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**Gunpowder Mills Study Group**

**NEWSLETTER 13, AUGUST 1993**

**MEETING AT THE INSTITUTE OF HISTORICAL RESEARCH,  
SENATE HOUSE, UNIVERSITY OF LONDON  
SATURDAY 25 SEPTEMBER 1993**

**PROVISIONAL PROGRAMME**

- 10.00-10.30 Assemble and Coffee in Common Room
- 10.30-11.00 'Phillippa Walton, Powdermaker': Keith Fairclough
- 11.00-11.20 'Stamp and Edge-Runner Gunpowder Mills in the 18th Century':  
Glenys Crocker
- 11.20-11.50 'Recent Research on Faversham Mills': Jenny West
- 11.50-12.20 'The Last of the Powder Makers: a Personal Account of  
Smokeless Powder Manufacture, 1947-1956': David Ashton
- 12.20-13.00 General Discussion
  
- 13.00-14.00 Packed lunch in Common Room or use nearby cafeterias and pubs
  
- 14.00-14.30 'Opening of the Visitor Centre at the Royal Gunpowder Mills  
Ballincollig': Alan Crocker
- 14.30-15.00 'Current Developments at Waltham Abbey': Discussion led by Ken  
Bascombe
- 15.00-15.30 'The GMSG International Survey of Gunpowder Mills': Brenda  
Buchanan and Alan Crocker
- 15.30-16.30 'Ideas on future Group Activities and Management': General  
Discussion

We shall be meeting in The International Relations Room on the second floor of Senate House. Goodge Street, Warren Street, and Russell Square underground stations are nearby. Parking might 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 made. It would be helpful to know approximately how many people will be attending. Please therefore let Glenys Crocker know if you are coming (6 Burwood Close Guildford, Surrey, GU1 2SB; tel 0483 65821).

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**VISIT TO THE WALTHAM ABBEY GUNPOWDER SITE**

CIVIX, the consultants who are advising the Ministry of Defence on the proposed developments at the former Royal Gunpowder Mills at Waltham Abbey have invited members of GMSG to visit the site on the afternoon of Friday 24th September, the day before our Autumn Meeting. We shall meet at the main entrance at 14.30. We have agreed to let CIVIX know, on Monday 20th September, the names of those coming. So, please let us know before then if you would like to come. Eds.

## THE GUNPOWDER MILLS STUDY GROUP: ITS PRESENT POSITION AND FUTURE PLANS

The Study Group, especially its Chairman and Secretary, can take much of the credit for the present heightened degree of awareness of the historical importance of the gunpowder industry. This has been achieved through the essential groundwork undertaken by the Group in exploring sites, compiling a gazetteer and bringing together interested members in meetings which have included days or weekends in London, or longer field trips to the regions or abroad. Through scholarly articles and books, and by contact with societies with similar interests, a wider public interest is now being formed. This may at present be seen most actively in the concern expressed about the future of important sites such as at Waltham Abbey. But what of the future of the subject itself, and of ourselves as an informal study group?

The following remarks do not ask that we should lose our present informality, but that we should build upon it in order to strengthen our approach to the subject. In particular we need to set aside time to discuss our future projects. At a practical level the inclusion of a regular business meeting would allow us to avoid as far as possible a clashing of dates with the industrial archaeology or other groups to whom members have a responsibility. More importantly, it would allow us to discuss the organisation of meetings on significant themes in addition to those which have a regional base. It would for example be very helpful if we could discuss 'Problems in the Manufacture of Gunpowder', looking particularly at the technology involved. The wide range of expertise in our Group could be brought to bear on this subject, and an edited volume of proceedings could then be the welcome outcome.

Longer term plans could involve the organisation of an international meeting. Our contacts are extending all the time in this respect, and it would be worthwhile consolidating these, perhaps under the umbrella of a larger organisation. We could look for accounts of manufacture in different countries, or again adopt a theme, such as 'Trade in the Raw Materials and Finished Product of Gunpowder'.

Plans such as these for meetings at a national and international level would help us to focus our aims as a Group and to define our research interests as individuals.

Brenda Buchanan

## FINANCIAL POSITION OF THE GROUP

As the Group has always been managed in an informal way, we have never had regular financial statements. However, in view of the last item on the Programme at the forthcoming Autumn Meeting, the following information might be helpful. In practice Glenys Crocker, in her role as Secretary, has handled the Group's financial affairs. She uses the Guildford High Street branch of the NatWest Bank and at the end of the 1992-93 financial year the balance was £358.38. The chief regular expense is for the newsletter, which costs approximately £35 per issue. Bank charges in 1992-3 totalled £32. Also in 1992 we spent £35 on displays for the Waltham Abbey Planning Forum and the Guildford Civil War Fair.

## GUNPOWDER PRODUCTION AT WALTHAM ABBEY IN 1561?

Keith Fairclough

In 1561 a merchant of Venice, Marc Antonio Erizzo, wrote a letter to a John Thomworth (Tamworth) at Waltham Abbey in which he mentioned the possible sale of saltpetre. This letter has been cited as evidence that gunpowder was being manufactured at Waltham Abbey at this date, the assumption being that Tamworth was the producer. Yet the letter does not warrant such an interpretation. It is a letter from a foreign merchant to an influential courtier discussing several possible sales. The main concern was a jewel which Erizzo was trying to sell to Queen Elizabeth but he also mentioned a deal in hides, tin and lead, for which he offered as security those sums already due to him for previous sales of bows\* and sulphur. It is only at the end of the letter that he mentions that he cannot supply saltpetre at less than £3.10/- a cwt and in any case he could not supply it immediately. Erizzo asked Tamworth to write to Cecil on these matters. At the same time Erizzo wrote to Cecil offering to sell saltpetre from Naples at 10d a lb and brimstone from Italy at 20/- a cwt. (1)

Tamworth was not a gunpowder producer, but he was an influential figure at the court of Queen Elizabeth, and he was then living at Waltham Abbey. He was one of the grooms of the Queen's Privy Chamber, a department of state that had formerly been the government treasury and which still had some financial role at this date, even though the Treasury had taken over most of the more important financial functions. (2) Evidence of his prominence is that in 1563 he was granted the right to retain twelve men besides his household servants, that he was the Receiver of Lincoln, and that in 1565 he was sent to Scotland on a mission to intercede with Mary Queen of Scots on behalf of the Scottish lords who opposed her proposed marriage to Darnley. (3) Such was his prominence that in 1565 when Daniel Hochstetter was seeking authorisation for the Society of the Mines Royal, Tamworth was one of those who was offered shares in the venture, along with the Earls of Pembroke and Leicester, Sir William Cecil, and the London alderman Lionel Duckett. Indeed Tamworth became a Governor of this and an associated company, the Company of the Mineral and Battery Works, holding a moiety of one twenty-fourth share in the former and one thity-sixth share in the latter. (4) Gunpowder makers were not this illustrious or this important.

