

Gunpowder Mills Study Group NEWSLETTER 14, FEBRUARY 1994

SPRING MEETING AT BISLEY, SURREY
SATURDAY 30 APRIL 1994

Programme

Morning (from 9.30 am): A demonstration with hands on experience of the use of gunpowder in a variety of original firearms on the **Short Siberia Range**.

Lunch Break (1.00 pm to 2.00 pm): A buffet lunch will be provided in the historic **Clubhouse of the Surrey Rifle Association** in Bisley Camp.

Afternoon (from 2.00 pm): A display at the **Surrey Clubhouse** of containers, packaging and means of carrying powder for immediate use provided by Dr De Witt Bailey and William Curtis, who will talk on this subject. Participants are urged to bring along any of their own materials to add to the display. Any early firearms that can also be brought along will be of interest.

Mid Afternoon Break: Tea, air and a tour of the Bisley Ranges is suggested.

Remainder of Afternoon: Talks and discussions within the Group.

Total cost: About £5 including lunch, plus a small charge for tea. Further information on a leaflet enclosed with this Newsletter.

We are indebted to **Bill Curtis** for arranging this meeting. Those interested in attending should contact him as follows: W S Curtis, PO Box 493, Rhyl. Clwyd LL18 5XG. Phone 0745 584 981.

AUTUMN MEETING, SATURDAY 24 SEPTEMBER 1994

This year our full-day Autumn Meeting will again be held at the Institute of Historical Research, Senate House, University of London. The programme is being arranged by Brenda Buchanan on the theme of 'Problems in the Manufacture of Gunpowder'. Further particulars later; please note the date.

SUBSCRIPTIONS FOR 1994-5

The annual subscription has been £3 for single and £4 for double membership since 1989. At the 1993 Autumn Meeting it was agreed that there should be an increase because of additional expenditure: larger newsletters, postage and bank charges. The new rates are £5 single and £6 double. A renewal slip is enclosed. Please return this to Glenys Crocker, 6 Burwood Close, Guildford, Surrey GU1 2SB; cheques payable to Gunpowder Mills Study Group.

INDEX OF PLACENAMES IN NEWSLETTERS 1-10

With this Newsletter is being circulated an index of placenames in issues 1-10 of the Newsletter. This is not intended to be comprehensive or even consistent and it has in fact been tailored to fit neatly on to two pages. However we are finding it useful and hope that other members will as well.

THE AUTUMN MEETING IN LONDON

Jenny West

This well-attended meeting was held on 25 September 1993 at the Institute of Historical Research, University of London. Members presented reports and spoke on a wide range of gunpowder research projects; the material demonstrated, as on previous occasions, the increasing interest and research on the subject. The contributions are summarised below.

Philippa Walton, Powdermaker

Keith Fairclough

Philippa Walton inherited Waltham Abbey powder mills in 1711 on the death of her husband, John, and was shown to have been a significant contributor to the Ordnance Office in time of war. She was one of several such widows during the first half of the eighteenth century, and was certainly the most productive in a business which became one of the largest, if not the largest, in the country. In spite of having ten young children, she appears to have managed alone until her son John joined her as a partner. Keith described the selection of a magazine site at Barking Creek by Philippa and three co-partners, the proportions of investment in the mills by mother and son in terms of time, finance and involvement with the government, and posed such questions as possible previous experience of Philippa and specific problems of women as powdermakers.

Stamp and Edge-Runner Gunpowder Mills in the 18th Century

Glenys Crocker

The change from pestle mills to edge runners in the 18th century presents problems in that differing opinions have been held about their relative merits, from the point of view of both the quality of the product and safety of operation. Although in Britain stamps were made illegal in 1772 on grounds of safety, there was concern in some countries that the friction caused by the shearing movement of cylindrical edge runners could give rise to dangerous heating and this influenced the shape of edge runners, making them less effective for incorporating the product. More evidence is emerging on the date at which mills adopted edge runners. In particular, documentary evidence is reported of powder mills "with millstones" near Dublin in the early 1720s. These mills were established by the Grueber family who continued to use stamps at their Faversham and Chilworth mills until they sold out in the 1730s.

Recent Research on Faversham Mills

Jenny West

Faversham powder mills were the first such mills, from 1759, to be held and run by the government. The aim was to try to boost stock at a time of unprecedented demand during the Seven Years War. Study of production indicates the problems involved in the daily running of the concern. The Ordnance Office found it could produce no more than other makers. Recent research shows how the insight of Major Congreve, Deputy, then Comptroller of the Royal Laboratory, saved the mills from sale by introducing new ideas. This he did predominantly by improved organisation, pertaining to such aspects as increased number of mill units, keeping units in full working order to maintain the chain of production, better pay and shifts for powder makers and greater purity of raw materials.

The Last of the Powder Makers

David Ashton

It is intended to publish David's personal account of smokeless powder manufacture between 1947 and 1956 in a future issue of the Newsletter.

Opening of the Visitor Centre at Ballincollig

Alan Crocker

The gunpowder mills at Ballincollig, established in 1794, were taken over by the Ordnance Board in 1804 and run for approximately eleven years, after which they lay idle until 1835. There were several owners including Curtis's & Harvey. The mills stopped work in 1903 and were owned later by ICI. In 1974 they were taken over by Cork County Council which has undertaken a programme of restoration. The official opening of the site and visitors' centre this summer was attended by Glenys and Alan Crocker on behalf of the Study Group. Alan showed slides of associated buildings, along the River Lee and the new mill race, such as the original magazines, blast walls, saltpetre house, charge houses and a new incorporating building and waterwheel. Several pairs of incorporating units have been left without cover and may be seen when the new building is shut. Restoration has posed some interesting questions: gearing, pan and scrapers in the incorporating mill are new and the scrapers are not functioning correctly - their position is critical. Among those present at the Opening were Brendan Kelleher, Cork County Planning Officer, Fred Hamond of Belfast who was responsible for rebuilding the mill, and another Group member, Vincent Coneghan.

Current Developments at Waltham Abbey

Ken Bascombe

Ken's report on the current position at these mills was an important one. Investigations by the Royal Commission on the Historic Monuments of England, in support of English Heritage (EH), has established that the site is of great international importance. As a result, EH has recommended to the Secretary of State for the Environment that most of the site (including the SSSI area) should be scheduled as an Ancient Monument and 20 buildings in the remaining part should be Listed under the Planning Acts. (A complete survey has been made of all the standing structures on the site). The expectation is that the MOD will in due course vest the site in a Trust, which will take over its management. So far, a Steering Committee has been set up, including members from EH, English Nature, the Lee Valley Regional Park, and the local District and Town Councils. MOD's consultants, CIVIX, provides the secretary. The first two meetings were held as planned, but the third has had to be postponed, apparently due to a change of heart by MOD. It is hoped that this can soon be overcome; until this hiccup occurred, vesting day was expected in spring 1994. An area, devoid of important buildings, in the south-east corner of the site has been cleared and put up for housing development; part of the proceeds is expected to accrue to the Trust in due course. A planning application for the rest of the site has been submitted by CIVIX. However this includes provision for a further area of housing development, which at one point would impinge on a potentially sensitive part of the proposed Scheduled area. From the chair Alan Crocker asked John Boyes, Jim Lewis and Ken Bascombe to look into this and if appropriate to make a representation to the planning authority. On the ground, the main activity is decontamination to dispose of explosives and asbestos; this involves much earth-shifting and digging out of filled-in ditches and waterways, and the work is expected to continue into 1994.

The International Survey of Gunpowder Mills

Brenda Buchanan

Brenda's report, including an announcement of a forthcoming ICOHTEC Symposium in Bath, is given on page 5 of this Newsletter.

Ideas on Future Group Activities and Management

General discussion took place on dates, venues and programmes for 1994. Bill Curtis had kindly undertaken to look into the possibility of a spring meeting at Bisley. [Arranged for 30 April; see page 1]. Attending members agreed that the Institute of Historical Research was an appropriate venue for the Group's autumn meeting; subsequently Jenny West made a booking for 24 September 1994 [see page 1]. Brenda Buchanan and Jenny West were asked to consider whether they would plan a programme for this meeting. Brenda suggested that this might be structured round a specific theme. It was generally considered that the theme might form the main part of the day with time also allocated for more general discussion and any additional members' contributions.

