

Gunpowder & Explosives History Group

Newsletter 11, Summer 2005

GEHG AUTUMN MEETING

Saturday, 29th October 2005, Faversham, Kent

This meeting will give members the opportunity to visit the Fleur de Lis Centre with its displays on the local explosives industry and an excellent bookshop that sells a wide selection of explosives related books, including many hard to find pamphlets. Also close to the town centre are the Chart Mills, including a reconstructed early nineteenth century water powered gunpowder incorporating mill. In the afternoon the group will meet to visit the recently restored Oare Gunpowder Works. The site includes a visitor centre in the former coopers' shop, trails through the works and the restored 1920s powder mills with a steel incorporating edge-runner mill that has recently been brought down from Ardeer.

- 10.0 Meet informally at Faversham Society's Fleur de Lis Centre, Preston Street, Faversham for a self-guided tour of the museum. The Fleur de Lis is close to the town centre car parks and about 10 minutes walk from the railway station. The Faversham Society's website www.faversham.org contains information on the Chart Mills & the Fleur de Lis Centre.
- 11.0 Short walk and tour of the Chart Mills.
- 12.0 Lunch – members may bring their own lunch or purchase a snack in the many cafés, pubs and shops in Faversham town centre, travel to the Oare Gunpowder Works by foot, private car or taxi.
- 13.0 Meet at Oare Gunpowder Works visitor centre – introductory talk and walking tour of the site, please come equipped with walking shoes and old clothes. see www.gunpowderworks.co.uk
- 15.0 Short group meeting and Annual General Meeting
- 16.0 Disperse

If you would like to attend the meeting please contact Wayne Cocroft wayne.cocroft@english-heritage.org.uk or 01223 582700. The cost of attending the meeting will be £5.

**REPORT ON THE GEHG SPRING MEETING, 21 MAY 2005, WALTHAM
ABBEY ROYAL GUNPOWDER MILLS**

Brenda Buchanan

The WARGM Archive: Family Papers of Sir Frederick Abel

30 of our members and guests attended the meeting, and apologies were received from 12 colleagues. We were pleased to be able to repeat our meeting place of last spring, the Saltpetre House. Here, as well as the historical echoes, the modern facilities are excellent - especially the provisions for tea and coffee-making which allow for informal discussions during breaks. The staff and volunteers at WARGM were helpful as always.

Although our theme was the archives in general, our special focus was upon hitherto unknown papers of Sir Frederick Abel, recently made available through the generosity of his descendants in placing them on loan at WARGM. In these circumstances it was particularly pleasing to be able to welcome several members of the Abel family, descended from Sir Frederick's brother. These included the senior member, Mr. David Wallis, his sons Will and Matthew, and daughter-in-law. Their surname indicates a further close family link, with the famous scientist and inventor, Barnes Wallis. When we consulted our good friend Professor Seymour Mauskopf, well-known for his researches in this field of study, about the unexpected availability of these papers, the lure of new material was enough to bring him over the Atlantic, to study them and to speak to us.

Chairman's Introduction

Individual speakers have kindly made available to us a brief account of their talks, but before turning to these I would like to elaborate upon my own remarks by adding further notes on the WARGM Archives in general, in the light of my experience as one of the four initial Foundation Trustees of the establishment.

In 1997 the de-commissioned northern site was handed over by the Ministry of Defence to a Foundation Trust, of whom I was the nominee of the Science Museum. Also represented were the MoD, English Heritage, and English Nature. The whole site and its contents, buildings as well as land, and 'chattels' or moveable objects (including the archives), were vested in the Trust by the MoD, who also made a handsome financial settlement. This was in large part an Endowment Fund, to be invested to provide some of the revenue needed for running the site. Consultants experienced in obtaining HLF grants were appointed, and after much research (as to likely visitor numbers for example), an application was made. A substantial grant was secured, to finance the restoration of the site and its presentation to the public. And because similar projects had gone astray through the over-enthusiastic expenditure of funds, a system of separate powers was established: an Operating Company was to be set up to run the site, on a business plan approved by the Foundation Trust. The Company was to have its own Chairman, and a Board composed of volunteers and local authority nominees, with the power to appoint its own Director and other specialist officers. The Company's income was to come in part from their success in running the site and attracting visitors to it, and in part from the Foundation's investment of the MoD endowment. In terms of both visitor numbers and investment returns, the differences between expectation and reality have been disappointing, limiting the revenue available.

In the matter of our present concern, the archives, the Foundation Trust initiated two provisions at an early stage, to tide us over the gap before the Operating Company could take charge. First, with the advice of our HLF consultants an Academic Advisory Board was established, to consider amongst other matters the provisions needed for the care of the archives at a professional standard. When our consultants withdrew after the success of the HLF campaign, I was asked to chair this committee: meetings were minuted and records survive and may be consulted. I was also invited to establish the present location of the archives which were of necessity cleared from the site at its de-commissioning. I was able to do this with the help of excellent advice from Malcolm McLaren, an outline of whose paper follows these notes. I corresponded with the PRO, and felt happy that although we were unlikely ever to get them back, the documents of national interest were safe with them. At Fort Halstead I drew a disappointing blank on the existence of material of a scientific/military nature known to have been sent there, but that may have been due as much to matters of security as to negligence. The Special Collection, composed of material of local and historical interest, had been re-housed appropriately in the Epping Forest District Museum. The Foundation Trust (now supplemented by three members of the Board of the Operating Company) received regular reports on my survey, but it was realised that at a site such as Waltham Abbey, undergoing major restoration and working towards public presentation, the situation could not remain static. With the Operating Company and its professional staff now up and running, and design consultants appointed, a new stage had been reached. Easy access to the local and historical material, including maps, was now required, and the responsibility for these now passed to those on the site, with consequences that are surveyed by Les Tucker in his paper reported below.

In concluding my comments on the archives, I should add that as the design consultants went about their task, every single interpretation and scenario that they devised for the exhibition came under scrutiny by Wayne Cocroft of English Heritage (who had already undertaken archaeological work on the site) and myself as the Science Museum nominee. Further specialist advice was received from Alan Crocker, then the Chairman of the Gunpowder Mills Study Group and a member of the Board of the Operating Company. As the design consultants knew a great deal about the presentation and display of material but much less about the history of the WARGM and gunpowder & explosives, these voluntary responsibilities proved onerous and very time-consuming. We have the many drafts with numerous corrections and suggestions to prove this!

Morning Session The papers in the morning session began with that by Malcolm McLaren, formerly the archivist and librarian at the MoD establishment. Malcolm brought with him several copies of the detailed catalogues he had compiled.

The Waltham Abbey Special Collection Malcolm McLaren

The Waltham Abbey Special Collection (WASC), comprising historical material in the form of articles, reports, maps, drawings, photographs and artifacts, relating to the activities of the Research Establishment and its manufacturing predecessors, and covering the fields of gunpowder, explosives, propellants and specialized materials, was put together from the mid-1950s. The Collection was built up over the next 35

years to more than 2500 items, including the major sets of early site maps and drawings of early buildings. It was housed in a small museum and used to demonstrate the historical importance of the site to staff and official visitors.

A series of policy decisions in the 1980s resulted in the privatisation of the South Site of the Establishment, and the eventual closure of the North Site in 1991, leading in the latter case to the dispersal of the Collection. The separately-catalogued sets of maps and drawings went straight to the Public Record Office, and the remainder to the archives of the Ministry of Defence, to await selection for the PRO. Items of general scientific interest were assigned to the Royal Armament Research and Development Establishment at Fort Halstead. Those items relating to the manufacture of gunpowder or of local interest were passed to the Epping Forest District Museum in Waltham Abbey.

Attempts are now being made to recover as much as possible of the non-PRO and non-MoD archives material.

The theme of recovery was then taken up by Les Tucker, Friend of Waltham Abbey and Honorary Archivist to the WARGM, in the second presentation.