Tamworth did live in Waltham, but seems to have left and moved to London by his death in 1570. In 1553 he was appointed an executor of the will of Dame Joan Denny, the widow and mother of the lords of the manor of Waltham. In 1557 he was said to be living at Waltham Holy Cross. In 1560 he possessed a granary at Waltham. In 1563 he gave 20 loads of timber to the church at Waltham Abbey, and he served on the Essex bench until about 1565 when he probably moved to London. (5) His will does mention property at Waltham, a lease to Sheepcotefeildes, and land known as Oxlees which brought in an income of £20 a year, but his main property does seem to have been the manor of Sutton in Lincolnshire, property in Hendon, and his shares in the mining and metal ventures. In 1569 when he made his will he was living in London and Fulham. (6)

If Tamworth is an unlikely producer of gunpowder, what of the mill sites at Waltham? The site later associated with gunpowder was a fulling mill until

\* ["bow staves for barrels": State Papers Foreign, 2nd Mar 1561. Eds]

1643, and there is no evidence to suggest any other use until it was converted to an oil mill at some date between 1643 and 1665 and then a gunpowder mill in 1665. (7) The mill near the abbey was a corn mill, and again there is no evidence of any change of use. (8) The mill at Sewardstone was definitely a gunpowder mill in the 1640s, but although no evidence for its use has been found before that, the probability is that it was converted to that use by John Berisford who began to supply the Ordnance Board in 1641. (9) There is no proper evidence to suggest that gunpowder was made at Waltham before the Civil War, so that persistent stories that it was gunpowder from this parish that was used in the Gunpowder Plot of 1605 must also be discounted.

#### References

1. Calendar of State Papers Foreign 1561-62, 1-2
2. Calendar of Patent Rolls 1555-57, 329; F C Dietz, English Public Finance 1558-1641 (New York, 1937), 407-12
3. Calendar of Patent Rolls 1560-63, 213; Calendar of State Papers Foreign 1563; *ibid* 1564-65, *passim*; P W Hasler, The History of Parliament: The House of Commons 1558-1603 (3 vols, 1981), iii. 474-75
4. Calendar of State Papers Domestic 1547-80, 255; W R Scott, The Constitution and Finance of English, Scottish and Irish Joint-Stock Companies to 1720 (3 vols, 1910-12), ii. 384-85; Public Record Office (hereafter PRO, PROB 11/52(8))
5. PRO, PROB 11/36(11); Calendar of Patent Rolls 1557-58, 329; T Fuller, The History of Waltham Abbey in Essex (1665), 20; J S Cockburn, editor. Calendar of Assize Records, Essex Indictments, Elizabeth I nos 3, 24, 46, 78, 90, 133, 166, 190. Of Tamworth's donation of wood Fuller commented 'This Gentleman ... seems better known to god than to me, having neither heard nor read of any of his name living in or near to Waltham'
6. PRO, PROB 11/52(8)
7. Fairclough, 'Early gunpowder production at Waltham', Essex Journal, Vol 20 no 1 (1985), 11-16. Several references can be cited to show a continuing fulling mill and that it was later converted to a gunpowder mill: Calendar of Patent Rolls 1553, 58-9; F G Emmison, Elizabethan wills of south-west Essex (Waddesdon, 1983), 20; N F Ticehurst, The mute swan in England (London, 1958), 67; Essex Record Office (hereafter ERO), T/R 36/1, September 1613; ERO, T?A 316/87; PRO, C142/718 no 143; British Library (hereafter BL), Add Mss 5505 fo. 23-24; ERO, D/DJg M1 fo. 41
8. References to Waltham Abbey corn mill include: PRO, E318/28/1572-73; Northamptonshire Record Office (hereafter NRO), WC Box 10 no 135; Hatfield House, Petitions 1434; ERO, Calendar of County Records (Essex), Sessions Records 1611-24, 221/93, 221/19; BL, Add Mss 5505 fos. 23-24; NRO, Additional Wake Papers 1965/129
9. Fairclough, 'Early gunpowder production at Waltham'

**DEVELOPMENTS AT WALTHAM ABBEY****Alan Crocker**

In Newsletter 12, I reported on the proposals to redevelop the Waltham Abbey site and noted that several members were due to attend a meeting at Waltham Abbey Town Hall on 22 March. At that meeting we were welcomed by David Stanners of the Ministry of Defence and then there were reports from Ron Dane of CIVIX, consultants to MoD, on the overall study and work to date, Don Spinks, Leader of Waltham Abbey Town Council on the local perspective, Dan Bone of CIVIX on achievements, Bob Watts of PSA Specialist Services on decontamination, Bob Stebbings, a consultant, on natural history, Bob McDonald of RMA/CIVIX on building surveys, Paul Everson of Royal Commission on Historical Monuments of England on the industrial archaeology survey, Martin Cherry of English Heritage on scheduling and listing, Renata Drinkwater of KPMG on a possible trust and Bob McDonald (again) on design options for the Trust.

Most of the discussion was on the Peat Marwick report on the feasibility of creating a trust to develop visitor attractions, of potentially national significance, and other leisure uses. They considered that the heritage potential was vital and that 130,000 visitors a year could be attracted after five years. However they estimated that there would be a funding gap of between £0.5M and £2.8M, depending on the sequence of developments. They felt that a charitable trust with 10 to 12 trustees was needed. The Town Council had been thinking of a rather larger group.

I have recently had a discussion with Ron Dane of CIVIX and the present position is as follows. This summer it is anticipated that most of the site will be scheduled as an ancient monument and that many of the buildings, including the incorporating mills, will be listed. The group involved in decontaminating the site has employed a Royal Commission archaeologist to monitor and advise on the work. Middlesex University has set up a Lea Valley Co-ordinating Committee which is vigorously pursuing a proposal to establish a Heritage Centre in the area. GMSG members Jim Lewis and Daniel Weinbren, who work at the University, are involved and Keith Fairclough spoke at a recent meeting organised by the Committee. They are holding a conference in November. English Heritage have plans to hold an international conference based on work at the Waltham Abbey site next spring (originally tentatively planned for this autumn). Finally a committee with a brief to set up a Trust sometime next spring has met on a couple of occasions. It all seems encouraging.

