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THE ROYAL GUNPOWDER
FACTORY UNSIGNED (A
HISTORY) 1947

E.R.D.E.

THE ROYAL GUNPOWDER FACTORY

(ca. 1950)

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THE ROYAL GUNPOWDER FACTORY.

Gunpowder was first used by English soldiers in war at the Battle of Crecy, and it is reputed that the gunpowder was made by the monks of Waltham Abbey for King Edward II.

The earliest known record however relating to Waltham Abbey Powder-mills bears the date 2nd. March, 1560. Queen Elizabeth was on the throne, and on her behalf, one, John Tamworth, a gentleman of substance in Waltham Abbey, was in treaty with Marco Antonio Erizzo for the purchase of saltpetre, sulphur, and bow staves for barrels. The saltpetre was offered to him for £3. 10. 0. per cwt. which he declared to be too dear, but it seems that Erizzo could neither accept less money nor offer early delivery, and there the record ends. Tamworth is mentioned, in certain MSS preserved in the British Museum, as the executor of Lady Joan Denny, widow of Sir Anthony Denny, who was Lord Chamberlain to Henry VIII and Edward VI. His name also appears in the Abbey Churchwarden's accounts for 1563 wherein he is recorded as having given to the parish "Twenty loads of timber, ready hewed". Other records shew him to have been a man of many benefactions, and it is probable that he was the owner or manager of the powder mills at this time, but Dr. T. Fuller, in his historical writings dated 1655, says of him "This gentleman, by his bounty to the public, seems better known to God than to me, having neither heard or read of any of his name in or near Waltham". The same author became curate of Waltham Abbey in 1648-9, and records that "the Mills in my parish have been five times blown up in seven years, but, blessed be God, without the loss of any man's life".

It is possible that the gunpowder brought to the Houses of Parliament by Guy Fawkes and his associates in 1605 was made at Waltham Holy Cross. No record exists as to where the conspirators obtained their material but it seems likely that all the powder needed would have been purchased from mills in this country, as smuggling of such a commodity would be extremely risky. Considering the state of the roads and the means of transport in the seventeenth century considerable risk would be entailed in moving explosives over any great distance. Secrecy would also make it very desirable that it should not travel over the public highway at all if it could be avoided. No source could have been handier than the Mills at Waltham Abbey. They were in private ownership, and what could have been easier than to convey the required quantities of powder down the Lea to its junction with the Thames, and thence up the Thames itself to the house in Lambeth, which had been rented by Percy as a store, and from which it was conveyed across the river to a second house, also taken by Percy, next to the Parliament House itself.

Mr. John Walton, a relative of Mr. Izaak Walton of angling fame, and described as a "gentleman of known honour and integrity", was then the owner, the factory being considered the largest in Great Britain at that time.

Power for the Mills, from about 1739, was supplied by horses and was used to some extent considerably later than 1770; indeed, records dated 1791 showed that double horse mills were still in use. Water power had been introduced however, about 1770, when an Essex historian writes of "curious gunpowder mills worked by water, having an output of 100 barrels each of one cwt. per week for Government Service".

The Board of Ordnance acquired the Mills from a later John Walton in 1787, but contracted with him and several of his best men to run them. Forty six hands were then employed. A pillar sundial, bearing John Walton's name, still stands in front of the old Main Offices inside the factory. In 1795 the surrounding lands were acquired by the Board of Ordnance, under whose direct management the factory then came, and the

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first records appear of gunpowder being sent by barge from Waltham to Purfleet for proof.

About 1790, the powder mills at Faversham and Ballincollig which were also in the hands of the Government, were incorporated with the Waltham Abbey Factory under General Sir W. Congreve, "Comptroller of the Royal Laboratory", who under date 31st. December, 1799 gives an account of progress at Waltham Abbey Mills, as follows :-

The original debt incurred, namely £10,000, plus the cost of new erections, repairs, etc. "so as to set at work", amounting to the sum of £23,449. 7. 6d. was paid with interest of five per cent per annum out of the profits arising from the manufacture of gunpowder at Waltham Abbey from 1st. March 1790 to 31st. December, 1795.

Here is another entry :-

Report to the Master General of the Ordnance, by General Sir W. Congreve, dated 20.4.1811.