Challenges of the Waltham Abbey Archive post-2003

Les Tucker

The talk began with an overview of the general situation pre-2003: de-contamination; the refurbishment of buildings; and the appointment of consultants to design the exhibition. The problem of retaining the integrity of the Archive when access was required by employees of the Operating Company, design consultants, educational staff, Friends and former employees, at the same time as boxes of material were being shifted from building to building to meet the needs of contractors, became acute. By 2003 the Collection was in a reduced and disorganized state, and it was therefore decided to begin an exercise in which every surviving map, plan, drawing, document, and photograph would be assembled in one room to be sorted, catalogued, and indexed. Here, luck intervened – a special Archive Room was allocated in the Mills offices, and an outside benefactor generously donated a computer for Archive use. The Collection was subdivided into discrete sets reflecting the components outlined above, and access to the computer meant this could be done as a series of databases. These are:

WASC - Waltham Abbey Special Collection

1800 documents approx.

Work in progress. Old computer index available.

As well as sorting and cataloguing the opportunity is being taken to replace where possible missing documents and add to the collection, including separate sub collections dealing with special subjects e.g. Sir Frederick Abel.

WAMP - Waltham Abbey Maps and Plans

300 items approx.

Sorted, catalogued and computer index available

The series starts with a map of 1590 showing the original fulling mill and covers the history of the Mills up to 1945, including the South Site.

WABD - Waltham Abbey Building Drawings
200 items approx.
Sorted, catalogued and computer index available

The series extends from 1840, including the later S.Site buildings.

WANBD - Waltham Abbey Non Building Drawings
Work in progress

This series includes machinery and plant drawings, and miscellaneous drawings such as boat plans and engravings. Many of the machinery and plant drawings are in books in WASC and these are now included in this series.

WAI - Waltham Abbey Images
Work in progress

Apart from separate photographs, photographs in WASC and WAAC are now included in this series.

WAN - Waltham Abbey Negatives
To be catalogued

WAL - Waltham Abbey Library
Books, Pamphlets, Journals etc.

WASO - Waltham Abbey Small Objects
Miscellaneous portable small objects
To be catalogued

WAOH - Waltham Abbey Oral History
Tapes of interviews with former employees
A manuscript summary of the content of the tapes is available.
This awaits transcribing.

WAAC - Waltham Abbey Accidents
This has been established as a separate sub collection, including
HM Inspector Reports, press reports etc. with cross referencing of
photographs to WAI and personnel detail to WAPP.
Computer index available.

WAPP - Waltham Abbey Personnel Project
This is a major project initiated in 2004 researching and recording
detail of Mills personnel from 1787. The information sources are
copies of Mills official correspondence from 1787 to the 1850's,
Winters Centenary book of 1888, and census details recorded by from
1841 two volunteers from the Waltham Abbey Historical Society.
It is hoped that this material will form the basis of a future Mills
publication.

Examples were given of the usefulness of the Archive, from assistance to family

history enquirers, answering a wide variety of technical enquiries, availability of photographs etc. for talks and tours, writing of articles. Some future projects were outlined - career summaries of the RA Superintendents, joint studies with other organisations, setting up of an Archive website, further sub collections. Finally the speaker offered the assistance of the Archive to enquirers and emphasised the debt owed to Malcolm McLaren without whose foresight and leadership none of the above would have been possible.

The morning session concluded with Sy Mauskopf's survey of the newly available Abel Papers, which amply conveyed the thrill of the historian at the discovery and reading of previously unknown documents. Our speaker had been able to compensate for the shortness of time in the Archives by photographing many of the documents which, portrayed on the screen, allowed us to enter more fully into the world of this eminent War Department chemist of the second half of the nineteenth century.

THE WALLIS ABEL ARCHIVE: NEW LIGHT ON THE CAREER OF FREDERICK AUGUSTUS ABEL (1827-1902) Professor Seymour Mauskopf

Although historians employ all sorts of material to reconstruct the past, the essence of our evidence remains the written record. To the research historian, there are few things more enjoyable or exciting than 'contacting' someone long since dead through the perusal of his writing. The Wallis Abel archive of original documents of (or about) Sir Frederick Augustus Abel provides just this opportunity. Moreover, it does so for a nineteenth-century chemist who has been unduly neglected, no doubt in part because of a dearth of original manuscript material on him.

Significance of Abel

The career of Frederick Augustus Abel has a three-fold significance for the development of modern British science. As a charter student in the Royal College of Chemistry, Abel was one of the first professionally-trained chemists in England.[1] The Royal College of Chemistry, founded in 1845, was based on the model of research training in chemistry that had recently been developed in German universities, particularly the University of Giessen under Justus Liebig.

Secondly, Abel was one of the earliest scientists in Britain to spend virtually his entire career in government service, working for the military arm as 'Chemist to the War Department'. And thirdly, Abel had a wide-ranging technological interest; he carried out investigations in areas that became particularly prominent in the late nineteenth and twentieth century, such as metallurgy, petroleum chemistry, and electricity.

But the focus of his research was unquestionably in military chemistry, particularly explosives and munitions. His research in these areas falls rather neatly into the three principal decades of his career. In the 1860s, Abel worked at purifying and stabilizing 'guncotton' (trinitrocellulose), initially as a military propellant but then for other military uses (mines and torpedoes) and as a blasting agent in civilian mining and construction activities. In the 1870s, Abel carried out the most comprehensive scientific study of gunpowder undertaken up to this time in concert with the artillery officer and gun manufacturer, Andrew Noble. In the late 1880s, Abel was appointed president of an Explosives Committee to develop a smokeless propellant. The

committee succeeded in developing a double-base powder (nitrocellulose/nitroglycerin), based on a similar powder of Nobel ('ballistite'), which they patented under the name of 'cordite'.

Although Abel was never an academic chemist in the strict sense, he possessed the prestige of a fully professional scientist, as shown by the numerous offices he held in scientific societies and his publications in the most prestigious scientific journals. At the same time, Abel took out patents for a number of results of his scientific investigations. But his attempts to develop some of these patents commercially raised serious issues of conflict of interest since he was a government-employed scientific expert and advisor. These issues were highlighted in two conflicts with Alfred Nobel: over dynamite versus guncotton around 1870, and then, twenty years later, over ballistite versus cordite. This latter resulted in a celebrated patent-infringement suit brought by Nobel's Explosive Company over cordite.

Documentary Sources on Abel

The Wallis Abel archive is one of the few repositories of written historical material pertaining to Abel. Aside from sources scattered through the archives of the Public Record Office, I know of only three other significant collections: (1) A collection of about two hundred letters of Abel to Andrew Noble, formerly held at the archive of the Library of the Royal Artillery School in Woolwich Arsenal; (2) Some thirty letters of Abel contained in the collection of the physicist, George Gabriel Stokes, in the archive of the Cambridge University Library; (3) A considerable quantity of correspondence in the Alfred Nobel Archive in the (Swedish) National Archives, Stockholm.

The Wallis Abel Archive

The archive consists of extensive correspondence and other written documents of Abel's as well as a cache of Abel's account books and his diary for two years. Mr David Wallis, the discoverer and owner of the archive, and a collateral descendant of Abel, has organized the written documents into three categories, the material in each separately boxed: (1) 'Letters and career summaries' (the green file); (2) 'Events' (the red file); (3) 'Personal letters, 1888-1902' (the blue file). For each file box, Wallis has provided an inventory of the contents. A good part of the contents of the red file concern what Wallis has titled 'The Affair of the Gun Cotton Patent,' for this, he has provided a very detailed and useful chronology.

