

Early Gunpowder Production at Waltham

Keith Fairclough

“... it is questionable whether the making of Gunpowder be more profitable or more dangerous, the mills in my Parish have been five times blown up within seven years, but, blessed be God, without the loss of any one man's life...”

Thomas Fuller, curate at Waltham Abbey 1648-58¹

IT HAS BEEN ASSUMED previously that Fuller was referring to mills on the site at Waltham now occupied by the Royal Armament Research and Development Establishment.² Sufficient contemporary evidence remains, however, to show that he was talking about gunpowder production at Sewardstone, a hamlet, which in the seventeenth century was still part of the parish of Waltham.

Gunpowder had first been made at Sewardstone Mills in the 1640s, whereas at Waltham production did not start until 1664 or 1665, after Fuller had died. Production was to continue at both sites for many years. Sewardstone Mills were converted to other uses shortly after 1715, but those at Waltham continued until an enemy land mine put the last powder mills out of action during the winter of 1940-41.

Gunpowder is made by combining saltpetre, sulphur and charcoal. Originally it was mixed with a pestle and mortar, but later, stamping mills, until they were banned as dangerous in 1772, or incorporating mills with edge runner stones were used. These mills were driven either by horses or water (Figure. 1).

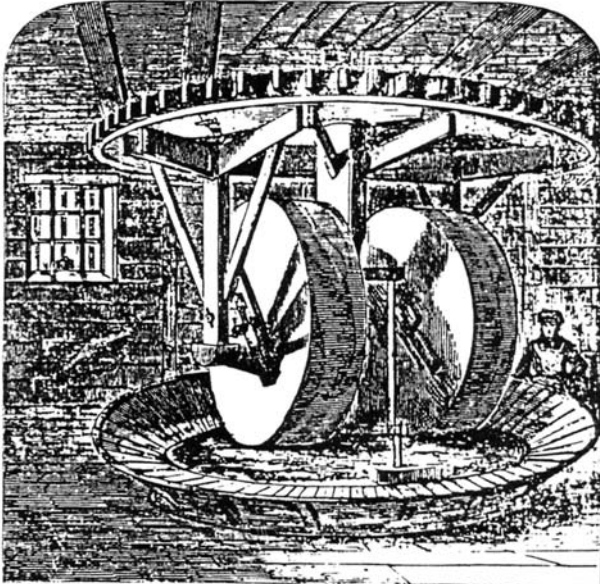


Figure 1. The incorporating mill (Essex Record Office)

Recipes varied according to the intended use of the gunpowder, but saltpetre was the most important ingredient. It usually made up about 75 per cent of the mixture. The best saltpetre was imported from India and Persia by the East India Company, but during the seventeenth century this supply was inadequate, and domestic production was necessary. Saltpetre men were unpopular because they had rights of access to all dovehouses, stables, cellars and similar properties to dig up earth, which was then mixed with animal excrement, lime and ashes, and watered with urine to obtain

a less satisfactory and more expensive home product. The other raw materials were sulphur, imported from Italy or Sicily, and charcoal.

The industry was a dangerous one, and the various processes had to be physically separate so that accidents during one operation did not destroy the whole works, making remote and extensive sites necessary. The engraving of the Waltham works in 1735 illustrates this, as well as showing the large number of mills on one site. Further information is available in articles written by journalists who visited the works at Waltham during the last century.³

