

THE BUILDINGS AND EQUIPMENT USED AT PENNERLEY MINE, SHROPSHIRE, IN THE LATE 19TH CENTURY

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Abstract: Pennerley Mine lies on the western flanks of the Stiperstones Hill about 4 miles from Hinsterley and between the celebrated lead mines of Tankerville and the Bog. Its history goes back over 200 years but workings were on a small scale until the area was drained by the 'Boat Level' Adit in the 1780s. This Adit was only at about 300ft depth, the workings were deeper than this in the 1830s so water had to be pumped and by 1860 a depth of over 1,000 ft had been reached. For its time the mine was very modern and mechanised with over 10 steam engines at its peak. Fortunately two inventories survive of 1890 and 1902 and these have been used to build up a complete picture of a British lead mine at this period.

THE MINE

The mine was worked on the usual stop-go basis, often in association with the neighbouring mines mentioned above which have tended to overshadow it. It has however, for short periods produced good quantities of lead ore (by local standards) and from the 1870s to 1890 was a producer of zinc ore, with barytes from 1890. The peak year for employment was 1883 when 146 persons were employed. The mine worked six principal veins of ore from four shafts: Gin, Engine, Blands and Potters Pit. Until the 1830s some ore was also removed from the mine by boats on the drainage level, hence the name. The Boat Level has its outfall nearly a mile away from the mine.

Pennerley Mine produced 600 to 900 tons of lead ore per year from 1871 to 1876 and an anomalous peak of 1,150 tons in 1883, in which year it also produced 2,300 oz of silver. Its peak for barytes was 625 tons in 1892 and for zinc 50 tons in 1884. The mine closed in 1895. During the 1870s the mine was owned by the Pennerley Company and for most of the 1880s by the Tankerville Great Consols Co. After 1890 (the date of the principle inventory) it was controlled by Arthur Waters Sn. During the 1860s mine management included Arthur Waters Sn., and from 1881 to 1887 both father and son were involved as A. Waters & Son. until A. Waters Sn. died in 1887 aged 53. From 1888 Arthur Waters Jn. was agent until taking full control in 1890 and remained in control until production ceased in 1895.

Although nowadays the mine looks derelict, only one building being recognisable as such, the site is remarkable. It has one of the most complete records of equipment that was present during its 1870/80s heyday that is available for any mine during that period. It also had on-site at least 10 steam engines ranging from a large Cornish engine through beam and horizontal to small portables, some single cylinder and some compound, perhaps one of the widest combinations of such equipment at any mine of its size at that time. Archaeological research would undoubtedly produce much more evidence of the equipment and buildings than is immediately possible from documentary and site inspections. It is useful to note that most of the clumps of trees now on the site mark the foundations of the groups of buildings on the early O.S. maps.

There are no records of any late eighteenth century Boulton and Watt engines at Pennerley despite there being up to five at Bog and Roman Gravels mines within a few miles. Pennerley had however at least one steam engine by the 1830s. In 1870 Liscombe recorded three engines at Engine Shaft, (a pumping engine, a horizontal engine for lifting pump rods or capstan engine, and an engine for winding and crushing). Liscombe also records a fourth engine at Blands Shaft, which was almost certainly 'old' then and which wound from three shafts. By 1880 a further large engine had been installed as a compressor

at Engine Shaft and by 1890 several smaller specialist engines were to be found about the mine.

These engines are all described in two inventories:

1. *Licence to search for minerals etc., Earl of Powis and A.R. Lloyd to A. Waters 2 July 1990. (Shropshire Record Office No. 1709/6/Box 2).*
2. *Pennerley and Tankerville Mines Catalogue of Sale, Sept 5th 1902 (copy in Shropshire Local Studies Library SLSC24/misc). The Catalogue has also been published in Shropshire Mining Club Journal 1972-3 pp.17-21.*

The only known illustrations of features on this site are those shown on some abandonment mine plans. These are preserved in the Shropshire Record Office (5607/2/116-8) and are dated 1878 and 1928. Copies of these were made by Percy Blight in 1920 and used by Shropshire Mining Club in their *Account 10* (1972) and by T.J. Davies (1969), and also appended to this paper. Although many buildings are shown on the 1883 and 1902 maps there is no identification of use given. The location of the engines has here been deduced from other information and site evidence (see Brown 1993) but cannot be guaranteed. The most important visible remains are around Engine Shaft, where, south east of the shaft and alongside the road, two enginehouse foundations can be made out complete with engine beds and flywheel pits. In summary the engines and probable locations are as follows (see Plan 1)

Engine Type	Probable location
1830s pump	1a
1860s pump	1b
Winding/crushing	2
Capstan/sawmill	3
Compressor	4
'Old' capstan	5
Jigger	8
Link motion	7
Portable/orebins	8
Beam (Blands)	9
'Short-term' horizontal 1870s(Potters)	10a
Semi-portable (Potters)	10b
Total - 12 engines, but with a maximum of 10 at any one time.	

