

CAT

**The Newsletter of the Cumbria Amenity Trust
Mining History Society**



**Walney Island salt evaporation plant and finishing shed,
circa 1897.**

Cumbria Amenity Trust Mining History Society

Newsletter No 113, November 2013.

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Society Officers and Committee Members

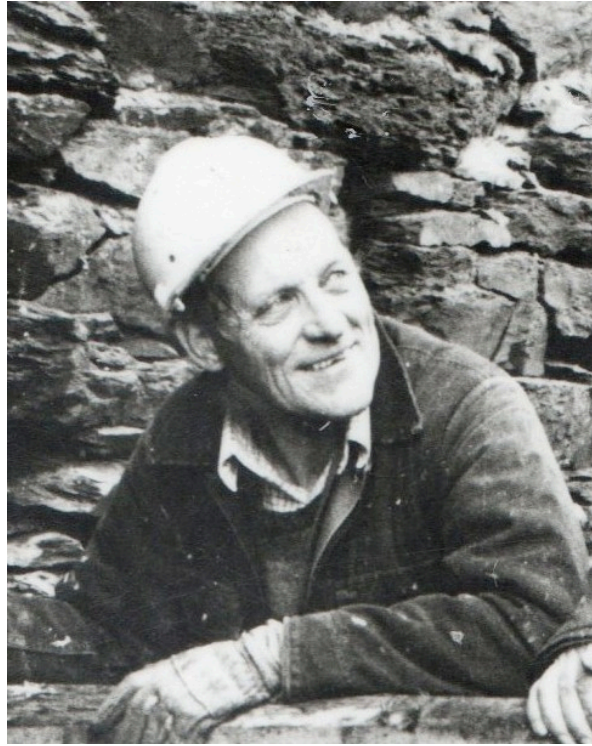
Back cover

John Helme

It is sad to have to report the death of John Helme, on 4th September. He had been fighting a losing battle with cancer and deteriorated rapidly during his last week. He passed away peacefully at home. A Service of Thanksgiving was held at Stricklandgate Methodist Chapel, Kendal.

John joined CAT in the early 1980's and he took an active part in the activities and organisation of our society. He became a committee member in 1987 and was Treasurer from 1990-96. He received the Chairman's Award in 1992 and 2006.

It was as a CAT member that John started his work with Newland Furnace. He was involved for over 20 years with its conservation, and the success of the project is in large part due to his organisation and guidance.



During 1987/88 the late Dr John Marshall tried to interest national and local authorities in the dire condition of the Newland Iron Furnace, built in 1747 and closed in 1891. In 1989, he approached local societies CIHS, CWAAS and CAT for help and John became heavily involved

The Newland Furnace Trust was formed in 1998 and in 2001 a 999 year lease was completed, in 2002 the furnace stack with adjoining buildings was "scheduled" and in 2003 the Conservation Plan was published by Oxford Archaeology North and financed by English Heritage.

Due in large part to John's efforts the first major professional work, the repairs to the Charging House, was carried out in 2005, financed by English Heritage, CCC and SLDC. Foundations of the stack extension were unexpectedly revealed in 2007 and consultation with English Heritage led to a revised plan, so that this feature would not be obscured. A 100% grant from English Heritage and further bridging loan from CATMHS led to the completion in 2009 of the protective roof and water disposal system.

Newland Furnace has recently been taken off the Monuments at Risk list, and now stands as a testimony to John's dedication and enthusiasm.

Our thoughts are with to Joan at this time.

Membership.

We are pleased to welcome brothers Richard and Christopher Morgan, from Barrow-in-Furness.

Subscriptions

Membership renewals become due on 1st November. Those with an email address should receive a reminder from the Treasurer and a paper renewal form is included with this newsletter. Please renew promptly (now!) as it makes it so much easier for the Secretary. Note that if you have not renewed by 31st December then your Public Liability Insurance will expire.

LDNPA Archaeology Conference, November 2013

By the time you read this it will probably be too late for you to attend the 2013 Lake District Archaeology Conference, to be held at the Theatre by the Lake, Keswick, on 3rd November. For those who missed it, here is the program:

Introduction. *Vivienne Rees, Chair of Historic Environment Advisory Group, Lake District National Park Authority.*

Archaeology in the Lake District National Park 2012-13. *John Hodgson, Lake District National Park Authority*

Reflections on History – survey and investigation of slate quarrying in Great Langdale and early mining near Grasmere. *Jamie Quartermaine, Oxford Archaeology North and Jamie Lund, National Trust*

Survey of long houses in the Duddon Valley. *Peter Matthiessen, Duddon Valley Local History Group*

Recent work of the Cumbria Amenity Trust Mining History Society. Warren Allison, CATHMS

Geophysical survey and excavation of the Roman vicus at Ravenglass. *Kurt Hunter-Mann, York Archaeological Trust*

Geophysical survey of the Roman fort and vicus at Ambleside. *Jamie Lund, National Trust*

The Roman Settlement project at Maryport. *Stephen Rowland, Oxford Archaeology North*
3.10 Discovering Derwentio: Recent archaeological investigation of the Roman site at Papcastle. *Frank Giecco, Wardell Armstrong Archaeology*

There will be a report in the next Newsletter.

Notice of NAMHO General Meeting 9th November 2013 at Radstock, Somerset

The next NAMHO Council (General) Meeting is being held at The Fromeway (<http://www.fromeway.co.uk>) on Saturday 9th November 2013, starting at 11.00 am. Minutes of the last council meeting are available on request and a few copies will be available on the day. Draft minutes are available on the NAMHO website www.namho.org.uk Please remind fellow members of your organisation that the Council Meeting is *not* a closed meeting and all are welcome. The first representative from each organization is entitled to have expenses reimbursed at standard NAMHO rates.

Extracts from NAMHO Newsletter No 66, September 2013

NAMHO Conference 2014

Mining Technology: Technical Innovation in the Extractive Industries

Next year's NAMHO Conference is to be held (provisionally, with dates to be confirmed) on 25th-27th July 2014 at Bangor University, Bangor, Gwynedd. This two-day conference will examine some of the technologies involved in winning material from the ground, with the opportunity for field visits to relevant mining and quarrying sites in north-west Wales. There will also be the usual program of lectures.

Nenthead Mines Conservation Society

Cumbria County Council has been successful in their application for High Level Stewardship of the site. Countryside Consultants of Alston have been awarded a contract to produce a management plan for the site. The plan requirement is to determine the work required to secure the future of structures and deposits associated with the Scheduled Monument.

This plan will inform any subsequent application to Natural England for funding for conservation works. Priority features have been identified as the Smelting Mill spine wall, the Rampgill Burn culvert, the North Powder House, Dowgang woods reservoir, and the bridge outside Smallcleugh Level. It is also thought that some work might be done at Rampgill Level entrance. Nenthead Mines Conservation Society has continued to caretake the site for Cumbria CC, and has continued with minor maintenance.

The Society has also managed to run three open Sundays with bookable trips into Carrs Mine which have been very well supported and donations from those days are approaching £800. Further open days are planned. See our website at www.nentheadmines.com

Alston Moor Mining News - Update

A second phase of exploratory drilling at Nenthead has been announced, after pervasive zinc and lead mineralisation was discovered in all four of the first phase drill holes. The local press is bullish in terms of potential jobs and the impact on the region's economy. Minco's press release is more restrained, see below.

North Pennines, England - Minco has commenced a new exploration initiative in the North Pennine Orefield located in the northern English counties of Cumbria, Northumberland and Durham. Minco plans an initial US\$1 million exploration programme, including 4,000 metres of diamond drilling.

Exploration is focussed on the search for stratiform, replacement-style zinc and lead deposits in the unexplored, more massive limestone formations of the basal Carboniferous stratigraphy. There is significant untested potential for such mineralisation approximately 300-400m below previous, adit-accessed workings, and such deposits could be significantly larger than any previously discovered.

Specific exploration targets have already been identified by Minco and initial exploration drilling will be focussed at three principal sites. Minco will complete approximately 4,000 metres of core drilling. The average depth of each hole will be approximately 500m. (22/08/2013)

Northern Mines Research Society

The Northern Mine Research Society is pleased to announce this major advance in the research tools available on its website. Mike Gill has prepared extensive databases giving the locations and historical details of coal and metalliferous mines in the British Isles. Starting with coal, these are now being made available on the website by superimposing the data on Google Earth mapping.

Some 23,000 mines will be covered, and basic information such as the opening and closing dates, the mineral worked, and the ownership history (all where known) is given.

To find the 'Collieries of the British Isles' go to the 'Mining in the British Isles' section of the main website (<http://www.nmrs.org.uk>) click on 'Information' (penultimate entry on the option bar) and select 'Mines Information'. Click on Coal, and at the foot of the map choose the 'Online Mapping' option.

16th C. Waggonway on Tyneside



I realise this is a little outside of Cumbria but it may be of interest to members. Redevelopment work at the old Neptune Ship Yard by Shepherd Offshore has uncovered remains of the Willington Waggonway adjacent to the Roman Fort at Wallsend. The 25metre section is thought to date from around 1795 and was used to cart coal from the nearby pits at Bigges Main and Willington to staiths on the River Tyne. Archaeologists are looking at ways in preserving the remains, as a previous timber waggonway excavated at Lambton Co Durham has now rotted away after exposure to the air. Malcolm Charlton.

Hudgillburn Mine Cave System

Beginning in 1994 under the leadership of Sheila Barker, Hudgillburn Mine, at Nenthead, was re-opened by CATMHS. Later the entrance portal through soft ground was completely excavated and the stone arching rebuilt (probably to a higher standard than originally) The site was completely re-instated and a stream diverted to protect the renewed lining. Work was carried out to install ladders to provide access to the "Cavern"



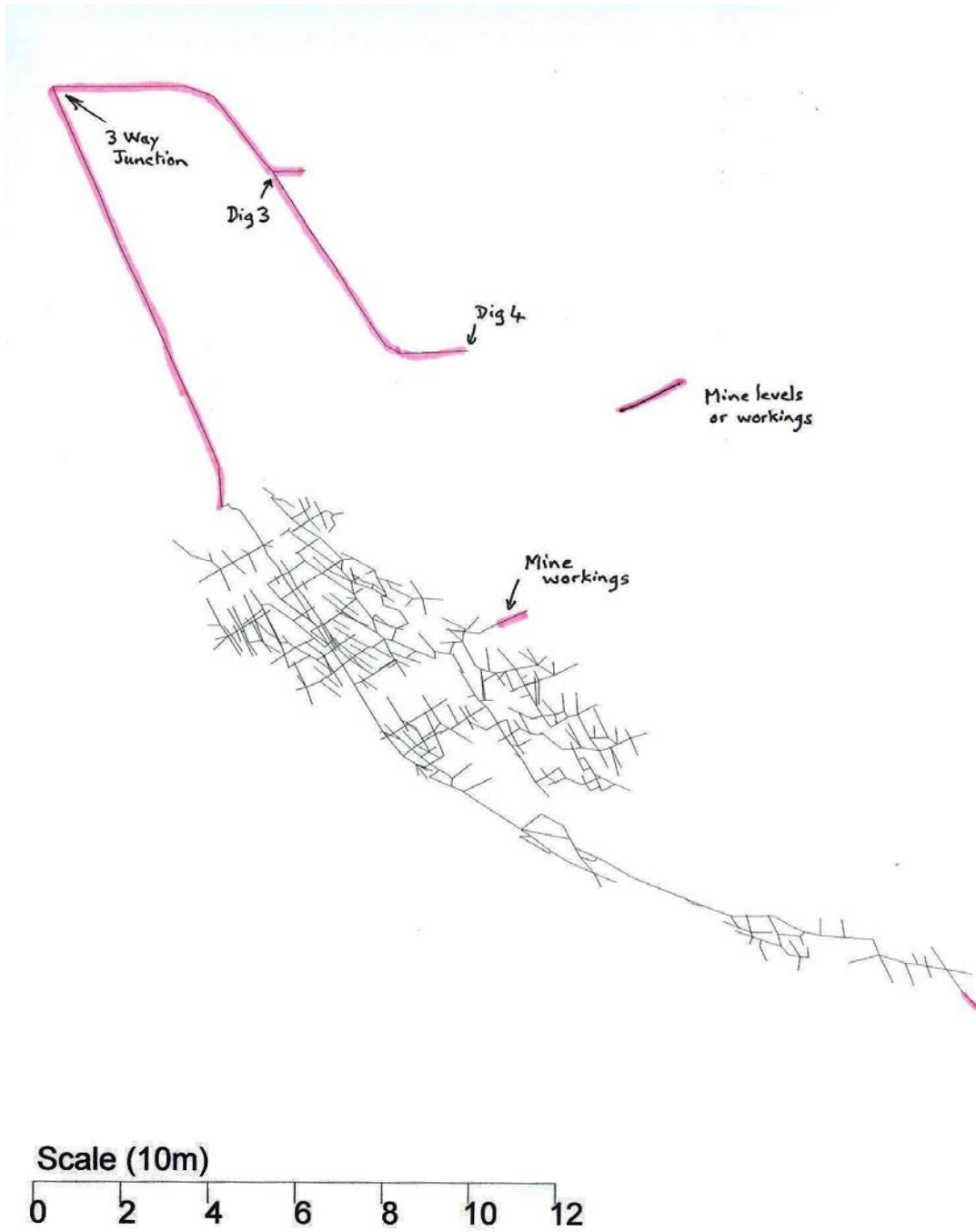
A group of cavers have recently been surveying the HGB cavern; they are all well established experienced cavers led by Tony Harrison and Peter Rider. It will soon be the largest known maze cave in the UK, and as such will be of great interest to the karst geology professionals.