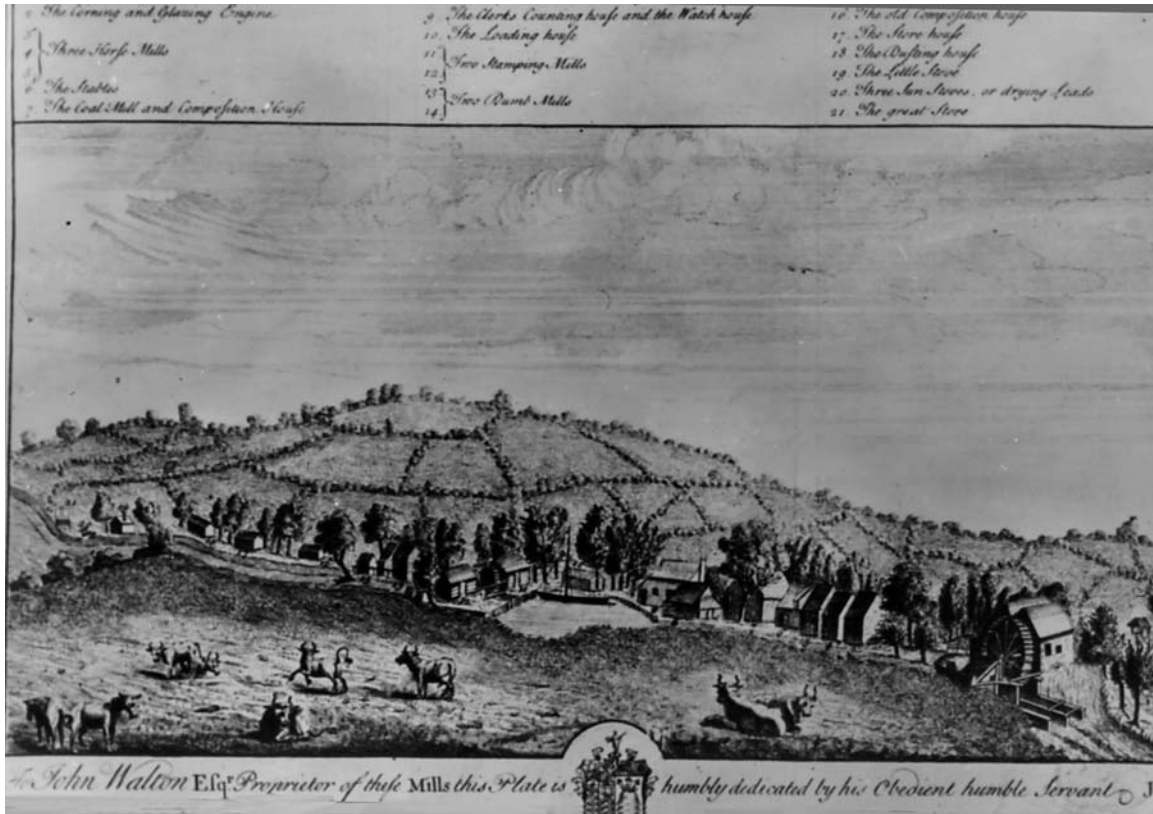


Fig. 2. The powder mills owned by John Walton at Waltham 1735 (from John Farmer's 'The History of Waltham Abbey' published in 1735) R.A.R.D.E (WA).

The Lea valley was a good location for the industry. It was close to London where the imported raw materials were brought and plentiful supplies of charcoal were available locally. In addition, the major customers, the Ordnance and the private merchants, were situated in London. The flood valley of the Lea provided many remote sites with an adequate supply of water to drive the mills and the river was a good and safe means of carrying both the raw materials and the finished product.

Surrey was the first centre of the industry,⁴ both for political as well as economic reasons. During the reigns of Elizabeth 1, James I and Charles 1 government contracts and production monopolies had been granted mainly to those with interests in that county. At the turn of the century there had been some gunpowder production at the tidal

mills in Stratford,⁵ but it was not until the abolition of the gunpowder monopoly in 1641 that the Lea valley emerged as an important centre of the industry.

Fuller commented on this development that "more (gunpowder is) made by Mills of late erected on the river Ley, betwixt Waltham and London, then in all England besides", and in 1673 Blome listed gunpowder as an important industry in Essex.⁶ This has not been noted by historians since.

This article concentrates on Sewardstone and Waltham Mills, but between 1640 and 1690 the following mills were also producing powder at various times: Naked Hall Mills in Enfield, Enfield Lock Mills, Enfield Mills, Tottenham Mills, Walthamstow Mills, and the Temple Mills at Leyton.

Sewardstone Mills

After the ending of the gunpowder monopoly in 1641 a new supplier to the Ordnance Board emerged, John Berrisford, a London grocer, who continued for the rest of the decade. In 1642 he took out a lease on the Temple Mills, replacing the existing blue starch and oil mills with gunpowder mills, but in March 1650 he assigned this lease to other powder makers. He had also acquired an interest in Sewardstone Mills.

