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HOLMAN MUSEUM CATALOGUE

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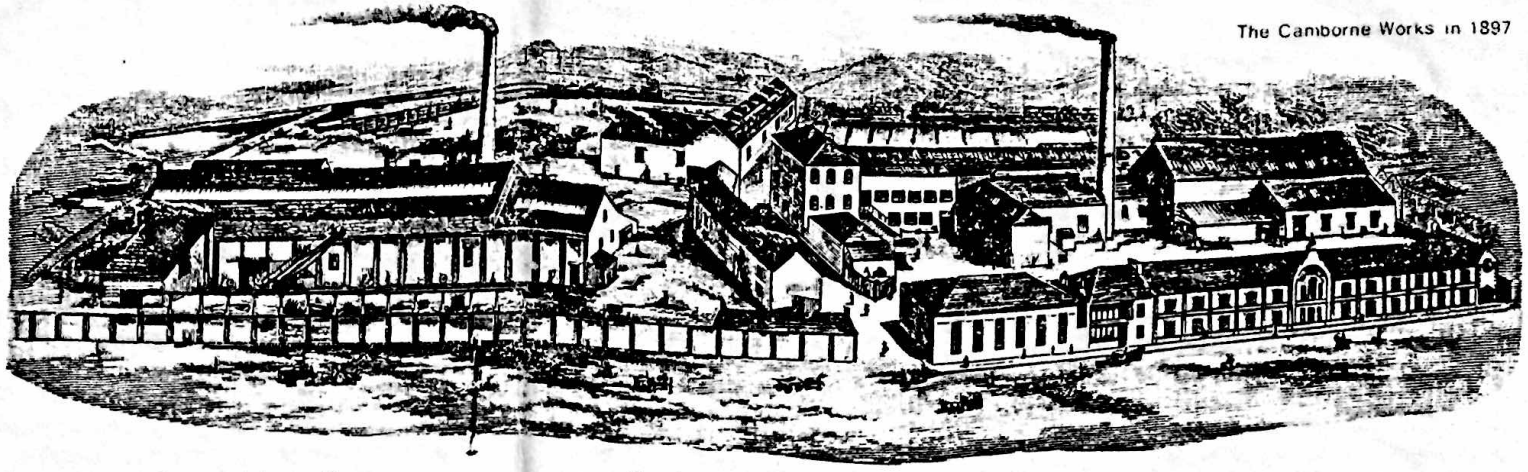
MUSEUM EXHIBITS

