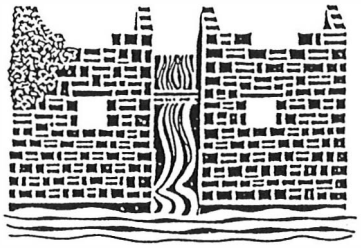


Gunpowder Mills Study Group

NEWSLETTER 23, AUGUST 1998

GMSG MEETING AT THE INSTITUTE OF HISTORICAL RESEARCH
SENATE HOUSE, UNIVERSITY OF LONDON
SATURDAY 31 OCTOBER 1998

PROVISIONAL PROGRAMME

10.00-10.30	Assemble and Coffee in the Common Room on the Ground Floor
10.30-10.35	Chairman's Introductory Remarks
10.35-11.05	**Glenys Crocker**, "Chilworth in the 17th Century: Interpreting the Landscape"
11.05-11.35	**Keith Fairclough**, "Chilworth: the Early Business Ventures"
11.35-12.35	**Peter Edwards**, "Local production of Gunpowder in the Civil War"
12.35-13.30	Lunch. It is recommended that members bring a packed lunch which may be eaten in the Common Room where hot drinks can be purchased.
13.30-14.00	**Alan Crocker**, "Capacity of English Gunpowder Mills in the Late 17th Century"
14.00-14.30	**Bill Curtis**, "Innovations at the Confederate Powder Mills at Augusta, Georgia"
14.30-15.30	Reports on "Gunpowder History at the 25th ICOHTEC Symposium" and on "Progress of the Waltham Abbey Project"
15.30-16.00	Members' Contributions and Discussion of Group Activities
16.00	Prepare to vacate room

We shall be meeting in **The Low Countries Room** on the third floor of Senate House. This is not the room we have used on previous occasions. Goodge Street, Warren Street and Russell Square underground stations are nearby. Parking may be available in the University of London car park - entrance at NW corner of Russell Square. To cover administrative costs a fee of £2 will be collected.

Please let Alan or Glenys Crocker know if you are coming and if you would like to make a member's contribution: 6 Burwood Close, Guildford, Surrey GU1 2SB; tel 01483 565821, fax 01483 259501; e-mail a.crocker@surrey.ac.uk

This Newsletter is being sent to a number of people who have not renewed their subscriptions. If this applies to you, please send a cheque for £5 (individual) or £6 (joint), made payable to the Gunpowder Mills Study Group, to Glenys Crocker at the above address.

GMSG MEETING AT BISLEY 6 JUNE 1998

About twenty members and friends of the Group attended the Spring Meeting at Bisley. We spent the morning at the Short Siberia Range where Bill Curtis and Alan Bell, a fellow member of the National Rifle Association, demonstrated the loading and firing of six early firearms. Bill has described these as follows:

1. British 'India Pattern' Flintlock Musket (Brown Bess) first type circa 1800. Calibre - nominal .750 - actual in this one .780 (probably a Sea Service barrel pressed into land service use for the emergency). Charge six drams.
2. British Long Sea Service Flintlock Pistol c.1795, Ordnance converted c.1817 to Short Sea Service by reduction in barrel length from 12 to 9 inches. Calibre - nominal .56 - actual .575. Charge two drams.
3. French 'Carabine de Versailles' Modelle 1793 Flintlock Rifle - calibre .53. Charge two and a half drams.
4. British Pattern 1861 Short Enfield .577 percussion rifle made for the War Office by W & J King in 1864. Charge nominal 70 grains - this time 55 grains.
5. Whitworth hexagonally bored percussion military target rifle by the Manchester Ordnance and Rifle Co. Calibre .451 made in 1862. Charge 75 grains.
6. British Pattern 1853 Enfield (Fourth Model) dated 1864 and converted c.1867 to breech loading on the Snider Breech system. Charge nominal 70 grains - this time 55 grains.

We are deeply indebted to the Museum of the National Rifle Association for this display and to Bill and Alan for preparing the firearms and cartridges, demonstrating them and answering our many questions.

We had a substantial buffet lunch in one of the historic club houses at Bisley and then visited the new NRA Museum which has excellent displays on the history of the Association at Wimbledon and Bisley and of course many firearms and related equipment. We then returned to the club house for tea and members' talks and discussion. In particular Alan Crocker presented a paper prepared by Will Adye-White on "Gunpowder Packaging, Distribution and Storage" and this is printed on pages 4-7 of this Newsletter. He also showed slides of labels in the Hagley Museum archives in Delaware and from Alice Palmer's collection, now deposited at the Ulverston Museum in Cumbria. He then distributed photocopies of illustrations of early copper powder magazines, manufactured by James Walker, again sent by Will Adye-White. These are the subject of another article on pages 26-27 of this Newsletter. Finally Bill Curtis gave a brief account of a visit he had made to Sebastopol to study sites and artefacts of Crimea War battles. Many thanks to Bill Curtis for making all the arrangements for the meeting.

Alan Crocker

New Members

Peter R Adams, 52 Kings Avenue, Woodford Green, Essex IG8 0JF ☎ 0181 504 6590

P Cartwright, The Stud Store, Keir by Dunblane, Scotland FK15 9NU ☎ 01786 824100

David Harding, 30 Rosebery Road, Muswell Hill, London N10 2LH, ☎ 0181-444 9323, fax: 0181-883 5286, e-mail: david.harding@virgin.net (historian, author and publisher, interested in the history of his Regiment and of the East India Company).

Beryl Williams, Sira, Main Street, Whilton, Daventry NN11 5NN (interested in Weedon Royal Ordnance Depot).

Changes of address

Robert A Howard, Box 317 Montchamim, De 19710, USA ☎302-654-2151; fax 302 654 4848

Paul Merricks, 206 Bickenhall Mansions, Bickenhall St, London W1H 3DD ☎ 0171 935 9221

OBITUARY: MICHAEL WILKS

Members will be saddened to hear of the death on 11 May of our member Michael Wilks who became interested in the history of gunpowder manufacture because he lived at Carshalton in Surrey near the site of a gunpowder mill established in 1653. He did not think he was related to the Wilks family who were partners at the Dartford gunpowder mills in Kent. Michael was a distinguished professor of medieval history at Birkbeck College, University of London, and he and his wife Stella hosted the first meeting of GMSG at Birkbeck in March 1985. Indeed we met there on three further occasions before he retired in 1992. Michael and Stella also came on the Group's visit to Denmark in 1989 and attended several other meetings before Michael suffered kidney failure a few years ago. He contributed a detailed paper on "Josias Dewye and the Carshalton Gunpowder Mills" to GMSG Newsletter **8**, pp 9-14, Nov 1990. Also, in recent years he has collaborated with Alan and Glenys Crocker and Keith Fairclough in transcribing, annotating and discussing documents relating to the gunpowder industry in Surrey (Carshalton, Wandsworth, East Molesey and Chilworth) and Kent (Faversham). The resulting volume is to be published by the Surrrey Record Society in 1999.

Michael was in fact an authority on all the mills along the River Wandle, which is well known for having powered, between Croydon and Wandsworth, a wide range of manufacturing industries including paper, iron, oil, leather and textiles as well as gunpowder. He was Chairman of the Carshalton Society, Treasurer of the Surrey Local History Council and a valued member of the Surrey Industrial History Group. These leisure interests were all very different from his University research and teaching, which was based on the philosophy of religious and political theorists in the later medieval period, but he treated them all in a rigorous academic manner. He was a friendly, large man with minute handwriting and a quiet voice but what he wrote and said were always carefully considered and worthwhile.

Glenys and I attended his memorial service at Carshalton church and took the opportunity of visiting a local carpenter's workshop housed in a timber-framed listed building, which was threatened with redevelopment. We felt sure that Michael would have approved of our interest and the report I made to The Society for the Protection of Ancient Buildings. Michael will be greatly missed and we offer Stella our condolences.

Alan Crocker

A further service in memory of Michael Wilks will be held on Tuesday 13 October at 2.30 pm in the Church of Christ the King, Gordon Square, London WC1. Anyone who knew Michael is invited to attend but, if you intend to be present, it would be helpful if you inform Barry Coward, Department of History, Birkbeck College, Malet Street, London WC1E 7HX.

THOMAS TULLOCH: EXPLOSIVES EXPERT

John Glanfield of Guildford has produced an 8 page A4 report on the career of Thomas Tulloch who was born in 1868, was an officer in the Royal Artillery from 1888 to 1895, was at Woolwich Arsenal from then until 1903 and was associated with the Chilworth Gunpowder Company from 1904 until it closed in 1920, becoming its last Managing Director. In World War I he acted as an explosives expert for the Navy and Army and encouraged the British to adopt TNT (he was nicknamed "Tri-nitro Tom") and chaintrack machines (tanks). If any member would like to see the report with a view to providing further information please contact John (01483 203933) or Alan Crocker (01483 565821).

GUNPOWDER PACKAGING, DISTRIBUTION AND STORAGE

Will Adye-White

The packaging for distribution of gunpowder is one of the great unresearched areas of the gunpowder industry. The following observations and thoughts are from the perspective of a collector.

The history of gunpowder manufacture is a fascinating study in itself but once the powder was made, storage and shipping, as well as intermediary distribution providess another set of problems. Most if not all of the powder mills attempted to ship their wares as soon as manufacturing was completed. The reason for this was two-fold. Economics dictated that in order to produce more powder, more ingredients were required. In order to pay for more ingredients and provide the proprietor a return on his or her investment, cash-flow was required. Also, fresh powder was deemed by end-users to be of superior quality than stored powder. Hence the desire for quick turnover of inventory.

For manufacturers of military powder, shipping and storage was not much of a problem. Most military contracts of the 18th century called for powder to be shipped in 200 lb wooden kegs. It is probable that they received powder in other sized contains as well (50, 100, 200, 400 lb?). Sporting powders presented a significantly different problem. In England, only the wealthier had firearms, and could afford powder in any quantity. This meant that powder had to be broken down into much smaller, economical units. For the gun dealer or shop owner, wooden kegs of 25lbs, ½ kegs of 12.5 lbs, and 1/4 kegs of 6.25 lbs were ideal. The shop owner did not have to stock more than the anticipated demand. Thus his inventory was reasonably fresh if he only had small stocks on hand that turned over reasonably quickly. This was fine during the shooting season, but woe be to he who overstocked!

For the sportsman, handling of smaller amounts of powder was ideal. However, he had to make sure that the powder that he had on hand was kept dry. Powder that had been wet and subsequently dried lost considerably in potency. Five pound, one pound, 1/2 lb, and 1/4 lb containers were ideal for this market place. Unfortunately, economics did not always allow the optimum solutions for all. Most English, Scottish and Irish gunpowder mills sold their product in paper containers. Generally, this was for the lower grades of shooting powders. This greatly decreased the cost to the producer since a powder tin was far more expensive. However, tins were used for the better grades of powder.

What exactly is a powder tin? Prior to the 1850s most powder tins were just that, tin, or tin-coated iron sheeting, most often produced by a tinker or tinsmith who either worked directly for the powder mill or supplied the mills on contract. That changed significantly in the 1850s when tins were produced using metal working machinery, and in some cases, metal stamping equipment. No longer did the tinsmith have to cut out the individual pieces of the tin and hand solder them together. The hand soldering still went on, but now the pieces could be stamped out fully formed. This led to uniformity of output in both size and shape and this in turn produced economy of scale. Producers were now able to produce tins almost as cheaply as paper. They could now supply powder in 'water resistant tins' instead of water attracting paper. One problem was solved.

This was well and fine for producers in Great Britain. However, in North America, the situation was slightly different. Many of the early powder mills sold their powders in kegs only. These would then be sold to agents who in turn either resold the kegs to retailers or shooters or broke down the kegs into smaller tins and paper containers. Due to the great distances involved getting the product to market, setting up a distribution network similar to that available to English makers was not possible. In both Canada and the USA, roads were either poor or non-existent. This meant water travel or very slow horse or horse-and-cart and wagon travel. Later railways and improved road networks helped this situation.

However, smaller kegs and tins were the order of the day. Paper was not well suited to the local climates or travel conditions. Both Dupont and Acadia Powder Company, of Nova Scotia, are known to have produced paper containers, although very few have survived to date from either producer. In England, only those with money could afford to shoot. In North American, you shot to eat. This meant everyone shot and thus everyone needed powder.

The relative wealth of various areas and the incidence of tin size can be easily studied. Although the following is anecdotal, it is still of interest. The east coast provinces of what is now Canada, consisting of Prince Edward Island, Newfoundland, Nova Scotia and New Brunswick, were (and still are) comparatively poor provinces. The economic base was (and is) subsidence agriculture and fishing, with only small amounts of industry. Cash was never plentiful. Local inhabitants bought small amounts of powder from local merchants who generally took their tins and refilled them. This explains why 1/4 lb and 1/2 lb tins (in poor condition) are by far the order of the day in that part of the country. It was only the merchants or the wealthy who could afford 1 lb tins or kegs. It should be noted that much of the sporting powder produced by Acadia Powder Company of Nova Scotia was in 1 lb paper containers (very rare), 1/2 lb tins and 1/4 lb tins.