Elsewhere it is stated that all boilers (other than for the smaller engines) were "Cornish or Galloway" and each set seems to have supplied steam to several engines. There were probably other engines on site of which nothing is known. There are records, for example, of an aerial ropeway to take ore from Potters Pit to Pennerley dressing floor but which engine powered this can only be guessed. However, this must have been one of the finest collections of steam engines available at the time, and a search for the foundations on site could be quite fascinating.

SKETCH MAP OF PENNERLEY MINE Shropshire

Roads & Tracks based on O.S. map 1974
Buildings based on O.S. map 1902

PROBABLE LOCATIONS OF

Engines

- 1 Pumping
- 2 Winding / Crushing
- 3 Capstan / Sawmill
- 4 Compressor
- 5 'Old' engine / Capstan
- 6 Jigger
- 7 Link Motion?
- 8 Engine at Ore bins
- 9 Blands / Beam
- 10a Potters 1870's
- 10b Potters Portable

Other buildings

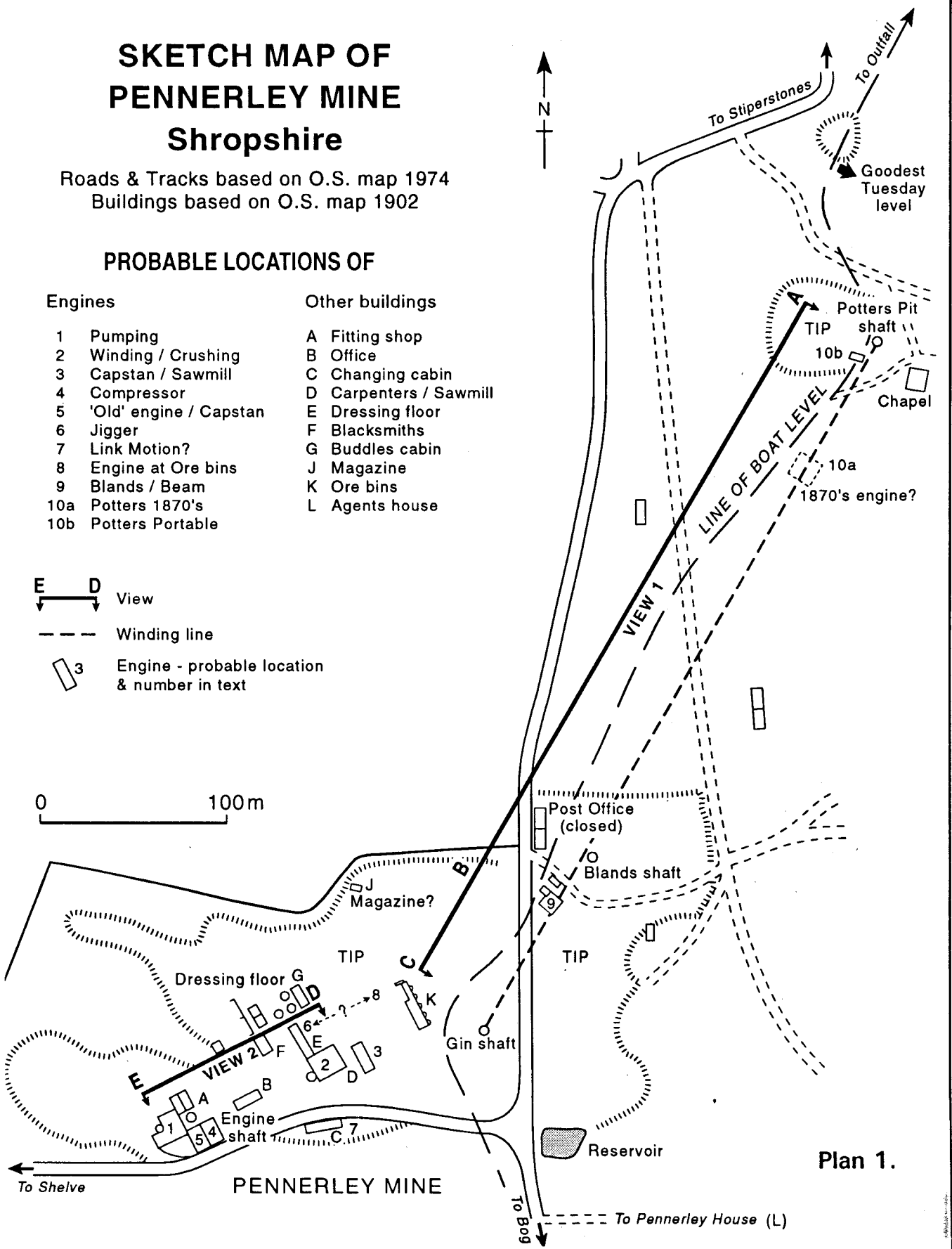
- A Fitting shop
- B Office
- C Changing cabin
- D Carpenters / Sawmill
- E Dressing floor
- F Blacksmiths
- G Buddles cabin
- J Magazine
- K Ore bins
- L Agents house

