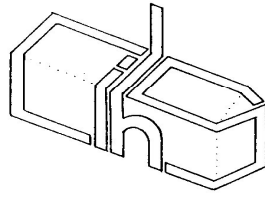


Cumbria Industrial History Society



BULLETIN

www.Cumbria-industries.org.uk

No. 62

AUGUST 2005

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EDITORIAL

We are now well into this years summer programme and the Society has enjoyed some excellent meetings. Please note that the date of the Sedgewick Gun powder works visit has been changed. We also have a very exciting October conference arranged and booking forms are enclosed.

You should all have received a copy of volume five of the Cumbrian Industrialist. I apologise for the printing error. However I have already received the first article for volume six and I would request any of you members out there with research that needs writing up to get on and please submit it. Do not be afraid we can help you produce a suitable piece for the Industrialist.

The committee is well on its way to organising an exciting programme for 2006 already. If any members have ideas for either day or evening meetings or conferences, please let one of the committee members know.

It has been suggested that the Society should organise a weekend trip to visit the industrial heritage of a different region. If you would be interested in such a trip can you please let a member of the committee know and we may take the idea forward for the future.

Hope to see many of you at the remaining meetings for this year.

SOCIETY EVENTS

TYNEHEAD LEAD MINES AND SMELTER SATURDAY 6TH AUGUST 2005

A walk along the South Tyne to view the remains of various lead mines and the smelter and other features. The walk is mainly along paths and roads although can be very wet in places. Meet 10.30am at the end of the tarmac road at NY 757 384 ample parking on grass over cattle grid. Bring packed lunch and suitable wet weather clothing.

SEDGEWICK GUNPOWDER WORKS SATURDAY 3rd SEPTEMBER 2005

NOTE CHANGE OF DATE

A visit to this site meet at the car park at 10.30am

OCTOBER CONFERENCE KESWICK INDUSTRIES SUNDAY 16TH OCTOBER 2005

See enclosed booking form for details

NOVEMBER EVENING MEETING PORT CARLISLE AND CARLISLE CANAL COCK AND DOLPHIN KENDAL 7.30PM TUESDAY 22ND NOVEMBER 2005

Illustrated talk by David Ramshaw.

NON SOCIETY EVENTS

NEWLANDS FURNACE

Open day Saturday September 10th 2005 10am to 5 pm.

Details contact John Helme 01539 731020

BOOK REVIEW

“AH’D GAA BACK TOMORRA!” MEMORIES OF WEST CUMBRIAN SCREEN LASSES.

A compilation by Maureen Fisher and Sue Donnelly. Published Whitehaven miners’ memorial and living history project ISBN 0 9544112 1 8 price £5.00

This is a series of recollections of various women who worked on the screens sorting coal at various West Cumbria pits. The accounts cover both the work involved and also their general lives including the death of husbands down the pit and the frequent deaths of young children.

The book is well illustrated with photographs of the girls at work and also group and individual portraits.

KENDAL BROWN: THE HISTORY OF KENDAL'S TOBACCO AND SNUFF INDUSTRY.

By J. W. Dunderdale (ed. A. Bonney) Published Helm Press ISBN 0 9540497 5 6 Price £10.95

This is an account of the tobacco and snuff industry written by an engineer who retired in 1979. It sets the background to the industry and then deals with the three firms of Samuel Gawith & Co., Illingworth's and Gawith, Hoggarth.

SITE NEWS

KIRKBY STEPHEN EAST STATION

The Stainmore railway has now signed a 30 year lease on the station. This will allow to improve the site with the removal of rubbish, creation of a car park, and repairs to the footbridge over the line. It will also allow them to apply for grants to repair the buildings.

MERRYGILL SIGNAL BOX

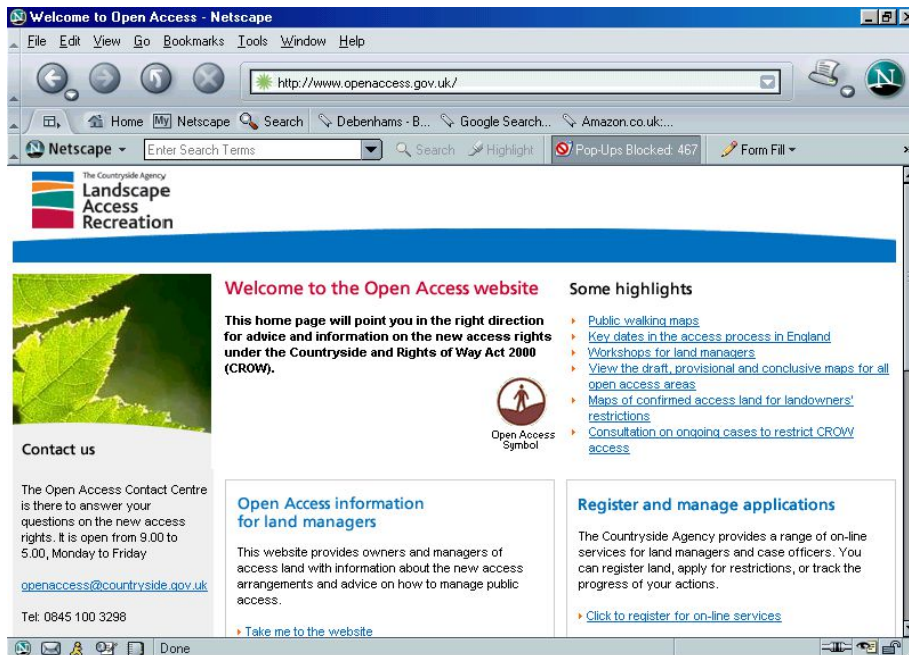
The Northern viaduct Trust and the Stainmore Railway company have uncovered and excavated the remains of the signal box at the end of Merrygill Viaduct. This controlled the traffic in and out of Hartley Quarry. They have uncovered the lower portion of the box is uncovered showing the floor and the area in which the wires and rods were housed. The site can be viewed by walkers on Northern viaducts footpath from Stenkkirith Park, Kirkby Stephen.

THE RIGHT TO ROAM OR OPEN ACCESS

This spring saw the CROW Act become law in this part of the country. This Act allows the general public to access large areas of open land over which no formal rights of way are present. The Lake District in the past has usually had a reasonable amount of freedom, but the north Pennines have been severely restricted due to the number of commercial grouse moors.

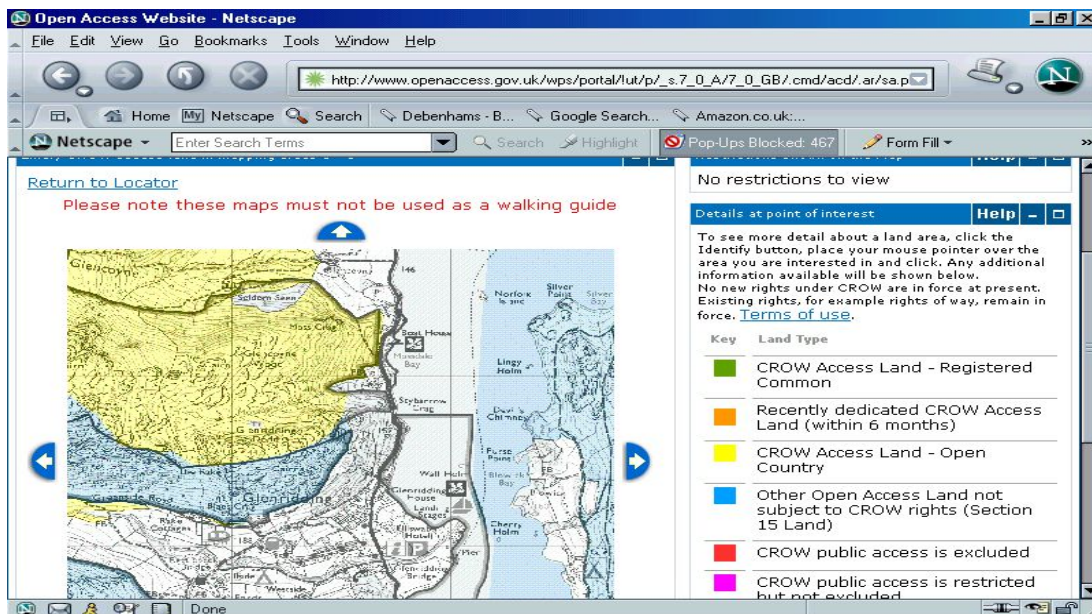
This new law allows you to access these areas and therefore many of the old industrial sites especially mine sites on the north Pennines etc. There are various restrictions that land owners can apply for on there land. This can be complete ban on access at all times, (this is usually restricted to important nature reserves) restriction of people with dogs (usually grouse moors) and also up to 28 days of total closure. This total closure is usually for such occupations as grouse shooting, heather burning etc.