Figure 1. Tin for 16 ounces of FFF gunpowder used by John Hall & Son of Faversham.

In Quebec there was more money but not a lot more than in the eastern provinces. Here we find 1/2 lb tins and some 1 lb tins, as well as the occasional keg. In Ontario, the situation changes again. Kegs, 1/2 kegs, 1/4 kegs, 5 lb tins, and 1 lb tins are far more common. However, the Hamilton Powder Company did produce significant numbers of 'canister powder' tins of 1/2 lb size for the local market. This however was early in their existence (1852-1870s). When we move to the prairie provinces, kegs and 1 lb tins are encountered. This was due to the fact that retailers were far and few between, and if you didn't buy enough powder to get you through the winter, you in all probability died. British Columbia did not have much of a history of powder manufacture until the late 1880s and early 1890s when the railway was being built out there. Much of the powder was imported from eastern Canada and the eastern American states, as well as large quantities of Curtis's & Harvey and John Hall & Son (see figure 1).

Distribution analysis across the U.S. is similar to Canada. However, they were much more regionalised in the early years. In the eastern states, many of the mills that sold sporting powder, sold it by the keg only, it being repackaged by agents or resellers. Many early stencilled tins are marked with resellers names from Boston, New Hampshire, New York State, etc. As was the case in England, many of the smaller mills manufactured only to fill the needs of local mines and quarries. This was the case with many of the Pennsylvania mills, particularly the ones in the anthracite coal district. It is no wonder that few if any kegs exist from these mills, and virtually no sporting powder tins exist for many of them.

With the advent of the more modern production methods, steel drums started to replace wooden kegs. The first American patent for steel gunpowder drums was taken out on July 12,

1859. However, kegs continued to be offered (at least in Canada) up until about 1910. Several companies started to use metal drums exclusively. Kings Powder Company of Cincinnati, Ohio is one example. Hazard Powder Company made extensive use of metal drums, but they still sold significant amounts of powder in kegs, as is evidenced by the number (although still scarce) of their wooden kegs still found by collectors. Austin Powder Company, of Ohio, switched at an early date to metal drums.

During his trip to Europe in 1856, Lammot Dupont. noted that American kegs tended to be better constructed and sturdier than English ones. A visual examination attests to this. All of the English kegs examined by the writer to date have been of inferior construction and finish. Although American kegs were of good quality, Canadian kegs produced by the Hamilton Powder Company appear to be slightly superior still. Up until 1876 when the company moved from Hamilton in Ontario to Montreal in Quebec, all kegs were similarly constructed to their American counterparts. After the move to Montreal, Hamilton's kegs were machine made. The staves as well as the bands were machine turned, and when put together, produced a slightly tighter keg. This was important since much of the powder of the time was shipped to Western Canada to assist in the building of the railway. Breakage was an expensive proposition.

Figure 2 (above). Neck of a John Hall & Son flask displaying the patent registration of 1851.

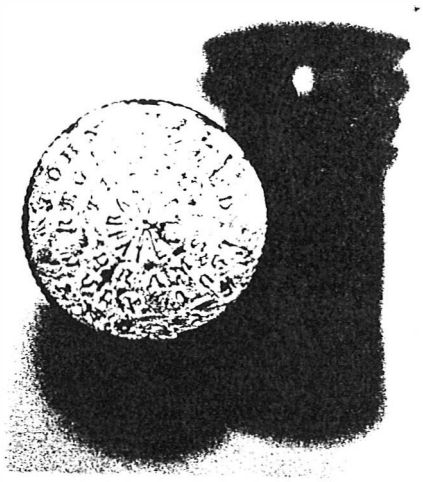


Figure 3 (right). John Hall & Son safety stopper and measure, patented in 1851.

There are numerous patents that apply to tins. One of the earlier ones, no. 2864 dated 27 June 1851 (see figure 2), was by John Hall & Son. This was immediately followed up by patent 2886, 15 July 1851, for a 'Safety stopper & measure for powder canisters & flasks' (see figure 3). Also on 16 November 1866, J S Pigou of Dartford (presumably of Pigou & Wilks) patented a powder canister. Also of interest is the fact that Lt Col P Hawker claimed to have advised Mr Butts of Hounslow (predecessor to Curtis's & Harvey) to seal his tins with corks to keep the moisture out. This must have been prior to 1820. Hawker goes on to lament the fact that C&H now dealt with the trade only. In his book *Instructions to Young Sportsmen in all that relates to Guns And Shooting*, Hawker goes on to explain how he developed his Sea Shooting powder for Punt Guns with Curtis's & Harvey.

Dampness, as noted earlier was of great concern early in the 19th century, and undoubtedly prior to that period also. James Walker of Wapping patented a copper barrel for gunpowder storage in 1810 under patent 3373 (1810). Several different powder storage containers are known to have been made by or for him. Whether or not these were for the trade or sportsmen is not known. However his initial patent was usurped by Sir William Congreve, controller of the Royal Laboratory for use on board ships. Walker sued the government successfully in 1816 for that one. Over the years various makers, gunsmiths etc. produce similar types of tins or storage drums. Recently found (see Figure 4) was a copper gunpowder container with the nameplate 'Newton Bros./ Makers/Hull'. These were gunmakers in the Hull

Figure 4 (above). Copper gunpowder container with the name plate "Newton Brothers/Makers/Hull".

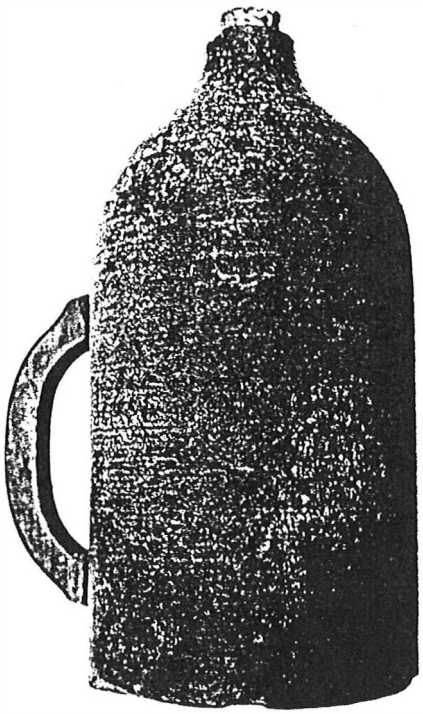


Figure 5 (right). A Curtis's & Harvey cork powder flask.

area from 1826 to 1833. This would date this tin/drum from that period. The container was originally red in colour, and had been subsequently painted black. Inside were small traces of paper, possibly bags for gunpowder.

Figure 5 is a photograph of a Curtis's & Harvey 'Safety First Powder Flask'. These were used for transporting and loading shots within fiery coal mines. This particular container was found with a number of others of the same make in an old coal mine in Pennsylvania, U.S.A.. This container is made of cork with a wooden handle, and fibre base. The base is pegged to the cork body by wooden pegs. The base has the following impressed inscription: "Safety First/C&H/Powder Flask.". The mine that these flasks are from, was in operation during the period 1870s to 1910.

The tins and labels on the tins, kegs and drums are a small reminder of the rich heritage that is slowly disappearing from the landscape (literally!). Collection and preservation, along with research is one small way in which this heritage can be preserved.

SHOT TOWERS

Alan Crocker

At the Bisley meeting on 6 June there was discussion about the production of lead shot in small moulds and by drop-forming in shot towers. As a result **Fred Lee** has sent us a 4-page A4 article on "Shot from Baltimore" by Ron Pilling. Baltimore had three shot towers of which only Merchant's survives. It is 234 ft high, was built in 1828 and closed in 1892. It had a platform near the top where lead bars were melted and the liquid poured through a colander-like pan and hence fell in spherical droplets which hardened and were caught in a pan of water at the bottom. Smaller shot hardened more quickly and could be dropped from half-way up the tower. When cool, the shot was polished in rotating barrels (glazing!), tested by rolling down an inclined trough, so that imperfect spheres which wobbled could be rejected, and finally graded for size using sieves. Let me know if you would like a copy of the paper.

TORSEBRO GUNPOWDER FACTORY, SWEDEN

*This short guide and history has been provided by **Arthur Percival**. At his request, it was translated from a Swedish brochure by a friend of his, **Roger Tanner**, and we are indebted to them both for allowing us to reproduce it here - in a slightly abbreviated form.*

Nothing Else Like it in Skåne

Surviving are powder magazines, shelters, rolling mills, the manor house and a number of workers' cottages - an antiquated industrial environment, unique of its kind in Skåne. In olden times the factory had its own garrison, and about eighty buildings were still extant in 1910. Gunpowder production continued until as recently as 1923.

A good deal has been pulled down since then, including the powder mills themselves, which stood between the shelter alongside the mill race in the Helgeån River. Of the surviving buildings, the manor house and the living quarters are in a good state of preservation, while storehouses and other out-buildings are in some cases considerably decayed. The park was almost completely overgrown and several of the old buildings were on the point of keeling over when, at the end of the 1960s, the National Labour Market Board mounted a relief work project to help the County Antiquarian save what was left of Charles XI's gunpowder factory.

Traverses, powder magazines and rolling mills were restored in 1970 and 1971 with funding from the National Labour Market Board. In addition the park was cleared of undergrowth.

Welcome to Torsebro and the Gunpowder Factory

"Skåne (Scania) had recently become Swedish - following the Treaty of Roskilde in 1658 - but these were troubled times. Several cartloads of gunpowder from the neighbouring province of Småland had been hijacked in the thickly wooded frontier districts, and so in the 1680s it was decided to set up a powder factory in Skåne itself. The choice of Torsebro as a location was presumably due to the possibility of establishing powder mills here and to the proximity to the then fortress of Kristianstad."

This then was the genesis of Charles XI's gunpowder factory at Torsebro - one of the attractions of the Municipality of Kristianstad and well worth noticing, but frequently overlooked by tourists and locals alike.

For more than 200 years, Torsebro powder factory remained an important part of Sweden's national defence, but at the same time a deadly dangerous and accident-prone workplace. Today Torsebro is a well-preserved, idyllic industrial heritage site of a kind otherwise hardly to be found in Skåne. In addition to the manor house and its two wings, a large number of the older buildings are extant, among them a powder magazine dating from 1692.

"Gunpowder Park" and the old manufacturing site are open to the general public. It is a beautiful large park, slightly overgrown nowadays, with ancient, gnarled oaks. While walking through the grounds, with your imagination turned on, you will be able to picture the days when the powder mills of Torsebro were a going concern.

The Factory and its Owners

The first powder mill is said to have been built during the minority of Charles XI, in 1663, at the waterfall formed by the Helgeå River at Torsebro. Tradition has it that the mill was established by "the manager, honest and sensible Arent van der Hagen," as he is called in the contract with the War Office. But the tradition is not to be relied on completely, because the contract does not mention the site.

Either way, it is quite definite that, following the war which had lasted from 1675 to 1679, Charles XI set about establishing a Crown gunpowder factory at Torsebro. Production began

in earnest after the Skåne (Scanian) war ended in 1679.

The first manager of the factory was the Superintendent of the saltpetre mills of Skåne, Johan Anckar - later ennobled as Anckarstråle - and the first inspector was Captain Christian Rossow of the Jönköping Field Artillery. Following the death of Captain Rossow in 1686, he was succeeded as Superintendent of the factory by Captain Hans Lilliegranat.

Starting in 1716, Torsebro was vested by the Crown in various members of the Danckwardt and Staël von Holstein families, but in 1784 Baroness Eleonora Staël von Holstein was guaranteed permanent and complete possession of the factory for herself and her descendants. That family owned Torsebro gunpowder factory until 1901. The last owner of the factory was Svenska Nitroglycerinaktiebolaget, which discontinued operations in 1923 and in 1926 sold the property to Hjalmar Ståhle, a company director, who beat swords into ploughshares by substituting fruit growing for gunpowder production.

The manor house was the home of Miss Ann Mari Ståhle until her death in 1984. Miss Ståhle took a great interest in conserving the traditions of the place and in making the park and the industrial site accessible to the general public.

The Making of Gunpowder

To make gunpowder, you needed saltpetre, carbon and sulphur. Ordinary gunpowder production also required charcoal, mostly alder, while the high-quality pistol gunpowder required alder buckthorn. The farmers were commanded to convey the wood to Torsebro, a distance of up to 50 or 60 km for some of them. The wood was then turned into charcoal, which in turn was pulverised.

Sulphur was extracted from a mine in central Sweden and carted in barrels to Torsebro. It was suspected that several explosions were due to the barrels being of such poor quality that gravel and stone got into the sulphur.

Saltpetre was hardest to produce, especially as it was needed in large quantities. This again the farmers had to procure, and Charles XI had introduced a regular quartering organisation in the locality for this purpose, with every farm being required to supply a certain amount of saltpetre, proportional to the number of horses it had.