Between 1.1.1789 and 31.8.1810, 407,408 barrels of gunpowder, each 100 lb. made at Waltham and Faversham, showed a profit of £288,357. 6. 0½, and the profit on "regenerating" 127,419½ barrels in the same period was £53,091l. 1l. 3¼ or a total profit of £341,448.17.3¼.

The total amount expended by the Government on original purchase, repairs, erections and improvements in the 12 years 1787 to 1799 was £45,683.2. 7½. Evidently our accountants then were as meticulous guardians of the public purse as they are to-day!!

The first recorded fatal explosion occurred in the Powder Mills in October 1665, two men losing their lives. No record exists of any further loss of life until November 1720, when one man was killed. Since the Government took possession, fatal 'blows' have recurred at fortunately infrequent intervals, mostly in the nineteenth century. It is interesting to note that in 1801, after an explosion which killed nine men and four horses, a Committee of the Royal Society visited the works to report on the possibility of danger arising from electrical excitation caused by rolling barrels on the leather covered floors, or by the use of silk screens.

The early part of the nineteenth century saw the acquisition of water power rights, and the installation of hydraulic presses in place of the old screw presses. Horse power was finally done away with in 1814, and steam power had, to a great extent, supplanted water power by 1870. In 1872, in addition to gunpowder, the manufacture of gun cotton was started. The demand grew until it became necessary to provide more facilities, and 100 acres of land known as Quinton Hill was purchased and a new factory erected there which came into production in 1890. The manufacture of smokeless powder (cordite) was commenced in 1891, and for its production a nitroglycerine mill was erected also on Quinton Hill Site.

At the beginning of the present century, R.G.P.F. covered 411½ acres, and in addition to cordite, produced gunpowder, fine grain powder for fuzes and priming cartridges, picric acid, nitroglycerine, guncotton, nitric acid. All the sulphur and saltpetre required for gunpowder and fuze powders was refined in the Factory.

During two world wars, the factory supplied the nucleus of trained staffs for starting up the new ordnance explosives factories, besides producing to its full capacity explosives, propellants and intermediates of very high quality. Experimental pilot plant for the manufacture of R.D.X. was erected here and continued to produce throughout World War II.

Waltham Holy Cross.

Waltham in the time of Tovi le Prude or Tofig the Proud (A.D. 1035 - 1042) was a mere wilderness, overgrown by trees, and unmarked by any house or church. Its derivation is from the Saxon, "Weald-ham, i.e. weald, a wood, and ham a town; hence, a village or dwelling near a wood. The extensive forest of Waltham covered this district, and was the favourite hunting resort of the Saxon Kings and later of the Normans.

The only house in the neighbourhood was a hunting lodge belonging to Tovi, who held the high office of Standard Bearer to King Canute, and whose name is linked with the legend of the Holy Cross and with the erection of the earliest church at Waltham. The legend, taken from the early manuscripts is as follows :-