Utility of the Wallis Abel Archive for Historical Research

In the three days that I spent exploring the archive, I found much of real significance pertaining to Abel's scientific career and to his personal life. By implication, the archive is also a rich source of material on late nineteenth-century science and society. In conclusion, I shall give a few examples of material that I found useful to my own research:

The details of Abel's career

One of the problems in studying the life of any scientist is establishing the details of his career, especially the early years, which are often poorly documented. In the case of Abel, there has been uncertainty about the precise details of his career before he

became Chemist to the War Department in 1855. Documents in the ‘green file’ provide complete clarification. Firstly, there are a number of documents that give a narrative of his career in military chemistry. One begins with an entry for 1849:

First established classes of instruction in practical chemistry, of cadets, Royal Military Academy and Officers R.A. [2]

These documents are complemented for the early years by a copy of Abel’s letter of 9 February 1852, in which he applied for the position of Professor of Chemistry at the Royal Military Academy, Woolwich. The letter itself was addressed from St. Bartholomew’s Hospital, London, at which institution he mentioned in the letter that he had been employed for ‘twelve months’ as ‘Assistant Teacher of Chemistry’. He also gave a very detailed account of his education in chemistry and the various positions he held. [3]

I would like to return to the narrative document of Abel’s career in military chemistry for it provides an invaluable account of how Abel created a niche for himself as a government military chemist:

When the chemical establishment of the War Dept (Ordnance) was created in 1854, no special duties were assigned to the chemist, on whom depended the development of the Department. – During the first few years they were chiefly connected with the purchase and inspection of stores for the Manufacturing Establishments. And other branches of Supply Departs (the system of select competition being introduced in many directions through Mr Abel’s exertions). [4]

Abel went on to delineate in great detail the very complex functions that he and his staff took on. Although space constraints preclude illustrations of them, this and similar documents will afford the researcher information on Abel and, more generally, on the development of government scientific activities in nineteenth century Britain.

Abel’s social connections

As a sign of the success with which Abel established his position as a government scientist, he came to move in the very highest social circles. This was recognized by his quondam opponent, Alfred Nobel. In a letter of Nobel to the General Manager of Nobel’s Explosives Company of 19 January 1892, over the impending patent-infringement lawsuit over cordite, Nobel cautioned that ‘one of the opponents is on very friendly terms with a powerful Prince’. [5] Nobel was undoubtedly referring to Abel and the Prince of Wales, and this royal friendship is borne out in correspondence in the blue file. I quote a charming example from a few years later. Dated 13 February 1900, it is an invitation (or friendly royal command) from the Prince of Wales to Abel by Sir Francis Knollys, the Prince’s Private Secretary:

The Prince of Wales desires me to say that Prince Charles of Denmark would much like to dine with you tomorrow, if you would kindly ask him, and go to the concert afterwards.
Perhaps you will take care there are not 13 at dinner as the Prince of Wales is rather superstitious on that point.

H.R.H. hopes that you will be good enough to tell those who have stars and ribbons that they could [possibly ‘should’] wear them, but only of course one star.[6]

Conclusion

I have endeavoured to give a few glimpses of how the rich and valuable material in the Wallis Abel archive can be deployed in connection with other archival resources to illuminate the life and career of Frederick Abel. This archive is a splendid addition to the available historical resources on nineteenth-century British science, technology, and government.

NOTES

- 1 I say ‘England’ here because there had been somewhat more of an academic chemical tradition in Scotland.
- 2 Green file, Document No.5 (in Wallis’ inventory). Title is very faint but inventory gives it as: ‘Memo: Nature of F.A. A.’s Services, 1849-1887’.
- 3 *Ibid.*, Document No.1, titled: ‘To Colonel Portlock Application for Appointment as Prof of Chem to Royal Mil Academy’. The letter appears to be a contemporary copy not in Abel’s hand (at least the hand is very different from Abel’s mature hand). The letter refers to testimonials ‘which I shall shortly have the honour to submit to you’. I found a copy of this sixteen page testimonial booklet in an unlikely place, the papers of James Dewar at the Royal Institution (D1b/3).
- 4 Green file, Document No.5. I have largely maintained Abel’s capitalization. I do not know to what ‘the system of select competition’ refers.
- 5 Alfred Nobel – Thomas Johnston, Riksarkivet, Alfred NobelsArkiv, Signum: BI:8 (De12): Kopiebö 1890-1894, p.119.
- 6 Blue file.

Afternoon Session We were doubly fortunate in our next presentation, for it was the chance discovery of the once-restored but now closed Ballincollig Royal Gunpowder Mills by Jenny Webb that had sparked her interest in the site, and the help received from the writer Anne Donaldson and Jenny’s own family, that allowed us to have such a splendid pictorial tour, courtesy of PowerPoint. The site is known to many of us, not least through the account by Brendan Kelleher of the initial restoration of the site, in his contribution to the volume I edited entitled *Gunpowder: The History of an International Technology* (Bath Univ.Press, 1996). That gave a jubilant portrayal of the help received from all the levels of government up to the then European Community, but the account of its fate just a decade later, presented by Jenny, is a sad lesson in the difficulty in keeping such brave projects going.

AN UPDATE ON BALLINCOLLIG GUNPOWDER MILLS HERITAGE CENTRE

Jenny Webb



The heritage centre at the powder mills opened to great acclaim and a burst of fireworks in the spring of 1993. Thanks to an EU grant, Cork County Council had built the centre and restored incorporating mill number 3 to working order together with one of the charge houses. It closed exactly nine years later, having failed to attract a sufficiently high level of visitor numbers to make it economically viable. Road signs proclaiming Ballincollig home to the Royal Gunpowder Mills have sadly all been taken down and replaced with no mention at all of the mills.

Although the site itself is under state protection as a National Monument and therefore cannot be built on, there is little hope of the heritage centre reopening. In fact it is currently being remodelled as administrative offices for the council. The information panels and photos are still on the walls; outside, the grounds are being maintained but I doubt if the machinery of the restored mill is. The early retirement of Brendan Kelleher, former chief planning officer for the county, has also been a blow as he was a driving force behind the centre.

However, it is worth remembering that the heritage centre only enclosed the incorporating mills area with the seven blast walls and four charge houses. The rest of the 130 acre site, now Ballincollig Regional Park, is freely open to the public every day of the year. As well as the main canal, running for the most part in parallel to the River Lee for one and half miles, numerous stone ruins, built from local limestone, can be identified. These include an impressive stove house, circular coal store, oval traverses and a vault-like magazine.

The guide which Anne Donaldson and myself hope to produce next year will highlight all the remaining structures as well as providing a history of the site, an insight into the powder making process at Ballincollig and an idea of the local people who worked there and their trades. In so doing we hope to revive an interest in the mills and ultimately persuade the council to provide information boards in front of all the prominent buildings or at the very least numbered signs which will relate to our guide.

Our talks concluded with an illuminating presentation by Wayne Cocroft who, through his intensive archaeological work on the site, must know the physical aspects of WARGM better than anybody.

SURVIVING STRUCTURES ASSOCIATED WITH SIR FREDERICK ABEL

Wayne Cocroft

Sir Frederick Abel as the War Office chemist was usually based at the Royal Arsenal, Woolwich. In the early 1860s, while he was carrying out his important work on the manufacture of guncotton he designed a new chemical laboratory, one of the earliest purpose-built chemical laboratories in the country. The building comprised offices and a double storey laboratory with a gallery walkway at first level, such an arrangement both provided a light and airy environment, and a platform that allowed Abel to observe the work going on below. The building is Listed Grade II and has recently been converted into flats.

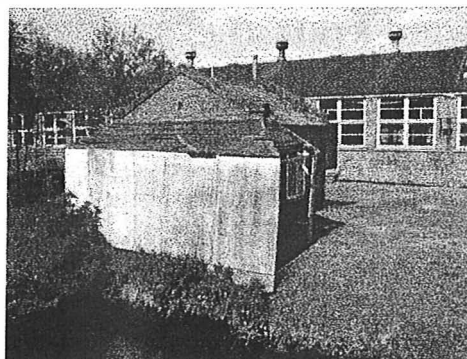
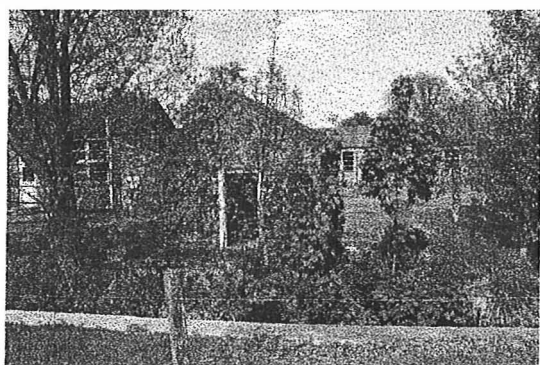


Royal Arsenal, Woolwich, 1864 Chemical Laboratory designed in accordance with the views of Sir Frederick Abel

In 1863, at Waltham Abbey Frederick Abel began to experiment with various methods for the manufacture of guncotton. It was by no means certain that these trials would result in success, and instead of constructing new facilities the old saltpetre refinery on Highbridge Street was adapted. This building provided a large open floor area for the nitrating pots and the adjacent stream was used for washing the guncotton.

