ROYAL
GUNPOWDER
MILLS
WALTHAM ABBEY

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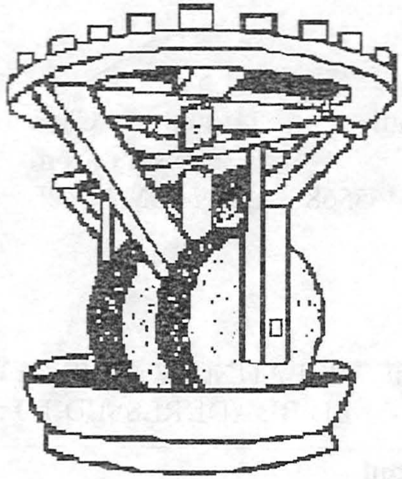
Touchpaper

The Newsletter of the
ROYAL GUNPOWDER MILLS WALTHAM ABBEY
FRIENDS ASSOCIATION



**JUNE
2004**

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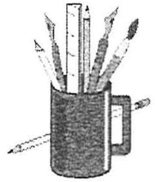
PLEASE NOTE: Deadline date for submissions to the next issue is 15th August 2004



EDITORIAL

The article on the Quinan Stoves in the December issue continues to generate a lot of data and reminiscences, which is fortunate since the number of other articles and 'snippets' for TouchBytes is sadly lacking this time.

I am also pleased to see that Jim Jeacocke has taken up his pen again after some illness - welcome back to our pages Jim. I can only hope that it may spur other members to send in contributions.

I know that you all read every word of Touchpaper but just an extra reminder that I have also, very reluctantly, taken over as Treasurer so all future correspondence regarding membership and finances should now come directly to me.

Norman Paul
Editor

AGM REPORT

At the AGM , held at the Royal British Legion Hall on the 14th May, the following Officeholders and Committe members were elected for the forthcoming year:

CHAIRMAN John Wright

SECRETARY Richard Penfold

TREASURER Norman Paul

Special thanks were recorded for the work of the retiring Treasurer, Frances Burgess. The sterling work she has done has kept our finances on track.
Despite significant expenditure since the last AGM the Association finances remain healthy with satisfactory reserves.

COMMITTEE MEMBERS ELECTED:

Brian Clements,	Harry Edwards,
Bryan Howard,	Dave Manners,
Dave Sims,	Les Tucker,
Ron Treadgold	

There were no amendments to the constitution or proposals tabled at the meeting.

REUNION

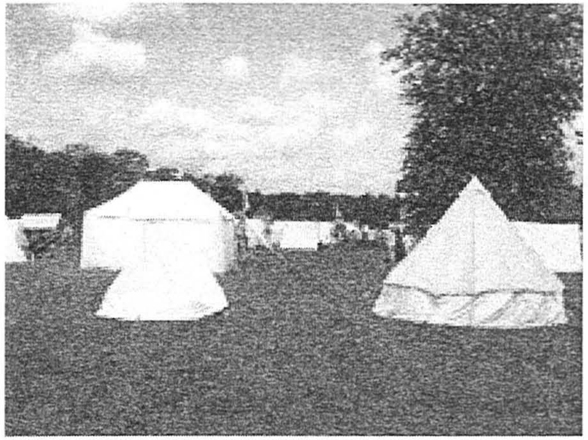
This followed the AGM and was attendeed by about 80 members. A buffet lunch was provided by the British Legion and we are grateful for their continued support for this event in allowing us to use their facilities.

As usual the main business of the day was the swapping of reminiscences and bringing everyone up to date on what has happened in the past year.

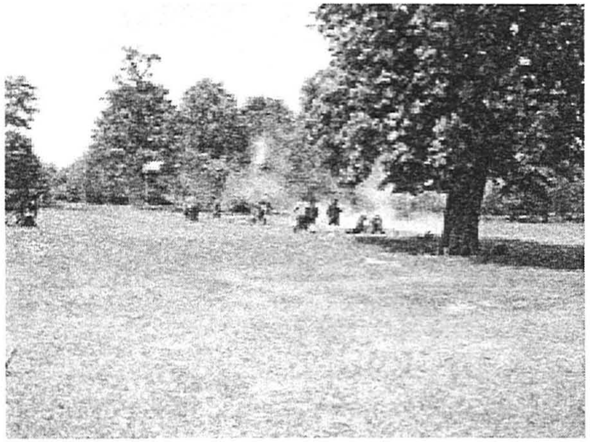
SITE NEWS

Despite the recent fine weather visitor numbers are somewhat disappointing though all those who do come are very impressed by the site and many say they would come again.

