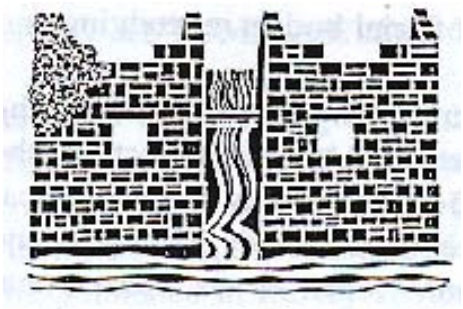


Gunpowder & Explosives History Group

Newsletter 12, Spring 2006

SPRING MEETING

Joint Meeting of the
Royal Society of Chemistry Historical Group
and the
Gunpowder and Explosives History Group

Sulfur and its role in Gunpowder

The Council Chamber, Royal Society of Chemistry, Burlington House, Piccadilly, London, W1J 0BA

Thursday 8 June 2006

14.00 Gerry Moss (Queen Mary, University of London)
Introduction to the preparation and role of sulfur in gunpowder

14.30 Paul Kelly (University of Loughborough)
The history of sulfur allotropes - from identification through to synthesis

15.10 Tea

15.40 Brenda Buchanan (Chairman of the Gunpowder and Explosives History Group)
Sulphur, the enigmatic ingredient of gunpowder

16.20 Robert Smith (formerly the Royal Armouries)
Sulphur - an experimental approach. Recent work and future directions

17.00 Discussion

17.30 Meeting ends.

OARE GUNPOWDER WORKS, FAVERSHAM, KENT Wayne Cocroft

In October 2005 the group made a return visit to Faversham. Since our last visit in 1997 (*GMSG* **22** February 1998, 2-6) the Fleur de Lis Centre, the Faversham Society's headquarters and museum, have been substantially refurbished with the aid of grant from the Heritage Lottery Fund. The museum tells the story of Faversham and includes a new section on the local explosives industry that was once one of the area's main employer. A return visit was also made to the Chart mills, which were saved by the Faversham Society in the late 1960s (Percival, A 1969 'The Faversham gunpowder industry (Part 1)' *Industrial Archaeology* **5** (1) 1-42.

Late 19th century cooper's shop adapted for use as a visitor centre (W D Cocroft)

Site of glazing house, late 19th century and refurbished in 1926 (W D Cocroft)

The most substantial change in recent years has been the development of the Oare Gunpowder Works as a heritage attraction, again mainly funded by a Heritage Lottery Fund (*G&EHG Newsletter* 2005 **11**, 13-4). The Oare works is one of the best-preserved gunpowder works in England and its layout survives almost intact, through its tracks, leats, buildings and ruins. A visitor centre has been created in the former cooper's shop with an adjacent car park. The most impressive part of the work is the partial reconstruction of the 1926 incorporating mills, which has included the installation of a steel suspended edge-runner mill recovered from the 1930s ICI factory at Ardeer, Ayrshire. To house the edge-runners mill brick mill and engine bay have been reconstructed.

The project also included the dredging of the works' internal canal network and the laying of signed trails. There has also been some consolidation of the ruins around the site. Another significant aspect of the site is its importance as a wildlife refuge and there is continuing programme of woodland management supervised by the Groundwork Medway Swale.

The part restored 1926 gunpowder incorporating mill with mill bay and motor room (W D Cocroft)

The site is open to the public in day light hours, the visitors' centre is open at weekends and bank holidays, but visitors are advised to check its opening hours on its web site **www.gunpowderworks.co.uk**

For further information see

Cocroft, W D 1994 *Oare Gunpowder Works*, Faversham Paper 39, Faversham: Faversham Society

Patterson, E M 1995 *Gunpowder manufacture at Faversham Oare and Marsh factories*, Faversham Paper 42, Faversham: Faversham Society

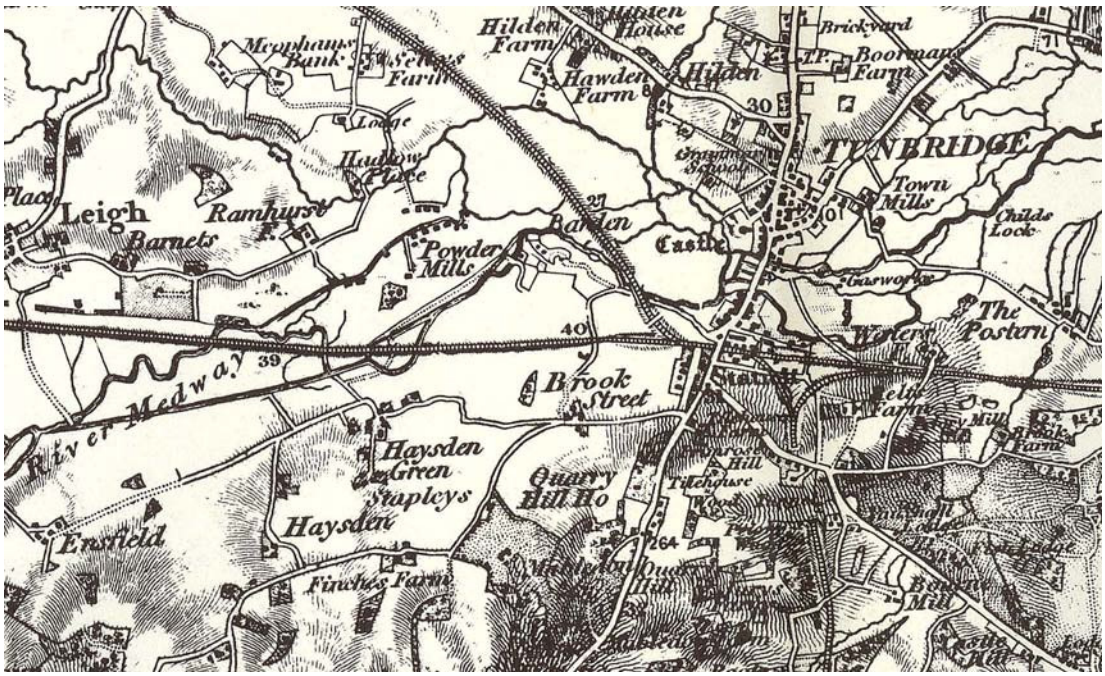
LEIGH GUNPOWDER WORKS, KENT Chris Rowley