1. The first Holman rock drill 1881. Weight 280 lb.
2. Holman tappet valve drill - 1882. Weight 260 lb.
3. Holman 3¼ in reciprocating air valve drill - 1902. Weight 320 lb.
4. Holman Holbro drifter drill - 1924. The first Holman machine with independent rotation.
5. MacDermott and Glover patent percussive rock perforator circa 1860.
6. Doering rock drill made in Germany in 1867. Steam operated, it is believed to be one of the first rock drills to be used in Cornish mines.
7. Early Loam rock drill - 1870.
8. Stoper leg drill attachment.
9. Holman automatic feed 'Newmatic' drifter drill - 1934.
10. Holman SL11A sinker with Australian type retainer - 1928.
11. Holman SL240 drifter mounted on a hand feed cradle.
12. Holman SL280 drifter with automatic rocker type feed screw - 1935. This was an experimental machine.
13. Holman SL106 sinker - 1927.
14. Konomax rock drill - 1920. African designed and produced but never went into full production.
15. Sectionalised Holman 2¾ in reciprocating air valve rock drill - 1915.
16. Holman 402R screw feed Rotodrill - 1940.
17. Holman Dryductor drill. The first ever rock drill for dustless drilling - 1949/50.
18. Holman Baby rock drill - 1906.
19. Holman SL14 Streamline drifter - 1929.
20. Holman VR3 Vole hammer for down-the-hole drilling using 3¼ in and 3½ in drilling bits.
21. Holman 2 in reciprocating rock drills. These are the actual prize winning machines used in a South African stope drilling contest in 1909/10.
22. Holman 30 Pounder drill. One of a popular range of light hand drills manufactured in the early 1920's.
23. Holman SL9 Handril and Handyleg - 1926. A forerunner of the present airleg mounted machines.
24. Holman SL11 drifter - 1925. One of the first small drifters made.
25. Holman SL8 hand drill - 1928. First in the range of small streamlined machines.
26. Holman AFW2 hand rotation stoper - 1919. Designed for drilling at or near vertical, this machine became known as the 'widow-maker' because of the dust falling about the operator from above. This he breathed into his lungs and invariably it lead to him developing the dreaded miners disease silicosis from which hundreds of Cornishmen died.
27. Holman AFW2 stoper with automatic rotation - 1922.
28. Holman SL12 sinker - 1928. Fitted with a sprung handle to help absorb vibration.
29. Holman SL9 hand drill - 1928. An extremely popular machine of which over 18,000 were produced.
30. Holman WLC hand drill - 1924. One of the first machines to be produced in South Africa under licence. It was also the last machine made with a side mounted valve.
31. Weatherley water spray - late 19th Century. Introduced to spray water onto the rock face at the point of drilling in order to allay the silica dust. Whilst not fully effective it was a positive step forward in reducing the dust hazard.
32. Holman PV160 drifter - 1925. Another extremely popular machine.
33. Holman PV40 hand drill - 1923. A useful lightweight drill.
34. Golden Arrow stoper.
35. Coal boring machine. Believed to have been made by the Hardy Patent Pick Co. of Sheffield. It was used for boring holes in the roof of stall roads for blasting purposes. This exhibit was presented by a former coal miner Mr.A. G. Hemmings of St. Austell, who purchased the drill in 1910. Miners in those days bought all their own tools including blasting powder.
36. Hand held jumper - 18th Century. In pre-machine times this was a method of drilling vertical holes. The miner would lift the jumper, thrust it down into the rock and turn it at the same time to enable a round hole to be obtained. This drill was chisel tipped at each end and allowed the miner to turn ends before the need for re-sharpening.
37. Hand forged drill bit - 19th Century. Found at Scraith Hole, Carshields, Hexham, Northumbria and presented to the museum by Mr. Eric Richardson. These bits were formed by using a 'set' fixed to a stand, when heated the bits were hammered onto the set and then finish-filed before being tempered.
38. Gas turbine components. The parts displayed are the main assemblies and some associated parts of an experimental prototype gas turbine air compressor set. The unit was designed as a small, highly portable package weighing less than a ton and producing 1000 ft ^{3}/min free air at 100 lbf/in ^{2}. This prototype was built and underwent a programme of development testing in the late 1950's, completing over 1000 hours running time. At the time of its inception, small gas turbines promised to be a viable proposition but, although development proceeded satisfactorily, the project was dropped for commercial reasons before reaching the production stage.
39. Sectionalised Holman 620 submersible pump - 1935.
40. Holman vertical steam engine - 1870. Believed to be one of the first engines of its type to drive machine tools. It was used in the main Holman production shop where its power was transmitted

Holman Baby rock drill. Item No. 18

by means of a belt drive around its flywheel, on to an overhead 'lay-shaft' system of small individual belt drives to each machine.