To find out what restrictions apply to an area of open country which you may wish to visit then a visit to the open access web site is the best port of call. This is found at www.openaccess.gov.uk. On the home page on the right hand-side you will find a list of options the option of maps of confirmed access land for landowners restrictions.



OPEN ACCESS HOME PAGE

Clicking on this will take you to a screen allowing you to enter a location either as a place name or grid ref. This will then bring up a map of the area with the access land shown in different colours depending on the restrictions in place at the time. Also there is a list of restrictions for that map area to the side giving further details i.e. length of duration of restrictions and reason why.



MAP SHOWING ACCESS LAND IN THE GLENRIDDING AREA

WESTMORLAND MARBLE

My interest in Westmorland Marble arises from the presence in the Stone Parlour at Sizergh Castle of a chimney piece known to have been quarried near Hawes Bridge, about a mile and a quarter North East of the Castle (1). The chimney piece which is probably by the Websters, is of veined brown and white marble with a central white marble panel, has distinctive chamfered corners, freestanding Tuscan columns supporting a deep mantelshelf, and probably its original fire surround and grate.

Dr Ian Goodall in his architectural study of the Castle (2) cites a reference by Thomas West to the quarry from which it may have come (3). *“A quarry of marble has lately been discovered near this town, [Kendal] which produces quite a new variety. It is of different colours, beautifullu variegated, and takes the highest polish. When inlaid in statuary marble it has the best effect, and is equal, if not superior to any imported from Greece or Italy. Chimney-pieces, and other ornamental works, are made of it and of the common limestone of the country, which also polishes very fine, and in good stile, by Webster and Holme, masons, in Kendal, who have erected a mill for sawing and polishing the same.”*

Cecilia Strickland of Sizergh, in her correspondence in 1796, with her brother Charles Townley, a noted connoisseur of classical sculpture refers several times to her farm manager's interest in developing a local marble industry. (4) *“What Wm Ellison wants to say about the Marble is, that he has very lately hit upon a Rock of Marble much superior in quality and richness of colouring to what has been got on Mr Wilsons Estate on the other side of the River Kent, this seems to be the Solid Rock of which the other side is a smaller branch and which has not yet been found without abundance of cracks & soft places, also a large share of Limestone in it - Wm thinks this is so good, that he has ventured upon hiring workmen from Liverpool and Manchester capable of finishing Chimney peaces - Tables & any Inlay patterns on Statuary Marble - But what he is at a loss for, is good Designs for Chimney peaces, & c - And thus he Humbly begs, I will entreat you to procure for him, either approved printed ones, or good Designs coloured according to some approved work, of Marbles Inlay with Various Colours - He says tis worth his while to give away Money for good Designs, now in the beginning of his undertaking, that he may have Choice things to show, & which shall be different from those already done at Kendal - which he thinks Yours will be, if you are so good to intrist yourself in choosing for him - & if you could send him by Mail Coach, a printed book of such things with your Mark to those, whose beauty of Proportion & figure you most approve, he can next week - have all things ready to begin to execute anything. -his wish is, to make Samples of the sorts of Marble he finds good & in plenty, as soon as possible, first - to send to you, & to Various places where he may be advised as likely to sell, either in finished work, or in Block, to Marble workers - Mr Wilson is now in London & did take samples of the best of his Lumps picked by his workmen here, & it is expected he will procure both orders and patterns to send down - As Wm means to push ye sails of Sizergh Marble to the out most, he Craves Your favour, & that of Mr & Mrs Standish to name it to any of Your acquaintances who might be likely to be Tempted with Mr Wilsons - as least so far as to postpone their orders till a few weeks may show what at present bids to be of Superior Quality - It will be safest to direct to me, what you send to Mr Ellison rather than to Sizergh - When Bored is in a drawing mood, perhaps he will make a Sketch of something in fashion that can be done in Marble - Wm intends to keep his men at work on Chimneys or something likely for Sail, till there be time to have orders & the thing to be known - - You see I have written in my closest Manner to keep on one sheet of paper, as a Dubble is unavoidable for the enclosed -*

for which I am extreemely thankfull for the sight of & wish to hear if a handsom Visit be made to you all, as I hope it will-Ó .

An account of the Kendal based business of Francis Webster and Sons is given in Angus Taylor's book 'The Webster's of Kendal'. (5) It includes the following passage. *'The Marble Works in the town and neighbourhood ... are very extensive, and were first brought into repute by the late Mr Webster, architect, who about 30 years ago [1799] , constructed machinery ... for sawing and polishing the marble. This machinery is brought to such a state of perfection, that every description of mouldings, whether straight or circular, is now wrought by it with more accuracy than manual labour; and the flutings of diminishing columns are furnished by it in a most beautiful and regular style. In the town Messrs. Webster have their splendid show-rooms for manufactured chimney-pieces, &c. The surrounding mountainous district supplies the finest black and other marbles; and the advantage possessed by Kendal of sea and inland navigation facilitates the importation of Italian marble to be here manufactured and re-shipped to most of the principal towns in the kingdom.'*

It is clear that local marble was used extensively by Websters from the references to Westmorland marble, Kendal Dark Imperial and black Kendal marble.

Further afield, marble from Orton was used to floor the entrance to Abbott Hall; Dent crinoidal marble was used in the waiting rooms of the Carlisle to Settle railway; marble from Baycliff Quarry, Ulverston was used in Dent Church; marble of Cumbrian origin is in Blackburn Cathedral and Windsor Castle (6); and Westmorland marble was used for the plinth of the Nelson Monument in Liverpool.

Other British Marbles

A visit to the Natural History Museum Geological Gallery in London revealed show cases containing examples of marble from all parts of the British Isles. The display includes specimens from :-

Ireland Irish Dove, County Kilkenny; Middleton, County Cork; Galway black; County Down; Erne Fossil; Irish drab marble, Carrick Quarries, nr. Edenderry, Co Kildare; Irish Black marble, Co Limerick; Armagh marble, Co Armagh; Ophicalcite (serpentised limestone), Clifden, Co Galway;

Scotland Serpentine, Portsoy, Banff; Dropside marble, Isle of Tiree, Argyle.

Wales Sepentine with hornblende, Rhoscolyn, Anglesey; Moric marble, Rhoscolyn, Anglesey.

England Purbeck, Peveril Point, Swanage, Dorset; Serpentine, Lizard, Cornwall; Polyphant stone, Launceston, Cornwall; Petworth marble or Sussex marble, (Wealden); Grey clouded Petitor marble, Petitor, Torquay; Coral limestone (Babbacombe marble), Torquay; Rosewood marble, Chatsworth; Duke's Red marble, Alportmire, Castleton, Derbyshire; Oolitic Carboniferous limestone, St Vincent's Rock, Bristol; Frosterly marble, Stanhope, Weardale, Co Durham; Crinoidal limestone, Birdseye marble, Hopton Wood, Winksworth, Derbyshire; Derby fossil marble, Derbyshire; Dent marble, Dent; Sizergh marble, Sizergh,

Cumbria; Landscape marble, Cotham, Bristol; Bryscom marble, Bryscom Quarry, Draycott, Cheddar, Somerset; Onyx marble, Derbyshire.

Examples of the use of these marbles can be seen in great houses and public buildings all over the country. Penrhyn Castle, near Bangor, has fire surrounds of black Anglesey marble; Chatsworth uses several different local marbles in staircases, window bottoms, decorative panels and ornaments; Birmingham Town Hall has Anglesey marble features; and Ticeley marble was used in Inverary Castle.

A detailed account of one local industry has been published by the Peak District Mines Historical Society. (7) The book details the working of Ashford Black Marble, used in decorative stone work and ornaments, many of which had elaborate inlaid detail using patterns of different coloured marble.

Local marble in the present day

The industry thrived at the end of the 18th century and up to 1900 was still active in many places. Gradually, probably through cheap imports and changes in fashion, demand fell away. It is difficult now to find working quarries. One still active in producing marble is the Aber (Anglesey) Stone Quarry in Moelfre, Anglesey, but many have closed. While there are still ample reserves of workable stone, it does not appear that local marble can still make a viable industry.

