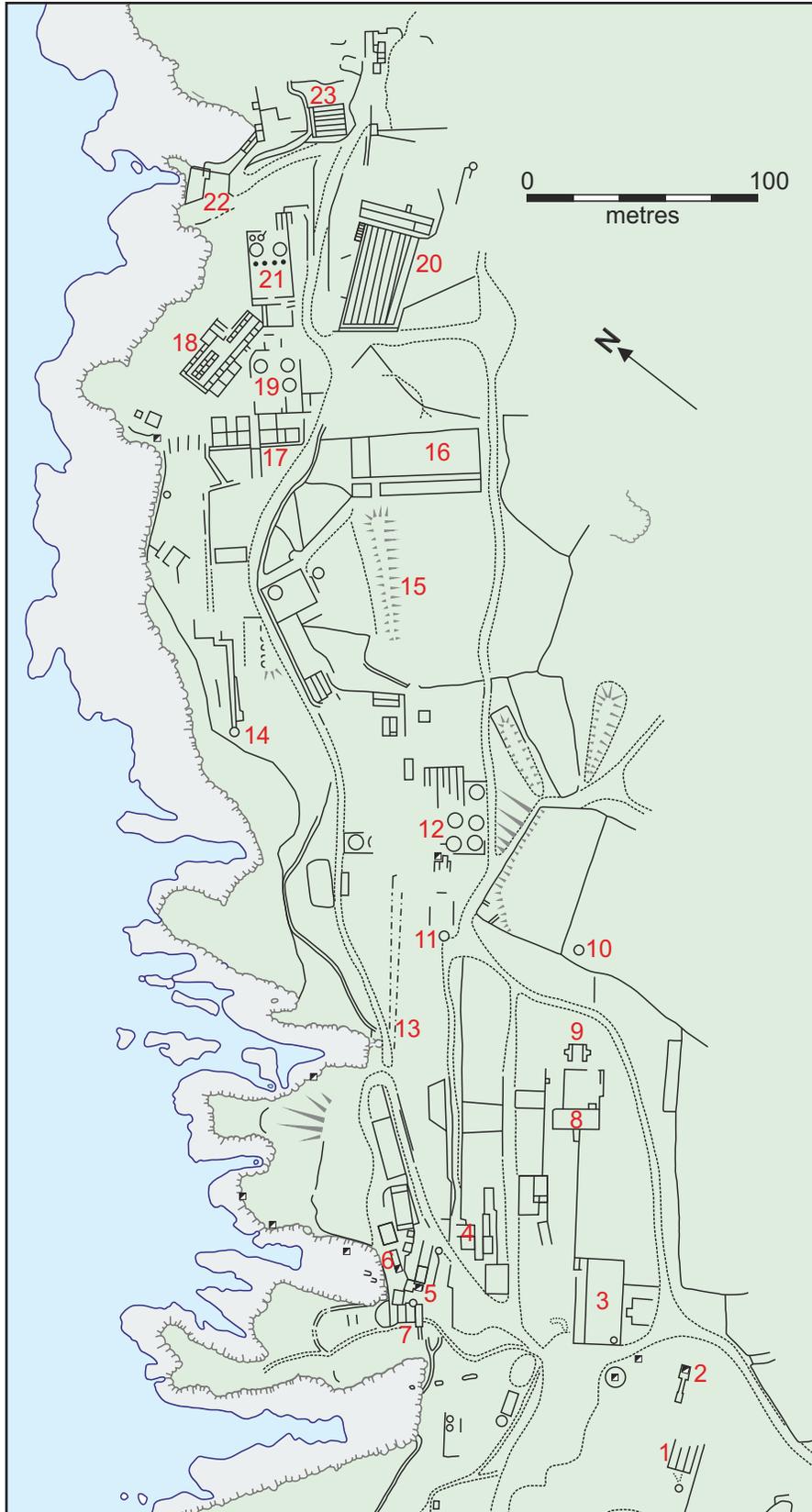
It was finally decided to sink a new vertical shaft. The site for it was chosen some distance east of the compressor house. Here a patch of level ground can be seen, covered with heather, where the ground had been cleared to sink the shaft. But no further work took place, and the heather spread over the ground, where the soil composition had been changed. A winding-engine bought from the Basset Mines, Carnkie, presumably a result of Freathy Oats' association with that mine, was never erected or put to use.

Redrawing of one of the fireplace tiles in the count house and recreation of the fireplace.



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In the absence of a new shaft there was little choice of a way into the mine. There was no point in using the ladder road of the pumping-engine shaft, and the alternative was to go down the cliff into the narrow cleft of Levant Zawn and to enter the mine by the adit. The new company inherited a vast amount of antiquated and worn-out equipment, and Thomas Robins Bolitho blamed



KEY

Some features omitted for clarity

1. Site of man engine house
2. Man Engine Shaft
3. Dry
4. Count house
5. Engine Shaft and pumping engine house
6. Skip Shaft and headframe
7. Whim engine house
8. Compressor house
9. Loadings for hoist for proposed new shaft
10. Site of proposed new shaft
11. Stamps engine stack
12. Buddle yard
13. Tramway to stamps
14. Calciner stack
15. Tramway for Californian stamps
16. Californian stamps battery
17. Calciners
18. Copper precipitation yard
18. Buddle yard
20. Settling strips
21. Small dressing floor
22. Water powered stamps
23. Settling strips

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the mineral lords for this. There had certainly been years of negotiations for a new lease, and until it was secured the company had been reluctant to incur capital expenditure. The mine had the misfortune to have three sets of mineral lords. One was concerned with mineral rights below the land (originally Messrs. Robyns, Trezise and partners) while the Duchy of Cornwall held the rights to the part between high and low water. Below low water the third party was the Crown, in the shape of the Office of Woods and Forests. The last-named described themselves as “lords of the undersea leases of South Trewellard Mine”, but is nowadays known as the Crown Estates Commissioners. There was also the lords’ insistence on the payment of royalties on mineral sales even when the mine was running at a loss.

New leases were concluded when the limited company took over, but it was obliged to abandon the submarine part of the mine, since men could not be expected to climb down to 350 fathoms or 2,100 feet, which would have rendered their labours uneconomic. The men did, however, climb down and up from the 190 fathom level below adit, or 1,140 feet. However, when they reached the mouth of the adit, with the climb up the cliff in all conditions of wind, rain and sea spray, they did not have a covered way to the dry. But despite the discomfort they were just glad to have a job.

Despite the abandonment of the submarine section, the working of the less-rich landward lodes, and the fall in the price of tin after the First World War, production of tin was quite good. Development was carried out between the 130 and 190 fathom levels. It was remarked by another Bolitho, Horton, that Colonel Oats “lived for ten years on ground that had been abandoned in my grandfather’s time”. The mine staggered on against all the odds and its manifest deficiencies but the end came in October 1930, in the depths of a world economic depression. The price of tin was dropping and had fallen to £99 per ton. A notice appeared in the dry stating that the mine would close the following Saturday. Of wages due a third would be paid following the sale of machinery and timber, a further third at the next Christmas and a final third the following Christmas.

Some years before this the Treasury had granted a £10,000 loan through the Trade Facilities Act Committee. As soon as the Company collapsed the Treasury appointed a liquidator and in the event all the plant on the mine, save the whim engine, was sold for scrap at the ridiculous sum of £600. Over 200 men had been thrown out of work. It took the heart out of the St Just mining district, where only Geevor remained somehow to survive. An institution had passed away.

Immediately after closure the machinery on the mine was coated in a black bitumastic paint, presumably so that it could be re-used if the mine was to re-open if the price of tin rose. It was the threat to scrap the whim engine in 1935 which caused the formation of the Cornish Engines Preservation Committee, the direct ancestor of the Trevithick Society. From 1984 a group of Trevithick Society volunteers, which became known as the Greasy Gang, started working to restore the engine to its former glory and to make it run on steam. The old, worn-out, equipment was largely scrapped, but the more modern equipment was sold to other mines. The pumping engine was scrapped; during the process of removing the beam it stuck and had to be dynamited to encourage it out of the house.

In the late 1950s, Geevor, having already decided that its ore reserves were not sufficient without expanding its operations into Levant and developing that mine in depth, resolved as a first step to seal the breach. The first attempt to seal the breach in the sea bed was made in 1961, when divers placed a concrete plug in the hole and put a reinforced concrete mat over it. But unknown to the engineers there was a wide gunnis with unstable walls and roof below the hole, where the lode had been taken away, and the action of the sea soon broke up the concrete mat.

In 1965 a second attempt was made to seal the breach. It began with pumping 30,000 gallons an hour of sea water out of Skip Shaft. This had the effect of drawing loose material from the sea bed into the mine to within a few feet of the bedrock, so that the bottom of the new plug would

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Levant staff and volunteers in 2014.

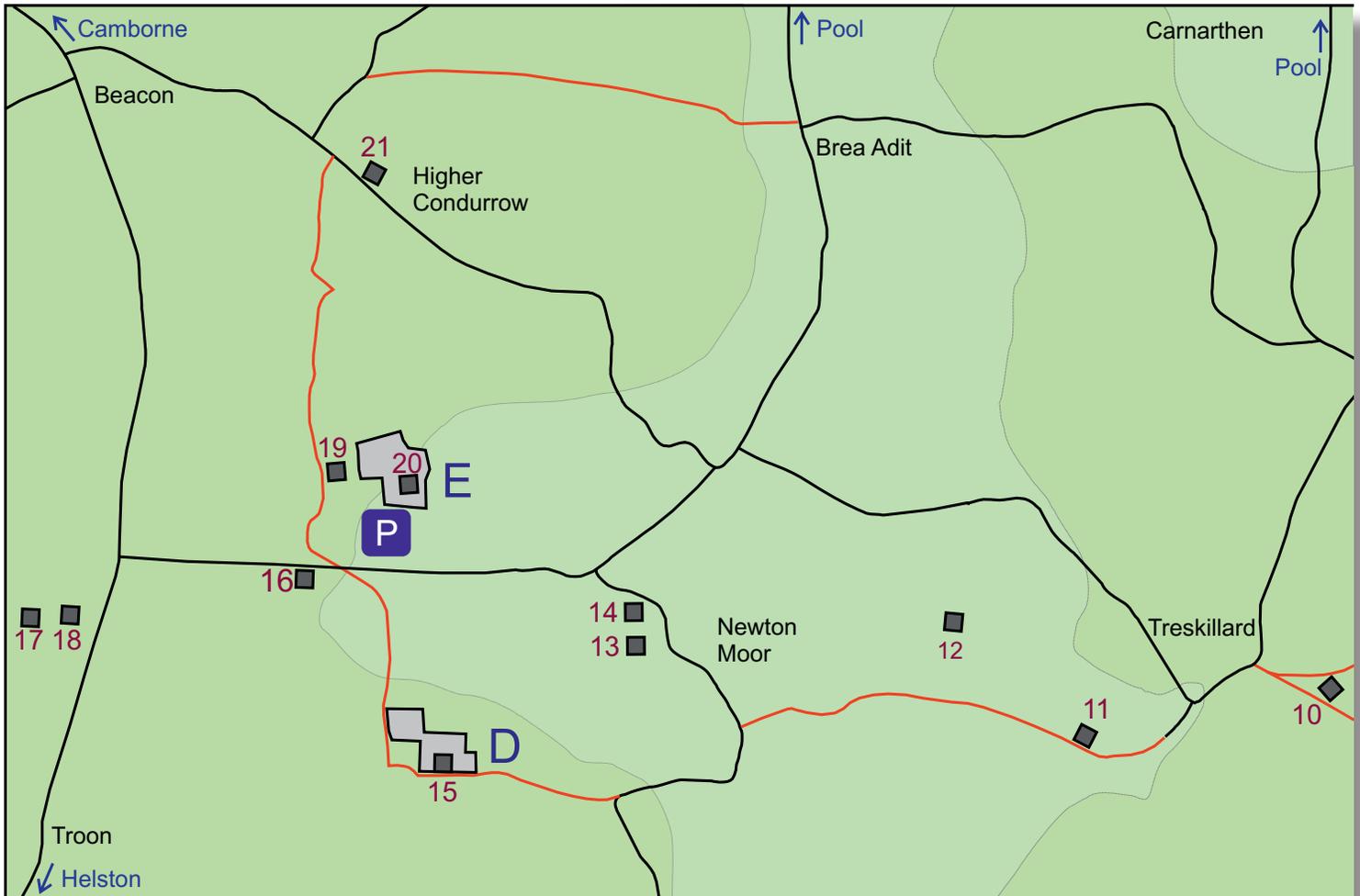
rest on natural fill. The remains of the old concrete mat were then removed, and a wall of sand-bags filled with quick-setting cement was built round the hole for a good distance on either side of the breach. Some 7,000 bags of quick-setting cement were dumped over the side to make a much larger new reinforced concrete mat. Then pipes were installed, leading from cement mixers set up on the top of the cliff and down into the hole. About six hundred tons of concrete were laid under the sea in this way before the breach was filled. The technical achievement was remarkable, and won for its promoters the coveted Gold Fields Award, the first time it had been awarded outside South Africa.

Following the success of the sealing, the mine was unwatered, a winding-engine was erected, and Skip Shaft was fitted out with a cage for the transport of men and materials. Sealing of the undersea levels was completed by March 1966, and in 1967 diamond drilling was started in the old workings, including a horizontal hole from the 40 fathom level in the direction of Botallack.

At the 1969 Annual General Meeting the Chairman of Geevor was able to announce that the sub-incline shaft from Geevor to Levant had been completed, that Levant would be tapped and drained down to Geevor's 1900 ft level, with a drive from Geevor's 1800 ft, to connect with Levant's 278 fathom level. Unfortunately, once the opportunity had come to properly explore the old Levant workings it was realised that the expected reserves were not there.