From the middle of the Napoleonic Wars until 1934 the Leigh Powder Mill's site was been used for the production of gunpowder. Now, in 2006, all that remains of the early factory workings are 6-8 earth mounds, which are the remains of protected storage buildings; the overgrown foundations of over twenty buildings; the top millstream with ten sluices going down to extensive waterways on the tail stream level and a canal which enabled barges to come up from the Medway. There are also several large millstones and other pieces of machinery, all of which are in an overgrown woodland site.

The site represents an industrial archaeological feature that is very unusual in southern England and is currently being assessed by English Heritage.

The Start of the Firm and Reasons for Siting the Mill

The first record of the powder mill was in 1811 when two fathers and sons, the Burtons and the Childrens, decided to start a company. It was known initially as the Ramhurst Powder Mills, although it later became The Tunbridge (sic) Gunpowder Works. This part of the country had plenty of wood for the charcoal needed in the processes. There was already a millstream, which had powered the corn mill at Ramhurst – at the bottom of Weir Lane – until it was put out of use in 1812. It was easy to construct access downstream to the Medway and thence to the major naval base at Chatham. Transporting heavy goods by road in this era was difficult, particularly in winter. Additionally, the Children family also owned this portion of land and were local bankers. The initial investment in the company was the large sum of £30,000. *For details of the 1811 Gunpowder Licence, a map and description of the site of the Mills and the 1813 Rateable Value of the Mills – see "Kentish Sources III" by Elizabeth Melling p127-135.*



Leigh powder mills (centre left), 1st edition 1-inch Ordnance Survey map, Maidstone Sheet 80

Sir Humphrey Davy

The famous scientist and later President of the Royal Society, Sir Humphrey Davy, was keen to try a new formula for gunpowder and initially was a partner in the scheme, although he did not invest any money. However, by 1812 he had become less enthusiastic (his wife was very anti-trade) and he withdrew.

For further information about Davy's involvement, see pamphlet "Sir Humphrey Davy: Tonbridge Associations" by G. P. Hoole July 1978 and an article by J. Z. Fullmer, a copy of which is held in the Tonbridge Reference Library in a special folder headed Powder Mills, Leigh.

Early Years

By 1813, two out of the three initially planned mills, a house for the manager and some cottages for the workers had been constructed. A canal of about 500 yards had been constructed, complete with a stone-faced lock where it joined the Medway. The tailwater had branches around the mill site to enable goods to be moved around between the various processes.

Unfortunately, the Children family bank was beginning to have financial difficulties (Biddle, 54-55) and the Children sold out to the Burtons. William Ford Burton – the son – was left in sole control in 1824 after the retirement of his father.

The Process

Gunpowder is a mixture of charcoal (carbon 12%-15%), Saltpetre (potassium nitrate 75%), and brimstone (sulphur 10% - 12%). Willow and alder were the main source of the charcoal, which is ground down into a powder and made into a "wetten dough" with the other ingredients. The mixture then has to be made into uniform sized grains – with sieves – a process called "corning". Finally, it is glazed, dusted and dried.

Wheel pit and foundations of a water mill (W D Cocroft)

The Main Years

Production seems to have run successfully throughout the main part of the 19th century with canal barges belonging to the Medway Navigation Company carrying the gunpowder down to the firm's magazine at Erith at fifteen shillings a ton – more than twice the rate for other goods.

However, there was nearly a problem. In 1829 the Penshurst Canal Company was formed with the aim of making Penshurst the top navigable end of the Medway rather than Tonbridge. The Straight Mile – a canal above Tonbridge - was started which would have taken water out of the Medway above the start of the millstream. It was clearly something which was thought to be liable to affect the power for the Powder Mills and William Burton objected. However, the canal project was abandoned in 1832. *The Leigh History Society archive has a 1837 map with a key to the various parts of the Estate; and a 36 page booklet 'A History of the Medway Navigation Company' compiled by John Hilton – gives more details of these events and a general background to trade on the Medway including gunpowder.*

Local newspapers reported various incidents. 16 April 1835, the Maidstone Journal told of an explosion in the corning house in which two people were killed; and another accident happened ten years later, although no one was killed.

At the time of the 1851 census, Charles Sealy, aged 45, was the resident manager employing sixteen men, five boys and four women, all of whom were residents of the Powder Mill cottages. In 1840 there had been nine cottages but by 1851 the number had increased to fifteen; and in 1855 new mills – still water powered – were installed.