We are greatly indebted to Jenny West who not only handled the administrative arrangements for the meeting but also presented a very stimulating paper and wrote most of this report on the day's activities.

Eds.

A WORLD LIST OF GUNPOWDER MILLS SITES

Alan Crocker

Brenda Buchanan explains on page 5 how she is building up an international network of scholars interested in the history of gunpowder making. In order to support this activity I thought it would be helpful to prepare a list of all the gunpowder manufacturing sites in the world, other than those in the British Isles, which are mentioned in books and articles which I have at home or can consult fairly readily. So far I have compiled a list of 189 sites in 25 countries and the number is gradually growing. They have been listed alphabetically under country and mill name and as far as possible the location and known period of operation have been given together with the sources of the information. The following is a typical example of an entry:

Canada: Acadia, Waverly, nr Halifax, Nova Scotia (1863-83): CJAC 5(2) p 42 [It is explained that CJAC is an abbreviation for the Canadian Journal of Arms Collecting].

At present the list occupies six A4 pages including a detailed list of the 21 sources used. This is rather too long to reproduce in the Newsletter but the following list of the countries and the corresponding number of mills might be helpful. The notation (n/m) means n sites named out of m reported to have existed and > indicates 'greater than'.

Australia (2); Austria (4); Belgium (2); Brasil (1); Canada (4); China (4); Denmark (4/18); Finland (0/4); France (15/>22); Germany (41); Greece (0/20); Holland (9/24); Italy (2); Japan (2); Luxemburg (1); Norway (3/10); Portugal (1); Rumania (1); Russia (5); Spain (3); Sweden (1/55); Switzerland (16); Turkey (1); USA (66/>200); Yugoslavia (1).

I shall be happy to let members have a current copy of the list on request and would be very pleased to receive additional information on mills which can be included. Clearly as we know of nearly a hundred sites in the British Isles there are far more than 189 in the rest of the world! I am of course letting Brenda Buchanan have updated copies.

THE INTERNATIONAL SURVEY OF GUNPOWDER MILLS

Brenda Buchanan

This is a summary of a presentation made at the Group's Autumn Meeting in London. In a brief introduction the origins of the survey were traced to a short visit to the Danish powder making site at Frederiksvaerk in 1988 (and an unexpected meeting there with the expert molinologist Anders Jespersen), which was followed by a longer field trip to that country organised for the GMSG in 1989. It then seemed a good idea to try to discover what was known about the history of powder making in other countries too, and a meeting of the International Committee for the History of Technology (ICOHTEC) in Hamburg that same summer offered the opportunity to begin finding out. It was from these discussions that the idea of a shared international study of the history of gunpowder, the location of sites, and the surviving remains, began to take shape. ICOHTEC members have continued to give a great deal of support to this project, supplying the names of scholars who might share this interest, and in some cases themselves approaching people on my behalf.

As a result of these and other contacts I have been in correspondence with more than 50 international scholars, resulting in the building up of a network which was described in some detail at the meeting. In introducing myself and the subject it has been very helpful to be able to refer to the name of the GMSG and the office of International Secretary which I have been pleased to hold since first reporting on this project to the Group. ICOHTEC's support has now been expressed in a very positive way with the suggestion that the subject of 'The manufacture and marketing of gunpowder' should become one of the three main themes to be discussed at their meeting in the summer of 1994. This invitation presents problems as well as opportunities but I am now writing to my contacts to discover how many would like to offer a paper at the symposium, and to consider how these possibly shorter approaches may be blended with the earlier idea on contributions on powder making in the different countries, together with a gazetteer of the sites involved. A very useful discussion followed the airing of these problems at the GMSG meeting, for which I should like to thank the members present. An abbreviated notice of the symposium follows.

**22nd International Symposium of the
International Committee for the History of Technology
Saturday 30th July to Thursday 4th August 1994
Bath College of Higher Education**

- The general title will be
International Themes in the History of Technology,
with particular consideration being given to three topics:
1. International aspects of the institutional organization of engineers.
 2. The manufacture and marketing of gunpowder.
 3. The value of physical artefacts in international comparison in the History of Technology.

The Fee for the Symposium, including full board for 5 days, is £275
For further information please contact:
Professor Angus Buchanan, Centre for the History of Technology,
University of Bath, Claverton Down, Bath BA2 7AY (tel 0225 826826)
or Dr Brenda Buchanan at her home address.

PRESENTATION OF RCHME REPORT ON WALTHAM ABBEY SITE

Malcolm McLaren

A major presentation of the Survey Report on the Waltham Abbey Royal Gunpowder Mills site by the Royal Commission on the Historical Monuments of England was given, on site, on 21 January 1994. The meeting was held in the former Lecture Theatre of the Royal Armaments Research and Development Establishment and addressed by Paul Everson, Head of the RCHME Keele Office, and Wayne Cocroft, Team Leader of the RARDE Survey Team. The invited audience, numbering about 80, included 30 councillors and officers from the four local councils, groups from English Heritage, English Nature, the Lee Valley Regional Park Authority, Royal Ordnance, former RARDE staff, other surveyors and archaeologists working on the site and the press.

The proceedings were opened by Ron Dane of CIVIX, the Ministry of Defence consultants, who outlined the steps taken leading to the survey. Paul Everson then gave a resume of the survey work and a description of the form and context of the archive report. The survey had been carried out from January to March 1993, when ground conditions were at their best. Three distinct topographical areas had been identified for action: North Site, South Site and Lower Island (the linking strip between the other two) but the South Site was not examined so extensively. Modern site management had been used with updating of the site plan to record changes. Some 750 black and white field photographs had been taken together with 250 large format photographs of the larger buildings. These will now be available through the National Monuments Record archive. Oblique aerial photographs were taken to give general and medium views and to show individual buildings. These have been lodged with the national collection of aerial photographs at Swindon.

Collections of documentary material at the Public Record Office, MOD and its archives, Epping Forest District Council and the Nathan Collection in the Royal Society of Chemistry were consulted to augment the RCHME archive and to complete the Component Sheets.

The primary function of the Report is to provide a written account of the identified areas, capable of being updated, for the National Monuments Record archive. It comprises four sections: an introduction with a summary and bibliography, an area-by-area description, an analytical report giving the variation through time and the collection of Component Sheets, which record all salient details of individual buildings. A separate binding of maps is included in the second section. The intention is that the Report should be made available, at photocopy rate, to interested parties.

Wayne Cocroft then gave accounts of the manufacture of gunpowder and explosives (guncotton, nitroglycerine, cordite, tetryl, TNT and RDX) at Waltham Abbey, interestingly making use of both historical slides and material from the Report as illustrations.

In the questions session, RCHME were complimented on the thoroughness of the Report. Paul Everson responded to a query on the site's importance by stating, repeatedly, that it was of extraordinarily high importance on all sorts of scales, nationally and internationally. This is a view which is unlikely to go unheeded by those with influence in the audience. Questioned on future action, he stated that, with the Report completed, RCHME would draw a line under the activity. In closing, Ron Dane added that decontamination would be carried on to completion in 1995, that planning permission action for the small area at the town end of the North Site would continue and referred to the formation of a Trust to coordinate activities.

ENGLISH HERITAGE'S "MONUMENTS PROTECTION PROGRAMME: THE GUNPOWDER INDUSTRY"

English Heritage has recently circulated this report, prepared by one of our members, **Shane Gould** of the Cranstone Consultancy, to about 70 individuals and organisations, including about 20 members of the Group. The covering letter asks for comments by the 31st [sic] June 1994. The report is part of a major effort by English Heritage to evaluate and select industrial monuments for statutory protection. It is estimated that at least 30 industrial topics will need to be tackled and gunpowder, together with lead, tin, copper, brass, other non-ferrous metals and alloys, iron and steel, coal, glass and alum, is one of the first to be examined. Also, because the gunpowder industry was relatively simple and because much help was available from "various experts on the subject", progress has been rapid. Thus, Shane Gould has been able to include three of the six steps of the exercise in a single report. In summary these are: (1) description of the industry, its development, chronology, regional diversity, existing records and identification of experts, (2) data gathering to identify sites considered to be important, with some site visits but mainly desk-based activity, (3) producing a report listing important sites and providing a structured evaluation of each site. The remaining three steps are: (4) confirmation of important sites and recommendations drafted for action (scheduling, listing etc), (5) consultation within English Heritage, with the Royal Commission on the Historic Monuments of England and with outside experts and bodies, (6) formal recommendations for protective action and records of sites transferred to the National Monuments Record and county Sites and Monuments Records.