So the career of the old champion Cornish mine had come effectively to an end. Levant was distinguished by its submarine development a mile under the sea, and for many features, perhaps not always for the best. It produced in its life a wealth of copper and tin and even a little gold and silver. If the management over a hundred and ten years had not always been as far-sighted as it might have been, at least it was remarkable for its tenacity. The miners, over many generations, worked in very demanding conditions, subject to many hazards, but, like Raymond Harry, were proud to be miners working in the famous Levant. It bred characters as diverse as Dr Quick and Major White. It had its terrible man-engine disaster, which even after ninety-five years (in 2014) is still remembered in the district and seems to have been implanted in the minds of many visitors.

Gazetteer of sites along the Great Flat Lode.



D. Wheal Grenville New Stamps

E. King Edward Mine complex

P: Car parks

Black lines: roads

Black dotted lines: former tramway

Red lines: foot/cycle paths

10. Pascoe's whim

11. Daubuz pump/whim

12. Bailey's pump/stamps

13. Fortescue's whim

14. Fortescue's pump

15. Grenville new stamps

16. Goold's pump

17. Marshall's whim

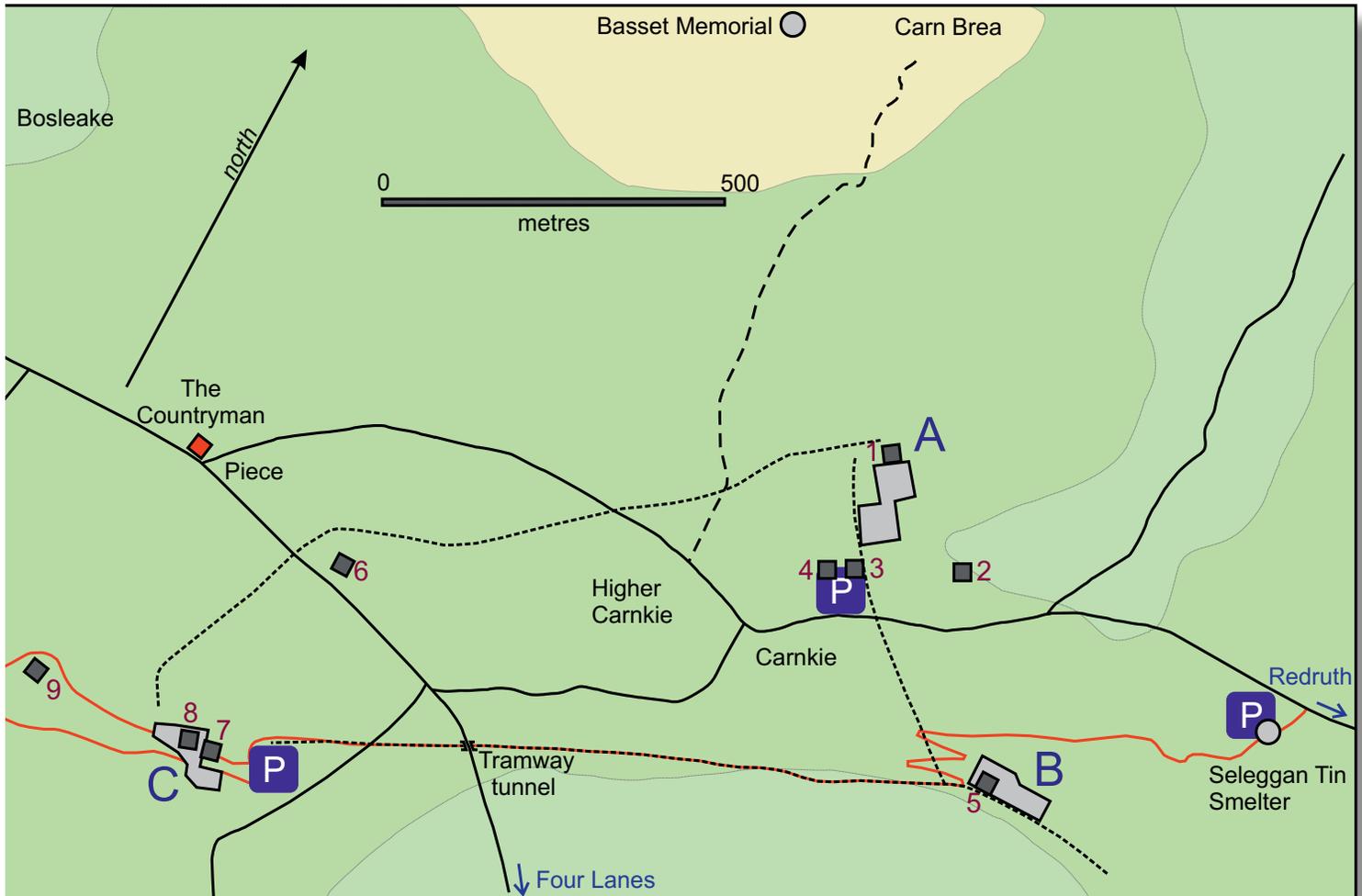
18. Marshall's pump

19. South Condurrow stamps

20. South Condurrow whim

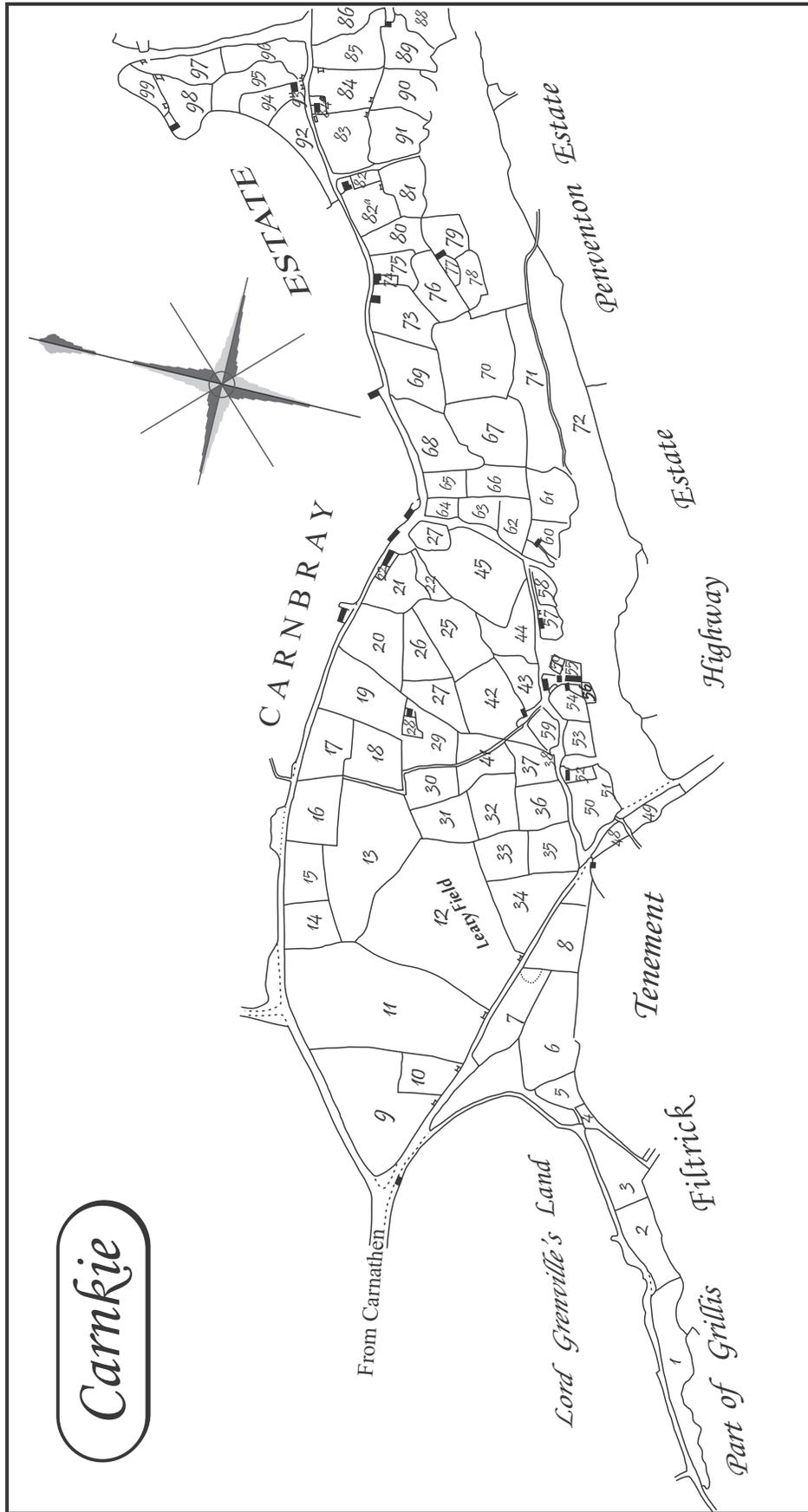
21. Neame's/Woolf's pump

Gazetteer of sites along the Great Flat Lode.



- A. West Basset Stamps
- B. (East) Wheal Basset Stamps
- C. Marriott's Shaft complex

- 1. West Basset stamps
- 2. Horizontal cross-compound whim
- 3. Lyle's pump
- 4. Lyle's whim
- 5. (East) Wheal Basset stamps
- 6. Thomas' pump
- 7. Marriott's whim
- 8. Marriott's pump
- 9. Pascoe's pump



Carnkie Bonython tenement, 1782, Tehidy Estate map.

Saturday May 16th morning

West Basset Stamps

Rather confusingly, the West Basset dressing floors lie some distance to the east of West Wheal Basset and were constructed in the North Wheal Basset sett. The area around Carnkie was formerly worked for copper as Carnkye Bal.

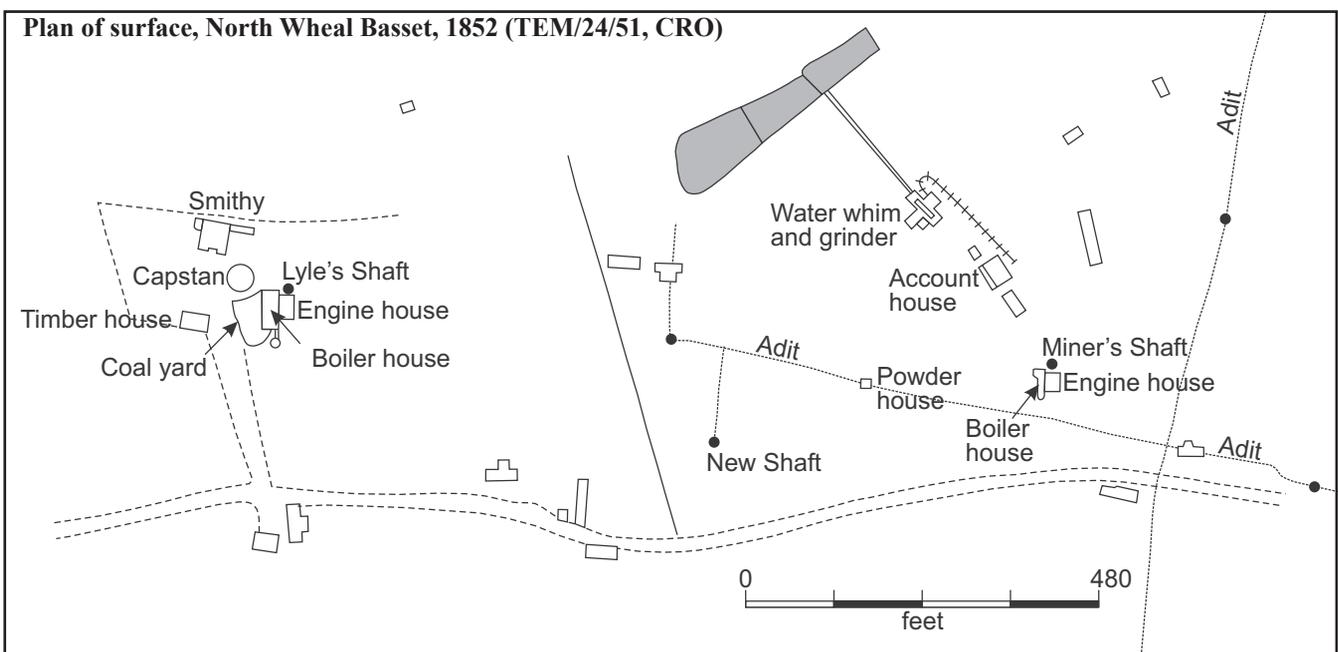
When the first recorded mention of Carnkye Bal appeared in 1546, the group of mines there was well-established. Alongside tin mines at Troon, Treslothan and Carn Mogh (between Troon and Beacon), by the middle of the sixteenth century Carnkye Bal was an important group of tin bounds. The valleys on either side of Illogan Parish were exploited for alluvial tin from prehistoric times until the early nineteenth century, by which time most alluvial tin was gone. It was the diminishing return from alluvial workings which caused tanners to concentrate on the primary tin lodes in the middle of the fifteenth century.

During the 1750s the eyes of local miners were turned to the prospects to the north of Carnkye Bal, and in 1754 Thomas Rosewarne and his partners sought permission to drive north from “the present level now begun nigh Matthew Rogers’ house in Carnkye and carry the same with true levels north into a mine called Wheal Rock.”

In August 1757, another approach was made to the mineral lord to extend the Carnkye workings to the north.

John and Thomas Davy of Redruth apply for a Sett for Tin & Copper of Wheal Ram Load etc in Carnkye & propose to drive Carnkye Adit Northward about 40 ffathoms to Wheal Ram Load from a Shaft about 15 ffathoms Deep near Pauls tenement – To have 150 ffathoms Westward & 50 ffathoms Eastward on the course of Wheal Ram Load from the shaft where the said Load is already Cutt – & 10 ffathoms on each side & 50 ffathoms each side of all Loads Cutt in driving the Adit to Wheal Ram Load.