They report that 'During our continuing surveying of the Hudgill natural caves, we have come across some mining activity which we thought you might like to hear about.

It's in the remote far north-east of the maze, at the edge of the natural cave passages (which hereabouts are full of breakdown boulders and fairly open but confusing caverns) and is where a mine working has broken through into the natural cave in a low 60cm by 60cm crawl through dead ends. The miners clearly crawled in and rested in a natural cavern here but did not appear to venture further into the maze (judging from footprints in the dried mud). The attached plan shows the location, and we have also surveyed some of the mine levels to your Dig 4 to enable you to locate the "new" workings precisely. You'll see that it appears to be at the south-west end of the SW Strings, rather than a continuation of Hudgill South Vein.

We have not surveyed all these "new" mine workings but we have explored them. There is about 50m of passages working a vein which appears to have died out here (at the edge of the natural caves) and they are on 3 levels, most running approximately 240-60 degrees and connected by climbable rises (each about 4-5m in height). There are no obvious artefacts (some small lumps and veins of galena) but in one place there was a wheelbarrow track! We have failed to find how they entered this area - all the workings appear to close down. We assume they have backfilled their "entrance passage" which must come up from the lower level near your Dig 4; maybe a thorough search will locate it.

Meanwhile we continue with our survey work. We've now surveyed about 4.25km of natural cave - we are adding about 100-200m per survey trip, and there's clearly a lot more to go at.' (The current longest maze cave in the UK is 4.5km!!!)



NOT the NAMHO Weekend June 2013

Friday 28th – Sunday 30th June Lliwedd Copper Mine

Attendees
John Aird
Mark Waite
John Ashby
Jon Knowles (ML)

While many trips go very well there are some which seem to attract more than their fair share of bad luck. The team had planned to be taking attendees at the NAMHO conference through Ratgoed Slate Mine over the weekend of the 29th & 30th June and had allocated the Friday to rigging the six pitches, however the trip had been cancelled earlier in the week due to delays in agreeing access with National Resources Wales and only 2 people wanting to go on it. This did not justify a days rigging by four people and 4 leaders. Due to this and a reasonably favourable weather outlook a decision was taken to concentrate on Lliwedd Copper Mine, with the expectation that the exploration would be finished in a maximum of 2 days.

Following the last reported visit in April the team had been back on the 8th June and had entered an open cutting at a higher level (A, on marked up aerial photograph). This crossed a dry winze (please note for later), which required a bolted traverse to give access to a level which passed a flooded winze and was then blind. The dry winze was descended a process which required a series of deviations and re-belays to avoid the worst of various collapsed floors. Using two 50 m ropes the author got to a point where rope could be seen to be lying on a lower level but by this time he had run out of battery power and hardware and more bolting was needed to effect a safe descent. At this point it is worth digressing to mention that when charging the drill batteries immediately before the trip, two of the three, originally purchased with the drill in 2003, refused to charge, this was thought to be a charger problem but further investigation showed that both batteries had failed at the same time.

Returning to the 28th June the group flogged up to the site in warm mist with two batteries. Due to heavy rain the previous day the dry winze now had a good quantity of water going down it. The author offered others the chance to rig but was not knocked over in a scrum to pick up the drill. Starting down with 100 m of rope, the drill and much rigging gear (but not the spare battery) the first part of the descent was damp but manageable, but lower down the route used on the 8th June was impassable due to the volume of falling water. Due to this an alternative, drier route, was rigged.

After crossing a length of false floor and a section of hanging wall, which was no longer hanging, a route down to a sub-level was found. The team then descended to join the author – apparently with all the kit. The landing point was a length of false floor where a section of floor was missing and this appeared to be the obvious way on, although the hole was very ragged with numerous loose rocks. Out-bye the level entered solid rock where there was a flooded winze, crossed by two submerged planks, before an open stope was entered. At its out-bye end the surface was only 10m above. Note that at this point a couple of hours digging would enable a direct connection with the surface to be re-established. The flooded winze was crossed with some difficulty by bridging across it, a process those with shorter legs found even more difficult. In the times we crossed this over the coming days a number of the team ended up swimming, one even boasting that his head had gone under when he fell in.

At this juncture it was thought prudent to change the drill battery but after some searching the second battery could not be found and it was thought it had been left on the surface. Due to this we decided we see how far we could rig with what remained in the battery. Descending underneath the false floor it became apparent how poor it was, not only was it thin but all the support timbers were hanging and the edge was badly undercut – it was not a place to linger. Landing 30m below on a pile of rocks the level could be seen to proceed in both directions. In-bye, where the drill shot down the moment the author put in on the ground, the pile of rocks led down to a flooded winze where a large quantity of water fell down, and pack wall up out of the winze prevented progress. This area remains to be explored since it was too wet to bolt or free-climb. Out-bye a step down of 4m gave access to a level where shortly a flooded winze was encountered. The author thought that this could be easily crossed on some old timbers and started across before the others joined him but was soon chest deep in water with a footloop around a submerged plank. The winze was crossed on the second attempt to be joined by the other members of the team. Further outbye the level broke into a stope which rose to surface and also descended a long way, accompanied by water. At this point the exploration was stopped for the day.

The initial plan had been for the author and Captain to free climb out of the open stope on the level above but the wetness of the rock had made this approach impossible and it was abandoned. The ascent was made harder by a significant increase in the volume of falling water which prompted one of the team to remark "I would have given up if I thought anybody would have heard my cries". Unbeknown to us there had been heavy rain all the time we were underground. On attaining the surface there was water everywhere and every minor cutting had become a raging stream and torrents of water cascading down every hillside. The upper part of the route was derigged since in future the open stope could be used for entry. The battery was not found in any of the bags on the surface. The walk down was a wet affair although the waterfalls were impressive.



Mark relaxes after having got out of the water.

Friday night was spent in Spooners in Porthmadog until the excitement got too much!

On Saturday the weather was much better and after checking all the bags for the missing battery (Captain checked his bag) without success the team rigged a descent down the open stope (B, on marked up aerial photograph). It was also decided to put a traverse line along the length of the sub-level to provide safety in the event that the floor collapsed. On the floor below a rope was put in on the 4m step and a traverse line installed to enable the flooded winze to be safely crossed without immersion.

The descent of the large stope was then started. Water fell down the stope at the start and for this reason a traverse was installed to take the line of descent further out into the stope, but not so far out that it came close to another dubious area of partly collapsed false floor. Two large boulders perched on a timber were knocked down the stope and were heard to fall a considerable distance. The traverse was completed but by then the drill battery had been completely emptied. On arriving back at the car park Captain "found" the spare battery in his sack and quickly offered to buy drinks that evening. The moral of this story is that if you need something carrying, Captain is your man, since he does not seem to notice the odd NiCd battery.

Saturday night was spent at the Black Lion at Derwenlas, a pub which consistently provides good food, although a notice warning customers not to put coal on the fire due to the danger of burns seemed to be taking Health & Safety warnings to an excessive level. This also shows how far we have come in having to warn people of the blindingly obvious – have you ever seen an animal walk into a fire! They manage to survive without warnings.

On Sunday the walk up seemed a little easier. The plan had been to rig a traverse line over the upper flooded winze until it was realised that the drill had been left lower down in the mine. When this came to light Captain quickly announced that he would explore on the surface. The author, Ashby and Mark entered the mine with the author descending first. Unbeknown to him Mark had difficulty crossing the winze remarking "something in my back went". Others were asked to pass this message along

From the end of the traverse the author landed on a series of solid rock steps on which the boulders he had knocked down the previous day now resided – these were thrown down again. After two re-belays and a deviation, and another length or rope, a landing was made on the level first visited in April.

At this point the injury to Mark's back became more of an issue where he announced that he was concerned that it would seize up on the ascent. We quickly agreed that the best approach was for the author to take all the sacks up, with Mark coming up next, leaving Ashby to de-rig. Mark made the ascent steadily without assistance and by the time he had ascended to the sub-level the author and Captain had rigged a traverse line above the flooded winze.



Mark Waite crossing a flooded winze. This is something that he will not be doing for some time!

Once outside, with Mark showing all the sprightliness of someone double his age (he's now 50 in case he didn't tell you) the lowest adit was re-entered. Contrary to what is stated in David Bick's "Old Copper Mines of Snowdonia" the track gauge is definitely two foot and not 18" as he states, although the rails are "T" section and they do sit in cast iron chairs. One wonders if his statement that wagons remained in this level was also incorrect, or whether they have been lost under the fall which now prevents direct access along the entire length of the level – we will almost certainly never know.

On returning to the car park we offered to drive Mark home but he said he was OK although a subsequent visit to casualty diagnosed torn muscles in his back.

With everybody safely on their way home the author then almost had a head on collision on a blind bend with a tourist descending the winding road from Pen-y-gwryd on the right hand side of the road and looking over the wall at the scenery at the same time.

Despite all of the above, a return visit is required to the level at B to proceed in-by beyond the hole in the false floor; dry weather is required for this since it will be necessary to cross where the water falls through the workings. This should also give access to the area beyond the pack wall on the lower level.

This exploration has shown that the workings do extend over a considerable vertical depth, estimated to be 80m at their greatest, although the payable mineralization never went far beneath the surface (the hill is steep here). Seeing how high the main workings are above the mill it is suggested that most of the rock was extracted prior to the mill being erected. Although timber has been used underground, it has been used only when strictly needed and it is suggested that this is due to the difficulty and cost that there would have been in getting anything to site. In summary a site with very interesting surface remains and although the workings are sporting to explore they unfortunately contain few artefacts.