41. Holman stretcher bar hoist - 1910. Steam or air driven twin 3 in x 5 in cylinders provide the power for hauling up mining equipment in the 'winze'. To lower equipment the drum was disengaged from the cylinder by means of a simple horizontal lever which, when operated, would slide the small gear wheel along its key or the main drive shaft. It would then disengage from the gear toothed winding drum and allow the weight of the load to lower itself to the level below, a hand brake being used to regulate the speed of descent. A 'winze' is a small shaft, separate from the main shaft, connecting one level with another.
42. Holman 5 in x 7 in twin cylinder reversible steam or air hoist - 1910. This hoist was one of a range designed for working on the surface of mines and in quarries, foundries and ships.
43. Holman horizontal steam driven air compressor - 1894, known as the 'Cornish Compressor'. The two cylinders - one to provide the steam pressure to drive the crankshaft, the other being a double acting air compressor - were mounted on a cast iron bed which formed the air receiver. Each connecting rod joined to the horizontally opposed crankshaft which provided maximum steam pressure at the time of maximum air compression. Air was drawn into the compression cylinder by means of two small spring loaded valves, situated at each end of the cylinder. With the piston working in either direction it meant that as air was being drawn into the cylinder on one side it would, on its other face, be compressing the air that had been drawn in on the previous stroke before passing it into the receiver. Working at 100/150 rev/min it produced air pressures of from 40 to 80 lbf/in^2
44. The Rostowrack Rotative Cornish Beam Engine. One of eight similar engines built by William West of St. Blazey in 1851, it has a cylinder diameter of 22 in with a 6 ft stroke and a maximum speed of 22 rev/min. Incorporated in its design is Watts separate condenser. The beam, or 'bob', as it was often referred to, weighs 3 tons 12 cwt, the connecting rod or 'sweep' rod weighs 3 tons and the 16 ft diameter fly-wheel weighs 2 tons 8 cwt. This engine began its working life in 1851 in a slate quarry near Launceston, North Cornwall, where it spent 9 years pumping water from the quarry. It was then moved to the Rostowrack china clay pit where it worked for 91 years pumping clay and water slurry from a depth of 300 ft at a rate of about 400 gallons per minute, working on a steam pressure of between 35 and 65 lbf/in^2. It was 'retired' in 1952, dismantled and re-assembled at the Holman premises. Still in fine working order the engine now runs off compressed air and can be seen working by special arrangement with the Curator. In 1971 its ownership was passed onto the National Trust to ensure its preservation for it is now believed to be the last engine of its kind in the world.
45. Morgan's Patent Traversing Winching Engine - 1898 (model 6 to 1 scale). Henry Morgan, Chief Designer for Holman Brothers in 1898, designed the original engine for winding duties in somewhat unusual circumstances. It was installed at the Dolcoath Mine in Camborne working on William's Shaft or New Shaft as it was known, which was situated on the side of a steep hill. Having a depth of 3000 ft, it was at that time the deepest tin mine in the world and was cylindrical in shape and brick lined from top to bottom. The engine, weighing 120 tons with a winding drum 21 ft in length and 10 ft in diameter, was mounted on a four wheeled rail bogey at each of its corners. From a worm drive at each end of the drum a drive was taken to racks at both the front and rear of the engine and through this arrangement one rotation of the drum would result in the entire engine being traversed along the rails the exact width of the rope. This allowed the winding rope to maintain continuous alignment with its two sheaf wheels on top of the mine headgear. Because of technical difficulties in scaling down this model, it does not completely conform to the original machine. It does, however, clearly demonstrate the principle of the traversing engine.
46. Holman pneumatic 'Newgrip' drill steel sharpener - 1930. This early drill sharpener was designed primarily to meet an increasing demand by small enterprises where capital was limited. Its low air consumption and negligible upkeep costs made it ideal for the small smithy. This was a much needed piece of equipment in the smith's shop where the old forged type bits were in constant need of resharpening when drilling in hard rock. The eventual introduction of tungsten carbide tipped bits, in the mid 40's, was to increase the drilling life enormously.
47. Holman portable petrol driven air compressor - 1926. The smallest of a range of five portable compressors, producing 82 to 400 ft^3/min at 80 lbf/in^2, it was given to the museum by Consolidated Roadstone Limited after a 30 year working life having clocked up an estimated 150,000 hours actual running time. It is a vertical, two cylinder, totally enclosed, single acting type. The twin cylinders are cast in one block and have



The Camborne Works in 1897

cranks set at 180°. In the compressor there is one large outlet valve situated in the cylinder cover and one large suction valve fitted in the piston head.