**AN ACT FOR MAKING SALTPETRE, PRINTED BY JOHN FIALD, LONDON, 1652**

This first edition folio (title and 6 pp, new boards) was offered for sale for £120 by Young's Antiquarian Books of Tilligham, Essex CMO 7ST (tel 0621 778220) in their catalogue 48. The blurb states:

"Not in Wing. The government were concerned about the supply of gunpowder and by this act encouraged the saltpetremen to dig for it. They were permitted to dig on private property so long as restoration was made - the penalty for failure being somewhat severe - and the digging times were strictly laid down".

## THE LIVERPOOL GUNPOWDER MAGAZINES

Alan Crocker

Between 1737 and 1945 gunpowder was stored in magazines at several sites around the mouth of the Mersey. The locations of three of these are known and are indicated in figure 1. The earliest was on Brownlow Hill near the centre of modern Liverpool, the second was on the opposite bank of the Mersey at Liscard in Wallasey and the third was farther upstream on hulks moored in the river off Bromborough.

### The Brownlow Hill Magazine

During the 1730s the Liverpool slave trade was developing rapidly. Gunpowder was one of the commodities involved and it was also needed for the guns used by the ships. (1) At that time gunpowder was not being made locally, the earliest mill in the north of England, at Thelwall in Cheshire, being built by Liverpool merchants in 1758. (2) However in 1737 three powdermakers from the south of England, Robert Norman of East Molesey in Surrey, Samuel Underhill of Bedfont in Middlesex and Thomas Pearse of Faversham in Kent and Chilworth in Surrey built a magazine in Liverpool on what is now the north side of Brownlow Hill just above Russell Street. (3) Figure 2 shows a plan of this magazine, which measured 20 x 23 yards, and indicates how it was divided between the three owners. This is sketched

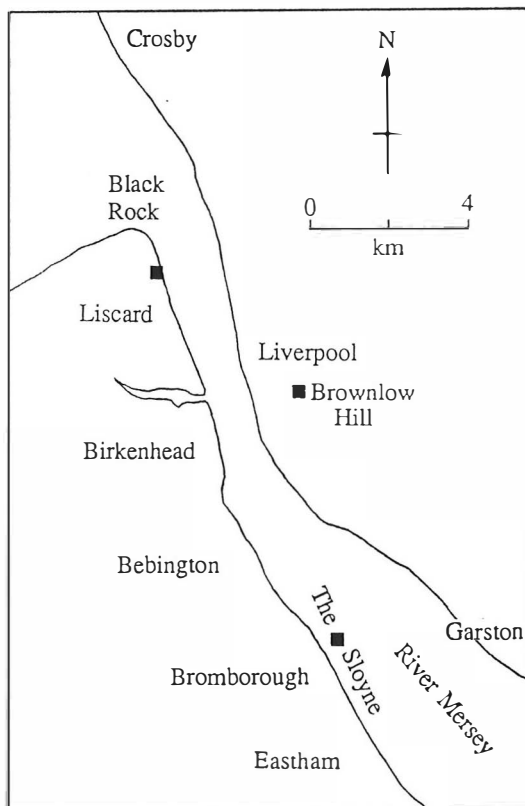


Figure 1. The three Liverpool magazines (squares) and other places mentioned in the text.

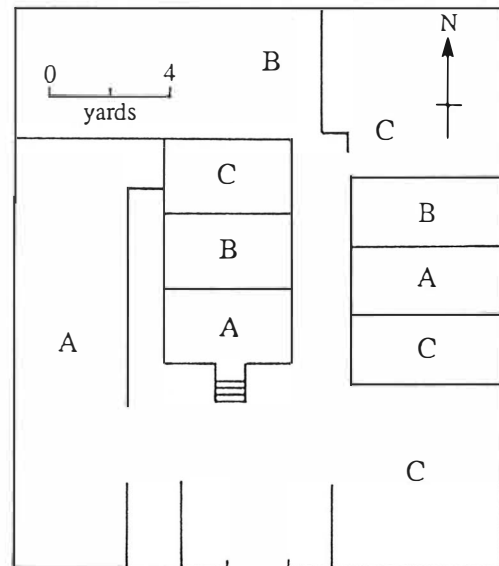


Figure 2. Sketch plan of the Brownlow Hill magazines in 1744. The areas marked A, B and C were occupied by Robert Norman, Samuel Underhill and Thomas Pearse respectively. The powder houses are at the centre and the filling rooms at the right.

from a map accompanying a 1744 lease which refers to "powder houses or magazines, filling rooms, vaults, cellars, buildings and premises". (4) It was surrounded by a close of land, again subdivided between the three owners, and measuring 56 yards E-W and an average of 129 yards N-S. The land was leased from the Corporation of Liverpool which in 1751 agreed to purchase "a piece of land in Cheshire, near the Black Rock, for to erect the powder magazines on, when they shall be removed from the present situation near this town". (3) This new magazine was built on waste land in the district now called Liscard.

### The Liscard Magazines

A 1753 inventory of the Faversham and Chilworth gunpowder mills includes newly built magazines at Liverpool with stock and effects. (5) In particular the building cost £8.10s.0d in 1752, the beam and weights £1.10s.0d and the gunpowder in store was worth about £160. This clearly refers to magazines at the Liscard site and soon other powdermakers were active there. Thus, for example, by 1756 Baugh, Ames & Co of the Woolley gunpowder mills near Bristol were exporting gunpowder from Liverpool and several other mills in the south of England were also involved. (1) Then in 1763 John Stanton, the Thelwall powdermaker, built a magazine at Black Rock, Liscard. (6) The first gunpowder mill in the Lake District, operated by John Wakefield, opened in 1764 at Old Sedgwick and was joined by Daye Barker's Lowwood mill in 1798. (2) In the early years of the 19th century when the slave trade was at its height, these two firms dominated the use of the Liscard magazines. (7) However the Thelwall, Hounslow, Bristol, Bedfont, Dartford, Ballincollig, Ewell and Greenock (Gorebridge?) powdermakers also used the site. Then in 1807 slave trading by British ships was abolished and the magazines went into decline. (7)

A considerable amount of information about the Liscard magazines is provided by a detailed report on the safety of the site, dated 1836. (8) This was prepared by Lt William Robinson of the Royal Engineers following a request by the Mayor of Liverpool addressed to Sir Hussey Vivian, Master General of the Ordnance. Robinson visited the magazines on 2nd and 4th February 1836 and his report includes plans upon which figure 3 is based. He explained that all vessels arriving at Liverpool with gunpowder were obliged to deposit it in the magazines before docking and it remained there until they went to sea again. The magazines were also used for merchants to store their powder. They were contained within a rectangular enclosure measuring 280' x 150' on sloping ground about 360' from the river and 45' above the high water mark. There were 33 magazine rooms in three low buildings and four additional rooms in a further building under construction. The rooms were of various sizes between 18' x 17' and 18' x 8' and the walls were about 8' high. The total storage space available was therefore about 30 times that at the earlier Brownlow Hill magazine. The outer walls were 14" and the partition walls 9" thick. Some were battened and boarded but others were plastered and whitewashed. The floors were boarded and fixed with wooden pegs. The roofs had slates fixed with iron nails, the undersides of the rafters being lathed and plastered. Each compartment had a door but only a few had a window. Locks, keys and hinges were of iron.