Rigging details are as follows:-

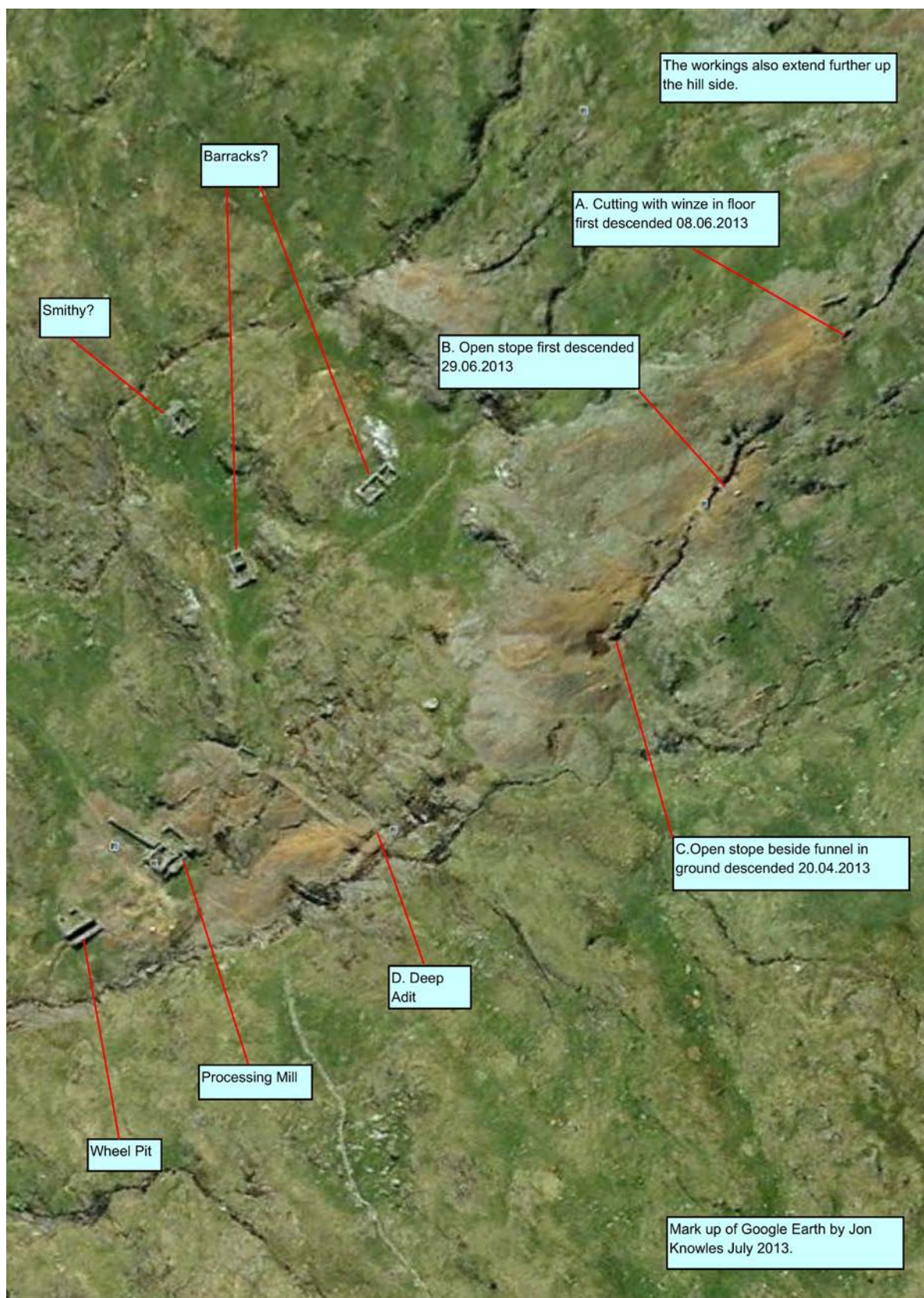
Entrance A

2 x 50m
2 x rope protectors
15 x hangers
17 x krabs
6 x short slings

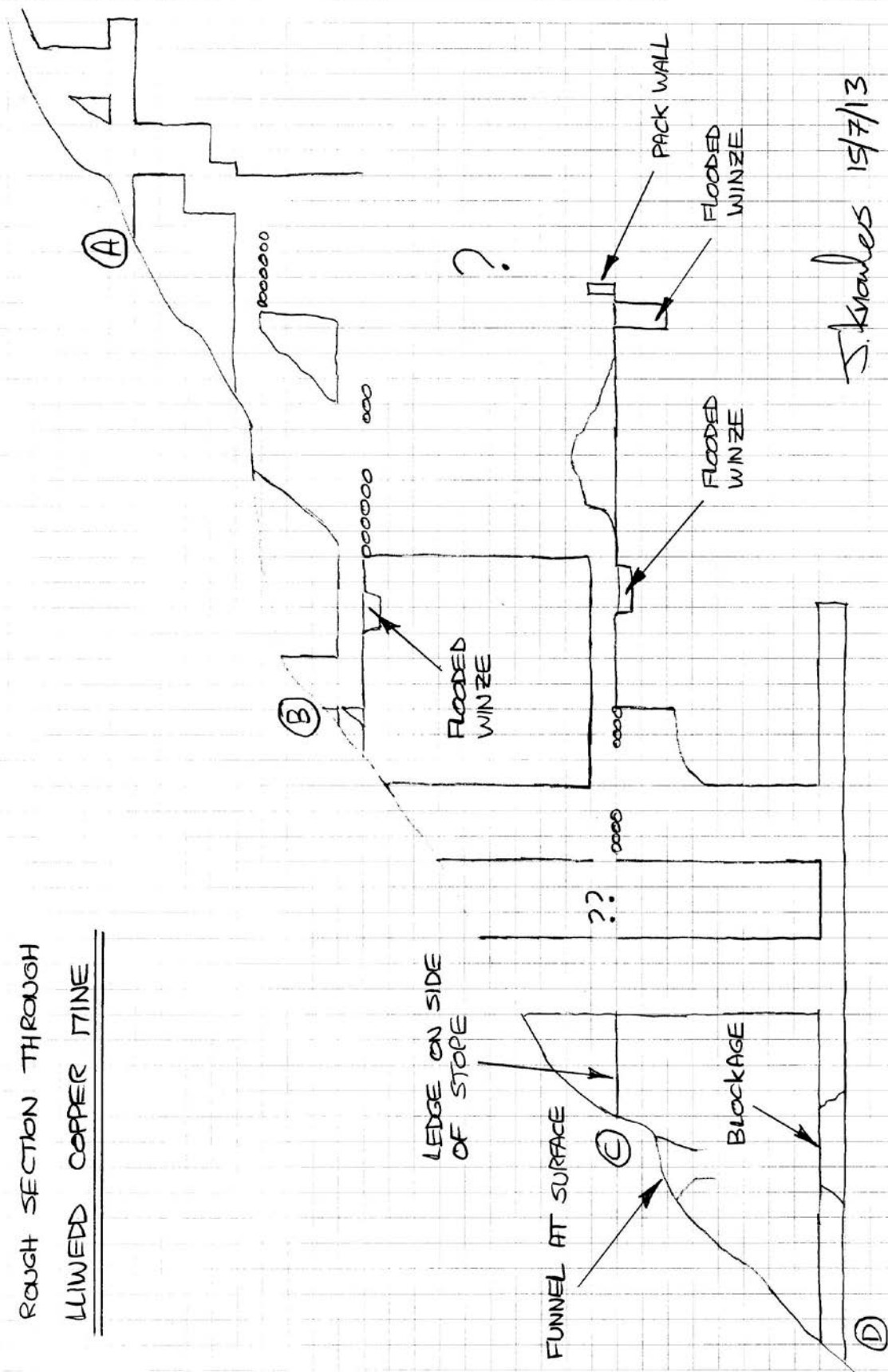
Entrance B

First Pitch	1 x 12m rope 2 x hangers 2 x krabs	Traverse over winze	1 x 12m rope 2 x hangers 2 x krabs
Traverse & pitch	1 x 50m 5 x hangers 6 x krabs 1 x long rope protector	Traverse over winze	1 x 10m 3 x hangers 3 x krabs
Descent to deep level	1 x 50m rope 1 x 35m rope 9 x hangers 1 x rope protector 2 x slings 12 x karabiners		

Jon Knowles



ROUGH SECTION THROUGH
LIWED COPPER TINE

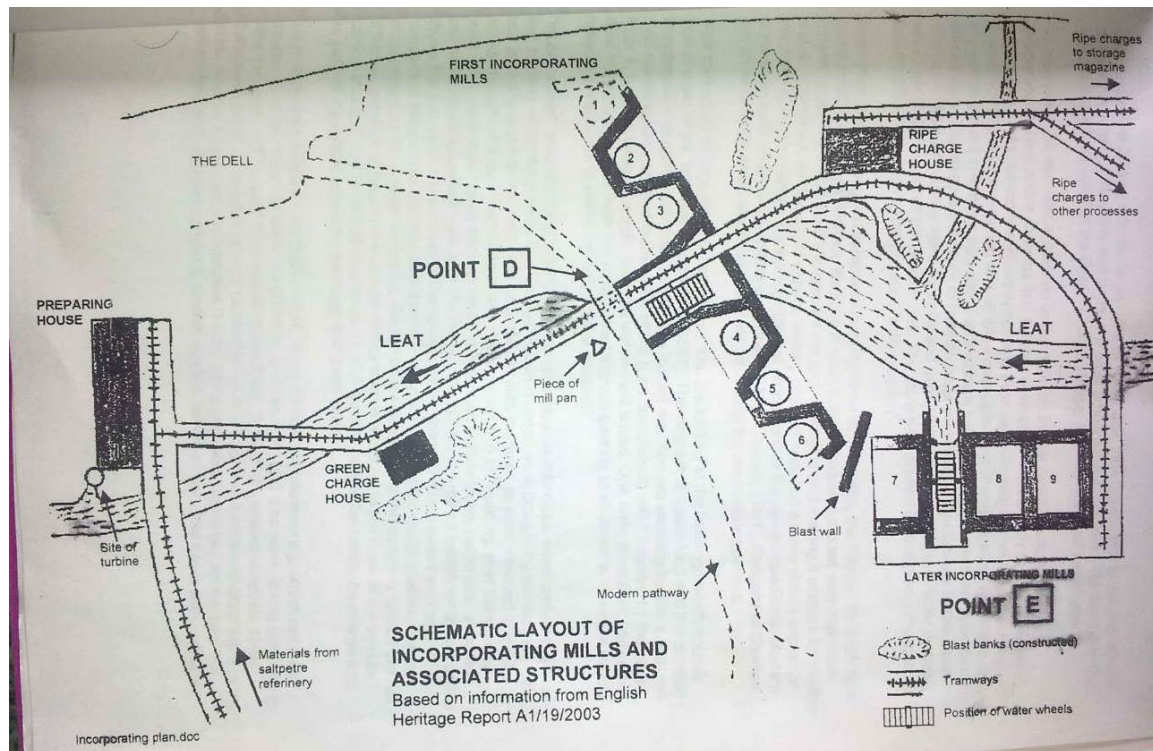


Sedgwick Gunpowder Works Visit - 13th September 2013

Present: Warren Allison, Mike Mitchell, Mark Simpson and Colin Woollard

The purpose of the visit was to obtain an overview of the condition of the remains and the issues that surround activities in order to conduct remedial works.

The site is located south of Kendal near the village of Sedgwick on the north bank of the river Kent. The site is owned by the National Trust and the Low Park Wood Caravan Club site is located within the site in and around the remains of the “new” gunpowder works. The site extends for some 800m or so in length beside the river and it includes a major water leat, water wheel pits and turbine locations together with many unique buildings used in the perilous art of high volume gunpowder manufacture. The site includes a stone lined massive underground tail race, a test firing range and sawmill and cooperage works where thousands of barrels were manufactured. The site lies outside the Lake District National Park. A report of the new Sedgwick Gunpowder Works has been produced by English Heritage.