In 1859, William Burton having died, the works were put up for sale. The property consisted of the charcoal processing area, four mills with eight pairs of stones, the press house, the corning house and the glazing and dusting houses, together with 50 acres of land, the twelve-roomed managers house, and fifteen cottages built for Powder Mills workmen (who paid rent). The annual gunpowder output was said to be between 7,000 and 14,000 barrels.

The firm was bought by Charles and Thomas Curtis for £10,000 and, as the annual profit was said to be £2,000 - £3,000, it seems like a good buy for Curtis – a firm which continued to grow over the next fifty years.

In 1860, an Act of Parliament was passed governing the making of gunpowder. In 1864 the Tonbridge Telegraph told of an accident in the Dusting House. The works manager, George Grey, was reported as saying it was "unheard of . . ." It was clearly serious because four workers were buried in Leigh churchyard. By now forty people were employed including a number of coopers to make the barrels to hold the gunpowder of which 60lbs were mixed at a time and there was stabling and a farrier's shop.

The Medway Navigation Company was increasingly becoming unreliable, although it did not go out of business until 1911. In 1874, the inhabitants of Maidstone complained that they were worried about the safety of the gunpowder barges and transport on the Medway ceased.

The works was owned the firm of Curtis & Harvey, it took its moral duties to its staff seriously, as the descendant of one of the workmen there, James Swain, has a bible with the inscription - 'The Society for Promotion of Christian Knowledge. Curtis & Harvey. Christmas 1876'.

In 1876, Continuation Certificate No. 21 was issued to the company and, a little later, steam power was introduced to supplement waterpower. Explosions continued to occur; Lawrence Biddle noted that there were five in the years 1878 – 1885. In 1885, new equipment was installed to produce prismatic powder, and by 1897 the manufacture of the old black gunpowder had ceased.

By the end of the nineteenth century there were six or seven pairs of mill-houses and over a mile of narrow gauge railway – with small trucks pushed by hand – around the site, as well as the waterways.

Footbridge and watch house (W D Cocroft)

In 1898, Curtis & Harvey became a public company, owning many powder mills all over the country.

The First World War

In the period leading up to the First World War, the firm was producing smokeless sporting powder, primarily for sporting guns, but the start of the war meant a big expansion to produce explosives for munitions. Young boys (including Charlie Ingram and Cecil Smith from Leigh), and more unusually, women, were taken on.

Tonbridge and other villages and a tarmac cycle path ran to the Powder Mills from both Ramhurst and Tonbridge. The original white workmen's cottages were demolished and the current houses erected by Curtis & Harvey. In 1917 there was an explosion when a building was struck by lightning. The noise woke up sleepers in Leigh and debris was said to have fallen as far as *The Plough* pub. Another report from a 1965 company newsletter says that people could read a newspaper in Tonbridge High Street in the glare.

Although one account seems to indicate some people were killed, a villager, Eric Batchelor remembers his family memories saying the explosion occurred on a Sunday night when the only person there was the night watchman, Eric's grandfather, Alfred Batchelor. He was blown off his feet but not badly hurt and, it was said, surprisingly, there were no other injuries.

After the First World War

At the end of the War production was – not unnaturally – dramatically cut back and the firm changed ownership, becoming Nobel and eventually forming part of Imperial Chemical Industries whose best known product from this factory was Black Diamond Gunpowder. Coincidentally, one of the founders of ICI, Robert Mond, lived at Combe Bank six or seven miles away in Sundridge from 1906-1924 and used his large gardens to try out explosives, causing some concern to the locals.

Under Curtis & Harvey and its successors, the Powder Mills had an active social scene for both adults and children. In the 1920s and early 1930s there was a club with billiards – not snooker in those days – darts, table tennis and cards. There was the use of a tennis court and cricket pitch at Meopham Bank; shooting at targets was done in the field opposite the Ramhurst Manor entrance, and there was a soccer team with its pitch on the water meadow below what is now the Hunter Seal Close. There is a formal picture of the shooting club, with 20 men in dark suits and tie and two trophy shields and two cups. There is also a 1923 article and photo of the soccer team which had won the Division II Charity Shield. The soccer team included Noel Jempson who not only worked at the Powder Mills but became landlord of *The Plough* for many years until the 1960s and has left some memoirs. There were also regular Christmas parties for children.

There was another large explosion in 1927 and several people were killed including two from well-known local families with a long association with the Powder Mills – the Batchelors and the Scotts.

By 1930 the site was still well maintained. However, in September 1934 ICI moved all its explosive operations to Scotland where it was thought there was less risk of wartime attack and where hydroelectric power was a new cheap source of energy. The land and the houses were sold off and a good number of staff left unemployed, although ICI was acknowledged to have tried to look after its staff – some of whom, including John Evelyn, who had been the Manager for 14 years, being re-employed in Scotland. There is one eyewitness report describing how virtually everything was removed from the site or raised to the ground by ICI.

After Gunpowder

After the works had been left derelict for some years, the site was bought in 1942 by a firm who used it for a variety of light engineering projects, including some war work.

In 1949, a small pharmaceutical company, Menley & James, bought the site initially only employing five people. In 1952, Smith Kleine & French owned the whole site and by 1956 it was employing around thirty people. Smith Kline & French became Smith Kline Beecham and finally at the turn of the 21st century GSK (Glaxo SmithKline) which has expanded in size with the integration of the research side of Wellcome from Dartford. The site, now employs around 300 people and concentrates on pharmaceutical research rather than the production of chemicals.