E D View

--- Winding line

3 Engine - probable location & number in text

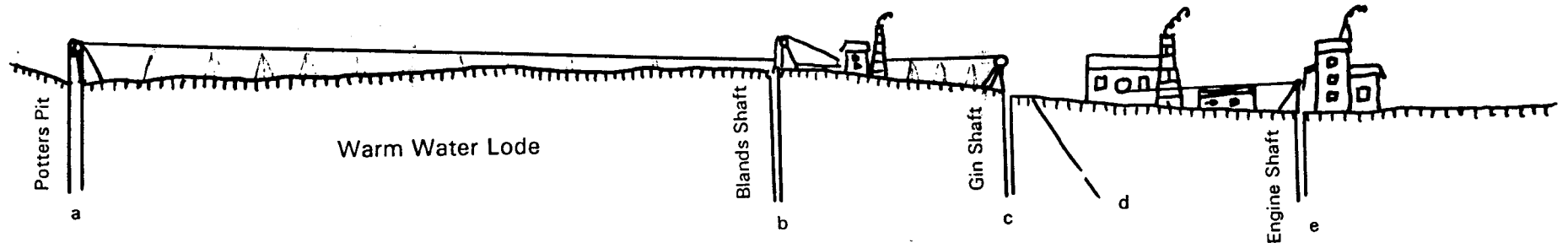
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Plan 1.

Plan 2

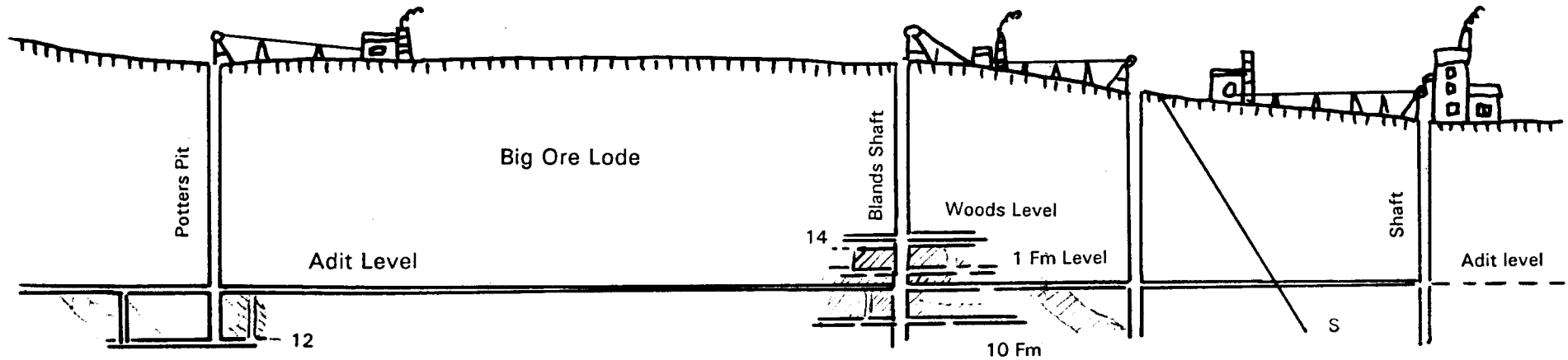
Before c.1875



PENNERLEY MINE - LONGITUDINAL SECTION

Reproduced from tracings taken off original mine plans by P. Blight (1920).