The industry provided employment for many in isolated rural areas. Where examples of the use of local marble have survived, they are much admired for their quality and appearance. Locally quarried, locally worked and locally used it was a wonderful example of a sustainable industry. It appears that Westmorland marble was used to make inlaid ornaments. So far as is known none of these objects have survived! Apart from the Ashford Black marble publication mentioned above there is little recorded information. A reason for publishing this account is to alert interested researchers to the existence of this fascinating local industry and draw attention to the need for recording and documenting surviving examples of quarries, machinery and examples of marble artefacts.

Notes and References

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2. English Heritage. Sizergh Castle. Architectural Survey Report. NBR Index No 99114. 2000.
3. West, Thomas. Guide to the Lakes (Seventh Edition, London and Kendal). 1799.
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5. Taylor, Angus. The Websters of Kendal. Ed. Janet Martin. CWAAS Record Series Vol. XVII. 2004.
6. Haworth, J. Notes on the History and Development of the Marble Industry in the Cumbrian region 1788 - 1969. Typescript deposited in Kendal Library Local History Collection. 1969.
7. Tomlinson, J.M. Derbyshire Black Marble. Peak District Mines Historical Society Special Publication No 4. 1996.

Dick White

THE DEVIL'S PORRIDGE – THE MANUFACTURE OF CORDITE AT HM FACTORY GRETNA DURING WORLD WAR 1.

Those who attended the Spring Conference will remember that the speaker from the Devil's Porridge exhibition was rather reluctant to give much detail on the processes involved. The following notes summarise information on the process in a paper – “The Gretna Garrison”; Chemistry in Britain, March 1996, vol. 32, No. 3, pg. 37.

By the end of the first year of the First World War the British forces were having difficulties in obtaining sufficient ammunition. The solution to the problem was to build HM Factory Gretna with the capacity to produce 800 tons per week of cordite, the propellant for shells and bullets. This was more than the combined outputs of all existing UK sources of cordite.

It was a huge undertaking, eventually stretching the nine miles from Annan to Longtown. Started in mid 1915, 15,000 workers, mainly Irish, built the plant within a year with the first test production starting in January 1916. At its height it employed over 30,000 workers from all over the British Empire. Such a large workforce needed more accommodation than was available in the surrounding area and a new town was built, complete with high quality welfare and social facilities. Once the war was over production was quickly run down and the factory closed in 1919. Whilst all the houses were sold off, most are still standing, together with two churches (one of which houses the Devil's Porridge exhibition) the social hall and other important buildings.

The process

The active ingredient of cordite is nitro-glycerine. To make this highly unstable material safe to handle, it was adsorbed onto the surface of “nitro-cotton” - chemically charred cotton waste (which became known as “gun-cotton”). When extruded and dried, the finished product resembled hemp rope, which lead to the name *Cordite*.

The factory synthesised all the ingredients needed to produce cordite and recycle as many of the reagents and solvents as possible. This meant that the factory had to accommodate a wide range of processes covering a vast area, partly to separate the processes in the interest of safety. This article will only outline the central production process.

Nitro-cotton was made by charring cotton waste with “Oleum”, a mixture of concentrated nitric and sulphuric acids. The workers filled stoneware pans with the acid mixture and added the cotton to it, stirring with rakes. This process was obviously hazardous, with danger of splashing and fumes. When ready, the raw nitro-cotton was transferred into vats of boiling water to wash off the excess acid. It was then scooped out of the vat and washed with cold water and powdered chalk to remove any remaining acid before being centrifuged and dried with warm air. The finished material was transported to the next stage, “paste making”, in rubber bags.

Nitro-glycerine was synthesised by reacting glycerine with a mixture of concentrated nitric acid (HNO_3) and disulphuric acid ($\text{H}_2\text{S}_2\text{O}_7$), the glycerine being obtained by distilling the residues of soap making. The glycerine and acids were gently mixed in lead cylinders and then allowed to settle, when the nitro-glycerine floated to the surface and could be skimmed off. It was then washed with a dispersion of chalk in water to remove excess acid before

being moved under gravity along lead lined troughs to the paste making room. Gravity was used as the nitro-glycerine was too unstable to pump or move about the site in containers!

In the “paste making” stage, employees mixed nitro-glycerine and nitro-cotton by hand on (open) lead tables shaped like shallow mixing bowls some five feet in diameter. A solvent, traditionally acetone, was added to assist with the mixing process which resulted in a cordite paste. However, acetone could not initially be synthesised until later in the war and a mixture of ethanol and ether had to be used initially. Clearly this was a very dangerous process, with health hazards in addition to the ever present threat of explosion! On a visit to the factory in 1916, Arthur Conan-Doyle (of Sherlock Holmes fame) described the paste as “The Devil’s Porridge”. The paste was pressed through leather sieves into clean rubber bags for transport about the site. Trains of bags of paste were pulled to the cordite press house by a “Steamless” engine in which the steam was generated remotely from the engine.

In the cordite press house, women used presses to force the paste (known as “dough”) through apertures to produce long cords of explosive. These cords were cut to length and left to dry for six days in stoves below 80°F when the ether/alcohol mixture evaporates. The finished cordite strips were tested for quality and then blended in 50 ton lots for shipment to the munitions factories. Final (firing) testing was carried out on each batch at Woolwich Arsenal.

A social experiment

The wages of workers in the factory were up to £20 per week which, in 1916 was a huge sum, especially when compared to the average farm labourer who received only £3. One of the side effects of this was that drunkenness in the surrounding towns became a severe problem and said to be causing “more damage than all the German submarines put together”. Lloyd George, the Prime Minister who was a Methodist favoured full prohibition, but subsequently insisted on a compromise – to reform the drinking habits of the workers!

By the Carlisle and Gretna District Defence of the Realm Act (DORA) the state took control of Carlisle Brewery and all public houses in the region. They were refurbished and facilities for food and entertainment (such as bowls and skittles) introduced. Good beer was provided at reasonable prices and no one was allowed to buy a round, only to buy their own drink. The aim was to transform them from drinking dens to more pleasant places for relaxation.

The experiment was successful in reducing the consumption of alcohol from 81 million gallons in 1915 to 39 million gallons by the end of the war. The arrangements continued until 1973!

A visit to The Devils Porridge exhibition at Eastriggs, where you will find much more information, is well worthwhile. It is signposted from the A75 between Gretna and Annan. The exhibition is open Monday – Saturday 10.00 to 4.00 and Sunday 12.00 to 4.00 till 29th October. Entrance is £2 and £1 children/over 60s with a family ticket at £5. For further details on location, events and subsequent opening times etc. visit www.devilsporridge.co.uk

Ron Lyon

A DEVIL'S PORRIDGE.

In his talk on Devil's Porridge, Douglas Fairburn, at the Spring conference of CIHS (23 April 2005) gave us an interesting review of why a large explosives factory (within an area of 29 miles) was established between Dornoch and Longtown, and the social history of the people involved especially the workers, mainly women, many very young, who stirred the porridge. However, he felt unable to give much technical detail on the chemistry of the processes. One statistic was that 56,000 tons of cordite were produced.

I offer the following from my school chemistry background, mostly forgotten, and from Perkin & Kipping's Organic Chemistry 1943 edition (so the following may not fit current international nomenclature).

GUN COTTON (P&K p301)

The name **cellulose** (P&K p300) is given to several similar carbohydrates of general formula $(C_6H_{10}O_5)_n$ occurring widely through the vegetable kingdom being the main component of cell walls and wood. Cotton wool, linen, hemp, freed from inorganic matter by acids, are almost pure cellulose.

When purified cotton wool is treated with nitric acid or nitric and sulphuric, acids a mixture of nitrates of cellulose of varying composition is produced depending on the concentration and quantity of the acids and the length of treatment time. If cotton wool is soaked in a mixture of 1 volume of nitric acid of specific gravity 1.5 and 3 volumes of concentrated sulphuric acid for about 5 minutes, then thoroughly washed, the product is **gun cotton** of approximate composition $C_{12}H_{14}(O.NO_2)_6O_4$. - cellulose hexanitrate - used as an explosive. (It is insoluble in alcohol and ether. The tetra- and penta-nitrates do dissolve, forming collodion. Various similar solutions are pigmented to make cellulose lacquers such as used to be used to paint cars.)

The gun cotton so made is cleaned and dried with ether and alcohol. Heating is not recommended. The dry product can be exploded by friction. It burns rapidly but quietly when a flame is applied, but explodes violently when fired by a detonator.