In 1996, the developers, D H Ward, applied for permission for a change of use on the Hunter Seal site from industrial to an all housing scheme. The proposal was strongly supported by local residents and, although the Sevenoaks District Council would have preferred a mixed light industrial/residential scheme, the all-housing proposal was eventually agreed and seventeen houses built.

Ownership of the Site

Currently half the site on the western side, the former powder works, is owned by GSK and the other half is owned by a residents' association, this section lies in Tonbridge & Malling Borough Council area. No parts of the site are available for viewing by the general public.

Summary

For around 125 years the Parish of Leigh had a gunpowder-producing company. Whilst it employed a number of people from Leigh, it was always a separate community, with usually around a hundred people living in the houses largely built for the powder mill workers. The site continues to be the parish's largest employer although the vast majority of the works of the site come from outside the parish. It is hoped that current plans formally to do a full survey of the site and to consider restoration/preservation will be fruitful.

Compiled from notes by D P Hansell and from Lawrence Biddle's book *Leigh in Kent*, with additional material from Eric Batchelor, Muriel Brooker and Roy Brooker and other sources quoted in the article. *See* also D P Hansell *GMSG* **5** February 1989, 7.

KRUDTVÆRKSMUSEUM IN FREDERIKSVÆRK, DENMARK Kristian Jensen

When I found out, through the Hagley Museum Delaware USA website, that there was a powder mill museum in England, I was more than eager to have a look at it. And so in December last year, at the invitation of Ian MacFarlane and Les Tucker, I got the chance to see the impressive Royal Gunpowder Mills Waltham Abbey.

At the same time I was told that you had established a Friends Association, and after returning home I was even accepted as a corresponding member of this honourable institution! By now I know quite a bit about Waltham Abbey, but The Friends' knowledge of *our* museum must be very limited. In *Dangerous Energy*, our museum is not described and only gets a mention (almost in parentheses), and so I promised Norman Paul to try and write a few words about 'us'.

His Majesty King Frederik V founded our town by signing a contract with Messrs Classen and Fabricius at Fredensborg Castle on 25th August 1756.

In the contract it is stated how much gunpowder the two men had to deliver to the Army and how much sulphur and saltpetre per year they should have from the Crown. The king gave his permission to name the place Frederiksværk ie Frederik's Works.

Before that date there was almost nothing in the area except a canal from Lake Arresö down to Roskilde Fjord transporting 50 million cubic metres of water per year; but within 2 years the production of gunpowder and bronze cannons had begun.

The production of black gunpowder continued up to 1965, and of cordite but only from 1892, while the casting of bronze cannons stopped in the 1860s. In 1965 the Powder Mills, Härens Krudtvärk, was closed down, as it was no longer profitable. Typically such a factory would have been thrown on the scrap heap and all houses demolished, but staff from the *'Museum of Arms & Uniforms'* in Copenhagen saw the chance of establishing a museum with some of the oldest buildings and the best machinery, and these were placed at their disposal. We are more than grateful to them! They opened the museum in the summer of 1968 and it is still open to the public every summer from June to mid-September and one week in October (the schools' *Potato-Holiday*).

In 1996 we had some of the exhibitions renewed and of course there is still maintenance work to be done on such old houses and machinery. Two years ago the local authorities took over and now run the museum, which includes 4 full-time employees and an equal number of part-timers. During the season we have a number of hourly-paid guides, of whom I am one.

What have we now got inside the 14 registered buildings? I think we have the necessary machinery - if we were clever enough - to start production of black gunpowder tomorrow, if only we could get the necessary permission from the police and could buy the ingredients. In the first house with machinery in it we have a pulveriser and visitors can hear the rumbling of the 1.5 cm bronze balls inside the rotating drum driven by a water turbine.

Pulverising mill in a ball drum

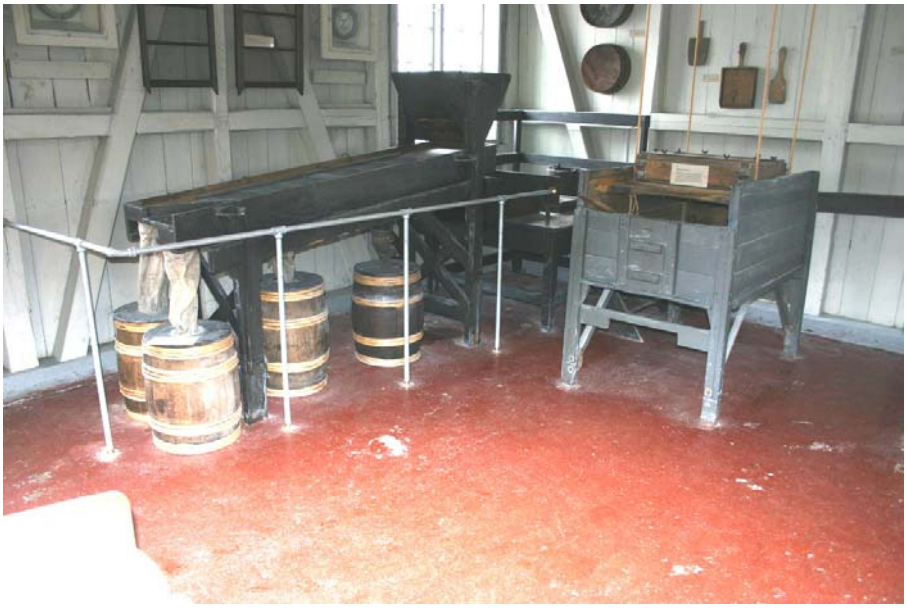
In the next house there are the mixing drums for both binary and ternary mixing, but here the rumbling is softer as the balls (dimension 3.5 cm) are made of Pokkenholt (hardwood) and the inside of the ternary drum is clad with leather. In the graining house we have our real wonder: A Lefebvre's Graining Mill dating from 1875. We believe that this mill is the only one of its kind in existence – not just in Denmark, producing grain gunpowder up to 1965!