As early as 1640 he was admitted to copyhold property on the death of his father-in-law, Thomas Stock. Then in May and July 1648 he was admitted to other properties in the manor, including a "Stream of Water called Sewardstone Mill Dams together with the Mills" and "Mills called the Powder Mills". K. Bascombe adds that Berrisford was already the tenant at Sewardstone Mills in 1646 when Richard Stock mortgaged the property to him. John Berrisford surrendered the powder mills in Sewardstone to his son, Rowland, in January 1649.⁷

This evidence suggests that John Berrisford was producing powder at both sites throughout the decade, but that at the end of the Civil War he divested himself of his interests in the industry, never to return. Whether his son continued to produce powder at Sewardstone has not been established. Shortly afterwards, however, powder was being produced at the mills by a John Freeman, definitely before October 1652, and most probably from July 1651. John Freeman was a London merchant closely identified with the Parliamentary side in the Civil War. He had delivered 100 barrels of powder to the Ordnance in July 1644, supplied timber for the palisades erected during the fortification of London in 1646, and helped provision the armies in Ireland and Scotland.⁸

He and his son, John Freeman the Younger, were merchants involved in several trading ventures. References to their trade in match, tar, hemp, masts, hides, grain, currants and raisins and to links with Norway, Hamburg, Nantes and Amsterdam occur in the State Papers.⁹ The son was an assistant of the Eastland Company in 1654.¹⁰

Such activities suggest a close interest in the success of the First Dutch War (1652-54), the outbreak of which stimulated John Freeman the Elder to invest in the industry. In July 1651 he, together with one of his trading partners, Thomas Steventon, had delivered 100

barrels of powder to the Ordnance. They then signed contracts with the Ordnance in July 1652 and October 1653. After this date Freeman continued to supply powder, but on his own account. At no time were they major producers, but at the height of the war they were contracted to supply 75 barrels of powder a week. Each barrel contained 100lbs (45.4kgs) of powder. Such quantities suggest that Freeman or Steventon had interests in other mills besides Sewardstone, but no such interest has yet been traced.¹¹

Sewardstone powder mills were sufficiently important that the Council of State wrote in 1653 to both the Commissioners of Sewers for the river Lea and the Earl of Carlisle, lord of the manor of Sewardstone, requesting them "to permit John Freeman to build a weir at Susan (Sewardstone), and to allow him to erect new powder mills".¹² The weir would increase the amount of water to drive the mills, whilst the new powder mills could have been either an expansion of existing capacity and/or a replacement of mills that had blown up.

Explosions were frequent. An undated petition from Freeman and Steventon asks for financial help to erect new mills to replace those which had "lately twice blowne up, to the loss of above five hundred pounds".¹³ A later petition from Freeman notes the failure to pay his bills and the fact that his mills had blown up six times in four years,¹⁴ not an exact correlation with Fuller's estimate of five explosions in seven years, but forceful confirmation of the hazards of the industry, both as an investment and in terms of safety.

It is difficult to establish what happened at Sewardstone Mills after the Restoration. Some powder makers who had supplied the Ordnance during the Interregnum continued to do so. John Freeman did not, even during the crisis of the Second Dutch War (1664-67). The first evidence that the family supplied the Ordnance again is a contract signed in July 1673 by John Freeman the Younger. Thereafter he and his partner, Sir Polycarpus Wharton, emerged as major suppliers. Chilworth Mills in Surrey was their main centre of production, but Freeman did work Sewardstone Mills on his own account.¹⁵

The fact that the family did not have an Ordnance contract between 1660 and 1673 does not mean that production ceased at Sewardstone. In February 1662 a Benjamin Olden, powdermaker of Sewardstone, was bound over to keep the peace. In May 1666 a John Freeman was given liberty to supply powder to the Spanish ambassador, and in November 1674 a John Freeman was working as a sub-contractor to Vincent Randyll of Chilworth Mills.¹⁶ Various options are thus open. Sewardstone Mills could have been sub-let, or the Freeman family could have worked the mills to supply the private market or as sub-contractors to other suppliers to the Ordnance. Further evidence is necessary.