After c. 1875



The story does not end in 1902, however, for several attempts have since been made to reopen the mine. For example, in 1953 the local newspaper reported that a new shaft was being sunk, then 30 feet down, and that the company was anticipating the arrival of mining equipment. It is not known if an engine arrived, but it is unlikely it would have been steam. However much equipment did arrive and when the writer first visited the mine in the late 1950s, it looked more like a scrapyard. Recent research by Mike Gill (1993) has shown that some of this modern mining equipment was sold-on in the 1960s to Beaver Mine and other mines in Yorkshire.

EQUIPMENT USED AT PENNERLEY MINE 1890 AND 1902

Notes. Based on the 1890 inventory. Additions in (brackets) are taken from the 1902 inventory. Items in *italics* are added by the writer.

Pennerley Engine Shaft

Shaft sinking probably commenced in the 1920s. Deepening took place in the 1940s at which time it had a 24 inch pumping engine which was sold soon afterwards. The shaft was refurbished in the late 1860s and eventually reached a depth of 990 feet, with a Boat Level at 210 feet depth. The 1860s pumping engine is said to have been severely damaged by lightning some months before the 1902 sale. The engine, headgear and pulley, and the two capstan pulleys with pedestal are described at the 1902 sale as being "across the shaft".

Cornish Pumping Engine

Position immediately to west of the Engine Shaft

1. Cornish Engine 60 inch cylinder, stroke 10 ft in, 9 ft out (by Harvey, Hayle Foundry, Cornwall, "as she now lies partly fallen over the shaft")
2. 1 large cast iron balance beam (with extra strong shafting and pedestals by Harvey, Hayle Foundry, with balance box filled with scrap iron.
3. 2 (wrought iron) boilers 30 ft by 7 ft (with 2 tubes, No. 5 injector and fittings).
4. (About 30 ft 4 inches) cast iron exhaust and steam piping.
5. 170 fathom of pitwork 16 inch pumps, under water
6. 80 fthm of perpendicular (pitch pine) rods 13 inch by 13 inch, under water.
7. 90 fthm of perpendicular (pitch pine) rods 12 inch by 12 inch, under water.
8. 130 fthm of 15 inch pumps, perpendicular rods, under water.
9. 140 fthm of 9 inch pumps (including 220 yd from shaft to pool).
10. 3 x 15 inch plunger poles with H pieces (top doors, working barrels and winch bores in shaft, mostly under water):
11. 1 x 9 inch plunger pole (as above).
12. 1 x 15 inch drawing bucket lift (mostly under water).
13. (Quantity of 3 inch piping, as it now lies across the shaft).
14. 160 fthm of 2 inch gas pipe, 200 fthm of 1 1/4 inch gas pipe.
15. (Pitchpipe headgear with cast iron winding pulley 7 ft diameter, as they now lie across the shaft).

Winding and Crushing Engine

16. (Two cast iron capstan pulleys with shafting, pedestals and shapping plates as they now lie across the shaft).
17. Horizontal engine 22 inch cylinder, stroke 4 ft (14 ft 6 inch flywheel) *positioned about 75 yards to east of Engine Shaft* drawing and crushing gear complete, (with condenser force pump, indicator, about 20 ft of 6 inch cast iron piping from engine to boiler, two pressure and vacuum gauges).
- 18.1 Boiler (wrought iron with 2 tubes) 30 ft by 7 ft (with steam and steam valves. double safety valve, steam and water gauges, damper and weight. About 30 ft of 2 1/2 inch cast iron

piping from boiler to force pump).

19. (1 winding drum, 5 ft 9 inches, with extra drum end and spur wheel, shafting and 2 pedestals, length of shafting 10 ft 6 inches by 8 inches square).
20. 250 fthm of 1 inch wire rope, only fit for fencing.
21. (Crushing plant consisting of spur wheel in halves 7 ft diameter, 8 inch face; shafting 16 ft by 6 1/2 inches square, heavy cast shafting, strap pulleys, cog and spur wheels, pedestals, rolls, sieves, small cast iron winding drum and balance boxes. *See also details in dressing floor section.*

Capstan and Saw Mill Engine possibly positioned 10 yards east of winding engine.