After 1780, the mine disappears from the extant records, and its position was summed up by A. K. Hamilton Jenkin in Volume ten of his *Mines & Miners of Cornwall* (p.8): *A year later the mine seems to have fallen a victim to the prevailing depression and closed down in November 1780 with a loss of £502-1-7d.*



Saturday May 16th morning

Mining on the old workings began here in 1844 for copper, and work continued through the 1840s and the 1850s, but once the reserves were exhausted, no new bodies of ore were located (despite the existence of the Great Flat lode beneath the property), and the mine went into decline. In 1864 the eastern part of the mine was abandoned and development concentrated on Grace's Shaft to the west. By the mid-1860s it was clear that the copper ore on these lodes was exhausted, whilst tin values were so low as not to be worth the expenditure required to mine them. Extraordinarily, the adventurers had not cut the Great Flat Lode, and in 1872 the company was wound up. In 1878, the sett was incorporated into Wheal Basset, which undertook the redevelopment of the lodes within the sett, concentrating their efforts on Lyle's (or Waddington's) Shaft.



Lyle's pumping engine house at Carnkie. The whim is far right, hoisting from Miners Shaft.

From 1879 onward, Wheal Basset adventurers concentrated their efforts in the sett to the north of the old workings. The managers anticipated the potential wealth of the Great Flat Lode within this sett. As noted above, North Wheal Basset had closed in 1866 and subsequently, by the end of the 1870s, the lease of its sett had been acquired by Wheal Basset. The adventurers of North Wheal Basset had been exploiting several steep-dipping lodes in the vicinity of Flat Rod, Miners, New, Lyle's, Grace's and Western shafts, but had not seriously considered the Great Flat Lode. This lode had been, to some extent, exploited by South Carn Brea Mine, to the north-east and North Wheal Frances to the west. Wheal Basset management believed, rightly, that this lode remained virtually untouched in North Wheal Basset sett. They intended to change that. They set about making ambitious plans to open up the mine from the old North Wheal Basset Lyle's and Grace's shafts.

The pumping engine on Lyle's Shaft had a 60-inch diameter cylinder, and the one on Grace's, which had been moved there from Miners Shaft in 1862-63, was a 40-inch engine. After closure, there was an attempt to de-water the mine by means of these pumps, and in May 1867, they had drained the mine to the 70 fathom level, but were making slow progress, and were ultimately unsuccessful. These two engines were replaced, in 1879, by a new 80-inch engine, erected on Lyle's Shaft, which was to be the centre of the mine. The new engine, known as Waddington's Engine, was designed by John Hocking & Son and built by Harvey & Co. of Hayle. It cost £1,840, out

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of an intended overall outlay of £6,000. The pitwork was second-hand. The new 80-inch engine began pumping in October 1879, and by the following summer it was also powering flat rods, which pumped from the flooded workings at Grace's Shaft.

In September 1880, a Darlington rock drill was introduced into the mine. This machine had proved successful at Wheal Agar and in Germany, and the management put in air pipes so that four more Darlingtons could be brought into use. By the end of the year, one machine had driven 48½ft in a month, at a cost of £6 6s a fathom. This was in the north crosscut on the 112 fathom level, toward the Great Flat Lode. Hand-labour tuteurs had failed to take up contracts to drive this crosscut, offered at £8 10s a fathom, undoubtedly due to the depth of a drive which would have had poor ventilation. The compressed-air powered Darlingtons brought their own air in with them. Although a rise was being put up to drain the old South Carn Brea Mine above, seepage from those flooded workings did the job before the rise got there. These new machines helped facilitate the north drives to open up that great tin lode.

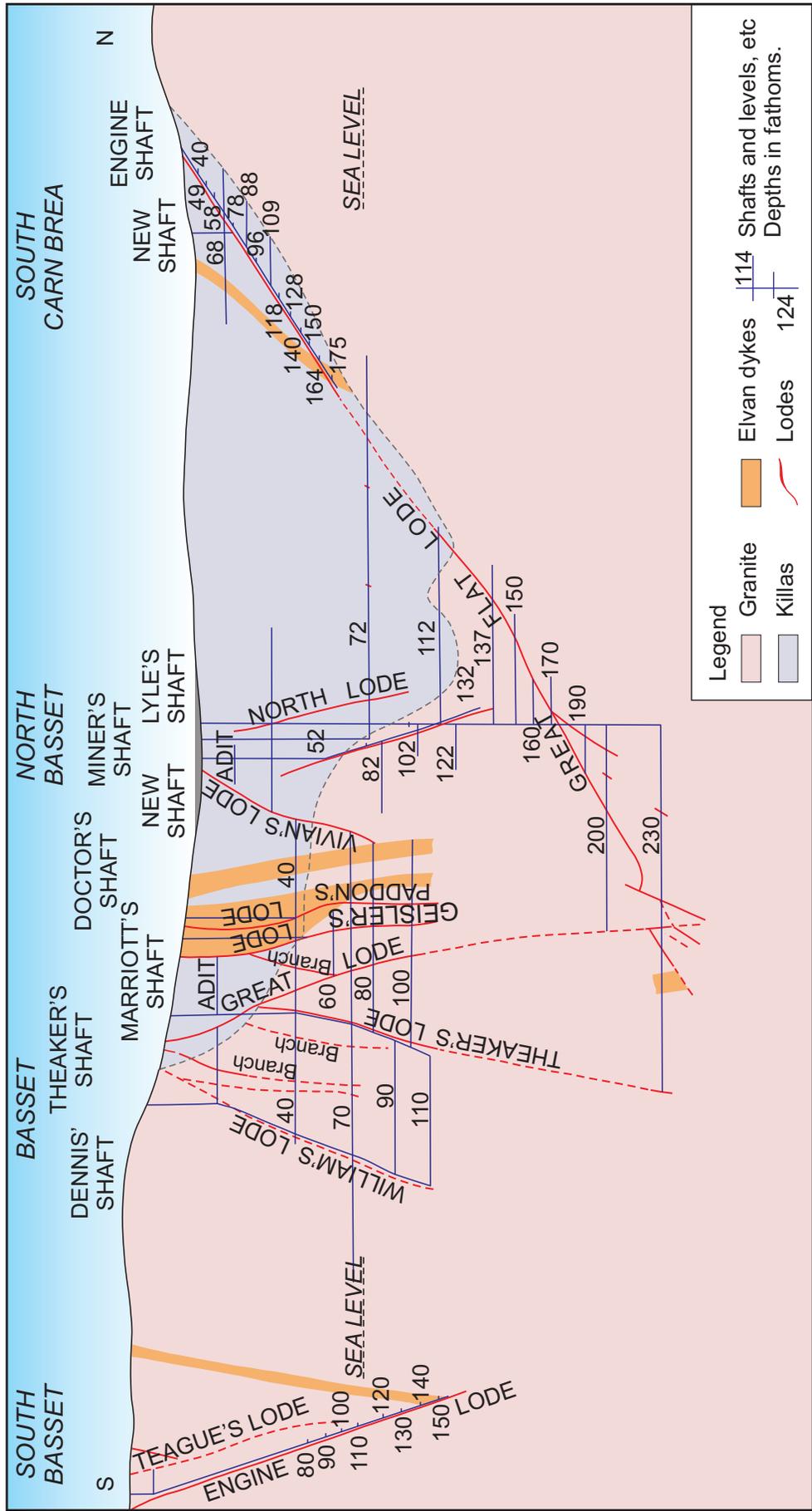
Production during this period of transition was low, with only eight tons of black tin produced in both 1880 and 1881. With the tiny tonnage of copper ore sold in 1880, the combined income from those two years was a mere £788. It was to be 1882 before tin from the Great Flat Lode was produced, with 60 tons sold for £3,622. In the spring and autumn of that year, the stamping capacity was increased significantly, and within a couple of years it was further increased to some 46 heads. As the anticipated tonnages from that lode rose, so did the confidence of the adventurers, who had coughed up some £46,000 in calls by 1885. With such high hopes, and undoubtedly the memory of their vast profits from the earlier copper workings, few defaulted on their calls.

As Lyle's Shaft deepened, so crosscuts were driven north to intersect the Great Flat Lode, and by the time the shaft was at the 190 fathom level, in 1885, crosscuts were being driven on the 137, 150, 160 and 170 fathom levels. The shaft passed through the south-dipping lode just below the 180 fathom level. Rises were put up from the 112 fathom level to the 100 fathom level, and from the 137 fathom level to the 124 fathom level. Below the 180 fathom level, the crosscuts were driven south. By 1885, a double skip-road had been put in Lyle's Shaft, and dams were installed on the 112 fathom level, to protect against water inflow from Wheal Uny, to the east. The winter of 1885-86 saw Lyle's engine working to a higher capacity as the stopping of Hind's engine, on Wheal Uny, caused severe water problems for the mine.

In the last six months of 1886, Lyle's Shaft was deepened over 40 feet below the 190 fathom level. Nine men and three boys were sinking at a rate of £60 a fathom, which indicates the difficulties being experienced by these shaft sinkers. The adventurers were anxious to access the Great Flat Lode from as many levels as possible, and the 100, 112, 124, 137, 170, 180 and 190 fathom levels were all being opened to realise the greatest possible tonnage from that lode. The tin grades from these levels varied from 1½% to 2%, and the tonnages obtained more than justified the confidence of the adventurers in the lode. The ever-fluctuating tin price continued to alter the financial situation at the mine, with the price received rising from £55 12s a ton, in the summer of 1886, to £60 7s in the autumn. In January 1887, the *Mining Journal* reported that tuteurs at Wheal Basset were averaging £3 13s 6d a month, which was nearly 14s a month more than the mine's tributers.

1887 saw some 370 tons of black tin raised, stamped, dressed and sold, bringing an income of £24,230. For the third year running the mine paid out a dividend, £3,380, which was over twice the total for the previous two years. The following year saw another healthy dividend of £3,072, but that, unfortunately, was the last time the old mine was to give a return to its adventurers.

In 1888, the mine once again experienced rapid fluctuation of the tin price, and once again the result was potentially disastrous. Early in the year, the price rose to £91 14s a ton, but then collapsed three months later to £51 14s. However, with the reopening of Wheal Uny at that time,

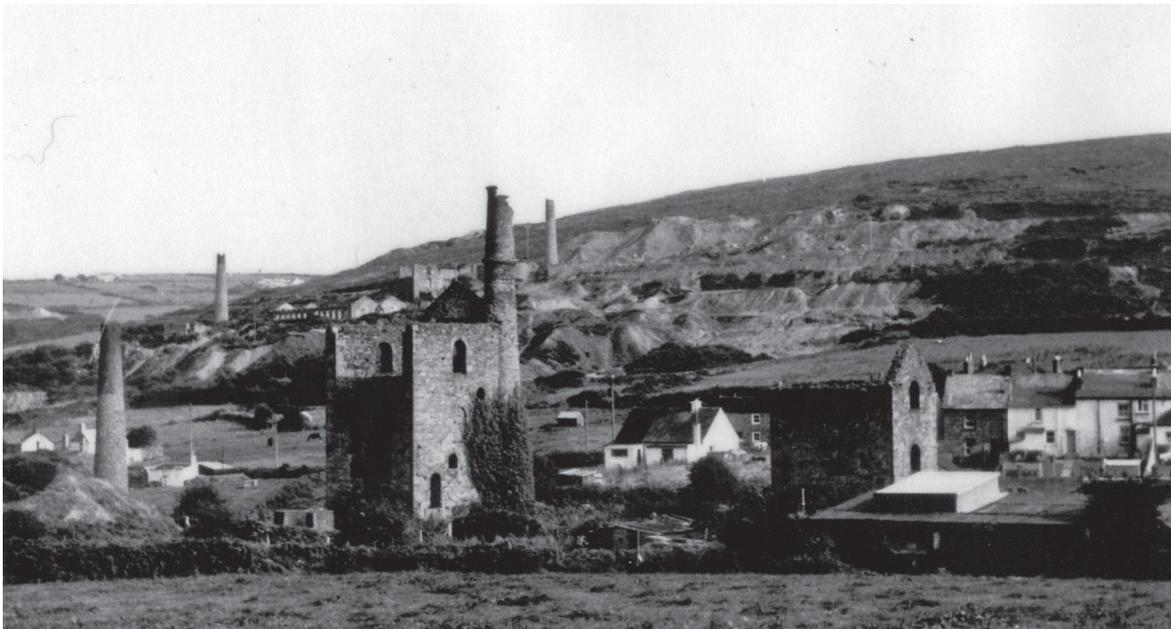


The lodes worked in the various Basset mines. Redrawn from Dines.

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and the negotiating of a good coal contract, the adventurers were, once again, encouraged. They invested in a new engine and jaw crusher from Harvey & Co., at a cost of £290. Lyle's Shaft sinkers had reached the 200 fathom level and work started to develop access to the Flat Lode, by means of a south cross-cut. Nothing ever remained steady in any Cornish mine during that troubled period, and Wheal Basset had its further share of problems. The mineral lords, the Bassets, increased their dues from 1 60th to 1 24th, 'generously' reducing them to 1 30th until the finances of the mine allowed for the payment of dividends – some hope! To make matters worse, the mine, having increased the men's wages when the tin price rose, now attempted to reduce them again. The miners went on strike.

1889 saw all levels between the 137 and 200 fathom level being opened up, with tributers working in a dozen locations in groups of two or three men. Development on the 170, 190 and 200 fathom levels was by rock drill, although elsewhere hand-labour was still the norm of the tutworkers. The manager complained to the adventurers that, without increased hoisting capacity, the mine would grind to a halt. Any small hold-up would be disastrous. As the 170 fathom level had almost reached Grace's Shaft, he suggested that Lyle's Whim should be moved there, and a new whim be erected at Lyle's. The latter could also hoist from Miners Shaft. To facilitate the use of Grace's Shaft, machines were to be used to raise to it, hurrying up the process. A new engine was erected to pump much-needed water for the stamps and dressing floors. The cost of this new machinery, together with a second-hand boiler from West Condurrow Mine, was £1,206, necessitating a further call on the adventurers' purses. Meanwhile, Lyle's Shaft was being sunk below the 200 fathom level at a cost of £60 a fathom. By the autumn of 1889 the shaft had reached the 215 fathom level, which was being rapidly opened up. During the year, 387 tons of black tin were produced, bringing £21,323, but with the tin price received at just over £55 a ton, the mine continued to lose money. This loss was also caused by the considerable expense of sinking Lyle's, raising to Grace's, installing a new skip road in the latter and the cost of new engine houses, whims and compressors. The last dividend the adventurers received at Wheal Basset was paid the previous year. The adventurers obtained a new 42 year lease from the Basset Estates, in December.