The many and varied structural remains are located amongst the caravan site pitches in a heavily wooded area of outstanding beauty. Areas outside of the caravan site have not been maintained and are natural woodland, although there is access to a pleasant walk and many remains. The underfoot conditions were wet and slippery, with poor quality timber fences and walkways at key points of exposure - adjacent to the sometimes deep

water leat on one side and the river on the other. All structural remains are overgrown by summer vegetation and are difficult to access safely. Seedlings have taken root on walls and in some cases are quite large, causing damage to masonry. It was noted that *Impatiens glandulifera* (Himalayan Balsam) has taken hold, as the area is typically its preferred environment. Early cutting before seeding is a key eradication strategy for this weed. The major water leat has become silted to some 300+mm in places with debris over a considerable length, making access to the leat very difficult and dangerous. The various wheel and turbine pits are overgrown and represent a significant hazard if access beyond the simple barriers is undertaken.

Mike and Mark provided an excellent tour of the site and its historical context leaving no doubt about the significance of the site but demonstrating the sheer enormity of any project to attempt stabilisation or restoration. Indeed, it was evident that significant impact cannot be achieved without the full and willing participation of the landowner – The National Trust.



The water wheel pit, Spring 2013. photo Mike Mitchell

The discussion on site led to a feeling that the site was within the scope of interest for CATMHS. Seeing the volume of work needed to attempt simple stabilisation, let alone development of the site, it was felt that there may be a worthwhile opportunity to try to gain a multi-society approach to generate interest in the site. There are several like-minded societies relevant to this site in the South of the County. Could CATMHS help to bring these parties together to help the Trust to develop a plan for action? Would this be a worthwhile aim since we alone really cannot muster sufficient volunteers to make an impact. If a campaign was successful and the Trust began a project, then interested volunteers could support the cause directly through the Trust volunteer scheme, thus placing the responsibilities back with the landowner, who has all the necessary resources and expertise to discharge the work in accordance with their own objectives.

It was evident that this is a very significant and extensive site (scheduled) and the concern of our members is well founded and deserves serious consideration to see how CATMHS can assist.

THRELKELD MINE- YELLOW DAM

Threlkeld Mine was split into two distinct workings, Woodend Mine (the lower of the two) and Gategill Min, although both were connected underground. Woodend Mine was accessed by the Horse level adjacent to Gategill Farm and from a 30 fathom shaft sunk in front of the farm known as Gillside Engine Shaft. The history of the mine has been covered by J Postlethwaite in Mines and Mining in the English Lake District, W T Shaw in Mining in the English Lake Counties and Ian Tyler in Carrock and the Mines of Skiddaw and Blencathra.

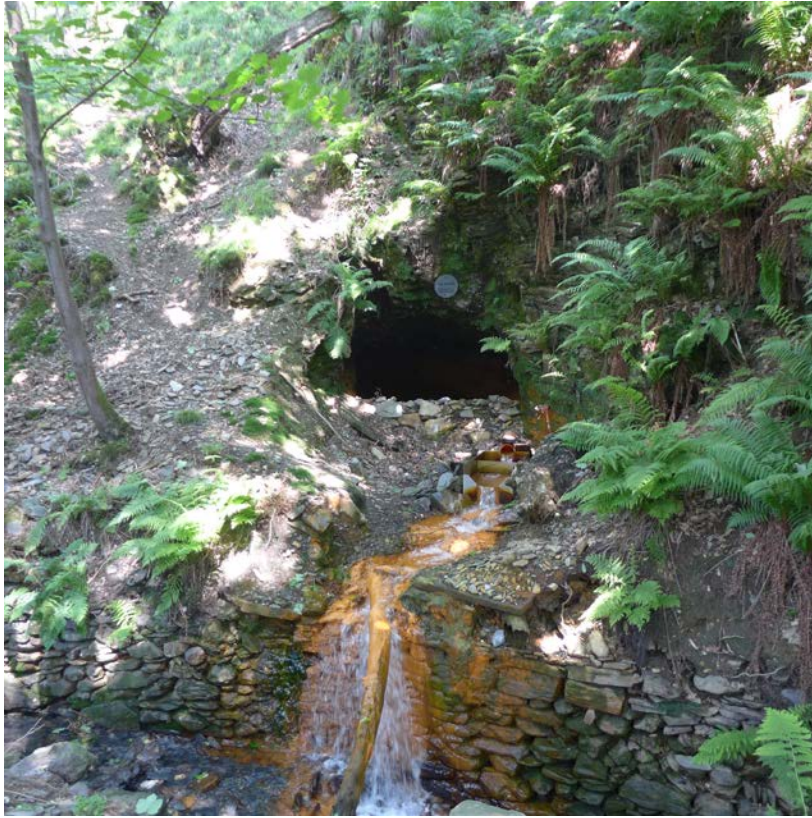
The mine worked two veins, Gategill which yielded predominately Galena, and Woodend which produced Galena, Zinc Blende and Iron Pyrites. It finally closed in 1928, although was on care and maintenance until the end of the Second World War. It was reported while the mine was working that the water coming from the Horse Level was very acidic and that it very quickly rotted iron and only parts made from brass lasted any length of time. A substantial dressing plant was built below Gategill Farm and to the side of another old farm known as Woodend.

There are currently two concerns with the site. The first one is the acidity and quantity of Zinc which comes from the Horse level, which is having a detrimental effect on the rivers; the mine is one of the most polluting in the country. The second issue is the stability of one of the dams which is just below the Horse level, known as Yellow Dam. The Environment Agency is currently putting a proposal together to treat the mine water, while an investigation is ongoing as to what to do with Yellow Dam.

On the 11th September 2013 the Environment Agency arranged a drop-in-session at Keswick Golf Club titled 'Managing flood risk from Yellow Dam'. I attended the session and offered a historical outline of the mine which included taking copies of the first and second edition Ordnance Survey along to show how the mine had developed. It was here that I met Mr Hall who lived at Woodend, and his son. Afterwards I had a discussion with both of them about the mine and Mr Hall also explained that his Great Grandfather was the one who drove Horne's rise in Force Crag Mine which was named after him. I agreed to copy a plan of the underground workings at Force Crag Mine as well as the maps of Threlkeld Mine which I took to Mr Hall at his house the following day.

On arriving, Mr Hall proceeded to show me copies of photographs of Threlkeld Mine which included the flooding of the old A66 in 1929 and 1952 from the blocking of the culvert in Yellow Dam during a period of heavy rain, the dressing plant and one of men at the shaft top. He allowed me to make copies and some are shown below. Returning a week later Mr Hall, who owns much of the site of the old dressing plant and spoil heaps down to the old A66, showed me around. I had taken the OS maps and it is still possible to make out various features on the ground which are shown on the maps although much of the site has now been landscaped. At the time that he purchased the property the boundary of the mine came right up to his house; there was not even any access to the windows on one side, so he purchased the spoil heaps and part of the dressing plant. When in his garden you can actually make out the various remains, which include water courses.

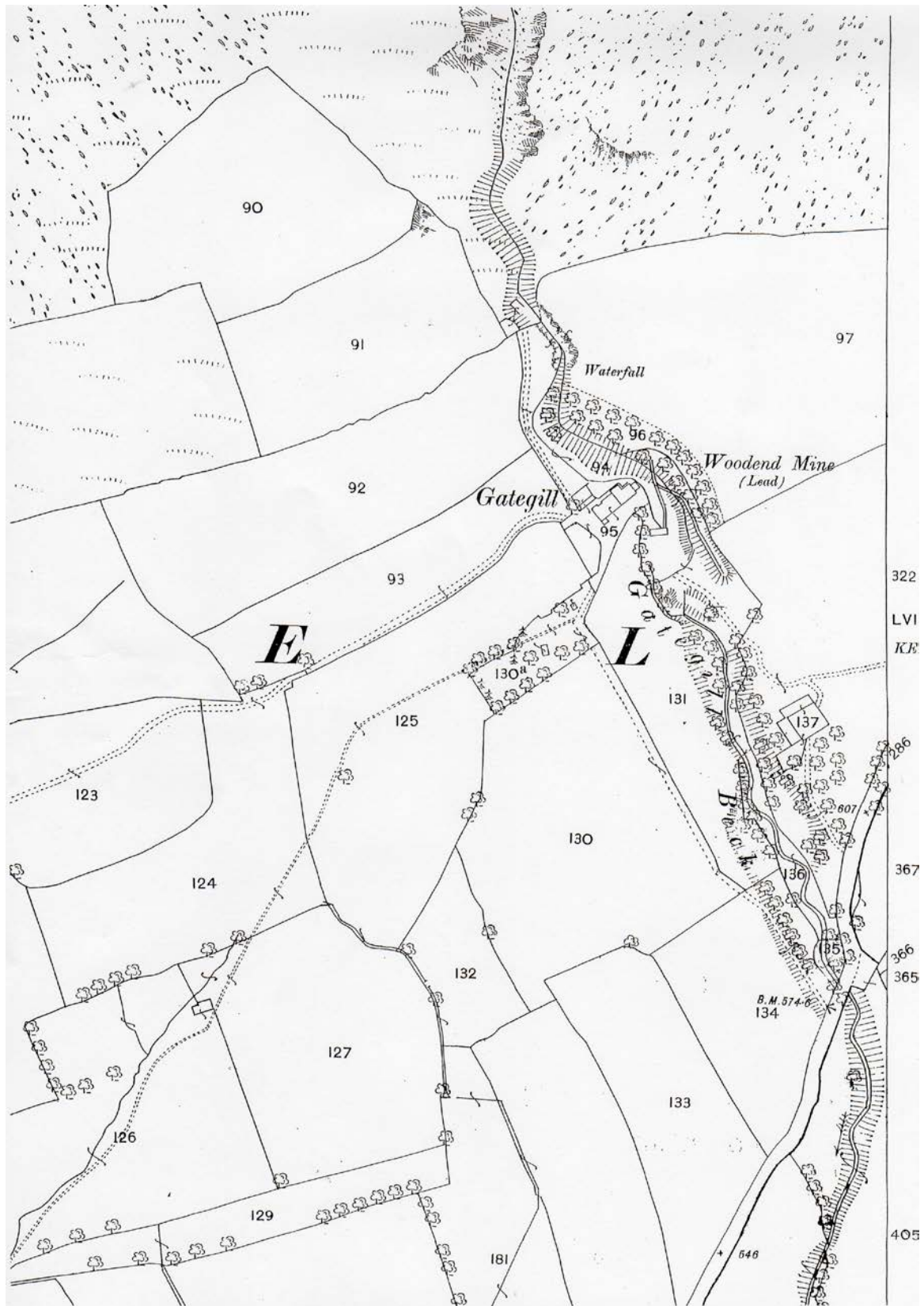
It has been suggested to the Environment Agency that an archaeological survey of the site should be undertaken based on the OS Maps, photographs and interpretation of the site, which would give them an understanding of how the site worked and this would greatly assist them in their future proposals.