The Report is of A4 format and consists of 24 pages of text, 5 pages of bibliography (79 entries), a 1-page table of counties with or without gunpowder in their SMRs, 16 pages of maps and line drawings (22 figures), a 2-page appendix of assessed sites and a 6-page circulation list. The text makes major use of the Group *Gazetteer*, the Newsletter and the Shire album on *The Gunpowder Industry*. Following an introduction it has sections entitled raw materials, technical outline, history, regionality, components, sources of information, the step 3 survey and acknowledgements (with lots of familiar names). The fact that almost nothing appears to survive of the early industry (before about 1700) is noted several times. The components section is particularly interesting as it identifies alphabetically 48 features of gunpowder works from *blast bank* to *workers housing*. Each of these entries defines the feature, gives the date range, assesses its importance and lists the known sites. For example:

saltpetre beds. An area where saltpetre crystals were produced from carefully prepared beds of nitrous earth, decaying vegetable matter and rubble; **saltpetre refineries** may have stood nearby. Medieval? to 19th century. No known examples have been identified and any with surviving field evidence are a high priority. Sites: None.

A total of 59 assessment sheets relating to 32 former gunpowder mills were completed. The features on each sheet have been graded using the following star system. *** = major national importance; ** national important; * = borderline or uncertain importance; 0 = no case for statutory protection. Two sites, Tonbridge and Waltham Abbey, were not assessed because of access problems, the latter in any case having been considered directly by English Heritage and RCHME. Seven sites, Chilworth (Surrey), Kennall Vale (Devon), Littleton (Avon), Lowwood (Cumbria), Oare (Kent), Powdermills (Devon) and Woolley (Avon) have been graded *** in

whole or in part. A further seven sites, Allerston Manor (North Yorkshire), Chart and Stonebridge Pond (Kent), Gatebeck charcoal retorts (Cumbria), Marsh workshops (Kent), New Sedgwick (Cumbria) and Peppering Eye (East Sussex) have been graded ** and 13 sites, Bishops Wood (Cornwall), Elterwater and Bassingill (Cumbria), Farthing and House (East Sussex) Bedfont and Hounslow (Middlesex), Dartford (Kent), Worsborough Dale (South Yorkshire), East Molesey, Worcester Park, Abinger Hammer and Godstone (Surrey) have been graded * and Ewell and Stanwell (Surrey) have been allocated 0. One of the 59 assessment sheets has been circulated. This concerns the mortar at Powdermills on Dartmoor and unfortunately is not a very helpful or typical case.

We shall be commenting on the Report on behalf of the Group and also contributing to the comments being made by other organisations. We would also like to encourage all those members who have received copies to send in their comments. If you have not received a copy and would like more information please let us know

A VISIT TO HAGLEY MUSEUM AND LIBRARY

Alan Crocker

During October, Glenys and I were able to spend nearly five days at the Hagley Museum and Library on the Brandywine River at Wilmington, Delaware, USA. We were the guests of our member Robert Howard, who is its Curator of Industry and Technology. I had paid a very brief visit to the museum about ten years ago but it was Glenys's first visit and, as we enjoyed our stay so much, we thought we should tell members of some of our impressions. It was at Hagley that the Du Pont family started to make gunpowder in 1802 and continued to do so until the end of the First World War. It is also where they lived, overlooking the works, and the family home is part of the Museum, which was established in 1952. Linked with the Museum is the Library, in a modern building opened in 1961, and the nearby Manuscript Collection, in the converted soda house originally built in 1888. The soda was sodium nitrate which Du Ponts used instead of potassium nitrate to make some of their gunpowder.

The Museum and Library are operated by 80 full-time employees, reduced recently from 88, and a number of part-time volunteers. I imagine that Beamish, Ironbridge and Weald & Downland, corresponding British museums, would be pleased to have half that number. Robert Howard claims that salaries are low by American and perhaps British standards. However, the working conditions seemed to be exceptionally good, especially during a sunny week in the fall. Certainly all of the staff with whom we interacted provided a wonderful service, finding documents, papers and books and photographing and photocopying material we requested very quickly.

We spent the first couple of days looking at documents in the Manuscripts Collection. Our aim was to discover more about the visits Lamot du Pont made to gunpowder mills in Britain in 1858 and 1862. This we did and we plan to write articles for future Newsletters on some aspects of our findings. For example we studied interesting correspondence between Lamot and Henry Drayson of Maresfield Mills in Sussex and discovered that, when he left Maresfield, Drayson started to make black powder at Fritham (Eyeworth) in the New Forest. This was the mill which was later taken over by the Schultze gunpowder company who manufactured a successful modern propellant and not black powder. What we had not realised was that Lamot

took back to Wilmington a large collection of gunpowder ephemera including the labels which I have written about on pages 10-11.

The library, where we spent much of the rest of the week, is a spacious building containing a unique collection of books and other printed material on the history of technology, especially gunpowder manufacture and the chemical industry. In particular it holds the Oscar Guttman Collection on gunpowder and explosives. We only had time to look at a few items from this unrivalled collection. I particularly enjoyed two catalogues, dated 1890 and 1894, of gunpowder making equipment being manufactured by Krupp and their predecessors Gruson at Magdeburg. These include lists of Krupp customers in many countries including Chilworth and Waltham Abbey in England. I also plan to write about these catalogues in a future Newsletter.

G.P.
At 1830?
date

We also looked around the main museum display in the Henry Clay Mill, a former cotton mill of 1814 at the entrance to the site. This contains general exhibitions on technology and, in a school's workroom on the top floor, an interesting exhibition of water turbines, including cut-away examples. The gunpowder industry is displayed, in part using models, in a wing of the Millwrights' Shop of 1858 and also in many of the original separated gunpowder buildings along the millstream. Of particular interest is the Eagle Roll Mill or incorporating mill of 1839 with a pair of iron edge-runners driven from below and powered for demonstration purposes by a water turbine. The graining or corning mill (1830s) has a long horizontal corning machine and the press house a horizontal press. The glazing mill is not normally open to the public but Robert took us in to see a very large decaying glazing barrel. He also told us that the yellow lumps in barrels in the sulphur store, which I have shown on a slide in many lectures, are limestone painted yellow! The oldest gunpowder building is the Birkenhead Mill with a reconstructed 16 ft diameter waterwheel. Between 1843 and the 1880s all of the site's waterwheels were replaced by turbines. We also saw an 1870s steam engine at work in the engine house. The surprising thing is that almost all of this equipment has been brought to Hagley from other parts of the USA. Most of it was discovered and restored by Robert Howard, some of the work being carried out in a wonderful machine-shop in the basement of his home. However, I suspect that most visitors gain the impression that it is all Hagley equipment.

Robert also showed us the extensive museum store but much of the reserve material was packed away ready to be moved to a more convenient building. We did not therefore see, for example, the large collection of canisters some of which came from Britain. However we did see a small incorporating mill for experimental work, a pair of small testing mortars and a pendulum eprouvette. Finally we went to the museum shop which was very disappointing. There is no substantial guide to the site only a glossy picture book. Fortunately I had bought an excellent guide published in 1976 on my previous visit. Also there were very few slides of the gunpowder buildings on sale and not even many books about the Du Ponts. The social history of the local and wider community is served rather better.

In conclusion Hagley is a wonderful place with a tremendous collection of equipment, books and documents relating to the gunpowder industry, and all displayed in attractive restored original buildings plus the modern library. We were particularly fortunate in having a world authority on the industry as our host. Of course as soon as we got home we realised that we had not studied at least one key document, so we shall have to go again.