Recent weekend events have included the Napoleonic Society



and the English Civil War re-enactment group.



'FRIEND'S EXHIBITION' Laboratory and Rocketry

This past couple of months working parties have been busy setting up an exhibition in the annex of L157 showing various aspects and equipment of chemical laboratories and a display on rocketry.

The exhibition, which is now open, gives a good insight into these two topics

With the limited support of members it has not been possible to demonstrate and explain to visitors the many aspects on display on every open day but we hope that most of the exhibition is self explanatory.

THE RDX LAB

When the decision was taken to to build the RDX Pilot Plant on the South Site a new laboratory facility was needed so a small hut was built adjacent to the Main Lab specifically for that purpose *(presumably the 'Green Hut' that still stands. Ed.)*

This was necessary since one of the specification tests (carbon content) was so sensitive to contamination that a relatively clean atmosphere was required (even blowing into the reaction flask was enough to give erroneous results). Many rumours circulated about this new material, in particular that it turned one green. At least a change from the bright yellow from Tetryl that I was at the time! But eventually the lab was up and running.

Then, disaster; 'Our lab" was to be taken over by a lot from Woolwich who had been bombed out. We didn't think much of that and, for a time, there was a certain animosity between us.

Ernie Bowell was one of the first 'evacuees', the others that I remember were: Wood, Clarke, Kemp, Quick, Townley (on whom I played the TNT coated bluebottle trick mentioned in an earlier edition) and, in particular, G J Bennington-Davies.

We soon began to fraternise, especially when we discovered that they had an alternative use for the extraction bath, which was to keep a continuous supply (source unknown) of hot coffee available.

If you read this Ernie, greetings from the past.

A PRANK THAT BACKFIRED

Part of the 1st floor of the Main Lab was fitted with a false roof to form a balance room, extraction room and office. The loft, so formed was used as a repository for obsolete and obsolescent equipment and had facility for on and under bench storage. Hot air, with its tendency to rise, brought with it the dust and grime of ages. I have mentioned before that, in the early days, we worked a 6 day week with a courtesy Saturday afternoon off. Some of us, anxious to go out in the afternoon, would come to work wearing 'second best' clothing. In such cases it was well to keep out of the way of the 'old man' (W C Blanchard) as, if he saw anyone respectably dressed, would immediately demand retrieval of some archaic device in the remotest corner of the loft. Two of us, having spoilt the knees of numerous pairs of trousers, decided to take revenge. We had been working long enough to know some of the properties of diethyl ether, in particular its low boiling point. It was a hot summer and with the aid of a bicycle pump we injected a few mls of ether into the front tyre of his bicycle in the hope that, as he cycled home the ether would expand and give him a puncture. The thought of this rather florid gentleman wheeling his heavy bike home intrigued us. Unfortunately we had overlooked another property of ether, its solvent effect and cycle inner tubes were made of rubber. I was then 'nobbled' by the old man who asked if I would have a look at his front tyre which was flat. I approached the task with trepidation but on removing the inner tube found that the ether had loosened an existing puncture repair patch which was easily replaced. There was, however, a strong smell of ether about so I inflated and deflated the inner tube a few times to remove the last traces - there I did wrong, the ether had swollen the tube so that when I came to put it back on the wheel it was now about 9 inches too long. I called my fellow conspirator and, by putting a number of 'tucks' in the tube we managed to get the outer cover on and inflate the tyre.

With a silent prayer we kept an eye on the cycle for the rest of the afternoon but, thankfully, all was well.

Jim Jeacocke

NON-LISTED PRINCIPAL STRUCTURES OF THE ROYAL GUNPOWDER MILLS

Part III DEVELOPMENT OF CHEMICAL EXPLOSIVES AT WALTHAM ABBEY

Section 6. 20th Century - Tetryl (CE) and other High Explosives

Historical Background

Tetryl, in British military terminology Composition Exploding, CE, had a symbiotic relationship with high explosives and the following first gives a brief overview of the development of high explosives in the late 19th and 20th centuries.

In the era of gunpowder the powder was employed either as a military propellant, providing the power to project an object such as a cannon ball or in a blasting role in demolition and in civil construction, mining etc., i.e. producing a disruptive shock wave.

In the military field the concept of the bursting shell was developed, where a metal container of explosive, a shell, was projected, containing a fuse set to cause detonation of the contents, resulting in an explosive shock wave which burst the metal casing.

From the beginning of the 20th century the era of chemically based explosives brought with it the possibility of evolving progressively more powerful explosives for filling shells. These explosives were known as high explosives (HE) reflecting the high pressures and consequent shattering power developed. The basic principle remained the same - initiation of the main charge by a smaller detonating charge.

