ECTON MINES.

By NELLIE KIRKHAM.

ECTON HILL is one of the border places, like the rest of the Manifold Valley, and the Axe Edge moorlands, which are topographically akin to Derbyshire, and have nothing in common with the rest of Staffordshire to which the county boundaries assign them. And Ecton Hill and its mines are of close interest to Derbyshire people because of their long association with the Duke of Devonshire, who still holds the mining rights of most of the mines there, and it is always believed that the Crescent at Buxton was built with the profits of Ecton Copper Mine, its cost being generally given as £120,000, and Ecton from 1760-1768 yielded copper worth nearly £57,000. From 1776-1817 the value of the copper was over £677,000, the ore generally yielding 15 per cent. of copper, while in the 1770's ore in Cornwall was only yielding 12 per cent. In 1781 all the Cornish copper mines produced 3,459 tons of copper, while Ecton produced 12 tons weekly. A century later in 1871 the situation was very different, for the yield at Ecton had sunk to one ton of copper a year, although at that time Alderley Edge was yielding 8,600 tons, four more mines their thousands, and others hundreds of tons, and Ecton Mine was the smallest yield in the list.

All who visit the Manifold Valley know this grand hill, with its smooth green sides and rounded summit, where one can walk on a typically lonely bare limestone

hill, looking north and east over similar spacious land, a hill equally fine whether under a blue and white wind-blown sky, or when the rain lashes across horizontally as well as vertically, or when the mist closes down and shuts the hill away from the rest of the country, with so remote an air that one would accept without surprise ' t'Owd Man '—as the centuries-old miner was called—if he walked by in the mist.

Geologically, Ecton Hill is carboniferous limestone in an anticline with its axis running north and south, and an angle of dip varying from 10°-45°. Folding of the rocks occur in many passages, but Dale Lead Mine, on the west side of the river, is the most interesting for contorted strata, and is comparable with the exposure of Apes Tor quarry. In East Ecton Mine, the dip is the same, towards the east.

The stone-walled enclosures on Ecton Hill are large and break its lines very little so that, if we want to imagine the hill in the past, that aspect can be little different, but in other ways, if we go back seventy years, or one hundred and seventy years ago, the scenery in Ecton village itself is changed.

Old miners say that the mines ceased to be worked in 1887, ' Jubilee year,' though one plan has a level dated 1889, but by 1900 all work seems to have been at a standstill. But there still remains a large number of shafts all over the hill, some with wire-and-post fences round a 300 ft. drop, some with stone beehives, others opening in the grass at the walker's feet—like much of Derbyshire, it is not a place to be crossed by the unwary after dark.

Dutchman Level, above the 900 ft. contour, has a great hillock, nearly 100 ft. high, and an entrance with a door. Clayton Level, by the roadside, has a grating in it. The vast hillocks of Deep Ecton Mine on each side of the road below the small village of Ecton were still large a year or two ago, but are now being removed

and utilized for road-working. The limestone quarry to the south is being worked, as also is the unusual and geologically interesting quarry of what are known locally as ' crossleys,' and which is of calcrete, fragments of limestone and shale cemented by percolating limewater.

Down by the river is the flooded opening to Deep Ecton Mine Adit, with an arch with the letters ' R-S ' and the date 1774. Above it little is left now of the Cheese Factory.

The stone barn on the skyline of the north shoulder of the hill, 300 ft. above adit level, is the site of Deep Ecton Engine House, and most of the shaft mouths to the immediate south of this are on Deep Ecton, and there is a level called Salt's Level, and New Level now buried part way up the hillside, which run into Deep Ecton drawing-shaft. ' Deep Ecton ' and ' Old Ecton ' seem to be used rather indiscriminately, but, judging by old plans, confirmed by exploration, Deep Ecton seems to apply to the main shafts and adits of the 18th century, while ' the Old Mine ' is a series of pipe[1] workings from the top of the hill to adit level.

On the hillside, well above Dutchman Level, is the mouth of a pipe-working, wider than a shaft, which drops 60 ft. at approximately 60°, into old workings which connect with Dutchman. I am of the opinion that this is Stone Quarry Mine, as shown on an undated section.

On the east side of the hill, walking it southward on the 1,100 ft. contour, the first large shaft, quite open, wide, with bare rock sides in a large rough patch of ground, is what is still called the ' smoke chimney ' of Clayton, an old worked-out pipe-working which was used as a chimney for the beam-engine pump 420 ft. below. This is unusual, though it has been found in Yorkshire lead mines. Also on various plans, here is

[1] See glossary, p. 80.

marked the Clayton drawing shaft with a horse-engine, or gin,[2] and there is the usual rounded flat space still to be seen, but at the present time there is only one open shaft.

The evidence of a stone drain running up the hillside N.W. suggests that the smoke may have been brought up the side of the drawing shaft. This drain is used as a fox trap. Foxes are driven in, and then small dogs are sent in to get them. A subsidence is really a shaft-mouth arched over and covered with earth. Mr. Gregory suggested that it may have been a balance shaft. But I wonder if it was not the drawing shaft in 1858, for a mine-section shows (1) the engine at adit level,[3] (2) a pipe to surface (i.e. the present smoke-chimney-pipe-working), (3) a drawing shaft here from adit level to surface. In Mr. Gregory's mining days there was no Clayton drawing-shaft.