NITROGLYCERIN (P&K p223) or rather GLYCERYL TRINITRATE $C_3H_5(O.NO_2)_3$.

Glycerol (glycerin propenyl alcohol) is carefully added to a mixture of 4 parts concentrated sulphuric acid and 1 part of nitric acid of specific gravity 1.52. Nitroglycerin, a heavy oil, is produced which is then water washed and air dried. It explodes violently if heated suddenly or subjected to percussion, but can burn quietly in small quantities. It is especially dangerous in its solid state - ie below -20EC. It is used as an explosive and for treating heart disease.

DYNAMITE is nitroglycerin mixed with kieselguhr (powdered siliceous remains of small marine animals), which calms it down a bit.

GELIGNITE, BLASTING GELATINE, BALLISTITE are mixtures of gun cotton and nitroglycerin.

CORDITE is also a mixture of gun cotton and nitroglycerin, made into a gelatinous mass with acetone and vaseline and formed into threads used as a **smokeless gunpowder**.

The speaker mentioned the acids and organic solvents but did not give the chemistry.

Ian Dunmur.

CUMBRIAN COPPER SITES

Back in 1995 English Heritage as part of their Monuments Protection Programme published their step three assessment of the copper industry remains in England. Below is a list of the sites in Cumbria which they thought were relevant and a grading scale.

Cumbria

1 Hesk Fell mine	SD 175	942	*
2 Cockley Beck mine	N 249	013	*
3 Seathwaite Tarn mine	SD 264	993	*
4 Black Scar mine	SD 273	997	*
5A Bonsor dressing floors	SD 289	985	***
5B Paddy End mine	SD 285	987	**
5C Red Dell mine and dressing floors	SD 287	990	**
5D Back Strings openworks	SD 281	990	***
5E Brim Fell mine	SD 278	985	*
6 God's Blessing mine	N 285	005	**
7A Tilberthwaite mine	N 298	009	**
7B Penny Rigg copper mill	N 306	007	**
7C Wetherlam mine	N 296	005	*
7D Hawk Rigg mine	N 300	015	**
8 Greenburn mine	N 290	021	**
9 Buttermere mine	N 180	157	*
10 Dale Head mine	N 222	157	**
11 Long Work openworks	N 228	162	**
12 St Thomas' Work openworks	N 230	166	**
13A Goldscope mine	N 226	185	***
13B Goldscope dressing mill	N 226	185	0
14 Little Mine Crag openworks	N 233	191	0
15A Stoneycroft smelter (upper)	N 225	213	0
15B Stoneycroft smelter (lower)	N 228	212	*
16A Copper Plate opencut (lower)	N 247	177	**
16B Copper Plate opencut (higher)	N 242	176	**
16C Salt Well mines	N 255	189	*
17 Brigham Forge	N 281	240	**
18 Silver Gill mine	N 299	341	**
19 Roughtengill (Lainton's shaft)	N 304	344	*
20 Hay Gill mine	N 308	359	*
21 Haltcliffe smelter	N 351	350	**
22 Carrock End mine	N 351	342	**
23 Upper Brandy Gill mine	N 322	338	0
24 Haweswater mine	N 494	160	0

*** Major national or international important site. Priority for protection

** Nationally important site. Sites meriting statutory protection.

* Lesser national important site. Sites whose loss would impoverish the archaeological record but statutory protection not justified. 0 Sites not of national importance. No case for statutory protection. May be of regional importance.

Descriptions of manufacturing businesses, premises, processes, and products in the *Carlisle Journal*, 1821

(Continued from the *Bulletin of the Cumbria Industrial History Society*, No. 61, April 2005)

Compiled by G. W. Oxley

387. Manufacturing near Carlisle

Warehouses, offices, warping and dwelling rooms and a two stalled stable recently occupied by Mr Stubbs and adjoining Mr Pattinson's brewery. The premises are within ten yards of a constantly running stream. Warping mills, fixtures and other implements may be taken at a valuation.
Advertised to be let, *CJ* 1157, 13 Jan 1821

388. Corn milling at Harraby Green, near Carlisle

A water corn mill one mile from Carlisle having four pairs of grinding stones (ie one of French burrs, one of blues and two of greys), a barley mill for shilling, dressing machinery, a good drying kiln, other offices, upwards of eight acres of good arable land adjoining and a dwelling house. The mill is carried by a good overshot wheel and has a sufficient supply of water at all times. It has lately undergone a complete repair.
Advertised to be let by the owner, Joseph Shollick *CJ* 1157, 13 Jan 1821

389. Dyeing at ?

John Porter has commenced business as a dyer of woollen, silk, and cotton. He will attend the following places to receive goods every market day: Mr Blakelock, boot and shoemaker of Green Market, Carlisle and at the Shop adjoining the Fleece Inn at Penrith. He will also receive goods at Mr Carmack's Post Office in Wigton
Advertisement, *CJ* 1158, 20 Jan 1821

390. Cotton spinning in Dalston

Pursuant to a decree in chancery in the cause of Stephen Nicholson against Samuel Waldie and others the creditors of Thomas Stubbs of Dalston, cotton spinner, are requested to come in and prove their debts, cotton spinner of Dalston
Advertisement, *CJ* 1158, 20 Jan 1821

391. Corn milling at Petteril Crooks in Hesketh parish

A water corn mill with a dwelling house, outhouses, and six acres of land, carried by a never failing supply of ware which has lately undergone complete repair.
Advertised to be let, *CJ* 1159, 27 Jan 1821

392. Lime at Brampton

Best quality lime will be delivered to Brampton Coal Staith at 12d. a Carlisle bushel, not 13d. as last year
Advertisement signed by James Thompson, coal agent, *CJ* 1161, 10 Feb. 1821

393. Brewing at Bog near Wigton

Assignment by John Benn to William Little, George Little, and William Little (sic) of Annan in the county of Dumfries common brewers and copartners and William Burton of Wigton, wine and spirit merchant
Advertisement, *CJ* 1165, 10 March 1821

394. Limestone quarrying in the parish of Sowerby and Sebergham

The Bankend Estate including an inexhaustible quarry of the most excellent limestone and two kilns erected thereon. Advertised to be sold by the owner, William Jack of Bankend, *CJ* 1167, 24 March 1821

395. Corn milling at the Tyne Bridge end of Alston

A water corn mill with a drying kiln, barley mill, dwelling house, and outbuildings
Advertised to be let, *CJ* 1168, 31 March 1821

396. Coach manufacture at Highgate, Kendal

James M'Naught has at his coach works a nearly new genteel landau and various other second hand carriages
Advertisement, *CJ* 1171, 21 April 1821

397. Weaving in Shaddongate, Carlisle

Two dwelling houses, each with a garden or yard and a pump occupied by Mr Dixon and Rev. Mr Woodwork and a four loom weaving shop with two dwelling rooms above occupied by Adam Little
Advertised to be sold by the owner, John Penrith, dyer, *CJ* 1173, 5 May 1821

398. Carding and spinning wool at Denton Holme near Carlisle

Three rooms lately used as a wool carding and wool spinning manufactory situated adjacent to Denton Holme corn mill a quarter of a mile from Carlisle, recently occupied by James Atkins, cotton wick manufacturer, and served by a regular supply of water
Advertised to be let, *CJ* 1175, 19 May 1821

399. Dyeing at Denton Holme near Carlisle

Two cradle pots for grinding indigo late the property of Joseph Fisher, formerly of Denton Hill, dyer
Advertised to be let or for sale, *CJ* 1175, 19 May 1821

400. Cotton spinning at Dalston

An eight day timepiece, a double mahogany desk and drawers; an iron bookcase and chest; a mahogany table and counters; writing desks; extensive shelving; two beam scales and weights large and small; oak, stone, and other tables; a screw press; a weighing machine; joiner's and smith's tools, several stoves and pipes of great length; thirteen cotton yarn boxes on wheels; five warping mills and about 200 dozen bobbins; sixteen cutting frames; six grinding stones; a stiffening machine, Corny, and other articles for finishing and making up cotton goods, three large leaded tubs for chemical bleaching; pumps, spouts, and seven large iron boilers with tubs, winces and stands; from 80 to 100 pair of looms mostly complete and working; a variety of flies, broad and narrow reeds, gears, beams, poles, rails, old cast metal, iron drums, cylinders, pulleys, planks and many other valuable articles.