Lyle's engine houses in the 1930s. Wheal Basset stamps and tramway to rear..

During 1890 the adventurers pressed on with what amounted to a major period of re-equipment and reconstruction. Two new whim engines were purchased, each with 24-inch diameter cylinders, and a new horizontal engine was bought to power the buddles and Brunton calciner.

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Activity was progressing to open up and exploit the 112, 137, 150, 160, 170, 180, 190 and 200 fathom levels. The two deepest levels were being developed by rock drills. However, it appears that Lyle's Shaft, which had reached the 230 fathom level, was sunk by hand labour. During the years 1889 to 1891 the adventurers paid out £12,000 in calls, to pay for the increasing costs.

In autumn 1891, a steam loco was introduced onto the mine, to haul ore from the crusher to the stamps battery, where a further sixteen heads were erected. Although this made for greater efficiency and economy, costs still remained high, partly due to such unexpected problems as the stamps engine being stopped for repair, causing a fortnight's hold-up in the flow of ore for dressing. The pitwork in Lyle's Shaft also gave problems and had to be refurbished, adit maintenance proved unusually costly and boilers needed repairing. Sinking below the 230 fathom level continued slowly during the year but production levels remained healthy, with 22,784 tons being raised for 402 tons of black tin, which sold for £22,448. Between October 1891 and March 1892 the mine saw a profit of over £470, but during the following nine months there was a loss of £1,160, which wiped it out. In 1892, the mine further extended its dressing plant with new buddles and slime frames installed. Tin ore grades in the ends and stopes on the Flat Lode at the 200 fathom level were disappointing. The mines on the Great Flat Lode were all wet, and pumping costs continued to rise inexorably, as did the cost of coal for the pumping engines. In 1892 Wheal Basset purchased 1,950 tons of coal for £1,487, which was about 15s a ton.



Locomotive just west of the stamps engine house at West Basset Stamps. This line came from Marriott's Shaft to the west, with a connecting line to the Wheal Basset Stamps on the opposite side of the valley.

1893 saw the deeper levels being developed at a fair rate, with most production coming from the 220 and 230 fathom levels, the latter proving very rich indeed. Early in the year there was an accident with the pump which brought water up to the mill, causing a week's loss of work there. The capacity of the slime plant was further increased to cope with the anticipated extra work. Once again the hopes of the adventurers were dashed, as problems internal and external intervened to disappoint them. Wheal Uny once again stopped, and with its engines idle, water flowed

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into Wheal Basset. Dams were again installed to hold back the ocean of water which rapidly filled the abandoned mine. Despite the tonnage increasing to 23,490 tons, which brought in revenue of nearly £24,960, calls resumed. In 1893 the price of tin collapsed and by 1894 it was down to £40 10s a ton. To make matters worse, the cost of coal increased, as did the tonnage required to operate its machinery and pump out the water.



Surface workers in a buddle yard on the Basset Mines.

In 1895 the tin metal price dropped again, this time to about £39 8s a ton, and despite the increased tonnage and greater efficiency of the mine, losses continued. The drainage problem worsened, as not only was water flowing in from Wheal Uny, to the east, but South Frances United, to the west, was also experiencing serious water problems, with which it was hardly coping. Wheal Basset resorted to baling water with its whim, and increasing the work rate of Lyle's 80-inch engine from seven strokes per minute to nine. This speed was too fast and endangered the pitwork as well as the engine itself. The answer for both South Frances and Wheal Basset was amalgamation, and by August 1895 this was accomplished.

Between December 1895 and April 1896 two events occurred which greatly concerned the adventurers and the miners at these two mines. In the December, Marriott's engine was severely damaged by fire, followed four months later by Thomas' engine being similarly damaged. Arson was suspected in both cases, causing suspicion as to the culprits and fear for the safety of the miners and the expensive machinery on the mines.

West Wheal Basset

The sett of West Wheal Basset lay to the west of Carnkie, and adjoined South Wheal Frances (which included Marriott's Shaft) to the south. The earliest workings here may have been the Wheal Charmer recorded in the 18th century, though this sett was being worked as Wheal Haste in the 1830s. Although the Wheal Haste adventurers had installed a 36" engine and undertaken

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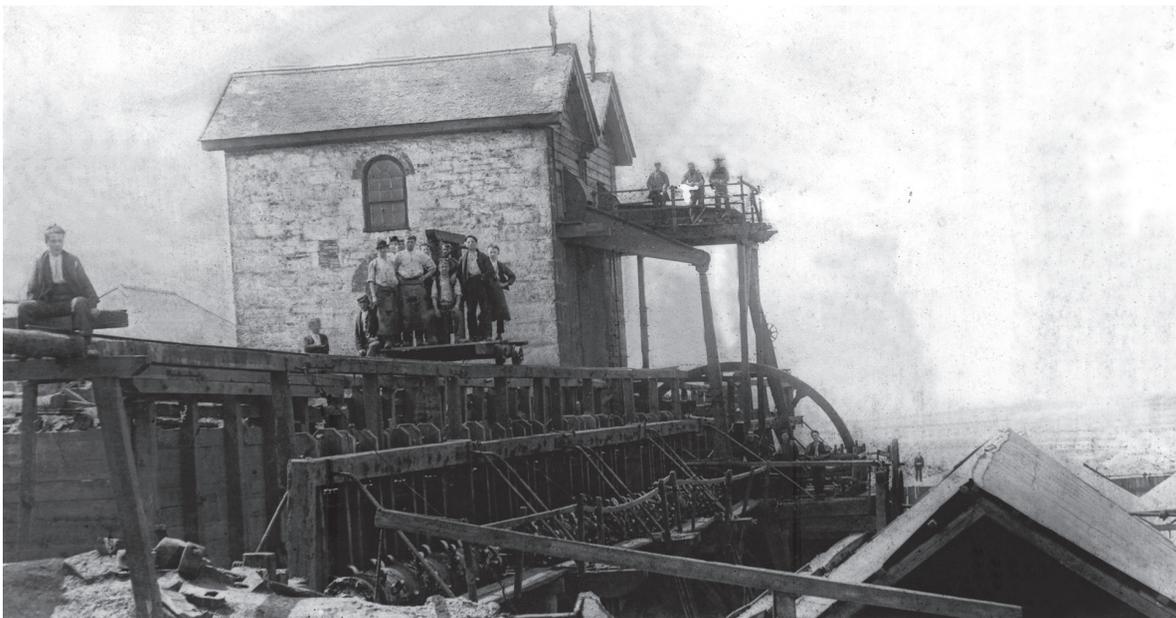
considerable development work, they had failed to locate any significant ore body. The mine became known as West Wheal Basset by about 1846, but closed in the following year.

Restarted in 1850 by a new company, the workings had to be completely refurbished, a new winding shaft and engine were established and by 1851, some copper ore had been found. The mine was a wet one, however, and a new engine: Thomas' and a shaft of the same name were required to keep the workings dry. Once this engine was at work (by 1854), development and production work could begin in earnest.

Disputes over sett boundaries between West Basset and South Wheal Frances from 1856 centred on a small but extremely rich area of ground in a disputed area on their boundary. After a protracted and expensive legal battle, West Basset lost their case. This period also marked the change from primarily copper mining to tin mining for the mine. Although copper continued to be produced throughout the whole life of the mine, it was tin that increasingly came to dominate its fortunes in the latter half of the 19th century.

In 1875 a new dressing plant and stamps battery erected on the southern slopes of Cam Brea was set to work on a piece of ground which had been relinquished by North Basset Mine, whose Lyle's, Miners' and Grace's Shaft's lay downslope. This new plant occasioned considerable expenditure to the company, who, in the face of falling tin prices, were forced to seek a reduction in dues from the mineral owners.

In 1871, plans to merge with South Frances were under discussion, but came to nothing. North Wheal Frances (which had been abandoned) was reworked in the early 1880s, and the "New" dressing floors further enlarged and re-designed. In 1884, Richard's engine on Wheal Basset was taken over jointly with South Frances in order to maintain its pumps at work and drain the extensive and connecting workings of the three mines.



Wheal Basset Stamps, presumably an early view with workmen of various trades posing for the camera.

Work continued through the mid-1880s, despite the generally low tin prices, but towards the end of the decade the market went into a severe decline, and West Basset, with the other wet mines of the Carnkie district, began to go into debt, despite further refinements to the dressing floors to enable more of its tin to be recovered.

Although the mine remained rich, water inflow into the workings continued to be a problem, necessitating the installation of additional pumping power. On the formation of Basset United

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Ltd, these workings were partially redeveloped and linked to the dressing floors on both sides of the valley, but operations ceased with the collapse of the group in 1919.

Plans were put in hand to erect a vanner house to take twenty Frue vanners, of which sixteen were initially installed. To the east of Miners Shaft, at the head of Redruth Coombe, 140 flat frames and eight round frames were built to cope with the fines. This work resulted in an impressive increase of ore through-put: 27,398 tons in 1901 and 49,007 tons in 1902. This produced 568 tons of black tin in 1901 and 793 tons in 1902. Costs per ton were reduced and there was less fine tin washed away down the Coombe. The owners were further encouraged by the news that Marriott's new compound engine was 84 percent more efficient than the older 80-inch at Lyle's Shaft, and used 37 percent less coal which, for the wettest mine in Cornwall, was very good news indeed.



Wheal Basset stamps from rear showing the double stamps engine houses. West Basset Stamps can be seen opposite in the background.

1903 was an extremely wet year, with rainfall being up from the yearly average of 38 inches, to an extraordinary 58 inches. This severely disrupted the efficient working of the mine, both underground and at surface, causing an 8,000 ton reduction in ore hoisted and crushed. The new plant at West Basset Stamps worked well despite the awful weather, which continued until the spring of 1904. There was a loss for the period, of £2,194. The reports indicate that during 1904, the new tramway between Lyle's Shaft and West Basset Stamps came into use, and with 50,000 tons crushed and the tin price at £85 a ton, the mine saw a profit. Archaeologists have raised questions about the use of this inclined tramway, as the top of it is below the level of the stamps there. It was certainly used to convey ore from Marriott's Shaft to Wheal Basset Stamps, during the period that West Basset Stamps and dressing floors were being rebuilt, and before the direct tramway between Marriott's and Wheal Basset Stamps was constructed. Captain James' 10th May 1899 diary entry refers to a rock chute erected at West Basset Stamps, 'in order to tip the stuff from West Basset tramroad to tram it to Lyle's rock breaker via the new tramroad across from West Basset Stamps to Lyle's. The tin price increase over the previous four years was £19 a ton, which filled the shareholders' hearts with hope. Most of this ore came from the eastern part

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Loadings for round frames below the West Basset Stamps.

of the mine, through Lyle's and Grace's shafts, but work also was carried on to refurbish Carnkie Shaft, installing a cage road down to the 80 fathom level. Although the mine had long been a tin mine, it was thought that there was payable copper ore in the old Carnkie section of the mine. A double Brunton calciner was erected at West Basset Stamps at that time, and the ruins can still be seen there.

In 1908 it was decided to modernise Wheal Basset Stamps, on the south side of the valley, in the eastern section of the mine. Frue vanners were installed and an 18 inch gauge railway line, from Marriott's Shaft to these stamps was laid. This involved tunnelling beneath two public roads; the tunnel beneath the main Four Lanes to Pool road remains today; and is still used by pedestrians and horse riders. The following year, a new German locomotive was purchased for the line and ran successfully between Marriott's and East Basset until the mine closed. In 1908 the mine erected a new dry, which was described as the 'best in Cornwall'. The manager reported that the eastern workings were only producing 5 percent of the total output, and recommended that Lyle's Shaft be sunk to open up more ground and that work should be concentrated more on Marriott's section. 1908 saw a loss of £4,358, and the company secretary, Richard Rendle, petitioned the Basset Estate for a remission of the dues: £1,475 was conceded, but only if Marriott's Shaft was sunk another 40 fathoms below the 260 fathom level, which was its current depth.

1909 proved another difficult year for the mine, for although the new plant worked well, the tonnage was far too low for a mine of its size. Only 42,587 tons were hoisted, crushed and dressed, and although the grade was higher, at 44.4 lbs per ton, the tin price had dropped to £75 10s a ton. There was a tiny profit of £86. However, the mine was pumping over twice as much water as any other mine in Cornwall – three million gallons a day! Basset Mines Ltd employed 542 workers in 1909, and development underground was proving very expensive, with returns not up to expectation. Despite the optimism of the shareholders, the experience and skill of the managers, the enormous capital outlay and the modern plant installed, the mine continued to struggle.