The treatment of organic compounds with acids - nitration, produced the two core chemical explosives - nitrocellulose and nitroglycerine. However they were too sensitive to be used as shell fillings generally, although some effort was made with guncotton (nitrocellulose).

Picric Acid

Picric acid was the first chemically produced material to be used as a shell filling by British Forces, in 1895.

A bright yellow solid, it was discovered in 1771 and for many years its primary function was as a textile dye. Also, it was one of the main treatments for burns until as late as WWII. Its usefulness did not end there. London brewers had enjoyed a competitive advantage over the Burton competition as their beer had a desirable bitter edge. The secret ingredient they used to achieve this was picric acid.

The main organic compounds treated by nitration were the aromatics and in 1841 Laurent nitrated phenol to produce trinitrophenol - chemically synthesised picric acid, which was discovered to have explosive properties. In 1871 Sprengel determined that it could be exploded with a detonator and in 1885 Turpin filed a patent to cover its use as a shell filling, giving it the name Melinite.
In Britain trials conducted at Lydd in Hampshire resulted in cast picric acid, given the name Lyddite, rapidly supplanting gunpowder at the end of the 19th century as the principal British shell filling. Lyddite brought with it a characteristic which was to lead to the development of tetryl - it required a more sensitive explosive as an initiator and a 'booster', to convey detonation from the initiator to the main charge.
Picric acid did have several disadvantages. For shell filling it had to be melted. It had a high melting point and the resultant high temperatures required for processing could cause it to decompose. It was a relatively strong acid and could attack metals, producing from lead and copper dangerous heavy metal picrates. To combat this inside surfaces of shells had to be laboriously coated with acid resisting varnish. Casting of picric acid was a difficult process.

Picric Powder 1895 - The first Booster at Waltham Abbey

The booster for lyddite was picric powder, a mixture of ammonium picrate and saltpetre (potassium nitrate), originally proposed by Abel in 1870 as a possible replacement for gunpowder but never taken up, achieving initiation of the lyddite by igniting it until the burning produced sufficient pressure to burst the shell. The manufacturing process for picric powder was similar to gunpowder, being pressed and granulated. It was first manufactured at Waltham Abbey in 1874, possibly in connection with Abel's suggestion, but disappeared from the scene until 1895 when manufacture recommenced in response to demand as a lyddite booster. Difficulties were encountered in obtaining ammonium picrate from outside and in 1898 a dedicated plant was built on the South Site to manufacture ammonium picrate from picric acid.

Boer War British munitions failure - 1899-1902

Just as the American Revolutionary War at the end of the 18th century then the Crimean War in mid 19th century had exposed serious deficiencies in British military materiel so half a century later at the beginning of the 20th century the Boer War exposed a further British munitions failure stimulating a corrective reaction. In spite of picric powder boosting many of the larger lyddite shells only partially exploded and a high proportion of the smaller shells failed to burst at all.

Composition Exploding - 1903

Research at the Armaments Research Department at this time was under the direction of Oswald Silberrad, a brilliant young chemist who had been appointed Director of Research at the age of 23. Silberrad investigated a possible replacement for picric powder. Detonation of a high explosive charge could be brought about by direct use of an endothermic substance such as mercury fulminate. But this was dangerously sensitive and the large quantities required would be very costly. Silberrad found that tetranintro dimethyl aniline was very promising. This material had first been chemically synthesised in 1877. However as with all such developments any further progress is reliant on large scale production being economically sound. For the new booster this was made possible by parallel developments in the dyestuffs industry.
Textile dye manufacture could be argued to be the kickstart for the growth of the organic chemical industry, with explosives closely following. In 1856 the 18 year old student William Perkin in a makeshift home laboratory accidentally discovered the colour mauve, a discovery that was to sweep the world's textile industry and make him a fortune. In 1857 he began to set up a factory at Greenford Green Middlesex,
the work being done by his father, with early laboratory work being conducted in the back wash-house of a house he had moved to nearby. Bearing in mind that the whole organic chemistry industry was barely starting it is remarkable that he was able to come to the conclusion that for economic large scale production the basic material he required was aniline made from nitrobenzene, made by nitrating coal tar derived benzene and that he would build his own nitrating plant. In a sense therefore he was setting out to make a non explosive explosive, in a nightmarish rudimentary nitrating plant the operation of which seems to have been based largely on prayer. Those who were aware of what was going on regarded it as a near miracle that Perkin did not consign himself and the good citizens of Greenford Green to oblivion.
But he didn't and the 'explosive' growth of the dyestuffs industry, incidentally causing Perkin to become involved in many patent battles similar to those of Nobel in explosives, meant that Silberrad was able to observe that supplies of dimethyl aniline, the basic building block for tetranitro dimethyl aniline, were available at an economic price from the dyestuffs industry and therefore the way was open for introduction of the new material as a very effective detonator. Initially known in the Services as 'Silberrad's Explosive', it was given the official title Composition Exploding (CE) and entered British Service use in 1903.
Later the name Tetryl was applied, the full chemical name being trinitro phenyl methyl nitramine