John Freeman the Elder died between October 1678 and October 1679. His will, which describes him as a merchant of St. George the Martyr, Southwark, provides no details of any powder business. He merely leaves his estate, after numerous small monetary bequests, to his son. The only clue is that he bequeathed £5 to the poor at Sewardstone "where my Mills are".¹⁷

Fortunately the son's will is more informative. John Freeman of Sewardstone, gentleman, died in September 1684. He was producing powder on his own account at Sewardstone Mills and at Naked Hall Mills in Enfield,¹⁸ which he bequeathed to Polycarpus Wharton, son of Sir Polycarpus Wharton. He was also in partnership with Sir Polycarpus at Chilworth Mills, and left him his stock there. In addition, he made several small monetary bequests to clerks in the Ordnance.

Freeman also held a third share in an unspecified glasshouse,¹⁹ but no other business interests are mentioned. To his wife, Anne, he left only a life interest in their residence at Sewardstone. Not surprisingly Anne contested the will, stating that her husband had not been sensible at the time. The will, however, was allowed to stand.²⁰

Polycarpus Wharton, a minor when he inherited Sewardstone Mills, died before he was of age. His father therefore took over and then inherited his interest. Sewardstone Mills became a small part of his large powder business. In 1687 it was estimated that Sir Polycarpus could produce 6 barrels of powder a week at Sewardstone, 45 barrels a week at Chilworth, and 12 barrels a week at a site in Clapton, so far unidentified.²¹

This large business eventually brought serious problems. The Ordnance had encouraged him to take out the lease on Chilworth Mills in 1677, and, although there were disputes during the life of this lease, he remained a major supplier until it expired in 1698. Thereafter major rows erupted between Wharton and the Ordnance over losses incurred at Chilworth and over settlement of the accounts of his deceased father, Sir George Wharton, who had been Treasurer to the Ordnance. His claims were rejected. By 1710 Sir Polycarpus was in debtors' prison, and as late as 1723 he was still demanding settlement of both accounts.²²

Little can be determined of the fate of Sewardstone Mills, except that its production facilities remained intact. Sir Polycarpus never mentioned these mills in his petitions, although he remained their owner until 1709. Since his last deliveries to the Ordnance had been made in 1696 or 1697, it might be that production ceased temporarily or that the mills were let.

In April 1707 Sir Polycarpus mortgaged the mills with the tenant, Edward Gibbon. Gibbon had signed his first contract with the Ordnance in May 1704 and was a regular but minor supplier until 1709. He was still the tenant at this date. The quantities he supplied suggest that he was only producing powder at one site, Sewardstone Mills.

Gibbon was the grandfather of the famous historian, and true to the character portrayed by the grandson, was not content with such a small involvement. In 1706 he made a proposal to the Ordnance that he supply them with 10,000 barrels a year for 10 years at existing prices. In return he wanted cash advances to rebuild Chilworth Mills and a guarantee that he would be given priority of employment. The Ordnance felt that these proposals would have been acceptable if it could be predicted that the war would continue, but since peacetime requirements did not rise above 5,000 barrels a year, they did not wish to be tied to a fixed contract. Negotiations were not pursued.

Gibbon's last contract was signed in May 1709, but he only delivered 59 barrels. In July 1709 Edward Parre the younger of Doctors Common, London, gentleman, took over Sewardstone Mills. Gibbon's career lay elsewhere, and his interests in gunpowder production were not noted by his grandson.²³

Parre signed a contract with the Ordnance in July 1709, but after it was fulfilled he never signed another. It is difficult to establish subsequent events as there were problems in transferring Sewardstone Mills from Sir Polycarpus to Parre. However, a schedule of the property in 1715 shows an operational gunpowder business.²⁴

In 1714 and 1717 Parre obtained licences to let his copyhold property in Sewardstone; by 1719 the tenants at the mill were an Andrew and Thomas Niblet, neither of whom supplied powder to the Ordnance. In 1726 Parre bequeathed the mills to his widow, Hester, for her life, after which they were to pass to his nephew Edward Pace. The latter was still the owner on his death in 1765. None of these sources state what products were made at the mills. It has been suggested that silk production began at the site soon after 1718.²⁵