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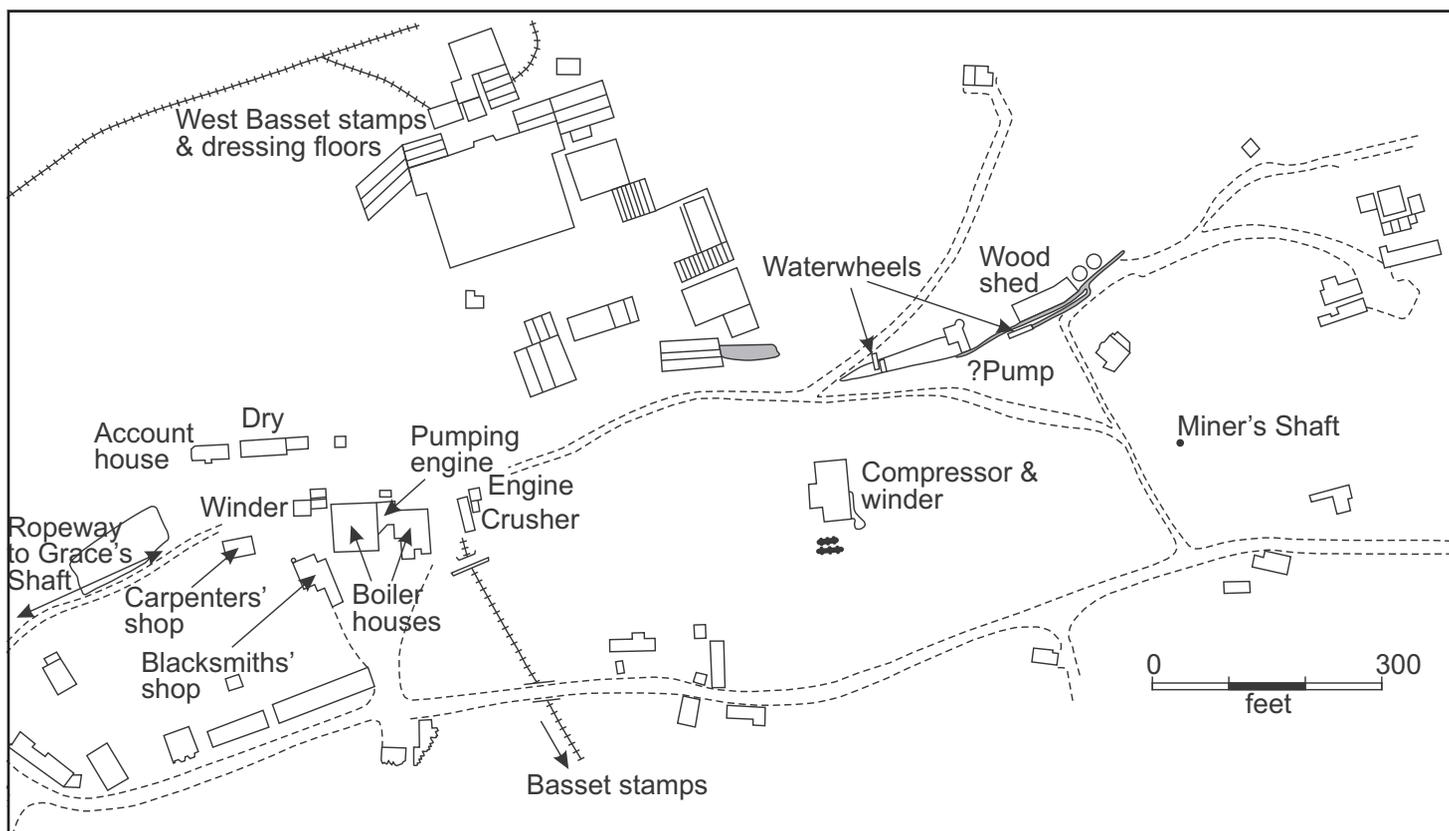
In 1910 the number employed dropped to 468, with 284 underground and 184 at surface: this was the lowest total since 1901. Production fell from 844 tons of black tin the previous year, to only 700 tons. Despite this, with the price increasing, income went up by £1,626 over 1909. In 1911 black tin production fell again, down to 586 tons, but income rose again, by £5,809 to £71,358. During 1911, for every ton of ore raised, the pumps removed one-hundred tons of water from the mine. Pumping costs were 6s 11d per ton of ore – the highest pumping costs in Cornwall!

West Basset Stamps

This is one of the most important tin-dressing sites remaining in Cornwall. The floors were built on part of the old North Wheal Basset sett by West Wheal Basset in an effort to increase the mine's stamping and dressing capacity. The site lies on a south-facing slope and can be seen clearly from the East Wheal Basset floors to the south.

The dressing floors are dominated by the stamps engine house at the north-west of the site, bracketed by stacks to the north and west. The house contained a 40-inch rotative engine; originally this drove 64 heads of Cornish stamps (32 heads each side) but in 1877 an additional 16 heads were added on each side. This house is of particular interest in that it was pumping water from a shaft to the rear of the house. There is a second plug door at the rear of the house and, as a consequence, the cylinder door is in the eastern wing wall. Below the stamps loadings is a building which housed a number of Frue vanners. Frue vanners were once very common in Cornwall however only one can now be seen, at King Edward Mine. Below the vanner house is the buddle yard which contains the remains of fourteen large buddles, seven convex and seven concave. Another three buddles can be seen elsewhere on the floors.

On the south-west side of the dressing floors can be seen a pair of Brunton calciners. No flues



West Basset Stamps as depicted on the 1889 25-inch Ordnance Survey map.

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Vanner house at the West Basset Stamps.

were constructed for these, the ore here contains little in the way of sulphide minerals and no arsenic was collected. The two calciners were attached to the stack to the south-west of the stamps engine house though the flue is long gone. No labyrinth ever seems to have been attached to the calciners, indicating that there was little or no arsenopyrite to recover arsenic soot from.

The floors were altered in the early 1890s and another buddle yard was constructed at the bottom of the site.



Wheal Basset stamps seen from the West Basset Stamps engine house. Calciner and stack to left, then vanner house. At the rear is the peculiar double stamps engine house.

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East Basset (Wheal Basset) Stamps

On the south side of the valley and facing the West Wheal Basset floors lie the dressing floors of East Wheal Basset. While not as extensive as the former the site is not without interest. Once again at the back of the site lies the site of the stamps however, unusually, rather than a single engine house there are two, joined together. The beams of the 30-inch single-acting engines were coupled to the stamps axles at 180°, so that when one beam was up, the other was down, obviating the need for rotative engines. The site came into use in 1868 and the engines eventually operated 96 heads of stamps. The engine houses were used as ore hoppers when the dumps were reworked in the 1930s.

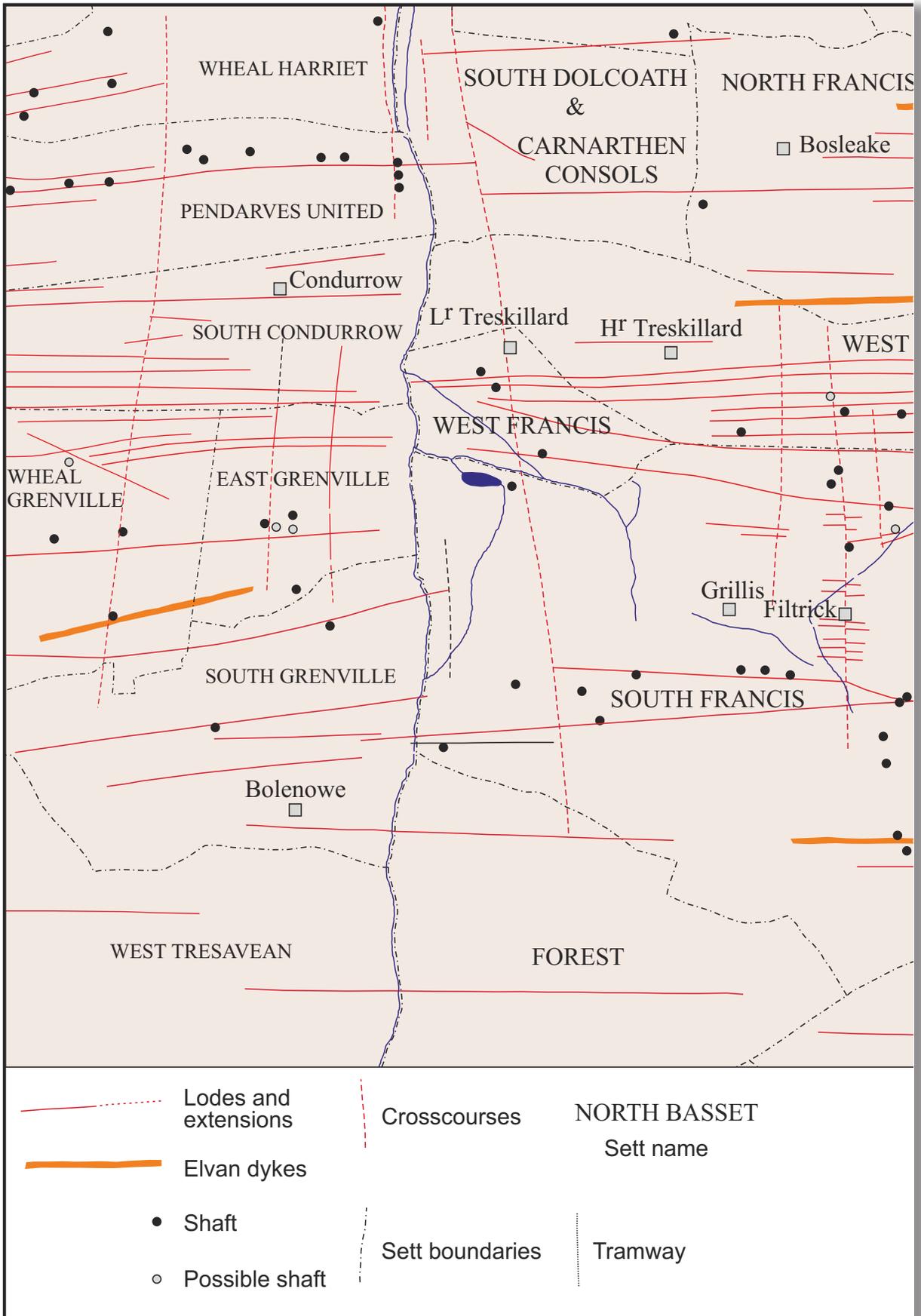


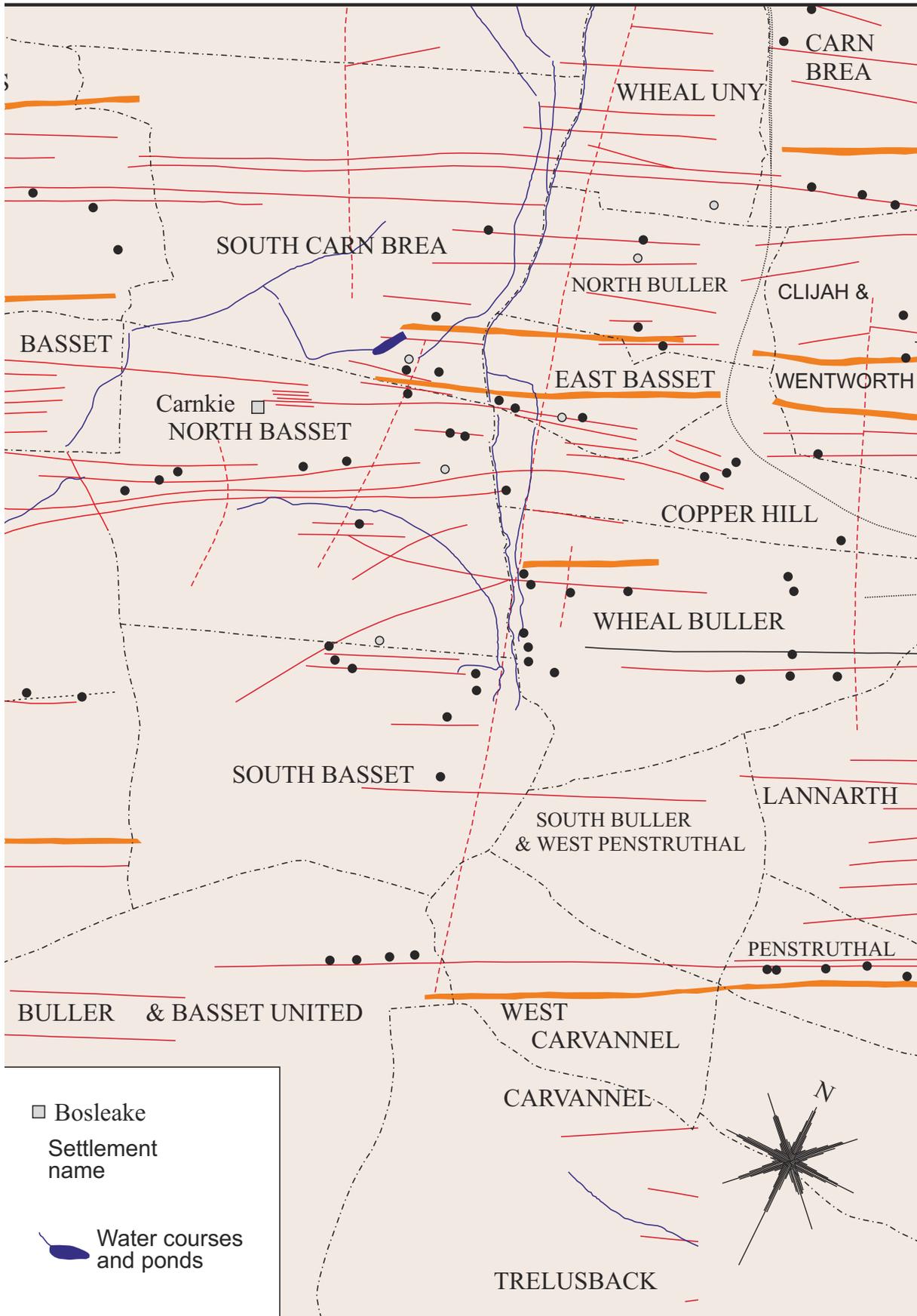
Wheal Basset stamps engine house; the vanner house is below to the left. The stack in the background is on the Seleggan tin smelter.

Unfortunately, little now remains of the 19th century dressing floors. The most conspicuous feature is the vanner house below the stamps. This dates from about 1908 and was modified in the 1930s. To the north east is a single Brunton calciner, again without flues, though the stack remains. There is no sign of the once extensive buddle yard below the stamps, the stone presumably having been robbed after closure. This may also have occurred during the 1930s as the yard would have contained a certain amount of tin which had been lost during the dressing process.

Above the stamps lies the remains of the tramway which once led west to Marriott's Shaft, while a branch to the north connected with the East Basset stamps floors. The line along which coal was brought to the mine from Buller Farm, to the east, was served by the Redruth and Chase-water Railway until its closure in 1915.