The next shafts, 450 ft. south of west, below the 1,000 ft. contour, are Chadwick, then Bag shafts, almost 1,000 ft. south of Chadwick; and south again, towards the end of the hill, are the extensive remains of buildings with bricked shafts and gin-circle, which belonged to Waterbank Mine; there never was an engine here. Spread over the hill are the shallower mines of Good Hope, Gregory, Clay, Hamnook, etc.

There have been three drainage adits on the east side, East Ecton, Chadwick, and Waterbank which still exists and has been a draining level, being only 3 ft. 6 ins. high, and about 18 ins. wide, one can creep in to find that it has run-in in about 30 ft.

On the west, a little distance to the south of Clayton adit, is a level with a door, which has a white sticky floor, and a strange smell, and which, for good reason, we named ' Whey Level,' but it is only a trial about 700 ft. long.

[2] See glossary, p. 80.
[3] See glossary, p. 80.

The entrance to East Ecton is closed and buried in private land.

Apes Tor Level, leading to Deep Ecton, is near Apes Tor Quarry. There is a protruding rock with two entrances, half built-up with stone walls, but exploration only reveals a deep water-logged hole. It was from here that a mine-section dated 1858 indicates an aqueduct carrying water into the mine.

There is a working south-south-west of Dutchman not indicated on any plan, which we named ' Fly Mine.'

These mines almost all belong to the Duke of Devonshire and were explored by the kind permission of the Chatsworth Estate Office, who also gave generous access to all the old Ecton plans which they possessed. Mr. Redfern allowed exploration of East Ecton.

On the west bank of the River Manifold is Dale Lead Mine, not belonging to the duke, which has shafts at the top of The Dale. The northernmost of the two levels is a trial which has never gone further than approximately 400 ft., it's entrance is cut in a syncline, and inside is worth examination for the angles into which the rock has been crushed. But the other level, originally made to drain into the Manifold at Dale Bridge, is most interesting from a geological point of view. As mine levels go, it is reasonably safe, except for about 100 ft. of very doubtful roof, and at approximately 800 ft. there has been a fall which practically blocks the way, local informants say that working ceased in the 1880's, and that the last man to work in the mine was brought out dead from under a fall, but one authority gives 1873 for the date of its closing. Here the ore was very rich, the galena being almost solid in a pipe, and was valued at £120 a fathom. An impressive cavern-like pipe can be entered on the left about 400 ft. in, it goes upwards for a good height, but downwards it is a dark pool of water of unknown depth. In another place a short climb-up brings one to a circular chamber

about 40 ft. long and 20 ft. high, its rounded roof enabling one to have the satisfaction of standing in the core of an anticline. The side walls of the main passage are crushed and folded and twisted, anticline jammed into syncline, in most exciting fashion. Along part of the floor of the passage is the remains of drainage troughing. One of the upper levels was so small and tight a crawl that one cannot believe that anyone larger than a boy could have worked it. Glover says that in this mine ore was found in shale, and that there was some copper as well as lead.

The one large house at Ecton, built on a mine hillock, is modern, but the few stone cottages are much older, and are all that remain of what was once a large village. As the immense mine-hillocks on the east side of the road are cleared, remains of buildings appear, and last century plans exist which show a large number of houses and mine-buildings. Old miners can still remember what Ecton looked like sixty or seventy years ago. Then, the hillocks were large and complete on the east of the road, and an overhead railway was carried over the road which then ran between high walls built to hold up the hillock-stuff. The ruins of the loading-chute on the hillside can still be seen, and the hillock-stuff was tipped on the west on the flat ground between the road and the river. At this period there was still a house standing on the west of the road, almost opposite the house still existing on the east of the road.

From the top of the hill, looking down on the hillocks, there can still be seen a faint trace of the position of the buddling pools.[4] Long before these buddling pools were there, at least as early as 1809, water was brought in a channel round the north skirt of the hill from the ' Fish Pond,' called the Reservoir on the old plans, there being only a 6 ft. drop in this distance, but plans seem to show that this water was used at the blast furnace, probably for a water-wheel which worked bellows.

[4] See glossary, p. 80.

Nothing but a few stones are left of the stamps yard,[5] and the blast furnace must have disappeared in quarry workings.

Seventy years ago Ecton engine-house still stood high on the skyline where now there is the solitary barn. The balance-shaft was still there, that is, a shaft down which the weights go while the ore comes up a drawing-shaft. At this period Waterbank Mine had been joined underground by a winze[6] with the southern end of Clayton Mine, but the connection has now run-in. It was only joined up for about a dozen years before work ceased, previously Waterbank Mine had been worked separately and then abandoned.

About £30,000 was spent about 1880 in driving levels and sinking shafts. Ecton Co. Ltd., ' explored and wrought ' pockets from 110-150 fathoms below Manifold Level in Clayton Mine, their lowest workings in the mine being more than 160 fathoms below the adit. A little work was done in Dutchman, but Deep Ecton was not worked.

At the top of the hill, near where the barn is now, the balance shaft, ' like scales ' in the vivid words of a miner, was still in existence, and the capstan was still there near it, and the boys of Ecton used to play with it, winding it round. But the great copper boiler had disappeared.