Unfortunately we have no hydraulic press to compress the powder before the graining – and only one roll of a rolling mill to do the same thing. The polishing mills are in the only house with a

working water wheel, driving the drums by cogwheels (with 126 wooden cogs) long axles and leather belts which are 20 cm wide.

Lefebvre graining machine with 10 copper funnels and sleeves leading the powder plates down to the barrels with bronze sieves and a beech disc on each sieve pressing the grains down into the boxes beneath. To the right is a close-up view of one of the sieves.

The powder grains themselves do the polishing as they tumble inside the drums – but now without balls of any kind. Built together with this house is the drying hut and on the other side of the canal the sorting house has running riddles and sieves driven with leather belts - but an electric motor.



The smallest of our sorting machines in the background and a hand operated corning machine to the right. The sieves on the wall were originally woven from silk but now are of nylon.

In addition to all these we have stores protected by earthwork banks. The museum is surrounded by 150-year old lime trees (the elms died during the elm-disease). In our oldest building, a half-timbered house dating from 1848, we have the shop and ticket office – it costs only £2 for an adult – in this building is a beautiful model of the museum together with old pictures, maps and drawings on the walls.

The Sorting House partly hidden behind earth rampart. The flag shows that a machine is running.

As you will see in the beginning of this article, king Frederik V signed the paper that founded our town in August 1756. So in August this year we will be celebrating our 250th Birthday. A book is being written to be sent out on that day while the whole town will be 'standing on glowing poles'.

So perhaps some of our Friends from Waltham Abbey would like to take part in the celebrations? We would be delighted to see any of you, if only to repay Les Tucker's kindness in giving me such an interesting guided visit in the middle of a very cold winter.

We will look forward to seeing you!

This is an edited version of an article that first appeared in *Touchpaper* the newsletter of the Royal Gunpowder Mills Waltham Abbey Friends Association. I am grateful to Norman Paul for bringing this article to my attention.

See also Brenda Buchanan 'Report on field trip to Denmark' *GMSG* **6** August 1989, 3-8.

JOSEPH MEADOWS COWPER (1830-1908) Arthur Percival

Gunpowder factory manager and Historian

Joseph Meadows Cowper is emerging from the 19th-century mists as one of the more unusual gunpowder industry figures.

Born in Wellingborough on 18 July 1830, he started work as a clerk in one of the town's iron works. He was advised to train as a teacher, did so, and joined the staff of Faversham's District Schools (now converted into dwellings known as St Mary's Court) soon after they opened in 1853. There he met Arabella Chaloner, a fellow-teacher, from Hay-on-Wye, and he married her in the Parish Church on 16 February 1856.

His talents (evidently varied) were spotted by the owners of the three local gunpowder factories and by April 1857 he had become Manager of the Marsh Works, where he lived 'on-site'. By 1861 he was probably also manager of the Oare Works and was probably living at the White

House (Grove House) at the north end of the factory. By 1868 he was Superintendent of all three factories and living almost certainly at Ravenscourt, at the top of Davington Hill, Faversham, an old timber-framed house in which Government officials had once lived when two of the factories were Government-owned.

Soon afterwards, however, he was replaced, though for a while he continued to live at Ravenscourt. Though he seems to have had no university education, he was a scholar of standing and edited a number of early works on English history for Trubner & Co. Before the Royal Historical Society in 1871 he read a paper, still useful today, on "Some Tudor Prices in Kent".

Later that year he was appointed to run a gunpowder plant, probably a government one, in Peru, where several of his children were born. These were turbulent times; and there was a revolution there in 1872 and then a civil war. Still Cowper completed his three-year contract, before returning to the UK and settling in Canterbury to continue his academic work.

He needed income to sustain this however, and returned to South America, this time to work for Grace Brothers, a big American business. On the outbreak of war between Peru and Chile in 1879 he returned to Canterbury. Here he worked as a volunteer in the City museum and the library at the Beaney Institute, starting to transcribe and publish old parish registers and churchwardens' accounts.

After 1887 his financial position improved when he was given charge of the London office of the Nitrate Railways of Peru, an appointment he held until he was given a pension in 1900.

Between 1887 and 1908, when he died at Harbledown, just outside Canterbury, he published another 18 books, mostly on the history of the city. In recognition of his work he was elected a Fellow of the Society of Antiquaries.

The question is: does any member know more about his work in the Peruvian gunpowder industry?

A GUN FELT FACTORY, WOTTON ST MARY, GLOUCESTERSHIRE

Ian Hollingsworth has been researching the water mills of the river Twyver in Gloucester and has discovered that in 1874 John Foy Reeves applied for a license to produce gun felt at Wood's Mill, Wotton St Mary. Wood's Mill was situated on what is now the corner of Coney Hill road and Eastern Avenue in Gloucester, it was demolished at the time of the construction of the Gloucester ring road. He has been unable to find any information on the manufacture and nature of gunfelt.

