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# GUNPOWDER MILLS STUDY GROUP NEWSLETTER 5, FEBRUARY 1989

## MEETING AT CHILWORTH, SURREY, SATURDAY 13 MAY, 1989

The meeting will be held at the Percy Arms (TQ 032 473). Meet at 10.30 for coffee. The programme will start at 11.00, with an introductory talk on Chilworth and other short contributions, followed by a ploughman's lunch. There will then be a tour of the neighbouring gunpowder site (wellingtons advisable). We shall then return to the Percy Arms for tea and a business meeting. Cost for the day including ploughman's lunch, tea and coffee and use of meeting room will be about £4.00. Please let Alan or Glenys Crocker know if you are coming, as the pub would like to know the approximate number for catering, and also let us know if you would like to make a Member's Contribution.

The inquest on the six victims of the 1901 explosion was held at the Percy Arms and the pub is said to be haunted! It is on the west-east A248 road from Shalford (2km south of Guildford on the A281 Horsham road) to Dorking. It is opposite Chilworth and Albury BR Station on the Reading to Tonbridge line but unfortunately there is no convenient train for a meeting starting at a reasonable time, i.e. there is no arrival between 09.31 and 11.31 from Reading or between 09.17 and 11.17 from Tonbridge.

## VISIT TO THE FREDERIKSVAERK GUNPOWDER MILL, DENMARK, 1989

A preliminary note about our proposed visit to the Frederiksvaerk Gunpowder Mill at the end of July 1989 appeared in Newsletter 4. From further discussion with Mr Anders Jesperson it now seems possible that we may be able to begin our exploration of powder making in Denmark with a visit to the State Archives. To undertake this plan we shall need to arrive in the country some days before the weekend of 28-30 July. An advantage of this timing is that it would qualify ferry passengers for the Super-Saver mid-week return offered by Scandinavian Seaways (formerly DFDS). The summer timetable of this company is now appearing in the travel agencies and should be consulted by those considering travelling this way.

A basic list of interested members was collected at the Waltham Abbey meeting in October, but if any others (plus friends) would like to hear more, please contact me at 13 Hensley Road, Bath, Avon, BA2 2DR.

Brenda Buchanan

## GROUP OFFICERS

At the meeting at Waltham Abbey in October it was felt that the Group has been successful since it was formed and it was therefore considered appropriate to formalise its structure by electing the following officers: Alan Crocker (Chairman), Elizabeth Tough (Secretary), Glenys Crocker (Treasurer and Membership Secretary).

Elizabeth Tough replaces Phil Philo who has left London to be Curator of Kirkleatham Hall Museum near Middlesborough, and can no longer be involved to the same extent in our activities. We shall greatly miss his hospitality at Gunnersbury Park Museum. We do of course expect him to rise to the challenge noted on page 4 of this Newsletter, wish him well, and are glad to know that he intends to keep in touch. Elizabeth is now working in London but was previously employed as archaeologist on the Glyn Neath gunpowder site.

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**SUBSCRIPTION**

A subscription of £3 (individual) and £4 (joint) is due on 1 April 1989, to cover the cost of future newsletters, postage, photocopies etc. Please send to the Treasurer/Membership Secretary Glenys Crocker at 6 Burwood Close, Guildford, Surrey GU1 2SB. A return slip is provided with this Newsletter.

**VISIT TO THE ROYAL ARMAMENT RESEARCH AND DEVELOPMENT ESTABLISHMENT, WALTHAM ABBEY**

Thanks are due to all those involved in organising the meeting at Waltham Abbey on 1 October, in particular Malcolm McLaren who made the visit possible, provided us with generous information packs, and showed us around the site, and to Ken Bascombe who helped to arrange the meeting. Talks were given by John Boyes on the Lea valley and its mills, by Ken Bascombe on the various powder mills on the river, and by Malcolm McLaren who spoke about the site in preparation for his guided tour after lunch. In view of the imminent closure of the establishment we were interested to know what might happen to the surviving industrial features and the archive material, and were glad to hear that steps are being taken to ensure their future.