This site suffered from somewhat aggressive shaft capping in the 1990s. The majority of the shafts capped in this area were 'coned'; in this process the ground was excavated back from the site of the shaft at an angle until either the collar or rock solid enough to form a seat was uncovered. The shaft opening was then plugged with concrete and the soil ploughed back. Unfortunately this results in an opening much bigger than the original shaft, and this resulted in the loss of any archaeology in the vicinity of the shaft.





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Marriott's Shaft - Wheal Grenville

In 1896 South Frances United and Wheal Basset, including their several constituent parts, were consolidated into the vast new mine called Basset Mines Ltd. This limited liability company included the old Wheal Basset, South Wheal Basset, North Wheal Basset, South Wheal Frances (United) and West Wheal Basset. It was capitalised at £100,000 in £1 shares, 34,499 fully paid and 30,000 part sold at 2s 6d a share. The mine obtained a sixty year lease from Arthur Francis Basset, which was to run from 1st January 1896.

The directors included Thomas B. Bolitho, Thomas R. Bolitho and Horton Bolitho, all members of the family of bankers, smelters, mine owners, ship owners and merchants; Henry Olds, Francis Oats, Francis Freathy Oats (his son) and Captain William James, the manager, who all had connections with Levant Mine (Colonel F. F. Oats would be its last manager), St Just; George Carter, Philip Henwood, John Mayne and Michael H. Williams, chairman of Dolcoath. Nicholas Trestrail was to be the consulting engineer.



Ore wagons to the rear of Marriott's Engine House; the old beam is in the background.

The existing plant included, at Wheal Basset, Lyle's 80" pumping engine, Carnkie 24" beam rotary pumping engine, 24" whim engine, 27" whim and capstan engine, two 30" rotary stamps engines, 12" horizontal engine for powering the buddles, calciners and other dressing plant, and a 12" engine for hauling Lyle's ore to the stamps. There was also a compressor plant, boilers for all the above engines and a Greens economiser. The Oxland & Hocking calciner at Wheal Basset stamps was giving trouble, and it was replaced by a Brunton calciner, designed by Nicholas Trestrail.

South Frances United plant included Pascoe's 80" pumping engine and 30" whim engine, Thomas' 60" pumping engine and 26" whim engine, Grenville 70" pumping engine and 24" whim engine, a 16" Tangey horizontal whim engine, Daubuz's 30" whim engine, 40" stamps

Details of Marriott's Shaft and the pitwork.

engine, with 80 heads of Cornish stamps and a 12-inch Tangye engine, which pumped water for the dressing plant. There were also the many boilers for the engines, a small compressor plant and several other pieces of plant, which were mostly to be moved to the vicinity of Marriott's Shaft, where the new mine was to be centred.

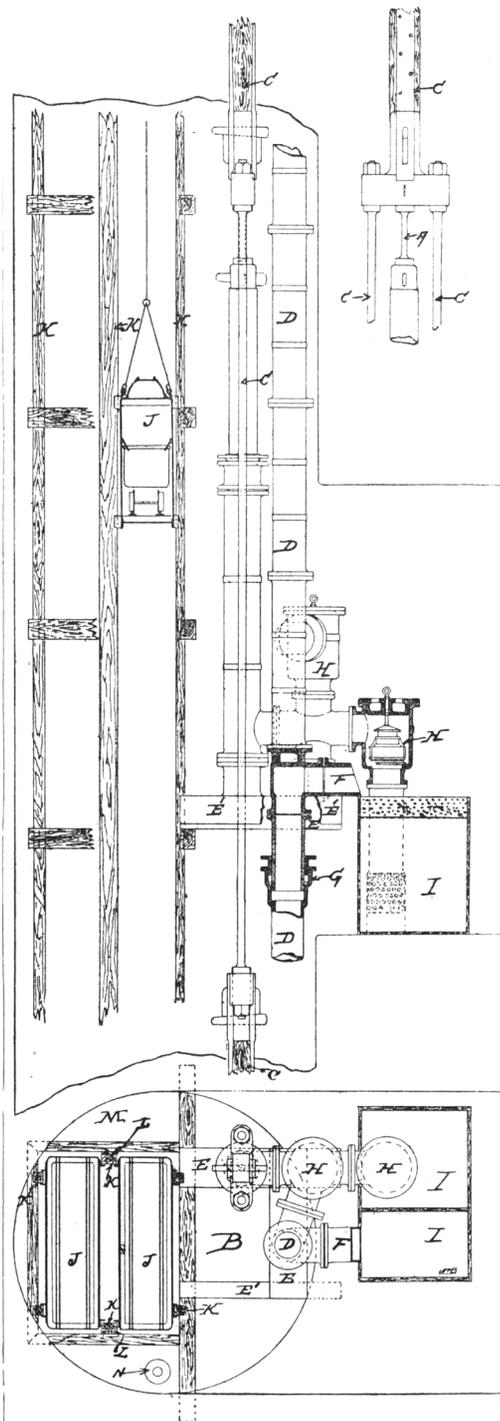
In 1897 over £10,000 was quickly spent to make the plant and mining side more efficient. Not surprisingly, there was a continuing loss during that work, and in 1898 there was a further call on the shareholders for an extra £17,750. Marriott's Shaft, which was crooked, had to be straightened, and was 'cut down', not only to straighten it but also to enlarge it to take extra compartments. The shaft was designed to have two cage winding roads, two sets of 18-inch pitwork for pumping, a capstan section, and space for a 10 foot diameter boiler to be lowered through the shaft when needed to steam a hoist, which was to be installed at a later date, deep underground. This large 16 foot diameter shaft was to be circular. The top 540 feet was brick-lined, and the shaft was intended eventually to go down 5,000 feet.

Marriott's Engine

Much has been written about this engine, purportedly built by Hathorne Davey & Co. at their Sun Lane Works, Leeds. Marriott's engine started May 1899; it had cost £4,591. The engine cylinders were 80" and 40" respectively, the 80" (low pressure) cylinder being the original engine which pumped from the shaft. The origins of the 40" cylinder are not known; it has been suggested that it was a whim engine however no Cornish whim ever had an engine this size though it could have been a stamps engine.

Until recently, the only connection between Marriott's Engine and Hathorne Davey & Co. was under Order No 5667 for the supply of Davey's Patent Differential Gear for an 80" compound Cornish engine, ordered on 19th September 1896, delivered to Redruth Station.

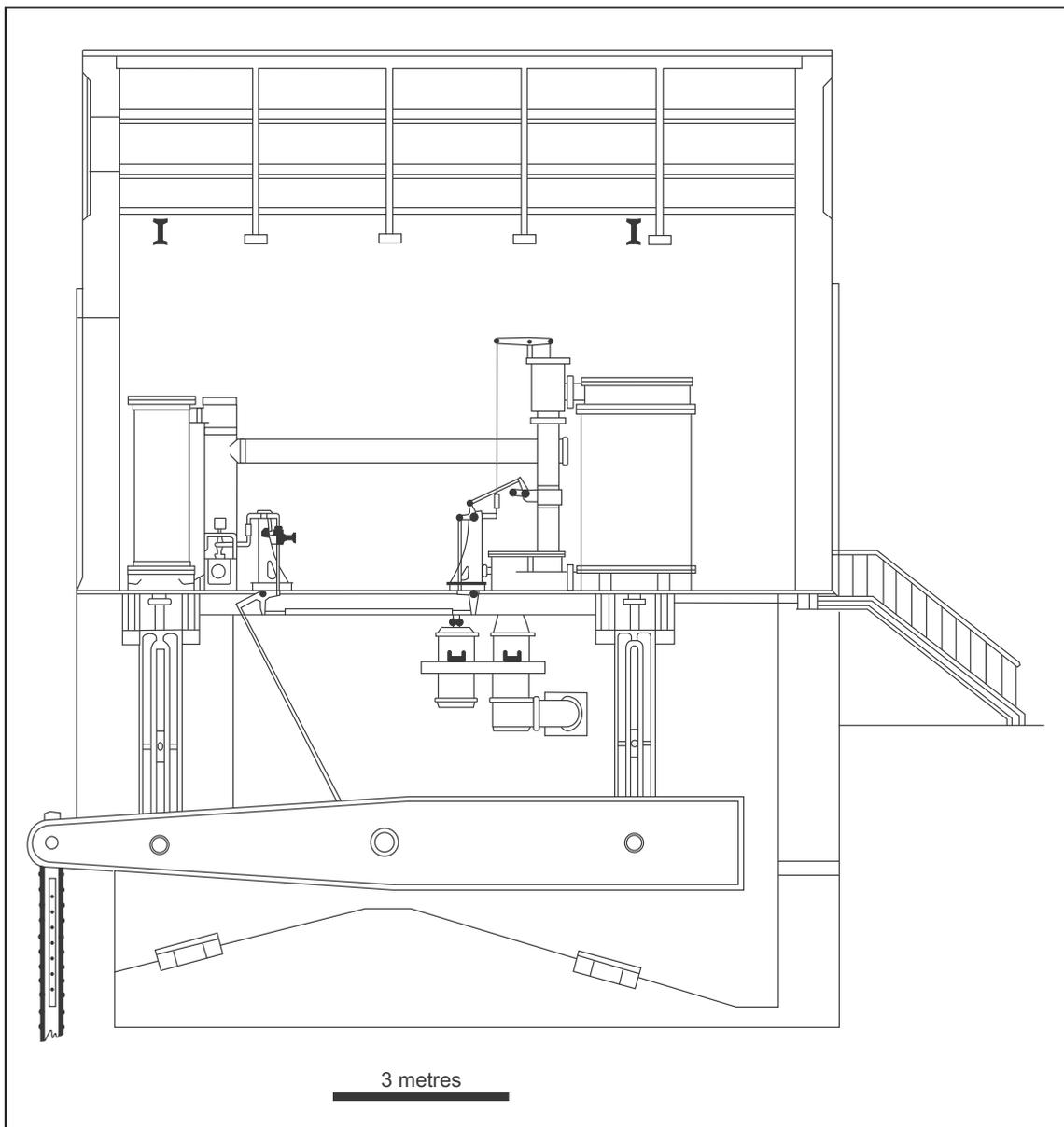
The West Yorkshire Archive in Leeds holds extensive records for the company, however there are no records of an order for this engine. However, an article in *The Engineer* of 1897 includes an article



16 FEET DIAMETER SHAFT FOR BASSET MINES (LIMITED)
REFERENCES.

- | | |
|---|--|
| (A) Short connecting rod from crosshead to plunger to admit of its being changed without disturbing the plunger case. | (I) Cistern. |
| (B) Capstan compartment. | (J) Cages. |
| (C) Main rods. | (K) Pit guides. |
| (D) Rising main. | (L) Filling pieces. |
| (E) Hollow girders. | (M) Space for ladder way. |
| (F) Delivery pipe | (N) Pipe for compressed air for rock drills. |
| (G) Stuffing box. | |
| (H) Valve boxes. | |

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Section of Marriott's Engine showing the two cylinders over the plate beam.

on this engine, written by Henry Davey, the mine's engineer. He was apparently asked to design this engine and it seems more likely that Hathorne Davey & Co. did build the engine; the lack of any order does seem odd however.

Another point of interest is that Marriott's shaft and engine house at Basset were designed to accommodate two similar compound pumping engines to take the shaft down to 500 fathoms. Had the engineers ever tried to install the second one they would have had a shock, because due to some error, the bedplate of the low pressure cylinder encroached about 9-inches the wrong side of the centreline of the shaft and house – the second engine would not have fitted!

Alongside the engine house was erected a boiler house to contain six boilers, although only four were installed initially. The boilers also supplied steam for the whim engine, capstan, crusher plant and compressor. The winder engine was built by Holman Brothers of Camborne, at a cost of £3,600. It was a 23"/43" horizontal compound engine, with Corliss valve gear, and a 12 ft to 25 ft conical drum. It could raise weights up to 2½ tons and hoist up the shaft at 2,000ft per minute. Steel headgear was erected, and with double deck cages and high level gantry it cost £1,400. The

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gantry carried track to crusher hoppers on the west side of the shaft. All of this new plant started up in May 1899, and at the same time, underground development resumed in the South Frances sett.

The manager, Captain William James, kept a diary, which began in 1896 when he took over the running of the mine. For the first few years he seems almost totally preoccupied with water problems. The erection and strengthening of the underground dams, and the constant breakages to pitwork, engine parts, balance bobs and pumps, caused him endless worry.

Meanwhile, in 1898, the Fortescue family granted the abandoned eastern parts of the setts formerly worked by West Wheal Frances and West Wheal Basset, to the new concern. Work there was to be centred on Grenville Shaft, just to the north of Treskillard Village, and the Thomas winder was used to hoist ore from it.

During the three years of Marriott's reorganisation and re-equipping, West Basset Stamps remained idle and all the ore, which mostly came from the east workings, was sent to Wheal Basset Stamps. In the summer of 1902, the manager, Captain William James, reported on the situation there:

The Wheal Basset section of the mine will continue to produce large proportions of tin until the deep ground is opened. There has been no shaft sinking here for the past nine years ... for the past six months our expenditure has been very heavy, a lot of extra expenses in getting our stamps ready and getting up to date machinery. It must be remembered that West Basset stamps were a total wreck. Seeing there was no machinery there worth working, I thought it wise to go in for Frue Vanners and all new machinery for the slime floors, work is still in hand.