22. 1 horizontal engine for capstan and saw bench 16 inch cylinder, 2 ft stroke (with powerful capstan gear complete, fitted with shafting and strap pulley, 6 ft diameter, 9 inch face for driving saw mill. *See Carpenters Shop and Saw Mill section for details.*
23. About 50 ft of 4 inch cast iron flange pipes from engine to boiler.
24. 200 fthms of 5 inch hemp rope.

Compressor Engine listed under Dressing Floor Section of 1902 list, so it could have been on the north side of the shaft adjoining the floor, but local tradition says it was against the road to the south. Position not clear. There could have been a second compressor, see entries 26 and 27 below.

25. 1 horizontal engine, compressor, steam cylinder 14 inch, air cylinder 12 inch, stroke 2 ft, (with fly wheel and connections, by the Sandycroft Foundry Company).
26. 1 horizontal engine, old and not in use, 9 inch cylinder, 1 ft stroke.
27. (1 cast iron air cylinder, new, 12 inch diameter, with cast iron bed plate by Sandycroft Foundry Co.).
28. 200 fthm iron rails.
29. 3 iron wagons.
30. (4 wrought iron kibbles).
31. (2 large coils of wire rope).

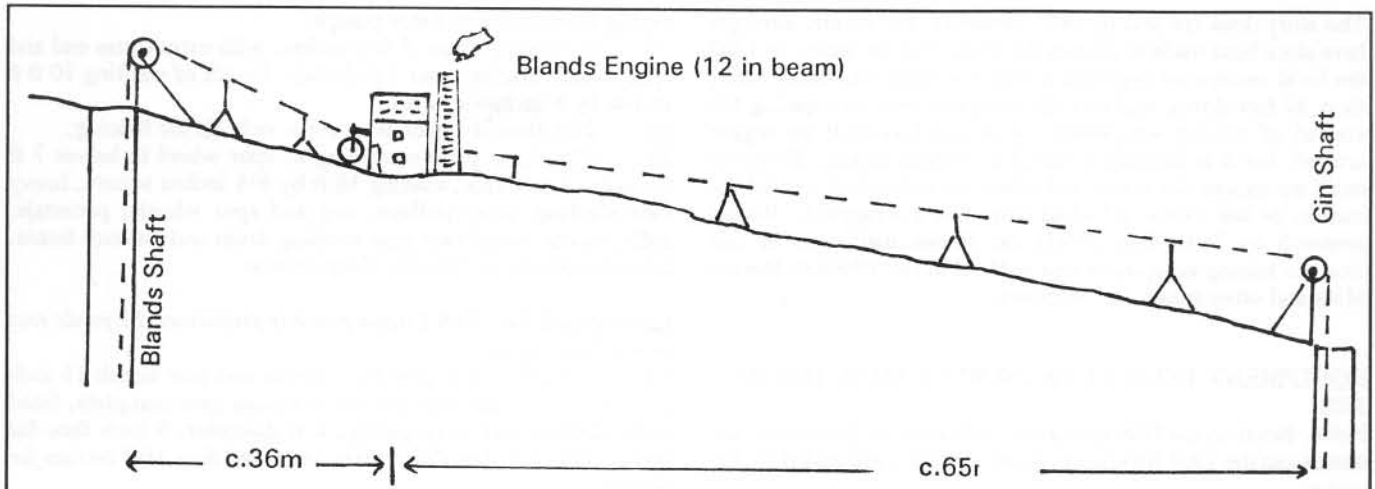
Carpenters Shop

32. Carpenters Shop (Joiners Shop), 40 ft by 16 ft. Zinc roof (corrugated iron roof with Saw Mill under Carpenters Shop, 40 ft by 16 ft. *Possibly located 10 yards east of the winding engine, building marked is about 48 ft by 15 ft, contained item 22 also, an horizontal engine.*
33. 3 benches in Carpenters Shop, a 'wood house' over the saw mill.
34. (13 tread step ladder, quantity of buffalo hide, sundries)
35. *In Saw Mill* 1 saw bench (patent iron, 5 ft 6 inches with timber carriage), grinding stone (and 4 circular saws).
36. (90 ft of 1 inch wrought iron gas piping).
37. (Cast iron strap pulley 3 ft 6 inches in diameter, new and unpacked).
38. (as above, 1 8 inch diameter, 9 inch face).
39. (Iron bucket, with lids complete, for pump).
40. (9 wrought iron holding down bolts).
41. (small turning lathe for wood turning).