TNT

Investigation of the booster led to investigation of the high explosive itself and Silberrad established that TNT, trinitrotoluene, produced by nitration of coal tar derived toluene, was a much superior product to lyddite. It was less sensitive and therefore safer to handle and store, it did not form dangerous salts, was relatively straightforward to manufacture, it had a fairly low melting point avoiding degradation from high temperatures and could be readily cast.

The aromatics required for tetryl and TNT production were initially obtained from coal tar, largely a gasworks by product. By 1914 petroleum had begun to appear and the toluene required for British TNT was obtained from Borneo oil produced by Shell. This was one of the forerunners of the petrochemical industry, employing aromatics as one of its major building blocks.

TNT and Tetryl

Relatively low sensitivity, whilst a distinct advantage in storage and transportation of TNT, meant that it required an effective booster. At this stage the two strands of Siberrad's research came together. Tetryl proved to be an eminently suitable booster for TNT.

Germany began large scale manufacture of TNT in 1904. In Britain in spite of its advantages it did not become an official explosive until the beginning of WW1 in 1914 and manufacturing capability was extremely limited. Whilst official inertia was largely to blame, part of the reason appears to have been that the British dyestuffs industry, in spite of being the country of origin of chemical dyestuffs, had fallen far behind the European competition and was incapable of producing sufficient base product required for explosives in war conditions, hence the emergency move to petroleum base in 1914. After frenzied effort the munitions industry managed to achieve the production of sufficient TNT for the Services from 1916.

It should be noted that, while large scale production of TNT was not carried out at Waltham Abbey a new continuous method for its production was researched and a pilot plant set up to prove the process which was then transferred to the main Ordnance Factories.

Oswald Silberrad

Silberrad became frustrated with War Department bureaucracy and in 1907 he left Government service to establish his own business as a consulting industrial chemist - Silberrad Research Laboratories in Buckhurst Hill, Essex. From there he made many valuable discoveries relating to chemical compounds and synthetics and continued to direct the business until his death in 1960. His vital contributions to British explosives development have therefore tended to be lost with his departure from Government employ.
His experience with the War Department makes an interesting comparison with Sir Frederick Abel, who appears to have been an extremely urbane man, combining scientific ability with mixing successfully in the highest social circles, thus ensuring acceptance by the Establishment.

Tetryl manufacture at Waltham Abbey and manufacturing process

Chronology :