Advertised to be sold by the assignees of John Waldie and Samuel Waldie, bankrupts, of whom Daniel Hebson and Thomas Sheffield can provide details, *CJ* 1177, 2 June 1821

401. Corn milling at Gamesby in the parish of Aikton

Insolvency of Joseph Brindle
Advertisement, *CJ* 1177, 2 June 1821

402. Iron working in Carlisle

RW & R. Porter have recently erected a forge for making bar iron, cart axles, sock plates, and other uses to any pattern. It has been constructed on the most improved plan and products are for sale retail and wholesale
Advertisement, *CJ* 1177, 2 June 1821

403. Corn milling at Dalston

Dalston Low Mill which has three pairs of stones, a dwelling house, outhouses, garden, and twelve acres of grassland
Advertised to be let, *CJ* 1179, 16 June 1821

404. Dying at Wigton

Insolvency of Thomas Porthouse, dyer
Advertisement, *CJ* 1179, 16 June 1821

402. Weaving at Broadguards, Carlisle

Dwelling houses, weaving shops and other buildings, gardens, and three acres of land 300 yards from the canal basin Advertised to be sold by the owner and occupier, Francis Beattie of Dumfries, *CJ* 1180, 23 June 1821

403. Wool spinning at Kirkoswold (i)

A well built and conveniently arranged mill for carding, and spinning woolen yarn. The mill and the situation are admirably adapted for an industrious and enterprising person, the surrounding country for many miles being very populous and inhabited chiefly by gentlemen, yeomen and substantial farmers who keep innumerable flocks of valuable sheep (of all breeds). Water is abundant and one peculiar advantage is enjoyed: the mill never wants water, nor is the wheel ever in a backwater. Alston and Brampton, two thriving and increasing market towns are distant about twelve miles and Penrith eight miles
Advertised to be sold by the owner, Mr Crampton of Kirkoswold, *CJ* 1181, 30 June 1821

404. Wool spinning at Kirkoswold (ii)

The valuable woolen machinery used in the mill comprising: one tease, one large cylinder, one carding engine with three large cylinders, two spring jacks with forty spindles each, all in complete working repair
Advertised to be sold by the owner, Mr Crampton of Kirkoswold, *CJ* 1181, 30 June 1821

405. Cotton spinning at Carlisle

Dissolution of the partnership of John Elliot of Manchester and John Slater of Carlisle, trading at Carlisle as Elliot and Slater. The business is to be continued by John Slater
Advertisement, *CJ* 1186 4 August

406. Tanning at Damside, Carlisle

Tan yard lately occupied by James Cartmell, deceased, in good repair
Advertised to be let, *CJ* 1191 8 Sept.

407. Coal mining at Talkin

Anew winning of Talkin coal has now been effected and coal of a very superior quality is now delivered for sale at Brampton Coal Staith at the usual prices
Advertisement by James Thompson of Kirkhouse, coal agent, *CJ* 1192 15 Sept.

408. Cotton spinning at Denton Holme, near Carlisle

A well built and commodious mill having good and spacious carding, spinning, roving and reeling rooms and every other convenience for making cotton twist. The machinery is carried by a large water wheel which even in the driest season has a constant and powerful supply of water. There is also a good dwelling house, a garden and three closes (seven acres) of arable and pasture land. Apply to Mr Dixon of Denton Holme
Advertised to be let, *CJ* 1193 23 Sept.

409. Dyeing at Wigton (see 404)

Dyeing utensils: a number of vats, two excellent iron boilers, stone plates, a copper boiler a quantity of vitriol, spirits of salt and aqua fortis
Advertised to be sold, *CJ* 1194 29 Sept.

410. Coach making at Penrith

Every article for carrying on the business of a coach maker
Advertised to be sold by H. Poole, cabinet maker, and John Wright of Penrith, assignees of J. Dawson of Penrith, coach maker.
Advertisement *CJ* 1195 6 Oct.

411. Dying at Denton Holme, near Carlisle

Notice of the payment of the final dividend upon the estate of Joseph Fisher of Denton Holme dyer
Advertisement, *CJ* 1195 6 Oct.

412. Stocking knitting in Carlisle

Eight stocking frames in good working order, one of gauge 16, one of 20, two of 24, two of 26, two of 28, one of 32, and sixteen dozen men's lambswool stockings
Advertised to be sold by the assignees of John Hart and James McAlpin of Carlisle, hosiers, *CJ* 1196 13 Oct.

413. Weaving in Caldewgate, Carlisle

Weaving shops with dwelling rooms over
Advertised to be sold by the assignees Robert Warwick late of Warwick Hall, banker, *CJ* 1198 27 Oct.

414. Brewing and beer retailing in Carlisle

Dissolution of the partnership of Daniel Pattinson and John Connell, trading as brewers in Carlisle under the name of D. Pattinson, Jr. & Co. The business to be continued as D. Pattinson & Co. by Daniel Pattinson and James Parker. Also the dissolution of the partnership of Daniel Pattinson, John Connell, and Robert Bell, beer retailers
Advertisement, *CJ* 1200 10 Nov.

415. Corn milling at Hesket Newmarket

Hivescale water corn mill on the river Caldew one mile below Hesket Newmarket, with a dwelling house and outbuildings and mow occupied by George Carruthers, the owner.
Advertised to be let, *CJ* 1204 8 Dec.

416. Limestone quarries at Dalston

Quarries on the estate of James Brougham, esq. at Broadfield
Advertised to be let, *CJ* 1204 8 Dec.

GASWORKS IN CUMBRIA – DRAFT LIST

I am doing some research into town gasworks in Cumbria, and have produced a little list of where I think they were located.

I would be very grateful if members could check their area, particularly to see if the location I have is correct, and fill in any other blanks if you can. There may be any number of small private gas works like Garlands Hospital that are not easy to trace, and maybe some small places like Staveley that I have not even considered as likely locations.

I will be looking at archive material next, and if anyone can point me in the direction of useful material – books, photos, leaflets, articles in local newspapers or newsletters etc. – that would be very helpful. And if anyone would like to join in this quest, even better!

Roger Baker

mbarb@freenetname.co.uk

01253 811324

4 Barnes Cottages, Back Lane, Preesall, Poulton-le-Fylde, Lancs., FY6 0HT

Place	Location	Start of production	End of production
Alston	Opposite the station		
Ambleside	Blue Hill Road		
Appleby	End of Chapel Street	1837	
Aspatria		1859	
Barrow-in-Furness	1. Hindpool 2. Salthouse	1. 1861 2. 1917 (ext. 1931)	
Brampton	Carlisle Road junction		
Burton-in-Kendal	Crofton Lea		
Carlisle	1.Collier Lane 2.Nelson Bridge 3.Bousteads Crossing	1.1819 2.1849 3.1922	1.1849 2.1922 3.
Carlisle – Garlands Hospital		1862	
Cleator			
Cockermouth		1834	
Dalton-in-Furness	Mary Bank, Goose Green	1853	1948
Egremont		1853	
Grange-over-S.	Meathop	1867	1968
Kendal	Parkside Road	1825	
Keswick	Greta Side	1845	
Kirkby Lonsdale	Bottom of Mill Brow, by river		
KL – Underley Hall			
Kirkby Stephen	Junction of North Road and		

	Middlegate Lane		
Maryport	On coast below cliffs north of town		
Millom	Facing Queen Street		1954
Milnthorpe	Next to River Bela, on site of Crampton's Paper Mill	1861	1974
Penrith	Netherend, off London Road		
Sedbergh			
Silloth		1858	
Staveley in Kendal	Main Street	1865	1913
Ulverston	Morecambe Road		
Whitehaven	By shore, north of town, between shipyard and William Pit		
Wigton	Tenters	1831	
Windermere			
Workington	1. Stanley Street 2. Ironworks coke oven plant	1. 2.1936	

SPRING CONFERENCE 2005 REPORT

Mike Davies-Shiel started the proceedings, talking about the development of the local gunpowder sites at Old and New Sedgwick, Basengill and Gatebeck, and showing us some of his collection of slides.

Mike explained that the Old Sedgwick site, developed from the 1760's was the earliest, it had a long leat, but little or no fall, so poor power, especially compared to the later sites such as Lowood which utilised the flow of the River Leven down from Windermere, and New Sedgwick where the leat was taken off at a three foot high weir from the River Kent, fed by rainfall in the Elterwater valley and Stickle Tarn. Eventually when other sites were developed Old Sedgwick was used for the finishing processes.