However, in 1740 the tenants were 'Frederick Tash & Partners'. Later it was stated that Frederick Teush had erected the only mills in England to make 'Powder Blue', a product used in the laundry industry to wash linen.²⁶

Such evidence suggests that Parre, or his tenants, converted the mills to other uses shortly after 1715. The long period of peace which followed the Treaty of Utrecht in 1713 would have reduced demand for powder, and it was common for some powder makers to move out of the industry at the end of a war. The only later connection between Sewardstone Mills and the gunpowder industry is that in 1880 the Schultze Gunpowder Company formulated plans to use the site, but negotiations between them and the owners of the mill, the New River Company, were unsuccessful.²⁷

Waltham Abbey Powder Mills

Having established that Fuller was referring to Sewardstone Mills, the question arises of when production began at the site at Waltham, later to be the nucleus of the only powder business in the valley. There are references to a John Tamworth of Waltham Abbey being involved with gunpowder in 1561 when the industry first developed in England. The evidence, however, suggests he was a person able to obtain contracts at Court, not a producer.²⁸

A map of Waltham made in the 1590 shows a fulling mill on the site under consideration²⁹ this fulling mill was let to a Mr. Lyon in 1643.³⁰ In 1669 a deed describes the mill thus:³¹

"All that Mill heretofore an Oyle Mill and now lately converted into two Powder Mills... with all necessary outhouses for grindinge boylinge corninge & drying of

powder... now in the tenure or occupation of Samuell Hudson or his undertenants".

At present, the writer has discovered no evidence of when the Hudson family first acquired an interest in these mills, or anything of their conversion to oil mills. However, the family also held the tenancy to Waltham Abbey Corn Mills between 1643 and 1674, and possibly even longer.³²

Sufficient evidence exists to provide a date for the conversion of the oil mills to powder mills. In January 1665 the Ordnance, facing shortages as a result of the Second Dutch War (1664-67), instructed their officers "to impresse soe many Mills for ye making of gunpowder for his Matie Service as they shall think fitt".³³ The following month a contract was signed with a new supplier, Ralph Hudson, the brother of Samuel Hudson and the sub-tenant at Waltham Abbey oil/powder mills.

The contract involved Hudson making powder from his own saltpetre, which he had authority to make in Bedfordshire and Hertfordshire, as well as from that delivered to him from the Ordnance. It was stipulated that he would receive an advance of £150 if he could deliver 100 barrels a month from May 1665 onwards, a deadline he achieved.³⁴ Such an advance may have been in the form of financial assistance to help with the conversion to powder mills.

Hudson is mentioned in the Ordnance accounts until December 1666, but afterwards references are few until he obtained a new contract in 1672, on the outbreak of the Third Dutch War (1672-74). This contract was for 140 barrels a month.³⁵ To obtain this increased output, Hudson expanded the works by erecting powder mills near Hook Marsh Bridge.

In 1672 complaints were made to the manor court about these new mills. It was said that they obstructed the right of way over the bridge, and fears were expressed that the mills and the barges loading at the site were a danger. The manor court ordered Hudson to remove the mills, but he ignored it, and the same complaints were made in 1673. These powder mills were still standing in 1676.³⁶

Unexpectedly, there is no record of Hudson delivering powder to the Ordnance after February 1673, even though the war was still in progress and other powder makers were making regular deliveries to the Tower. On his death in 1676 he was an active powder merchant with no other business interests. He had warehouses at Tower Hill, James Rope Walk, and Knightingall Lane in London, and at Waltham, as well as production capacity at the two sites there. Significantly he lived in Great Tower Hill. His will describes him as a gunpowder maker, the accompanying inventory as a citizen and grocer. After monetary bequests to his family, he bequeathed the powder business to his brother, Peter.³⁷

Peter Hudson continued the business, but it was not until March 1684 that he obtained a contract to supply the Ordnance. This, and a renewed contract in December 1686, were for only 500 barrels each. Such contacts illustrate the reduced demands of the Ordnance

during peacetime, and, since the capacity of the works was estimated to be 168 barrels a month in 1687, hint at the importance of the private market.³⁸

Although Hudson was supplying the Ordnance Board during James II's reign, his sympathies seemed to have been elsewhere. He supplied 400 barrels to William when he was Prince of Orange, and when William came to the throne lent him large sums of money. In July 1689 he signed a contract with the Ordnance to supply 1000 barrels over a xxx month period; subsequent contracts maintained this xxx until July 1693.³⁹

In June 1691 Hudson complained that the Ordnance owed him £1280, but he was soon to face more serious problems. In 1693 a Treasury official recommended that he be prosecuted for fraud in mingling bad powder with good in his deliveries to the Tower.

