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ALDERLEY EDGE MINES.

*Photos : F. M. Jones.*

West Mine.

*The Sphinx.*



Wood Mine.

*Rabbit Covers.*



Wood Mine.

*Main Chamber.*



# ALDERLEY EDGE MINES

Cheshire.

By ROLAND A. PAXTON

Commencing at Macclesfield, a ridge continues in a gradual ascent until it reaches Alderley, five miles to the north. There it terminates in the arresting and spectacular Edge, which is a landmark for miles around, and from which a most impressive view of the Cheshire Plain is obtained. "The whole prospect" says Bakewell in 1810, "comprises a panorama of extensive and varied majesty which can scarcely be equalled in the kingdom". This escarpment was originally due to an upheaval of the red rock along the line of a double fault trending E.W. and N.S. It ends in a steep cliff of conglomerates and variegated sandstone.

## GEOLOGICAL FEATURES.

The metalliferous rocks belong to the lower Keuper beds of the triassic sandstone. These beds are divisible into three classifications, the highest consisting of soft sandstone of varying hues; the intermediate of heavy marls; and the lowest containing marls, sandstones and conglomerates. A survey of the lower Keuper beds of the neighbourhood was made by the late Professor E. Hull, and the following classification and estimated thickness of the beds is taken from his Memoirs.

	ft.
(1) Waterstones. Flaggy micaceous brown sandstones.	150
(2) White and brown freestones (for building)	100
(3) Soft white, yellow or red sandstone	100
(4) White and reddish conglomerate	<u>100</u>
Thickness about	<u>450</u>

The ores of the West Mine occur in No.3. of the above, and those of the Wood Mine in No.4. The conglomerates are also worked at Engine Vein and Mottram St. Andrew.

There has been considerable dissension amongst geologists as to the mode of formation of the cupiferous deposits in this sandstone. Many varying theories having been advanced. These theories can be separated into two categories, one suggesting a subsequent infusion of the metalliferous components and the other of a contemporaneous deposition. Occuring under the former, there are deposits in the German Kupferschiefer which closely resemble those at Alderley, which some believe to have formed in a similar manner. In his book "Copper Mines of the World", Weed indicates that this breccia was due to a chemical precipitation of the metallic matter in sea water, accompanied by the deposition of clay in closed marine basins. The sea water also held alkaline sulphates which were decomposed by organic matter, and the hydrogen sulphide liberated immediately attacked the metallic sulphates, and precipit



-ated the bases as metallic sulphides. Also the number of fossil fish in the Kupferschiefer led Groddeck to suggest that they were killed by the discharge of cuperiferous springs into the basin, and on their decay liberated sulphides which united with the metals. Neither of these theories appear very convincing - for instance, in the West Mine an example occurs where a band of barren rock is sandwiched between two metalliferous layers. This indicated a period of discontinuance of the intermittent discharges of the Derbyshire Mineral springs, suggesting the rocks were mineralized at the same time as the formation of the rock.

Assuming a contemporaneous deposition, it is possible to imagine that on the Edge we really stand on an old sea shore, with a regular coast line stretching away to the north and south. Pebble beds which have been stirred and whirled about, originally comprised the shore at Alderley and Mottram St. Andrews. When Derbyshire was still in a state of volcanic chaos, mineral springs rising in this region were the cause of the formation of the minerals at Alderley Edge, being carried there by the rivers and deposited on the shore. The rivers also washed the minerals farther afield to the Peckforten Hills where the ore is less frequently found and of poorer quality. Also supporting this theory, some of the faulting is subsequent to the mineralization, such as the formation of the faults separating the deposits at Alderley from those at Mottram St. Andrew, where no remarkable quantities of ore occur. No rocks of igneous origin are known in the triassic sediments of the neighbourhood.

#### PREHISTORIC MINING.

There are some circular pits near Engine Vein from which were mined blue nodules of silicate of copper. These pits appear to have been sunk by ancient miners. Many stone hammers were collected from the region of Engine Vein, either from the bottom of the circular pits, or from the rubbish heaps close by. Many more specimens of these stone hammers were found in the Brynlow workings, which Prof. Boyd-Dawkins suggested probably referred to the Bronze Age. In 1905 an important find was made during excavations by Charles Roeder and F.S.Graves. They unearched the first iron pick ever to be brought to light from the prehistoric mines. This find fixed the period during which the pits were first worked, namely during the Roman occupation of Britain.