Basengill was developed about 25 years after Old Sedgwick, it comprised a series of incorporating mills along the side of the river, and together with New Sedgwick carried out the basic process of incorporation ready for the finishing process at Old Sedgwick.

Gatebeck was started in 1852 by John Wakefield. (This was about the time that Old Sedgwick was closed). Despite the fact that initially powder from Gatebeck was for civilian uses Wakefield was severely reprimanded by the Quaker Meeting House who disapproved of his venture.

One of the biggest problems for the industry was preventing explosions. Gunpowder is a mixture of 75 parts Saltpetre, 10 parts Sulphur and 15 parts pure charcoal. Traditionally charcoal was made by "cooking" the piles of coppiced wood slowly under a layer of sandy soil (the best source was from under tree roots). This charcoal frequently had grit from the soil as impurities, which was a major cause of explosions, and in 1794 the Board of Trade passed regulations banning the use of charcoal produced in the traditional way, and this caused the introduction of iron retorts to produce the charcoal. The shavings and sawdust

from the bobbin mills were used to heat the retorts to produce the fine quality charcoal essential for the gunpowder mills. 2 such retorts remain as gateposts at the Gatebeck site, unfortunately the new owners no longer permit access to the site.

Other measures to reduce the risk from explosions were the use of copper nails and tools, and even copper horseshoes, this all prevented sparks from igniting the powder. Blast walls, wide spaces between the buildings and powder magazines for storage of the finished product away from the production area all played their part in increasing safety. Together with rigorous safety rules, such as the amount of oil or tallow allowed for lighting, enforced by the lead hand or foreman.

Black Beck and Lowood moved to make more specialised powders, suitable for hand and shotguns, and they experienced more explosions than Sedgwick.

Mike's slides included views of all the major sites, plans of the sites including the 1854 plan of Sedgwick and a plan of the Basengill site showing 8 incorporating mills (previously there had been 10 smaller ones) an illustration and account from a French encyclopaedia describing the processes. We looked at slides of presses, wheel pits, the solid walls of the buildings, which would have had lightweight roofs, which kept the weather out but allowed any explosion upwards protecting buildings to either side. An incorporating mill at Gatebeck with runners on a steel frame, retorts, cartridge machines, and much more.

Chris Dunn (Team Leader Archaeological Survey, English Heritage Northern?) spoke next, about his involvement in the Cumbrian Gunpowder project, looking at who founded which companies, when and where. He divided his presentation into three sections followed by his slides

Firstly another quick guide to the history of the sites: John Wakefield established the old Sedgwick site; he was from a family with involvement in forge mills and banking. With the founding of Lowood on the Southern banks of the River Leven in 1798 (also backed by a banking family) there was something of a trade war, but by 1801 both were supplying gunpowder for construction of the Lancaster Canal.

David Huddleston, a Kendal banker commenced the Elterwater site in 1824 and in 1851 when the Old Sedgwick lease expired production from there was transferred to Gatebeck.

The New Sedgwick site was established practically opposite the former old Sedgwick site in 1857 by the owners of Sizergh Castle, but closed and later reformed in September 1864 as the New Sedgwick Gunpowder Co. In Dec 1860 a license was issued to erect mills at Blackbeck and in 1862 production probably started, this was steam rather than water powered.

The Cumbrian works continued to produce Black Powder and prospered until the end of the first world war (Germany was a principal customer!), but other areas of the UK changed to more modern techniques. ICI commenced a modernisation programme at Lowood, but rationalised production to Scotland and by 1935 all except Gatebeck had closed, Gatebeck ceased production in 1936

The second part looked at "why South Cumbria?"

- an ideal location - it was the centre of a ready local market (the quarries and mines) and the coastal location made possible trade to many destinations – first to Liverpool

then onwards, to the likes of West Africa. (Returning craft brought cotton and slaves)
The gunpowder industry could utilise coastal & inland routes developed by the iron industry, canal and railway networks developed, the Kendal canal extension was used by Old Sedgwick, and later the New Sedgwick Company had a warehouse at Hincaster. Horse drawn tram networks worked between the sites

- and the ideal location also in terms of the geography, water, trees, (protection and fuel) remote areas, rocky outcrops and hills (blast protection)
- There was also expertise locally to construct water wheels and leats etc.

Next we heard about the English Heritage project in more detail – it has been investigating all the Cumbrian companies including the sites and the process. 4 sites are scheduled, and are being surveyed as a record because they are deteriorating. The aim is to look at all the sites to enhance the understanding, irrespective of their current listing status. Fieldwork is carried out in the winter months making it easier to work in the woodlands, Gatebeck will be the last to be completed and is scheduled for this winter. Reports are published (National Monuments Record – Swindon office) The survey has also looked at how the sites are used post decommissioning.

At Basengill there are the remains of an abandoned garden in the quarry – this was a terraced walk with informal walks and a water feature. This middle area was the incorporating mills and the garden was developed at the same time.

Decommissioning – any building had to be dismantled if it was associated with the production process, hence there are now roofless ruins (Lowood) or foundations of walls and mounds (Lowood & New Sedgwick) mill races (Blackbeck) wheel pits (Sedgwick) and turbines. Remains of the internal transport networks survive with works tramways (often under or alongside metalled roads in the caravan parks) banks, embankments etc. There are still sleepers in situ at New Sedgwick. Some buildings not directly associated with the process survive; for example the gate house at New Sedgwick is now a dwelling, on the same site the sawmill and an open fronted barn survive. At Lowood the boiler house, 2 retorts at Gatebeck and at Elterwater the open sided coppice barn is now a hotel, and the surrounding buildings have been converted to accommodate tourists.

Workers houses survive at Elterwater, Lowood Gatebeck and Endmoor.

During world war two several former sites were taken over by the military, and used as munitions stores and camps, at Old Sedgwick the machine shop became a cook house and at Lowood the concrete platforms were the bases of POW huts.

Currently large parts of all the sites are caravan parks.

Chris went on to show us a large selection of his slides which included maps of the locations of the sites, plans of the surveyed areas, and some of the visible remains, interspersed with snippets of information – the plans of Basengill show the mills, the garden feature, wheel pits etc and other slides showed the wheel pit, the leat from the river (looking down from the bridge) and the wall of the terraced garden, in the 18th Century the female relatives of the owners were encouraged to take up gardening and study natural history, it is thought that the garden was built for Wakefield's niece.

From the New Sedgwick site we saw slides of the weir and mill race, the mills with their blast walls and a blast bank which separated the processes. Among the trees was an area that was the testing range. After the 1903 explosion the glaze house was rebuilt further north on the site and the storehouse was moved across the leat, a tramway was used and the cutting survives.

At the Old Sedgwick site previously there was a clock tower of Italianate design, whilst in the open fronted barn some of the soldiers' names can still be seen on the beams

At Elterwater the western area was rebuilt with a "modern" water wheel, the chimney was the end of the flue from the boiler house finds around the site have included bed stones and edge runners and a cannon ball which was probably used to test the gunpowder, there was probably a range at Elterwater.

Douglas Fairburn the Development Officer from the Devil's Porridge Exhibition spoke next about "The Greatest Munitions Factory on Earth" – eight years ago some local volunteers highlighted the importance of the site and this led to the development of the museum.

It was a large scale process, developed because the Woolwich factory, the major producer of raw cordite for propellants at the time, could not increase output sufficiently to meet the demand. Again the area was chosen because of the supply routes, the fact that it was sheltered by the Lake District geography also the area was out of range for Zeppelin attacks.

Kenneth Quinnan came to Gretna for the start of the process, and HM Factory Gretna (code name "Moorside") began. Experts were gathered from Australia, South Africa and India primarily but also other commonwealth countries, and it took just one year from the original survey in 1915 until production started, such was the urgent need. It was a huge operation involving 30,000 workers, and a site 9 miles long and 2 miles wide, the processes on the site were top secret! The development had a huge impact on the rural area, having been a green field site. The majority of the workers were young women from Gretna and Eastriggs

The explanation was not entirely clear, and I apologise if any inaccuracies have crept into my account, but it seems the process started at Dornock, one of the main head offices was at this part of the site, and each step in the process was carried out a bit further down the site towards Eastriggs and on to Gretna where the chemists and more technical staff were based.