In 1885 a lease was granted for thirty-one years to two Bowmans of Alport, and among the clauses was a charge of £10 for the use of Clayton Level, also they must keep not less than twenty-five ' able-bodied and efficient miners (unless allowed less by the Agent) ' and during the thirty-one years must expend not less than £15,000 in developing the mines. In 1889 they gave notice that they wished to terminate the lease in 1891.

In 1866 the Ecton Clayton and Waterbank Mining

[5] See glossary, p. 80.
[6] See glossary, p. 80.

Co. were ' in course of winding up voluntarily.' The whole of the mineral royalties of Ecton Hill did not belong to the duke, but part of it was known as ' the Burgoyne Mineral Field.' Among the names of mid-19th-century leases are Leresche, Mather, Blackett, and Bonsall. In 1856 the New Ecton Mining Co. was registered after the liquidation of the Ecton Consolidated Mining Co. and the former was voluntarily wound up in 1865.

In the 1840's and '50's Deep Ecton Mine had reached a depth of 1,380 ft. from the top of the hill, and Clayton 1,260 ft., and this last had a Cornish beam engine for pumping, which was installed at adit level, over 1,000 ft. in. Clayton level only reached as far as Bag; Chadwick level had not as yet been joined to it. Houses, instead of hillocks, existed to the east of the road, and at this time Deep Ecton was in great activity, the great copper boiler was a ' conspicuous object ' on the skyline, the balance shaft was in use, the ore being drawn up in two iron tubs on iron wire, one tub descending as the other ascended, taking four or five minutes to reach the bottom. The 1840's and the 1850's are apparently the only period to mention, or to indicate on mine-sections, a wooden aqueduct which ran from the mouth of the Apes Tor Level ' over the road leading to Hartington ' in order to collect the water of a stream, and convey it down the level 300-400 yards, to the great cavern of Deep Ecton, 300 ft. below the surface of the hill, where a great water-wheel 30 ft in diameter worked the pumps for draining the lower depths, and sent the water out again under the flooring of the adit. The ore was buddled in the river according to one account and smelted at Whiston.

The smelting works at Whiston, near Kingsley, Staffs, were erected in 1770, and enlarged in 1780, the Duke of Devonshire having bought the Hazlecross Estate because of the coal found there. Before that, the ore had been smelted at Denby, near Derby. Ecton copper, in

the early 19th century, was chiefly sold to a Cheadle Brass Company. Authorities differ, but the most reliable one at the beginning of last century holds that Ecton ore was not actually smelted at Cheadle. Miners living to-day can remember strings of horses and carts taking ore from Ecton to Whiston. In the 18th century it was carried by packhorses and mules like the jagger ponies of the Derbyshire lead mines, the carting later was done by Wetton farmers. At one time the wages used to be fetched from Chesterfield, and there is still in existence the old blunderbus which armed the men.

At Whiston there still remain large hillocks of slag, and small pieces of fused ore can be picked up there. I have also picked up similar pieces by the site of Deep Ecton engine house, which is curious as no plan indicates any smelting house there. This is suggestive, for high up here is not unlike the position of the old bole hearths of the lead mines, which might lead to evidence that the Ecton Mines were worked earlier than the earliest proved date of the early 17th century. Tradition says that a smelting mill stood on the site of the cheese factory, and now that it is razed to the foundations, slag and fused metal can be found there.

It seems possible that a system of one-way traffic in copper-carrying took place, as among the plans was a map of 1769, showing two routes, Warslow, Oncote, Ipstones, Frogbole. The other by Wetton Mill, Hillsdale Hall, Winkhill Bridge, Bellyband Grange, Windaway Cross, both going from Ecton to Whiston.

In the first twenty years of the 19th century, there was little difference in the outward features, there were houses and mine buildings on both sides of the road, and, of course, the mines underground were not quite so extensive. Clayton Level stopped short before Bag Mine. There is evidence which seems to show that the water channel for buddling was taken to the entrance of Dutchman Mine, and an undated plan, possibly of this

period, gives full details of a dressing floor just outside the entrance to this level. Now, with this plan in hand, one can trace the foundations and walls of the smith's shop, ore house, jig tubs,[7] engine bed, etc.

In Deep Ecton, the ore was being worked in three vast hollows to the depth of 1,320 ft. below adit level, and was said to be one of the deepest copper mines in Europe. These enormous pipe veins running with the bedding rock and swelling into great caverns filled with ore, in contrast to the more usual vertical rake veins in the limestone of Derbyshire and Staffordshire lead mines, are called by the Germans, stock-works. The Apes Tor Level was used as the draining sough,[8] and both bucket-pumps and a hydraulic pump were used in the mine. The cottages had little gardens, and there was a carpenter's shop, a cooperage, and a forge, and tradition says that the duke provided a small school for the children there.

Ecton Manor House is at the Wetton end of the Back of Ecton road and has had a varied history, for at one time it was a button factory, and girls worked in the top story and entered by a bridge across from the hillside, and at that time there was a smelting mill there, and the valley was dammed up and made into a lake to provide the water-power. In the early 19th century it was an inn called ' Pippers Inn.' Whoever holds it is lord of the manor.