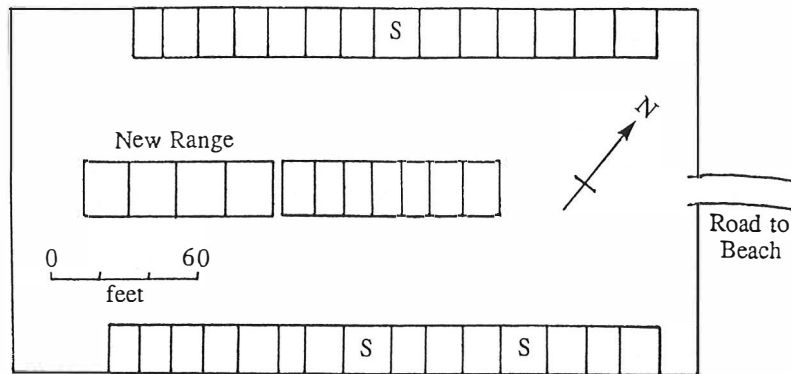


Figure 3. Sketch plan of the Liscard magazines based on an approximate survey ("the theodolite used having been found much out of order") carried out in 1836. There were 33 magazine rooms and three filling sheds marked S.

The powder was stored in whole, half, quarter and smaller barrels, which were "much inferior to those used in the King's service". They were stored in any arrangement convenient to the foreman, in some cases being on their sides piled to the roof. Up to 450 barrels were stored in a single chamber. The maximum number of barrels stored in the magazine over the past few years was estimated to be between 4,000 and 8,000 and about 24,000 came into the magazines from mills in a year.

The superintendant normally worked at an office in Liverpool and the foreman was in charge of the site. A few labourers took powder to and from the water's edge in two heavy and clumsy carts, the wheels having iron tyres. Each cart carried 25 whole barrels or the equivalent and there was no covering. A boat took 50 barrels at a time to or from vessels in the river. Some 400 to 500 barrels in a day were taken to or from the magazines and the men wore shoes made only of leather.

The magazine buildings also included three sheds used for weighing and moving powder from larger to smaller barrels. The scales had copper pans but an iron beam. Copper hammers were used for heading and unheading barrels and copper canisters for spare powder. In one shed there was 2,000 lbs of powder in small barrels with no covering. The sheds also acted as a shelter for the carts and were filled with empty barrels, old doors and windows, and fragments of wrecks with many iron nails. The roofs were old, with hollow or broken-backed ridges. The yard was the receptacle for old lumber, an old anchor etc and there was a trench for preserving potatoes. There were no drains and no lightning conductors.

Robinson considered that the magazines showed lack of attention and care and "anything more disreputable than the buildings or more insecure than the whole place could scarcely be conceived". He recommended that it be replaced immediately. However he conceded that there had only been one accident when in 1763 the West African brig *Charlotte*, laden with crockery, blew up just after taking her powder on board. Only one member of the crew survived. Robinson also noted that the deliberate destruction by the



British of two magazines, containing 4,000 barrels of gunpowder, a few days before the battle of Corunna in the Peninsular War caused no injury in the town 3 miles away. He concluded that if the Liscard magazines blew up no material injury would be caused in Liverpool, the nearest point of which was 1½ miles away.

The whole magazine was taken down in 1838-9 and entirely rebuilt. (9) The new premises had "separate chambers perfectly detached from each other, the intervening space being filled with earth and the whole being enclosed by a strong wall; this is again belted with a thick plantation and the whole surrounded by a lofty wall". However the population of Liscard and Wallasey was expanding rapidly and following an 1851 Act of Parliament the magazines were removed to hulks in the Sloyne, a channel of the Mersey, off Bromborough. At that time they were held by Curtis's & Harvey, The Royal Gunpowder Mills at Ballincollig and five other firms and they together received £9780 from the Corporation of Liverpool in compensation for the move. (10,11).

### The Bromborough Hulks and Powder Hoys

The magazines on the hulks at Bromborough were used from about 1852. A further Act of Parliament in 1865 restricted the transit of powder from the vessels and in 1881 the Admiralty set up a Committee of Inquiry because there was again considerable anxiety about possible damage from explosions. Then in 1890 the Manchester Ship Canal Co objected to the position of the hulks claiming that they would obstruct their canal, which was being constructed. At a public enquiry the case of the Canal Co was not accepted but, because the sandbanks in the Mersey had shifted, new anchorages were found for the magazines. (10,11)

In 1885 the owners of the floating hulks jointly formed the Liverpool Magazines Co Ltd. The workers lived in a little village of exceptionally solid houses and there were three old wooden hulks to store the powder. One of these was the *Swallow*, formerly owned by the Ballincollig Co but originally a steam river gunboat. (10,12) It was painted yellow and survived until 1946. The powder was taken to and from the hulks on four sailing boats known as flats or hoys. These were the *Bebington*, *Bromborough*, *Birkenhead*, and *Eastham*, being 60, 50, 40 and 40 feet long and weighing 43, 28, 11 and 16 gross tons respectively. All four were sloops constructed of oak, with 6" x 6" timbers, 2½" planking and ceilings of 2" pitch pine. The *Bebington* was built at Northwich in 1859 and the other three at Liverpool in 1852, 1861 and 1861 respectively. They had black hulls with a 5" red band and bold red diamonds on either bow preceded by the boat's number in red. The rudder heads and the top 3' or so of the masts were also red and red flags were flown. There were galleys on the hulks but not on the flats which were crewed by two men. (12)

By 1913 the Magazines Co had been taken over by Nobels who brought blasting powder by rail to Garston and then to the hulks on the flats. These also took powder from the hulks downstream to off Crosby, where it was transferred to ships of the Elder Dempster, United Africa Co and Clan lines, mainly for west and south Africa. Kegs containing 25 lbs of powder were loaded and unloaded by being sent down chutes and then passed like rugby balls. Explosives packed in boxes were much more difficult to handle.