Saltpetre was mainly extracted from soil which had become heavily saturated with dung and urine, e.g. beneath cow stalls. The soil was boiled and leeched in large copper pans. This work was done by saltpetre refiners, most of whom came from Småland, where this was a traditional activity. The saltpetre refiners went from farm to farm, collecting the soil from beneath the livestock pens. Special saltpetre barns were built, and Linnaeus describes them from a visit to the factory on 23 May 1749, during his tour of Skåne. He also records seeing Chinese ducks at the factory.

Powder production seems to have been fairly steady at about 1,000 centners (1 centner = 42.5 kg) a year. In the 1870s this rose to 1,700 centners, worth about 75,000 crowns at that time. Output and its value declined in about 1900.

Until about the end of the 1860s, the powder was incorporated in stamp mills powered by waterwheels. The stamps, which could be up to 16 in number, operated vertically in pairs in large wooden troughs. This was a very hazardous operation and many a stamp mill was blown up in the process.

The gunpowder factory had about 20 workers. Until some time in the 18th century it also had a squad of 20 soldiers commanded by a sergeant and reinforced with three cannon, for purposes of protection.

A stone wall complete with *chevaux de frise* - pointed poles of oak with withies in between - was constructed all round the area.

Delivery of the finished gunpowder sometimes involved difficulties, but here again the

farmers had to help, mainly by providing transport.

The Torsebro factory produced only black powder of various kinds. Production declined following the invention of dynamite and smokeless powder, and was discontinued entirely at the beginning of the 1920s.

A Round Tour of "Gunpowder Park"

A round tour of Torsebro Gunpowder Factory and Gunpowder Park starts from the car park in the lower courtyard.

1. In this courtyard, to the left of the entrance, is a small detached red building which used to be the factory's own forge.
2. The stone building opposite, on the extreme left, was occupied by the carpenter.
3. The half-timbered gable projecting from the stables (to the right of the entrance) is where the workers would assemble before work began.
4. In the stables there were a pair of coach horses for the Director's carriage and draught horses for pulling the cartloads of gunpowder. Hässleholm was a common destination, once the railway had been built. As we have already seen, the farmers had to help out with these transport operations as well.
5. The tour continues, and we turn off to the right at the road near the car park, entering the park through the gateway displaying the old emblem of the factory.
6. About 100 metres straight ahead are the remains of the wall which used to encircle the whole factory. Fitted with the pointed oak poles known as *chevaux de frise*, it is said to have been built by convicts, and farmers were also compelled to lend a hand.
7. Just outside the wall one can see the foundation stones of the building which served as a drying stove and which blew up in 1910. After that, the powder was carried by ropeway instead of by horse and cart.
8. Going back about 30 metres from the wall along the narrow footpath (which follows the line of the old ropeway), one finds, on the left, the site of the press house. This blew up simultaneously with the drying stove accident in 1910. The building contained a hydraulic press which, although very heavy, was shifted about 30 metres by the blast.
9. After walking another 30 metres, you see, on your left, a stone seat. This place was known as "the Umbrella", because there used to be one here, made of straw and timber. From here you can see the Sydkraft dam, constructed in 1909.
10. Continuing along the narrow footpath until you come to the wider road, you see the beginning of the mill race. The earliest powder mills were just on the other side of it.
11. Our walk now takes us to the traverses, which have been restored and reinstated in recent years. Inside them there are small cellars. In between them were a number of workshops, built during the 1870s.
12. At the end of the mill race are the remains of the turbine building from which the workshops received their power supply. A DC generator was already lighting up the park, the works track and the powder workshops in 1902.
13. Opposite the pond is a rolling mill, where there used to be two big iron rollers.
14. To the right of this, up the steep slope, the gunpowder assayer had his proof range, using the "powder tester" - a small gun which could be aligned with a protractor. The target is visible near the road, in a hollow cut out of the hill.
15. At the top of the hill on the right are two large storehouses, one of them built in 1692 and the other in 1828. This is where powder was stored for delivery to the armed forces, up to a limit of about 1,000 centners (42,500 kg). Restoration work has also been done on these two buildings.
16. Down by the "main road", on the other side of it, is a brick building which used to be

called the "weighing shed". This is where the powder was weighed and packaged.
17. From the road leading up to the living quarters you can also see a very old and famous oak tree, said to have been old already when the powder factory was started: its age is estimated between 800 and 1,000 years. This particular way was much used in the 18th century by the "gentlefolk", when it was known as "the Promenade".
18. In the open space near the living quarters, you can see the main building in the middle. That used to be the Director's residence, for the owner of the factory. The house to the left was the kitchen wing, and that on the right, dating from the 18th century, was an office building.
19. The red and white houses on the hill were living quarters for the workers when the factory was a going concern. Today they are summertime weekend cottages.

Accidents and Incidents

The history of the gunpowder factory includes many mishaps and accidents from the time when the factory was in use.

It was Christian Rossow, the factory's first inspector, who, following the severe accident in 1684, wrote to the Governor-General of Skäne, assuring him that rumours concerning the extent and the damage were greatly exaggerated. Losses in terms of powder, saltpetre and sulphur could not be valued at more than 200 dalers, he writes, no powder having been lost over and above the processed batch of 20 *lispund* (170 kg). He adds: "... no one is to blame for the powder lad having been killed as a result, for his duty required him to be there. If it had not happened to him then it would have had to happen to somebody else." This sounds horribly cynical in our years, but in 1684 it doubtless went unremarked. There was no such thing as workers' protection legislation, and respect for human life did not require superior authorities to bother about a labourer being blown up.

Production at the gunpowder mill had started in 1682 with cannon powder. The authorities were afraid of the new factory being attacked by the Danes and sabotaged by pro-Danish farmers and guerillas. The farmers of Östra Göinge and in the hundreds of Villand were therefore ordered to construct a defensive wall round the factory. Remains of that wall, which had gates and bastions and was protected with oak *chevaux de frise* and impenetrable thorn bushes - the barbed wire of the time - are still to be seen.

There was a serious accident on 21 November 1879, when an explosion killed four people and damaged the 1828 powder magazine. One person was killed in 1884 when a powder mill blew up.

The last serious accident happened on 25 February 1910, when a building used for drying the powder blew up in a terrible explosion. Fortunately, the workers normally employed in the drying stove were not there at the time, but the powder drayman was outside with his horse and cart. Both he and the horse were killed instantly. Nobody knows how the accident came about, but altogether between 3,000 and 4,000 kg of powder exploded. It was said locally that the drying stove rose straight into the air before shattering. Nearly every window pane in Torsebro village was broken.

[In the original brochure a traverse and the powder magazines are illustrated.]

[In GMSG News **18** (Feb 1996), p5, Glenys Crocker, reported that the Torsebro Gunpowder Factory had been open to the public on European Heritage Days in September 1995 and that it is featured on pp123-30 of *Bogen und Krudt*, a book, in Danish, on Scandinavian powder mills reviewed by Anders Jespersen in GMSG News **12** (March 1993), pp9-10. Glenys never received a reply to her letter to the museum at Kristianstad asking for more information. - ed.]

'PATRIMONY' IN THE GUNPOWDER INDUSTRY

Arthur Percival

Inherent in several accounts of gunpowder factories is the fact that employment in them seems to have been gained by something similar to patrimony. The industry started late to generate trade guilds but presumably it made sense for employers to select as trainee staff those who came from households where gunpowder was understood. There were risks involved and probably little trade secrets to be passed on from generation to generation.

One day perhaps someone will have time to undertake proper academic study of these 'powder dynasties', the members of which were perhaps more mobile than most, as they moved from factory to factory. There is evidence that seasoned Faversham staff were transferred to Waltham Abbey when it came under Government control, and doubtless other examples could be cited.

In the meantime, one illustration. The Faversham Society handles lots of family history enquiries and recently it had one from a lady in Farmborough, near Bath, who is tracing her ancestors. She has made good progress and was able to tell us rather more than we were able to tell her!

Her particular query concerned William Silver, who was baptised at Ospringe (just outside Faversham) on 3 December 1769 and died at Swanscombe on 10 January 1848. She knew he worked in one of the Faversham factories and wondered which one.

We were not able to tell her specifically, but could report that William appeared in a staff return of 29 February 1795 as a labourer at the horse and water mills in the Royal Gunpowder Factory - meaning, at the time, the Home and Marsh Works. We also advised her that this was just one of a number of regular staff returns in the WO records in the PRO and that from these she might be able to trace how long William worked there. (If anyone had the time, a complete transcript of these records would be useful.)

From the correspondence it emerged that William was just the first of three generations involved in the industry. His son William, baptised at Ospringe on 20 December 1789, joined his father at the Faversham factory and then in 1811/12, moved to become manager of the new works at Leigh, Kent. In turn his son Walter, baptised at Ospringe on 15 October 1809 (and great-great-great-grandfather of our enquirer), became foreman of the Low Wood company's magazine at Erith.

This and the adjacent magazine belonging to Hall's of Faversham blew up in 1864. Hall's foreman and his son were killed, as well as a Faversham seaman who was making a powder delivery, but though Walter Silver's cottage was virtually destroyed he escaped with minor injuries. His wife Ann, fortunately, was staying with friends at Maidstone, so was unhurt. Undeterred, Walter went on to be foreman of a magazine at East Tilbury.

Three generations - probably not very unusual. What parallels can members offer?

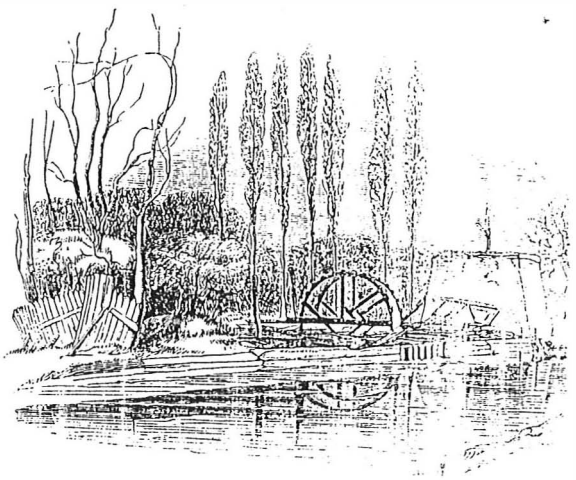
The Erith explosion was a serious one, which blew out windows in central London. There are contemporary accounts, but it seems that so far no modern study has pulled all the threads together. Is this a topic which might interest someone?

THE LAKE COUNTIES AT WORK

Ken Major has pointed out that this book by John Marsh, published by Alan Sutton in 1997, contains three historic photographs relating to gunpowder manufacture in Cumbria. On page 52 two photos from the late 19th century: eight Elterwater workers (seven women and one man) posing with boxes of sticks of compressed explosive and seven Ulverston coopers posing with their kegs. On page 60: a horse drawn tram on the track between the Gatebeck works and Milnthorpe station in about 1933.

EXPLOSION AT WALTHAM ABBEY IN 1843

Alan Gifford has sent us a copy of an account of an explosion at Waltham Abbey from the *Illustrated London News* of 22 April 1843. At 3.05 pm on 13 April an explosion first occurred in the north corning house and a few seconds afterwards a press house and washing house, also blew up. In a minute or two another corning house, about 200 yards from the first shared the same fate, followed by another press house and washing house. These buildings were all about 80 ft long and 29 or 30 ft deep. The corning and press houses were separated by strong brick buttresses 20 ft high, 15 ft thick and 30 ft deep, but these barriers were ineffectual in preventing the spread of the damage. This was also true of trees planted around the corning houses, trunks 2 ft in diameter having been snapped and thrown several hundred feet. Seven men working in the corning houses were killed, one body being carried over 130 yards. It seems that the corning houses contained 35 to 40 barrels of gunpowder. A coroner's court came to a verdict of accidental death and expressed the opinion that the works were superintended by Capt Tulloch with every possible precaution for the safety of the workers. The article was accompanied by the two illustrations reproduced, at reduced size, below.



Alan Gifford has also noted a report on the machinery and operation of the Gunpowder Mills at Waltham Abbey, complete with drawing and sketches, in the *Illustrated London News* of 11 November 1854, p 478 and a report on the explosion of the gunpowder magazine at Erith in the issue of 3 October 1864, pp 365-6.

CREMATORIUM THREAT TO HIGH GATEBECK SITE

Alice Palmer has alerted us to plans, deposited with South Lakeland District Council, to build a crematorium on an 8 acre site at the High Gatebeck gunpowder mill in Cumbria. *The Westmorland Gazette* reported on 12 June that local people are vehemently opposed to the scheme. In particular they are concerned about increased traffic and air pollution, especially mercury emissions, but not apparently about the threat to the remains of the gunpowder works. The area affected is centred at NGR SD 545 859, just north of the T-junction of roads leading to Summerlands, Gatebeck and Endmoor and thus surrounding a former magazine. We therefore contacted English Heritage and Margaret Nieke, an Inspector of Ancient Monuments, reported that they are currently processing a scheduling proposal for the Low Gatebeck site but are not intending to protect High Gatebeck. However they have checked the proposed development and concluded that it does not "affect the area of the mill site".

THE PETITIONS OF WILLIAM BABER

Nicholas Balmer

As discussed in GMSG Newsletter **21,** pp 19-21, Aug 1997, I have been researching William Baber's powder making activities. Recently following leads kindly furnished by Messrs Roy, Buchanan, and Edwards, further information has come to light in the PRO which sheds light on Baber's activities and suggests other locations of Civil War powder production.