In those days the copper ore was broken up with stone hammers then removed with oaken spades, separated, and heaped close to the mine. Lumps of smelted copper were found in a rubbish heap nearby, together with some charcoal remains, pointing clearly to the existence of a hearth. Only a limited quantity of ore can have been obtained from the outcrop at Engine Vein, compared with the prolific findings at the Brynlow Workings, where the largest number of stone hammers was discovered. At about the same time when most of these discoveries were made - 1900 to 1910 approximately - some flint artifacts determined the position of some three Neolithic settlements, at the West Mine, Castle Rock and Engine Vein.

#### PRESENT DAY CONDITIONS.

There are three principal mines, the West Mine, the Wood Mine, and the Engine Vein Mine. Also in the vicinity are many smaller levels and several open cast workings. By far the most extensive of the three is the West Mine, com-



prising several miles of levels and prodigious stopes from which between two and four million cubic feet of rock have been removed.

In the Wood Mine there are about one and half miles of levels and stopes excluding a long level which extended for seven-eighths of a mile, traversing Engine Vein and terminating in an adit at the foot of the Edge below Stormy Point. The workings here contain more surface water, which seeps into the mine, and are of inconsiderable proportions compared with West Mine.

Engine Vein is a large fissure some two hundred feet in length, which has been worked as a deep opencast with several levels. At its north western end some fifty feet below the top of the fissure a tunnel descends into a small system of levels which contain two shafts one eight feet deep and the other sixty. The latter shaft is inclined about sixty degrees to the horizontal, and descends into the passage seven-eighths of a mile long, previously mentioned. It is still possible to descend this shaft and negotiate this wet tunnel in a northerly direction, and emerge at the foot of the Edge a quarter of a mile away. In a southerly direction, towards the Wood Mine, this passage is completely impassible and probably flooded. There are indications visible in the fields at the surface, that the tunnel has collapsed in several places.

#### WEST MINE.

In the West Mine there are three metalliferous beds. Phillips and Lewis gave an account of these which were being worked during the year 1866. They say "the lowest of the three metalliferous beds is sometimes as much as sixty-feet in thickness, but it varies considerably in this respect; it dips at an angle of twelve degrees, and it has been worked downwards for a distance of about 300 fathoms". They must mean along the dip of the slope and not vertically. "Above this, which is known as No 1 bed, lies a seam of clayey sandstone, varying in thickness from one foot to six feet, and upon this rests the metalliferous bed No 2 which is eighteen feet thick and covered with about twelve feet of red clayey sandstone. Above this sandstone is bed No 3 also eighteen feet in thickness, but which has not been extensively worked".