The guncotton was then dried on lines, probably on the open areas to the north. One wall of the old saltpetre survives and is protected as part of the scheduled monument.

Although the work on guncotton was unsuccessful in developing a new propellant, through Abel's experiments a safe method of manufacturing guncotton was devised. In 1872 the manufacture of pressed guncotton began at Waltham Abbey for use as burster or demolition charges. Guncotton manufacture remained on Highbridge Street, but a new press house was built to the north of the recently abandoned pellet powder press house, later the Group E mills. The press house was located on the site of L137, it is unclear if any sections of the 1872 survive within the later building. Two expense magazines were built on the central canal to serve the press house, both of which survive.



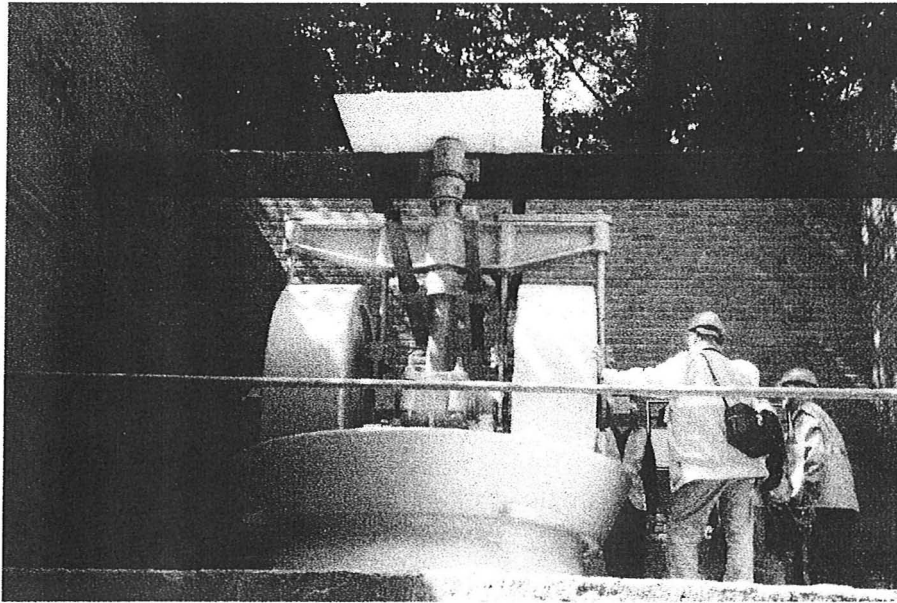
The expense magazines built to serve the guncotton press house.

Conclusion

It was appropriate that at the end of the day, after our sessions had concluded with a lively discussion and more tea and biscuits, Wayne should lead a tour of the site. Your Chairman must confess that after staying behind to wash up the cups, her attempts to join the tour were thwarted by encounters with posses of fierce-firing re-enactment troops, which led her to retire to the safety of the Saltpetre House and the comfortable bench outside. It was an excellent day, for which we must thank our speakers for their thought-provoking contributions, our members for their support, and most of all, the Wallis Family for placing on loan to WARGM these most significant Abel Papers.

OARE GUNPOWDER WORKS

Arthur Percival



April 2004, a suspended edgerunner incorporating mill from the Ardeer Works, Scotland after its installation at the Oare Works by Heritage Engineering

Oare Gunpowder Works, 1km W of Faversham, Kent, is now open to the public free of charge - from 8am to 5pm on weekdays and 9am to 4pm at weekends. It lies just off the B2045, close to the M2. Leased by Swale Borough Council for 175 years from the owners, the site has been conserved and made suitable for public access by Groundwork Medway Swale. Much of the necessary funding came by way of a key £900,000 contribution from the Heritage Lottery Fund.

This is the second most important gunpowder site in the UK after the former Royal Gunpowder Factory at Waltham Abbey. It was also second of the three Faversham powder factories to open. Started by Huguenot immigrants from Lyon in the 1680s, and it came to be a main supplier of the East India Company. One of the founders, Francis Grueber, also traded in silk in Seething Lane, City of London. His many descendants now live in the UK, India and New Zealand.

Like almost all powder plants, it has always been a place of great beauty and charm: even in its heyday a visiting journalist mistook it from the distance as a game reserve. Leats and narrow-gauge canals thread their way through woodland managed to minimise damage in the event of a 'blow' (accidental explosion); and at the north end, closest to Oare village and Creek, is Burney's Pond, one of the two millponds created to power the gunpowder mills. To be seen nearby is one of only three surviving gunpowder mills in the UK, repatriated in 2004 from Ardeer in Ayrshire. (Another is at Chart Mills, in Faversham itself.) Among impressive remains which have been conserved and consolidated are those of the 19th-century glazing and corning houses.

Special trails (including one for wheelchair users) have been laid by Groundwork to ensure that the site can be enjoyed to the full. A visitor centre is being created in the former cooperage, but at the time of writing the displays are not yet complete. It will be staffed by volunteers, initially at weekends and Bank Holidays, and some Society members have already come forward. It has taken about 10 years to realise what at first sight seemed just a dream, and members of the Faversham Society have been

much involved, providing advice and gunpowder expertise. Warmest thanks to Swale Borough Council (and Sheila Smith in particular), Groundwork Medway Swale and the Heritage Lottery Fund!

For further information see www.faversham.org/history/oareworks.asp.

GUNPOWDER IN CANTERBURY

Arthur Percival

The accounts of the Canterbury Marching Watch, a local militia, offer some intriguing insights into the local gunpowder trade. In their accounts there are many references to the cost of powder. In 1504 payment was made for to Arnold Lokyer for gunpowder bought at Sandwich, and at a later unspecified date payment was made for bringing a hogshead of powder and sack of match from Faversham to Canterbury. At this time both Sandwich and Faversham were important ports with extensive coastal trade and contacts with the continent, so it is impossible to say where the powder originated. Payment was also made for brown paper to wrap the powder in. Most of the powder was probably for the town's guns, but some was being used for small arms. In 1588, the Armada year (1588) a muster list for troops camped between Deal and Ramsgate reveals that the Canterbury men consisted chiefly of bowmen and billmen but that 20 were trained shots or 'calyver men'.

Brigstocke Sheppard, J 1878 'The Canterbury Marching Watch with its pageant of St Thomas' *Archaeologia Cantiana* 1878 **12** 27-46

COPPERAS

Arthur Percival

Copperas is the simple title of a ground-breaking new book from the Canterbury Archaeological Trust (CAT) which is now on sale at the Fleur de Lis, price £13.95 (£14.95 by post). The substance, known from Roman times, was used mainly as a dye fixative for woollens. It was made from iron pyrites (ferrous disulphide - FeS_2) - fool's gold in the vernacular - which is common in the London Clay. The nodules occur in profusion on the foreshore at Whitstable and Tankerton, and were being exploited for copperas manufacture by the end of the 16th century. The first archaeological evaluation of the Tankerton site was undertaken by CAT in 1997-8 and the book, by Tim Allen, Mike Cotterill and Geoffrey Pike, is a detailed report on this. Just as important, it includes the first overview of copperas manufacture in the UK. An important dimension from the Faversham point of view is that it was possible to extract the sulphur from the raw material. This was one of the three ingredients of gunpowder and in the early days the only source was from mines in Sicily - which made it expensive. So it may be significant that one of the Whitstable factories was established by a Faversham man, Thomas Mendfield, in 1604. He was wealthy, and large long-term capital outlay was needed at a copperas plant to yield any dividend. Another works was later established by Thomas Mascall, perhaps related to the John Mascall listed in the 1584 Faversham muster roll. With the local gunpowder industry developing, it would have been helpful if sulphur could be obtained locally.