After the tour of the site, Elizabeth Tough reported on what had been achieved by the project at Glyn Neath on which she was employed until last summer. Archaeological work then had to cease because of changes in the Manpower Services scheme under which it had been funded. There are still plans to continue with the conservation project.

It was a most interesting and enjoyable meeting and achieved a deservedly good attendance of nearly 30 members and guests.

**THE DARTMOOR PROVING MORTAR**

Members who came on the weekend visit to Devon and Cornwall in May 1987 were concerned to see that the proving mortar near the approach to Powdermills Farm was lying on the ground and its base had been removed. Deborah Griffith, the Archaeological Officer of the Dartmoor National Park, has informed us that the mortar was being conserved and is being returned to its original position.

**BLACK POWDER MANUFACTURE IN AUSTRALIA.**

A member, Ron Grosvenor of Tamworth, NSW, has been investigating the derelict ICI Deer Park black powder factory in Melbourne. He reports that it is a mass of crumbling earthworks and dusty machinery and is infested with red-back spiders. Three edge runners and the press and graining machines are however in good condition. There is also documentary material from the works from 1942 onwards which he has now collated, and he has acquired a small edge-runner mill which was formerly used in the experimental black powder section of the 'Albion' Explosives factory.

Mr Grosvenor wishes to obtain a sample of gunpowder maker's dogwood i.e. alder buckthorn (*Rhamnus frangula*) in order to compare it with woods used in Australia. Can anyone help? He has a copy of the 1938 Method Book for the Deer Park works and would like to obtain copies of Method Books used in factories in Britain, particularly Chilworth. He is happy to bear all costs involved. Again can anyone help?

**THE HAGLEY MUSEUM, DELAWARE, by Robert A Howard**

The Hagley Museum is located on the site of Du Pont's first black powder mills which were occupied from 1802 until 1921. Du Pont built his mills using the most up-to-date French technology of the time (including the Englsh-invented powder press). The business expanded until the mill and ancillary industries occupied about 3 miles of the Brandywine River Valley. It was by far the largest powder works in the United States. To give some idea of capacity: at the apex (ca.1900) there were 22 wheel mills which each ran 400 lb. charges (wheels weigh 8-10 tons each) between 2 and 4 hours.

The Hagley Museum owns 235 acres of the original site. There are over 50 complete buildings, another 20 above-ground ruins, 4 dams and raceways and countless other man-made features. Of special interest to the gunpowder study group is the operative wheel mill, static powder press, and horizontal graining mill. There are 2 glaze barrels in storage. A machine shop building contains an operating 19th century machine shop and a series of models exhibiting the powder process as it was done in the early 19th century.

Moving from technology to social history there is a complete restored worker's house, school house, carriage house, spring house and other remains of one of several communities. In another location is the Du Pont mansion, restored garden, first company office building, barn and other ancillary structures.

Equally important as the remains is the library. Included in the holdings is the Oscar Guttman Collection which is the largest collection of black powder material in existence. It was assembled by Guttman and augmented by the Du Pont Company and the museum. Supplementing it is the Du Pont Company and some of the Du Pont family manuscript papers, including a large quantity of the technical drawings. Of great interest to this readership is the notes by Lammot Du Pont of his tour of European powder mills in the late 1850s.

There are two special museum collections not exhibited which merit mentioning. One is a large collection of powder containers including both flasks and cans. The other is the largest collection of powder testers known to the writer, which ranges from hand-held pistol types to mortars to chronographs. Also included is a ballistic pendulum.

The museum is open daily from 9.30 to 4.30 from April through December. During the January through March period the museum is open at weekends and provides one afternoon tour daily. The library is open from 8.30 to 4.30 Monday through Friday. An admission is charged at the museum. It is located in the state of Delaware about a mile north of the city of Wilmington. Postal address: Box 3630, Greenville, DE 19807.