But the age of greatness of Ecton Mine was the late 18th century, and a long and interesting account exists in the *Gentleman's Magazine* of 1769. Viscount Torrington visited it in 1789 and went as far as the ' water engine which drains the mine.' He describes it as a ' dirty and tedious walk.' At the engine he was ' stunn'd by the noise, and astounded at the body of water: one river flowing above and one below.' Once

[7] See glossary, p. 80.
[8] See glossary, p. 80.

outside the mine again he went to the smelting house and to the crushing floors where children were employed ' in the laborious pounding of the stone, by which hand-work they *may* gain 6d. a day.' Women washed the ore.

The ore was in amazingly rich masses, and the best account of that period which has come to light is the one of 1769. After going along the adit they arrive in the centre where there ' is a spacious lodgment[9] of timber, for landing and receiving the ore from below, which is drawn up by a man at the winch, who generally works naked, and is put into four-wheel waggons that will hold about a ton and a half each. These waggons have cast brass wheels, and are run in grooves thro' the adit, by boys from twelve to fourteen years of age.' When on the lodgment there was a large hollow above, the account says 250 yds. high (which a number of authorities, including the *Geological Memoirs,* repeat) but the height of the hill makes this impossible, the height of the hill above adit level, and old sections, make it approximately 300 ft. ' By the sides of which there is a passage to the summit, but dangerous to attempt, as the timber works seem in a decayed state.' ' Passage ' is hardly the correct word, it is upward-winding worked-out pipes, used as climbing shafts, the present unusually good state of the ladders in parts of it make it certain that they must have been put in during last century. ' The late Duke of Devonshire ventured to this platform, took a cursory view of the works, gave the miners ten guineas to drink.' It is described as ' a horrid gloom ' with ' such rattling of waggons, noise of workmen boring rocks under your feet, such explosions in blasting, and such a dreadful gulph.' Below the platform, i.e. below adit level (which is approximately the level of the Manifold River) the mine went down about 480 ft. through different lodgments, ' by ladders, lobs,[10] and

[9] See glossary, p. 80.
[10] See glossary, p. 80.

cross pieces of timber let into the rocks,' until they reached the working place ' horrible to view as imagination can conceive,' blasting going on ' louder than the loudest thunder,' and at the bottom they stood in a niche, while the miners let off a dozen blasts in quick succession ' by way of welcome to these diabolical mansions.' The writer gives a vivid description of the ' monstrous cavern above, the glimmering light of candles and half suffocating smell of sulphur and gunpowder surrounded by a wall of limestone, with veins of copper ore, spar, pyrites in all colours,' contrasting with the sooty complexions of the miners. The country rock must have been very unshattered as no timber propping was required, and their water difficulties were not great. There were about 50 miners, working six-hour shifts at 2d. an hour, and they are described as a ' merry and jovial set of mortals.'

The Duke of Devonshire had taken over the working of the mines in 1764 when the last lease which he had granted had expired, for twenty-five years previously to that, the old abandoned mines had been re-discovered by a Cornish miner wandering over the hill prospecting for ore, and the duke had then leased them to ' Adventurers from Ashbourne ' who spent £13,000 before they abandoned them. But a second ' set of Adventurers ' took over the lease, and they sank a shaft 200 yds. deep, which would be clear if again we read ft. for yds., 200 ft. bringing them into the open pipes in Deep Ecton above adit level. If it is 200 yds. then they were down below adit level. They drove an adit, which must be Apes Tor Level, as the south adit has the date 1774 it must have been made after the duke took over. These ' Adventurers ' worked the mines at a profit until the lease expired.

The mines were not being worked in 1707, nor were they in 1686, for when Plot was writing in the 1680's the mines had been sufficiently long abandoned for the

workmen to be dispersed so that he was unable to obtain much information. He gives the reason that it was then cheaper to buy ore from Sweden. He says that the mines had been worked by the Duke of Devonshire, Sir Richard Fleetwood, and some Dutchman. He states that they ' broke the rocks with gunpowder.' He says that much of the ore lay so ' near the Day '[11] that it was first found by the plough, and that the veins were 8-50 yds. deep, which means that the mines were not more than 150 ft. deep before then. In *Industries of the Middle Ages,* Salzman, although speaking in particular of the lack of documentary evidence in Cornwall, prior to the 16th century, adds ' it would seem that most of the copper used in mediæval England must have been imported.' Neither Derbyshire nor Staffordshire are among the eight counties mentioned 10 Eliz. in the formation of the ' Corporation of the Society for the Mines Royal ' for the ' grant and care of gold, silver and copper.' Vague statements have been made that Ecton Mines were worked by the Romans, in the same way that very loose statements have been made about Roman lead mines in Derbyshire. Davies states that ' the mines at Ecton . . . cannot be proved to have been opened before the 17th century.'

Barely half-a-dozen out of thirty or so mine plans and sections are dated, although one can approximately date a few more by internal evidence, but one must be very cautious indeed about dating mines except on documentary evidence or actual archæological finds. Generally all one can say is that, by evidence of kind of workmanship, and general appearance, by comparison with other mines, one is ' older ' than another. Tentatively I suggest that Clayton Adit is later than Ecton Deep Adit, the first dated plan on which the former appears is 1818. The opinion that the climbing shaft (' passage to the summit ') of Deep Ecton is far

[11] See glossary, p. 80.

older than the mine at adit level was born out by the later discovery that it is called ' the Old Mine ' on plans. The workings in Clayton which form the smoke chimney are also very much older than Clayton Adit and its passages, so are the workings of Stone Quarry Mine, which I believe are older than the Dutchman Level driven to meet them, but I can see no evidence to prove whether by ' older ' one means 15th century, mediæval, or Roman.