BRITISH GUNPOWDER LABELS AT THE HAGLEY LIBRARY

Alan Crocker

The manuscript collections of the Hagley Library at Wilmington, Delaware, USA, include a volume of labels and posters used by British gunpowder manufacturers. Most of these probably date from about 1858. It was in that year that Lamot du Pont, nephew of Henry du Pont, President of the Eleutherian Gunpowder Mills on the Brandywine River at Hagley, visited Europe and returned home with an extensive collection of material. This particular volume (Accession No 384, Box 35A, Vol 4) contains the following items. (These are all rectangular unless stated otherwise; horizontal dimensions precede vertical ones).

- Page 1(a).** "Kames Treble Strong Gunpowder. Fine Grain 1". Olive-green with a stag's head and a boar's head. 80 x 149 mm.
- Page 1(b).** "Kames Gunpowder Co". Olive green. 97 x 23 mm.
- Page 1(c).** "The Kames Gunpowder Compy particularly recommend to dealers in sporting tackle their treble strong gunpowder now so much prized by all sportsmen. Wholesale to the trade at their offices in Glasgow, Liverpool and 147 Leadenhall St, London". Circular 85 mm diam.
- Page 1(d).** "Laurence & Son's Canister No 2 Gunpowder". 52 x 37 mm.
- Page 1(e, f).** "No 2 for percussion guns". 77 x 17 mm.
- Page 1(g).** "Curtis's & Harvey". Circular, dark blue. 18 mm diam.
- Page 2.** "The Kames Gunpowder Company's Crystal and other Sporting Gunpowder". Red, white and blue, with five vignettes portraying hunters, dogs, deer and game. Printed by King, College Hill, London. 367 x 291 mm.
- Page 3.** "Curtis's and Harvey's Diamond Grain Gunpowder Hounslow & London". Blue, yellow and white (circle in rhombus in rectangle). 195 x 231 mm.
- Page 4.** "Hall and Son's Rifle Gunpowder sold in flasks. Faversham & London. Under the patronage of His Royal Highness Prince Albert. Registered according to Act of Parliament". Green, red and white, portraying a red flask of rifle gunpowder with three labels. One of the labels bears "John Hall & Son, registered 27th June 1851". Another states that rifle gunpowder is "manufactured only by John Hall & Son". 223 x 263 mm.
- Page 5.** "Laurence's Battle Gunpowder". Black and white. 229 x 194 mm.
- Page 6.** "Burton's Superior Tunbridge Gunpowder. Office, 25 Broad St Buildings, London EC". Blue and white. 276 x 226 mm.
- Page 7.** "Curtis's and Harvey's Sporting Gunpowder. Hounslow & London". Black and white. Printed by King & Co, Printers, London. 264 x 367 mm.
- Page 8.** "Curtis's and Harvey's Sporting Gunpowder. Hounslow & London". Similar to page 7 but different lettering and border. Red, white and blue. Printed by King, Queen St, New Cannon St, London. 264 x 367 mm.
- Page 9.** "Sporting Gunpowder made by Laurence & Son. Battle". Gold, green and black on white, with two vignettes of huntsmen with guns and a powder flask, a horse, dogs and a dead hare. 368 x 271 mm.
- Page 10.** "Laurence's Improved Grain No 2 Gunpowder, Battle". Gold, green, red and black on white. 274 x 356 mm.
- Page 11.** "Pigous & Wilks Dartford No 2 Sporting Gunpowder. Office, 34 Throgmorton St, London". Purple, black and white, with a moorland hunting vignette and a border incorporating two guns and a stag's head. Printed by Reynolds & Co, Litho., 15 Old Broad Street, London. 271 x 377 mm.
- Page 12.** "Burton's Superior Tunbridge Cylinder Sporting Gunpowder. Manufactory, Gunpowder Mills, Tunbridge, Kent. London Office, 25 Broad St Buildings". Fawn, black and white, with moorland hunting vignette and border incorporating two guns and dead grouse and hares/rabbits. Printed by Lith. Waterlow & Sons, London. 256 x 320 mm.

Page 13. "The Celebrated Patent Electric Gun Powder manufactured solely by the Maresfield Patent Gun Powder Company Limited". Blue and white. Printed by Lith. Waterlow & Sons, London. 271 x 375 mm.

Page 14. "Pigou's & Wilks Dartford Rifle Gunpowder". Fawn, black and white with vignette of a shooting party firing at a target in the grounds of a country house. Printed by F Reynolds, Litho, 15 Old Broad St. 272 x 371 mm.

Page 15(a). "The Glass Gun Powder made only by John Hall and Son, Dartford, Sold Here. No 1 Fine Grain, No 2 Coarse Grain, for Percussion Guns". Black and white. 191 x 136 mm.

Page 15(b). "Superfine Extra Canister Gun-Powder manufactured by Burton, Children & Co, Tunbridge Mills, Tunbridge, Kent, upon the chemical principles of Sir H Davy Bart. Address 24 Birchin Lane, London". Black on orange. 82 x 74 mm.

Page 15(c). "Pigou's & Wilks, Dartford, Double Seal Gunpowder". Black on yellow with two 24 mm diameter red seals each bearing "Ps & W". Printed by Pocock, Printer, Dartford. Handwritten "18.32" added in black. 40 x 90 mm.

Page 16. "The Glass Gunpowder made only by J Hall & Son, Dartford". Glossy yellow on black with text in 122 mm diameter circle surrounded by a 16-point star. 197 x 220 mm.

Page 17. "Gun Powder made by John Hall and Son, Dartford. Sold Here". Glossy black on yellow with 158 x 120 mm scene of two hunters in a wood, with a horse, dogs and a canister of gunpowder, painted by R B Davis and engraved by A H Baily & Co, 85 [or 83] Cornhill. 187 x 274 mm.

Page 18. "Curtis's & Harvey have the pleasure to inform their Friends and Customers that they are now prepared to execute Orders for their Improved Coarse Grain and Improved Medium Grain Gunpowders packed in 1 lb and ½ lb Basket-Work Canisters, which they can confidently recommend for sporting and rifle practice. 74 Lombard Street, London EC. July 1857". Gold, blue, red, pink, brown, black and white, including a 95 x 174 mm drawing of a basket-work canister with an octagonal label - page 19(a). 201 x 257 mm.

Page 18v. "The Maresfield Patent Gunpowder Company (Limited) continue to manufacture their superior Electric Gunpowder, surpassed by none. Mr Gordon Cumming, the celebrated lion slayer says of it, 'It is of First Rate Quality, I am much pleased with it, and congratulate you on having such powder, an article of such deep and vital importance to the sportsman. I will recommend it among my sporting acquaintance, and on my next hunting trip I will further test its sterling qualities' - Vide his letter, 23rd September 1856. Offices, 37 King William Street, City, London". Black on white. 139 x 110 mm.

Page 19(a). "Curtis's and Harvey's Improved Coarse Grain Gunpowder. Hounslow & London". Blue, red, pink, brown, black and white. Octagonal with one axis of symmetry (vertical) - see page 18. 94 (max) x 89 mm.

Page 19(b). "Kames Gunpowder Compys. Superior Canister Gunpowder. FFF". Black on cream, the border including guns and banners. 85 x 121 mm.

Page 19(c). "Rifle Gunpowder made by Draysons & Harvey, Maresfield, Sussex". Black and white with a vignette of four soldiers with rifles. Printed by H Silverlock, London. 80 x 152 mm.

Loose (a). "Daye Barker & Co's Nulli Secundus No 2 Gunpowder, Lowwood Mills, Newton-in-Cartmel". Black on emerald green. 75 x 53 mm.

Loose (b). As loose (a) but "No 3".

Loose (c). As loose (a) but "No 6".

Loose (d,e). "Sharpe Adams & Co's Tower Proof Gunpowder. Coarse Grain. Ewell Mills near London". Light red with pink lettering. 82 x 107 mm.