"In the Tyme that Kinge Canut reigned in Ingland, theare lyved at a Place called Comonly Lutegaresbyry, in French Montague, a simple man by occupation a Carpenter and by Office Sexton of his parish to whom on a Night appeared a Vision of Christe Crucified Commaunding him that as some as Day brake he should goe to the Parish Priest and will him, accompanied by his parishioners in solemne Procession, to go up to the Toppe of the Hyll adjoyninge and to digge, wheare (if they would beforehand make themselves by Confession, Fastings, and Praier, worthy of suche a Revalcion) they should find a Crosse, the very Signe of Christes Passion. This Plaine Man, Supposinge it a fantastical Dreame, toke at first no great Head thereof, save that he imparted it with his Wife, who also thoughte it but an Illusion, Wherefore the Image appeared again, and so griped him by the Hande that the Dynt of the Nayles remayned in his Hand to be sone the Daye followinge. Being thus pricked forward he goeth to the Priest and discloseth the hole matter; he arrayth his Parrishe, displayeth his Banners, putteth on Copes and Surplis, and setteth the Carpenter foremost, as his Captaine, they digge awhile and anone they find a great Marble, havinge in it of black Flynt the Image of Crucifixe so artificially wrought, as if God himselfe (sayeth myne Author) had framed it. Under the right Arme of this Crucifixe thear was a small Image of the same Forme, a little Belle also, and a blacke Booke conteyninge the Text of the four Evangelists. All this they signified to Tovi le Prude then Lorde of the Soyle, Standard Bearer to the Kinge and his Chief Councelor; who came to the place in great Hast, and by the advice of his Gents, left the smalle cross in the Church theare determyninge to bestow the greater in suche Place as God should appointe. Forthwith therefore he caused to be yoked 12 red Oxen and so many white Kyne, and layeth the Stone in a Wayne, myning (if God so wille) to carry it to Canterbyre; but the Cattle could not by any Force be compelled to draw thytherwarde. When he saw that, he changed his Mynde and bad them dryve towards his house at Reading whearin he had great Delighte; but still the Wayne stode immoveable, notwithstanding that the Oxen did their best. At the Lengthe he remembered a smalle House that he had begone to buyld at Waltham for his Disporte, and commaunded them to make thytherward. Which Words he had no soner spoken, but the Wayne of itselfe moved. Now in the way many weare healed of many Infirmities; amongste the which threscore sixe Parsons vowed their labour towards the Conveiance of this Crosse and weare the first Founders of Waltham Towne wheare was nothings before but only a simple House for this Tovi to repose himself at when he came thyther to hunte, notwithstanding that he had thereby divers Landes, as Enfield, Edelnetun, Cetrehunt, Myns, and the hole Baronie that Goffrey of Maundeville, the first of that Name had. Now when the Crosse was broughte thyther, Tovi commaunded it to be set up, and whiles one by Chaunce Perced it with a Nayle, the Blood issued out of the Flinte in great Abundance. Wherat Tovi being greatly amazed, fel downe and worshipped it, promiseth before it to manumitte his Bondmen, to bestow possession on such as should serve it".

The manuscripts containing this legend are to be found in the Harleian 3776 and Jul.D.VI., Cottonian Library, British Muscum.

The lordship of Waltham stands prominent among Tovi's great possessions which, in course of time passed to his son Athelstan, who, it is

recorded, did not also inherit the excellent qualification of his father - but "degenerated from his father's virtues and lost a great part of his wealth including Waltham". Waltham was actually taken from him by Edward the Confessor, who later presented it to the Royal Earl Harold. This was the original endowment of Waltham, but, rich as it was, it appeared somewhat insignificant compared with the Confessor's foundation at Westminster.

The foundation of the College of Waltham was a spontaneous act of piety and munificence on the part of Earl Harold. History records that Toivi had erected a small church on the site of the present one, in 1030, presumably containing the Holy Cross. Harold is reputed to have been cured of a paralysis by the power of the Cross, and in thanksgiving caused to be erected a much larger and more dignified building on the same site between the years 1060 and 1115. On this Church he bestowed riches in abundance; caskets of gold and silver, censers, candlesticks, vestments, chalices, altars and relics, the latter reputed by monkish legend to have miraculous powers.

Harold's succession to Edward the Confessor as the last of the Saxon Kings, is history. In 1066 having successfully overcome an attempt by his brother Tostig and the King of Norway to land in the Humber and seize his Kingdom, he was hurrying South to deal with the threatened landing of the Normans at Hastings, and came again to his church. It is said that, as he prostrated himself in the form of a cross before the altar, the image, which before that time had looked upwards, bowed its head as sign that the future held no promise. And on the field of Hastings a bowman's arrow ended Harold's brief Kingship.

There are conflicting accounts of what happened to the body of the King after the battle. One says that he was buried at Waltham, another that William refused to give up the body, and had it buried on the seashore; yet another, that Harold escaped death on the field of battle, to live the remainder of his days as a monk. The most probable story appears to be that he was buried first on the cliffs above Hastings, and afterwards moved to Waltham. It is said that Harold's mother begged William to give her the body of her son, and that it was carried with great honour to Waltham, where it was buried "in the holy rode Chyrche, that he lethim self rere".

Harold's Church, consecrated by the Lord Archbishop of York on May 3rd, 1060, was founded as a Collegiate Church under the rule of a Dean and twelve Canons. It was therefore a "Secular Foundation" and not a Monastery, and for a period of 117 years the clergy lived and worked among the people of the Parish in very much the same way as the Parochial Clergy do to-day. In 1177 however, Henry II changed the College into an Augustinian Priory, which was raised, in 1184, to the Dignity of a Mitred Abbey, and became, in due course, one of the richest and most prosperous of such institutions in the whole land - exempt as a Royal "Peculiar", from all Episcopal jurisdiction except that of the Pope.