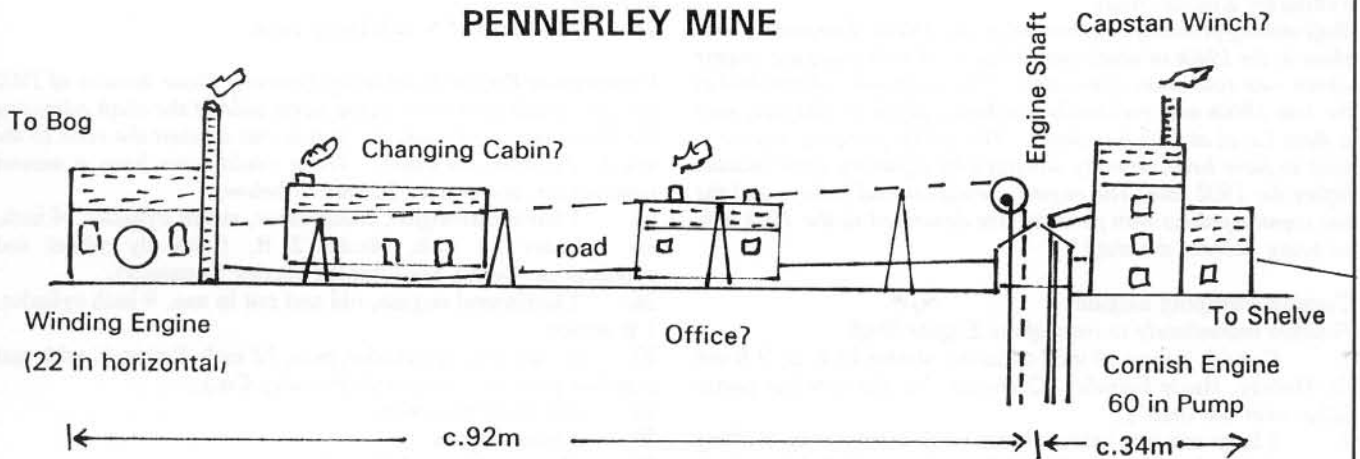
Dressing floor

North of the Winding Engine, includes crushers driven by the winding engine, cast-iron screen plates are mentioned in Engine Shaft section for 1902, 3 in number with 1 inch perforations. House is described as wooden, 27 ft by 12 ft: this could be part of the winding house complex building on map.

42. Wooden Shed 27 ft by 12 ft.
43. Crusher, 2 x 2 ft 6 inch rolls, 15 ft diameter.
44. 4 picking tables.
45. 2 hand jiggers.
46. 2 iron wagons.
47. 101 fathom of iron rails (198 yd of wrought iron bridge rails, 14 lb to the yd).
48. 100 fthm of 1 1/4 inch gas piping.



PENNERLEY MINE



(top) after 1875 - the area around Blands Shaft

(based on a tracing by P. Blight, 1920)

(middle) 1878 - the area around Engine Shaft

(based on Shrewsbury 5607/2/116-118, and HSE 9465 - Tankerville Great Consuls).

(bottom) view of area of above sections in 1990



Second Dressing Floor

Wooden house 75 by 17 by 42 ft is given, last dimension is usually the height, but this seems high for this site, the long building north of the winding engine may be the same, approximate dimensions 75 by 15 ft. The 'horizontal engine for jigger probably located here and so is included.

49. 1 horizontal engine forjigger, 9 inch cylinder, 12 inch stroke.
50. Wooden house 75 ft by 17 ft by 42 ft.
51. 6 machine jiggers, 1 Greens patent machine-jigger (strong threefold jigger, 3 Greens patent machine jiggers, wood staging over jiggers).
52. 4 round buddles (iron centres) 18 ft diameter, 1902 list gives 3 buddles and these are shown on the 1902 O.S. Map, although another half-circle lies on its own north of the Engine Shaft, but this is possibly item 53.
53. 1 machine impelled buddle (patent propeller with shafting and strap pulley, 3 ft 6 inches diameter, 11inch face). See also item 62, Buddles Cabin.
54. 4 wooden wagons.
55. 44 fthm of iron tram rails.

Third Dressing Floor

Wooden shed 39 by 33 ft; there does not appear to be a building of this size in the dressing floor area unless it is part of the Winding Engine complex or the building near Gin Shaft on the 1882 O.S. Map, altered by 1902.