1654 DELFT EXPLOSION*Wayne Cocroft*

On Monday, 12 October 1654, about half past eleven in morning one of the city's magazines exploded. The magazine, known as the 'Secreet van Hollandt' had been established in 1572 in the north-east corner of the city in the former Clarissenklooster (Convent of St Claire). The explosion was so large that it became known as the 'Delft Thunderclap' and was heard 150 kilometres away. The partly subterranean magazine contained about 90,000 pounds of gunpowder and the explosion destroyed a large part of the city and probably killed many hundreds of people. Amongst those killed was one of Rembrandt's most gifted students Carel Fabritius (1622-1654) who was at work in studio on Doelenstraat at the moment of the explosion. The artist Egbert Van der Poel painted the scene of devastation, he may have suffered a personal tragedy on that day for it is recorded that one of daughters was buried on 14 October. One of his paintings of the explosion is in the National Gallery, London, it was evidently a popular and saleable scene and he produced at least another 19 versions.

<http://gallery.euroweb.hu>

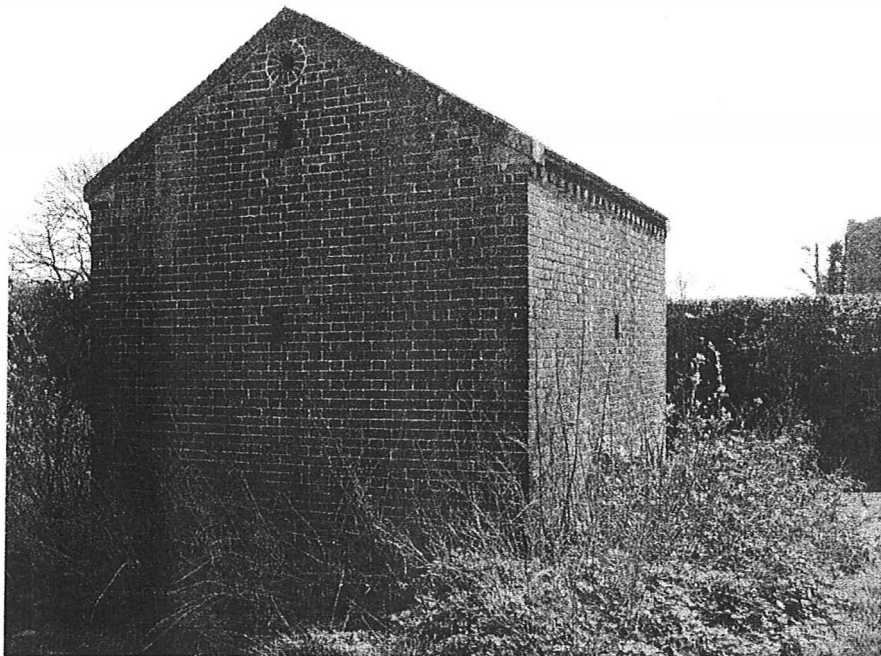
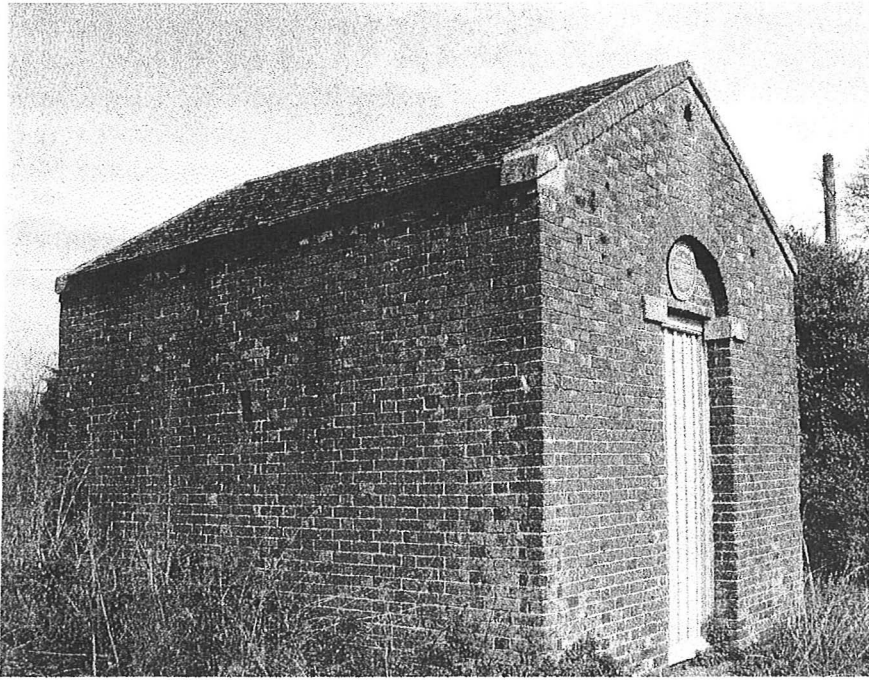
EXPLOSION AT HOUNSLOW HEATH FEBRUARY 1762 *Tony Yoward*

The Western Flying Post or Sherborne & Yeovil Mercury Monday 22 February 1762 reported that on 'Thursday night, about 10' clock, the powder mills belonging to Mr Smith on Hounslow, was blown up, but happily no lives were lost'.

PITSKELLY QUARRY A POWDER MAGAZINE?*Miles Oglethorpe*

Miles Oglethorpe in *Industrial Archaeology News*, 2005 **133**, 18, reports that a small circular structure with a vaulted stone domed roof was unearthed at Pitskelly quarry during the improvement of the A92 trunk road between Dundee and Montrose. It was reported that there was some sort of hearth in the building but it is unclear if this was secondary feature. There is still some doubt as to the function of the building, although a blackpowder store or smiddy have been suggested. After recording the building was demolished in 2004.

PORTCHESTER CASTLE, GUNPOWDER MAGAZINE *Elizabeth Whitbourn*



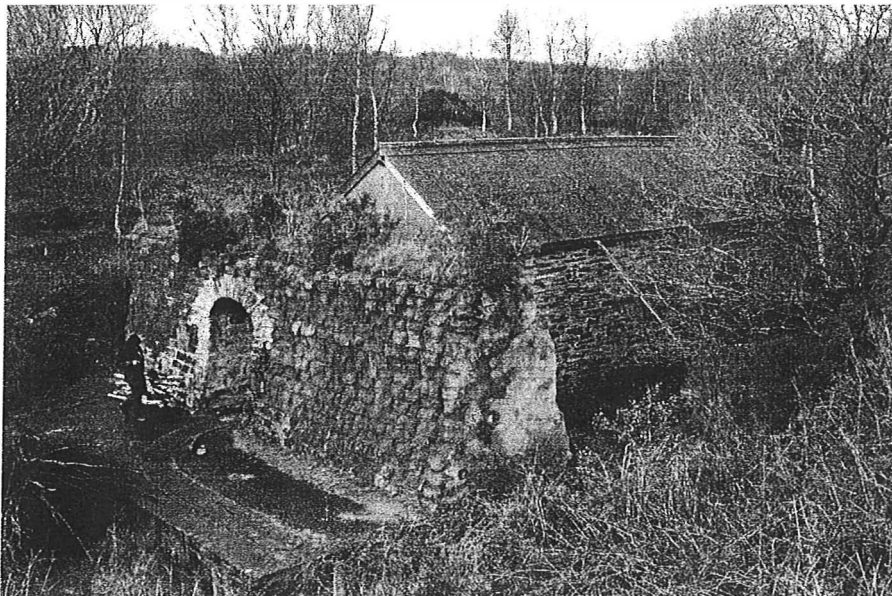
This powder magazine was one of three built in mid-18th to serve the military garrison at Portchester Castle, Hampshire.