Threlkeld Mine Horse Level- Note the yellow discoloration



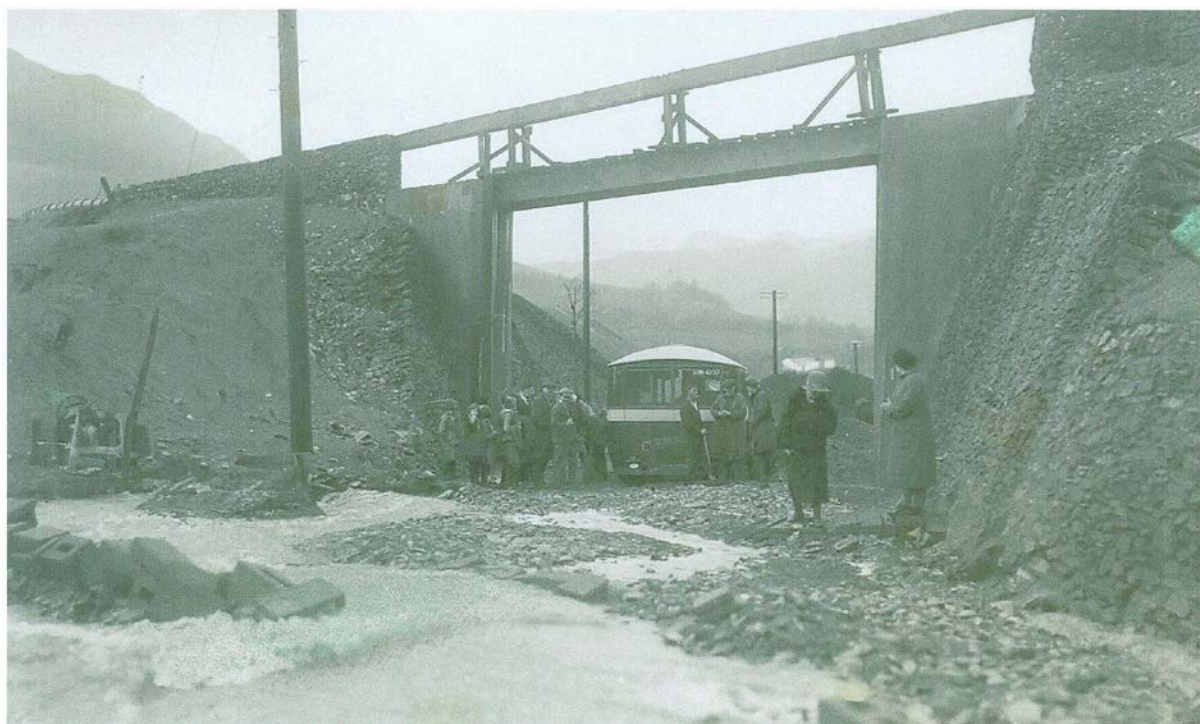
Yellow dam from the rear, the holes in the structure have been cut to try and release more water.



First Edition OS Map circa 1863. The building marked as 137 is Woodend, with the main entrance to the mine to the right of Gategill including spoil heap and the small dressing plant below with a water leat coming from the beck around the back of the farm.



Dressing plant just above Woodend, circa First World War



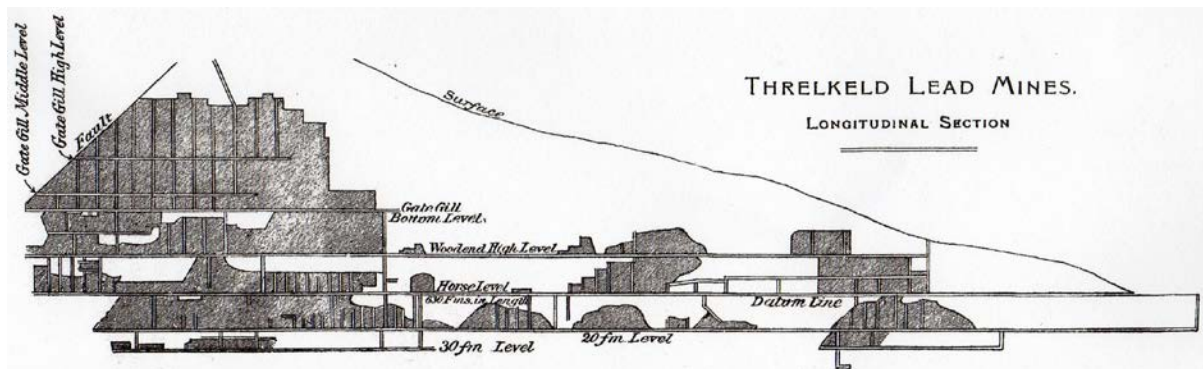
View from the East in 1929 showing the flooding of the A66, note the bridge to the slime ponds.



View from the West in 1952 showing the flooding of the A66; note the bridge to the slime ponds has now been partially removed. Much of this structure has now been removed, but the bottom three to four feet are still there.



Miners at Gillside Engine Shaft circa 1910



Cross section from J Postlethwaite, *Mines and Mining in the English Lake District*, Third Edition published in 1913. Warren Allison

Percy Pitprop

I am often pleased to receive compliments on our Newsletter, which I feel are really due to the contributors. However, perhaps it doesn't have the humour and erudition of some early issues written by Jones and McFadzean. This is reprinted from NL 2008, published in 1985. Ed.

Percy Pitprop's Definitions of mining terms.

- (1) "Level": Members leaving the PUB
 - (2) "Lode": Eliphants 'droppings.
 - (3) "Stemple": Plural of Temple !
 - (4) "Crosscut": Work of angry Hairdresser.
 - (5) "Orehopper": Type of Cricket found in Mines.
 - (6) "Stope": Habitat of Greater & Lesser Orehopper.
 - (7) "Kibble: Orehopper's Feeding Vessel.
 - (8) "Jackroll": Something he likes to do with Jill.
 - (9) "Run-in" Pub Doorway.
 - (10) "Dressing Floor": Area behind C.A.T. Members vehicles.
 - (11) "Wheel-pit": Hole where certain members get their cars stuck.
 - (12) "Drift: Additional Winter parking for certain Members!
 - (13) "Adit": A form of Boasting!
 - (14) "Backfilling: The art of leaving gear for others to carry.
 - (15) "Horizon: The point over which the Backfillers rapidly disappear.
 - (16) "Deads: The group left with the gear at the end of the day.
 - (17) "Hanging wall: Could be useful if things don't get better.
 - (18) "Footwall": A leg up for some members.
 - (19) "De-water: A useful practice before putting on a Wetsuit.
 - (20) "Fault.": Something you find always belongs to someone else.
 - (21) "Jumper": See "Aditt'.
 - (22) "Country rock": Music to go down Mines by.
 - (23) "Buddle": A bl++d" deep puddle.
 - (24) "Scraper: Method of getting onto the Committee.
 - (25) "Screening: Means of keeping you off the Committee.*
 - (26) "Fathom": Three people or One Man and his Dog.
 - (27) "Hush": A term of endearment used by my wife.
- *Believe it or not, in those far off days there were more members wanting to be on the committee than there were places available!

Barrow Salt

The production of Salt from evaporation of sea water or by concentration from sea-sand has been carried on for centuries along the Cumbrian coastline, and was one of the old rural industries of the area. At Barrow in the late 1800s and early 1900s Salt was produced by a rather more industrialised process from brine pumped to the surface and purified in extensive plant stretching for several miles spread over the southern part of Walney Island.

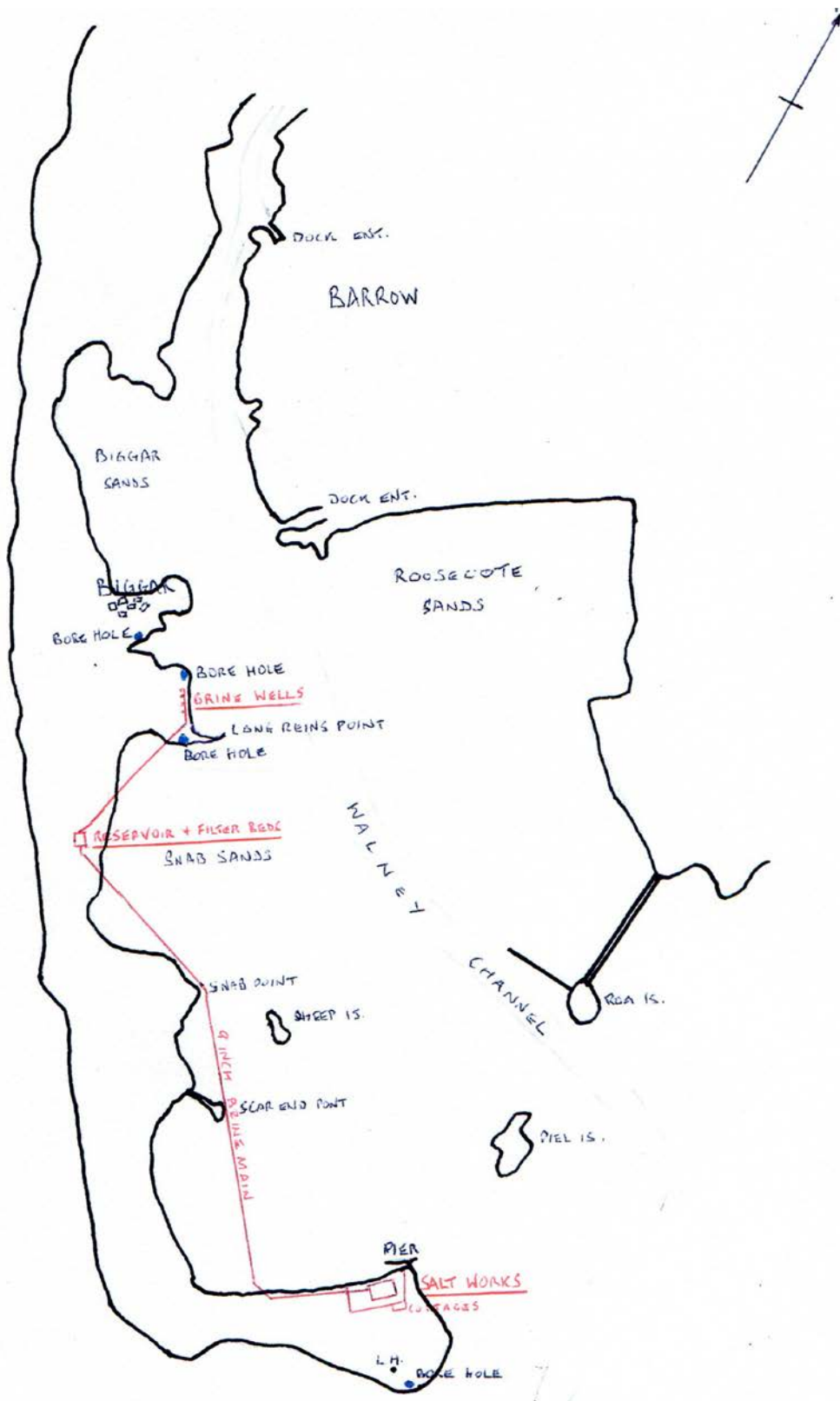
The Salt was discovered unexpectedly in bore holes searching for coal by the Diamond Boring process of John Vivian. This program was initiated in May 1887 by Edward Wadham (Diary 20 May 1887). The first test bore was close to the lighthouse at the extreme Southern end of the island.

Small amounts of Salt were found at various depths, but no particular attention was paid to them as the main objective was coal. There was no coal, so a second hole was bored just south of Biggar where it was thought coal might be found closer to the surface. Good quality Rock Salt in abundance was found at 272 ft from the surface under overlying strata of blue and red marls. The hole was reported as still being in Rock Salt when it was stopped just short of 1000ft down. Four further borings were made in short space of time to prove the extent and depth of the Salt, which was found to be very substantial and the discovery was made public on 1 January 1889 (Diary)

Following glowing reports from the Geologists on the quality and extent of the find it was decided to form a Company to mine the Salt. For various reasons which at the moment are not entirely clear, several years elapsed before work was begun, but eventually the plant was set up, beginning in 1896, and production began in 1897.

The Vivian Boring Company provided four 10" diameter Brine Wells with Derricks, pumps etc. very close to the shore at Copt Hill, and the Brine was pumped from here via a 9" cast iron main to specially constructed Filter Beds and a 700,000 gallon holding tank which were at Hillock Whins almost a mile away. Pumping was needed on this section of the main due to a 7ft difference in height, the Wells being at 37ft O.D and the reservoir and filter beds at 44ft O.D., but from the reservoir, the brine flowed under gravity, again in 9" pipes, to the Works which was virtually at sea level about $3\frac{3}{4}$ miles away at the extreme South End close to the Pier used since 1870 by Coulton Hunter for shipping of gravel extracted at South End. The Map shows the layout of the Plant and the positions of the more important bore holes.