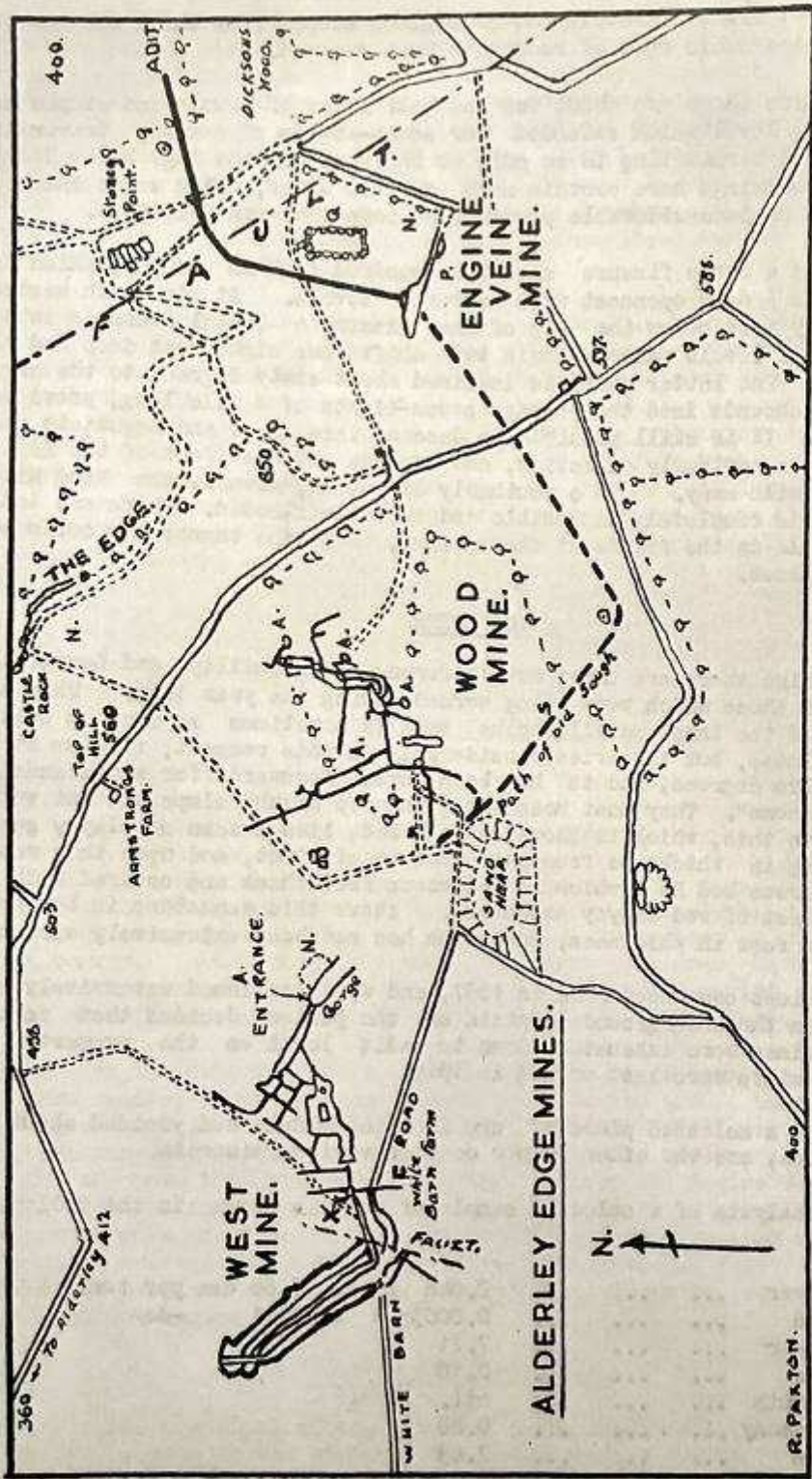
Mining operations commenced here in 1857, and were continued extensively until 1877, when the underground captain of the period decided that in his opinion the mines were exhausted down to adit level on the property in lease. The mines were last worked in 1915.

An analysis of a selected piece of ore from the middle bed yielded about 80 per cent silica, and the other 20 per cent of various minerals.

An accurate analysis of a selected sample of rock is shown in the following table:

Silver	...	...	...	0.048	= to 15.68	ozs per ton.
Gold	...	...	...	0.00035	= to 0.11	-do-
Copper	...	...	...	7.21		
Lead	...	...	...	0.18		
Bismuth	...	...	...	nil.		
Antimony	...	...	...	0.08		
Iron	...	...	...	2.49		





NOTES ON PLAN OF WOOD MINE.

The mine was last worked during the 18th century. All the  
 entrances to the mine are on the east side of the property and  
 as far as is known no work has been done by  
 the authorities.

LEGEND. ALDERLEY EDGE MINES.

- N. Neolithic Settlement.
- Q. Old Quarry.
- P. Prehistoric opencast pits.
- X. Plank Shaft.

The level is shown to a depth of 5/8 inches.  
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NOTES ON PLAN OF WOOD MINE.

The mine was last worked during the 1914/18 war. All the entrances to the mine are on National Trust property and so far no serious attempt to close them has been made by the Authorities.

The average height of the levels for the whole mine is between six and seven feet.

At the surface, the elevation of the Main Entrance is about 560 ft above sea level. At the point A at the end of the Sewer 510 ft. The marsh above the Blue Lake is 495 ft. The average depth of the mine is 40 ft below the surface or a little less.

o to f. The level is flooded to a depth of 6/9 inches.

zz. Twenty-five foot chimney dropping to lower level at A.