In his defence Hudson referred to his support for William and claimed that:

"...it lately happened to be his misfortune to employ some Workmen of lewd principles, who made a Considerable Quantity of powder for your Majesty's Use; all of it Tower prooffe, but hoping to gett some extraordinary Gratuity from him, They made the last part of it Stronger... they designedly putt the Strongest powder (unknowne to him) on the Topp of the Barrells & having So layd their Plott they by a letter demanded a Summe of Money or else they would accuse him as a deceiver..."

Hudson argued that it was because

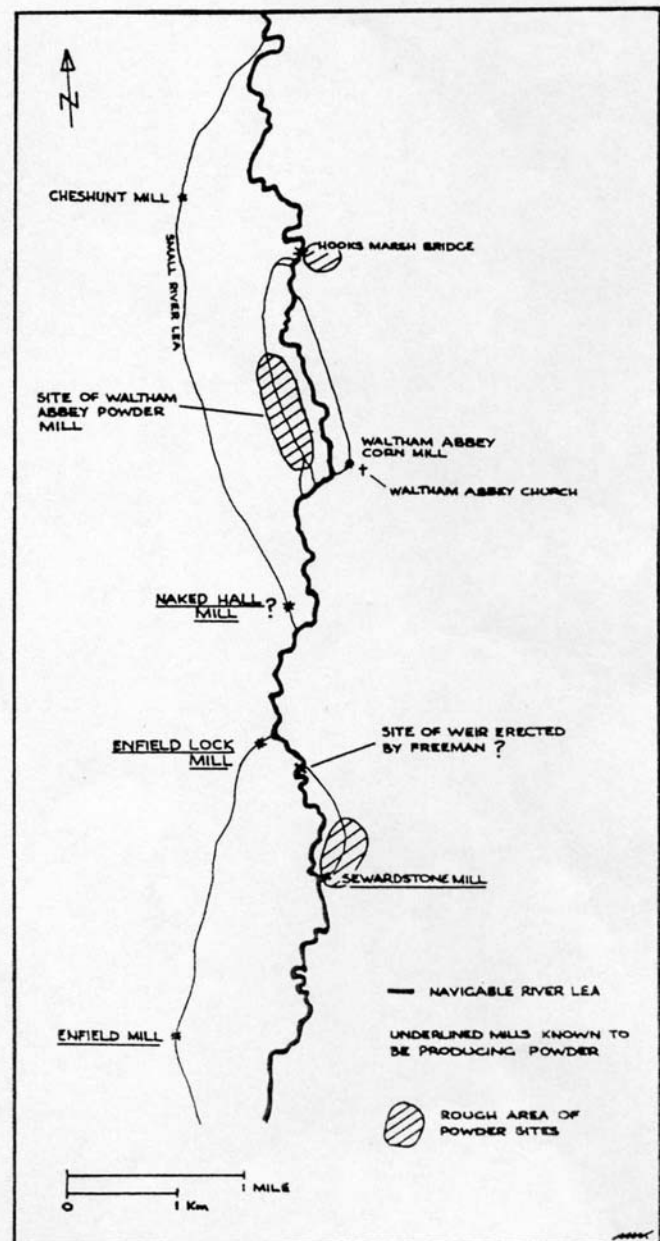


Fig. 3. Mills along the river Lea in the Waltham area. John Walton was responsible for some of the surveying for the original map on which this is based.

he had refused to meet their demands that the prosecution had arisen. Under the circumstances he asked that it be dropped. This request was granted but it can be no coincidence that he never again obtained a contract from the Ordnance⁴⁰