The documents are State Papers Domestic PRO SP 29/29 and PRO SP 29/232. SP29/29, "The Humble Petition of William Baber Gunpowder Maker", is undated and in two parts. Folio 162A seems to be a draft of the finished petition, folio 161. It is believed that this document dates from the 1660s from its position within the other documents in the calendar. SP29/232 is also undated but has a note in the margin "Att ye court at Whitehall Jan 20th 1667/8", and must presumably predate this. The second document is in a far more legible and confident script than SP29/29, and I believe represents, a second and possibly successful attempt at gaining payment.

I don't propose to transcribe the entire documents, but only to bring out the salient points. In those places where I am uncertain as to the exact wording I have used italics for what I consider the most likely words. The original spelling is retained throughout.

SP29/29 begins by stating "That your petitioner in [illegible] ... to his late Majesties service has owing 896£'s ... [illegible] ... to make Peeter & Powder in obedience to his Majesties ... came to Oxford and there sett up peeter works & built Powder mills, & did furnish his Majesty with powder. But upon some (*feigned pretences*?) your petitioners works & utensils were taken from him."

He goes on to say that these works and utensils were valued at £532.3s.6d, for which a warrant on the Privy seal was issued. This was not paid however due to "his Majesties urgent occasion for money". However the King ordered "Mr William Watkins, receiver of ye treasury money in South Wales" to pay the money. Baber claimed to have only received £4.00.

Baber then writes "your petitioner and his family hath & doo live in great penury & want & is utterly disabled to imploy himself, & them in his trade."

In a separately paragraphed summary he adds "So therefore most humbly beseecheth your Royal Majestie to ... (*consider*?) his sadd condition, having suffered for & in service of his said Majestie to the value of £3000.00. And that your majestie will be gratiously pleased to grant your letters of Privy Seal for the payment of the residue of the said £532.3s.6d due out of your Majesties Exchequer." It is hard to reconcile his claimed expenditure of £3000.00, with his receipt of £4.00, and a residue of £532.3.6d.

The second document SP29/232 contains a far more detailed statement of his affairs. It starts with "To Ye Kings Most Excellent Majestie. The humble Petition of (ye undone) William Baber Powder Maker."

He then says "That your petitioner in ye time of your blessed Fathers greatest extremity furnished his said Majestie with severall great quantities of Gun powders at Bristol Worcester Shrewsbury Taunton Exeter and other places besides 1000 £'s and upwards of his Uncle Randolph Tomms Powder maker at Bristol and 500£'s more of his son William Baber who was Powder maker at Taunton and Exeter and in that his said service lost his stock and materials amounting to at least 1500£'s more all that may at large appear by certificates if required."

It appears that besides Oxford he and his family were making powder at quite a number of places including Bristol Taunton and Exeter. Does anybody have any information or leads for evidence of powder making in either Taunton or Exeter during the civil war. Interestingly there is evidence for a William Baber in 1564 owning land at Curry which is only 5 miles

east of Taunton. Obviously this is not the same man, but there are lines of Williams, and Johns elsewhere in the Baber family down through the generations. Furthermore John Baber (1592-1644) JP, MP and Recorder of Wells, who seems to have to have been head of the family in this period was married to Elizabeth Walrond, daughter of William Walrond, JP of Isle Brewers, which is adjacent to Curry Mallet and Curry Rivel alongside tributaries of the River Parrett. It could be, as I believe was the case elsewhere at a later date, that powder mills were normally sited alongside rivers outside urban areas for safety, and that William Baber was using mills along the tributaries of the Parrett, and Randolph Tomms was using the many Mills along the River Chew, much of whose banks fell into land owned by other members of the Baber family at this period. Both of these locations could perhaps have been best described to a London bureaucracy, in the absence of detailed maps as being "close to" Bristol or Taunton.

The petition goes on to say "they were employed by Sir George Strode and John Wansford Esq who had his said late majesties engagement for his said losses and premises", in other books the later is always spelt Wandesford. The losses were to be "secured by Marybone Park and other landes since disposed of to other persons, so that your petitioner can neither have satifaction from Sir George Strode or his heirs or from Wansford or otherwise."

Baber was in distress and unable to pay his creditors for he goes on "Now for as much as your Petitioner by reason of this is unable to Satisffie his Debts then contracted for So that he is dayly tormented with the prosecution of his mercylesse creditors and for that your petitioner is unsatisffyed part of 4800£ due to him by Account from ye Office of the Ordnance for gun Powder delivered at New College in Oxford."

His final paragraph is a heartfelt plea. "Hee therefore most humbly beseeches your Majestie (for Gods Sake) that his distressed Condicon may be considered and heard and some speedy course taken for his satisfaccon as your Majestie in your Princes Wisdom and Justice shall thinke fitt."

The petition must have received attention because there are two marginal notes. The first, in a totally different hand, states "The Petition of William Baber. He, furnished his Majestie in his late wars with powder foe which he remains unsatified, praying that Majestie will *commiserate* his poor condition & order his relief." The second note is dated "Att ye court at Whitehall Jan 20th 1667/8." Says "His Majestie is graciously pleased to *inform* it to Collonel William Legge Lieut of his Majesties Ordnance & Laurence Squibb Esq to consider of this petitioners *petitions* And examine of what nature his *debt* is, how contracted, what hath been payd of it, what remains further due to him & from whom, and to report of (illegible) to his Majestie. Who will then declare his further pleasure for ye petitioners just satisfaction." The note is signed but unfortunately being in the corner is badly worn and unreadable.

At present I have no idea what his Majesties pleasure was. Wouldn't it be nice to find that we really were the rightful owners of Marylebone Park! I wonder what the back rent would be?

HERITAGE LOTTERY GRANT FOR COLLIERY MAGAZINE

An £18,000 Heritage Lottery award has been made to help to retore a small brick explosives magazine in the Darran Valley Country Park near Caerphilly in south Wales. It was built at the beginning of World War I for the Ogilvie Colliery which closed in 1975. The building is listed and has walls 25 inches thick, which taper up to a vaulted roof. The grant will also be used to provide interpretation and seating.

[From *Heritage in Wales*, Winter 1997/8, p 4; courtesy of **Bill Curtis**.]

CIVIL WAR GUNPOWDER MANUFACTURING IN NORTHAMPTON Nick Balmer.

While researching one of my interests, Northamptonshire local history, I came across an article on the Internet at http://web.ukonline.co.uk/glenn.foard/nptncwdef.htm which contained the following information on gunpowder manufacturing in Northampton. The full article originally appeared in *Northamptonshire Past & Present*, vol IX, 1994-5, No.1, pp 4-46 and was written by Glenn Foard

Northampton was an important Parliamentarian garrison throughout the Civil War. It was close to the Royalist capital of Oxford and was frequently threatened by Royalist armies. However unlike Leicester it never suffered a siege, although on occasion Royalist patrols reached the surrounding hills. Northampton prepared extensive new fortifications to supplement its surviving medieval town walls. In the middle ages Northampton's walls were the third longest in England, so the task of upgrading the defences was a major task which seems to have gone on throughout the war. Glenn Foard's article is full of the most careful research on the logistics and people involved in the task, and is well worth obtaining.

He says the following about gunpowder manufacturing in Northampton.

'Gunpowder was produced in Northampton, as well as being bought in, for in October 1643 a "Peeter Man" was brought to the town from London by Mr Ofthand who was at that time firemaster. There were also payments to the saltpetre men and for carriage and other works relating to the making of powder.(1) Production continued in the town for, in March 1644, 20 hundredweight of brimstone and a hundredweight of saltpeter was brought in from London.(2) In December 1643 Mathew Silesbie was in charge of "ye Powderworkes" (3) and was still supplying powder in November 1645 and January 1646.(4) However, in 1645 until his discharge on 23 July a Frenchman, Monsieur Chemitte, was employed as firemaster.(5) The powder works were apparently situated in the barns of the Tower, depicted on the south side of Derngate on Speed's map of 1610 (figure 2), because Hooper's account records the "curtain by the powder house" to the south west of the Derngate. According to Lee, who was alderman of the town during the Civil War, "In the time of the Wars the barns [of the Tower] were made use of to sett great Fatts in to receve the Salt Peter which was dugg out of Severall old sellars in the town and to prepare it for the gunpowder mill which stood in the Middle of the brook running from St.Thomas's Hospital into the Cow Meadow on the north side of the said meadow."(6) It seems likely that the mill will have been close to the bridge into the meadow near the postern gate at the bottom of Cow Lane, for this will have given easy access from the powder works in the adjacent Tower Close. The powder works were supplying significant quantities of gunpowder (7) but additional quantities were also purchased elsewhere for the garrison.(8) The other supplies for the guns were apparently provided locally.(9)"

In addition he quotes from a contemporary survey of the time, John Hooper's Survey Of The Defences Of Northampton Taken On The 9th Of October 1645.(10) This helps to confirm the position of the works, as the "durne gate" still exists as Derngate. The mill must have been close to where the modern Victoria Promenade crosses Derngate and meets Cheyne Walk. The old Cow Meadow has become Becketts Park.

After several pages of perambulation Hooper states: "ye square flanker 5 roods 4 foote [84 ft] the curtaine by the powder hous 22 ro [352 ft] to the corner and to the durne gate 18 ro 2 foote" [290 ft].

Interestingly at the same time that Monsieur Chemitte "a Frenchman" was fireworker, Northampton also employed an engineer, David Papillon possibly also from France. He published a book *A Practicall Abstract of the Arts of Fortification*.

References

1. PRO SP28/238 f.185, and f.68 20-28th October 1643.
2. PRO SP28/238 f.595.
3. PRO SP28/238 f.764. Mathew's brother Samuel, BA of Emanuel Coll Cambridge; brother Thomas of Queen's College, Cambridge. See Longden, *Northants & Rutland Clergy*, vol.12, p.173.
4. Warrants PRO SP28/35 f.427 & 7 Nov.1645, PRO SP28/239 unfol.; Born in Northampton in 1610, son of Matthew Sillesbye teh elder, a scrivener who was chosen Mayor in 1631. Mathew himself, who was bailiff in 1642, chamberlain in 1647-8 and elected mayor in 1649, was a substantial landowner in the town. H.F.Waters, 'The Will of Matthew Sillesbye, 18 April 1662', *NN&Q*, vol.V, 1893-4, item 725.
5. Warrant to pay Chemitte for goods, and Warrant to pay Ric.Redman as interpreter to Mr.Chemite PRO SP28/239 unfol., 28 June 1645.
6. Northants Records Library, Lee's History of Northampton, f.133.
7. Eg: 20 barrels of gunpowder supplied by Mathew Sillesbie, 8 Jan.1645(6), 105, PRO SP28/35 f.427.
8. 40 barrells of powder purchased with the new cannon in London, SP28/238 f.202.
9. Cloth and thread for the ordnance, 2 Oct 1643 warrant to pay Thomas Evans 3/1/8, PRO SP28/238 f.147; Cartridge paper for the ordnance, supply before 2 June 1645 on Warrant of 30 Dec 1645 to Thomas Collins, bookseller, PRO SP28/239 unfol.; "John Stephens for 4 copper ladles, one great copper ladle for a demie culvering and thick brasse to make disparts for the Cannons 30/4d", 28 Sept. 1643, PRO SP28/238 f.142.
10. Nottinghamshire Archive Office (NAO), MS81a, f.29 & 77-74. Where words have been deleted in the book they are shown here in brackets; where words are written above other words this is indicated here by a backslash. I have converted Hooper's measurements into feet and added these in brackets on the right.

CHURCH BRIEFS **Keith Fairclough**

In the era before the insurance industry developed there were other means to help some overcome a disaster. One of these was the issuing of church briefs by the ecclesiastical authorities. Such briefs permitted collections to be made in parishes for the relief of those named. In his book entitled *Church Briefs*, published in London in 1896, W A Bewes notes two briefs with a gunpowder connection:-

1. 15 September 1586 Brief of John, Bishop of London, for collections for the relief of the bearer, Thomas Butler of Colchester, Gunpowder Maker, who being at his work for the making of gunpowder, by sudden misfortune was pitifully burnt, and spoyled of his eyes and armes apparent yet to behold (p.9).

A cursory look at local records has produced no further evidence of this producer at Colchester, but it further indicates the smaller scale but more widespread nature of the industry before the gunpowder monopolies emerged after the problems experienced during the Spanish Armada.

2. 3 July 1658 a brief issued after an accident when gunpowder took fire in a powder house at Wapping and destroyed premises to the value of £9655 17s 6d. Many deaths and 846 housekeepers suffered (p.176-77) This must be one of the most serious of the known early accidents in the gunpowder industry, and further research into local records might produce more evidence of its extent.

ACTIVITIES AT CHILWORTH GUNPOWDER MILLS

Alan Crocker

Much of the land occupied by the Chilworth Gunpowder Mills in Surrey, including the Scheduled Ancient Monument area, is owned by Guildford Borough Council. It lies in the parish of St Martha and in 1996 the Borough and Parish Councils instituted annual public meetings to discuss the future of the site. These have been well-attended and a working group, on which Glenys and I serve, has been set up to arrange activities and prepare proposals for projects.