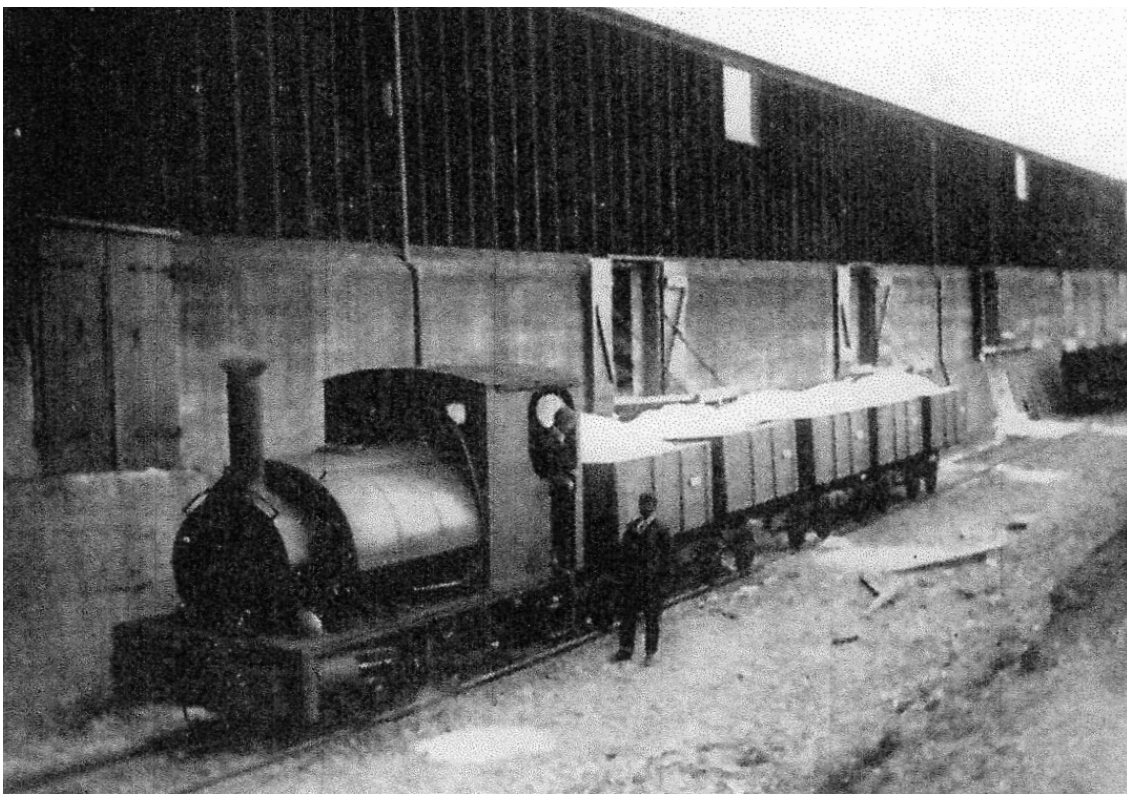
The flow of Brine by gravity from the reservoir to the Works could be controlled by the man in charge at the Works where it fed a range of twenty Salt Pans to make Common Salt all in one large Pan House, and a further four Pans under a separate roof for making Lump Salt and fine Butter Salt. All twenty four Pans were 64 ft long by 24 ft wide and were 2ft deep. The twenty Common Salt Pans were aligned back to back in two parallel rows of ten in the Pan House, with every four Pans having a coal fired furnace at one end each with a chimney 128 ft high. The chimneys were a prominent feature of the local landscape for some years, as the last of them did not disappear until 1925. Each Pan could make about 50 tons of Salt a week, and the lease stipulated that there was to be an



Sketch map: 'Simplified from a sketch map which accompanies the 1906 Lease held in Barrow Records Office (BDBUC/28/4/1)'

annual production of at least 52,000 tons. The four Lump Salt Pans had their own furnace and flue (with a matching chimney) which also heated a warm room where the lumps could be dried off and a store capable of holding 600 tons of finished lumps. Two huge stores for the Common Salt, each to hold 10,000 tons, ran the full length of the main Pan House, one each side, and were served on either side by branches of the internal rail system, as can be seen in the attached photos. My description is based on the only surviving contemporary account of the works which appeared in the Proceedings of the Institute of Mechanical Engineers in July 1901, p.757.

Add to this Salt producing plant the Pier and the quite complicated internal railway system (3ft gauge) to serve both the Salt and the Gravel Extraction industries for goods both in and out, and there emerges a picture of quite a substantial industrial site in this



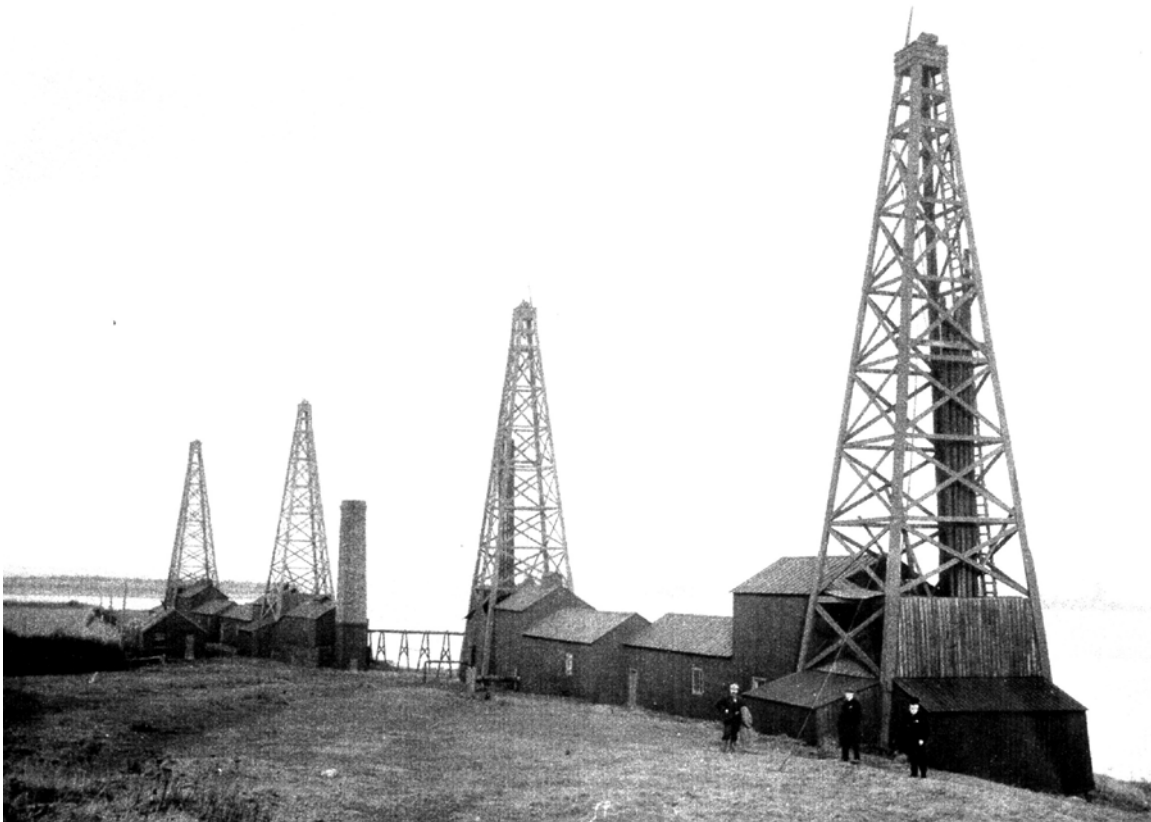
A freshly loaded train of Salt outside one of the Common Salt stores

somewhat remote location. They even built 10 cottages for the Salt workers and their families, though originally a whole village and amenities was planned.

After the discovery of Salt was first announced, a 30 year Lease was granted in 1890 to Augustus H. Strongitharm, a Barrow Civil Engineer, at a basic rent of £500 p.a., plus £10 an acre for the Works and £20 for wayleave of pipes. The Royalty was set at 1/2d per ton of Rock Salt or a ton of Brine (taken to be 1,000 gallons) increasing to 1d after 10 years; shipping dues were 1d a ton. For some reason the first company, which was to have been called 'The Barrow & Liverpool Salt Company Ltd', was never floated in spite of being actively promoted, nor was it Registered, and no work was done. Maybe Strongitharm,

Vivian and Wadham were holding out for a more advantageous Lease, because in 1896 this original Lease was cancelled and a second 30 year Lease framed in exactly the same way was granted. This time, basic rent was only £100 in the first year - £300 thereafter – with just £5 per acre for the Works (which turned out to cover 7 acres). Again there was £20 wayleave for pipes, but there was an increased Royalty of 1d a ton of Rock Salt or Brine for 10 years, rising to 2d a ton. Shipping dues were reduced to 1/2d a ton and there was to be a rent of £5 p.a. for each of the cottages, of which there were 10.

This Company, known as 'The Barrow Salt Company Ltd', was Registered on 22 June 1896 and immediately set to work constructing the extensive Plant briefly described here. Production began in April 1897 and went well for a time, but it ceased in 1902, the Company being wound up on 29 July, the usual reason given for failure being inability to compete with the Cheshire Salt interests.



The Brine Wells with derricks

Subsequently, in 1906, the undertaking was revived by Coulton Hunter, the Gravel Works proprietor on a 10 year Lease from 1 January – Rent £100 p.a. with an additional minimum rent of £50 for Mines and Wells; £35 for land occupied by the Works (as before) and also as before £20 wayleave for pipes. However Royalty was set at 2d a ton from the outset, and Shipping Dues were 1/2d a ton; expected output being 6000 tons p.a. By 1909 Hunter realized he had taken on more than he'd bargained for, and the Works closed a second and final time.

One interesting aspect of all three Leases was that, although all production was by the process of Brining, there was provision for Shaft Mining as well. The access shafts would descend into fairly standard Pillar and Stall workings, the pillars to be spaced at 70ft intervals and being 18ft thick; workings not to approach the boundary closer than 30ft, and no Brine to be worked within 60ft of a driftway. These regulations were aimed at keeping the workings dry and within the specified area of the Lease, since any Salt extracted in a Trespass would incur a penalty of £20 a cubic yard. These stipulations for the shaft mining are identical in all three Leases; though additionally in the 1896 one there is a requirement for clay, brick or shale etc to be used as a barrier to prevent ingress of water. On 22 October 1897 Wadham tells us that the Rock Salt Shaft has reached a depth of 43 ft. The whereabouts of this shaft are unknown, though on the day in question Wadham was inspecting the Brine Wells, so it is likely to have been in the same vicinity. It is not mentioned again in the Diary. However, a second attempt at shaft mining seems to have been made by Coulton Hunter, since in 1913 he wrote to Walter Wadham (Edward's son and his successor) to admit his failure to make the Salt Works pay, and asking to be relieved of his responsibilities for it. In this letter he lists many reasons for failure, one of which is the loss of £262/10/-d spent on trying to "open out a Rock Salt Mine" (this was out of a total loss on the whole endeavour of about £8,000). This could have been a new shaft, or more likely just development work on the original.