COOKE'S EXPLOSIVES LIMITED, PENRHYNDEUDRAETH Wayne Cocroft



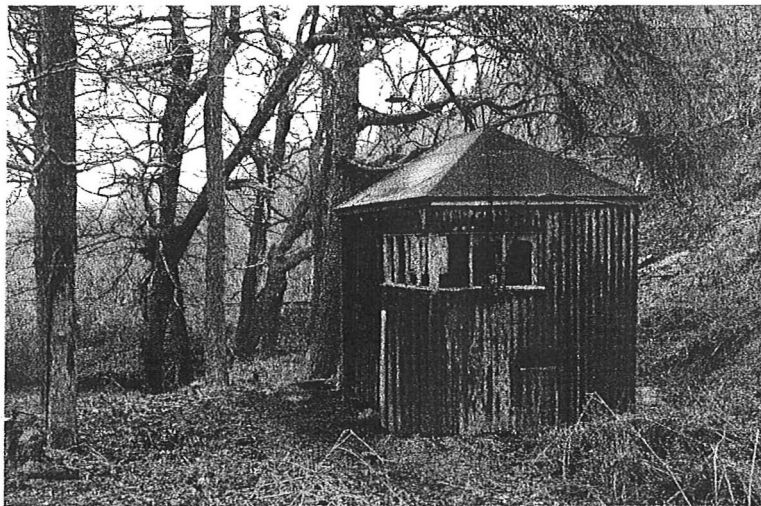
Gate to Cooke's Explosives Limited

In 1995 Cooke's Explosives Limited closed due to declining demand in the coal mining industry coupled with the introduction of new types of non-nitroglycerine based explosives bringing to an end one of the country's longest-lived explosives factories. The factory was originally established in the 1865 as Patent Safety Guncotton Company and was licensed in 1876 later becoming part of the New Explosives Company. In 1908, the factory became the Steelite Explosives Company Limited, manufacturing patent steelite explosives (Brayley-Hodgetts ?1908, 412). During the First World War, after a disastrous explosion the factory was taken into government control and became His Majesty's Factory Penrhyndeudraeth, after the war it returned to the private sector and became the Ergite and Cooke's Explosives Company Limited. In the 1950s, on Mr Cooke's retirement the factory was bought by ICI, but continued to be known as Cooke's Explosives Limited.



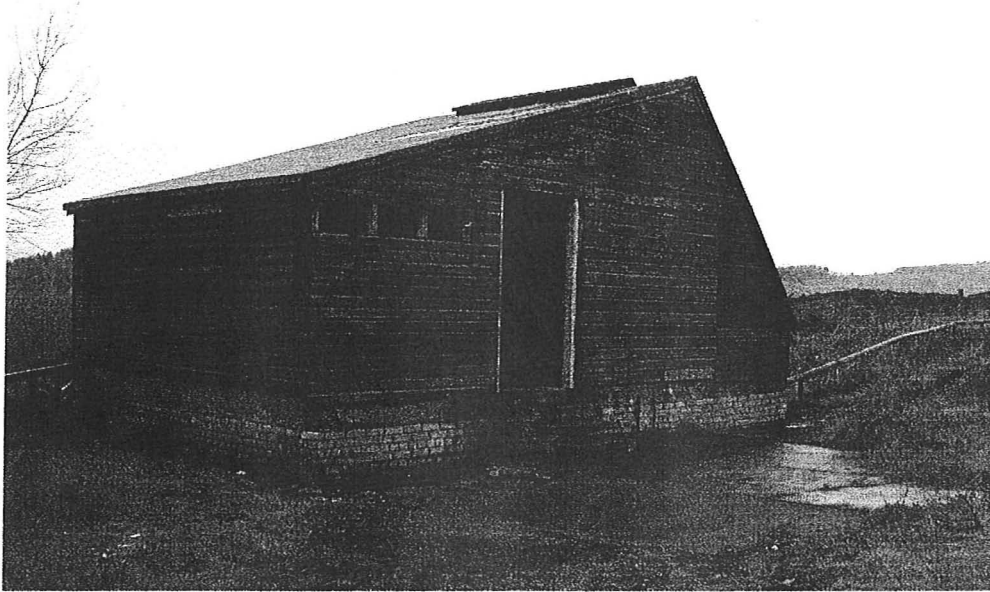
Explosives store house with solid traverse and remains of tramway

The factory lay to the north of Harlech at Penrhyndeudraeth, Gwynedd (SH 618 187), to the east of the Harlech to Pwllhelli railway line. The factory covering 28 hectares is set in an attractive location with views of the Dwyryd estuary to the west and Harlech castle to the south. The factory makes good use of the natural topography of three parallel valleys in which to place buildings, the natural slope of one of the valley's also being an ideal for the nitroglycerine section, allowing the nitroglycerine to be moved by gravity. During its long history the factory manufactured a variety of explosives including guncotton, nitroglycerine, picric acid, trinitrotoluene, detonators and a number of patent mining explosives. During the 1960s it was claimed to be the most advanced explosives factory in Europe, and at its peak during the 1970s 500 people were employed at the factory and producing 9000 tonnes of explosives annually.

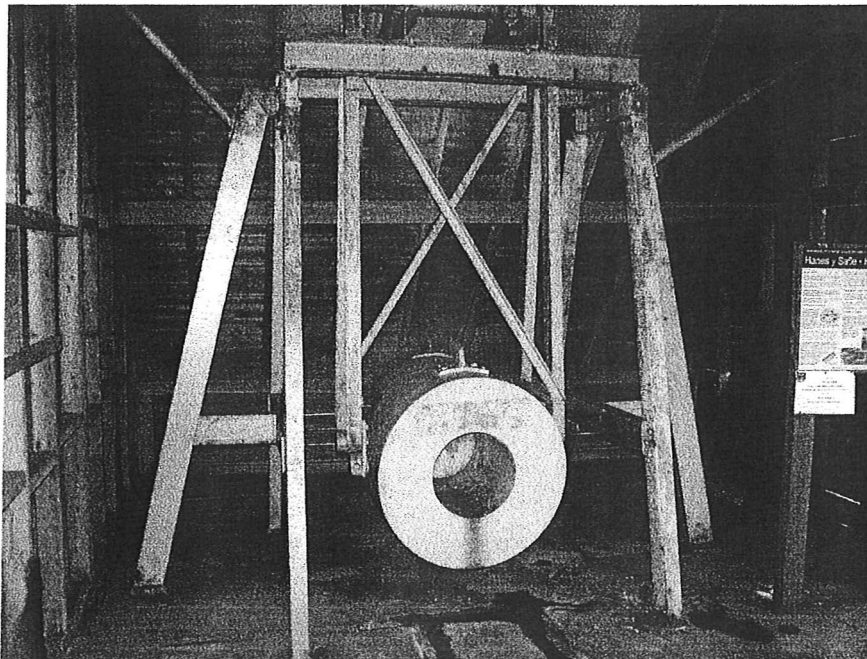


Control hut for a cable way

The factory, which mainly comprised relatively small shed-like structures, giving rise to the nick-name of one of the factory sections of 'Klondyke Valley', was cleared in the late 1990s at a cost of £6 million and was subsequently acquired by the North Wales Wildlife Trust. Seven of the original buildings have been retained as an acknowledgment of the site's industrial past and wildlife habitats. Amongst the building that have been retained is a small engine and control house for the factory's ropeway system. The largest surviving structure is a double storey stone and brick building known as the Belfast store, after its curved corrugated iron roof. Other buildings include stone built magazines and packing-houses with corrugated asbestos-cement sheet roofs surrounded by stone and earth traverses. In one store house wall, earthenware raschig rings (usually used as packing to increase the surface area in acid towers) have been set into its walls as vents.