The mills were established by the East India Company in 1626, had the national monopoly of gunpowder manufacture in the 1630s, was by far the largest gunpowder mills in the country in the late 17th century, declined in the 18th century, expanded again in the 19th century, were bought by a German company to make "smokeless" brown powder in 1885, established a cordite factory in 1892, was the site of a second (Admiralty) cordite factory in World War I and closed in 1920.

The first activity arranged by the working group was an Open Day on 28 June. There was not a great deal of publicity in advance but on the day the Borough put up lots of signs and party balloons and issued the organisers with tasteful T-shirts, the sun shone, and about 300 people turned up. We were based at a local farm and arranged a display in a cleaned-out stable. During the day we led three different one-and-a-half hour walks, roughly corresponding to the Upper Works (gunpowder 1630s-1700; cordite 1892-1920), Middle Works (1650s-1920) and Lower Works (1626-1704). About 50 people came on each walk and over 100 copies of Glenys's booklet *A Guide to the Chilworth Gunpowder Mills* were sold. The Borough had erected numbered labels around the site, corresponding to the numbers in the booklet, so that visitors not on the guided walks could also readily appreciate the significance of the remains. Everyone seemed to enjoy it all and it seems likely that the day will become an annual event.

In recent years the Borough has been involved in two major projects on the site. The first of these was the conservation of the 1885 terrace of six steam-powered brown powder incorporating mills, which is said to have cost £100,000. The second, jointly with the former Thames Water Authority, diverted much of the water from the 1650s millstream along the south side of the valley into the earlier millstream along the north side. This has been very unpopular with the Parish Council and the local community.

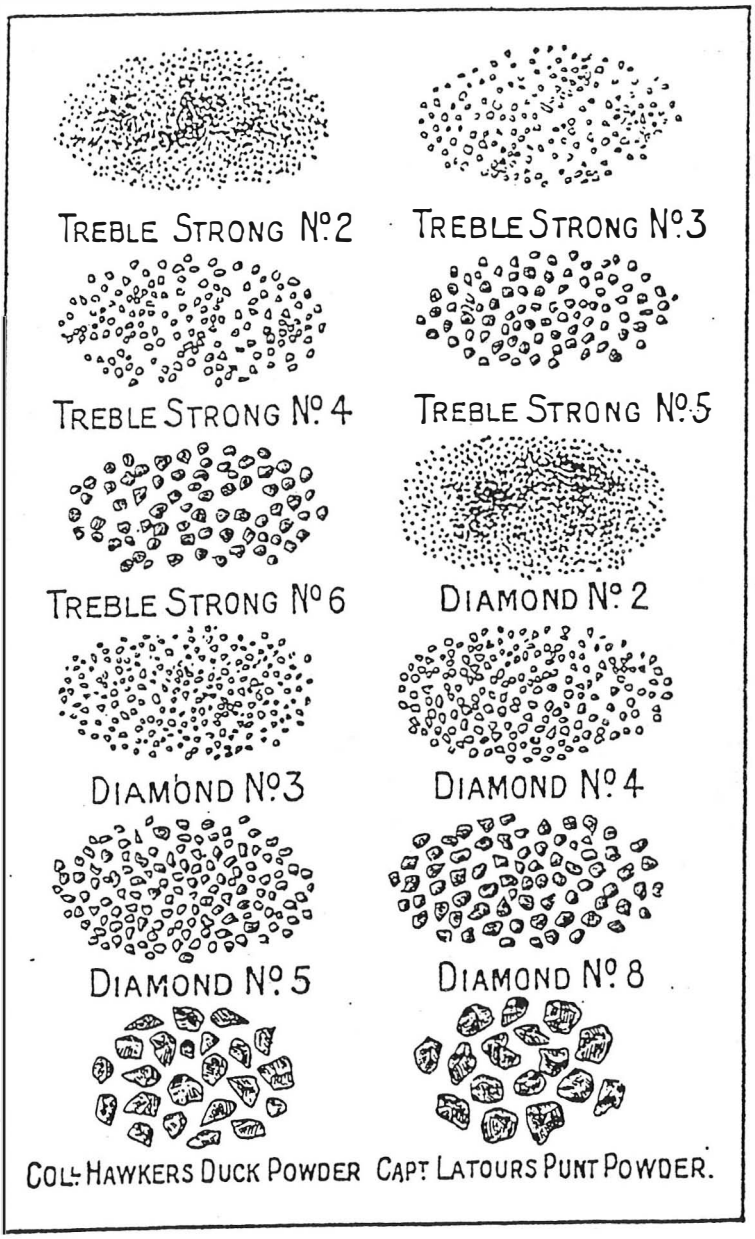
Glenys and I are currently working on an article on the watercourses and mill sites (corn, fulling, wire-drawing, paper and gunpowder) in Chilworth manor. Thois is based on documentary research supported by a survey of the site which a member of the working group is carrying out with our assistance. Some of this documentary research has enabled us to make a case for extending the area of the site which is a Scheduled Ancient Monument and English Heritage is currently considering this, in particular in relation to parts of the cordite works and also to the "packhorse bridge" which crosses the north mill leat and which appeared recently on English Heritage's "Buildings at Risk" list. The leat it spans may date from the 1630s when the mills were expanded and the watercourses were modified or may be a medieval leat, pre-dating the construction of the mill pond, which was re-instated in the 1630s. It is hoped to try to resolve this question by using carbon 14 dating on the mortar of the bridge. It is also proposed that conservation work should be carried out on the 1888 tramway bridge which crosses the southern, 1650s, millstream. This is a swingbridge as the stream was used for transport by punts as well as for water-power.

Finally we are providing information on the history of the Chilworth gunpowder mills to David Clarke, a well-known pageant-master who happens to live in a cottage at the edge of the site. He has been commissioned to write and produce a millennium play for the local community and has decided to base it on gunpowder.

REPRODUCTIONS OF HISTORIC COMMERCIAL BOOKLETS

Bill Curtis has provided us with A4 reproductions of three commercial booklets, produced by **Jim Buchanan**, a friend of his, and originally issued in the early years of the 20th century.

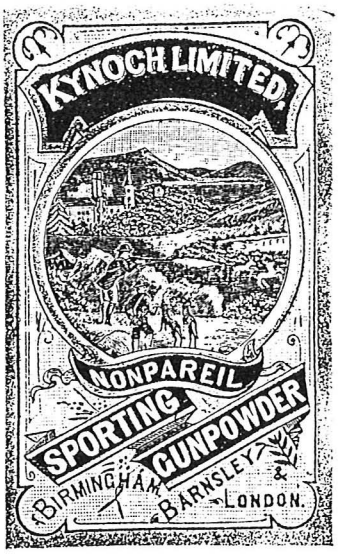
The first is an undated Curtis's & Harvey price list and the title page lists their factories at "Hounslow, Feltham, Faversham, Dartford, Tonbridge, Cliffe-at-Hoo, Glyn-Neath, Ballincollig, Kames, Roslin &c". This indicates that it is not earlier than 1900, when Cliffe-at-Hoo was opened. Also is might perhaps be not later than 1903, when Ballincollig closed, although C&H continued to own the site until they became part of Nobel Explosives Ltd in 1918. The booklet has 16 pages. Of particular interest are the prices for black sporting powders, which increase from 60s to 210s for 100 lb of loose powder through the sequence Cannon or Signal, F, FF, FFF, Tower Proof, Punt (for Duck shooting, Col Hawker's or Capt Latour's). Cartridge Loading (mixed grain), "Field B", Treble Strong, Rifle and "Diamond Grain". The F, FF and FFF were also available, at increased cost in cardboxes (1 lb, ½ lb and ¼ lb), the Tower Proof in cardboxes and canisters and the rest in canisters (5 lb, 1 lb, ½ lb and ¼ lb). Also of interest are the facsimiles of grain sizes reproduced here. The rest of the booklet is devoted to smokeless sporting powders (Smokeless Diamond, Amberite and Ruby), sporting cartridges and terms of trade (delivery, discounts etc).

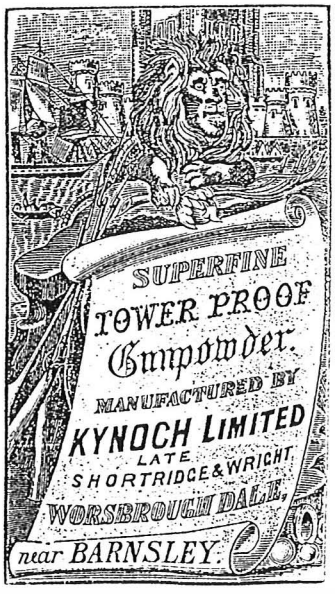


The second booklet, again undated, concerns "Modern High Explosives for Blasting and Mining Purposes" manufactured by the New Explosives Co of Stowmarket. This company was established in 1865 and the booklet was produced after they had nearly 50 years of experience and therefore presumably dates from just before World War I. They produced "Authorised Explosives" (Dynamite, Gelignite, Nitro-Gelignite (non-freezing), Gelatine Dynamite and Blasting Gelignite) for use in all ordinary mining work and "Safety or Permitted Explosives" (Stowite and Stomonal) for use in fiery and dusty coal mines. The original booklet appears to have contained over 47 pages but only 15 have been reproduced. These include nine full page photographs of: part of the blasting explosives factory; the acid factory; engineers shop; research laboratories; offices and laboratory, cordite factory; part of cordite factory; technical laboratory; physical laboratory; and guncotton factory. Some of these seem out of place in a booklet on mining and blasting explosives. There is also a page of photographs of a cartridge and a package of "Monogram Brand" dynamite for the Home Trade and of a cartridge, a package and a box of "Jackal Brand" dynamite for the Export Trade.

The final booklet is a little "Game Shooter's Note Book" published by the "EC" Powder Co Ltd, who manufactured "The Original Hardened Smokeless Powder". It mentions that a new improved EC powder (EC3) had been introduced in 1897 and that it only been exhibited twice, winning the highest award on both occasions. It must therefore have been published before 1908 when, according to *The Rise & Progress of the British Explosives Industry* (Whittaker 1909) it won a third highest award. Their factory was at Green Street Green, near Dartford in Kent. The booklet has 14 pages including one with two photographs of the factory. Apart from praising EC3, it gives information on the cost of gun and shooting licences and the shooting seasons for grouse, black game, partridges, pheasants and hares.

Bill Curtis and Jim Buchanan have also provided us with coloured photocopies of photographs of some canisters etc, including a Chilworth Medium Grain, two John Hall & Son FFF, a Hall's Gun Club a Hall's Southern Cross, a Curtis's & Harvey FFF, an EC3 Patent Smokeless, a Curtis's & Harvey Smokeless Diamond plaque, a Kynoch's packet of gun wadding and a Kynoch's powder measure. They have also given us photocopies of an advertisement for the Smokeless Powder Co Ltd, who had works at Barwick in Herts,.and of three canister labels used by Kynochs at Worsborough Dale near Barnsley, which they operated from 1893 to 1911. These are reproduced half-size below.





BOARD OF ORDNANCE CONTRACT WITH JOHN DE BERDT, 1703

At the beginning of May, **Bill Curtis** alerted us that Maggs Bros, Antiquarian Bookdealers of Berkeley Square, London, had a contract dated 1703 between the Board of Ordnance and John de Berdt (location not stated) for 420 barrels of gunpowder. The asking price was £175. We already knew, from information provided by **Keith Fairclough**, that de Berdt had purchased the Wandsworth gunpowder mills in 1702 and was a regular supplier to the Ordnance until his death in 1709. As we could provide them with this information, Maggs Bros allowed us to make a rough transcript of the document and this is reproduced below.

"10 May 1703. Contract between Principal Officer of Ordnance - Rt Hon John Lord Granville, Lieut-Gen William Bridges esq Surveyor-Gen, Christopher Musgrave esq Clerk of Ordnance, James Lowther esq Storekeeper with John D'Berdt for making working and delivering into the stores out of saltpetre ordered the 11th present, to be received from the New East India Co, to be delivered to him for that purpose at the refraction of ten pounds in every 112 pounds agreed upon for double refining and making it fit to be wrought into gunpowder the full number of 420 barrels of gunpowder tower proof, one third part to be fine the other cannon powder, well conditioned, corned, cropt and dryed and barrell'd and cask'd in good casque of well seasoned oake, full hoop'd, close jointed and dryed according to the pattern therefore remaining in the office. Each barrel to contain 100 pounds neat weight gunpowder. The first delivery to commence in such time after the delivery of the said saltpetre to him as that the whole 420 barrels at 50 barrels per week shall be delivered in the space of 8 or 9 weeks at furthest from his receipt of the said saltpetre and 5 weeks allowed for double refining the same and making it fit to be wrought into gunpowder, provided he be not hindered by blowing up of mills or other unavoidable accident, and the said John D'Berdt doth hereby for himself his heirs ... further covenant and agree that the said gunpowder shall hold and undergo seven years duration for tryall from the day of the proof thereof and if at any time within the space of seven years any part of the said gunpowder shall prove defective or be found decayed or unserviceable, the same having not been issued out of her maj stores or otherwise taken wett or damaged, in such case the said JD'B his exec ... shall take away all such defective powder and in lieu thereof deliver into the said stores the like quantity of good and serviceable gunpowder, without any money or other allowance for the same, for all which corn powder hereby contracted to be delivered ... JD'B shall receive 16s per barrel for sufficiently refining the saltpetre and working it into gunpowder as aforesaid, to be paid by bill of debenture according to the course of the Office within 14 days after the delivery of every 250 barrels of gunpowder and proofe thereof made ... which shall be within 10 days after the delivery thereof.