Two Poles Shaft. This ascends vertically 20' to small hole.

The Sewer. Normally flooded to a depth of 6/9 inches.

The Window. A small ledge from the passage at A, this over-looks B. Drop 10 ft.

The Mousehole. A small tunnel joining two levels. Vertical drop 8 ft.

Rabbit Caverns. A large stope from which between 10 and 15 thousand cubic feet of material has been mined.

Blue Lake. Flooded stope. In places water 10 ft deep.

v. Collapsed shaft. Used to extend from v to y.

s. The end of this level is blocked by a fall of clay but it has been determined that this was the level that connected with the Engine Vein. The approximate direction of this level has been plotted on the area plan.

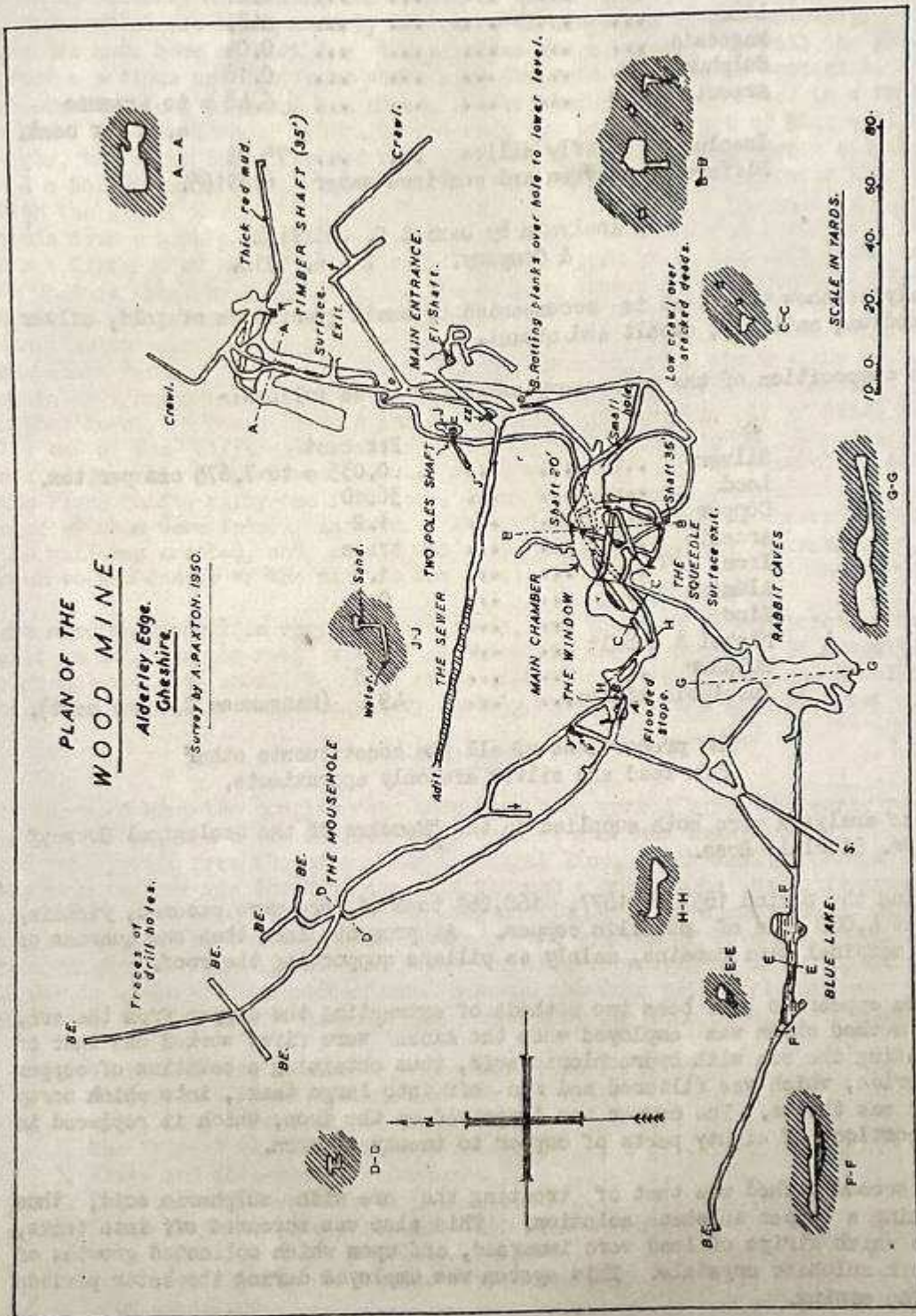
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# PLAN OF THE WOOD MINE.