On Saturday 14th March 1874, *The Gloucester Journal* reported

A Gun-Felt factory in Gloucester - On Saturday before the county magistrates Mr. John Foy Reeves resumed his application for a license to carry on the manufacture of Reeves's Gun Felt, at. Wood's Mill, in the hamlet of Wotton St Mary. Mr. Winterbotham, who made the application on behalf of Mr. Reeves, said that the manufacture of the article had been carried on for the last five years in the neighborhood of Stroud without any accident, but the premises there had now

become unsuitable, as they no longer answered the requirements of the Act. The Act on the subject was very precise, because it included other articles of a much more dangerous character than gun-felt; the regulations therefore were very strict as to distances from houses, and proximity to buildings of all descriptions, which made it very important to select premises quite away from other buildings. The manufacture itself, however, was not a very serious one, nor as regards quality was it likely to be of an extensive character. Major Majendie's report explained the nature of the proposed arrangements, and certified among other things, that there is no kind of danger whatsoever while the material is in its wet state, and Mr. Reeves fully assented to the proposition that a substantial barrier be erected before the buildings, where the wet and dry were manufactured. Indeed they were prepared to accept the report absolutely. There were certain stipulations in it, which would involve a good deal of outlay to his client, but everything seemed so thoroughly done in the interest of the public, that he could not take exception to any of them. He hoped therefore, the magistrates would grant Mr. Reeves a license "for the making and keeping, respectively, of a certain explosive preparation or composition, commonly known as 'Reeves's Gun Cotton' and for the filling of ammunition and blasting cartridges with the same." Mr. Reeves then handed in for the inspection of the bench specimens of his gun-felt; he said that much of the process of its manufacture was carried on while it was in a wet state, during which time there was no danger whatsoever; and even when dry, an explosion of a moderate quantity would not produce serious consequences unless the material were compressed, like it would be in a cartridge. He had, for the sake of experiment. Set fire to five pounds of gun-felt in a closed room and not a window was shattered or any other damage done. It simply went off in a sheet of flame. When compressed its explosive power was twice as great as that of gunpowder, but only one-fifth part of the explosive power of gun-cotton. It was not, however, so liable to explode as either gunpowder or gun-cotton, as it required a heat of about 400 degrees, which could only be produced by very severe percussion. The gun-felt was made up into cartridges, and used for blasting purposes. In its manufacture, he was prepared to accept and carry out all the conditions laid down in Major Majendie's report. Mr. Fryer (the magistrate's clerk) then read the report, which concluded with an appendix, containing a number of conditions upon which Major Majendie thought the license should be granted. These conditions included the observance of certain rules and regulations for the buildings. And at every stage of the manufacture; they stipulated that no inhabitations should be within 180 yards of the factory except in the case of a servant of the firm who might live at a distance of 100 yards; that in the filling room, not more than 50 pounds of material should be kept at a time; and that in the magazine the story's should never exceed five million cartridges, and one ton of gun-felt in any other form. After hearing the report and the conditions read the magistrates deliberated among themselves and finally decided to grant the license, subject to the conditions laid down in Major Majendie's report.

NOTICES OF NEW BOOKS AND ARTICLES - REVIEWS AND NOTES

GUNPOWDER PLOTS A CELEBRATION OF 400 YEARS OF BONFIRE NIGHT. Brenda Buchanan, David Cannadine, Justine Champion, David Cressy, Pauline Croft, Antonia Fraser and Mike Jay 2005. London: Allen Lane. Pp. IX + 189, illustrated. Hardback £14.99

This collection of essays was brought together to mark the 400th anniversary of the 1605 gunpowder plot against king James I. David Cannadine introduces the book with 'The fifth of November remembered and forgotten'. The early chapters deal with the political and social causes and consequences of the gunpowder plot, its aftermath and enduring commemoration. These begin with two essays on the gunpowder plot by Pauline Croft and Antonia Fraser, the latter speculating on the consequences if the plot had succeeded. David Cressy discusses the

social consequences and commemorations of this event, Justin Champion rails against this 'despicable relic' of religious intolerance, while Mike Jay revels in the annual anarchy of bonfire night in Lewes. The book concludes with a chapter by Brenda Buchanan on the practicalities and circumstances of firework manufacture in post-medieval England.

In the chapter on making fireworks Brenda Buchanan reviews the routes of technological diffusion of the knowledge to create gunpowder and fireworks. The role of Chinese alchemists in the discovery of gunpowder is well-known, but Brenda reminds us that we must also acknowledge the work of Indian military technicians. Transfer of this technology to Europe was probably both accomplished through intermediaries in the medieval Arab world and by direct European contact with the Chinese.

The early history of firework manufacture was closely associated with gunpowder's military applications and its importance to the state. In England, until the end of the Crimean War in 1856 the Board of Ordnance took responsibility for the often massive triumphal displays to mark important state occasions. In 1749, one of the most spectacular was in held in Green Park, London, to mark the signing of the Peace of Aix-la-Chapelle. This, however, nearly ended in disaster when one of the specially constructed pavilions caught fire. In contrast on the continent there were professional pyrotechnic workers who mounted lavish courtly displays, and whose origins may be traced back to at least the 16th century.

In this story the rocket figures both as a source of pleasure and as an instrument of war. The Chinese used rockets in war, but they were probably more effective as terror weapons rather than killing devices. In western Europe until the beginning of the 19th century the rocket remained in the hands of the firework maker rather than the armourer. It was not until the William Congreve (younger) developed an iron carcass for his rockets that it entered the armed forces' inventory. A more peaceable spin-off was the rescue rocket that has saved many mariners caught on stricken vessels. Today the black powder rocket is once again a source of pleasure at firework displays.