To sum up what survives in this country (June 1988): In the United States there is one operating black powder plant, one complete plant in mothballs at Radford Arsenal, one experimental plant which our government built, tested and shut down at Indiana Army Ordnance, one badly deteriorated set of machinery owned by Austin in Ohio and the machines that Hagley owns. The last plant in Canada was bought by GOEX and moved to the United States. World wide there is very little surviving of the black powder industry.

*Robert A Howard is Curator of Engineering at the Hagley Museum.*

**THE MANUFACTURE OF BLACK POWDER IN SWITZERLAND.**

Ron Grosvenor, besides making his investigations in Australia, has obtained a copy of a booklet about gunpowder manufacture in Switzerland. This has parallel texts in French and German: *Intendance Fédérale des Poudres, Berne, Poudrerie fédérale d'Aubonne, visite des installations.*/ Eidg Pulververwaltung, Bern, *Eidg Pulvermühle Aubonne, Besichtigung der Anlagen.* It explains briefly that black powder was first used in Switzerland for building roads and tunnels in 1707. The first powder mills (*moulin à pilons* = stamp mills) in the Vaud canton were on the edge of the Venoge, at Echandens. They had to make way for the construction of a railway. The Confederation acquired the land for the Aubonne powder works in 1853.

Renovation of the mills was carried out in 1974-6 and 1978 and in 1980 two pairs of mills were electrified to increase the production of powder for mines and to make the mills partially independent of water. They make powder for mining, artillery, sport, fireworks and for special purposes.

The major part of the book consists of 19 photographs of buildings and plant with descriptions.

***Romantik und Wirklichkeit der alten Mühlen, Kulturhistorische und volkskundliche Skizzen,* herausgegeben von Richard Wittich. Im Erich Roth-Verlag Kassel, 1977.** Ken Major points out a chapter on powder mills (pp.168-171) in this book of old sketches. This discusses drawings of edge runners and stamp mills from *Der grossen Kunst Artillerie,* by Daniel Elrich, 1676.

**GUNPOWDER SUPPLIES TO NORTH-EAST ENGLAND.**

One fact which emerged from compiling the *Gunpowder Mills Gazetteer* is that there were apparently no black powder manufacturing sites in north-east England, which seems surprising in view of the importance of mining in the area. The question arises as to where supplies came from. One of the barrel stencils which survived at Lowwood, in the southern Lake District, bears the name of George Baynes & Co, North Shields (information from the Abbot Hall Museum, Kendal) and Tom Hay of Darlington has made some inquiries about this company.

In Slater's *Royal National Commercial Directory of the Northern Counties,* Vol.1, 1864, George Baynes & Co, 5 Bedford St, North Shields, is listed under Grocers and Tea Dealers, and also as a tallow chandler.

In *Rivers of the North,* The London Printing and Engraving Co, 1894, p.198, there is a paragraph on George Baynes & Co, Wholesale Grocers, Tea Dealers amd Tallow Chandlers. This provides an account of the history of the firm which had been established 76 years previously, and of its retail and wholesale business, and continues: 'The firm, in addition to their ordinary business, control an extensive trade, as agents, specially appointed for the Elterwater Gunpowder Company, Ambleside, blasting powder; the National Explosives Company, London and Cornwall, dynamite and gelatine compounds; and Bickford Smith & Co.'s safety fuse, for blasting purposes. The firm roast coffee on the premises daily, and are equipped with the latest improvements of machinery for dispatch of orders executed.'

Northern Sabulite Explosives Co. Tom Hay has written an article in the *Cleveland Industrial Archaeology Society Newsletter*, December 1988: 'Northern Sabulite Explosives Company Limited: Home Office Explosives Factory No.322.' This operated at Haswell (390 425) from 1923 to the 1960s.

Article on black powder. He has also drawn attention to an article 'The properties and uses of black powder' by W. Payman, in *Mine and Quarry Engineering*, December 1936, pp.249-254.

## LAKE DISTRICT

### THE LOWWOOD GUNPOWDER WORKS CLOCK by Alan and Glenys Crocker

The most noticeable feature which survives of the Lowwood gunpowder works, on the left bank of the River Leven, is the clock tower with its single clock face looking north-west across the river towards Haverthwaite.