Alderley Edge,  
Cheshire.

Survey by A. PAXTON, 1850.



SCALE IN YARDS.

0 20 40 60 80



Alumina	...	...	...	...	0.37
Zinc	...	...	...	...	0.07
Lime	...	...	...	...	nil.
Magnesia	...	...	...	...	0.04
Sulphur	...	...	...	...	0.18
Arsenic Oxide	...	...	...	...	6.48 = to Arsenic 4.23 per cent.
Insoluble, chiefly silica	...	...	...	...	75.96
Difference. Oxygen and combined water	...	...	...	...	6.89165.

Analysis by Daniel C. Griffith  
& Company. 21. 6. 1918.

Analyses show that lead is accompanied by small quantities of gold, silver, vanadium, antimony, cobalt and nickel.

The composition of the rock carrying galena is as follows:-

	Per cent
Silver	... 0.035 = to 7.675 ozs per ton.
Lead	... 36.10
Copper	... 1.2
Arsenic	... trace
Iron	... 1.6
Alumina	... 0.7
Zinc	... 0.7
Nickel & Cobalt	... 0.1
Sulphur	... 8.5
Insoluble silica...	... 49.0 (Manganese 0.1 per cent).

The proportions of all the constituents other than lead and silver are only approximate.

These analyses were both supplied to the "Memoirs of the Geological Survey" by Dr. Sinclair Ross.

During the period 1857 to 1877, 168,269 tons of ore were removed, yielding about 4,000 tons of metallic copper. At present, less than one quarter of the original mine remains, mainly as pillars supporting the roof.

There appear to have been two methods of extracting the copper from the ore. The method which was employed when the mines were first worked was that of treating the ore with hydrochloric acid, thus obtaining a solution of copper chloride, which was filtered and run off into large tanks, into which scrap iron was thrown. The copper was deposited on the iron, which it replaced in proportions of eighty parts of copper to twenty of iron.

The second method was that of treating the ore with sulphuric acid, thus forming a copper sulphate solution. This also was screened off into tanks, into which strips of lead were immersed, and upon which collected growths of copper sulphate crystals. This system was employed during the later periods of the mining.

The rock carrying galena was separated by crushing and washing and the galena averaged between 30% and 40% of the rock mined.



A prospective visitor approaching the West Mine would note a gorge running in a north-westerly direction, the sides of which are very sandy, due to the efforts which are being made by the owner to close the mine completely. Bull-dozers have been at work for the past two years, trying to fill the gorge. After a serious accident some years ago, the main entrance to West Mine, some twenty-five feet high and ten broad, was bricked up and concreted to a thickness of fifteen inches. There is now only the top five feet of this wall visible, the other being covered with sand. Some enterprising person has blasted a hole in this wall, through which it is still possible to enter the mine with the aid of a rope. On reaching the mine floor below the wall, one proceeds down a wide passage some forty feet high, and in places forty feet wide for a distance of about fifty yards. Here a passage to the left leads down to what is known as Palm Beach and the Sphinx. From here we proceed via Plank Shaft to the Chain - this is the name given to the portion of the inclined shaft which connects all the various levels at the fault, to the west of Whitebarn Farm. Here this fault throws down the beds about sixty feet. A chain here helps the explorer to pull himself up the inclined shaft to the higher level. Now we have a choice of three main stopes, all of which follow one of the different metalliferous beds earlier mentioned. These stopes are of gigantic proportions and well worth visiting. As we return, we cross the Plank Shaft, fifty-one feet deep, down which several people have fallen, some of whom were fatally injured. Most of these accidents occurred before the wall was erected, and access was easy for anybody, and were not due so much to the danger of the mine as the carelessness of the people concerned.