At the Dornock end of the site, gun cotton was mixed with nitric acid to produce nitro gun cotton, (Cordite) this was then dried on trays in drying stoves and presses in the drying stores, which were built between Dornock and Eastriggs. Acetone was recovered from the cordite, it was drawn off over 2-3 days. There were nitric acid recovery houses in the same area, with cast iron vessels (recovery and recycling ensured the plant was self sufficient). This was the largest factory to produce cordite

The cordite was separated in the drying stores and loaded in to magazines. Each magazine held 100 tonnes of cordite. These were transferred by bogey on an internal railway (with fireless locomotive) towards Eastriggs and the mixing plant.

There were 30 paste-mixing houses, these "houses" were on a phenomenal scale, the walls were of nine-inch thick reinforced concrete, the windows were "glazed" with oiled silk, the floors were concrete covered in asphalt but with an excellent drainage system, and roofs were

wood with tongue and groove ceilings. The buildings were heated by hot water circulating through pipes, and lighting was angled to reflect from the wooden ceiling. There was a separate area for staff to change. The cordite and nitroglycerine were mixed by hand in large “cauldrons” – vessels of steel and wood lined with chemically pure lead. The grey lumpy appearance of the mixture in the vessel gave rise to the name of Devil’s Porridge. This “mineral jelly” was then shovelled into paste magazine with wooden spades to avoid sparks, each magazine held 15 tons of paste and was constructed of wood and lined with lead. This propellant was then transported to shell filling factories throughout the UK

Mixing by hand must have had health implications, but safety records were good, there were minimal accidents. The waste was dumped into the Solway I wonder about the environmental implications!

By the early 1920’s the site was redundant, everything that could be removed was sold off, and just the two townships of Eastriggs and Gretna remain, the red brick houses are characteristic in an area which is predominantly sandstone and granite. They were designed at the time of the Garden City movement so the houses all have gardens, there are spaces an institute and other amenities, the idea was to keep the communities self sufficient and therefore isolated for secrecy. On the site itself there are some remains, including olds blocks, a hall and dormitories with the best examples being at the Gretna end. There is a chimney on the site the only remains of ether and alcohol distilling which was also carried out on the site.

Raymond Ross was our final speaker He worked on the Blue Streak project and was instrumental in getting the Tullie House project running.

The Spadeadam site, just north of the A69 near Haltwhistle was chosen for its remoteness – the explosion was of 200ton TNT equivalent in magnitude, so needed to be away from populated areas!

From 1957-58 roads were constructed over the bog, using techniques developed by the Romans (floating brushwood) the largely Irish workforce lived in camps and the area is still known locally as “Paddy camp” A dedicated overhead pipeline was constructed to deliver oxygen from Carlisle, the process needed 100 tonnes of liquid oxygen per day.

Mr Ross showed us the “slides which were never taken, never released and don’t exist” according to official sources. He started with an aerial view of the site in June 1962, showing the offices, transport and support networks in place.

Some slides from 1969 showed the rocket test area “C” known as the C3 spillway – The main body of the rocket, the section tested at Spadeadam, was 80ft long and 10 ft in diameter, and it underwent every test here except the actual release, so the engines were test fired, but the rocket was never launched, (though it had the potential to reach Moscow)

There were two 100ft high test stands and the rocket firing components were oxygen and kerosene, so there was a tank of each at the base of the stand. The rocket exhaust reached temperatures of 2800°C and was water-cooled - 25000gallons per minute of coolant water were vaporised.

More slides covered the detailed structure of the engines, the control room and the engine test areas with the “retreat for firing” instruction – there was a blast wall behind which everyone

must remain during testing. A “normal” test firing lasted 105 seconds with a full test of 180 seconds – using a quarter of a ton of propellant per second!

The project was cancelled by the government in 1963, but Blue Streak went on to become the launch vehicle for the Europa satellite launch programme based at Woomera.

The final slides showed Spadeadam in 2004/05 – “a sorry mess” – only the bases of the engine test stand and spillway remain, the control room and blast wall are still there, but only the root of the C3 rocket stand remains. There was a slide of a Blue Streak vehicle on a transporter, abandoned and exposed to the elements as it had been for more than 30 years, its engine bay empty and corroded – a sad end.

Jan Bennet.

VISIT TO FORCE CRAG MINE SATURDAY 14TH MAY 2005

Force Crag Mine is situated at the head of the Coledale Valley about 2 ¼ miles south west of Braithwaite (NY200217). Opened in about 1839 to mine lead ore, it later produced zinc ore and barytes. It was the last working mine in the Lake District, finally closing in 1990, and is now owned by the National Trust. There is no public access underground, but the National Trust open the mine buildings (crushing and separating mill) to the public on a number of days a year, giving guided tours. The Cumbria Industrial History Society is particularly grateful to the National Trust for arranging a special visit for the Society. In particular we would like to record our thanks to:

Penny Webb, Countryside Officer, who managed a lot of the initial organisation but was unable to be with us on the day.

Jamie Lund, the Trust’s Archaeologist, who gave up a whole day to lead the visit and provided a lot of detailed information on the history and archaeology of the site.

Finally to the guides at the mill, whose extensive knowledge of the building and its contents added materially to our understanding of the processes involved.

The visit started at Bowe Barn, the National Trust Depot in Borrowdale. Jamie Lund introduced the day and showed us a plan of the mine made by English Heritage from a survey carried out in 1999.

Mike Davies-Shiel brought his extensive and unique collection of slides showing the mill at work in the 1980’s. Regrettably the blackout in the room was almost non-existent as the two roof-lights were not equipped with blinds. This made it impossible to see any detail on the slides which was a huge disappointment, particularly as this is such an important record. Let us hope that Mike can be persuaded to show the slides to us again at one of our winter evening meetings so we can study them more fully.

Mike told us that the minerals present in various parts of this mine were Sphalerite (ZnS), Galena (PbS), Pyrite (FeS), Cadmium, Manganese and Baryte. Of these the Galena, Sphalerite and Baryte were worked commercially. Mike also outlined the processes that were carried out in the currently existing mill. Briefly, the purpose of the mill was to crush the ore and separate it from the country rock. Firstly the ore from the mine was crushed to particles of 3mm diameter when, with the addition of carefully calculated amounts of oil and

other chemicals, an initial separation can take place in water in a jigger, the ore particles dropping to the bottom before the country rock. The resulting concentrated ore is then further crushed in a ball mill to a fine powder (7 microns) which is run into water filled tanks to allow separation by flotation of the sphalerite (zinc blende) and baryte from the country rock. For this to work, the carefully metered addition of hydrophobic xanthates is required. Air is then bubbled through, which adheres to the collector oils on the zinc particles, causing them to rise to the surface. Rotating paddles at the top of the tank skim off the separated ore. As this second stage is only efficient if run continuously, ores were brought in from abroad to Force Crag to ensure an unbroken supply.

Leaving Bowe Barn we made our way to the small car park above Braithwaite at the end of the mine access track. The National Trust Wardens had kindly cordoned off an area so that we could be sure of parking. From here we walked to the mine along the old mine track, constructed in 1842, which climbs on a gentle but steady grade to the mine, a distance of a little over 2 miles. On the way Jamie pointed out a number of features, including the track of the horse worked tramway, built in 1873/4 which ran from the mine to the village. Its main purpose was to transport ore from the mine and presumably other materials to the mine, but a tram was also run in the morning to take the miners from the village to the mine. The course of the tramway is clearly visible in the upper reaches as a carefully graded track cut into the valley side just below the current access track and in one place there is a shallow cutting. It is less easy to distinguish lower down, where it crosses the access track just above the car

park. The tramway was lifted in 1940 and the rails used for various jobs in the mine.



Approaching the mine we stopped to look at the site of Mill no 2. This was built in 1854 to process lead ore from Level 1 and appears on the 1861 OS map. It is possible to see part of the outline of the mill and its wheel pit which housed a waterwheel of about 30ft in diameter, fed by a partly visible leat from Coledale beck. It is known that in 1856 this mill housed a four stamp crusher. Close by is the outline of a small rectangular building

Force Crag looms behind Mine Plant.

believed to have been a smithy.

The approximate site of the first mill at Force Crag was pointed out, but it has been covered with waste during the quarrying of the mine tips for road stone in 1960/61 to provide material for the Portinscale bypass. Opened prior to 1839 this mill was initially used to crush lead ore from the earliest levels at Force Crag, now known as levels 2 & 3. Later it was used for a short period to crush barytes from level 4 and some from level 1, but is thought to have fallen out of use soon after 1872.

A little further along the track we passed the entrance to Level 0 on the north side, with a small locomotive shed just alongside. Started in 1914 this was the last level to be opened and the least productive. The aim had been to link up with the vein in Level 1 but this was not found. Further work on the Level was carried out on a number of occasions and eventually some ore was brought out.