Rock Salt mining and extraction by Brining were tried side by side for a while at about this time at the Preesall Salt Works directly across Morecambe Bay close to Fleetwood and in an area of similar Geology (see V.Landless in British Mining No 11, 1979). Salt here had been accidentally discovered in test borings made to try to locate Iron Ore to compete with Furness Haematite ! For a time all went well, then disaster struck as water began to dissolve the supporting pillars – even though nearby Brining had been stopped. In later years it has been pointed out (by Rose and Dunham in their 1977 Geological Memoir) that the Barrow and Preesall Salt deposits have what is known as a 'Wet Rock Head' – that is a stream flowing across the top of the Salt strata; and that when this is the case Brining is the only practical way to extract the Salt (see also the booklet by Jennifer Morrison on the Geology of Salt, a Salt Museum publication by Cheshire Libraries and Museums 2005).

The three attached photographs – all kindly supplied by the Cumbria Archive and Local Studies Centre, Barrow – show the Brine Wells with derricks and some idea of the accompanying plant; the main Pan House at the Works with its five huge chimneys and some indication of the rail system (cover picture, ed.), and finally there is a fine shot of a freshly loaded train of Salt outside one of the Common Salt stores, waiting to proceed to the Pier, and from this can be got a good idea of the type of loco and waggons they used.

At the present time I am looking through the material held in the Cumbria Records Offices and other sources to try to gain as much information as possible for a more in depth account of the Barrow Salt, and the Companies involved, but a final assessment will have to wait until a Barrow visit can be arranged.

Brian Cubbon.

Parkside engine smashed up

From Edward Wadham's diary 15 December 1870

Into Ulverston – engaged all day with the case against Robinson for smashing up the Parkside Co's Engine – Wife came home from Grizedale –

From the Ulverston Mirror 17 Dec 1870:

Injury from neglect of contract

George Robinson, engine driver, was charged by Henry Atkinson, agent of the Parkhouse mining Company, with having, whilst under a contract of service, so neglected his duties as to lead to certain damage as to the engine under his care. Mr Postlethwaite defended.

It appeared from the statement of the prosecution that the defendant was engaged 12 months ago to act as engine driver, at £5 per month, 7 days to a week. At the end of each week one of the drivers would have to stop on 24 hours, till the other came on. Up to the 13th of November there was no cause of complaint against the defendant. It was an understood thing that the defendant should not leave his engine whilst it was at work till relieved. He had to be on duty on Sunday, the 13th of November, till the other man relieved him. It appears that defendant left his engine at 5pm, came to Ulverston, and arrived back at a quarter past 10. The fire had been banked up, and the engine left ready to start on his return. Nothing at all was known of what happened, except what had been told Atkinson. In the former part of the day the engine was in good working order. With ordinary care the damage could not have taken place. Damage had been done to the extent of £60, and in addition, the mines had been stopped till the preceding day (Wednesday). This was the fifth case within a year and it was on public grounds that the prosecution was instituted. The bench would find that when the defendant came back he started the engine, but did not set the valve properly. He then fell asleep, and the engine worked itself to pieces. The act said that if any collier, pitman &c contracts to serve, and shall absent himself from service, or be guilty of any misconduct, then it shall be lawful for the justice before whom the complaint is laid to issue warrant for the apprehension of such person. The case *The Queen v James Lord* and other cases were quoted to sustain the prosecution.

..... the complainants were a deal better known by the name of the Parkside Company than by those of John Fletcher, Joseph Musgrave &c.

William Dennison said: I am a miner, working at Green Lane, Pennington. I remember seeing the defendant on the 13th of November about 5 o'clock attending his engine. He raked up the fire and left, saying he was going to have something to eat.

PC Smith said: I am stationed at Swarthmoor. I saw the defendant there at 10 pm going towards Lindal. He appeared to me sober. He bade me "Good night" and passed on.

PC William Bolton said: On Sunday night, the 13th November, about 12 o'clock, I saw the defendant. He told me he was going to Mr Atkinson's. I asked him what was the matter. He

said the engine had broken down. Atkinson came down, and said, "What's up, George?" Defendant said "I was lying asleep, and when I awakened the engine-house was almost on fire from sparks. I stopped the engine, took the fire from under the boiler, and came and told Atkinson." He said the wheels and something belonging to the pump were broken.

Henry Atkinson, mining agent for the Parkside Company, said: I have charge of the Pennington pit. I engaged defendant to work as an engine driver at that pit, about 12 months ago, at £5 a month, 7 days a week. On the 13th of November a current month was about half gone. On the 13th November defendant had to stay from 7 o'clock on Sunday morning to 7 o'clock on Monday morning. Another man was employed also, and these longer hours occurred whilst the shift was being changed. I had told the defendant he was never to be absent from the engine when the water was "ripe" (filling fast). It was the duty of the driver to be there, but he could leave for an hour or two if the water was low. On the 13th November there was a good deal of water in the pit. On the afternoon of the 12th inst, the engine was in good working order. Such an accident would not have happened had proper care been taken. When the defendant came to me he said, "There's been a regular smash up yonder." I said I would go up with him. I also said "Thou'st been asleep, George." and he said he had. When I got there I found that the pumping wheel shaft was broken in two, and the pedestal as well. The pinion wheels were stripped, and the pedestal as well. The upright the engine works in was also broken. All the machinery was damaged. Outside I found that the balance box was broken. I estimate the damage to the engine and gear at £60.

By the bench: At what time on the previous Saturday did you leave him?

Witness: I left the boiler being cleaned at 1 o'clock on Saturday. His regular time to leave on Saturday would be about 5 o'clock. The other driver drove the engine on the Saturday night.

Cross examined: The engine went about 18 strokes a minute. Mr Wadham said it was to go from 16 to 18 strokes a minute. I have never told the men to run the engine at 20 strokes when the water was ripe. It has run 25 strokes a minute. If they were running it 20 strokes a minute it might go to 21 or 22 strokes a minute, but it could be kept to 20 strokes a minute by looking at the watch. We had to wedge the bed up sometimes to keep all safe. I told Mr Wadham of it. The wedges were put in a few days before the accident. I saw the key after the accident. It had not worked loose. If the key had been $\frac{3}{4}$ " out of place I don't think the accident would have resulted from it. I am quite sure that the key had not worked loose

George Robinson (the defendant) was then called. He said he had had 14 years experience at the mines, and was accustomed to engines. He had been at a similar position at Mr Kennedy's before going to Parkside. He applied to Atkinson for a job, and early in February of this year was engaged by him at the weekly wages of 25s. The engine was at that time used for pumping and winding. The shifts were from 7 in the morning till 5 in the evening, and on Sundays they sometimes pumped water until 9 or 10 o'clock at night. It was never mentioned that he was to attend from 8 o'clock on Sunday morning till Monday morning at 7. He did it only twice. Atkinson never tied them to do it, except when the water was "ripe".

He might have stayed on two occasions 24 hours. On the Sunday in question he came away at 5 o'clock as there was no occasion to stay. The pump could draw an hour's water in three quarters. He was instructed by Mr Wadham that he was to draw at 14 or 15 strokes per minute and was told by Mr Atkinson that they might run 18, but he never stopped them running up to 20. The engine was small enough for the work, and a gin had been put up. He had often been 10 or even 20 hours away in summer time. The keys required tightening up with tin occasionally, and had been so tightened on the Wednesday or Thursday before the accident. The engine bed had given way which had to be wedged up and this had been done some time previously. Shortly before the accident he was working at 18 or 19 strokes; a fortnight before at 20 or 21. On the night of the 13th of November, about 11 o'clock, he applied tallow to the cylinder, and otherwise saw that all was in proper working order. The engine had run about $\frac{3}{4}$ of an hour - to the best of his judgement as he had no watch - when the accident happened. The water was then indicated at 18" above the sump. He had just flung some coals on the fire, and had sat himself beside the boiler fire on the bedplate, on the opposite side to the pump wheels, when the accident occurred which would be in about 2 or 3 minutes. He did not fall asleep but was awake. The accident might have been caused through the breaking of the pump wheel shaft. The first thing he did was to reverse the engine, and about half a minute elapsed before it was stopped. He looked at the engine previous to going to inform Atkinson. He found the pedestal was gone, the cogs stripped, and all was a complete wreck. He met a young man on the way to Urswick, and afterwards with PC Bolton, who accompanied him to Atkinson's house. Witness told him that the pump wheel shaft was broken, but told him nothing else as he was in a room at the back part of the house. Atkinson went with witness to the place, when he said it was a bad job. He also said, "Thou must have been drunk or asleep". Witness replied that he had been neither, and he said "Thou can't persuade me but thou has had some drink". There was a slight flaw in the shaft, which he (witness) had found on examination after the accident. The flaw was about half way through the diameter of the shaft, which was about 4 or 5". (Witness failed to explain sufficiently the appearance of the flaw so as to infer the nature of it). The wheel had shifted and had moved some clips, which had been placed as a stay. Witness had done all he could to prevent the accident. Nothing was mentioned about his being drunk or asleep when he saw Atkinson at Urswick, and it was until after that that was mentioned. PC Bolton was not there then.

..... The chairman said that they did not feel that they could then give a decision as they were wishful to know the condition of the machinery in action, and, to afford time for inspection by himself and Mr Hannay. To clear up this and other points on which they had a doubt, the case would stand adjourned until next week.

From Ulverston Mirror 24 Dec 1870:

The charge of damaging an engine

George Robinson was charged on the information of Henry Atkinson with neglecting an engine, and thereby causing damage, whilst in the employ of the Parkside Mining Company. The case had been adjourned from last week. The same advocates appeared as on the last occasion. After some conversation the bench determined to take the evidence of the engine

drivers who had previously been in the employ of the company, and had worked the engine alleged to have been broken by the defendant's neglect. Robert Cowan said: I am an engine driver at the Pennington Pit. Robinson, the defendant, and I worked together. I took one shift, he the other. I was with the engine before the accident. On Sunday morning when I left it, it was in proper working condition for anything I know. Robinson came before I left. I left all safe. I had worked the engine 31 weeks. It has never wanted wedging up since I worked it. I wedged it up before I worked it once. Our orders were to drive it at 16 to 18 and no more than 20 strokes a minute.

By Mr Fell: How did you know when it was going 16 and when 20?

Witness: I had a watch in my pocket. There were 3 wheels and a shaft broken after the accident. I saw nothing defective about the iron.

By the bench: In an engine of this description is it right that a man should be employed continually for 24 hours?

[no reply was given to the question]

Witness: (cross examined) The baulk was never wedged up whilst I drove it. It was unsteady while I drove it. I have not driven engines for 13 years like the defendant. The back balance bed was sometimes unsteady. The engine, in my opinion, was rather small, but it always did its work. When I was driving the engine once Atkinson spoke to me about the engine running 25 strokes a minute. I was forbidden to drive at that speed, but I had to do it to keep the men employed. The baulk now put down is longer than the other one. If a longer baulk than the old one was put in it would be steadier than the old one.

In reply to the bench, the witness said: the least thing in the world in turning the steam cock would drive the engine at a greater or less speed. There is no indicator to tell us how much steam we have on. There is a glass to tell the water in the boiler. There is no governor. There is no indicator to tell the pressure of the steam upon the piston.

George Birkitt, called for the defence, said: I have driven engines at Lindal Moor for 6 years. I drove this one for 8 months. She was light for her work. Mr Atkinson, with Mr Wadham's consent, engaged me. The responsibility of getting the water out rested on the engine driver. The engine was driven from 12 strokes to 23 or 24 a minute with Atkinson's knowledge. I wedged up the engine three times during the 8 months I was there. Atkinson once assisted to do this. There was nothing strange in this accident occurring - it might have occurred to any man. We have frequently left for some hours on a Sunday. If we put a good fire on the engine would drive itself for $\frac{3}{4}$ of an hour. There was nothing to indicate at what speed we were going except our watches.

Cross examined: I left the Parkside company because I took out a game certificate. The engine did its work properly when I left, with hard work.