The mine in general is very dry and sandy, and the rock is sufficiently compact to maintain the roof without any kind of extra support. If a visit is contemplated, it should be made at an early date, as with these levelling operations it is probable that very shortly the mines will be sealed for ever

#### WOOD MINE.

In the Wood Mine the conglomerate beds have been worked since the early years in the 1860's, and about 250,000 cubic feet of rock has been mined. The ore was transported from the mine along a mineral line, which used to extend from the main chamber via the drainage adit through a cutting to the mills towards the entrance of Wood Mine. Considerable difficulties were encountered during the survey, due to the congested nature of the systems of levels beneath the main chamber. The complicated nature of this labyrinth of twisting tunnels is due to their various connections between the four principal levels. The following section of the various beds comprising the mine is of interest:

	Feet,
1. White and grey sandstone, cemented irregularly with carbonate of lead, galena and the carbonates of copper, full thickness not known ... ..	12
2. The "First" or "Top" conglomerate... ..	4-5
3. White and pale-yellow sandstones ... ..	4
4. The "Second" conglomerate ... ..	5½
5. Light-grey to white sandstone with some seams of pebbles... ..	4
6. Red clay, the top and bottom few inches grey ... ..	2
7. Grey sandstone ... ..	5
8. The "Third" conglomerate.. ... ..	4-5



	<u>Feet.</u>
9. Red Clay ... ..	1-2
10. Grey sandstone ... ..	8
	plus

Beds 1, 2, 3, 4 and 5, are rich in copper ores; there is some ore in beds 7 and 8, while the basement bed 10 is locally enriched. The other beds are barren.

The mine was surveyed by a system of closed compass traverses and measured with 100 foot tape. The traverse stations for the main levels are marked with white paint, and number about fifty. In some of the subsidiary passages the stations have not been noted. In a more accurate survey under preparation, the closing error of the traverses is about 0.3% of the total length of passage. On the plan, the traverse stations are plotted by rectangular co-ordinates, originating from one major point, which is given a co-ordinate of any convenient value. From the bearings and distances measured, the latitude and departure of the corresponding positions can be calculated thus giving every station a co-ordinate value relating to the original major point. The shapes of the levels are measured by off-sets from lines connecting the traverse points.

The points underground are synchronised with the four surface exits of which a superficial survey has been made.

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A visitor wishing to descend Wood Mine has the choice of four modes of entry. Number One is the Main Entrance which will be found at the south end of the old quarry in Windmill Wood. Inside the main entrance a level branches off to the right, which ends in a chimney twenty-five feet in depth, down which he would have to slide to emerge at the easterly end of exit Number Two, the Sewer. If he wishes, to enter by the Sewer he would find it a rather wet one, as the water would just about cover the top of his boots. Entrance Number Three is Timber Shaft, some one hundred and seventy feet north of the main entrance, which is descended by means of a rope. This is also a dampish mode of entry, as one is liable to get a gentle showerbath from above as the descent is made. The Fourth Entrance does not seem to be very popular. It is called The Squeedle, and is situated some two hundred and eighty feet southwest of the main entrance. It is a small crack at the bottom of a funnel, into which considerable quantities of mud and water collect and ooze down into the mine. All one has to do is to lie in the mud at the entrance of this fissure and allow the mud to lubricate the downward slide. Assuming our visitor to enter by method Number One, we then proceed into Main Chamber, which is a large stope containing two shafts. From there we proceed via the bottom of the Squeedle down to Rabbit Caverns, another large stope, where considerable quantities of ore have been removed. A passage from here leads to Fourways, from which we descend to Blue Lake. As a point of interest, here in our early explorations we decided to try and get beyond the Blue Lake in a search of further levels. We left our clothes behind at "base" and waded into the ice-cold water up to our knees. We kept to the south side of the stope where about two feet under water was a ledge along which we were walking. As we penetrated further along, the ledge began to slide away towards the other side where the water looked to be very deep, but we managed to reach the