In witness thereof he hath hereunto sett his hand and seale ... day year aforesaid ... sealed and delivered (the paper being first stamped) in the presence of William Phelps, Row[Ron?] Gibson[Gilbert?].

John De Berdt [seal]"

The document consists of one sheet of paper folded to produce four foolscap pages. The writing is on the first two and the other two are blank. The watermark is a fleur de lis on a shield with WR (ligature) beneath. The countermark is GPC.

There are many interesting points in this contract including, for example, the requirement for the gunpowder to remain good for as long as seven years. Also, we were not familiar with the word "cropt", which appears to mean a process carried out between corning and drying and therefore suggesting dusting. One wonders therefore whether it corresponds to cropping hair, in the sense of removing small particles from the surface of grains of powder.

Glenys and Alan Crocker

BARRELS AND KEGS

Following a discussion at the GMSG Bisley meeting in June about the amount of gunpowder contained in a barrel and in a keg, **Fred Lee** has sent us copies of three documents, dated 1872, 1875 and 1877, from which he concludes that everyone in the United States knew that a barrel contained 100 lb and a keg 25 lb. He also considers that these weights were universally known before 1860. Most members would no doubt agree with this, but the documents actually reveal some subtleties and much further information. A few notes are therefore provided here.

The 1872 document is taken from the Articles of The Gunpowder Trade Association and lists the prices charged by the Hazard Powder Co. They sold "American Sporting Powder" in 6¼ lb kegs ($3.75), "Duck Shooting" in 6¼ lb ($3.75) and 12½ lb ($7.50) kegs and "Kentucky Rifle, FFFG, FFG and Sea Shooting FG" in 25 lbs ($6.00), 12½ lbs ($3.25) and 6¼ lbs ($1.75) kegs. The prices quoted here are for sale in New York but higher prices, for example up to $7.50 for the 25 lb kegs, are given for other locations. These and other powders were also available in square, oval and perhaps round canisters, containing ½ lb, 1 lb and 5 lb.

The 1875 document appears to be a list of gunpowders available from Penniman & Co of Asheville, North Carolina, who were agents of Du Ponts. They provided "Eagle Superfine Sporting" and "Eagle Rifle Shooting" in 6¼ lb metallic green and blue kegs respectively, "Eagle Duck Shooting" and "Eagle Sea Shooting" in 12½ lb and 6¼ lb metallic red kegs, and "Choke Bore" in 6¼ lb kegs. "Du Pont Rifle and Sporting (Water-Fowl) Shooting" (glazed) Fg, FFg and FFFg and (rough) Fr, FFr and FFFr were available in wood or metal kegs of 25 lb, 12½ lb and 6¼ lb, as was "Du Pont OPNF (Navy Proof) Musket", but "Du Pont OPNP (Navy Proof)" and "Du Pont OTP (Old Tower Proof)" were only supplied in 25 lb kegs. "Du Pont Mealed Powder (for Fireworks)" was sold in 20 lb kegs or as dust in 25 lb kegs. Blasting and Mining Powder was sold in 100 lb barrels, 50 lb half-barrels and 25 lb kegs. Finally, and very significantly, "Shipping Power (to Order)" was sold in 25 lb kegs, 12½ lb **half-kegs** and 6¼ lbs **quarter-kegs** but also in 20 lb, 10 lb and 5 lb kegs. Some of the powders were also available in cases containing 25 or 12 canisters of 5 lb, 1 lb, or ½ lb or 25 flasks of ½ lb. The firm also sold 100 lb and 200 lb casks of refined saltpetre, 100 lb casks of mealed sulphur, and pulverised charcoal and patent safety fuse in lots to suit purchasers.

The 1877 document is a "List of Brands and Packages sold by different makers of Gunpowder, with relative prices establishing Grades of Quality". The makers are Hazard, Du Pont, Laflin & Rand, Oriental, Austin, American and Miami and there are separate tables for Canister Powder and Keg Powder. There are seven categories of Canister Powder: four for 1 lb cans, and one each for ½ lb, 1 lb oval and 1 lb round cans. Similarly there are 14 categories of Keg Powder: five for 25 lb kegs, three for 12½ lb kegs, four for 6¼ lb kegs and, rather anomalously, two for 5 lb cans.

Thus, contrary to Fred Lee's conclusion, I feel that in the United States in the 1870s it was necessary to state the weight of the gunpowder contained in a barrel and, especially, in a keg, as it could not be assumed that everyone did know that they contained 100 lb and 25 lb respectively. However, the barrels which were not 100 lb were stated to be half-barrels, containing 50 lb, whereas the terms half-keg and quarter-keg seem to have been used sparingly. The examples of 20 lb, 10 lb and 5 lb kegs and 5 lb canisters classified as kegs are also rather surprising.

I was also interested to discover the appendages "g", and presumably "G", for "glazed" and the more obscure "r" for "rough", and the differently coloured kegs used for different types of powder.

Alan Crocker

NOTES FROM *RECORDS OF WOOLWICH*, VOL 1

Mary Yoward

On page 330 of vol **1** of *Records of Woolwich* there is the following report from "The Annual Register of 1766" about Gunpowder Trials held there.

"These warlike experiments were held by Mr Cross and were found to answer, but not adopted, for particular reasons (unstated),

1. To fix gunpowder under the earth and when trod upon to be blown up.
2. To fix gunpowder under a gate and when opened will be blown up.
3. To fix gunpowder under the earth and by lifting up anything that he may lie thereon, will be blown up.
4. To fix gunpowder under the greatest building on the London side of the Thames, Mr Cross will stand on the opposite side and blow it up without using match or train.

He has brought to perfection also a moving battery, which is to be drawn by horses and is to be made use of in time of battle, when fifty men can withstand a thousand firing cannon, small arms, grenades etc."

Also in this book, undated but seeming to be about 1890, are fairly contemporary accounts of the various explosions in Woolwich Arsenal and neighbourhood.

Waltham Abbey is referred to on page 353: "not half an hour's walk from Enfield Lock is situated the Government powder factory. Here dispersion instead of concentration is the rule. The necessity for isolation causes the factories to be distributed over a very large space of ground and the visitor (even in those days!) has to walk from workshop to workshop through groves and avenues of willow and alder as though he were visiting dispersed farm buildings. To such an extent do meadows and woods and canals abound that the idea of being in a powder mill is entirely lost in the impression that you are in the midst of a Dutch landscape. The visitor is, however, somewhat startled at finding a steam engine at work, and a tall chimney smoking its pipe in the midst of the gunpowder works, but these are really many hundreds of feet from the mixing-houses.

Glenys Crocker and Keith Fairclough, 'The introduction of edge-runner incorporating mills in the British gunpowder industry", *Industrial Archaeology Review*, vol XX, 1998, pp 23-36.

This is the published version of the paper which Glenys and Keith presented to the Group at its Spring Meeting in 1997 and which they summarised in GMSG Newsletter **21**, August 1997, pages 4-6. The published summary is as follows:

"In Britain, pestle mills had been largely replaced by edge runners for the incorporation of gunpowder by 1772, when they were in general made illegal by Act of Parliament. The earliest known evidence has until recently placed the beginning of this change at c.1720 in mills which supplied private markets. New documentary evidence indicates that the new technology was adopted earlier by powder makers under contract to the government in time of war. This new evidence, in particular inventories of Sir Polycarpus Wharton's powdermills at Sewardstone in Essex, significantly moves forward our knowledge of gunpowder technology in the late 17th and 18th centuries. Its implications are discussed and transcripts of the Sewardstone inventories are given in an appendix."

In addition to Sewardstone the paper discusses evidence relating to mills at: Wooburn, Bucks; Corkagh, Co Dublin; Woolley, Somerset; Waltham Abbey, Essex; Chilworth, Surrey; Faversham, Kent; and Thelwall, Cheshire. The appendix on the 1708 an 1713 Sewardstone inventories, which occupies two-and-a-half pages, includes notes and one of the six illustrations. There are 77 entries in the list references.

Ronald D Crozier, *Guns, Gunpowder and Saltpetre: A Short History*, Faversham Society, 1998, xiv + 97pp, 42 illus, 15 tables. Price £4.45 (post paid), cheques to Faversham Society, Fleur de Lis Heritage Centre, Preston Street, Faversham, Kent ME13 8NS. Personal callers can buy the book for £3.45.

This is yet another excellent and incredibly cheap book on gunpowder produced by the Faversham Society. It provides an overview of the history of gunpowder, from its first use in China to the present day. It also focuses on the evolution of methods of production of saltpetre on which the author writes with special authority. He has been involved in the saltpetre industry all his life and still spends part of his time in Chile, the source of most present day supplies. The chapters and sub-chapters (in brackets) are entitled; Introduction; China and the discovery of gunpowder, (400BC - 1300AD); Medieval European guns (1200-1550); Medieval gunpowder technology in Europe (1300-1550); Saltpetre refining (1300-1750, Gunpowder and calcium nitrate, Alchemical jargon and gunpowder chemistry, Saltpetre refining in England, Continental saltpetre refining, Nathaniel Nye and 17th century English refining); European saltpetre trade with the Far East (1500-1800); Gunpowder and the end of alchemy (1550-1700); Gunpowder, saltpetre and the Industrial Revolution (1700-1830, The British saltpetre industry, French saltpetre resources, Saltpetre production in Burgundy, British gunpowder technology, French powder manufacture); Spanish colonial gunpowder and saltpetre; British saltpetre supply before and after the Napoleonic Wars; Tarapacá and the Chilean nitrate industry; Rifles, rifled cannons and the strength of powders; British gunpowder manufacture (1830-1880); Blasting and Mining - Black Powders (Sodium nitrate powders). There is also a bibliography with 90 entries and an index with nearly 300 entries. A feature of the book is that the author relies heavily on extended quotations. It contains a great deal of valuable factual information, much of which is probably unfamiliar to most members of the Group. It is strongly recommended.

Mary Mills, "Gunpowder - Inspection and Death", *Bygone Kent vol* 19(1), January 1998, pages 25-8.

On page 25 of GMSG Newsletter **22** (Feb 1998), an article by member Mary Miles on "An Explosives Magazine at Greenwich", which had appeared in *Bygone Kent*, was summarised. This second article by Mary is on fatal explosions which occurred at Robson's Ammunition Works at Greenwich in the 1880s. Robson held patents for "firing signals and lights" and the works, which had been founded in 1845, produced a variety of signalling devices for ships and railways and also more conventional fireworks. One of the items made was a railway fog signal, which consisted of two small iron saucers enclosing a small amount of gunpowder. On 20 November 1882, there was an explosion in a shed where two women were making these signals and one of them died from the burns she suffered a few days later. Again on 11 June 1887 there was explosion in a shed where four women were making what were effectively fireworks and two of them died. Mary provides details about the causes of these explosions and the actions to be taken to try to prevent their recurrence. Much of this information has been gleaned from Explosives Inspectorate Reports, compiled by Col Vivian Majendie, the first Chief Inspector, who lived nearby in Charlton. It all makes a fascinating story and Mary notes that the factory was only a few yards away from the Millennium Dome site where, when the year 2000 arrives, many will see fireworks in safety, thanks to the work of people like Majendie.

GUNPOWDER PRODUCERS AS ZOO-KEEPERS

Keith Fairclough

In a 1990 issue of the GMSG newsletter P Hyde brought to light evidence of gunpowder production at Faversham as early as 1573, when she noted that a local muster roll of that date included Thomas Gyll, gunpowder maker.(1) It seems probable that this was the same Thomas Gyll who in January 1573 was awarded a grant for life in the office of keeping the lions, lionesses and leopards in the Tower of London. In September 1586 Gyll handed in this grant when a new grant for life was awarded for the lives of him and his son Ralph, and it was not until the death of a William Gill in 1686 that the family lost this lucrative position looking after the Royal Menagerie at the Tower.

It was a popular tourist attraction of the day.(2) Is it possible that it was his service to the state as a gunpowder producer that gained Thomas Gyll this reward or was it that his link to the Tower led them into gunpowder production? Whatever, nothing else is known about Thomas Gyll as a gunpowder producer, and there is no evidence that any of his descendants at the Royal Menagerie were involved in the gunpowder industry.