In the article 'A short history of the North of England Gunpowder Group' in the ICI Magazine for October 1929 it is stated that the clock was said to have been made by Daye Barker, one of the four original partners of the Lowwood Gunpowder Company, licensed in 1798. The early records of the company, dating from 1798 to 1846, are deposited at the Lancashire Record Office (LRO). The first ten years of these have been studied by Alice Palmer (AP) and discussed in a thesis (1970) which may also be consulted at LRO. Daye Barker died in 1835 (AP, p31) but the buildings adjoining the clock tower, and apparently of the same build, are dated 1849 in two places. In order to try to resolve this inconsistency we sought the help of Ian Haigh, a clock maker of Ambleside, who visited Lowwood with us and examined the clock mechanism. His description of the clock is given below.

The high quality of the workmanship, indicating that the clock was made by a professional clock maker, seems to disprove the story that Daye Barker made it himself. No doubt however the story has some basis, perhaps because Daye Barker acquired the clock and had a particular interest in it. He appears to have had a reputation for mechanical competence and ingenuity (AP, p32). It is clear from Ian Haigh's examination of the clock that it was not new when it was installed in the 1849 clock tower and that it could be considerably older. The bell bears the date 1792 and although it is not necessarily contemporary with the clock it is possible that the whole mechanism predates the establishment of the company in 1798.

Daye Barker had previously been involved in cotton spinning and was said to have been associated with the mills at Backbarrow. His marriage in 1788, when he was aged 40, is recorded in the Cartmel parish registers, as are the births of ten children. He also had business connections with Wigan and the gunpowder company had close links with Liverpool (AP, pp30-33).

The clock could have been obtained second hand in 1849, perhaps by Daye Barker the younger, when the present clock tower was built, or it could have been acquired by Daye Barker, the original partner, at any time during his career. If so, it is possible that information about it exists in the records of the company at LRO. The maker's name may also be engraved somewhere on the clock but if so this would probably only be revealed if it was dismantled for cleaning and restoration.

We are indebted to Robert Harvey for arranging access to the clock.

**REPORT ON THE LOWWOOD CLOCK, by Ian Haigh**

The Lowwood clock is of chair frame or extended barrel construction, an arrangement which allows long barrels to carry enough rope for long duration, and shorter stiff arbora or axles for the rest of the clock wheels. The rope drums are supported in the cast iron clock frame at the rear, and in split brass bearings in the wooden supporting frame at the front. The clock wheels are of brass, large diameter, and have large numbers of teeth. The wheels are quite lightly made with only four crossings or spokes. There are only three arbors per train excluding the barrels. The escapement is pin wheel, the pins on the wheel being machined from the solid rim of the wheel. The pallets are fixed to the pendulum rod, which is suspended on a double spring. The leading off shaft to the dial was originally in a different position when the clock was made.

The clock has an interesting arrangement of differential drums, where the rope from the clock barrels, 8" diameter, passes on to a larger drum of 24". Fixed to this is a smaller drum which drops the weight down the weight shaft on a single line without pulley. There is a separate drum for each train. This arangement allows the clock to run for the correct duration without the disadvantage of a long length of rope passing under a pulley and back to the top of the shaft. In damp weather the rope can twist itself up enough to stop the clock through loss of power.

Although this type of clock was produced by many different makers it is possible that it was made by William Bellman of Broughton in Furness, who made the first eight-day clock for Hawkshead Church. A very similar clock exists at Rydal Church, made by his son Daniel, and another was in the old church in Ambleside until fire damaged the tower in the late 1940s. These were almost certainly made by Bellman and not imported, as the count wheel on the Rydal clock is made from a long case clock chapter ring of Jonas Barbers, a well known local maker at Winster.

The clock is certainly restorable, the main damage being to the pins in the scape wheel. The ideal solution would be to fit automatic electric winders during the restoration which would keep the clock running with minimal attention.