56. Wooden Shed, 39 ft by 33 ft.
57. 3 picking tables.
58. 2 hand jiggers.
59. 2 iron wagons.

Other items shown on the 1890 list at Pennerly Engine Shaft are as follows:

60. 200 fthm iron rails.
61. 3 iron wagons.
62. Buddles Cabin 20 ft by 16 ft, stone walls, slate roof. There are several buildings shown on the 1883 O.S. map but at present this building has not been identified. It must, however, have been in the dressing floor area north of the Winding Engine or Pumping Engine. A possible building is that marked G.

63. Changing House (Cabin) 66 ft by 17 ft, stone walls. This is almost certainly the building on its own, south of the Shelve Road, on the map it measures about 60 ft by 18 ft.

64. 1 heating or drying apparatus in the house (wrought iron heating apparatus and furnace).
65. (part of link motion steam engine about 6 inch cylinder and 6 inch stroke).

66. Blacksmith's Shop 34 ft by 18 ft, stone walls, slate roof. The building 20 yards north-west of the Winding Engine is almost 36 by 18 ft, this is a probable position for the blacksmith's shop.

67. 2 forges and 2 anvils and materials (3 smith's anvil and blocks).
68. (1 working bench fitted with iron vice, powerful double vice and block, swage and hooping blocks).
69. (3 lots of useful tools).
70. (Several tons of smith's scrap).

71. (Fitting Shop) Not listed in the 1890 inventory, although some of the items are listed separately, e.g. 3 air drills. The building was near Engine Shaft, possibly south of the shaft, between it and the road and adjoining the 'compressor house'. It is a possible position for the capstan winch at the mine in the 1860s.

72. (Quantity of 2 inch boiler rivets).
73. (1 large, brass tallow cup).
74. (1 fitting bench with iron vice).
75. (3 sheet iron skips).
76. (1 Patent rock drill by the Sandycroft Foundry Co.).
77. (1 Patent rock drill by the Sandycroft Foundry Co.).

77. (1 Patent rock drill by Eclipse).
78. (Length of hose-piping for rock drills).
79. (double purchase crab winch, incomplete).
80. In 1902 also, '3 machine rock drill bars' are shown as being in the Carpenters Shop. See also item 85.

Store Rooms No 1 and No 2

81. (Store Rooms No. 1 and No.2) Not listed in the 1890 inventory and not positively located on the 1902 map.

No. 1

82. (Quantity of scrap, cast iron and wrought iron).
83. (Lots of useful timber).
84. (Lots of various chains).
85. (3 new steel bars) see also item 80.
86. (pair of powerful 3-sheave pulley blocks).
87. (Number of new cast iron tram wagon wheels).
88. (Number of old cast iron tram wagon wheels).
89. (Quantity of old brass).
90. (Number of Guy Pulleys 1 8 inches diameter).
91. (Number of various strap pulleys).
92. (Lot of bevelled cog wheels).
93. (Several lengths of various shafting).
94. (4 cast clack shells about 16 inches diameter).
95. (3 wrought iron kibbles).
96. 1 Spring shandry).

No. 2

97. (Strong coupling chain and sundry drills).
98. (2 snatch blocks).
99. (Wood tool chest and sundries).
100. Ore Bin. Not listed in the 1890 inventory and not positively identified on the O.S. Maps. It may include the half-circular feature shown north of the Engine Shaft otherwise thought to be a buddle, see item 52, or the row of 5 half-circles shown on the 1902 Map near Gin Shaft could be a series of ore-bins. This is more likely. Under the heading 'Ore bin' the following are shown:
 101. (Beam scales and iron weights).
 - 102 (Two hand barrows).
 103. (Sundries).
 - 104 (Wood shed 22 ft by 15 ft by 8 ft to the eaves) could be part of the long shed shown near Gin Shaft but not positively located.
 - 105 (Horizontal engine on iron bed, 9 inch cylinder, 12 inch stroke with fly wheel. Free pump, piping and fittings by John Fowler & Co, Leeds).
 - 106 (Portable boiler with fittings 9 ft 9 inches by 2 ft 4 inches by John Fowler).

Gin Shaft

(This shaft, which is located near the Bog to Stiperstones Road, probably dates from the late 18th Century. The name would indicate that there was a horse gin here originally. Unlike the neighbouring Bog, Grit and Gravels Mines there is no record of a late 18th or early 19th Century steam engine here. The engine was on the opposite side of the road and about 70 yards away, an illustration on the mine section of 1878 shows the rope or chain supported on four rolley posts. The shaft was finally 528 feet deep with access to the boat level at 288 feet depth. The shaft area is not mentioned in the 1890 inventory.