Curiously another gunpowder producer had links with the Royal Menagerie, for the will of Samuel Cordwell who produced gunpowder at Chilworth from 1636 until his death in 1649 mentions the possession of a reversionary grant to 'the keeping of the Lyons, Lyonesses and Leopardes in the tower of London' for 40 years. This grant was left to his son Luke, but until he came of age it was to be enjoyed by Samuel's brother, Robert, who was executor of his will and who made gunpowder at Chilworth mills until his own death in 1650.(3) There is no evidence to suggest that the Cordwell family ever gained control of the Tower's menagerie, notwithstanding this reversionary grant. It is possible that Samuel Cordwell was related to the Gyll family for in July 1596 a Robert Cordwell married Bennett Gyll at St Giles Cripplegate, but no other evidence of a link has been found.(4)

1. P Hyde, Gunpowder Mills Study Group Newsletter, 7 (May 1990), p 11.
2. Calendar Patent Rolls 1572-75, 74; Draft Calendar of Patent Rolls 28-29 Elizabeth 1 1585-87 part 1, List and Index Society Vol 242, p 43; F W Steer, 'The Gill family of Mucking and their connection with the Tower of London', Essex Review, Vol 51 (April 1942), pp 61-71: A C N Borg, 'The Royal Menagerie' in J. Charlton, editor, The Tower of London, its buildings and institutions (London, 1978), pp 100-3.
3. Family Records Centre, PROB 11/203 sig 41.
4. Guildhall Library, Mss 6419/1.

GUNPOWDER AND THE SLAVE TRADE

Alice Palmer had drawn our attention to Hugh Thomas's book *The Slave Trade, the History of the Atlantic Slave Trade: 1440-1870* (Picador, 1997), IBSN 0 330 35437X. In particular pages 324-5 give detailed information on trade in guns and gunpowder. It seems that West Africans developed a taste for guns from about 1650 and in the 18th century the cargo of Dutch ships setting off for Africa was usually 14% gunpowder and 9% guns. The total number of guns exported from Europe in the second half of the century approached 300,000 a year. Many of these were inferior and King Tegbesu of Dahomey complained that a consignment which he had bought from the English burst whenever they were put to use, and hurt his soldiers. A captain of a Liverpool ship reported in 1765 that gunpowder is "an article on which there is the greatest gains of any in the trade". In the 1770s and 1780s the quantity of gunpowder imported to Africa from Britain exceeded 1,000,000 pounds annually and in 1790 it exceeded 2,000,000 pounds.

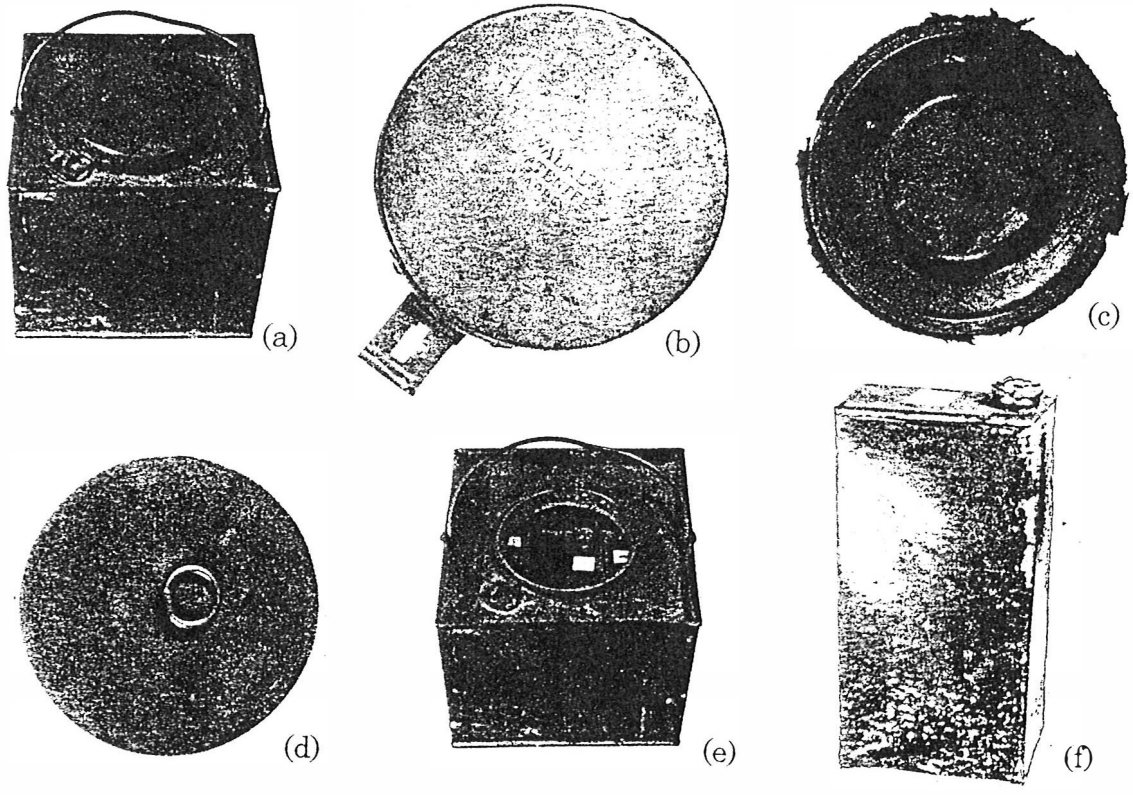
EXPLOSIVE MIXERS MANUFACTURED BY BAKER PERKINS

Ron Jackson, a friend who works for Baker Perkins Ltd, Engineers of Peterborough, has informed me that the company were major manufacturers of explosives mixers. He says that the design goes back at least to the beginning of the 20th century and was used extensively throughout the British explosives industry from before World War I to at least the mid 1960s, when they were supplied in large quantities to Iran (before the revolution). He suggests that the same type of mixer could have been used by both sides during World War I, as the Peterborough factory was taken over from a German company, Werner and Pfleiderer, at the end of the war.

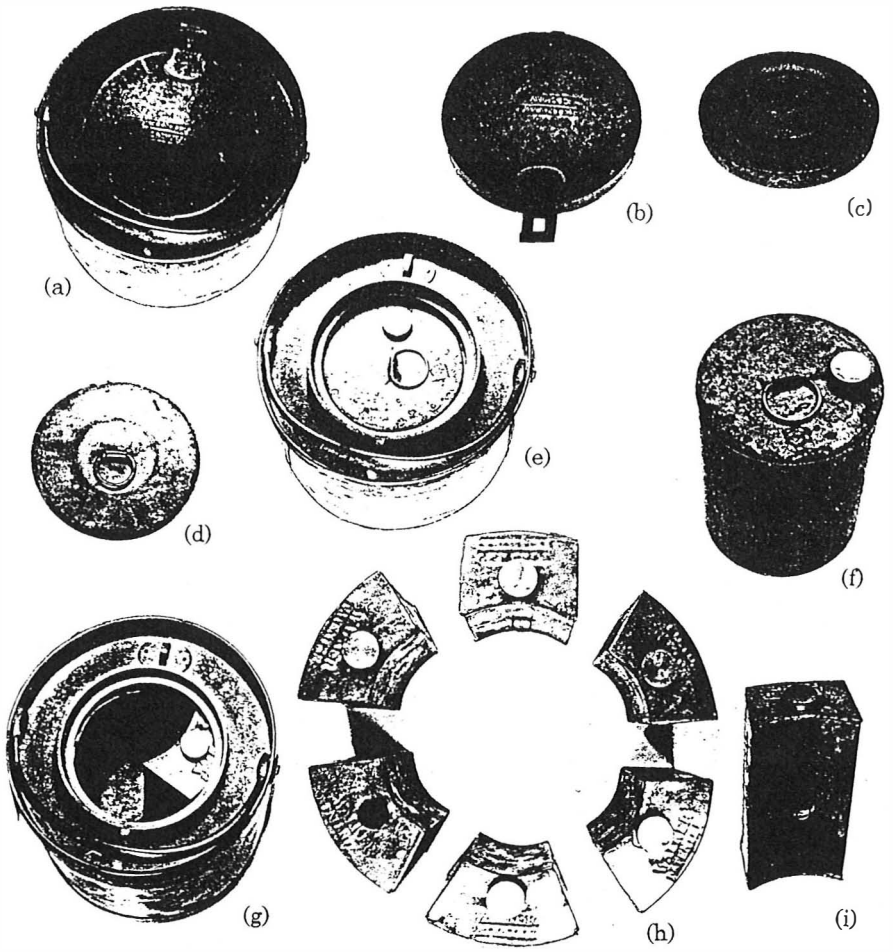
Ron has also sent information about Mr Perkins's steam gun. This was tested, in the presence of the Duke of Wellington and many other eminent people, at the Perkins factory near Regent's Park, London, in December 1825. "The discharges of steam were almost incessant for two hours, during which its incalculable force and astounding rapidity in discharging balls excited amazement and admiration in all those present. Mr Perkins's gun opens a new era as regards warfare, which we conscientiously believe, will ultimately lead to universal peace." - *The Courier, 9 Dec 1825, page 1.*

EARLY COPPER POWDER MAGAZINES

Will Adye-White has sent us the accompanying sets of photographs, taken from sale catalogues, of two Walker's patent copper magazines thought to date from the 1830s.



Magazine 1. This is 10" square and 9" tall. It has a handle of forged iron and contains 17 (originally perhaps 18) rectangular one pound cans with brass caps. The photographs show (a) the complete magazine, (b) the outer lid, (c) the intermediate lid edged with leather or similar material, (d) the inner lid, (e) the magazine with the three lids removed and (f) a can.



Magazine 2. This is 8" in diameter and 8½" tall. It has a handle and contains one central cylindrical red can with a brass cap surrounded by six wedge-shaped cans with brass caps (one of which is missing). After taking out the central can, it is possible to remove the others, starting with the key can which has a small handle. The photographs show (a) the complete magazine, (b) the outer lid, (c) the intermediate lid, (d) the inner lid, (e) the magazine with the three lids removed, (f) the central can, (g) the magazine with the central can removed and the key can displaced towards the centre, (h) the six wedge-shaped cans and (i) the key can with its handle.

An account of Walker's patent copper powder barrels (or magazines) has been given by **Bill Curtis** in chapter 15 of *Gunpowder: The history of an international technology* (Brenda Buchanan ed, University of Bath, 1996). They were patented in 1810 and tested by the East India Company (EIC), who in March 1814 sent a consignment of Pigou & Wilks gunpowder partly in wooden barrels and partly in Walker barrels aboard the *Thomas Grenville*. The ship returned in June 1815 and proof tests were carried out in September 1815. The powder in the wooden barrels was lumpy, had to be broken up before use and had suffered an average loss of 18% in range. The powder in the Walker barrels was in perfect condition. The Walker barrels were made in considerable quantities for the EIC and for commercial use and in small sizes for civilians. By 1820 the Royal Laboratory was making examples for trial by the Navy, who seem to have adopted them generally by the 1840s. However Bill Curtis considers that they were not as widely used as they should have been. GMSG member **David Harding** has pointed out that Walker was a managing owner of an East Indiaman.

AN EXPLOSIVE EPISODE IN DORSET - THE HOLTON HEATH CORDITE FACTORY. A DAY SCHOOL AT BOURNEMOUTH UNIVERSITY

Alan Bailey

This event was held on 23 May to mark the launch of the Royal Naval Cordite Factory Association. After introductory remarks by Dr J Beavis, Mr W Cocroft described his project to survey all the explosive manufacturing sites in England for the Royal Commission. He covered the period from the Civil War to today, the sites ranged from Waltham Abbey in Essex to the vast sites from the last war covering hundreds of acres and employing thousands of people. Today, very little explosive manufacture takes place in the UK, all of the gunpowder used being imported.

Next Dr S Alford described the chemistry of explosives from early forms of gunpowder to modern plastic explosives. He came complete with demonstrations, but the University fire alarm system for the lecture theatre could not be disabled. Therefore at lunchtime we relocated to the open air where a number of satisfactory demonstrations including small explosions took place to the delight of the spectators.

In the afternoon Mr W Harry, who started work at Holton Heath in 1942, described his work in the laboratory, carrying out tests on cordite, and also described annual events such as the flower show. He left later to enter the RAF for war service and subsequently returned to the explosives industry.

As well as the Holton Heath factory, another plant to double production was built in the last war near Chepstow - RNCF Caerwent. Mr M Parry described the Caerwent site which covered over 1000 acres. Explosive manufacture ceased after the war, but the site was used up to 1991 to store munitions for US forces. There are many buildings left standing, some of which may be preserved.

After the tea break, Dr D Evans described the current planning state for the Holton Heath site, from the Purbeck District Plan. A detailed archaeological survey of the remains on the site is required and English Heritage may list some of the buildings. Mr L Hayward outlined what the RCNFA hoped to achieve in the future - funds are needed to conserve and air-condition the site model - and to prepare a Lottery bid for the proposed museum.

Dr J Beavis said the proposed museum was important as it could be embedded in the community development plan. It is about the history of technology and could be used for a proposal for a national grid for learning for schools - subject Industrial Archaeology. The most important resources were the people who had worked there and their memories.