The amount of powder allowed on the hoys was less than their capacity, only 25 tons being permitted for example on the *Bebington*. Before 1939 the fleet was unrigged and the *Birkenhead* was fitted with a Widdop diesel engine and became a tug for the hoys. They worked in this way until 1945. (12)

In conclusion I would like to stress that this article is based on very few records and much more needs to be done before a satisfactory history of the Liverpool magazines can be prepared. Indeed, I hope that its publication will encourage others to add to our understanding both of these magazines and those elsewhere in Britain and overseas. Finally I would like to thank Glenys Crocker who has collaborated on much of the research described and has provided a great deal of the information included.

#### References

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12. Paget-Tomlinson, E W, "Powder Hoys on the Mersey", *Mariner's Mirror* 62(4), Nov 1976, pp 353-5. (Copy and annotated typescript at Liverpool Record Office, R359.05 MAR and H387.2 PAG).

## OPENING OF THE VISITOR CENTRE AT BALLINCOLLIG

In the Postscript to Newsletter 12 (March 1993), it was noted that the new Visitor Centre at the Royal Gunpowder Mills at Ballincollig in County Cork, Ireland, would be opening to the public in April. However, the Official Opening, a splendid occasion attended by some 250 guests did not take place until 25th June. The 5-hour programme included a reception and buffet supper in the Centre, with an opportunity to view the exhibits and see the audio-visual, the blessing of the site by the local priest, a performance by the local brass band, the opening ceremony performed by the Chairman of Cork County Council, which included operating a sluice so that the restored waterwheel and incorporating mill worked, lots of thankyou speeches, a grand display of Chinese fireworks and of course lots of meetings between old friends and introductions to new friends. We were particularly pleased to meet Paula Cogan, who manages the Centre, Colin Rynne, the County Archaeologist who attended the GMSG meeting in South Wales in 1986, Brendan Kelleher, the County Planning Officer who we had met at a lecture by Arthur Percival in Kent, Fred Hamond, the Belfast millwright who had rebuilt vthe incorporating mill, Vincent Coneghan, who is interested in rebuilding a gunpowder mill at Corkagh Park, Dublin, John Harrison, who designed the displays and produced the audio-visual for the Centre, Commander Mick Hartnett of the Irish Army, which occupies an adjacent site and of course John Kelleher and his mother, who have published the late George Kelleher's book "Gunpowder to Guided Missiles. Ireland's War Industries".

In all we spent three days exploring the gunpowder site which really is very impressive. There are substantial remains of all the buildings associated with the mills. These are all 19th century and water-powered. We congratulate Cork County Council for their achievements in creating the Centre and encourage all members to take the earliest opportunity to visit it, to explore the site and to meet the very friendly and enthusiastic staff.

## GREAT BALLS OF FIRE

This was the title of an article by Paul Simons on the Weather Page of *The Guardian* on 18th June 1993. It describes what may have been the worst lightning disaster ever. On 27th October 1697 there was a ferocious storm at Athlone in central Ireland. This brought violent wind and torrential rain followed by thunder and lightning. Finally a searing bolt of lightning ripped into Athlone's castle blowing up 260 barrels of gunpowder and a great quantity of armaments. This demolished the castle and set fire to the surrounding town completely destroying 64 houses and burning almost all the rest. The entire castle and town had to be rebuilt but only eight people were recorded as being killed. A contemporary account of the disaster suggests that it was caused by a fireball but it is still not known whether this phenomenon is the same as ball lightning.

## NEW SEDGWICK GUNPOWDER MILLS: ARCHITECT'S DRAWINGS OF 1859

Alan Crocker

One evening in February, Robin Clarke, a friend who is a national authority on the history of paper mills, phoned to let us know that Hollett's, the antiquarian bookdealer of Sedbergh, had an interesting item for sale at £475. This was a set of seven sheets of drawings of buildings at the New Sedgwick gunpowder mills, which were licensed in 1857 and opened in 1858. The drawings were prepared in May 1859, by Richard C Shaw, an architect of Kendal. The following morning I phoned Hollett's and discovered that the Cumbria Record Office at Kendal had already purchased the item. I therefore phoned the Record Office and arranged to see the drawings when we were in the Lake District at Easter. Fortunately the documents (WD/CAT 12) are in good condition and unbound so that we were able to get photocopies, which cost only £5.43, including postage.

The drawings relate to the two buildings at the southern end of the site, which are shown in black on the plan of figure 1. They are the 'Coopers, Fitters, Blacksmiths etc' building, which will be referred to as 'the tower complex', and the 'Store Magazine'. Four of the drawings, measuring about 625 x 455 mm are of the first building, which is near the entrance to the site (NGR SD 508877). This is shown on the 1856-9 1st edition 1:2500 OS map as two adjoining buildings with a leat leading to a small square projection (see figure 2(a)). The drawings reveal that this complex was then a saw mill, a coopers' shop and a wheel house, as indicated. However they also show plans and elevations of a proposal to build a watch house, a new saw mill 23 ft wide and, by extending the wheel house upwards, a clock tower 37 ft high (see figure 2(b)). Later plans of the site and the surviving buildings show that these extensions were indeed carried out. Of particular interest is the square wheel house, which was clearly built to accommodate a water turbine and not a conventional water wheel. Now presumably the wheel house was built in 1857-8 and at about that time the Sedgwick Gunpowder Company purchased two 'Vortex' turbines manufactured by Williamsons. This firm, which was later to become Gilbert Gilkes & Gordon, was formed in 1853 at Halfpenny Mill, Stainton, about 5.5 km due east of the New Sedgwick site. It moved to the Canal Basin in Kendal in 1856 and later that year installed the first Williamson turbine at Holmescales Farm, Old Hutton, 9.5 km due east of New Sedgwick. This turbine is now on display at the Abbot Hall Museum in Kendal. It is an inward flow turbine and the casing is about 3 ft in diameter. The two New Sedgwick turbines were identical to this one and were numbered 8 and 9. Incidentally turbine number 3 was sold to W H Wakefield, presumably for the Gatebeck gunpowder works (NGR SD 543850) which opened in 1852.

The drawings show that the turbine at the New Sedgwick tower complex had a vertical shaft with bevel gears which drove line shafts in both the old and new saw mills. The available head of water was about 15 ft. Figures 3 and 4, taken from a Gilkes catalogue of 1898, show the structure of the rotor and the type of installation respectively. The clock tower, as shown in the sketch of figure 5, which is based on the drawings, had a single clock face looking towards the incorporating mills. It was not nearly as grand as the tall 1849 tower at the Lowwood gunpowder site (NGR SD 347837), which still has a single clock face looking towards the main road across the valley and not at the mills.