Stage 1 - 1910

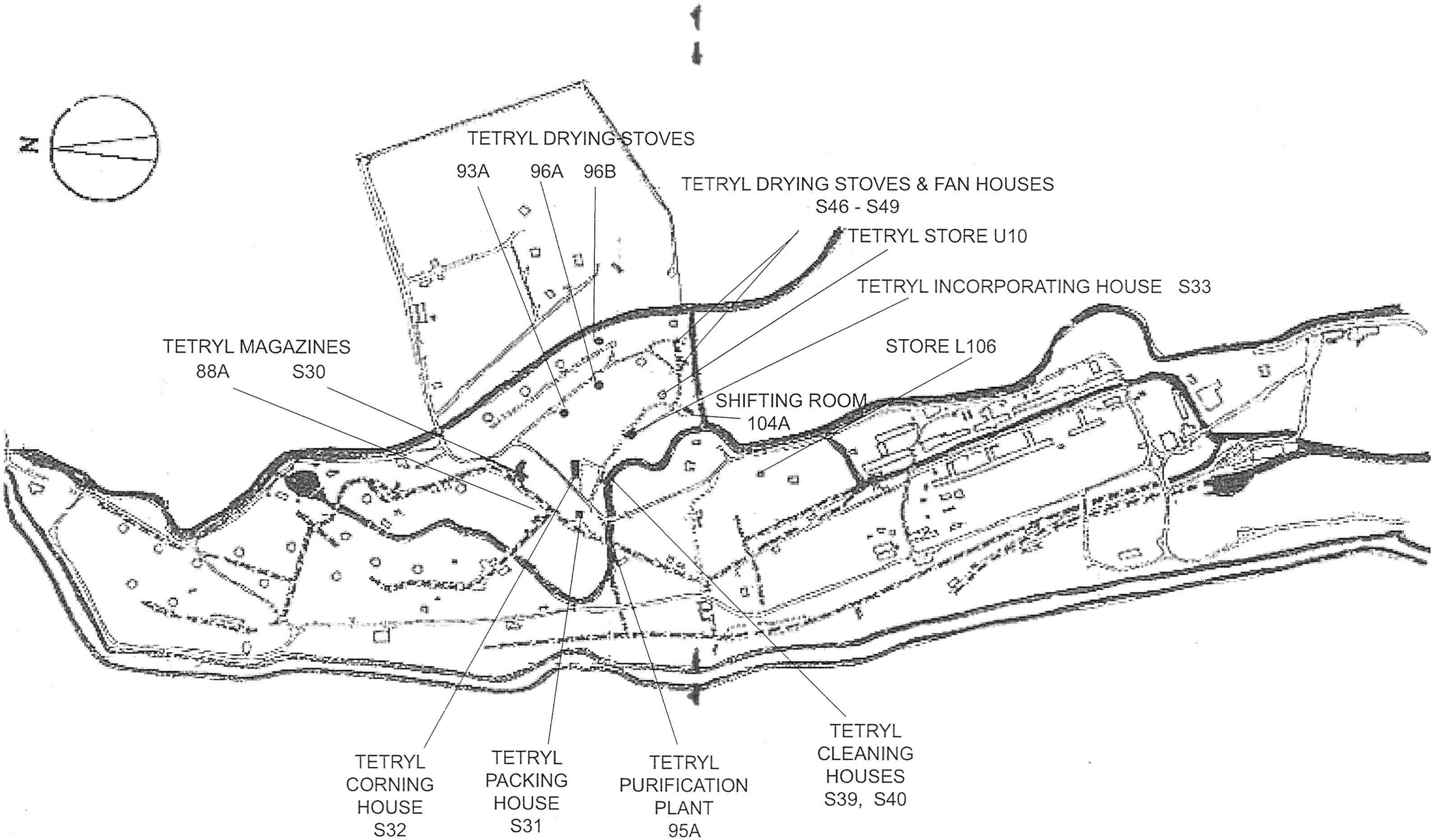
Typically, in spite of Silberrad's success, the Government did not approve erection of a CE plant at Waltham Abbey until 1910 and this on a very small scale. It then progressed in a very unsatisfactory way with piecemeal additions.
To secure ease of access to the nitrating acids the plant was built close to the acid factory on the north west of Edmonsey. Main buildings were ;- Nitrating House, Filter House, Drowning Sheds, Boiling Shed, Centrifuge House, with the hazardous Purification House on the other, west, side of the Millhead Stream.
Typical of the way in which wartime production was (mis) handled, in 1916 someone in Whitehall suddenly woke up and realised that success in producing TNT meant greatly increased demand for tetryl, and Waltham Abbey was expected to cope virtually overnight. The response was the hasty improvisation of a nitrating plant from lead and used acetone drums, which was producing within 24 hours of the first order. It was demolished after WWII. Had it survived it would probably have ended its life an object of awe to historians of the chemical industry. Until other factories came into operation in 1917 Waltham Abbey was the sole supplier of tetryl.

Stage 2 - 1918 New Purification Plant

A new water boiling purification plant was built in 1918, but was mothballed until 1935.