Present day exploration of the mines is exceedingly interesting, although very tantalising, for the vast bell-shaped chambers, some of which are indicated on sections as being 300-400 ft. across, are now under water, and Ecton was famed for the beauty of its specimens of varied copper ores, galena, much pyrites, barytes, some gold, blende, a light-coloured fluor, cave pearls (to be seen in Buxton Museum), and dog-tooth spar covered with copper pyrites, it is said that Paxton got his idea for the Crystal Palace from the beauty of spars taken to Chatsworth from Ecton. Now, in the levels still available—and there are of over 1,000 ft. of levels below water—there are bits of carbonate of copper, gypsum needles in shale, and streaks of calcite, but mainly the levels are drilled through bare limestone, or in worked-out pipes.

Deep Ecton can be entered by a drawing level which runs into the drawing shaft. In about 550 ft. one can stand on the edge of this and peer up to the bright speck of the day, while below it drops more than 100 ft. to the flooded workings below Manifold level. The climbing shaft is close by and can be descended in part by fixing rope-ladders, and in part by using miner's ladders of wood with iron rungs, which descend slantingly from very small wooden platforms. A patch of dark limestone is patterned with white veins of calcite, and a stalagmite flow is tinted a delicate pale green with copper. Just by the short, drilled, horizontal passage

to the climbing shaft, is a dangerous hole almost right across the main passage, this is the top of the great open cavity, dropping a hundred feet or so, with water at the bottom. Stepping gingerly round the narrow edge of the hole, the passage goes on for 500-600 ft., and this cavity must be the ' large hollow over your head,' and the climbing shaft the ' passage to the summit ' at the side of it mentioned in 1769. The more one sees ' t'Owd Man's ' work in old mines, the more one respects him, and in this case he made his climbing shaft in an older worked-out pipe with a wall of rock of several feet thickness between him and the great bell-shaped cavity. A recent experience brought home to us his wisdom, for three cyclists, walking over the hilltop, threw stones down a shaft connected with the top of the cavity, and stones, when they drop 300 ft. from the hill surface, not only gather good force themselves, but also dislodge a few tons of stuff on the way, and when they fall into a submerged shaft 170 fathoms deep, the thunderous noise and the turbulence of the water is an experience not to be forgotten—which none of the party would have lived to remember had they not been in the climbing shaft. Here we are in the part marked as the ' Old Mine.' At the bottom, on adit level, is an underground world of vast cavernous spaces and passages, there were upward shafts, and downward ones filled with water. In one open space, nearly 100 ft. long, there is a well-built mortared wall with ' 1823 ' on it, and much old timber and iron staples, etc., quite probably this was the position of the water-wheel. Some reddish stalactites were seen, and ochre mud, in one place a rake[12] vein crossed a passage, but it had not contained much ore, for, climbing up it, it was not extensive.

Brigadier Glennie and Miss Hazelton visited the mines in 1946 and obtained three species of diptera,

[12] See glossary, p. 80.

Crumomyia nigra Meigen (*Sphaeroceridae*), *Trichocera maculipennis* Meigen and Trichocera regelationis Linnaeus (*Trichoceridae*), including *Trichocera* larvae ; and from a large growth of mycelium in the cavern in Clayton Adit, over 1,000 ft. in, they obtained a beetle, *Lesteva pubescens* Mannerheim (*Staphylinidae*), examples of the mite, *Eugamasus niveus* Wankel (*parasitidae*), and the earthworm *Dendrobaena subrubicunda* Eisen (*Lumbricidae*). That particular day the diptera were not seen at their best—or worst, from the point of view of mere explorers. ' Fly Mine ' in September and October, 1944 was a nightmare, the whole of the walls of the chamber above the second pitch were literally covered with flies, they walked over candles—flame and all—over human faces, hands, caving lights, engendering frantic scratching and much bad language.

In Ecton Deep Adit a water channel had been made in the floor to one side of the passage, and there was a plug valve with timber strutting. There is a tradition at Ecton that there was a place with seats round it which used to be called the men's dining-room, and that a Warslow clergyman used to hold services in the mine not far from the entrance by Deep Adit, and there is certainly a large recessed space there which puzzled us, raised several feet above the floor of the adit.

In East Ecton there is a good deal of calcite formation, part is beautiful with stalactites, and there are some good floor-pools and cave-pearls, and ' paper-thin ' stalagmite. Outside the mouth of the mine a well-built, and unusually large, pumping shaft can be seen. The only level now above water only goes about 300 ft. with a pipe-working rising from it with a rusty miner's chain running up it, but the pipe had to be climbed without it's aid for it crumbled at the touch like biscuit. In a small side passage was some ' skeletonised ' crinoidal limestone, like small ribs sticking out. The strata dips to the east, there are

bands of crumbling black shale and grey clay, and veins of calcite, and reddish-stained stalactites, and geodes lined with calcite crystals, there are no rails now in the level, but there have been, and the first 40 ft. from the entrance are stone-lined and arched in typical fashion like Clayton Adit entrance. A section shows that the pumping shaft and the lower levels (60 fathoms deep) were made after 1873, and the land of East Ecton was called ' in Wheatcroft.'