Ballistic pendulum building



Ballistic pendulum

A unique feature of the site is large ballistic test pendulum that was installed as recently as the 1980s. Elsewhere, building rubble has been left to add to the diversity of wildlife habitats. As part of the decommissioning of the site it received some money from the European Commission LIFE project, which aimed to create an area with a higher bio-diversity than would have developed if the site had been allowed to naturally re-vegetate. The site is now freely accessible to visitors who may follow the former factory roads, however, without an original site plan the interpretation of its remains is difficult.

For further information see www.wildlifetrust.org.uk

ARTHUR BYWATER GEORGE MEDAL & CROSS*Wayne Cocroft*

Richard Arthur Samuel Bywater was born on 13 November 1903 in Birmingham, where his father was a chief clerk in charge of stores at Austin Motors, Longridge. Arthur was educated at Kings Norton Grammar School and later took a first in chemistry at Birmingham University, and was awarded a master's degree in 1936. He was chief chemist at Boxfoldia until 1939, when he became a technical assistant at the filling factory at the Royal Arsenal Woolwich, moving later to the experimental department. In 1940 he moved to the new Royal Ordnance filling factory at Kirby, Merseyside, where he was the development officer.

At 8.20am on 22 February 1944 there was an explosion in a building where 19 workers were filling powerful anti-tank mine fuzes. One female worker was killed instantly when one fuze exploded setting off the other 24, two other workers were also injured, one of whom later died. In the badly damaged building there were around 12,000 fuzes, held in trays of 25, in stacks of 40, which another explosion might set off. After the area had been cleared, over the next day Bywater and three volunteers removed 4,000 defective fuzes for destruction, and he personally moved 23 critically unstable fuzes. Only when Bywater was certain that the area was safe did he allow other workers to remove the remaining fuzes. For his heroism he was awarded the George Cross on 26 September 1944 and was invested by King George VI on 24 October 1944 at Buckingham Palace.

In August 1944 there was an even greater explosion, which scattered a deadly mix of anti-personnel, anti-disturbance and time delay bombs across amongst the wreckage. For his work in organising the evacuation of the workers and casualties Bywater was one of 11 employees awarded the George Medal, he received this decoration from the King on 6 November 1945 becoming the only civilian to receive the George Cross and Medal.

After the end of the war he became the manager of RN Coate Co, Cider makers, Nailsea, Bristol, in 1954 he moved to Australia where he helped to set up a new ordnance factory in South Wales. In 1999, he wrote *Reminiscences of a Non-Combatant*, an account of his wartime experiences. He died on Wednesday 6 April 2005.

The Times 8 April 2005; *The Daily Telegraph* 8 April 2005; *The Guardian* 18 April 2005

WILLIAM GEORGE SYLVESTER, GEORGE CROSS*Nigel Monslow*

William George Sylvester was born on 6 December 1914 at Chadwell Heath, Romford, Essex and during the Second World War was employed as a 'hillman at the Royal Gunpowder Factory, Waltham Abbey. On 18 January Sylvester was purifying nitro glycerine in No.2 Washing House when there was a tremendous explosion elsewhere in the factory. Although the Washing House suffered considerable damage Sylvester was well aware of the danger that might result from the nitro glycerine freezing and stayed at his post until the material in the building had been processed. For his bravery he was gazetted the Empire Gallantry Medal on 6 February 1940,

which was later exchanged for the George Cross after its institution as the highest civilian award. He later transferred to the new Royal Ordnance Factory at Marchwiell, Wrexham, he lived the remainder of his life in the town and died in 1995.

Extract from Williams, W 2001 *The encyclopaedia of Wrexham*

RNCF HOLTON HEATH, DORSET , FACTORY MODEL *Brenda Buchanan*

The Dorset Industrial Archaeology Society *Bulletin* 11 January 2005, 1 notes that the large model of the Royal Naval Cordite Factory, Holton Heath, made in c1940/1 has been moved to *Explosion* naval weaponry museum Gosport Hampshire.

ARABIC GUNPOWDER COMPOSITIONS, REVIEW Wayne Cocroft

‘Gunpowder compositions for rockets and cannons in Arabic military treatises of the thirteenth and fourteenth centuries’ Ahmad Y. al- Hassan 1-30 *ICON* 9 2003, 1-30

This paper presents a discussion of gunpowder recipes known from a number of 13th and 14th century Arabic treatises. It includes information from well-known manuscripts such as Hasan al-Rammah’s *The book of military horsemanship and ingenious war devices* and the St Petersburg or Rzeveski manuscript, as well other more obscure sources. In collating the various sources he notes that in most recipes potassium nitrate formed around 75 parts per hundred. It also discusses the purification of potassium nitrate as described by al-Rammah. Early Arabic accounts of the use of gunpowder in fireworks and portable firearms indicate that it was largely used to scare men and horses in battle, but was later developed for use in large siege cannons. He also discusses the use of celebratory fireworks in the medieval Arab world.

THE EAST INDIA COMPANY’S ARSENALS AND MANUFACTORIES

The East India Company’s Arsenals and Manufactories 1936 H A Young, 243 pp

The Naval and Military Press in association with Firepower have recently reprinted this rare book, which comprises a history of the East India Company’s ordnance and explosives factories in India.

Brigadier-General H A Young, Director of Ordnance Factories in India 1917-1920, wrote this book after giving a lecture to the Royal Society of Arts in 1924. It provides an account of all aspects of the East India Company’s ordnance manufactories, including the ordnance department, gun foundry, carriage manufactory, ammunition, small arms and other goods.

Copies may be obtained from, The Naval and Military Press, Unit 10, Ridgewood Industrial Estate, Uckfield, East Sussex, TN22 5QE. It costs £14.50 = £3.65 p&p.

CHILWORTH GUNPOWDER WORKS, REVIEW

Glenys Crocker

Wayne D Cocroft, 2003, *Chilworth gunpowder works, Surrey*, English Heritage Archaeological Investigation Report Series AI/20/2003. viii, 157pp, illus, maps, ISSN 1478-7008

The archaeology of the gunpowder industry has received considerable attention since the 1980s. Surveys of gunpowder manufacturing sites have been undertaken by the Royal Commission on the Historical Monuments of England and by English Heritage, with which the RCHME has amalgamated, in Devon, Kent, Essex and Cumbria. In 2000 English Heritage published the book *Dangerous energy: the archaeology of gunpowder and military explosives manufacture* by Wayne Cocroft, author of the present report on Chilworth.

It is to Guildford Borough Council's credit that they chose to draw on this fund of experience when they commissioned a survey of the remains of the Chilworth gunpowder mills in 2001. The Borough Council owns a large part of the site and actively supports and interacts with the local Working Group which represents historical, environmental and community interests in its care and management. The area occupied by the gunpowder industry at any time in the mills' 300-year history extends from a point just within the parish of Shalford in the west to Waterloo pond and the grounds of Postford House in the east. Guildford Borough Council owns the central part (from Blacksmith Lane eastwards to Lockner Farm Road) which became a Scheduled Monument in 1982. However, English Heritage extended its survey to include the area to the east that was scheduled in 1999 and comprises the site of the late 19th century smokeless powder works, which has rare surviving structures of an early cordite factory, and that of the Admiralty Cordite Factory built in the First World War.

The principal chapters of the volume are entitled Historical Background, Site Description, and Phasing and Analysis. The first reviews the extensive historical research which had already been carried out and adds new information, particularly on more recent periods, including the decades since the closure of the works in 1920. The Site Description begins with the watercourses that form the basic framework and then describes individual features in each of the four main units: the Lower Works, Middle Works, 1890s Smokeless Powder Factory and First World War Admiralty Cordite Factory. This section is illustrated with photographs, many of them coloured, measured drawings of structures on fold-out pages and a set of fold-out site plans on a scale of 1:1000. The analytical section describes the topographical and technological development of the factory chronologically, under ten period headings. The discussion is elucidated by appendices giving flow diagrams of the processes of manufacture, one for gunpowder (black powder made from saltpetre, charcoal and sulphur) and one for the processes of cordite manufacture which were carried out at Chilworth, ie excluding the initial preparation of cordite paste from nitrocellulose and nitroglycerine, which was done elsewhere. Transport is discussed at the end of the chronological account and covers the use of waterways, roads and the works tramway but does not raise the question of how far rail transport was used other than for bringing in coal for steam power.