MONUMENTA PULVERIS PYRII

Alan Crocker

This is the title of a book of reproductions of ancient pictures concerning the history of gunpowder, with explanatory notes by Oscar Guttman. It was published as a limited edition of 270 copies in 1906 and a few years ago Glenys and I were fortunate to be able to purchase a copy (No. 167). It was printed for Guttman by The Artists Press of Balham on hand-made wove paper with a watermark design based on the author's initials appearing on every page. The book measures 337 mm by 278 mm and is quarter bound in deep red leather with oak three-ply boards and two hand-chased brass clasps. There are 10 introductory pages and 34 pages of notes, all in English, German and French, 102 figures, most of which occupy a whole page, and three pages listing the subscribers. The book is divided into twelve sections on Roger Bacon (4), Berthold Schwartz (12), Saltpetre (18), Sulphur (3), Charcoal (5), Other Ingredients of Gunpowder (3), Manufacture of Gunpowder (20), Alchemistic Symbols in Gunpowder Manufacture (0), Tests for Gunpowder (3), The Oldest Guns (10), The Master Gunners (4) and Men of Note in Modern Times (20). Here the numbers in brackets refer to the number of illustrations on that topic, although there is some overlap. The illustrations are reproduced in sepia, although some of the originals are highly coloured. Apart from the portraits of 19th century scientists, they date from the early 14th to the late 17th century.

The list of subscribers is fascinating. Eighty copies were sold in England, 55 in Germany, 22 in the USA and 12 in Austria. All other countries are in single figures but the author retained 26 copies. It is surprising that although French is used as one of the languages only six subscribers came from France. Britain and its Empire accounted for 100 copies whereas Germany, Austria, Hungary, Poland and Czechoslovakia had a total of 73. In Britain 59 were acquired by individuals, 23 by companies and only 7 by societies and libraries. The companies included Bickford Smith (fuses), Chilworth, Curtis's & Harvey, Nobels (4), Paines (fireworks), du Ponts (London) and Wakefields. Many of the individuals gave their professional addresses including several at Waltham Abbey and Woolwich Arsenal. Finally it is striking how many of the British purchasers, like Guttman himself, had Continental surnames.

ROTHERHITHE WHITELEAD, SULPHUR AND SALTPETRE WORKS

Shane Gould has sent us plans of this works dating from 1843, 1870 and 1894-6. It was located at NGR TQ 353794 on the west side of Lower Road and adjacent to Canada and Albion Docks, part of the Surrey Commercial Docks system. The 1843 plan, which is held by Southwark Local History Library, shows three saltpetre refining rooms and a sulphur subliming room forming part of the 'Old Manufactory' with the whitelead activity concentrated in the 'New Factory'. More or less the same arrangement of buildings is indicated on the later plans, which are from 25" OS maps, but the functions of the different rooms are not stated. It appears that in 1843 the works was owned by "Messrs Brandram and Dummolow" as this appears on the surrounding meadows. Shane has not provided any information on whether they supplied sulphur and saltpetre to gunpowder manufacturers. However, it is interesting (but not really relevant) that Rotherhithe was the site of the first known gunpowder mills in Britain which were active for a few years in the mid-16th century. The estimated location of these is NGR TQ3680.

FREDERIKSVAERK

Anders Jespersen has published a long article on the Frederiksvaerk gunpowder mills in Denmark (40 km NW of Copenhagen) in *Den Danske Molle* vol 4, no 4, Oct-Dec 1992. This is the newsletter of The Friends of Danish Mills and is printed in Danish with a full English translation in a smaller type face. The paper on Frederiksvaerk, which some members visited with Anders in 1989 (see Newsletter 6, pp 3-8) occupies 43 A4 pages and contains 89 illustrations, including modern and archive photographs, prints, drawings, plans and documents. There are sections on history, topography, buildings, chemistry, the upper mill group, charcoal kilning, the central mill group and an appendix on the local corn mill.

The gunpowder mills are on a 1.7 km long, early 18th century canal which links Lake Arreso with Roskilde Fjord and hence the Kattegat. It creates a 4 m head of water at the mills which were established by General Classen in 1756. In 1820 there were 18 waterwheels powering equipment in buildings on either side of a long pentrough. The mills closed in 1962 but part of the site was opened as a museum, operated by the army, in 1969. The management of this was transferred to the town council in 1993.

The buildings include an 18th century saltpetre magazine and a charcoal house with its retorts intact, both of which lie outside the museum, the foundations of a pulverising mill which exploded in 1916, a ternary mill where the three raw materials were mixed, a reconstructed turbine house, the central incorporating mill group, with two of its four buildings standing but the other two and the Zuppinger waterwheel missing, a 50 m long pentrough, an 1880s (?) polishing mill with a Poncelet waterwheel, the sifting house and another turbine house.

Following a fire in 1887 a Holger Danske water turbine was installed in the upper mill group. This has not survived but the museum has been able to acquire a similar turbine, which has been restored and reinstated at the original location. Recording and excavations carried out at the site have enabled detailed plans and elevations of the buildings and of equipment to be prepared. All of this work was supervised by Anders Jespersen.

One of the delights of the article is an 'Instruction concerning Care in the Handling of Gun Powder' which is dated 2nd July 1776.

'Anyone who is working in or outside the Powder Magazines, should conduct his work with such humble quietness, demanded at such a place, where (in case the Almighty God in His Grace does not hold His Hand over the activities) the smallest carelessness can cause not only the loss of all lives present, but turn not only this place, but also the surroundings into a heap of rubble. Therefore are all requested to conduct all activities in handling gunpowder with the greatest possible care, meticulously observing all that has been commanded in this respect. Furthermore are all and everybody reminded strongly - whether they are working with the production or with transport of the powder, neither of ill temper in their work, and even far less out of malice to let any swearing or cursing go from their mouth, or far less of folly, to let go from their tongue any swearing or cursing, or any rash or lewd talk whereby the name of the Highest be discredited. Whoever is found to disobey this order will leave his work without any delay, and be placed into custody of the guard until the shift is over, whereupon he will be placed under arrest until he can be duly punished by the Court.'

Copies of the Newsletter can be obtained for 30 Danish kroner from the publishers: Trykt af Moldek, Lillemollevej 14, DK5800, Nyborg, Denmark.

AUCTION OF THE BROCK FIREWORKS ARCHIVE

Joan Waters, of the Science Museum and the BP Meadhurst Club at Sunbury-on-Thames, has sent us a copy of a Catalogue of Decorative Prints, including an important collection on the History of Fireworks, which was sold by auction by Bloomsbury Book Auctions on 2 December 1993. The collection belonged to the Brock family "pyrotechnists who led the world from their modern factories in England, Turkey, America and Australia".

Lots 1 to 36 were books including works by Babington (1635), Bate (1635), Biringuccio (1558), Capobianco (1598), Frezier (1741, 1747), Ruggieri (1802) and White (1677). Lots 37 to 42 comprised papers, photographs, illustrations, recipes and medals, mainly dating from 1865 to 1935. These included publicity material for Brock displays (handbills, posters, programmes), a collection of commercial and promotional ephemera (catalogues, trade circulars, order forms, receipts, labels, price lists, safety notices, advertisements, press releases, display programmes), firework display programmes (coronations, royal weddings, regattas, village fetes, wrestling matches etc), letters and papers associated with over 1,500 Brock displays at Crystal Palace (which included fire pictures 2,000 square yards in area composed of 30 to 40 thousand lights and representing for example the Battle of Trafalgar), other letters and papers (e.g. five manuscript receipts dated 1882 to 1886 from the Chilworth Gunpowder Company "from whom the Brock family had been buying its gunpowder since 1725"), material on military and marine pyrotechnics (rockets, flares, smoke screens, incendiary bullets etc), newspapers containing material on fireworks published between 1758 and 1874, papers on technical sales, recipes, testing, design, explosions (Mortram's 1818, Congreve's Rocket Manufactory 1824, Brock's 1824, Darby's 1861), firework factories (plan of Brock's factory at Sutton, Surrey, "largest in world", 200 acres, 7 miles of tramway, 120 buildings, 60 magazines and drying rooms with capacity for 5 tons of gunpowder and 1,333,000 lbs of fireworks, 350 employees). Lots 49 to 110 were prints of firework displays dating from 1570 to 1814 and Lot 111 was a miscellany of prints.

We felt that some of the material in Lots 37 to 42 was of interest, especially because of the Surrey connections but unfortunately the Science Museum, Surrey Record Office and Sutton Library decided not to bid for the material. However we have discovered that the buyer of these lots was a dealer: Southerans, tel 071 734 1150.

GUNPOWDER MILL IN CALAIS

Arthur Percival

There is a record that in 1556 (I think) Richard Carr, or Carye, man-at-arms held a "Powder Mill, called a Horse mill" close to the Castle, and perhaps in Watergate Street, in Calais.