Clayton Mine is exceedingly interesting and extensive, it being possible to walk approximately three-quarters of a mile into the hill.

The entrance is a typical arched sough, the water, whatever the weather is like, does not seem to vary from about ankle-depth. The level is dead straight, with a few side passages all of which end in blank walls of rock, though a few are worth looking at for the beauty of white calcite flow on the floor. The adit opens into a large cavern where the utmost care is necessary, for what looks at first glance like cavern floor is a great still pool of copper-green water of a great submerged shaft at least 960 ft. deep. The edge of a rotting wood lodgment is slowly disintegrating, but it is possible to walk carefully round the edge, and some white fungus has been found floating in the water. A large hook hangs from the roof, probably for a lamp, and a fine stone-and-mortar built wall with flue door must be the base of the chimney. The late Mr. F. A. Holmes told me that there was a Cornish beam engine installed here, which was ultimately sold for scrap, and in a short passage to the north there is the base of an engine bed, also another in a small side chamber. The adit level is railed but was simultaneously used for draining. When the pump was working, even at great depth, there was not more water than could be dealt with and the flow down the adit was only about what it is now. It is said that at one time the owners of the cheese factory

wanted water and had the idea of pumping it out of Clayton Level by installing a small pumping engine in the great cavern. An engineer went up the adit and tested the timber and prepared the engine bed. He went up the next day—and had a shock—for his timber, and the timber he had been standing on, had disappeared in the water of the sunk shaft.

There is also a local account that when the cheese factory, with Dale Lead Mine, and Ecton Copper Mines, were accused of polluting the river, the cheese factory fixed a pumping apparatus (of which the valves and concrete emplacements remain) in the level we call ' Whey Level ' ' and pumped whey in there—to leave, even to-day, a peculiar smell, and a whitish stickiness underfoot.

Proceeding south along the rails, the first side passage on the left is Chadwick, and a water-filled shaft—of unknown depth, as up-to-date no one has fallen into it—fills the passage from side to side, but if it is crossed by roping-up and ' walking a plank ' there are ' steps ' each 20-30 ft. high, going upward, which are shown on old sections, and which used to have rigid ladders, but now have to be climbed without. If in the old days Chadwick drained into the Fishpond, it now drains inwards and these verticals are soakingly wet waterfalls, guaranteed to turn a soot-covered human form to a peculiar greyness.

At Waterbank end of Clayton adit level there is a winze to Clayton, marked on a plan, but now it has run-in, and all the passages off the adit end in blanks.

But the most interesting place in Clayton is just before the adit reaches the main chamber with the submerged shaft. Here, on the south, is a wooden-framed opening which must have been a ventilating door to make a draught in the smoke-chimney, and here an old pipe-working rises in a series of climbs upwards for about 200 ft. until one is in a small chamber at the bottom of

a shaft too vertical to tackle without pitons which we did not possess. The lower portions of this pipe have not been a smoke-chimney, the soot deposit, from 1 in. to 1 ft. thick, and which turns explorers into niggers, is met with about 150 ft. up, where a downward pipe is believed to connect with the walling in the main chamber, and therefore with the ' fire-engine ' when it was there. This pipe is the only place in the mines where very rotten wooden stemples[13] for climbing were seen. There is an amusing black-and-white effect of white stalagmite flow and wet black soot.

Nearby is another pipe which, after a climb upwards, ends in a blank. Several places in the mines have received unorthodox names, and this was called ' Bill's slide ' as the last member of the party, after the rest had descended, decided to do a voluntary slide downwards, face inwards, for the last 20 ft., emerging without a scratch and explaining that it was quicker and easier than looking for footholds where they hardly existed.

A green trackway above Dutchman, running south above the 1,000 ft. contour, leads to a pipe-working opening to the day, which, as it is unnamed on any plan, we called ' Fly Mine,' a 50 ft. rope where there has once been a fixed ladder takes one down between firm bedding rock as ' lid and sole,'[14] and here is probably the best place of all to see the tilt of the beds to the east in the interior of the hill. A very short passage with deads[15] on the floor leads to a worked pipe, and here again the floor slabs and the roof slope downwards at approximately 40°, and another rope is required although there are remains of a miner's ladder. At the bottom are passages, and a way upwards and a shaft with a short climb-down on a somewhat rusty chain-ladder from

[13] See glossary, p. 80.
[14] See glossary, p. 80.
[15] See glossary, p. 80.

a take-off on a false floor. Below, it opens out promisingly, but a wet climb down disappointingly ends in nothing.

Dutchman Mine is not only interesting in itself, but raises queries and problems relating to mining history. On all old plans this level is marked as Dutchman's, and I think we can accept this without query, also the correctness of Plot's statement in 1686, he says before he ' came into the country ' at Ecton a mine had been abandoned after being worked by ' my lord of Devon himself, Sir Richard Fleetwood, and some Dutchmen.' For reasons given later Watson's statement (1781) is also good evidence, he says German miners were sent for by Prince Rupert to work the copper mines at Ecton.