Two topics are singled out for special Notes. The first, on the millstones, discusses the history and use of edge runners at Chilworth and contains a table giving details of the 29 stones found on the site. The problem of the source of the stones, which has puzzled geologists and for which no documentary evidence has so far been found, is not however touched upon. The second Note gives an account of the renowned Burbach iron and steel works which supplied structural steel members to the Anglo-German Chilworth Gunpowder Company established in 1885.

The report does not seek to set an agenda for further investigation -- that is outside its terms of reference -- but several unsolved questions receive due mention. The historical section notes the unexplained anomaly that the powder mills were contracting at the time when war was breaking out in 1701. In the context of the landscape, the problem of the purpose of the causeway in the lane from Lockner Farm to Chilworth Manor is noted and the interesting suggestion is made that a dam and pond here may have been related to water management for agriculture (water meadows being one of many significant landscape features of the Tillingbourne valley). Buried features were outside the scope of the survey but it is observed that there is archaeological potential in the former materials preparation and service area west of Blacksmith Lane and that structures representing earlier technology may lie under remains of 18th century mills in the Middle Works.

Given the scale of the commitment and resources employed in this project, it may seem ungrateful to point out that the extreme eastern and western ends of the site, where some of the 17th century pestle-and-mortar type mills were located, are outside the designated area of the survey and are not analysed in detail. The author does however consider the industrial complex as a whole and notes that much has been destroyed by redevelopment, both west of Blacksmith Lane and on the site of Bottings' mill at Postford. The area redeveloped, and monitored, in the 1990s at Postford did not extend as far as the most easterly mill site on the dam of Postford Pond, as shown on a 1728 survey. Similarly at the western end, where the gunpowder mills were succeeded by paper mills in the 18th and 19th centuries, later industrial development did not extend over the parish boundary into Shalford, where the mill recorded in 1677 as 'Shifford' mill must surely have stood. So questions remain for future investigation.

The principal aim of the report is to provide data on which to base policy for the site. It is encouraging that moves are already being made to assess the condition of the recorded remains in preparation for drawing up a management plan. The report also provides a clearly and attractively presented account of the mills for those who simply wish to know more about them and will be of interest to anyone involved in recording industrial sites. The use of some of the buildings as housing in the inter-war and early post-war period occurred within living memory. The report refers to this inhabited complex as 'Tin Town' but according to some local residents this name was reserved for the post-war 'prefabs' on the Hornhatch estate. A worthwhile project for the Chilworth Local History Society, newly established in 2004, might be to study this period and to clarify such matters, fill in the details and ensure that local memories are recorded.

Copies of the report may be ordered from English Heritage, Brooklands, 24 Brooklands Avenue, Cambridge, CB2 2BU. It is exceptionally good value at £15.00

and a CD containing the related professional papers is available at £5.00. Prices include post and packing and cheques should be made payable to English Heritage.

This review first appeared in *Surrey Archaeological Collections* **91** (2005)

BASINGILL, CUMBRIA, INDUSTRY AND DESIGNED LANDSCAPE *WDC*

Hunt, A and Everson, P 2004 'Sublime Horror: Industry and designed landscape in Miss Wakefield's Garden at Basingill, Cumbria' *Garden History* **32** (1) 68-86

This article resulting from recent English Heritage fieldwork at Basingill discusses the creation of an early 19th century garden by Isabella Wakefield the daughter of the owner. This garden is set in a wide context of contemporary aesthetics of the sublime and picturesque.

NEW BOOKS

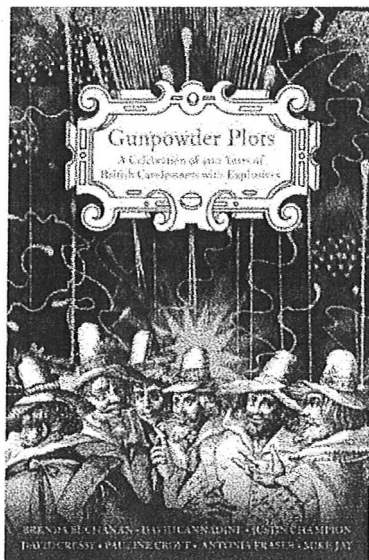
Wayne Cocroft

The Silvertown explosion London 1917

Graham Hill and Howard Bloch, 2003, Stroud: Tempus

Gunpowder Plots: A Celebration of 400 years of Bonfire Night

Brenda Buchanan, Justin Champion, David Cannadine, David Cressy, Pauline Croft, Antonia Fraser and Mike Jay, 2005, ISBN 0713998865 London: Allen Lane £12.99



400 years ago this November the most ambitious and extraordinary plot ever conceived in this country came close to success: the attempt by Guy Fawkes and his fellow conspirators to destroy in a single, annihilating blast the entire British ruling class and royal family. This book draws on the expertise of different writers to bring to life their immense implications of the Plot and the strange way they have echoed down to us over four centuries in what remains the quintessential English festival. Pauline Croft writes about the amazing plot itself and the anxious, unstable world of Jacobean Britain, Antonia Fraser imagines a world in which the plot had succeeded,

Justin Champion dramatizes the national emergency that followed the plot's discovery and its savage anti-Catholicism, David Cressy traces how Bonfire Night has been celebrated since its inception as a holiday, Mike Jay focuses on the most famous and enduring rituals held each year at Lewes and Brenda Buchanan offers a wonderful history of fireworks in Britain. (Publisher's publicity review)

The History of Rotherwas Munitions Factory, Hereford

John Edmonds 2004, 114 pages, illustrated, Logaston Press: Almeley
ISBN 1 904396 27 5 paperback £9.95

Gunpowder a history of the explosive that changed the world

Jack Kelly 2004, 260 pages, illustrated, Atlantic Books: London
ISBN 1 84354 190 4 hardback £14.99

A review will appear in the next Newsletter

Gunpowder, explosives and the state

Brenda J Buchanan (ed) forthcoming, c.450 pages, illustrated, Ashgate: Abingdon
ISBN 0 7546 5259 9 hardback c.£55.00

ADVANCE NOTICE OF GEHG SPRING MEETING MAY 2006 Wayne Cocroft

Following the pattern of recent years it is planned that next spring meeting will follow a theme and will probably be held in conjunction with the Royal Society of Chemistry Historical Group. It is proposed that next year's topic will be Sulfur or Sulphur. Sulphur has been the least discussed ingredient of gunpowder and the organisers would welcome contributions on the sources of sulphur, its trade, refining and its role in the combustion of gunpowder. We might also broaden this discussion to include the early production of sulphuric acid that was crucial in the manufacture of many chemical based explosives. The meeting will probably be held at the Royal Gunpowder Mills Waltham Abbey in late May or early June. If you would like to contribute paper on this or any other subject please contact Brenda Buchanan or Wayne Cocroft.

ADVANCE NOTICE 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 again be co-ordinating a session on the history of gunpowder and explosives technology, any member who would like to consider presenting a paper should contact Brenda.

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The editor welcomes short articles and notes, notices of meetings and publications relating to the archaeology, history, and technology of gunpowder and explosives for inclusion in the newsletter.

Deadline for the next issue: 31 December 2005 – submission by email or 3.5-inch floppy disc, Word 2000 (or earlier versions) appreciated. Published by the Gunpowder & Explosives History Group. Edited by Wayne Cocroft, c/o English Heritage, Brooklands, 24 Brooklands Avenue, Cambridge, CB2 2BU, email: wayne.cocroft@english-heritage.org.uk