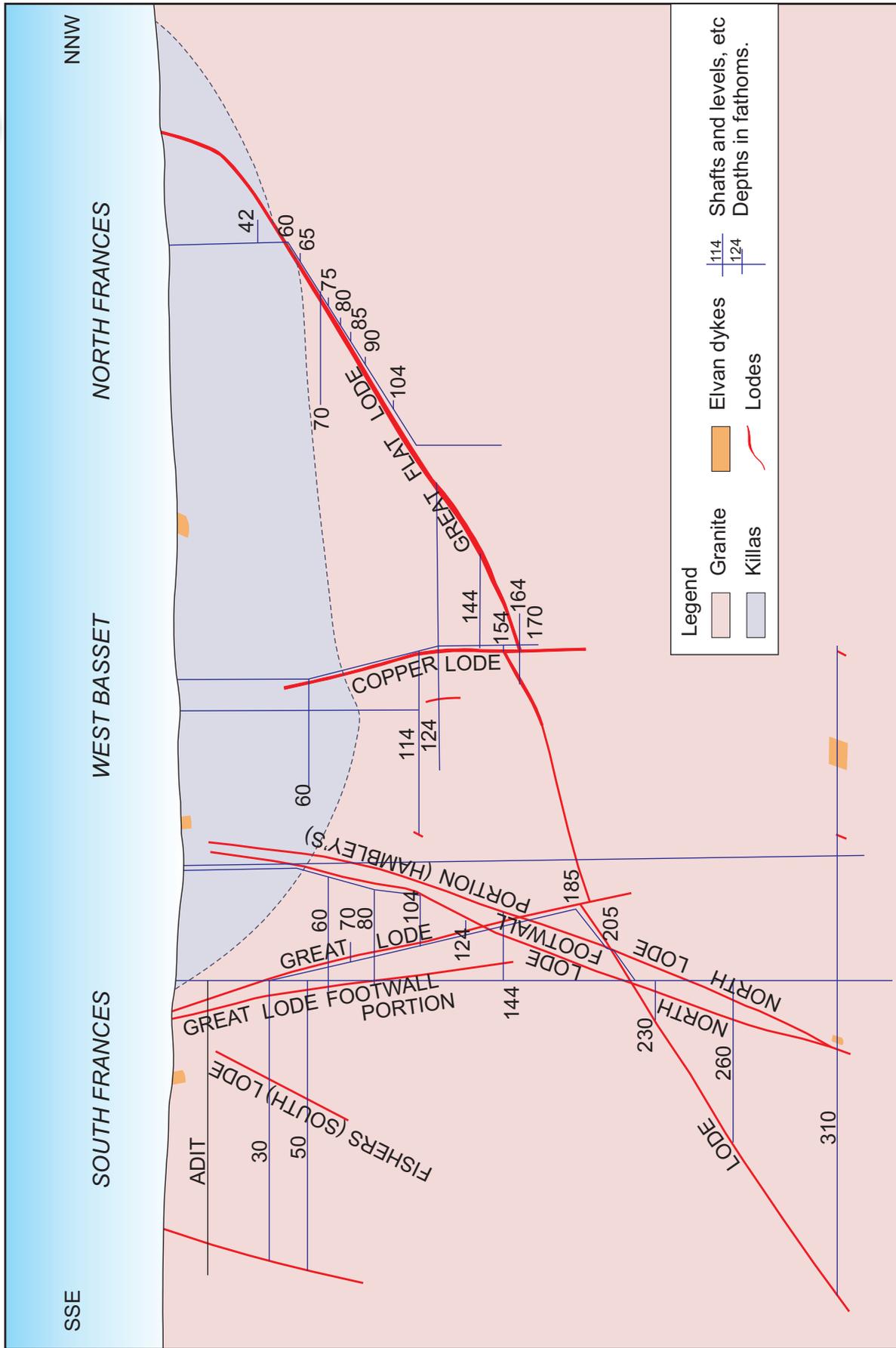
In June 1900, Captain James expressed disappointment at the performance of Marriott's compound engine.

I must confess I was hoping we had more power in the Engine I don't think she is equal to a Cornish 90 inch Engine. I should say she is only equal to a Cornish 85 inch, but she is working very well so far.



The buildings around Marriott's Shaft: from far left: dry, winding engine house, boiler house, pumping engine house, compressor house, rock crusher.

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Lodes worked at the various Frances mines. Redrawn from Dines.

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The interior of Marriott's engine house.

1903 was an extremely wet year, with rainfall being up from the yearly average of 38 inches, to an extraordinary 58 inches. This severely disrupted the efficient working of the mine, both underground and at surface, causing an 8,000 ton reduction in ore hoisted and crushed. The new plant at West Basset Stamps worked well despite the awful weather, which continued until the spring of 1904. There was a loss for the period, of £2,194. The reports indicate that during 1904,



Afternoon shift, or core, at Marriott's Shaft.

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the new tramway between Lyle's Shaft and West Basset Stamps came into use, and with 50,000 tons crushed and the tin price at £85 a ton, the mine saw a profit.

The tin price increase over the previous four years was £19 a ton, which filled the shareholders' hearts with hope. Although the mine had long been a tin mine, it was thought that there was payable copper ore in the old Carnkie section of the mine.

The Carn Brea electricity generating plant had come into production, and with several of the Camborne mines beginning to use the supply, the management of Basset Mines also seriously considered it. Despite the greatly improved efficiency and economy of Marriott's compound engine, with the vast amount of coal still being used for pumping, electricity seemed a sensible option.



Marriott's Engine House with compressor house to left.

By 1906 new compressors were installed at Marriott's, using steam from the existing boilers. The new compressor was a multi-stage compound machine, made by Fraser & Chalmers. Things were not helped by one of Marriott's boilers exploding, although it led to three more being installed, making the total up to the originally intended six.

During 1906-07 the mine was profitable, due largely to the high tin price being realised; in 1907 it reached £99 10s 10d a ton. Due to the high tin price the drive to re-open old workings from Carnkie Shaft was pushed on. These had been suspended when the tin price was very low.

Despite continuing problems, in 1912 the mine acquired Knighton's Bolenowe sett, at the extreme western end of the mine. The following year, 575 tons of black tin was sold for £67,763, but the total number employed went down to 444, the lowest since 1901.

1914 saw the most dramatic change in the financial, political and social situation in Cornwall, as it did throughout the country and the world. The Great War changed everything – there was a dramatic loss of skilled labour, as the young and fit went into the services, every commodity the mine needed became scarce: coal, timber, dynamite, fuze and essential replacement parts for worn-out machinery. Not only were these things hard to come by, but their cost increased steeply.

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Unsurprisingly, the mine lost £14,145 that year, due largely to the low tonnage hoisted of only 40,874 tons. The average grade was only 27.2lbs a ton, and the average tin price was £82 18s 2d. There were 450 workers on the mine, up slightly on the previous year, but the trend thereafter was inexorably downward.

During the years 1915 and 1916 mining was much reduced, with only a small tonnage of ore raised. The grade in 1915 was 38.4 lbs a ton, and in 1916 it was up slightly to 41.5 lbs. Losses for those two years were £3,416. One cause for this loss was the fracturing of a cross-head on Pascoe's 80-inch engine, which caused damage to the cylinder and piston. The mine engineer, William Jelbert, could not get the engine repaired locally, due to wartime restrictions and shortages, and he was forced to obtain a new engine from Worsley Mesnes Iron Works, in Wigan. Only the original beam, made by the St Blazey Foundry, was retained. It is thought that this engine was the last Cornish beam engine to be manufactured.

In 1917, Captain William James resigned and was replaced by William Jopling. This Mr Jopling appears to have been the man who was to become foreman in charge of sinking New Dolcoath's Roskear Shaft, in August 1923. James remained as a director of Basset Mines. Because of the lack of horses available for haulage, due to the war, the company bought a traction engine to take the coal to the several engines on the mine. Basset was using the massive total of 18,000 tons of coal per annum. By the end of 1917, with only 298 workers on the mine, Basset had lost £23,422 and had an overdraft of £11,646.

On April 2nd the second pump rod from the bottom of Marriott's Shaft broke, 'the engine came into the house' and broke the bottom of the cylinder. The pump at Lyle's Shaft was also damaged, causing a hold-up there as well. Surprisingly, with all these problems, there continued an impressive amount of development and stoping underground. The development figures for those last few years show the confidence the owners and managers had in the mine, even when faced with the unprecedented conditions caused by the Great War.

In 1918, after being forced by creditors into liquidation, the mine closed. All the men were



Pascoe's pumping engine house with whim in background.

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Smith's engine house. This engine pumped from Smith's Shaft and was also used for stamping. After the engine was removed the lower openings were bricked up and the house used as a water tank. In the background can be seen the whim and pumping engine houses at Fortescue's Shaft and, on the skyline, the pumping engine house on Marshall's Shaft.

dismissed and on 21st December 1918 the pumps were stopped. During that final year, the mine had hoisted and crushed a mere 14,440 tons of ore and sold only 318 tons of black tin.

By the spring of 1919, all recoverable kit underground had been brought to surface. It had been a desperate race against the fast-rising water. Thereafter the surface machinery and other gear were sold, much of it for scrap.

Wheal Grenville Stamps

The once-important Wheal Grenville tin and copper mine lies on the southern side of the Camborne mining district. Since the late-medieval period tin had been worked in the area, and Newton Lode, one of Wheal Grenville's principal mineralised structures, which was worked for tin and copper, was exploited to the west of the mine as early as the 1540s, and contributed to Camborne Parish Church. Tolcarne Mine, which also lies just to the west of Wheal Grenville, was described by John Norden, in about 1584, as among the 'chiefe tyn mynes in Kirier'. Tolcarne Mine was worked almost continuously from the mid-sixteenth century until 1987, when, as part of Wheal Pendarves Mine, it finally closed.

When the Swedish industrial spy, Henric Kalmeter, visited the district in December 1724, he described several tin and copper mines in the locality of Wheal Grenville. The workings at Carnmough and Condurrow, immediately to the north of Wheal Grenville, were already old tin mines when Kalmeter inspected them, and they were just becoming significant copper producers also. Kalmeter did not venture further south than what became South Condurrow Mine, but the mine workings he visited were within a few yards of the original lodes exploited by Wheal Grenville.

The modern mine really started its life a little to the south of the later, more famous, workings, and operated under the name Wheal Gine or Polgine Mine. Polgine was located immediately

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to the north of the centre of Troon, and lay across the road between Camborne and Troon, and stretched for a considerable distance as far as Newton Moor. The 1850 Robert Symons 'Plan of Camborne & Illogan Mining District' shows Wheal Grenville centred on the old Polgine Mine, with the mineralised structures of Newton Lode and Newton South Lode lying well to the north of the main workings.

By the early nineteenth century Polgine was being worked under various names, and by the 1820s it was known as New Dolcoath Mine. This period ended in 1827 with the sale of its 58-inch pumping engine. In 1835 it again was using the name Polgine, and encompassed several mines to the north and east, including Newton Moor, and Condurrow. In 1845, the mineral lord, Baroness Grenville, issued a new lease, and the mine became known as Wheal Grenville. For a few years it struggled on, being taken over at one point by John Taylor & Sons, but in 1855 it was again abandoned, and then sold to another hopeful group of investors, headed by H. B. Rye. In 1859 the adventurers split the sett, forming East Wheal Grenville from the workings to the east of North Shaft. These were centred on the area around Fortescue Shaft. These two mines soldiered on without noticeable success for several years, and survived the most difficult period for mining in the nineteenth century, as copper and tin prices fluctuated wildly and costs increased inexorably as the depths of the mines increased.

As the 1860s progressed, and Wheal Grenville had been sunk to the 100-fathom level, her prospects suddenly began to look good. The Great Flat Lode, worked by South Condurrow Mine to the north of Wheal Grenville, passed into Grenville below the 90-fathom level, as the lode dipped to the south. From about 1870 Wheal Grenville's fortunes changed. The Great Flat Lode was wide and rich in tin ore, and the mine's prospects were very good. East Wheal Grenville, in the doldrums for some time, was abandoned in 1877, and taken back into Wheal Grenville.

With increased production and profits, the mine needed greater ore stamping and dressing capacity, and the last years of the century saw the area between East Wheal Grenville and North Shaft turned into a vast tin mill, with new and larger stamping plant, increased buddles and round frames as well as the more modern Frue Vanners and calciners. A new stamps engine house was built in 1891 and was finished by July that year. New tramways were installed to bring the ore from New Shaft at the western end of the mine and Fortescue Shaft at the eastern end, to the Wheal Grenville New Stamps. From the stamps the sand and slimes, containing the fine cassiterite, was fed down-slope to the



Grenville New Stamps engine house showing the site of the boiler house. The Basset memorial can be seen on the skyline to the right.

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Grenville New Stamps showing the flywheel loadings in front of the house. The slope running from right to left is the tramway for taking ore to the stamps.



Contemporary photo of Grenville New Stamps: engine house and stamps (covered) to right; auxiliary beam for dressing water at front of house; launder in foreground; possible settling strips behind launder; vanner house to left.

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mill, where the buddles, round frames and Frue Vanners separated the black tin concentrate from the gangue material. Finally, the fines, which still contained tin, were fed into settling pits where the finest tin slimes could be washed clean.

In 1906 Wheal Grenville amalgamated with South Condurrow and part of West Wheal Francis to become Grenville United Mines. This saw the mine in continued good health, exploiting the tin riches to be found at depth on the Great Flat Lode. The Great War put an end to this success story, as it did to so many others, and with its skilled workforce dying on the Western Front and commodities difficult to obtain and exorbitantly expensive when they were, the mine went into a terminal decline. The price crash following the War finished the mine off. The Wheal Grenville New Stamps site dates from the turn of the twentieth century, being the modified plant which was mostly installed in the 1890s and early 1900s. The long flat concrete building in front of the stamps engine house is the remains of the Frue vanner house. On the wall of the Frue Vanner house, on the north side of the New Stamps engine house, the dates 1900 and 1901 can be seen in the wall plaster, together with the name of the manager, C. F. Bishop, the Cornish arms and motto, 'One & All', and the initials 'W G', for Wheal Grenville. The stamps and dressing plant continued in use until the final closure of Grenville United Mines in 1921.