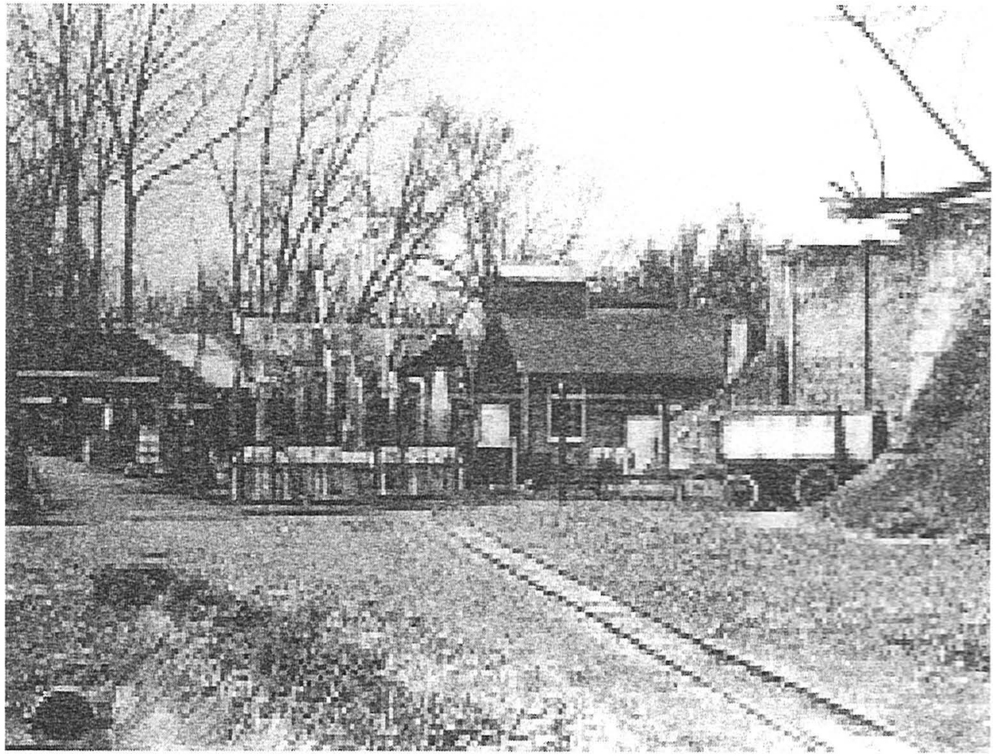
ROYAL GUNPOWDER MILLS WALTHAM ABBEY

NORTH SITE TETRYL BUILDINGS



Stage 3 - WWII Tetryl Factory - the east side

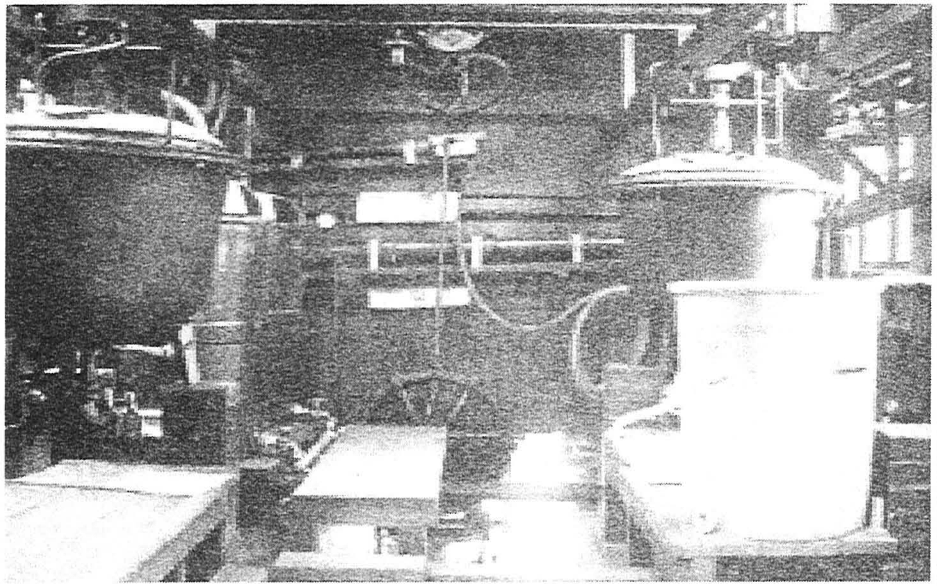
The new purification plant had been built to the east and in the early 1940's new buildings were added to make this the centre of production in an area bounded to the west by the Old River Lea and to the east by the guncotton stoves running parallel to the Cornmill Stream. The surviving tetryl buildings are therefore in this area, see map.