The immediate fate of his powder business after this setback has not been discovered. His will in July 1703 makes no mention of a powder business, but he had not been ruined by the powder business, for he left over £4000 (more than f ¼ million at today's prices) in monetary bequests alone.⁴¹

The probability is that Hudson had moved out of the industry before his death and that the site at Waltham was taken over by William Walton, the eldest son of William Walton of Mortlake in Surrey. Walton signed his first contract with the Ordnance on 3rd February 1702, becoming within a few years one of the major suppliers to the Ordnance during the War of the Spanish Succession (1701-13). Besides Waltham, he was also producing powder at mills in Balham, where he was still resident when he died intestate in May 1711. His widow, Philippa, inherited the business. She and successive members of the family first concentrated on and then expanded production at Waltham until they sold the works to the state in 1787.⁴²

Genealogical research may show family links between the powder makers so far discussed. John Berrisford, who produced powder at Sewardstone before John Freeman took over, left a will which named a Richard Freeman of Rickmansworth as a trustee of some almshouses. John Freeman the Elder bequeathed 40s to a William Walton to buy a mourning ring, and in October 1675 a John Walton married a Lydia Freeman in the parish church at Waltham.⁴³

What remains to be uncovered is the story of the Walton family's enterprise at Waltham. The locational advantages of the Lea valley continued to exist, but during the 1670's and 1680's most powder mills in the valley were converted to other uses. After this date production continued only at Waltham and Sewardstone. Then shortly after 1715 production ceased at Sewardstone, and gunpowder continued to be made in the valley only at Waltham. The Business acumen of Philippa and her son, John, must have been a major reason for their success in expanding the works during the long years of peace after 1713.

Acknowledgements

1. I would like to thank the following: Dr. Ken Bascombe for providing the exact dates of Fuller's curacy at Waltham and other additional information which I had not seen previously; Mrs Kenneally and the staff at the Greater London Record Office for allowing me access to the recently deposited records of the New River Company; Mr. Pryor, of the Royal Armament Research and Development Establishment (Waltham Abbey), for bringing the 1669 deed to my notice and for a more than usually helpful reply to my initial enquiry; Mr. M. McLaren also of R.A.R.D.E. (WA) for providing Fig 2., Mr. V. Gray of the E.R.O. for Fig 1., and Mr. M. Walters for drawing the map.

References

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2. W. Winters, *Centenary Memorial of the Royal Gunpowder Factory, Waltham Abbey* (1887); W. H. Simmons, *A Short History of the Royal Gunpowder Factory at Waltham Abbey* (1963); M. McLaren, 'The Explosives Research and Development Establishment, Its Historical Background', *Journal of Naval Science I* ,No.2(1975) 176-183; *Victoria County History Essex* 11,453; *V.C.H. Essex* V,164.
3. W. G. Fitzgerald, 'How Explosives are Made', *The Strand Magazine* IX (1895) 307-318.
4. *V.C.H. Surrey, II*, 306-329; E.A.B. Hodgetts(ed), *The rise and progress of the British explosives industry* (1909).
5. In 1588 the Three Mills were described as "but 1 corn mill and 1 powder mill, which powder mill standeth still more than she goeth", James Monnson was the master of the powder mill; in 1589 George Hall of Blackwall and in 1598 William Smyth of West Ham made powder; in 1597 and 1622 St. Thomas Mill produced powder: E.R.O.,T/P 48/1 and Session Rolls, Epiphany 1598/9; P.R.O., Req 2 65/42; City of London R.O., Bridge House Plans 52A.
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8. P.R.O. WO 47/1, fo.80; Cal. S.P.Dom.,1645-47,381; *ibid*,1649-50,587; *ibid*,1650,595; *ibid*.1651,555,565; *ibid*,1651-52,602,615; E.R.O., D/DB M200, fo.14.
9. Cal. S.P.Dom.,1650,570,579; *ibid*,1651,567,576; *ibid*,1651-52,614; *ibid*,1652-53,131,175,207,211;*ibid*,1653-54,430,438,461;*ibid*,1655,373;*ibid*,1655-56,114,156; *ibid*,1656-57, 261; P.R.O. WO 47/3, fo.322.
10. R.W.K. Hinton, *The Eastland Trade and the Common Weal in the Seventeenth Century* (1959) 220.
11. Cal. SP.Dom.,1651,577; *ibid*,1651-52,115,144; P.R.O. WO 47/2-4.
12. Cal. P. Dom .,1652-53,391.
13. Bodl. Rawlinson Mss. A.184,fo.21.
14. P.R.O., S.P. 18/126 no.60.
15. P.R.O. WO 47/9-14; P.R.O. WO 48/16,18,22-23,27; P.R.O. WO 55/1756.
16. P.R.O. WO 47/8; P.R.O. WO 47/19B; Dr. K. Bascombe, private communication 4.2.1985.
17. P.R.O., PROB 11/361(128).
18. Mills worked by John Lucas between April 1665 and August 1673 and maybe later. Not known when Freeman acquired them. Site may be on Small River Lea near where it rejoins the navigable river, but not definitely known: P.R.O. WO 47/19B; P.R.O. WO 47/7, fos.58,90; British Library,B.M. MAPS K.I TAB 18(10).