This comes from a paper on 'Calais and the Pale' read to the Society of Antiquaries on 18 June 1891 by its Secretary, Harold Arthur Dobbie, and published in *Archaeologia*, LIII, pp 289-388. He quotes two main sources for his very detailed account of the use of buildings in the town at the time and I am not sure which this comes from. It is either a Survey of Calais and the Pale undertaken in 1556 which, at least in his day, constituted vols 371 and 371[?] of miscellaneous books formerly in the Augmentations Office; or a Rental of Crown Lands and Revenues [etc] in Calais and the Pale dating from 6 Edw VI (Harleian MS 380).

PROGRESS AT TAMWORTH GUNPOWDER MILLS, NSW, AUSTRALIA

Ron Grosvenor

[Earlier reports on Ron Grosvenor's plans to make black powder have appeared in Newsletter 5, p 2 (Feb 1989) and the January 1991 News Sheet].

Recently I arranged to purchase a small edge runner mill from Australian Defence Industries. In fact this machine rests in storage in Tamworth awaiting fine weather. Our internal roads are too muddy to bear heavy transport so I must wait. The condition of the machine is basically good - a little cosmetic damage but nothing that a week's cleaning and de-rusting etc won't fix. It is exactly the same as the one I have been using; also from ADI. The first was from their Albion Factory and the second from their Mulwala Factory. They were decommissioned in 1945, mothballed and dispersed from Albion - where they had been used for time-ring fuze powder manufacture.

The first machine is now in pristine order and looks resplendent with grey paintwork generally but crushing rolls black painted on the sides and hand-rubbed to a smooth highly finished surface. This works well as powder does not adhere and cleaning is very easy to do. Yes! It does make excellent powder as recent velocity tests confirm. Comparative ballistic tests indicate that a result equal to Chilworth Rifle Powder is achievable - with care. WAHO and GOEX are somewhat behind in ballistic effect, indicating that modern-made black powders are not equal to those made when powder making was an art.

The machines are obviously of an English design and make, as they just shout 'quality'. With shining paintwork and gleaming bronze work the "Grand Duchess" is magnificent to behold. I wonder just where enthusiasm ends and fanaticism begins? I know that I am not eccentric as only wealthy people can afford to be eccentric. I may just have to settle for "mad".

PERNAMBUCO POWDER FACTORY, BRAZIL

Ron Grosvenor

It is interesting that a powder works in Brazil is alive and well and is presently sending powder to the USA to supply the recreational and re-enactment market. The firm is called the Pernambuco Powder Factory, Rua Imperador Pedro II, 511-2 Andar Sto, Antonio, Recife, Caixa, Postal No 63, Brazil. The mills were established in 1866 and the story is that ICI-Nobel took over the Lundgren Group and, in keeping with their world-wide policy of divesting themselves of blackpowder manufacture, got rid of the powder works. The present owners seem to be simply running on the old technological information. I doubt whether they have a BP [Black Powder] background as, indirectly, some guidance has flowed from me to them. Their powder, even though lacking some ballistic effect, burns consistently with a soft residue and does possess these advantages over the USA made GOEX.

Some bleached Brazilian "Elephant" brand powder reached me from the USA. Bleached powder has the potassium nitrate removed and the firm's logo is an elephant. I re-manufactured this powder using their 74:16:10 proportions and using Haifa Industrial Grade potassium nitrate, as they do. The resulting powder although quite viable is unremarkable. Their charring wood is Umbarba, a rainforest species of light density.

By the way the "Elephant" has been well received by American users of black powder firearms.

Editors' Note. When we were at the Hagley Library at Wilmington, Delaware, in October, we referred to a catalogue issued by Krupp Grusonwerk of Magdeburg-Buckau and dated January 1894. This contains a list of customers including four entries for the Perambuco Powder Factory, Brazil, in 1890/91. These are for (a) the entire lay-out of the works, (b) 2 edge-runner mills, (c) a press and (d) a corning machine.

EXPLOSION AT BASSINGILL: 18th OCTOBER 1929

Ted Patterson has given us copies of a letter and a memorandum about the above explosion which he obtained from A P (Jumbo) Cattle who was manager of some of the Cumbrian gunpowder works and later of the Ardeer Black Powder Department. The letter, dated 13th November 1929, is from J Ashby and is on paper headed "Imperial Chemical Industries Limited. From W H Wakefield & Coy., Limited, Gatebeck Gunpowder Mills, Kendal". (Bassingill incorporating mills were of course managed from Gatebeck). It is addressed to "Technical Dept (Nobel Section), Engineering Section, Stevenston" (i.e. Ardeer) and receipt was recorded by R Currie. It concerns an explosion at Mills 2 and 3 at Bassingill on 18th October and a decision to use them in future "only as and when there is an emergency". They would be "regarded as a standby as soon as the repairs to the waterwheel are completed at Sedgwick". Ashby had been allocated £117 from the Insurance Department to repair the mills but the enclosed memorandum, prepared by Mr H G Seabury, proposed major works "to prevent the movement of the mill buildings which is extensive at Bassinghyll". Ashby feared that this would incur considerable expenditure which could hardly be justified. He also states that in any event it had been decided not to run mills 2 and 3 together in future, only 1 and 2 or 1 and 3. This was because 2 and 3 were adjoining and "an ignition on the part of one of the mills has invariably communicated to the other".

Seabury's memorandum states that mills 1, 2 and 3 were timber with roofs of Canadian pattern galvanised iron sheets. The basements, which housed the driving gear, were of stone and the waterwheel separated mills 1 and 2. The mill beds were carried on pitch pine beams and the bearings at the tops of the vertical shafts were also fixed to timber beams. "There is a lack of rigidity with this arrangement and often considerable movement of the entire mill building". Mills 4 and 5 were built on the same lines but had a heavy stone wall on each side of the waterwheel extending above roof level. They had the same problem with the vertical shaft bearings. Mills 6 and 7 were the same. He recommended that steel and concrete floors should be introduced. Also that Capstan-type vertical shafts, similar to those used at Sedgwick and Blackbeck, should be fitted. These had top bearings carried in a casting bolted to the cheese and no bearings were fitted to the building superstructure. He concluded that it might be possible to utilise the shafts and cross-heads from Blackbeck (which had closed in 1928).

We visited Bassingill mills on the Group's field trip to Cumbria in April 1991 (see Newsletter 9, July 1991, pp 2-5). Mills 1, 2 and 3 appear to have been the most northerly group, i.e. those closest to Force Bridge. Judging by their state, Seabury's proposals do not appear to have been adopted and the mills may not have been refurbished at all.

"GUNPOWDER RAILWAYS OF SOUTHERN LAKELAND"

This is the title of an article published by H I Quayle in *Railway World* in November 1974, pp 476-77. It concerns the tramways at the Lowwood and Blackbeck gunpowder mills and their connections to the Furness Railway. It includes a map of the Lowwood site and measured drawings of a Lowwood open wagon and a Lowwood van. We already knew of an article by Quayle in *The Iron Horse* (Journal of the Lakeside Railway Society), Summer 1971, and the book *The Lakeside and Haverthwaite Railway* by Quayle and S C Jenkins published by Dalesman in 1977 but the *Railway World* account provides some additional information. We are grateful to Henry Gunston of the Association for Industrial Archaeology for bringing it to our attention. One of the Lowwood vans, rescued by the Lakeside Railway Society in 1986 has now been restored and is on display at Haverthwaite Station.

GUNPOWDER MILL AT ULVIK, NORWAY

We have discovered a scribbled note (Glenys's handwriting) as follows: 'Ulvik, Norway, off Hardanger Fjord, near Ossa. Remains of gunpowder mill, associated with fruit farm, used for civil engineering.' Apologies for having forgotten who told us about this but any member going to Norway might like to search for it.