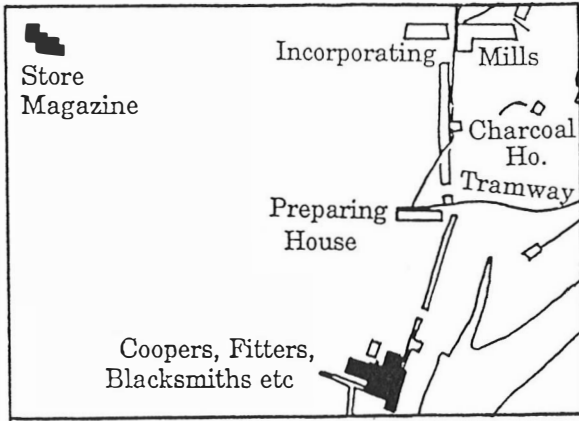


Figure 1. Plan of the southern end of the New Sedgwick Gunpowder Mills. (See GMSG Newsletter 11, p9, Sept 1992).

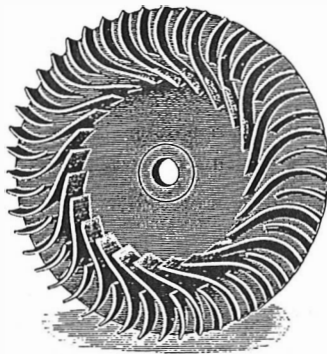


Figure 3. Vortex turbine wheel.

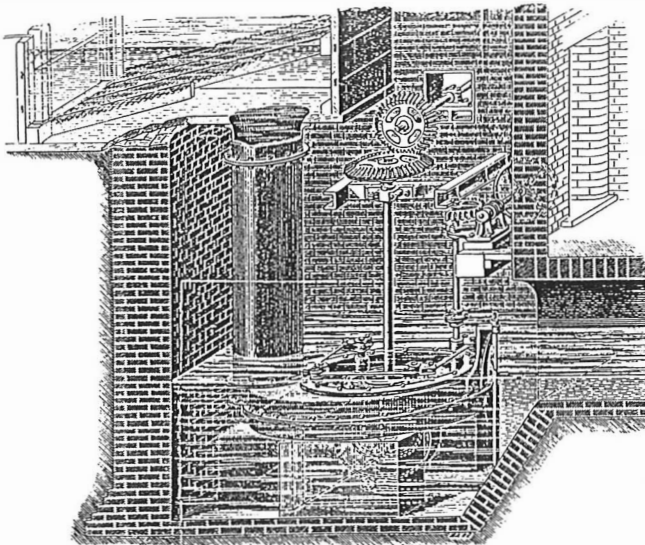


Figure 4. Vortex turbine installation of the type adopted at New Sedgwick.

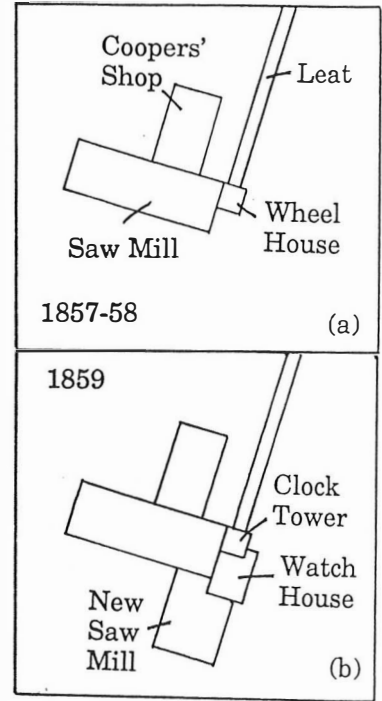


Figure 2. Sketch plans of the buildings of the tower complex in 1857-58 and 1859.

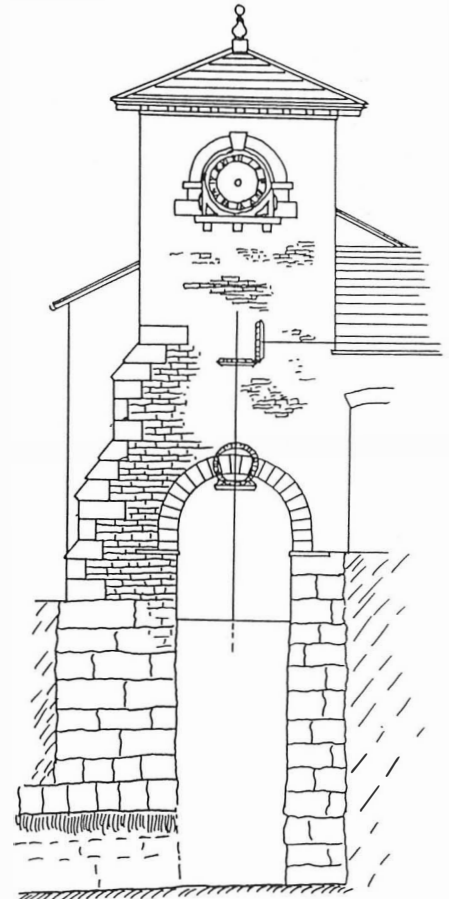


Figure 5. The clock tower and turbine pit.

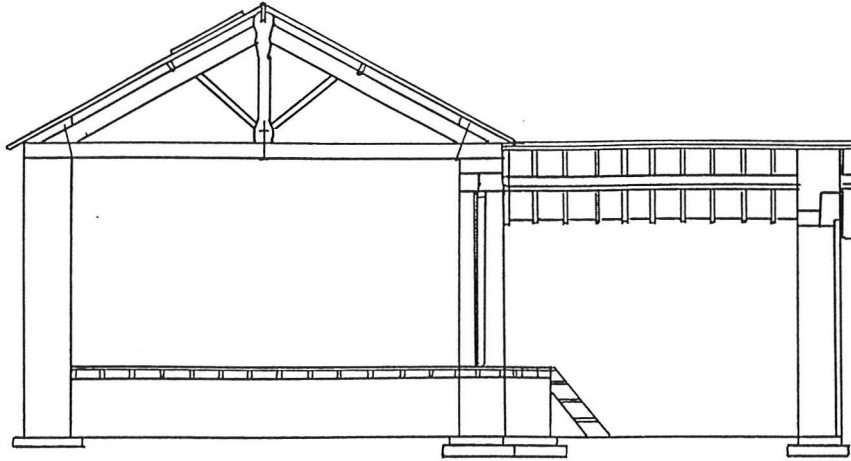


Figure 6. Section of the magazine and loading shed

The remaining three drawings are of a proposed gunpowder magazine and the site was probably that shown in figure 1, 220 m north-west of the tower complex. Two of the drawings, which are about 230 x 355 mm, show a single storey rectangular building measuring 24 x 20 ft, with an 8.8 x 5 ft porch. The floor is shown 3 ft above ground level and the exterior walls are 12.5 ft to the eaves of the lightweight gabled roof. The walls are shown as being 2 ft thick but a note says that they should be flushed with mortar and be 3 ft thick. The floor boards were to be spiked down with oak pegs (no nails) and there was to be a sky-light of extra strong glass. A note explains that these plans were not adopted because the magazine required a loading shed and not a porch. The shed was to be the length of a horse and cart and have a loading stage 3 ft high. The remaining drawing, measuring about 300 x 390 mm, shows the revised plan, the loading shed being 15.3 x 13.7 ft. The elevation shown in figure 6 is based on this plan. Assuming that this structure was built, figure 1 shows that it was later extended to at least twice the size.