✓ **BOOKLET ON LOWWOOD.** *The Lowwood gunpowder works: a short history*, by Glenys Crocker, 1988, 8pp. Published by Robert Harvey, who now trades in the clock tower building of the former works, primarily for interested customers. Available from the author (50p and A5 s.a.e.)

**AN 18th CENTURY BANKER IN KENDAL**

***Christopher Wilson of Kendal, an Eighteenth Century Hosier and Banker*, by John Satchell and Olive Wilson. Published jointly by Kendal Civic Society and Frank Peters Publishing, Kendal, 1988. 55pp, illus, paperback, £7.95. ISBN 0 948511 50 8**

This book has been produced to mark the 200th anniversary of the founding of Maude, Wilson & Crewdson's bank in Kendal. Based on a ledger which has recently become available for study, containing entries mainly from the period 1768-80, it is a beautifully produced volume which provides an insight into the commercial background against which the Lake District powder mills were established. Christopher Wilson's son, Christopher II, was one of the partners in the Lowwood gunpowder mills founded at Haverthwaite in 1798, and the first powder mills in the area at Sedgwick were started by John Wakefield, another entrepreneur of wide ranging interests who also started a bank in Kendal in 1788.

**SIR HUMPHREY DAVY AND THE COMPOSITION OF GUNPOWDER, by David Hansell.**
*(Sir Humphrey Davy was associated with the powder mills established at Tonbridge in 1811 by the Children and Burton families. David Hansell has recently searched the Davy archives and laboratory notebooks at the Royal Institution, for evidence of experiments on the composition of gunpowder.)*

Unfortunately I was not able to uncover more information than was already published in the article by J Z Fullmer, *'Humphrey Davy and the Gunpowder Manufactory', Annals of Science* 1964, **20**, 165. However examination of the single page of calculations, and comparison of those figures with those of his letter to Children with recommended figures for the blend, confirms my suspicion that the latter were not based on experimental work but derived solely from Davy's figures for the 'combining proportions' of the elements. These figures can be confirmed from his own *Elements of Chemical Philosophy* as N=13, O=15, S=30, K=75, C=5.7. That is he assumes potassium oxide to be KO and our carbon dioxide (his carbonic acid) to be CO, although in places he seems to use C=11.4. As he is consistent in any one context, the net result is the same. Thus, although he takes potassium sulphide (sulphuret of potash) to be KS, this leads to proportions of K:S :: 75:30, not too far from the modern figure of 2.44. It also appears that he would have written nitre as $KO.N_2O_5$ with what we would call a molecular weight of 191, (Dr Fullmer has misread Davy's notes here). His recommended composition of nitre 191, sulphur 30, and charcoal 28.5 therefore represent exact molecular proportions, in our terms of 2:1:2.5, and I do not think it unduly cynical to assume that these were not derived from experiment.

The puzzle remains as to why Davy, having provided sufficient sulphur to combine with the potassium, did not provide sufficient charcoal to combine with all the oxygen, i.e. 6 x 5.7 instead of 5 x . However as Dr Fullmer points out, this remains the first known attempt to apply the 'law of definite proportions' to a manufacturing process. There is no record in the laboratory notebooks of any experiments on gunpowder composition, and although it is conceivable that Davy carried out experiments privately and recorded them in books that have not survived, I remain sceptical, and I would take his firm recommendations as a further instance of his sanguine temperament.

**THE BIRMINGHAM PROOF HOUSE.**

*Country Life*, Christmas 1988 p.226 contains an article about the Birmingham Gun Barrel Proof House, which was established by Act of Parliament in 1813, and still operates, handling some 1200 guns per week, mainly imports. It is self-supporting and profits go to the upkeep of the premises, a 19th century listed building near New Street Station. The article is illustrated by a photograph of the establishment's proving mortar.

***Gunpowder Mills Gazetteer: black powder manufacturing sites in Britain.*** 1988. This book which was compiled for the Group by Glenys Crocker, is obtainable from SPAB Wind & Watermilll Section, 37 Spital Square, London E1 6DY, price £2.00 plus 35p for post and packing.