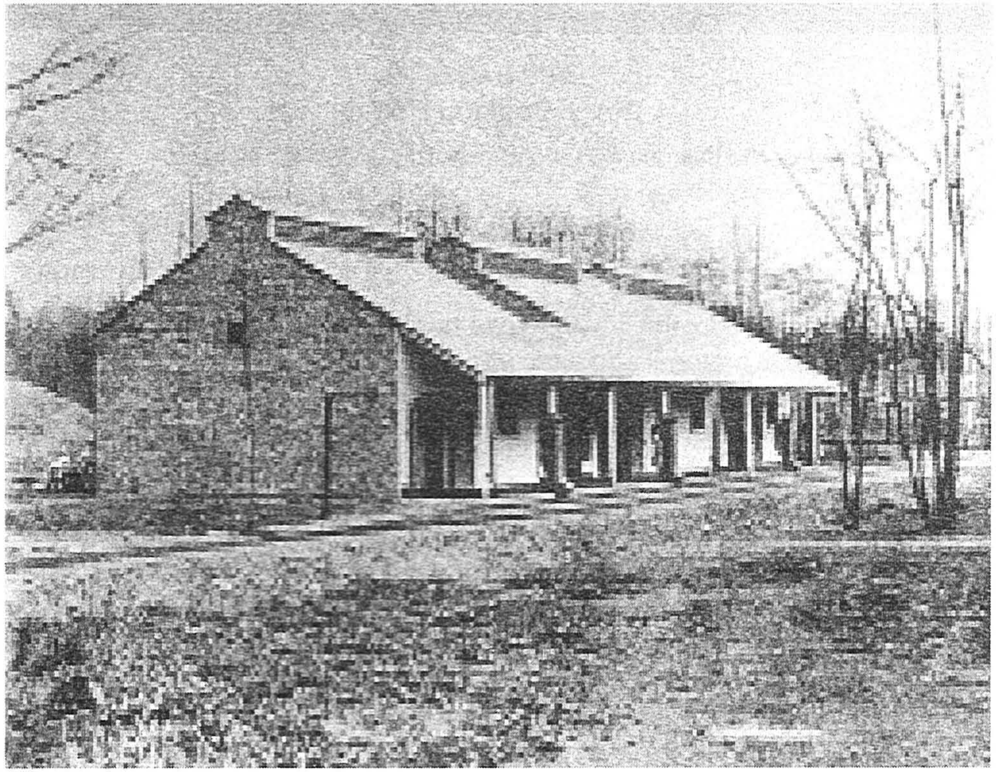
Tetryl Water Purification Plant 1919

Building S31 Packing House on the right

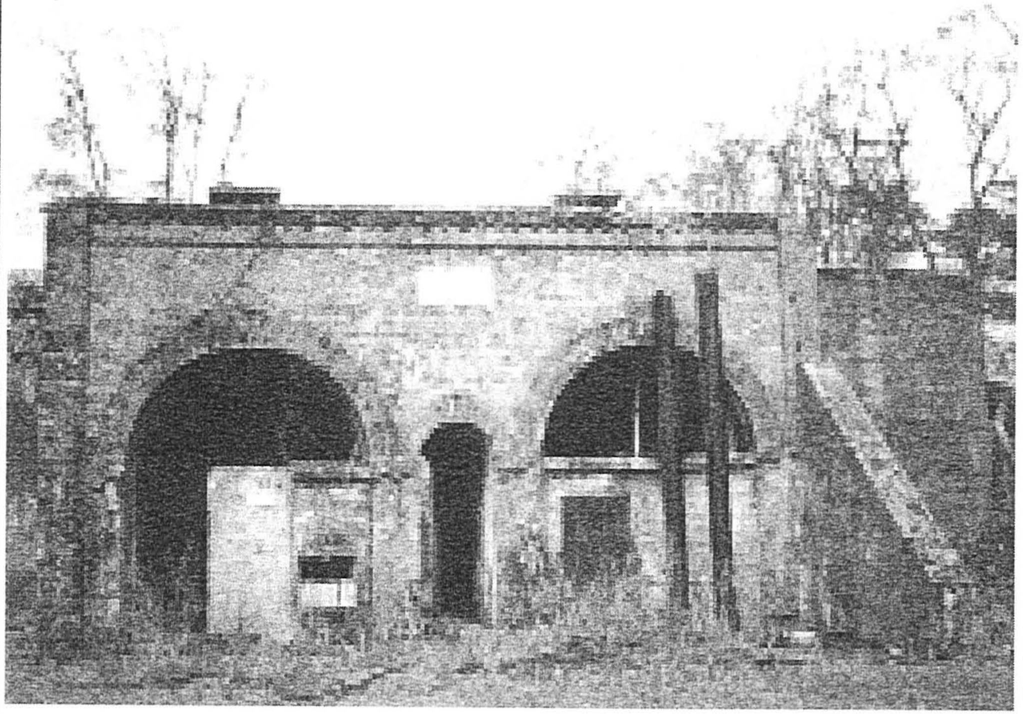
18 inch gauge railway in foreground



Interior of Tetryl Nitrating House



Tetryl Sieving House 1919



Building S31
Tetryl Packing House

Prior to this use S31 went through 4 different functions:

1879 Press House No.4	1886 Moulding House
1898 Cylinder Cutting House	1908 Cordite Blending House

As in WWI so in WWII for the first three years Waltham Abbey found itself the sole supplier of this vital material and even after 1942 when other suppliers had come on stream pressure on supplies was intense and in fact the tetryl factory was the last facility to close when manufacture ceased at Waltham Abbey in 1943.