Higher up the hillside than the entrance to Dutchman Level is the top of an open pipe. ' Stone Quarry Mine ' I believe from its position on an old section. The dip of the Ecton beds can well be seen even from the surface, and down it, even before it was proved by exploration to connect with Dutchman, one could safely be of the opinion that here was one of the older workings on the hill. A 60 ft. climb-down on a rope, then a short stooping narrow passage, with small pieces of ore still in the crumbling walls, brings one to a pipe-working going up and down, exceedingly loose and dangerous. The downward pipe has been explored down to Dutchman Level, but it is steep, body-tight in places, lined with sticky mud and with large loose rocks poised in the mud, it is undoubtedly the most dangerous part we have yet seen in Ecton. As a whole the mines are safe—for old mines — compared for instance with many old Derbyshire lead mines. The levels are mainly drilled through solid rock, the workings themselves are mostly pipes swelling into open spaces with softish crumbly walls, but not dangerous like old rake veins where in narrow rifts ' t'Owd Man ' often stacked his deads for anything from 5-30 ft. above one's head, or in the now dangerous

ginging[16] of narrow climbing shafts of unknown age. There is little stacking in Ecton Mines, though more in Dale Lead Mine. The chief danger in Ecton Mines are the deep shafts, often water-filled, which open without warning in the middle of a passage.

In Stone Quarry Mine, returning to the bottom of the 60 ft. climb back to the day, a short climb-up opposite to the rope leads to passages (in one of which an alarmed bat flapped by our heads) and down another rope-climb to lower workings which come to a dead end.

Here I believe are the old parts of Dutchman, it is possible that they may be even older than the coming of the Dutchmen, but if they were first worked by the latter, they would undoubtedly have driven the level to meet these workings.

Dutchman's Level is an interesting mine to explore, with the added amusement of some hundreds of feet of waist-deep wading in clear very cold water. There are a large amount of cave pearls, a great deal of calcite flow, rises to upper levels, and at one place a cavern with what I believe has been a buddling pool, judging from its puddled appearance. The south-east branch goes to Good Hope Mine, two plans and a section show this, also a proposed link with Bag Mine, but we could not discover that the latter was ever carried out. We have not been able to descend Good Hope from the surface, only to reach it from Dutchman, but I have an idea that probably Good Hope workings are older than the extension of Dutchman's level.

A number of authorities from the present day to the 18th century say that the German drill marks are visible in the level. 'German' and 'Dutch' seem interchangeable in mining records, just as in a certain lead-mining centre in Derbyshire I was told that some years previously a 'nigger' had been working the mines—he turned out to be a European. One has the right to be

[16] See glossary, p. 80.

sceptical of every unproved statement, and these drill marks are of the supposed old kind, very much wider and very long compared with those found in most 18th and 19th century mines, and they mostly occur well in the mine, including more than 1,000 ft. along the south-east branch. Also they are seen at adit level of Deep Ecton, which all the evidence goes to show was late 18th century.

Plot says 'they broke the rocks with gunpowder,' Hunt says it was first used in Mendip mines in 1689, Watson says 1684, and the latter has a long passage, saying he had made enquiries from 'a very able and intelligent person' who had known Ecton for more than 50 years, and that this person stated that he had 'often seen the smith's shop in which, tradition says, the first boring auger that had ever been used in England was made; and that the first shot that was ever fired in Derbyshire or Staffordshire, was fired in this very copper-mine at Ecton. The inhabitants of Wetton tell me the auger was made by some German miners, sent for by Prince Rupert to work this copper mine at Ecton. The Prince (Rapin says) came into England in 1636 . . . it was most probable the miners came during his first abode in this kingdom. I am well convinced of the truth of the above tradition, because the fathers of my informers might be well acquainted with the miners that introduced blasting among them.' Watson adds that the method of splitting the rocks by gunpowder was published by the Royal Society in 1665, and that it was used in Somerset about 1684. Watson is a good witness because not only did he make this personal enquiry into the matter, but he was, for his day, a scientific writer, also gunpowder was one of his particular interests, and he had actually been in many mines, including Ecton. Phillips believed Watson's evidence.

John Taylor, miner of Tavistock, writing in Tiloch's *Philosophical Magazine,* 1799, gives 1670 as the date,

and repeats the statement re Prince Rupert and the German miners.

Hodgetts makes a curious statement in his Chronology (mainly relating to saltpetre) ' 1629 Prince Rupert, son of Queen of Bohemia, nephew of Charles I, obtains a grant for £300.' But he was only 10 years old then, and had not been to England. He arrived in England in 1635 or 1636, and was very gay and popular at the Court, according to his mother ' he spends his time idly in England '—if so, it was the only time in his life when he was ' idle.' It is not beyond the bounds of possibility that he might have visited Ecton, for he stayed at Belvoir Castle, but he left England by June, 1637. From then his life was full of imprisonment abroad and fighting in the Civil War, followed by a wandering life until he returned to England at the Restoration. Facts possibly relevant to the question are that from 1657-1660 he lived at Mainz, inventing ' Rupert's Drops,' and developing the mezzotint process, and after he returned to England, in November, 1661, he had rooms in Windsor Castle fitted as a laboratory and a forge, and he made ' Prince's Metal,' a mixture of copper and zinc, gunpowder ten times the ordinary strength, and ' invented a method of blowing up rocks in mines under water which would have been useful at the seige of Lichfield in '43,' he took out a patent for tincturing copper on iron, and in 1668 petitioned for sole right to coin farthings. Prince Rupert kept up his interest in gunpowder to the end of his life. Two years before his death, when he was already in ill-health, two men were sent to Germany to report back to him on strong gunpowder. In 1662 he became one of the first fellows of the Royal Society, and it seems more likely that *circa* 1670 is the date for the introduction of blasting at Ecton, and one might suggest that underground evidence could bear this out, if we accept these extra large drill marks as those of the 17th

century Dutchmen, occurring so sparsely and so far in, one can imagine the main part of the levels in the Dutchman Mine to have been made by them before they used gunpowder.