*I am indebted to Mike Davies-Shiel for providing much information about the New Sedgwick site, to Dennis Taylor and Ken Major for information about Williamson Vortex turbines, and to the staff of the Cumbria Record Office at Kendal for their assistance.*

#### Further Reading

Alan and Glenys Crocker, 'Gunpowder Mills of South Cumbria', *GMSG Newsletter*, 11, Sept 1992, pp 8-14.

J D Marshall and M Davies-Shiel, *The Industrial Archaeology of the Lake Counties*, 2nd edition. Michael Moon, Beckermest, Cumbria, 1977, pp 75-88.

P N Wilson, 'The Gunpowder Industry of Westmorland and Furness', *Trans Newcomen Soc*, 36, 1964, pp 47-65.

P N Wilson, 'Gilkes 1853 to 1975, 122 Years of Water Turbine and Pump Manufacture', *Trans Newcomen Soc*, 47, 1974-76, pp 74-84.

Lord Wilson of High Wray (P N Wilson), *A Short History of the New Sedgwick Gunpowder Mills*, National Trust, no date [1970s].

George D Kelleher, *Gunpowder to Guided Missiles, Ireland's War Industries*. Inniscarra, John F Kelleher, April 1993. pp 400 + xvi, 20 illus, hardback. ISBN 09514264. £25.00

Some members may not be aware of the background to the publication of this book. George Kelleher, one of the founder members of GMSG, had been researching the history of the Ballincollig gunpowder mills in County Cork for many years when he discovered that, although he did not hold a University first degree, the regulations of University College Cork enabled him to submit a thesis, based on his research, for a higher degree. Nobody had ever submitted an unsupervised thesis in this way previously and, when George did, he was advised to extend the subject matter to include the manufacture of modern Irish explosives and armaments. This he did but sadly in 1987, before he could be examined formally, he died. His mother and his brother John then requested that a higher degree be awarded posthumously and, although this was a precedent, he was in 1989 awarded an MA of the National University of Ireland. It was then felt that the thesis should be published and despite many difficulties this was eventually accomplished in April 1993. John Kelleher acted as publisher and correctly decided that it would be inappropriate to make any but very minor changes to George's work. The book therefore is essentially George's thesis.

It consists of two major chapters on Black Powder (89 pp) and High Explosives (72 pp) followed by six short chapters on Inventors, The World Wars, Guns, Armoured Vehicles, Ships and Aerospace (101 pp combined), an Epilogue (9 pp) and finally a large section containing detailed information on sources and indexes (121 pp). The material of particular interest to most members of GMSG is of course the chapter on black powder and the corresponding information on sources. The first section of this is on the introduction of gunpowder to Ireland and the mills on the River Poddle and River Camac at Dublin. These worked intermittently between 1589 and 1822. and were operated by Robert Poynter, Nicholas Grueber, William Caldbeck, Henry Arabin and Richard Chevenix.

There are then four chronological sections on the Ballincollig mills on the River Lee, some 6 miles west of Cork and across the river from the Kellehers' home at Inniscarra. They were established in 1793 by Charles Henry Leslie who called them The Royal Irish Gunpowder Mills as most of the powder went to the British government. However some was shipped to Liverpool for use in the slave trade. In 1805 Leslie sold out to the Board of Ordnance, who had run the Home Works at Faversham since 1759 and the Waltham Abbey mills since 1787. It is difficult to understand why the Board bought Ballincollig rather than one of the mills near London. Charles Wilks was appointed as Superintendant and there was a tremendous expansion of the facilities, including building a new bigger canal system to provide more waterpower. The mills flourished until the end of the Napoleonic wars in 1815. They were then closed and remained idle until 1834.

After various legal problems, the Board of Ordnance eventually sold the mills for £15,000 to the Tobin family of Liverpool, who had made their money from privateering and the slave trade. However, following the Acts of 1807 and 1833 to abolish slavery, they had become the leaders of the palm oil trade with Africa. The purchasers styled themselves the Ballincollig Royal Gunpowder Mills Co. They had many squabbles with the local

authorities particularly about the location of magazines at Cork harbour and access to these. In 1858 Lamot du Pont visited the mills, which boasted the best machinery in the world; he was not shown the buildings. Tobins were also deeply involved in the Company of African Merchants Ltd which was formed in 1863. An explosion in one of their storehouses in Old Calabar (Nigeria) in 1872 destroyed 1,000 barrels of gunpowder together with rum, gin and other goods valued at £9,000. At this time about 30,000 barrels of gunpowder were being exported each year from Cork harbour, about 20% of the national total.

The next section concerns the Fenians, the secret organisation founded in 1858 pledged to overthrow British rule in Ireland by force of arms. They were active in Ballincollig and there was great concern that they would blow up the magazines at the mills where up to 6000 barrels of powder were stored. In 1865 the Commander of the Forces in Ireland tried to persuade the government to prohibit the manufacture of gunpowder at the site but the Company was not contravening the Gunpowder Act of 1860. The Commander then tried to remove his troops from the nearby Ballincollig barracks but this did not happen. The Tobins offered to sell the mills back to the government for £60,000 but this was not accepted. Eventually an arrangement was made to store gunpowder on Rocky Island in Cork harbour and the War Office decided to replace the solid masonry roof of one of the mill magazines by a timber and slate roof. In practice the Fenians did not attack the magazines and in 1870 the whole affair fizzled out.

After 1883 the works were in decline and in 1888 the Tobin company was wound up and a new company the British and Irish Gunpowder Manufacturing Co Ltd was formed but this soon took on the old title of The Royal Gunpowder Mills Co Ltd. It was run by John George Briscoe who had previously been a salaried manager with Tobin and had carried on a business as a gunpowder merchant. However, black powder was unable to compete with the new propellants and explosives and in 1898 Ballincollig became part of the Curtis's & Harvey amalgamation. Ballincollig was allocated 33,330 £1 shares out of a total of 448,000. There was a boost in production during the period of the Boer War but in 1903 Curtis's & Harvey closed down the mills. However they failed to sell the property which in 1926 was transferred to ICI. Eventually it was sold to the Ministry of Defence in 1949 who in turn sold it to Cork County Council in 1974.