48. This town clock is believed to be over 200 years old. Although its origin is not known records show that it was working in Redruth in 1800 and continued to do so until 1904 when it was removed and taken to St. Day where it worked until 1948. It was then decided to put it into retirement as some of the parts were too worn for it to continue as a good time-keeper. The clock was given to the museum by the local Council.
49. Bell from Ting Tang Mine - 1844. This 2 cwt bell was cast at William's Perran Foundry, Perran-ar-Worthal in 1844 for the Ting Tang Mine. This was a copper mine situated about a quarter of a mile from Carharrack and is famous as being the second mine in Cornwall at which James Watt erected one of his pumping engines in 1777.
50. Mine director's carriage. This was one of the first passenger carriages to run on rails in Cornwall. In about 1800 it was used by the directors of the United Mines, Scorrier to run between Scorrier and the port of Portreath, a distance of about four miles. It is interesting to note that the carriage sports an early form of independent suspension - the bodywork being suspended at each corner by a four link chain. The line it travelled on was known as the Portreath-Poldice railway and used horse drawn carriages to convey tin from the local mines to Portreath for shipment to South Wales for smelting. On the return journey they brought back coal to the mines for fuelling the Cornish beam engines. These carriages ran on flanged rails which were attached by a single pin, to stone sleepers on 'setts'.
51. Trolley made and used at the United Mines, Gwennap in about 1850. This trolley, plus a metal carrying container, would have been used on the surface of mines by the 'Bal' maidens and young boys. One of its uses was to convey small broken rock to the stamps for crushing. Although men were employed to break larger rocks, the breaking of smaller pieces known as 'spalling' was done by the 'Bal' maidens using a small sledge hammer. Trolley on loan from Mr. L. J. Bullen.
52. Barlow rail. On display are two sections of early West Cornwall Railway rail. This type of rail was first used in about 1850.
53. This piece of rail was uncovered in Trelowarren Street, Camborne in 1973 during road work improvements. It was part of the Camborne to Redruth passenger tram car line which ran from Commercial Square, Camborne along the present A30 road to West End, Redruth. There were also mineral branch lines to Tolvaddon Mill, East Pool and Agar mines. The service started in 1902 and passenger traffic ended in 1927, mineral traffic continued to 1934.
54. John Holman's Cornish Range or 'slab' - circa 1870/90. It features an iron kettle, box and flat irons. Also there is a 'grizzler' for cooking meat over the open fire. The trough-like framework collected most of the juices and fat from the meat and it then drained into the receptical at the base of the handle.
55. Model of 80 in Cornish Beam Engine, built by Mr.R.F.W.Jarvis of High Wycombe. The late Mr. Treve Holman provided Mr. Jarvis with drawings of an original Cornish engine, and after scaling these plans, Mr. Jarvis made the necessary patterns. The parts were cast in a small local factory near his home in Buckinghamshire. All the intricate machining was done in his spare time using specially made jigs and tools to ensure that everything was strictly to scale - 1 in to 1 ft. Three years of labour earned its just reward when the model won the Silver Medal, New York Society of Model Engineers Prize, and the Ferguson Prize at the Model Engine Exhibition held in London during August 1951.
56. Mr.F.D.Woodhall's beautifully made models, of very fine detail, show a Cornish pumping engine, Cornish rotative winding engine of 'whim' as they are known in the county, and the Cornish 'fire' stamps. They give a realistic picture of the use of steam power in our local mines over more than two centuries of mining history.
57. Cornish 'fire' stamps. This particular model clearly demonstrates the principle of the stamps. The rotating wooden drum has protruding cams which engage with the stamp lifters to raise the stamp heads one after the other. When the cam slips the lifter, the weight of the stamp head (about 6 cwt) falls onto the rock being fed into it from the storage hoppers. This action crushed the tin bearing ore into a fine aggregate thus allowing the tin to be separated from the waste. Stamp heads were usually arranged in multiples of four, and the word 'fire' denotes the difference between the early water wheel driven

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stamps and the later boiler fired Cornish engine driven stamps.

58. Model of Wheal Treasure, Silverwell, Truro. Last worked before 1914. The shaft upon which this model is based was sunk to a depth of 20 fathoms. The adit was 5 fathoms deep, there were two working levels at 10 and 20 fathoms, and a bucket lift pumped to adit. The original engine, built by Bartle's Foundry in 1870 was a combined pump and winder, the winding drum was operated by a dog clutch for hoisting and the kibble was lowered by disengaging the clutch and using the brake for controlling the speed of descent.
For economy of space the detail in the shaft represents the top section to adit, and the bottom section to the lowest level and sump.
This model was made by the late Mr. W. H. Newton and the surface and underground setting by Mr. L. J. Bullen.

59. This model of Trevithick's engine and boiler is of the high pressure type patented by Richard Trevithick and Andrew Vivian of Cornwall in 1802. The boiler was of cast iron, the back end is dished and the front end is flanged to allow the wrought iron front to be bolted on. To this is riveted the return horse-shoe shaped flue, one end accommodates the grate and the other leg is tapered and joins the chimney. On top of the boiler is a lever safety valve, the pressure being limited to 50 lbf/in². Steam from the boiler is led to a hand adjusted valve in the valve chest of the steam cylinder which is sunk in the boiler. Steam is admitted to the cylinder by a four-way cock, worked by a tappet from the cross-head. Two connecting rods from the cross-head drive the cast iron crankshaft below the boiler. The cylinder is 6.37 in bore by 30.5 in stroke, the exhaust steam passes out through a Trevithick pipe feed-heater. The flywheel is 9 ft in diameter, at 50 rev/min and 50 lbf/in² the power developed was in the region of 7½ h.p. Power was probably taken off by a spur-wheel on the crank-shaft.