**MORE POWDER MILLS.**
Two more sites to be added to the list in the Gazetteer are:

BUCKINGHAMSHIRE, WOOBURN, NGR SU 898872. This was a water-powered paper mill on the River Wye which was known by the name of 'Fuller's Mill' or 'Gunpowder Mill'. Only the name is known and further information would be welcome.

CIVIL WAR POWDER MILLS: HEREFORD. In addition to the Civil War powder mill at Oxford listed in the *Gazetteer* p.55, and the one at Lichfield noted in Newsletter 4, a mention has been found of one at Hereford. This appears in *The cottage homes of England* by Helen Allingham and Stuart Dick, 1909 rep.1984, p.18. In the introductory chapter *On cottages in general*, in a discussion on the mostly anonymous builders, there is an account of one of the few who is known by name, one John Abel. He was born at Hereford in 1577 and took an active part in the town's defence during the siege by the Scotch army in 1645. The book quotes a despatch from the Governor of the town, Barnabas Scudamore, sent after the raising of the siege to Lord Digby (no reference given):

> 'I may not forget one remarkable piece of Divine Providence that God sent us singular men of all professions very useful and necessary to us in this distresse ... such as skilful miners, excellent canoneers ... an expert carpenter, the only man in all the country to make mills, without whom we had been much disfurnisht of our means to make powder (after our powder-mill was burnt) or grind corne.'

It is likely that a number of corn mills, and perhaps particularly fulling mills, which used a form of stamps, were temporarily converted to powder mills at this time. Horse mills were probably also used, for instance when powder was made in a castle. A reference to powder making in Nottingham Castle in Autumn 1643, has been noted in *Memoirs of the life of Colonel Hutchinson*, by Lucy Hutchinson:

> '... and having a very ingenuous (sic) person Mr. Hooper who was his Engineer, and one that understood all kind of operation in all things allmost imaginable, they procur'd some saltpeter and pouder in the Castle, which they made both very good; they also cast mortar peices in the Towne ...'

Have we any Civil War enthusiasts interested in pursuing this topic?

## WILLIAM SIM'S METHOD OF BLASTING

The request for information about William Sim's method of blasting using huge quantities of gunpowder, which was made in Newsletter 4, brought a response from Mr John Robertson who provided a copy of a report in the *North British Daily Mail* of 14 February 1871. Headed 'Monster blast at the Bonaw granite quarries. 80,000 tons of rock thrown down.' It explains that preparations had been in progress for 18 months previously and continues:

> 'A rough protecting house was formed for the battery at a point one hundred yards from the mouth of the mine, and on the same level as the quarry floor., along which the conducting wires were laid till they formed a junction with the battery near to the site of the quarry at the shipping quay. From this point Mr Sim crossed Loch Etive to the Goat Island - two hundred yards distant - with the working cords of the battery ... At five minutes before two o'clock the signal shot was fired ... and at two o'clock Mr Sim set the battery in motion, and instantly thereafter the whole mass of rock operated upon was on the move. There was no report or noise, merely a silent heaving of the mountain ... The quantity of rock displaced is enormous ... constituting this blast the largest and best which Mr Sim has had during his 18 years experience of this peculiar system of blasting.'

The report goes on to commend the quality of the gunpowder supplied by Messrs Curtis & Harvey from their works at Glenlyon (sic - Glen Lean) and to record the delight of the causeway-dressers, who were paid by piece work, at the abundant supply of good rock for them to work on.

Another much later notice in the *Glasgow Herald* of 15 July 1948 states that 12 tons of gunpowder at Bonawe Quarry will in a few weeks be ignited by an electric spark. There was a tunnel 70ft long and two explosive chambers 50 x 20ft.

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**GUNPOWDER MILLS STUDY GROUP : RENEWAL OF SUBSCRIPTION April 1989**

**NAME**

**ADDRESS**

**POST CODE** **TEL.**

**Subscription enclosed £3.00 individual / £4.00 joint.**

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