George Kelleher tells this story in an indiosyncratic, mischievous and amusing manner without compromising its accuracy. Indeed there are 294 references in the sources section for this chapter on black powder alone. He revels in exposing intrigues involving important figures in national and local government and commercial concerns. He follows all the loose ends and provides valuable biographies of all the principal characters. In addition summaries are given of the complex background of Irish history. This is all fascinating material but the book is also rather frustrating. For example no plans are provided of the Ballincollig site at different periods and there are only two poorly reproduced photographs; plus a splendid one of George leaning against an edge runner. The crucial thing however is that the book is crammed with information on the British gunpowder industry in general and not just Ballincollig. Also the excellent index makes it easy to extract the information one is seeking. It is strongly recommended.

Alan Crocker



## MANUFACTURE OF GUNPOWDER IN FRANCE IN 1702

This is the title of a two-part article being published in the Journal of the Ordnance Society. The first part appeared in volume 5, pages 47-55 and covers saltpetre, sulphur and charcoal. It is a translation by David H Roberts of the gunpowder section of Surirey de Saint-Remy's "Memoires d'Artillerie" published in Amsterdam in 1702. Five pages and two full-page illustrations are on saltpetre, one is on sulphur and charcoal and the last contains translator's notes on terminology and weights and measures.

The account of saltpetre is based on the refining techniques used at the Paris Arsenal, where the raw material was primarily earth from the floors and powdered plaster and brickwork from the walls of cellars, stables etc. The workshop contained 126 tubs, 24 of which were filled each day with new wood ashes, saltpetre earth and straw as a stopper. Water was poured into 8 of these tubs and normally drained through a hole in the bottom in one day. This water was then poured into 8 further tubs and then the 8 remaining tubs. It was then poured back into the first 8 tubs which had been refilled with fresh ashes. The resulting leachings were then placed in a copper cauldron. Meanwhile fresh water was poured on the other tubs in another complicated sequence to produce an equal amount of leachings which were added to the cauldron. One of the illustrations shows the workshops with 10 labourers carrying out these various tasks.

The leachings were boiled for 24 hours when the "marine salt", which had been deposited on the bottom of the cauldron was removed and the liquid put into a wooden or copper purifier for 30 to 45 minutes. It was then run off and taken to large copper basins to congeal, which took at least 5 days. These basins were then tilted on their sides to allow the remaining liquid to drain away leaving the crude saltpetre behind. This was then delivered to the gunpowder mills where it was again put into a cauldron with water and heated. When it had dissolved, a jug of egg-white, fish glue, vinegar or alum was added. This caused grease and dirt to rise and form a scum which was skimmed off. The saltpetre liquid was then poured into basins, allowed to congeal for 5 to 6 days and then the remaining liquid drained away. The process could then be repeated to obtain even purer saltpetre. It was claimed that 100 lbs of crude saltpetre produced 72 lbs of refined saltpetre, the remainder being common salt, grease, sand and mud. The second illustration shows 9 labourers working in the refinery watched by an overseer and two visitors.

The section on sulphur states that it came from Sicily or near Naples and that most of the refining was done in Holland. No details are given. The wood used for charcoal was black alder, otherwise called alder buckthorn, which grows in great profusion in Lorraine. Sticks were placed vertically in a hole in the ground and burned, the fire being extinguished with a broom and not water. It is implied that the charcoal was made at Essaunes [Essones], a valley with a gunpowder mill just south of Paris. The article also gives the costs and proportions of the raw materials and explains how saltpetremen perpetrated frauds by preventing the common salt from being deposited on the bottom of the cauldron.

[We are indebted to John Day of The Ordnance Society for bringing this article to our attention. The second part will be published in volume 6].

### GUNPOWDER MAKING IN XING WEN, CHINA

On the evening of 15th July, ITV London showed a film of a 1992 British expedition to explore the caves at Xing Wen in China. It transpired that for many years the local people had excavated bat droppings from the caves to produce nitre and a steaming saltpetre pan was shown. In addition the water in the caves was polluted by effluent from neighbouring sulphur mines and refineries which were also filmed. Much of the area is forested so charcoal was also readily available. Indeed the film also showed fire-crackers being let off at a wedding. No wonder the Chinese invented gunpowder when all the raw materials were available so close together. In four weeks the cavers explored 30 km of passages, found a connection between two cave systems and performed for the cameras.

### PROCEEDINGS OF THE ROYAL ARTILLERY INSTITUTE

Charles Trollope

When I was at the Royal Artillery Institute in July I noted that in RAI Proceedings, vol XIII for 1885 there is a "Brief Sketch of the Gunpowder Works in Bengal" by Major Stubbs: 14 pp plus plans. Also in vol IX there is "A List of Important Gunpowder Explosions, 1649-1866".

### MORTARS FOR TESTING GUNPOWDER

When we were at the Opening Ceremony of the Visitor Centre at the Royal Gunpowder Mills at Ballincollig we spoke to Mick Hartnett the Commandant of the neighbouring army barracks. He said it might be possible for him to obtain a proof mortar for display at the Centre and we offered to try to provide him with information about the type of mortar used. What we had in mind was to ask Charles Trollope to write to him and we think members will be interested in the contents of Charles's letter:

"The first suggestion for a proof mortar, in writing, is by Master-Gunner Nye in his "Art of Gunnery" dated 1647. This idea was taken up by the French and other foreign governments but not at that time by the English.

The first purchase of mortars by the Board of Ordnance specifically for gunpowder testing is dated 15 January 1747/8, by warrant dated 21 May 1747 (Tower XIX 284&285). About ten years later at least one more was purchased (Tower XIX 210). All are of 8 inch calibre.

By 1800 eprouvette mortars were in use at the main magazines for proof testing of gunpowder.

From 1804, the Ordnance store keeper's journal (PRO Supp 5/8) shows a steady issue of the standard 8 inch iron mortars to outstations and powder works for proving powder. Cork was issued with two on the 22 June 1804. With them would have been issued six solid iron shot of 68 lbs and 7.965 inches in diameter.

The charge to be fired in proof was 2 or 3 ozs. The 68 lbs shot, fired at an angle of 45 degrees, being required to travel a certain number of yards depending on the powder type and quality.

They continued in use till the 1860s when the method of proving powder was changed to suit the new heavy RMLs coming into service."

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