The day was attended by 40 people ranging from those interested in the history of explosives to those who had worked at Holton Heath and had family connections. One was Mr Alexander, aged 90, who started work at Holton Heath in 1924. The first formal meeting of the Association was arranged to be held at Holton Heath Administration Building at 7pm on 10 June.

GUNPOWDER IN JOHN GIBBON'S *THE ARTILLERIST'S MANUAL* OF 1860

This book by John Gibbon is dedicated to the officers of the United States Artillery. It was first published by Van Nostrand in 1860 and reprinted by the Greenwood Press, ISBN 0-8371-5007-8, in 1970. It has 14 chapters on different aspects of artillery (gunpowder, ordnance, form of ordnance - materials, rifles, projectiles, artillery carriages etc, the theory of fire, the practice of fire, fuzes, implements, ammunition, field artillery, attack and defence of places, passage of rivers etc).

The gunpowder chapter occupies pages 9 to 49 and contains a wealth of information. After a brief historical introduction the three ingredients, charcoal, nitre and sulphur are described in detail. Manufacture using pounding mills (stamps) and cylinder or rolling mills (edge runners) is then described and the two methods compared. One interesting point is that in France, because pounding mills were still being used, open-pit charcoal was preferred as cylinder-charcoal was too hard to be pulverised thoroughly by the pestles. The French claimed that their method was "better adapted to the promiscuous service of all arms", was less injured by exposure to moisture and was less injurious to guns. Gibbon rejects these claims saying that French powder had to be worked for at least 14 hours to be of a force nearly equal to US powder, which was worked from between 30 mins and 3 hours. He also notes that "the force retained by some Waltham powder, after being kept for 30 years without special care, speaks strongly in favour of the English mode of manufacture".

The processes of mixing, graining, glazing, drying and dusting are also examined. This is followed by statements about the ideal density of powder and methods of obtaining its specific gravity. Packing was in 100 lb barrels, 20½" long and 14" in diameter, with enough vacant space for the powder to move when rolled in order to prevent caking. The inspection and testing of powder and the proportions of the three ingredients are then explained in great detail. There are sections, for example, on combustion, ramming, pressure, ignition, rate of burning, the mortar eprouvette, the ballistic pendulum and Navez's machine. This electro-ballistic machine had been invented by a captain in the Belgian army and adopted throughout Europe but not in the US, so Gibbon uses 14 pages to describe it in detail. He then writes about hygrometric qualities, restoring unserviceable powder, storing powder, ventilating magazines and transportation. Finally, there is a 4-page section on guncotton.

I am indebted to **John Day** for lending me his copy of this book.

Alan Crocker

PHOTOGRAPHS OF POWDER CANISTERS

Will Adye-White has kindly sent us about 120 colour photographs of powder canisters, mainly from his own collection.

The British firms represented are: Chilworth Gunpowder Co, Guildford, Surrey; Curtis's & Harvey, Hounslow, Middlesex; E C Powder, Dartford, Kent; J W Edge, Mancheaster (gun manufacturer); John Hall, Faversham, Kent; Kames, Millhouses, Argyll; New Explosives Co, Stowmarket, Essex; Nobel's, Ardeer, Ayr; Pigou's & Wilks, Dartford, Kent; Pigou, Wilks & Laurence, Dartford, Kent and Battle, Sussex; Schultze, Eyeworth, Hants; J & T Sharp, Chilworth, Surrey.

The North American firms include: Austin, Cleveland; Bellona, Baltimore; California, San Francisco; Dittimar, Boston, Baychester and Binghamton, New York; Dupont, Wilmington; Oriental, Boston; Hamilton, Montreal; Hazard, Hazardville, Connecticut; Robin Hood, Winnipeg; King, Cincinnati; Laflin Rand, New York; Laflins, Smith & Boies; New England, Boston; Oriental, Portland and Boston; Wm Russell, Bennington, Vermont; Savage, Utica, New York; Schachticoke, New York; Sycamore, Tennessee.

There is also a canister of Luigi Colombo, Genova.

It is proposed to select examples of these photographs which will copy satisfactorily to illustrate issues of the GMSG Newsletter. Also if any member would like further particulars of the canisters for any particular firm please let me know.

Alan Crocker

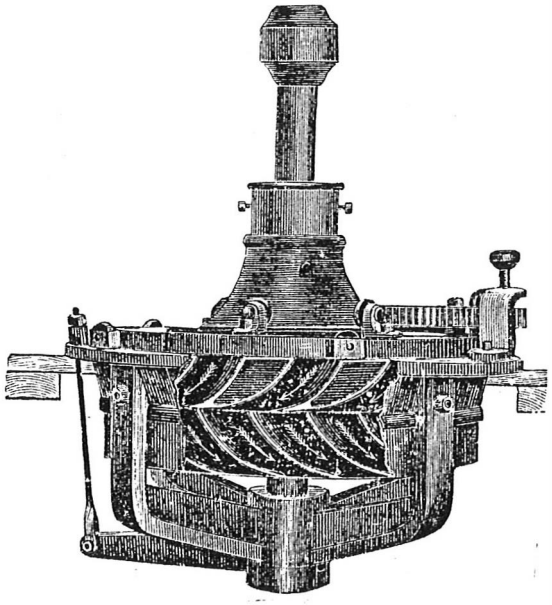
JONVAL WATER TURBINES AT GUNPOWDER MILLS

Alan Crocker

Keith Fairclough has discovered a reference reporting that Jonval water turbines were installed in the mid-1860s at the Royal Gunpowder Factory at Waltham Abbey and at Messrs Curtis's & Harvey at Glyn Neath, by Hick Hargreaves & Co of Bolton.(1) As reported in GMSG Newsletter **16** (Feb 1995) pp 17-18, I was already aware that this firm had supplied turbines to these mills but did not know that they were Jonval turbines. This is interesting as a Jonval turbine, unused since 1903, survives at the former sawmill of the Ballincollig gunpowder mills in County Cork. This example has been discussed in detail by Colin Rynne.(2) It was installed in or about 1854 by a Mr Perrot, who is otherwise unknown.

The earliest successful water turbine was developed by Fourneyron in France in the 1820s and has two concentric horizontal wheels with opposed vanes. The inner wheel is fixed and known as a stator. It is surrounded by a rotating outer wheel known as a rotor. The water spirals outwards through the stator causing the rotor which is mounted on a vertical shaft to turn. Through gearing this drives machinery in the mill. One problem with the Fourneyron turbine is that the rotor is large and therefore relatively heavy so that there is a tendancy for the bearings to wear quickly. This problem is overcome by the Francis turbine in which the water flows inwards through the vanes of a stator before entering a smaller rotor. This type became very common in the late 19th century.

The Jonval turbine, developed in France in 1843, is different in that the water flows axially downwards through a fixed horizontal wheel with curved vanes below which is a rotor that acts as a multi-vaned propellor. This is again mounted on a vertical shaft and hence drives machinery. Advanced types of Jonval turbine were still being made in the 1890s and were said to be 73-83% efficient and to be suitable for low to medium heads of water.(3) They were supplied by many manufacturers, the accompanying illustration being Bodine's Jonval as advertised in 1887.(4) However, in a Gilkes catalogue of about 1890, it is available but not illustrated and not strongly recommended, being said to be expensive.(5)



If members know of other examples of Jonval turbines which were installed in gunpowder or other mills, please let me know.

References

1. 8th Annual Rpt. of Transactions National Association of British and Irish Millers (1886). BL, 8245cc, 7-10th Annual Reports.
2. Colin Rynne, "An Early Turbine at Ballincollig Gunpowder Works", Journal of the Ballincollig Community School Local Hist. Soc., 1986, pp 13-17.
3. Charles Singer et al (eds), "A History of Technology", **5**, p 529, Oxford, 1958.
5. Anon, "Illustrated Catalogue of Bodine's Jonval Turbine", The Gennessee Valley Manufacturing Co, Mt Morris, New York, 1887.
4. Gilbert Gilkes, "On the Development of Water Power", Kendal, c1890.

PROGRESS ON THE WALTHAM ABBEY PROJECT

Alan Crocker

In GMSG Newsletter **22**, Feb 1998, pp 18-19, Brenda Buchanan summarised the background to the Waltham Abbey Project and I commented on the rescue of buildings and documents from the South Site. Since then, there has been a great deal of progress on the plans for opening the site to the public in April 2000. Much of this involves detailed administration and management matters and may not be very exciting but it is all crucial to the success of the project. The Trust Company on which Brenda serves is now known as The Waltham Abbey Royal Gunpowder Mills Charitable Foundation Ltd or the "Foundation" and the Operating Company on which I serve has become The WARGM Co Ltd or the "Company". After much negotiation, the wording of a Management Agreement between the Foundation and the Company and of a Lease of the site from the Foundation to the Company has been agreed and these are due to be signed formally in August 1998.

A Chief Executive Officer, Robert Saunders, who has a wealth of experience in developing heritage sites, took up office in June and a Project Delivery Team, led by Turner & Townsend Project Management, has been established. This includes interpretive display specialists, architects, landscape architects, service engineers, structural engineers, transport and traffic consultants, planning supervisors, woodland consultants and quantity surveyors.

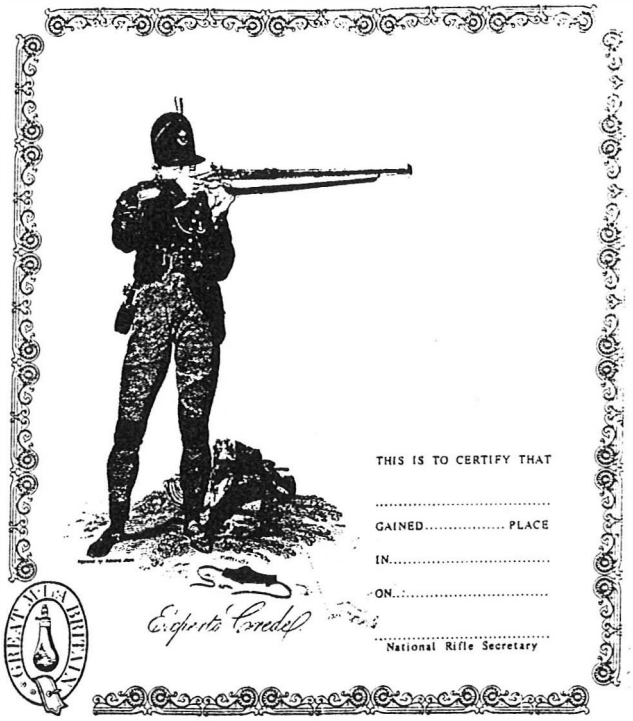
The (abbreviated) key objectives are: (1) To conserve by maintaining for posterity the designated site, structures and ecology. (2) To foster the public understanding of the site's unique combination of social, technological and ecological interest through controlled visitor access and educational services. (3) To ensure that the ongoing maintenance and management commitments are financially sustainable. The key requirement is to attract at least 78,000 visitors a year with an average entrance spend of about £5.

At present, largely because of restrictions imposed by The Heritage Lottery Fund, the site is being developed as an "interpretive heritage site" and not as a museum. This means that the displays will not be object-based but use multi-media, audio-visual, graphics, models, selected objects and other devices "to engage the public imaginatively, inspirationally and educationally so that they have an enjoyable and worthwhile experience of the site". Some of us are not happy with this policy!

The Board of the Company on which I sit consists of 20 people, most of whom live in or near Waltham Abbey. Only a few have much knowledge of gunpowder and modern explosives and propellants. Most have experience in business, local government and national government. However there are two school teachers and two with museum experience. There are various sub-groups including Revenue and Marketing, Site Management, Interpretation (formerly Curatorial), Education, and Community Relations. There is also an Academic Advisory Board which reports to both the Company and the Foundation. Brenda Buchanan now chairs this Board, Wayne Cocroft represents RCHME, I represent the Company and Steve Chaddock (as site archaeologist) is in attendance.

Brenda Buchanan arranged for the Newcomen Society to hold a day meeting at the site on 25 April and this was very successful. Also the site is being opened to the public under the "Heritage Open Days" scheme on 12-13 September. However this is fully booked and there is a long waiting list. An attractive glossy Newsletter about the Project has been distributed to local households but unfortunately contains historical inaccuracies, particularly about the date when the mills were established in the 17th century.

A **Waltham Abbey Royal Gunpowder Mills Friends Association** has been established and GMSG members are encouraged to join. The annual subscription is £7 adult, £5 junior (under 18) and £10 family and should be sent (cheques to WARGM Friends Association) to the Chairman, Norman Paul, 24 Anglesey Close, Bishop's Stortford, Herts CM23 4PE .



Bill Curtis gave each member attending the Bisley meeting on 6 June an unsigned copy of the certificate of the Muzzle Loading Association of Great Britain, which is reproduced here (x 0.4). The original is on white card, with the figure and text in black, the logo at the bottom left in red, the border in blue and a large feint central logo (hardly visible here) in grey.

PRINCIPAL CONTENTS

Names in brackets indicate sources of information rather than authors

Deadline for contributions for Newsletter 24 is 15 Jan 1999 but earlier submission, especially on 3.5" floppy disc would be helpful.

Published by the Gunpowder Mills Study Group
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