19. In September 1684 John Freeman of London merchant involved in an agreement with the Glass Sellers Company. James Sotheby, lord of the manor of Sewardstone, also involved in glass production: Guildhall Library, Ms.5556; E.R.O., D/DB M202.
20. P.R.O. PROB 11/380(103), PROB 11/381(161); E.R.O., D/DB M202.
21. P.R.O. WO 49/220. No mention is made of Naked Hall Mills.
22. P.R.O., TI/19 no.30, T1/76 no.61; TI/87 no. 127; Cal. Treas. Papers,1720-28,228; V.C.H. Surrey 11,325-27, Glenys Crocker, Chilworth Gunpowder (1984).
23. Greater London R.O., Acc 1953, Bundle 42; P.R.O. WO 48/44-50; P.R.O., TI/99 no.15; Edward Gibbon, *Memoirs of my Life* (ed. G.A. Bonnard,1966) 12-17.
24. Greater London R.O., Acc 1953, Bundle 42.
25. *Ibid*; London Borough of Enfield Library Services, River Lee Book of Sewers in the Years 1719 & 1720; V.C.H., Essex 11,463.
26. P.R.O., RAIL 845/53, Court of Sewers 4 August 1740; E.R.O., D/DQ^t 125.
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28. Cal. S.P.Foreign, 1561-1562,1-2.
29. Hatfield House, MAPS 11/23.
30. British Museum; Add. Mss. 5505, fos.23-24.
31. Propellants, Explosives and Rocket Establishment (Waltham Abbey),1049/a.
32. British Museum, Add. Mss.5505, fos.23-24•, Northamptonshire R.O., Additional Wake Papers. 1965/129.
33. P.R.O. WO 47/6, fo.106.
34. *Ibid*. fo.127; P.R.O. WO 48/5; P.R.O. WO 47/8; P.R.O., PROB 11 /352(141). This last source implies a Mr. Raddon owned the mills.
35. P.R.O. WO 47/19A, fos.7,17,140, P.R.O. WO 48/5; P.R.O. WO 48/10, fo.271.
36. Propellants, Explosives and Rocket Establishment(Waltham Abbey), WASC 307; Northamptonshire R.O., BH(K) 783; P.R.O., PROB 11/352(141).
37. P.R.O. PROB 11/352(141), PROB 4/1508.
38. P.R.O. WO 48/24-27; P.R.O. WO 49/220.
39. P.R.O., S.P. 44/237, fo.47; P.R.O. WO 48/29-34; P.R.O. WO 55/1758.
40. Cal. Treas. Books 1689-92,1194; *ibid*,1693-96,365; Cal. S.P. Dom., 1694-95,150; P.R.O. S.P. 44/237 fo.47.
41. P.R.O., PROB 11/470(110).
42. P.R.O. W048/41; P.R.O. WO 55/344 fos.176-79; P.R.O., PROB 11/415(119); PROB 6/87:
43. P.R.O., PROB 11/312(117); PROB 11/361(128); W. Winters, *Centenary Memorial of the Royal Gunpowder Factory, Waltham Abbey (1887)* 18

Keith Fairclough is working on a Ph.D thesis on the early industries of the river Lea between 1671 and 1767.