At this period considerable additions were carried out, including the creation, to the east of the existing Nave, of a Monastic Nave and a Monastic Choir, with two Towers and two sets of Transepts. (Most of this information was authenticated in 1937, when considerable excavations were carried out by experts on the site). At the time of these extensions, a vast number of Conventual Buildings, including provision for housing the Mitred Abbot the Prior and Augustinian Monks, were established.

After the Dissolution of the Monasteries in 1542, the whole of the Church, with the exception of the Nave and the Lady Chapel, and almost all the Conventual Buildings were destroyed.

It is believed that the Nave of Harold's Foundation is that which exists to-day as the Abbey and Parish Church of Waltham Holy Cross. The site of the original high Altar, near which tradition says King Harold was buried, lies several yards East of the rose window in the present building. The rose window (one of the earliest works of Sir E. Burne-Jones, R.A.) and the wall supporting it were built into one of the arches, of which there were four supporting the tower of the original edifice. Part of the main Abbey Gateway, consisting of a large and smaller Gothic arch, stands a little distance to the North of the present doorway and is preserved as an ancient monument by the Ministry of Works. Nearby is Harold's Bridge which was probably constructed about 1370, and was so named because of Harold's close connection with the Abbey.

The Explosives Research and Development Establishment.

General and Historical.

In 1945, as part of the general reorganisation of the Defence Departments under the Ministry of Supply, the Royal Gunpowder Factory, which had worked to more than capacity through the two wars and maintained Service supply and research in the years between, was relinquished by the Ordnance Factory Organisation, and closed down at the peak of its long and meritorious career.

The experiences of the war years 1939 - 45 had also led to a decision not to re-unite the scattered groups of chemists at the Armament Research Department, Woolwich, but to set up a separate organisation to deal with the chemical aspects of explosives research and manufacture from the fundamental stages right up to plant-scale production. The choice of a location for the new Establishment eventually fell on R.G.P.F. Waltham Abbey, and the nucleus staff moved in in August, 1945.

By then the war-time Ordnance Factory staffs had been considerably reduced, but a permanent cadre remained, consisting of Engineers, Chemists, Clerks and other non-industrial grades, which was absorbed by the Chemical Research and Development Department by which title the Establishment was first known. This cadre was invaluable. Besides contributing an intimate knowledge and experience of the factory, it had been trained in its traditional, long established ways, and in conversation with the older members of the staff, the visitor will quickly discover that this pride in belonging to the old R.G.P.F. and of helping to make its history, is a very real and vital thing.

The Research Department had been no stranger to Waltham Abbey, From its inception in 1902, Dr. Silberrad at Woolwich enjoyed facilities at R.G.P.F. for plant and process research in collaboration with Dr. Robert Robertson, who was then research chemist at the factory, and in 1907 Dr. Robertson himself joined the R.D., bringing with him a wealth of knowledge of manufacturing procedure and safety precautions hitherto lacking. He was knighted for his services in World War I, and retired a few years later, but came back to serve again throughout World War II. News of his recent death was received with the greatest regret by all who knew him.

Dr. Silberrad, the first "Superintendent of Chemical Research", had a much shorter career in the Department at Woolwich. He had been appointed by the Explosives Committee set up during the Boer

War in May 1900, under the Presidency of Lord Rayleigh - "to examine the causes of defective performance of much of our armaments during that struggle, and to ascertain in particular, what were the best smokeless powders (i.e., propellants), and whether a better high explosive than lyddite could be developed".

Silberrad in the early days engaged in a continual fight to preserve the department from military interference, but in the end the military prevailed, and in 1906 Silberrad resigned. Under his direction however, notable achievements had been made. He began with a staff of six chemists, and for two years carried out research on propellants and high explosives, chemical stability being one of the main items examined. The development of explosive "S" (Silberrad's Explosive) which was later designated Composition Exploding or Tetryl, and the design of the first fuze used in the British Services containing a straight fulminate detonator by means of which lyddite shell could be successfully detonated, were outstanding.