This book in its attractive and lavish gold binding is clearly aimed at the person who may only ever read one book on the gunpowder plot. Its stimulating essays will provide them with a concise account of the plot and the how its commemoration has been constantly reinvented during the following centuries. To the more knowledgeable reader the breadth of topics covered will bring new perspectives to this well-known event and its enduring legacy.

W D Cocroft

GUNPOWDER

Gunpowder *2005 London: Chatto Clive Ponting 244 pages £16.99*

BALLINCOLLIG ROYAL GUNPOWDER MILLS Jenny Webb

A new book is shortly to be published on Ballincollig Royal Gunpowder Mills, its title is *Ballincollig Royal Gunpowder Mills with A Hidden History in apposition*. 21.99 euro or £15, 128 pages and 16 colour plates. A review will appear in a future Newsletter.

Please see **www.nonsuch-publishing.com**

GUNPOWDER: ALCHEMY, BOMBARDS, AND PYROTECHNICS – THE HISTORY OF THE EXPLOSIVE THAT CHANGED THE WORLD. By Jack Kelly. New York: Basic Books, 2004. Pp. X + 260. $25. also Atlantic Books: London, 2004. Pp X + 260 illustrated hardback, £14.99.

The publication of this book marks an interesting stage in the evolution of gunpowder studies, because an important subject which has animated a small group of historians for the last twenty-five years or so, is now being made accessible to the general reader. Jack Kelly assures us he has no intention of writing a 'scholarly work', but this disclaimer is followed by a review of his sources which shows how fully he has read his way into the subject. Indeed the comprehensive nature of the bibliography and the perceptive notes on each item are a valuable aspect of the book. They also serve to show how recently this subject has 'taken-off'. Chancing upon gunpowder manufacture in the course of documentary research in the mid-1970s, my own primers were mostly books written around 1900 like Oscar Guttmann's *Manufacture of Explosives,* with Partington's *Greek Fire and Gunpowder* (1960) only adding to the mystery, and the great Needham's *Military Technology: the Gunpowder Epic* (1986), vol.5 part 7 of his *Science and Civilisation in China* series, still to come. Now, this general survey provides a useful addition to the growing list of specialist publications.

The big aim of this relatively small book is that of describing and explaining the way in which the tenth-century innovation of gunpowder making was transferred from China by various avenues to western Europe and the rest of the known world, where it was first respected as an agent of progress, but later feared as a barbaric source of destruction and national aggrandisement. Gunpowder is presented as unique, since its effects cannot be replicated by any other combination of natural ingredients; as a catalyst, because of its subsequent effect on the history of the world; and as an anachronism, because in a world increasingly dominated by science it survived until effectively the end of the nineteenth century as the product of a craft-based technology.

The story is well told. Kelly excels in word pictures and describes with great verve the intensity of battles on land and at sea; the part played by such exigencies as the need to carry a ship's powder from the relative safety of the magazine below deck to the guns aloft; and the fatalistic courage required to withstand the onslaught of furious sound and smoke. But for the academic reader this very certainty of touch is a disadvantage. We reach in vain for the familiar apparatus of the footnote to check out some statement, but the text stands alone. Similarly, the intriguing chapter headings such as "The Most Pernicious Arts", "No One Reasons", and "Conquest's Crimson Wing" have no accreditation, and the sparse illustrations also lack underpinning. The reader receives little explanation of the two engravings from Diderot's *Encyclopédie* (1762-77), and since the acknowledgements at the end of the book give ownership not source, the Hagley Museum and Library is credited but not the French encyclopedist.

The reader also loses out in the trade-off between maintaining the sweep of the story and exploring the details. Take for example the process at the heart of gunpowder making, that of selecting the ingredients and then grinding or incorporating them so thoroughly that they are present in the right proportion in every grain, which is not dealt with adequately in the text. Incorporation may be achieved by stamp mills, favoured by the French until well into the nineteenth century, or by upright edge runners or wheels, favoured by the British and coming into use from the early eighteenth century. Under the French influence, the du Ponts set up stamp mills at their Brandywine works in 1802, but then after some 20 years they began to make the costly and inconvenient change to wheel mills, perhaps influenced by the probably superior

mixing and shearing effect of the edge runners. Another significant omission is the story of the transportable rocket, which so impressed the British when it was used against their troops in India in the 1790s that they took over the idea. The weapon was developed by Sir William Congreve jr. and used in the Napoleonic Wars, and against Fort McHenry in the war of 1812-14. It achieved immortality thereafter by the reference in the American national anthem to "the rockets' red glare, the bomb bursting in air". These stories deserve to be told, for their interest and for the detailed information they can convey about gunpowder manufacture and use.

I commend the book for its scope – its lapses only show how closely it has commanded my attention.

This review was first published in *Technology & Culture* 2005 **46** 405-6.

Dr Brenda J Buchanan

GUNPOWDER: A CAPRICIOUS AND UNMERCIFUL THING

'Gunpowder: a capricious and unmerciful thing' Brenda Buchanan *History of Technology* 2005 **25** 141-160

This study discusses the regulation of the manufacture and storage of gunpowder by rules and regulation, and how buildings and sites were designed to minimise risk.