The engine house at Grenville New Stamps lies on the skyline above the remains of the stamps loadings. Wheal Grenville Old Stamps lay to the west but all of the buildings and dressing floors here were swept away and no trace now remains. Grenville New Stamps, which supplemented the old stamps, was built between 1889-92. Bought from West Condurrow for £300, the engine had an auxiliary beam operated by the left-hand stamps flywheel to pump water to stamps grates. The engine had been acquired second-hand by South Tolcarne (the old name for West Condurrow) in 1881. West Grenville stamps were increased to 136 heads in 1892 and a 20-inch engine was acquired to pump water to the floors; the auxiliary beam was dispensed with at this time. The



Decoration in the cement render of the vanner house.

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Decoration in the cement render of the vanner house.

stamps engine house and stamps loadings constitute a Scheduled Ancient Monument.

Hidden in the vegetation below the vanner house is a Brunton calciner, the stack of which lies to the west of the vanner house. The stamps and dressing plant continued in use until the final closure of Grenville United Mines in 1921.

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South Condurrow/King Edward Mine

Originally worked as under the name of Old Tye, a lease of the sett was granted in 1844 but workings did not recommence until 1850; the mine was renamed South Condurrow Mine in 1850. An engine, probably a 45" cylinder, was erected around 1859; Engine Shaft was under the 50 fathom level by 1862 but abandoned by the end of the year.

A new Engine Shaft was commenced in January 1864; the site, now obliterated, is on the western part of the present King Edward Mine site. Sinking stopped when the shaft reached the water table, 16 fathoms below the adit, because of inadequate pumping facilities. The mine's first record of production, 20 tons of copper ore, was in 1864; copper would never be an important product. The production of black tin commenced the following year.

King's Shaft was collared in 1865; this site has also been obliterated. A second Vivian's Shaft commenced in 1866, named for Vivian and Son, the consultant engineers. It was possibly sunk to replace the old Vivian's Shaft which had previously been flooded through collapsed workings. New Shaft also dates from this time and lies below the playing field at KEM.

Prior to 1868 a steam whim had been installed on the site though its location is not known. In 1868 a new engine house was built for it; this still stands on the eastern side of the present King Edward Mine site. The whim was used to hoist from Engine Shaft to the north.

Tin dressing had been carried out by eight heads of water-powered Cornish stamps in the Red River Valley; this was now proving insufficient to meet the increasing amounts of ore being raised and the lease of another twenty water-powered stamps, lower down the Red River Valley at Tuckingmill, was arranged.

The bottom of the mine was flooded in the winter of 1868-69 through the breakage of a main rod and balance bob. More water problems occurred in 1869, culminating in the collapse of King's Shaft below the 82 fathom level. The decision was taken to sink a new shaft on one of the steeply dipping lodes. The stamping capacity was once again proving insufficient and in the same year the decision was taken to erect a steam stamps on the mine. The engine and boiler houses cost £150 to build. The stamps battery, with 48 heads, commenced in November. A shaft was sunk to the deep adit to raise water for ore dressing. With this new plant, tin production rose from 51 tons in 1866 to 217 tons in 1870. **The House for 60-inch pumping engine at Marshall's Shaft. Photo taken prior to conservation work.**



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Whim engine house for Marshall's Shaft and possibly one other shaft. Photo taken prior to conservation work.

mine was still shallow however and profits were helped by low hoisting costs.

The winter of 1871/72 was very wet and water rose to the 30 fathom level by February 1872. By this time the stamps had been increased to 96 heads. Later in the year the 45" was replaced with a 55" Harvey-built engine in order to deal with the water. At this time the stamps engine was recylindered and provided with a new piston and cylinder cover.

Changes to the management took place in 1871 when Vivian and Son were dismissed as consultant engineers and replaced by a management committee. The introduction of Captain William Rich as manager was not entirely popular, not least because he took some credit for the work carried out under the auspices



King Edward Mine panorama. Stamp battery house left background, survey office in foreground, mill to rear, whim engine house in background and calciner and stack to right.

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South Condurrow stamps engine house to the west of the KEM site.

of the Vivians.

After the abandonment of East Wheal Grenville in 1876 the pitwork in the Engine Shaft was enlarged to deal with the extra water. Despite this, water problems were to continue, caused by heavy rains in 1877. Breakages at the stamps occurred in March and April this year, each time disabling 48 heads. However, despite the price of tin dropping, the mine's profits increased.

In 1881 a new shaft was collared in a new part of the sett acquired to the west of the mine; this became known as Marshall's. The plan was to explore the western end of the Great Flat Lode. While this lode ran through the Condurrow sett it was at quite a shallow depth; in places the 82 fathom level was only 15 fathoms inside the southern boundary of the sett and the lode was not accessible below the 93. Sinking commenced in January and was sunk against a raise from Boundary Shaft from the 30 fathom level; the two were holed in April. During the summer a 26" was acquired from West Chiverton Mine reportedly to hoist from this shaft. However the flywheel loadings at the front of the shaft do not point to Marshall's Shaft to the south; the whim therefore must have hoisted from a different shaft initially, which implies that it actually predates the sinking of Marshall's Shaft. The shaft was sunk to the 70 fathom level by early 1872 with the aid of raises from the 42 and 70 levels.

This section of the mine proved quite wet and more pumping equipment was required. Over the winter of 1886-87 a new engine house was built at Marshall's Shaft. A 60" pumping engine was acquired from Wheal Jane, where it had been bought second-hand in 1881, and commenced pumping here in 1888. Interestingly the boiler house was built at a right angle to the engine house, as it would have blocked the path of the hoisting rope from the whim had it been erected in the usual style. Presumably Marshall's whim was still hoisting from another shaft, with a rope serving Marshall's Shaft, its direction changed by dolly stands.

This section of the mine was never very successful and was effectively subsidised by the rest of the mine. In 1890 the shaft was slashed out (widened) to accommodate a water skip and allow for man riding. The shaft reached the 123 fathom level in June.



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In 1892 the Wheal Grenville management applied to use the old pumping engine in the centre of the South Condurrow sett at its own expense. The following year South Condurrow management made its first call for many years, to pay off a debit balance of £667; ore revenue had declined by 50% since 1888.

In 1897 the old mine was given to the School of Metalliferous Mining at Camborne for use as a training mine. The engine house and headframe were demolished but a new headframe was erected over Engine Shaft to continue access to the underground workings. The mine was completely re-equipped, both on surface and underground, with modern machinery reflecting what was then considered the best Cornish practice. It was intended that some of the tin produced would cover most of the teaching costs. The mine was renamed King Edward Mine on the accession of King Edward VII in January 1901 but it will always be known, particularly to the many ex-students, as KEM.



Round frame in the KEM mill.

The mine regularly produced tin up until World War 1 when operations were suspended. By 1920 it was back in production. This was short-lived however for in 1921 the adjacent deeper Grenville Mine stopped working. As the two mines were interconnected, the consequent flooding of Grenville also flooded the King Edward workings. Underground operations, on a much reduced scale, were transferred to a dry shallow section the Condurrow Mine to the north.

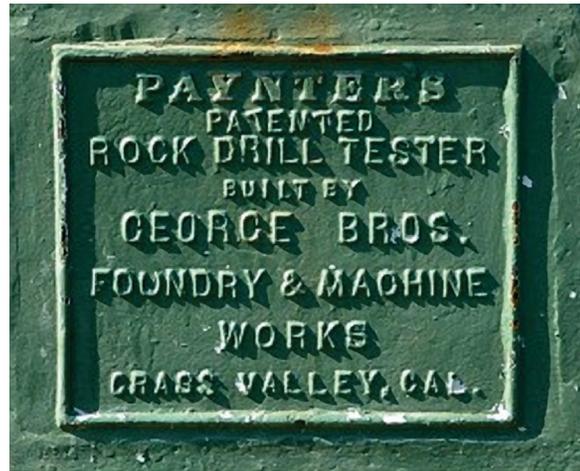
The surface area of the mine was retained and used for teaching mining, ore dressing and surveying. The remainder of the lecturing continued to be carried out at the main campus in Camborne. In 1974 the pilot plant and most of the lecturing in mining, ore dressing, management, and surveying moved to the main School of Mines building. The mill complex was no longer needed and it became a store.

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Name plate from the Paynter's rock drill sharpener, formerly used at Holman Brothers

In 1987 a volunteer group was formed with the objective to conserve the site as an educational resource for the future and to operate it in a manner that benefits the local community. Using rescued machinery the mill has been restored to working condition much as it would have been in the early years of the last century.

King Edward Mine and its satellite Condurrow Mine ceased to be used by Camborne School of Mines in 2005. KEM, then operating as a museum, was purchased by Cornwall Council and Great Condurrow by the Carn Brea Mining Society. The buildings are all Grade II* listed and are of National importance. The site is part of the World Heritage Area of Cornwall.



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Moseley Industrial Narrow Gauge Tramway and Toy Museum

The Moseley Industrial Narrow Gauge Tramway Museum was created by Colin Saxton as a craft project at Moseley Boys Grammar School in Cheadle, Cheshire in 1969. Moving to a new site at Cheadle Hulme two years later, a narrow (24-inch) railway was laid around the edge of the playing field and railway sheds were erected. Over the next twenty five years the railway collection became a public Museum, with over forty narrow gauge locomotives operating on half a mile of the narrow gauge track.



Junction outside the engine shed.

Due to various problems including closure of the school site the collection was dispersed in the 1990s. The spirit of the Moseley school project and the nucleus of the original museum forms the recreation of the MINGTM on its new site at Tumblydown.

Narrow gauge trains are now housed in a large shed within the Tumblydown Farm complex. A twenty-four inch gauge line runs from there through the horse paddocks for about seven hundred yards. The track is being extended gradually, as time permits.

There are seven working locomotives on site and one under going restoration. Five are battery electric vehicles and three are diesel units. The Moseley collection has approximately fifty items of rolling stock including carriages, wagons, mine tubs and specialist vehicles. The exhibits include wagons from Wheal Jane, South Crofty and Geevor. One of the more unusual locomotives on show is a Greenwood & Batley No.2345; this was built in September 1951 and acquired by the Admiralty for the Royal Navy Torpedo Depot at Bingleaves, Weymouth.

‘Passenger’ trains normally consist of a battery locomotive and an open wagon. Passengers ride in the wagon with a brakeman. Progress is slow and the experience is best described as a mine railway but in the open air. The out and back journey includes a number of right-angled bends and a continuous loop after which the train retraces its journey.

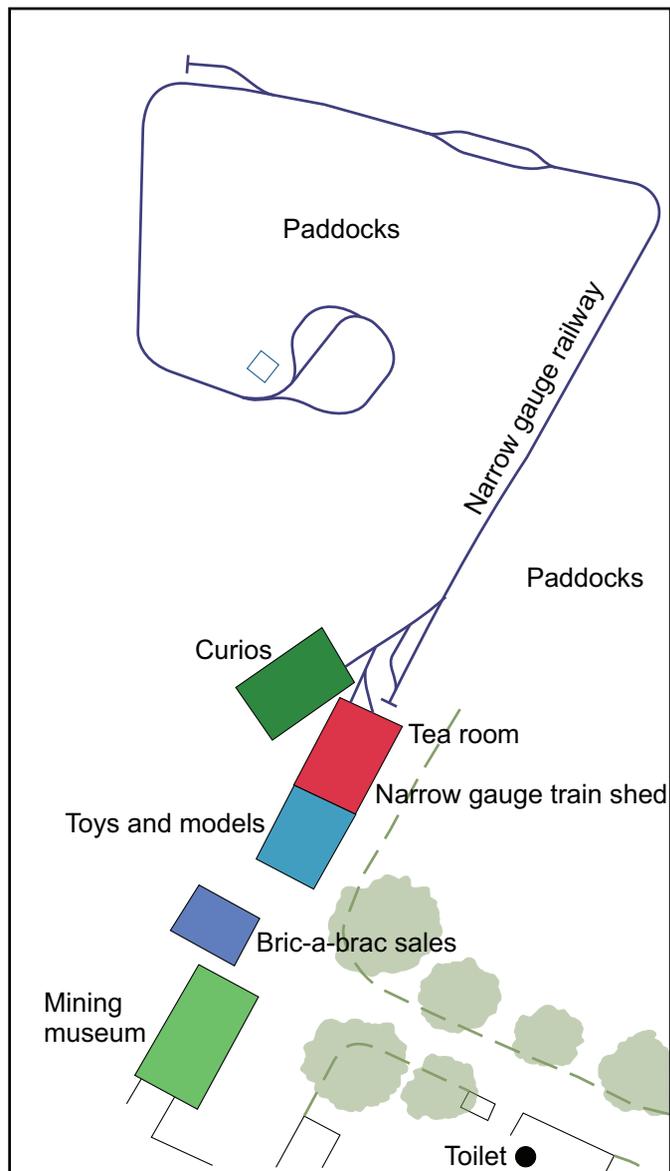
On display is a wide variety of vintage toys, such as working tinsplate trains and construction

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sets. Examples include model railway layouts of various makes such as Hornby 'OO' gauge, Hornby Dublo, Meccano, Lima 'OO' gauge, Trix Twin Scalextric, Dinky Toys, Bayko, Tinplate Toys, Dinky Builder, Ace trains and LGB. The Hornby layout includes metal-bodied locos such as *Duchess*, A4 Pacifics and Class 4MT tank engines. There are also many Meccano models, including the Titanic, a double decker bus, Lancaster bomber, a helicopter and the steam winder which operated the Portreath Incline.

Mining tubs and artefacts are presently on display in the main museum collection. A purposely designed series of mine galleries is under construction which will eventually house this important historic collection. These galleries include a chain-hauled tramway and stables with more planned. Within the museum are dozens of domestic and industrial artefacts, some recognisable and others long forgotten.

Society members may also be interested to learn that this museum is the home of the Murdoch Flyer, which can sometimes be seen in steam.



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Historic Cornwall (Cornwall Historic Environment Record): www.historic-cornwall.org.uk

King Edward Mine Museum: www.kingedwardmine.co.uk

Tumblydown Farm (Moseley narrow gauge railway) www.tumblydownfarm.co.uk

Rear cover illustration: Sunset at Levant Mine.