John Onslow, for Messrs Westray and Foster's said: Twelve months ago I saw the engine made. I have since seen a part of the machinery, I did not see any flaw in it. I should think it would work with safety at 35 lbs or 40 lbs to the inch. It would work at that pressure at the rate of 17 or 18 strokes. The water in the boiler should not be allowed to go below the glass. It would make the engine go faster if there were a large fire underneath. There were no governors to the engine - it did not require any if used for winding purposes only.

Cross examined: It was not safe to drive the engine at 23 or 24 strokes a minute. It would shake all over. 18 strokes was quite sufficient.

The bench (Mr Hannay and Mr Fell) retired for a few minutes and on their return they said: The magistrates have given this case a great deal of consideration, and I may say that we are of the opinion that the evidence which was offered on the part of the plaintiff was not conclusive against the possibility of an accident, and so long as that doubt exists the magistrates are of opinion that they cannot convict.

Cuttings supplied by J Wignall, abridged by P Sandbach



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History and Description of the Greenside Silverlead Mine, Patterdale. By W. H. Borlase. An extract from an 1894 meeting of the North of England Institute of Mining and Mechanical Engineers, provided by Chris Twigg.

Greenside is one of the oldest, if not the oldest, silver lead mine now at work in the United Kingdom. Its history up to the "eighties" (*eighteen* eighties. ed) must have been one of gratifying success, but of late the prices of silver and lead have materially militated against results.

The original workings are situate on a tableland and slope of one of the spurs of Helvellyn, starting at an elevation of 1,850 feet above sea level, and through a hill rising to the north, having an altitude of 2,500 feet. The washing and dressing appliances were of the most primitive type, and were only workable nine months in the year, frost and snow interfering during the winter months with this operation. The ore at that time was conveyed to the neighbourhood of Keswick on the backs of horses for smelting, but for the last sixty years the company has itself smelted the produce, de-silverizing the same, and selling it in soft lead pigs and pure silver cakes.

The predominating geological formation is porphyritic, being largely made up of syenite, felspathic ashes, and traps, which more or less intrude on and into the vein in different sections of the mine. The composition of the vein varies considerably, in sympathy with its structural surroundings. The ore-bearing sections are embedded in a hard massive (either orthoclastic or plagioclastic) felspar, in which it is composed of quartz, carbonate of lime, sulphate of baryta, with blende (sulphide of zinc) thinly dispersed, and argentiferous lead-ore. When baryta is present the vein generally opens to a great width, yielding in some cases 10 tons of silver lead-ore per fathom. The non-productive sections are encased in a less compact and softer series, the vein itself being reduced to small proportions, and principally composed of flookan and friable quartz, with small quantities of iron pyrites. The bearing of the vein is about 20 degs. east of north, with an underlie or inclination dip to the east of 18 degs. from the vertical line.

The southern portion of the workings is singularly disordered by a cross-course, locally termed "crossback" or clay vein, which though small in size when compared with the Greenside vein (which it crosses nearly at right angles), has, nevertheless, so mastered the latter that it is broken up and split into branches, and has never been recognized south of the intersection. The north section of the mine has also a crossback or cross-course, but the result at the crossing is so completely reversed that one is struck with astonishment to see the opposites in the same formation. But on studying the conditions of the intersections the difference may, to some extent, be accounted for. The former bears south-east by north-west, with a southern underlie, carrying a good hanging wall or cheek, and composed of soft clay flookan. The latter (north cross-course) is small, well defined, bearing south-west by north-east, with a slight dip northwards, bringing with it from the west a hard and well-defined greenstone.

To the north of this intersection—the effect of which is that the vein is carried away nearly due east for 60 feet, after which it gradually recovers its proper bearing—the vein opening out to a width of 16 feet, is composed of friable quartz, carbonate of lime, and is very productive of lead-ore. Here we meet with a bastard granite or syenite, very hard at

times, and at others partially decomposed, resembling very much the china-stone of Cornwall, the vein being more productive in the harder portions, the softer portions giving a great deal of labour and trouble when the stuff is being removed from the headings and stopes, the hanging side exfoliating extensively. This action occurs more especially where the vein throws off what are known as the east branches, or may we say where the feeders of the vein come in from the east; for in close proximity to these junctions there is invariably a good deposit of ore.

The vein at times carries large quantities of felspar, having a flintlike appearance, quite phonolitic, and may be termed clinkstone.

Up to the year 1869, the workings were carried on through the various day-levels, the highest starting at 2,000 feet, the lowest, the Lucy Tongue level, at 1,100 feet above sea-level, and they are mostly cross-cuts. The last-named was started on a vein, known as the Lucy Tongue vein, which runs parallel to the Greenside vein, and the driving was continued on its course until the south cross-course or clay vein, already mentioned, was intersected, and being a loop for the two veins was made use of, the level vein turned and driven on it for a considerable distance; but the bearing being too southerly for the ore-producing zone proved in the upper levels, the direction was again changed to north-west, to come under the productive ground ; consequently the last portion of this level is in country rock. Seventeen years were occupied in this driving, the whole distance being $\frac{3}{4}$ mile, and considering that there were no means of ventilation beyond a small fan-blast, one is led to wonder how the work was accomplished. We are certain that such proceedings would not be allowed at the present day.

From the level driven at the altitude of 1,800 feet, a shaft is sunk to the base of the Lucy Tongue level 480 feet below, and the ground intervening is considerably wrought, the haulage being done by a hydraulic double-cylinder engine, receiving its power from a store of water 180 feet above, giving a working pressure of 80 lbs. per square inch. This, for many years, was the only engine employed in the mine, and until the Lucy Tongue level was driven up to the vein, and a shaft sunk on the point of intersection, no other was needed. The No. 2 hydraulic engine was erected to work this shaft, receiving its power from the exhaust water of the No. 1 engine, having an effective head of 480 feet or 212 lbs. pressure to the square inch.

There are three shoots, so-called, or deposits of ore in the developed property. The south and middle deposits have been somewhat erratic in their productiveness, either very good or very poor. But the north shoot, which was first discovered in the high mountain-lands, has been continuous, apparently improving as depth is attained, and judging from the present appearances of the vein and the rocks in which it is encased, the author ventures without hesitation to assert that great riches still remain for deeper sinking.

The middle bunch (or deposit) showed at first in the low level, but became poor about 60 feet below and remained so until 78 feet below the Lucy Tongue level was reached, where it made a splendid deposit of ore for 150 feet in length, suddenly cutting out as suddenly as it came in. Compactness in the surrounding rock in this section is singularly

absent when the vein is non-productive, and probably accounts in some measure for the erratic character of the vein here, for as soon as the ground assumes its normal hardness productiveness is resumed.

The same remarks will more or less apply to the southern deposit or bunch of ore, excepting that the intermittent productiveness must be credited to the near proximity and influence of the cross-course. Throughout the mine the ore-bearing ground has materially lengthened from the Lucy Tongue level downwards, the vein being more compact and the ore much more concentrated.

The levels are usually driven 7 feet high by 7 feet wide, over which another level is driven, leaving an arch or roof of 5 or 6 feet between them. This plan is adopted to save wooding. Through the arches or roofs hopper-holes are sunk about 18 feet apart, and shoots put in to fill the stuff direct from the headings into the waggons, from whence the same waggons deliver their contents to the washing and picking-grates. The headings are continued from roof to sole of the levels, and are worked in sections or lifts of 12 feet high each.

The 120 feet level below the Lucy Tongue level is only driven through the southern deposit of ore, but the 240 feet level is driven as far north as the Lucy Tongue level, and still continues in good ore. At this level, near the No. 2 shaft is fixed a Cameron pump driven by compressed air, supplied from outside the mine, a distance of nearly a mile, and it was found quite adequate to deal with the whole of the water in the mine at this depth; but when sinking for, and the driving of a 360 feet level was required, this power was no longer available, unless at the expense of the rock-drills and sump winding pneumatic engines. As we were fully convinced that an extra or supplemental plant must be provided, the question arose of compressed air versus electricity.

With the former we had already some experience and were aware of its capabilities, and after mature deliberations in matters of site for the initial power to be employed to generate the extra power needed inside the mine, and to avoid robbing any of the existing machinery, the author decided in favour of electricity. He accordingly recommended the new power to his directors, who readily entertained the suggestions, saw the advantages offered, and in due time ordered the work to proceed.

The following description of the plant conveys some idea of its extent at work and provided for, its power capabilities and utility. On the eastern slopes of Helvellyn lies a small natural lake called Red Tarn, and on the north-east another called Keppelcove Tarn. Between these two waters rises the hill of Catchedecam, at the base of which the overflows join, and near to which the turbine-dynamo station is erected. The water is taken at an elevation of 1,750 feet above sea-level, and flows through an open watercourse $1\frac{1}{4}$ miles in length to a wooden tank, from which it is conveyed down the hillside for a distance of 1,080 feet, in cast-iron pipes 15 inches in diameter. The fall at the station is equivalent to a vertical head of 400 feet, and the effective horse-power is about 200.

The generating-station contains a Gilkes vortex turbine of 100 horsepower, driving a four-pole compound-wound dynamo, and provision is made to duplicate this plant when necessary; pipes, watercourses, etc., are already laid for this purpose accordingly.

The electric current is conveyed by two bare copper conductors on poles for 3/4 mile, where it enters the mine at an elevation of 1,600 feet above sea-level. The conductors from this point are insulated and covered with lead. About 3/4 mile in the mine and down through No. 1 shaft, or 1 1/2 miles from the dynamo, a 9 horse-power series-wound motor is winding the stuff from a pair of sinkers. Farther into the mine, another 1/4 mile and down through No. 2 shaft to the 360 feet level or bottom the mine, is fixed another 9 horse-power motor working a three-throw pump, forcing the whole of the water in the mine below the Lucy Tongue level, up to that level, 360 feet high.

About midway between No. 1 and No. 2 shafts is fixed a transformer, which reduces the pressure from 600 volts to 250 volts, for the purpose of working an electro-locomotive in the lowest day-level, through which runs the water used by the two hydraulic engines. The locomotive runs with a train of twelve waggons, the total weight when loaded being 18 tons (exclusive of itself), and it does the work with the greatest ease over gradients in places of as much as 1 in 20 and 24. The conductors in this day-level are of phosphor-bronze wire, and the current is fed to the locomotive by four contact-pulleys. The difficulties encountered in fixing this plant and wiring the level can only be appreciated by the practical miner. The curves are so numerous that the train occupies three and four of them at a time in places. The gauge of the railway is 22 inches, width of locomotive 32 inches over all, and height 46 inches.

The engine-rooms, caging-stations at the different levels, and shaft tops, are lighted by six 100 volts 16 candle-power lamps, wired in series. The adoption of this power has enabled the mine to be worked with six horses less underground, and has effected considerable saving in other ways. The cost of maintenance since December, 1891, including accidental breakages and wearing renewals, i.e., brushes, etc., has not exceeded £25, which speaks for itself, when taking into consideration that no professional electrician is employed on the staff.

The turbine-dynamo station and offices outside are in communication with the chief stations inside the mine by telephone. The dressing department is equipped with Blake stone-breakers, from which the stuff gravitates to Cornish and other crushers, from them through revolving-trommels and V-classifiers, which supply Green and other continuous jiggers, the finer stuff and slimes being taken to larger V-classifiers, and from them to automatic and other round buddies. The ore is dressed up to 80 and 82 per cent, of lead. The smelt-mill is provided with roasting and other calcining-furnaces, Scotch hearths being used for smelting, and the Pattinson process for de-silverizing.

Few mines are so advantageously situated for cheap power as this one, consequently many are being compelled to cease working owing to the very low prices which have now continued so long. But the directors of this company have still a hope that the once flourishing and important industry of lead-mining in this country will not become extinct.

(There will be a description of the lead ore washing plant in the next Newsletter. Ed.)

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