To the south of the track the remains of two large settling ponds are clearly visible. These were built around 1907 in compliance with the terms of the lease at that time. The more westerly of the two was later filled in, possibly to seal in the sediments, but the other was refurbished in 1972 and used until the mill closed.



Entering top of plant. Inspecting ore samples. Conveyor from Grizzly Hopper.

Across the valley to the south a track is clearly visible climbing from the Coledale Beck steeply up the valley side before contouring along in the direction of Coledale Hause. This track was built in 1928 to allow carts to bring ore down from the High Force workings to Mill no 3. In 1939 the whole length of the track was widened and resurfaced so that it could be used by lorries. Driving the lorries was considered a hazardous activity and the track soon acquired the name “Burma Road” – looking at it and considering the technology of lorries of the time it is easy to see why!

Behind us, on the north side of the valley the course of an aerial ropeway, constructed in 1940/41 to bring ore from High Force workings to the Mill, thus obviating the need for the hazardous Burma Road, could be picked out. It ran in one large zigzag to ease the gradient, coursing from the workings in an easterly direction, before turning at an acute angle and running back towards Mill no 3. However the ropeway was liable to freeze up in the winter and was abandoned after the winter of 1946/7. The pylons remained until 1972, when they were cut up for scrap.

A short distance along the track brought us to Mill no 3. The present building dates from a major rebuilding in 1939/40, when there was a major capital investment in the mine. It replaced an earlier mill on the site built in 1906 which was itself modified on a number of occasions. The present structure is a typical unaesthetic concoction of stone, brick, timber, steel and corrugated iron. It is built down the slope of the valley side to make the best use of gravity, with the undressed ore being fed into the top of the mill and the refined concentrated ore coming out from the bottom.

The entrance to Level 1 is clearly visible though securely shut, but a substantial flow of water issues from it. The level and its accompanying small engine shed are almost directly behind the Mill and a little above the level of its top floor. What we now see is in fact an entrance to Level 1 made in 1967, as the original entrance was unstable. Level 1 was the most intensively worked level at the mine. Started in 1849, by 1855 it had cut a major lead vein. When this was worked out the level produced barytes and later zinc.

Levels 2, 3 and 4 are sequentially further up the north side of the valley. Levels 2 and 3 can be identified by tips around their entrances. It is believed that Level 3 may have been the earliest level, being close to the surface exposure of the vein and work probably started here in 1839. Level 4, the lowest of the High Force workings, is out of site from the mill.



Grizzly (coarse screen) on Hopper

practicalities of crushing and separating the ore from the country rock in the most economical and efficient way. Much of the present machinery appears to have been bought secondhand, brought in and modified as necessary to fit into the building and the processing. This gives some of it a rather “Heath Robinson” appearance. The building is completely filled by the machinery, so the noise and dust when it was in operation must have been awesome. The accompanying diagram, courtesy of Jamie Lund and the National Trust gives an appreciation of the sequence of processes, most of which are self-explanatory. The Grizzly hopper is outside the mill, and consists of a large hopper covered with a grid of bullhead rails giving a grid size of about 9 inches. The ore was tipped onto the grid as it came out of the mine. Any lumps too big to pass into the hopper were broken up by hand until they fell through. The conveyor from below the hopper took the ore into the mill building where the ore was tipped into a 21inch jaw crusher made by H. R. Marsden of Leeds. At each stage of crushing the resulting material was passed over screens, and that which was too coarse was returned to pass through the crusher again.



**Jaw Crusher behind mesh barrier.
Return Conveyor above.**

tanks.

Originally Elmore flotation tanks were installed in about 1908/9. Now there are two Wemco flotation tanks, one for zinc and one for barytes. The tanks consist of a large vessel into which the slurry is pumped and various chemicals are then added. The metering device for

Turning to the west the Coledale Beck can be seen descending from Coledale Hause in a series of waterfalls. Alongside it the line of the penstocks are easily seen following the line of the beck. These fed a Pelton wheel installed in 1912 which provided power for Mill no 3 and for the compressed air drills in the mine. Mains electricity was not connected until 1967. Also alongside the beck is a small explosives store built around 1960 and thought to have housed gelignite. Returning to the Mill, the tour of the inside revealed that there were no concessions to anything other than the

From the fine ore hopper the ore passed by conveyor to a double deck screen and on to the 4 compartment jig, where the initial separation took place. From here the concentrate was taken by a bucket conveyor to the surge hopper, whose purpose was to ensure that there was a continuous flow of concentrated ore into the ball mill. The slurry from the ball mill was then directed to a rake classifier whose purpose, I believe, was to collect any particles which were too coarse for the

flotation process so they could be returned to the ball mill. A slurry pump then moved the material on into the flotation



Wemco Flotation Tank. Slurry from ball mill with additives is frothed by air from perforated plates, seen through horizontally rotating paddles which skim the ore off into the gutter.

to the mining history of the Lake District and making available to the public. The National Trust has owned the Coledale valley since 1978, but only when mining ceased in 1990 and the mine was declared abandoned in 1991 did the future of the site become their responsibility. Although we may feel that the Trust came rather late to recognise the importance of the industrial heritage of the Lake District it is to their great credit that they resisted pressure to sweep away all visible remains of the mine and “tidy up” the site. English Heritage carried out a survey of the surface features in 1999, which formed the basis for the future management of the site. Since abandonment the site and structures had been subject to various unauthorised usage and to vandalism. Some of the machinery from the mill had been displaced or removed, the buildings were in disrepair and the mine tips which had been undercut by the quarrying for road stone were a source of concern from a safety point of view.

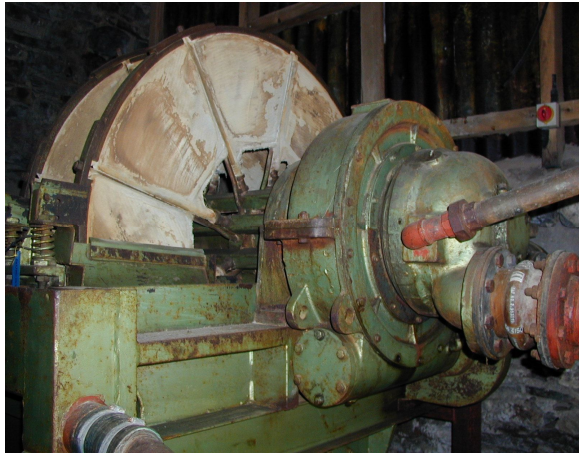
The first task was to stabilise the tips which was carried out in 2000. Then the structure and fabric of the buildings was restored, carefully using appropriate materials. Finally, last year, the machinery was conserved and as far as possible returned to the original positions. The result is a good example of a small mineral mine mill, warts and all, because the Trust has bravely resisted the temptation to over clean and tidy the premises, and has only altered the interior where absolutely necessary for reasonably safe public access. It gives a good idea of what working conditions in this industry must have been like in the latter half of the 20th

the necessary additional chemicals is very ingenious, and even though it has a distinctly homemade appearance was clearly effective. In the floor of the tank are a number of perforated truncated cones, through which air was blown. Along the top sides of the tank are horizontal rotating paddles which skim off the ore as it rises to the surface and deposit it in a sloping gutter alongside. From here the separated ores are passed to Denver cleaner and scavenger cells, and on to rotating disc filters which separate the ore from the water so that it can be packed into sacks or cans for dispatch.

No report of the visit would be complete without some description of the work of the National Trust in preserving this monument



Additives for Flotation Separation



Denver Machine. Hollow, sectored canvas discs rotate, dipping into slurry. Vacuum sucks slurry on; partially dries it. After a quarter revolution, vacuum changes to compressed air and ore is scraped off.



One of three metering devices for additives. Cam shaped hopper collects liquid from buckets

Century. It also serves to remind visitors that much of the Lake District that they love was in fact an industrial landscape in previous years, which has helped shaped the villages that they admire and the trackways by which they walk on to the fells. Is it too much to hope that the site might be developed so that at least a taste of underground conditions could also be included?

I am indebted to Jamie Lund for providing me with his notes for the day, and to Mike Davies-Shiel for his informative handout. The text has drawn heavily on both of these.

Bibliography

For a detailed history of the mine “Force Crag: The history of a Lakeland Mine” by Ian Tyler and published by Blue Rock Publications, Carlisle.

There are also short passages in:

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