60. The Man Engine. The increasing depths of mines in Germany and Cornwall in the early decades of the 19th Century resulted in a serious decline in the health of the miners who had to climb, in some cases, nearly 2000 ft vertically after their days work. In 1835 a German engineer named Norell hit on the idea of utilising the twin pump rods in a deep shaft as a means of lowering and raising men by fitting platforms for them to ride on. The plan was successful and, adopted for general use. Plans for the apparatus were brought to Cornwall and the principle was used at Tresovean Mine in 1842 and another at the United

Mines in 1843, both were of the double rod type as in the German original. In 1852 Capt. Williams Ruckey of Fowey Consols designed a single rod Man engine which he installed at Fowey Consols. The single rod type was less expensive, took less room in the shaft, was considered safer for the miners and had other advantages. By 1862 single rod Man engines had been installed at Levant, Par Consols, Wheal Reeth and Cook's Kitchen and later at Dolcoath and Tincroft.
At Fowey Consols and Cook's Kitchen they were worked by water wheels, in the other mines by steam engines, the standard stroke was 12 ft. However, the use of Man engines in Cornish mines stopped with the tragedy at Levant when, on 20th October 1919, a link pin sheared and the whole rod assembly with men riding on the platforms crashed down the shaft killing 31 miners and seriously injuring a further 60.

61. Holman patent air cushion stamps. This type of stamp was introduced by Holman Brothers in 1903 and the model represents a double head of stamps each with a separate unit. A main design feature was the air cushioning of the piston rods and stems which prevented undue shock and therefore greatly reduced breakage of parts - a common occurrence with its predecessor the Californian stamps. Working at a rate of 130/140 blows per minute a set installed at Dolcoath Mine crushed 27 tons per head a day as against the Californian stamps production rate of 2 tons per head a day. This model, to 1 in scale, was made and presented to this Museum by Mr. C. B. Trewhella of Mylor, Falmouth.

62. Trevithick's Plunger Pole Pump and Hydraulic Engine. This water powered engine was first introduced by Trevithick in 1797. In many places water was cheap and plentiful, thus water power was used to pump water. The 'Pole' acted as a piston to which the pump rods were connected by a cross-head. Several such engines were used in the mines of Cornwall. One hydraulic engine installed in Derbyshire in 1803 had a piston diameter of 25 in and with 75 lbf/in² water pressure it gave a thrust of 16 tons. Since it was double acting it developed twice the power of the great 63 in Watt engine at Dolcoath Mine.

63. Trevithick's Steam Pole Pressure Engine. This engine similar in principle to Trevithick's hydraulic pump, was designed to work on high pressure steam. At this time high pressure steam was very much on the mind of Trevithick and in 1812 such an engine was erected at Wheal Prosper in the Parish of Gwithian.

64. Model table. Among the models of early steam driven engines is a fine working model of a 'Tandem' Mill engine made by the late Mr. Orchard of Newquay, a former Superintendent of the Boiler Makers shop at Devonport Dockyard. Two rotative beam engines, whilst not of Cornish principle, do incorporate Watts' 'Parallel Motion'. An early Road Locomotive, previously owned by the late Mr. Treve Holman's father and believed to have been imported from Germany in kit

form. Maudslay's 'Table' engine of 1807 also used in many of the mines throughout the world. An 'Oscillating' cylinder engine and vertical and horizontal Stewart engines.