GUNPOWDER MILL AT REGENSBURG

David H Jones of the Wind and Watermill Section of SPAB has provided us with a copy of a large plan and elevations of a powder mill at Regensburg on the Danube in Germany. He discovered this at the Regensburg city archives and says that it almost certainly dates from the late 17th century. It was the only powder mill in the city, its site is known and it was one of a number of adjoining mills for a variety of trades. The measurements on the drawing are given in Bavarian feet. The waterwheel is 15 ft in diameter and 12 ft wide and David has noted that it could be raised or lowered, using a counterbalanced lever system, as the level of the water in the river changed. The only equipment in the mill is a set of 19 stamps, each 10 ft tall. Sixteen of these work in sequence, in sets of four, in four elongated mortars and the three remaining ones work individually in three circular mortars. All seven mortars are in one beam 18 ft long.

The drawings reminded us of some photocopied pages of *Theatrum Machinarum Molarium*, published in Leipzig in 1735, which Ken Major sent us a few years ago. Chapter XIV is entitled "Von Stampff Muhlen" and, within this, paragraphs 28 to 44 (pages 87 to 90) deal with powder mills. The text is in German Gothic script and we have not read much of it but there are two pages of related drawings. One of these shows a water powered mill with a beam with eight circular mortars each having two stamps. In addition there is what appears to be a corning machine. We would be delighted to let anyone prepared to translate the text have a copy!

POWDER BARRELS FROM HMS INVINCIBLE

John M Bingeman, who is the Government licensee for the *Invincible* Historic Wreck site in the Solent, which he has excavated since 1980, has written to us about markings on powder barrels. The *Invincible* was built by the French in 1744, captured by the British in 1747 and lost on 19 February 1758. The excavations have included the forward magazine and nearly 50 complete oak powder barrels have been raised. These are 0.503m high and the diameter of the top and bottom is 0.350m. There are five hazel and two copper bands at each end. The copper bands have reacted with the gunpowder to form a hard purple oxide which is very brittle. There are four different markings on the barrel ends:

G		R		G		I	C
I	C	R	P	P	C	P	O

Also there is a 20 mm branded broad arrow on the opposite end to these letters and this is repeated occasionally on the staves. John Bingeman would very much like to know what the letters signify. Can anyone help?

John Bingeman has written a fascinating well-illustrated article on the excavations entitled "Interim report on artefacts recovered from *Invincible* (1758) between 1979 and 1984" which was published in *The International Journal of Nautical Archaeology and Underwater Exploration*, 14.3 (1985) pp 191-210. Other items described are sandglasses, leather buckets, wooden bucket, magazine tools (two sets of a bronze adze and a cooper's brass setter), spirit barrel, miniature barrels (writing kit?), messdeck utensils, shovels, cannon accoutrements (including powder boxes, also known as 'saltboxes' (saltpetre), for carrying powder from the magazines to the guns), small arms, hand grenades, buttons, blocks, fids (for splicing large anchor hawsers), parrels and trucks, bullseyes, deadeyes and coils of rope.

BRITISH BLACK POWDER PRODUCTION BETWEEN 1934 AND 1937

Dr E M Patterson has sent us a copy of monthly production tonnages he has abstracted for the surviving six British mills between March 1934 and December 1937. During this period Roslin worked continuously, Faversham stopped production in June 1934, Lowwood and Sedgwick in May 1935 and Gatebeck in September 1936. The first figures for Ardeer are for April 1935. In spite of all these changes the monthly totals are remarkably uniform, lying between 399 and 731 tons. It is also striking how small the original five mills were compared with Ardeer. This is shown by the following table which gives the total, average monthly and maximum monthly tonnages for each of the six mills.

Mill	Total	Average	Maximum
Ardeer	14,382	436	601
Faversham	692	173	194
Gatebeck	3,582	119	214
Lowwood	1,978	77	103
Roslin	3,961	88	154
Sedgwick	1,257	90	102

GUNPOWDER AT THE AIA ANNUAL CONFERENCE IN CUMBRIA**Alan Crocker**

The 1993 Annual Conference of the Association for Industrial Archaeology was held at Ambleside, Cumbria at the beginning of September. I gave an introductory talk on the gunpowder industry and Glenys and I conducted two tours to the Lowwood, Sedgwick and Gatebeck gunpowder mill sites. We were very pleased that Ted Patterson, who is a great authority on the history and technology of the gunpowder industry was able to be present, together with Keith Falconer, Head of Industrial Archaeology at the Royal Commission on the Historical Monuments of England, Wayne Cocroft, also of RCHME, who carried out the survey at Waltham Abbey and Shane Gould who had just finished his national survey for English Heritage. Also John Crompton, President of the AIA, gave us two attractive but rather modern and very empty canisters of ICI gunpowder.

WILLESDEN PAPER**Glenys Crocker**

An appeal for information on the use of paper as a roofing material, by Dr Malcolm Airs, was printed in the Association for Industrial Archaeology Bulletin no 86, 1993. I responded on the subject of Willesden paper in gunpowder mills, citing the Explosives Inspector's report of an accident at the Roslin Gunpowder Factory, Midlothian on 2 January 1890 (Report no 91, *Parliamentary Papers* 1890). Also Gerry Moss provided a reference to the report of an accident at Chilworth on 30 April 1887, in the Inspector's Report for 1887. In this case three mills exploded and "the Willesden paper with which mill 23 is covered caught fire, but was soon extinguished."

Dr Airs has established that a technique of using paper for roofing was used in the period from about 1780 to about 1830 in Oxfordshire, where it was advocated by the agricultural reformer J C Loudon, and in other locations including Scotland, Kent and several other English counties. He notes that Willesden paper was the most successful of several later paper products which were chemically treated, and was used for example in 1884 on a temporary hospital for infectious diseases in Liverpool. Also it was still being specified in the 2nd edition of Jaggard & Drury, 1942.

If any member has further information on paper roofs in gunpowder mills, would they please contact Dr Airs at the Department of Continuing Education, 1 Wellington Square, Oxford OX1 2JA.

GUNPOWDER REFERENCES IN HOGG'S *THE ROYAL ARSENAL*

John Day of The Ordnance Society has noted that there are many references to gunpowder in: O F G Hogg, *The Royal Arsenal* (2 vols), O.U.P., 1963. These include: (1) Robert Mildenhall's privy wardrobe account, March 1346: 'powder for engines' produced in the Tower of London. 10 May 1346 - supplied Rolleston with 912 lb saltpetre and 886 lb quick sulphur; more issued 3 days later. (2) Storehouse and refining of saltpetre in 1662 and many further references to saltpetre storage. (3) Saltpetre manufactory 49ft x 17 ft in 1841. (4) Saltpetre used for pyrotechnics in Royal Laboratory; construction of slow-matches, rockets etc. (5) John Evelyn sees demonstration of mortar in 1687. (6) Gunpowder filling for all explosive shells until January 1896.

ULVERSTON HERITAGE CENTRE

At the suggestion of Alice Palmer, we recently visited the Ulverston Heritage Centre in South Cumbria. This has a small but very good display on the local gunpowder industry, particularly Lowwood and Blackbeck, to which Alice has contributed. Also the Centre holds an archive of documents on Lowwood, covering the period 1850 to 1919, which was rescued from the site and kept previously by the Ulverston Civic Trust. The display has been created by Dan Birtwistle who has also prepared a brief index to the archive. We only had an hour or so to examine this material; it would take several months to do it justice. It includes a collection of ten trade cards of Daye Barker & Co of Lowwood, John Hall & Son of Faversham, the Kames Gunpowder Co of Argyll, Burtons of Tunbridge and Pigou & Wilks of Dartford. They give detailed information about the types of gunpowder being produced by each firm and will be the subject of an article in a future Newsletter. The fronts of two of these cards are shown here (x 0.65).

DAYE BARKER & Co.,

LOWWOOD GUNPOWDER MILLS,

Newton-in-Cartmel.

LONDON OFFICE.

63, FENCHURCH ST., (E.C.)

FILBY & CO., AGENTS.

FAVERSHAM MILLS.

JOHN HALL & SON.

Gunpowder Manufacturers,

OFFICE, 23, LOMBARD STREET,

LONDON. E.C.

CLONDALKIN POWDER MILLS, DUBLIN

Tony Colley of Dublin has written to us about some property known as Kilmatead, at Clondalkin, just outside Dublin, which is owned by his family. This formed part of the gunpowder mills on the River Camac which were founded by Nicholas Greuber in 1717 and there are several ruined mill buildings on the property. Inspired by the work done at Ballincollig he plans to restore at least one of the mills. We have provided him with information and put him in touch with some of our Irish members.