107. (Pitchpine headgear, with cast iron winding pulley, about 5 ft diameter).
108. (Wrought iron pit cage tub and two iron kibbles).
109. (Almost 460 yd of bridge rails, 14 lb to the yard). 16 ft by 12 ft, stone walls lined with wood.

Blands Shaft

This shaft is about 35 yards from the east side of Bog to Stiperstones Road, with the engine house to the south west of the shaft. The shaft was sunk in the 1850s and a 13 inch engine erected for winding. Initially the engine wound from Blands, Gin and Potters Pit shafts, but about 1875 Potters Pit, which

was about 350 yards away was provided with its own engine. Blands shaft was finally about 708 feet deep with connections to the Boat Level at 312 feet depth.

110. 1 pulley frame with pulley 7 ft diameter (cast iron pulley, with wrought iron arm, 6 ft 6 inches diameter).
111. 1 beam engine 12 inch cylinder, stroke 3 ft with drawing gear, very old. Mistakenly, described as 12 feet cylinder on a 1902 list, since it is "very old" it may be the "13 inch" described in the 1850s but since the post 1870s mine section illustration shows a whim vertical-type engine with a large flywheel/drum to the front it might have been older than this and secondhand.
112. (Cast iron winding drum, 4 ft diameter, with spur wheel and clutch gear, two brass lined pedestals, wrought iron shaft, 7 ft 6 inch long by 5½ inch diameter).
113. 250 fthm of 1 inch wire rope for fencing.
114. (1 single flue boiler 30 ft by 7 ft with steam and feed valves, 4 inch piping and castiron feed tank).
115. (1 wrought iron tip wagon for pit cage).
116. 50 fthm of tram rail. (About 60 yd of wrought iron bridge rails, 14 lb to the yard).

Potters Pit Shaft

An old shaft, probably late 18th Century, on the line of the Boat Level. Formerly a shallow mine it was deepened in 1864 with winding from Blands Engine, then after about 1875 it is shown as having a small horizontal engine with boiler house and chimney attached to the house. An engine is described here in 1890, it was not present at the time of the 1902 sale. The final shaft depth was 960 feet and the Pit was connected to the Boat Level at about 330 feet depth. The pit water is said to have been very hot at the time the mine was being worked. It is reported that during the 1880s mineral was transported from Potters Pit to Pennerley Dressing Floor by aerial ropeway but this must have been removed by 1890.

117. 1 (Pitchpine) pulley frame with 6 ft diameter pulley (cast iron).
118. 1 patent; compound semi-portable engine 20 hp with 8 inch and 14 inch cylinders, stroke 16 inch, with drawing gear complete.
119. (Cast iron drum barrel, 12 inch diameter).
120. 250 fthm of 1 inch wire rope.
121. 2 rail wagons.

Miscellaneous

122. Powder Magazine

Believed to be the one surrounding building 90 yards north west of Gin Shaft and on the northern boundary of the main Pennerley site, 100 yards west of Blands Engine. 16 feet by 12 feet, stone walls lined with wood.

123. Office

Not described but possibly the building 30 yard east of Engine Shaft and shown on the 1878 mine section.

- 124.1 (deal, oblong) table, 6 (Windsor) chairs, (2 wood benches).
- 125.2 large cupboards with shelves (1 yellow pine cupboard containing drawers).
126. 1 brass scales and weights.
127. Dial box.

128. Agent's House

Not listed in 1902 list, not located for certain but could be the house known as Pennerley House about 130 yards south east of the main reservoir. 1890 list states that the house has three bedrooms, kitchen, parlour, and back kitchen.

129. Reservoirs not shown on either list but shown on the OS Maps. In item 9 the water is stated to be 'pumped' 220 yd from 'shaft to pool'. The reservoir is about this distance, from the shaft in an easterly direction.

130. Weighbridge

Both lists include a weighing machine to weigh 4-5 tons. The 1902 list places this at Blands Shaft and a suitable building is shown next to the track north of the engine house.

131. Small buildings

These are shown on the O.S. Maps on the tip 70 yards east of engine shaft, there are also two shown near the road, at the north east corner of the main site near to Pennerley Post Office. One of these two could possibly have been a weighbridge.

132. Unlocated items

- 1 large winch double power.
- 2 skips and 2 old skips.
- Lot of oak timber.
- 50 fthm off 16in pumps.

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