These initial successes established the case for a larger Establishment, and from a small building containing three rooms near the Proof Butts at Woolwich, the department succeeded to a group of new buildings comprising the existing laboratory block, containing analytical laboratories and a few smaller rooms, an autoclave and closed vessel house, a mounded nitrating house, shell bursting cell and a small propellant factory. These were erected at a cost of £7615!! The present H.E. laboratory was fitted up there as a metallurgical laboratory.

We have gone a long way since then. On the reorganisation of the R.D. Woolwich in 1907, when Dr. Robert Robertson became Superintending Chemist, alternate military and naval personnel were appointed as Superintendents, each for a period of four years, and this arrangement continued until 1942, when control was again vested in a scientist. There followed a rapid expansion of work and staff, and in the ensuing years until the end of World War II many notable developments in explosives and weapons further enhanced the already high reputation of the department. But the demands of those hectic years brought their lessons, and led to a division of responsibility culminating in the formation of the Chemical Research and Development Department, under which title we occupied the R.G.P.F. in 1945. Our first Chief Superintendent was Dr. F.J. Wilkins, who, on appointment to Ministry Headquarters as D.C.R.D. in 1946, was succeeded by Dr. H.J. Poole. The title of the Establishment changed to the present one during 1948. Dr. C.H. Johnson succeeded Dr. Poole on the latter's appointment as P.D.S.R.(D) in October, 1949.

Buildings and Amenities.

One of the main reasons why the choice of location for the new Establishment fell upon Waltham Abbey was that facilities had to be found for process development and chemical engineering research. Much useful plant and a number of mounded buildings, stores and permanent facilities were available.

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Above all there existed a fine force of experienced process workers to whom "safety" precautions were second nature.

But the picture had another side. The acids and explosives plants, with the exception of a nitric acid concentration unit and the R.D.X. experimental plant, were worn out and ready for scrap. There was no roadway at all for vehicles beyond the coal dumps on the North and South Sites. All internal transport had been by barge on the waterways by which the whole site is intersected. The buildings had been put up, over the years, as required and where required with little attempt at a planned layout, and had become impregnated with whatever explosive substance had been made in them. There was no waterborne sanitation on the North Site apart from the Main Office installations and the amenities were little better on the South Site. (This is still the case to-day). Offices, workshops, changing rooms and canteens needed modernising.

These, then were the conditions when we took over in 1945. A planning organisation was immediately set up to convert process workrooms to laboratories; to improve internal road access; to clear certain development areas of brushwood, and to build up as far as possible from existing facilities, the new installations required for our job.

Lack of laboratory and development facilities, and especially of housing, at Waltham Abbey meant that 35 to 40% of the scientific staff had to remain at Woolwich, and it seems that no considerable transfer of this personnel and their facilities can take place until new buildings are completed at Waltham, estimated for 1952 - 54.

The conversion work carried out since 1945 has been done by the Building Works Section at E.R.D.E. which has taken over entire from the R.O.F. organisation. The highest praise is due to this small body of skilled craftsmen, their foremen, the mechanics and engineering staff, the electricians, and the planning staff, for the ingenuity displayed and the high quality of work put into these conversions. No new laboratory or process building has been erected at Waltham Abbey since 1945. Existing shells have been used throughout.

It is not only the Woolwich staff who have been adversely affected by the dearth of houses at Waltham Abbey. Many journey daily from as far asay as the western suburbs of London, and, from Walthamstow and Ilford areas. Some scientific staff travel to Waltham every day from the Eltham and Woolwich areas and must continue to do so until housing accommodation is available.

Future Development.

The extensive programme of rebuilding the Establishment and giving it some amenities, which has been completely held up since 1945, very recently came to life. The most urgent items are the provision of a new solid propellant development area on the South Site, and houses for staff. Financial approval has been given for both. A Building Contractor has put his sign up. Other items of immediate importance include roads and sewers, extensions to workshops, a canteen, a Surgery, and shifting houses (i.e., changing rooms for industrial staff). Laboratories for chemical engineering are also high upon the list.

Office accommodation at Waltham Abbey is totally inadequate but it is obvious that plans for a new Administrative Block, a Library and several other items of this sort must await the completion of process buildings and laboratories required to meet the urgent needs of the country at this moment.