THE ART AND MYSTERY OF MAKING GUNPOWDER

Brenda J Buchanan, 'The Art and Mystery of Making Gunpowder: the English Experience in the Seventeenth and Eighteenth Centuries', in Brett D Steele and Tamera Dorland eds 2005 *The heirs of Archimedes. Science and the art of war through the age of enlightenment*, Cambridge Mass & London England: MIT Press

RICHARD WATSON: GAITERS AND GUNPOWDER

'Richard Watson: gaiters and gunpowder' Colin Russell 57-83 in Archer, M D and Haley, C D 2005 *The 1702 Chair of Chemistry at Cambridge: Transformation and Change* Cambridge: Cambridge University Press

Richard Watson, bishop, politician, and scientist, made a crucial contribution to the improvement of British gunpowder manufacture at the end of the 18th century. In correspondence with William Congreve (senior) he suggested that by regulating the production of charcoal by preparing it in sealed retorts that a consistent form of gunpowder might be produced. This innovation along with other improvements introduced by Congreve gave British forces a marked advantage during the French revolutionary and Napoleonic wars.

UPNOR CASTLE AND GUNPOWDER SUPPLY TO THE NAVY 1801-4

'Upnor Castle and gunpowder supply to the Navy 1801-4' Andrew Saunders *The Mariner's Mirror* 2005 **91** (2), 160-174

This paper gives an account of a Board of Ordnance letter book, covering the years 1801-4, and its correspondence with the Upnor Castle magazine, Kent. The letters contain a lot of fascinating details about the supply and management of gunpowder at the beginning of the 19th century. This was an interesting time for British gunpowder as the Commissioners of the Admiralty were pressing the Royal Navy to introduce cylinder powder. The letters also give instructions from Congreve about the use of different types of powder, for example, that Red LG (large grain) was to be used for distant shooting, while White LG was for close fighting, salutes, and for 'sealing pieces of ordnance'. The article concludes with an appendix of ships unloaded or loaded from Upnor Castle.

THE DEVELOPMENT OF THE CHILWORTH GUNPOWDER WORKS, SURREY, FROM THE MID-19TH CENTURY

'The development of the Chilworth Gunpowder Works, Surrey, from the mid-19th century' Cocroft, W D and Tuck, C 2005 *Industrial Archaeology Review* **XXVII** (2) 217-34

This paper presents the results of the recent English Heritage survey of the Chilworth gunpowder works. The main theme of the article is the development of the works during the 1880s to manufacture brown prismatic powder and its later adaptation to produce chemical propellants.

ICOHTEC CONFERENCE 2006

Brenda Buchanan

The International Committee for the History of Technology (ICOHTEC) will be holding its annual conference in Leicester in August 2006. Brenda Buchanan will be co-ordinating a session on the history of gunpowder and explosives technology.

For further details see **www.icohtec.org**

OBITUARIES

Brenda Buchanan

We are sad to have to report that two of our members have recently died suddenly: MARY YOWARD and BRYAN WILLIAMS. We offer our deepest sympathy to their partners, Tony Yoward and Beryl Williams.

MARY and TONY YOWARD were a good team from their earliest professional days. Indeed, they had met in Bristol whilst training as pharmacists, and this early professional connection was cemented by a long-standing marriage and family life. Having registered with the Royal Pharmaceutical Society in 1948, Mary retained her professional interests for some 40 years, serving also as a magistrate and as a member of the Inland Revenue Complaints Commission. From the mid-1980s retirement allowed for the growth of the many interests Mary shared with Tony, especially as the search for milling ancestors developed into an interest in mills in general including, most happily from our point of view, gunpowder mills. My own first recollection of

the couple is of sharing a cheerful evening meal with them in a small hotel in Truro in 1987, when we all enjoyed one of the several exciting tours of discovery arranged for the Group by Alan and Glenys Crocker. This experience was repeated in Paris on the 1996 tour organized by our colleagues René Amiable and Patrice Bret, but we also learnt then that Mary and Tony appreciated not only the conviviality that went with shared meals, but also the food itself, for they were quite put out to find that Angus and I had been served breakfast on our flight from Bristol whereas they, on a flight from Southampton, had not. It was then no surprise to find Mary and Tony at meetings of the Newcomen Society, where I recall Mary speaking up at one AGM against the Newcomen practice of not permitting shared membership of the Society. The Association for Industrial Archaeology in particular also owed an enormous debt to the couple because for many years they played a vital part in handling the membership arrangements for conferences. In this they were helped greatly by their early development of an expertise in computing. Perhaps most significantly from the point of view of academic achievement, they put these talents to the use of the Mills Archive, helping to make retrievable from that repository, information of all kinds on mills and millers. Life was not always plain sailing, for in recent years Mary underwent surgery for joint replacements, but it was a virulent form of meningitis that caused her death within days. Mary was a woman of great kindness with a wonderful capacity for friendship, and we shall all miss her.

BRYAN and BERYL WILLIAMS are colleagues from the later rather than the earlier days of the Gunpowder Group, drawn in by an interest in magazines, especially that at Weedon near their retirement home. They met more than 50 years ago, both having studied chemistry, a subject that Bryan served for over 25 years as Head of Chemistry at Christ College, Brecon. Bryan's research interests and practical talents lay in church organs and church bells, but he also enjoyed our more unorthodox meetings. We remember in particular the talk that Beryl gave on the subject of Weedon at our Purfleet weekend in 2002, when she was supported as always by Bryan. We all know how much such undemanding support matters, and how it frequently enables us to achieve more than would otherwise have been the case. Bryan died suddenly in his mid-70s, and we would like Beryl to know how much we shall miss his quiet helpful presence at our meetings.

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Names in italics indicate sources of information rather than authors