The 1769 account has a good description of the ore-dressing, there could not have been a stamping mill then as the ore was broken with buckers[17] by about fifty women, little girls from eight to twelve years old sorted the ore, the women were paid 4d. to 8d. a day for piece work, boys and girls 2d. to 4d., about three hundred men, women and children were employed. All the best ore, when dressed, was bought by the smelting houses, and the refuse ore was smelted on the premises, and the mines gave employment to many villages besides Ecton. Wetton churchyard has a number of names from Ecton, and, although I could not find it, there is reported to be a tombstone there of ' Sam Bonsall, 33 years Captain of Ecton Mine, d. Sept. 7, 1870, aged 71. The stone was erected by 178 subscribers as a token of their esteem and respect for his integrity.' A ' captain,'[18] in the words of an 18th century writer was ' a superintendent over all,' and had bottom-captains and grass-captains under him. Captain Bonsall was always sinking trials over the hill-top, most of the shallow shafts on the top are still referred to as ' Bonsall's Trials.'

A few more items with reference to Ecton deserve mention, such as some words which differ from these found in Derbyshire lead-mining glossarys, and which show the influence of Cornish miners.[19] ' Hannaway ' was the name for lumps of spar and stone containing ore, ' goods ' were good sized pieces of ore, only a few

[17] See glossary, p. 80.

[18] See glossary, p. 80.

[19] The evidence shows that it was Derbyshire miners who influenced the Cornish. During the 13th and 14th centuries large numbers of Derbyshire miners were sent to work in the king's mines in Cornwall and Devon, and all mining terms used both in Cornwall and Derbyshire are English, not Celtic as they would have been had their origin been Cornish. This applies to the two words by the author.—Editor's note.

names of parts of mines are marked on old plans, such as Smackers Open, Old Gunny, Master's Venture Vein. ' Gunnies,' in old Cornish mines, were hollows filled with water.

It is a link with Derbyshire that much fluor was brought to Ecton in the early 19th century from Knowles Mine on Masson Hill.

Buxton tokens of 1796, minted by Boulton and Watt, are said to have been minted from Ecton copper, and one could come to a close on the wishful-thinking that perhaps it was Ecton copper to which Collingwood referred in 1803 during the British blockade of Napoleon's ports, when he complained of the unseaworthiness of his overworked ships, ' we have been sailing for the last six months with only a sheet of copper between us and eternity.'

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Glossary of mining terms used, mainly abstracted from ' Glossary of Words used by the Derbyshire lead-miners during the past 250 years,' by F. Williamson, *D.A.J.*, N.S. Vol. I.

ADIT. A sough, or level, generally made for drawing off water.

BUCKER. A broad headed flat hammer for breaking down masses of mineral.

BUDDLING. Washing the rough ore and stone after it has been brought out of the mine.

CAPTAIN. A Cornish term, i.e. see Pryce *Mineralogia Cornubiensis*, 1778, p. 174, etc. The captain had control over everything to do with the mine, a bottom captain saw to the underground, a grass captain to the surface. The captain was over these. The term was used in Wales, 100 years ago — see Borrow, *Wild Wales*.

DAY. The open-air, i.e. a miner speaks of the head of a shaft ' opening to the day.'

DEADS. Barren veins which consist of minerals unaccompanied with ore. Also a ' dead vein ' unproductive of ore.

GIN (WHIM, WIM). A wooden erection with a horizontal drum round which the winding rope is wound, and a horse (horses) walk round in a circle winding the ore up the shaft.

GINGING. Lining a shaft with stone where it is sunk through insecure rock or soil. Very usual at the top of the shaft.

JIG TUB. In a hand-jig the sieve containing the ore and stone, etc. is moved up and down in water, in mechanical jigs, or jiggers, the water is directed on to a stationary sieve.

LID and SOLE. See VEINS, PIPE and RAKE.

LOB, LOBB. A vein going down in stages like a stairway. Lobs are steps that ascend or descend in a mine.

LODGMENTS. Wooden platforms, the ladders go down in stages from one platform to another.

PIPE. Differs from a vein by its irregularity. Has a roof and floor (lid and sole) of bedding rock and spreads widely horizontally. It is flat, not vertical, although it may swell out into irregularly shaped caverns.

RAKE. Wider and stronger than an ordinary vein. It is more or less perpendicular, may be miles long and of good depth but has little width.

STAMPS, YARD and MILL. The mechanical stamps for crushing the ore.

SOUGH. A passage driven in the ground for drawing off water. Sough and adit are interchangeable except that occasionally adit is used for a level not made for drainage.

STEMPLES. Pieces of wood put crosswise in a shaft to climb by, also sometimes used for wood for propping unsafe rock, or to hold-up deads.

VEIN. A fissure in the rock filled with ore, earth minerals. See RAKE and PIPE.

WINZE. A small shaft sunk downwards from one level to another.

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Plans and sections from the Chatsworth Estate Office and from the Office of H.M. Mines.