WIND AND WATERMILLS IN CRETE

Alan Gifford of the Midlands Wind and Watermills Group is organising an 8-day mills holiday in Crete, starting on 18 October 1994. It is limited to 20 people and the cost will be £850 plus insurance and £50 single supplement. Probably no gunpowder mills but it sounds excellent. Those interested should contact Alan on 0283 702299.

Published by the Gunpowder Mills Study Group

Edited by Alan and Glenys Crocker

6 Burwood Close, Guildford, Surrey GU1 2SB. Tel. 0483 65821

THE GUNPOWDER MILLS STUDY GROUP

SATURDAY, 30th APRIL 1994 AT BISLEY

PROGRAMME FOR THE DAY

MORNING (From 9.30 am)

A demonstration with "hands on" experience of the use of gunpowder in a variety of original firearms on the **Short Siberia Range**. See sketch map for location.

LUNCH BREAK (1.00 pm - 2.00 pm)

A Buffet lunch will be provided at the historic Clubhouse of the Surrey Rifle Association in Bisley Camp.

AFTERNOON (From 2.00 pm)

After lunch there will be a display at the Surrey Clubhouse of the containers, packaging and means of carrying powder for immediate use provided by Dr. De Witt Bailey and William Curtis who will talk on this subject. Participants are urged to bring along any of their own materials in this line to add to the display. Any early firearms that can also be brought along will be of interest and the owners may well be able to learn more about them.

A mid-afternoon break for tea, air and a tour of the Bisley Range complex will be suggested.

The remainder of the afternoon will be available for other talks and discussions within the Group.

ARRANGEMENTS, ENQUIRIES AND BOOKINGS

Would all members who are interested in attending this day's functions, please let Bill Curtis know by 20th April so that the essential arrangements can be made.

Any further enquiries may be directed by telephone to him on 0745 584 981 or in writing to P.O.Box 493, Rhyl, Clwyd. LL18 5XG.

ESTIMATED COSTS FOR THE DAY

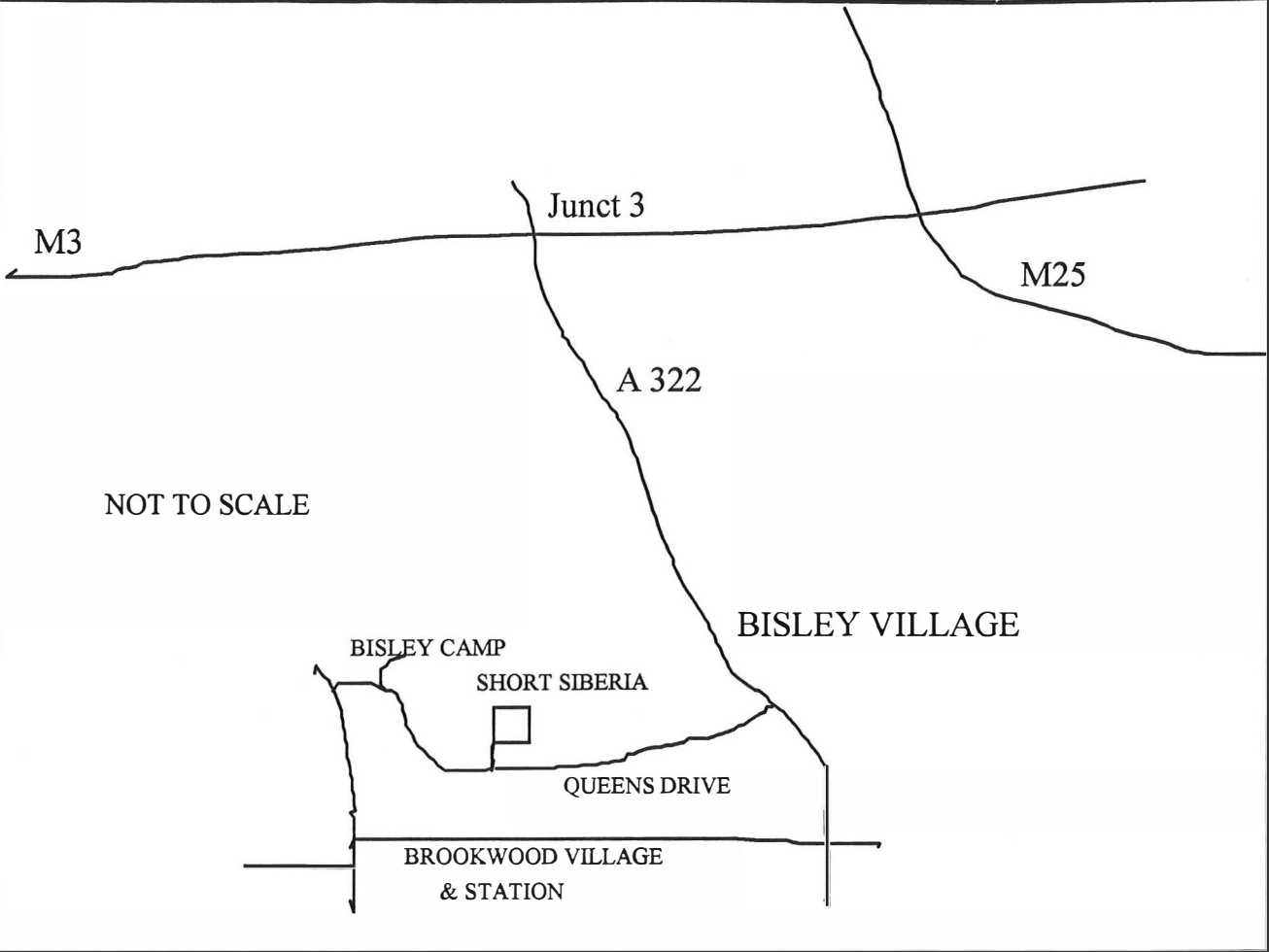
The charge for the use of the Range and the hire of a Target Marker is fixed and will be spread amongst those attending. The numbers present will, therefore, govern the cost per member but this is unlikely to exceed £2 per head. The buffet lunch should be about £3 plus a small charge for afternoon tea.

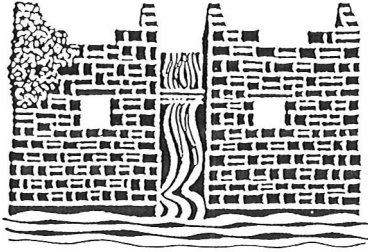
The National Rifle Association also operate a camp site for tents and caravans as well as having a number of cabins. If any member is interested in these facilities, please let Bill Curtis know when writing to confirm your attendance.

A letter or call letting us know if you are coming should be sent by 20th April to:-

W.S.Curtis, P.O.Box 493, Rhyl, Clwyd. LL18 5XG (Phone 0745 584 981)

ROAD MAP OF THE AREA RELATIVE TO BISLEY CAMP AND RANGES





Gunpowder Mills Study Group

NEWS-SHEET JULY 1994

POSTPONEMENT OF AUTUMN MEETING 1994

At the meeting in London in September 1993, the date of Saturday 24 September was chosen for the corresponding meeting this year. Unfortunately it has been necessary to postpone this meeting to a Saturday later in the autumn, probably at the Institute of Historical Research, University of London, as originally planned.

Details will be announced in a newsletter to be sent out towards the end of August, which will also include reports of important meetings to be held over the next few weeks. These are the ICOHTEC meeting in Bath on 30 July - 4 August and a seminar on "The history and future of the Royal Gunpowder Mills site at Waltham Abbey" which is being organised by English Heritage on 6 August, in conjunction with an exhibition and presentation by the Royal Commission on the Historic Monuments of England (RCHME). It is planned to have a talk on the Commission's work at Waltham Abbey, including recent discoveries, in the programme of our own autumn meeting.

The Commission's report on the site, *The Royal Gunpowder Factory, Waltham Abbey, Essex: an RCHME Survey, 1993* (1994) is available, price £12 including post & packing, from: RCHME Publications Section, Kemble Drive, Swindon, Wilts. It will be reviewed in the forthcoming newsletter.

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