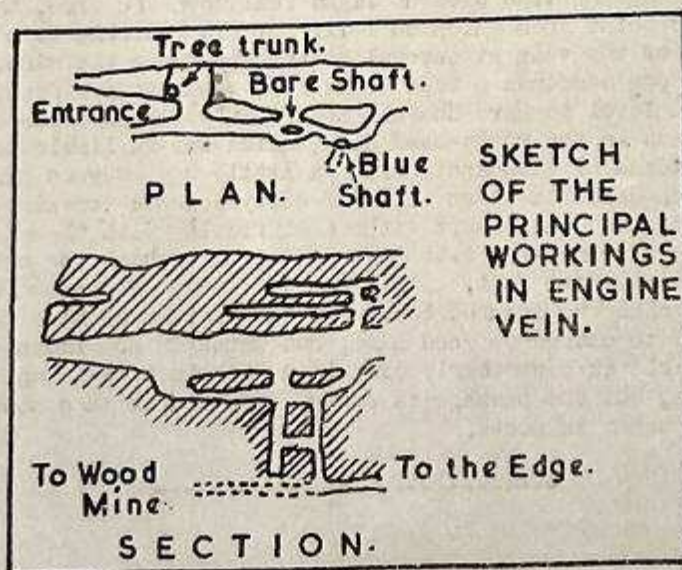


Jetty without incident. From here the water was very deep and we had to swim for about thirty feet till we came to a ledge of rock which was flush with the water level. A little further along we had to wade again until eventually we were splashing along in thick mud. Our excursion ended some minutes later when the floor of the passage became dry and sandy, and took a turn to the left to terminate in a black rock face. We returned to the Jetty and were proceeding back along the ledge when Derek, my companion in this exploration, slid down into deep water and completely disappeared for a second or two, after which he struck out for base with great gusto. There we dried and were very thankful for a cup of hot coffee.

From Blue Lake we returned via Fourways to The Mousehole, a small hole about three feet diameter, through which we squeeze to a lower level some eight feet beneath. We return through the maze of levels beneath the Main Chamber, and eventually find ourselves near Timber Shaft, which is within easy access of the four exits.

#### ENGINE VEIN MINE.

This is the smallest of the three mines, yet probably the oldest, as the old miner sunk pits into the superficial sandstone, where concentrations of ore were visible. Most of these pits were destroyed by the workings of the later miners.



The mine has been worked as a deep open-cast, going down about thirty feet along the line of fault trending east and west, and at an angle of sixty degrees to the horizontal.



The following section is exposed on the south side of this fault in the open -cast:-

	<u>Feet</u>
Yellow sandstone, some copper ore ... .. more than	6
Red clay, with green bands at its base and top ...	1 $\frac{1}{2}$
Conglomerate, some copper ore... ..	6
Dark-red clay, green at its base and top ...	2
Pale yellow sandstone, cupriferous in patches ...	34

I have collected many interesting specimens from these workings, including the following:-

1. Lenticular lumps of high quality galena.
2. Blue nodules of silicate of copper, about the size of small peas, found in the dark red and green clays.
3. Specimens of conglomerate cemented with galena and lead car -bonte.

At both ends of the bottom of this open-cast are levels, the ones at the north end being the larger in extent.

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There has been several accidents by would-be explorers in these mines. The latest to be reported in the press occurred in the Bare Shaft in Engine Vein when a boy entering the mine without light fell down the same, this is fifty feet deep at the point from which he fell. It is possible to scramble down into the bottom of the vein at several points and enter the mine. A short distance inside one descends a tree trunk for about twelve feet, then continues along the level to Bare Shaft. Some ten feet before the shaft itself is a small by-pass on the right-hand side, which one is liable to miss without sufficient means of illumination. A little way beyond Bare Shaft is Blue Shaft, which descends at an angle of sixty degrees for sixty feet. It is possible to descend this shaft without difficulty with the aid of a rope. Half way down is a connection with Bare Shaft, from which the bottom of Bare Shaft is only twenty-five feet. This was the mode of descent by which the rescue party reached the injured boy. At the bottom of Blue Shaft is the level which used to extend to Wood Mine, but which is now impassable. It is however, negotiable in a northerly direction terminating in an adit at the foot of the Edge, but the passage is contracted, and it is necessary to wade through mud and water in parts.

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I am indebted to F.M. Jones for assistance with the survey, also the Memoirs of the Geological Survey which contributed to some of the information and the Tables quoted.