65. Roseworthy Hammer Mills. This water wheel driven 'Tilt Hammer' was used for the making of the Cornish Vanning shovel which was used in tin mines for separating tin and other metals from the waste rock. Presented by King Edward Mine of the Camborne School of Mines.
66. Hand cut files - 1837. These 5 ft files were used at Hayle Foundry and presented to Holman Brothers in 1900. They were made by the firm of Johnson Cammel & Co. Ltd. between 1837 and 1855. The steel is undoubtedly genuine crucible cast, the forging, grinding and cutting operations were all carried out by hand. The heating for hardening would be by a bellows forge and the flies would be finally quenched in brine.
67. Flat wire rope from Silver King, Silver Lead and Gold Mines, Park City, Utah, U.S.A. The shaft is of three compartments, timbered depth is 1300 ft. The flat rope winds up on a drum like a cinema film spool, the cages are single decked and as the circumference of the drum with the cage at the top of the shaft is much greater than when the cage is at the bottom, the cages would be moved unequal distances when changing decks. Cornish miners worked in all these mines where their technical knowledge of mining was in great demand. The Silver King Mine stands at an elevation of over 8000 ft above sea level.
68. Flat winding rope from the Snailbeach Lead Mines, Shropshire.
69. Elephants tooth - circa 1850/70. Recovered from foundation rubble used in the construction of the Heat Treatment Department. Holman Brothers Limited. This rubble was obtained from mine spoil heaps at United Downs Carharrack, Redruth.
70. Clanney safety lamp. Invented by Dr. W. Reid Clanney (1776 - 1850). This lamp, invented about the same time as those of Davey and Stephenson, had a glass cylinder substituted for the lower portion of the wire gauze as with the Davey lamp. The air for supplying the flame entered at the bottom of the gauze and passed down the inside of the glass protecting the latter to some extent from becoming overheated. As a large amount of light was lost by absorption in the glass where was no great advantage over the ordinary Davey lamp to compensate for the extra weight and cost, especially as the safety property of the lamp depended on the glass cylinder which could be readily broken when subject to the ordinary accidents of work.
71. 19th Century engineers calipers, found at Hayle Foundry.
72. A Count House candle snuffer.
73. Cornish miners candle holder.
74. Model of Blacksmiths anvil made from 3 in diameter steel bar - 1920.
75. Early low pressure steam boiler.
76. Set of wooden Cornish miners tools in glass bottle.
77. Models of 'Cornish Double Beat or Equilibrium Valves'.
78. 18th Century steel tipped drills. The drills or 'Boyers' as they were called in Cornwall were, prior to about 1850, always of iron with steel tips welded in to form the cutting edge.
79. 19th Century Vernier measuring scale.
80. 19th Century Cornish miners pick, hammer and chisels.
81. Cornish miners helmet and candles or 'dips'.
82. Tin concentrates,
83. Polish miners inspection pick.
84. Ukranian Underground Mine Manager's inspection pick.
85. Water suction pump - circa 1850.
86. Model of horse whim.
87. Model of tin sack packer.
88. Display cases contain geological specimens of metallic minerals and rocks from Cornwall and many other parts of the world.
89. The Holman works played a full part in the Second World War effort, and one of the more unique items to be developed and manufactured at Camborne was the Holman Projector. This was made for the Admiralty and installed on coastal shipping for use as a defence against low flying aircraft. The operation was similar to that of a mortar in that the projectile would fire itself on being dropped down the barrel. Three versions were produced, the Mk.I used compressed air as the means of propulsion, the Mk.II was fired by steam pressure fed from the ship's boilers and the Mk.III was operated by a cordite cartridge. This latter model was also used for flare throwing at sea and the firing of 10 lb depth charges against one-man submarines. Incidentally, the damage sustained by one of the Projectors on view was not a result of any malfunction, but caused by flying shrapnel whilst the ship was under attack.

SOME MINING TERMS

BOREHOLE (FOR PROSPECTING): A small diameter hole drilled to intersect the reef (mineral bearing rock), either from the surface or a development tunnel underground. The drill is so constructed as to cut a cylinder of rock (the 'core') which can afterwards be geologically examined and assayed.

CEMENTATION: Injecting a thin slurry of water and cement at high pressure into rock through which a shaft is to be sunk (or a tunnel driven) in order to seal off any water-bearing fissures which may be met.

CROSSCUT: A level tunnel driven in 'country rock' (waste rock). A crosscut is most frequently driven towards mineral-bearing rock in order to open that rock up.

DEVELOPMENT (TUNNELLING): The work done in a mine to explore an orebody and to prepare it for exploitation.

DEVELOPMENT FOOTAGE: The amount of tunnelling accomplished, as measured in linear feet.

DIP: The layer of mineral-bearing rock (reef) lies at an angle to the horizontal. This angle is called its dip.

DRIVE: A horizontal tunnel, usually on the plane of the roof or just below it.

FACE: The surface of rock exposed