It is interesting to note that if Tetryl were discovered today it's now known toxic properties means that it would never have been brought into service. It is readily absorbed into the body and the then workers were known as 'canaries' since it turned their skin yellow. Those working in munitions factories engaged in filling shells were likewise turned yellow. Although it was subsequently found to be carcinogenic there are no known records of any subsequent fatalities from among the workers and one can only speculate on the fate of the tetryl workers.

Manufacturing Process See Appendix

As with cordite, TNT was a vital part of British ordnance in two World Wars But TNT could not have functioned without tetryl as a booster and for the first half of these two wars Waltham Abbey bore the entire brunt of production.
Cordite, Guncotton, Nitroglycerine are terms which have passed into the public consciousness but tetryl and the work of Oswald Silberrad in discovering the material and developing a manufacturing method and in establishing the superiority of TNT are unknown.
Sir William Crookes in an address to the Council of the Royal Society at least was in no doubt as to the value of Silberrad's work.
"In 1902 Dr. Silberrad discovered tetryl, thus creating an immense national asset out of this practically unknown chemical curio. He subsequently worked out the conditions for the manufacture and purification of this product. I confidently leave it to the Council to imagine how great a catastrophe would have befallen the country had it not been for Dr. Siberrad's discoveries ".

Les Tucker

This completes the original commission, in March 2001, of a series of articles on the Mills from Government purchase in 1787 to 1940. This series was to form the basis of booklets for sale to visitors to the Mills. The first of these, on the Listed Buildings, and the Editor's booklet on the Trees of the site were published in March 2002. Work will now start on the third booklet - Guncotton and Nitroglycerine.
The continuing series, detailing postwar developments, will be written by past employees of the Research Establishment.

Appendix

Tetryl manufacturing process

The manufacturing process for tetryl was :-

Starting material - Dimethyl Aniline

Sulphuric acid solution of Dimethyl Aniline added to an excess of Nitric Acid under strict temperature control (70°C).

Precipitation of Tetryl crystals by the addition of water.

Product filtered through quartz

Washed in water 4 times

Boiled

Centrifuged to reduce water content to 5%

Purification - Dissolved in anhydrous acetone and run into water

Precipitated and recrystallised as pure Grade 1 Tetryl

Dried on trays

Incorporated with gum arabic

Corned

Dried to take water content to around 2%

The following Appendix was omitted from the article on the Quinan Stove in the December 2003 issue.

Appendix
The Quinan System for drying Guncotton

Pre-Quinan - The use of dried guncotton blended with nitroglycerine to make cordite initiated the building of guncotton drying stoves at Waltham Abbey.
These consisted of batteries of stoves served by Engine and Fan Houses. The Engine House powered a belt drive to the Fan House which blew air over heaters and into the stove. A later version comprised a central Fan House with blowers which blew hot air from a heat exchanger consisting of pipes served by steam from boiler houses.
Drying was a time consuming and expensive process and efforts were directed to increasing the amount dried at one time. By the late 1930's stoves were drying 5000lb of guncotton for 60 hours at a temperature of 35°C.
Quinan appraised this system, identified disadvantages, and produced a design which eliminated perceived disadvantages and improved performance.
The characteristics of the existing system were :

The drying of a large quantity at one time for a prolonged period led to super drying - continued drying of material after part is dry. This could lead to electrification of the batch

Handling of material in large unwieldy batches led to the risk of friction which in conjunction with electrification could lead to fire and explosion

'The GREATEST POSSIBLE CARE is to be taken when handling Dry Guncotton to carry out all operations as quietly as possible . FRICTION OF ANY KIND IS TO BE AVOIDED' [Extract from Factory Rules for handling Dry Guncotton]

Prolonged heating could lead to loss of product stability

Excessive drying times restricted throughput and increased utility costs

Quinan's design turned the existing system on its head, eliminating the disadvantages and conferring further advantages.

Electrification avoided by eliminating super drying. This was achieved by rapid, 60 minutes, drying of smaller quantities in smaller containers, 16lbs, at a much higher temperature, 61°C, with the warm air being passed directly through the guncotton, which was spaced out in thin layers

Danger of friction in handling at the unloading point substantially reduced by laying the material on a sheet in the drying basket with sheet only being lifted out complete with contents at the end of drying

Provision was made for the guncotton to be cooled before handling by circulating through the material compressed air which cooled as it expanded

Avoiding prolonged heating eliminated loss of product stability

Safety increased by separate drying bays with fireproof walls

Substantial reduction in cost of utilities

MORE ON THE QUINAN SYSTEM / STOVE FOR DRYING GUNCOTTON

Correspondence

Thanks to Steve Bell and David Hewkin for their letters on the Quinan article.

The Touchpaper articles so far have taken the story up to the late 1930's. When booklets are ultimately published information on the later period as in this correspondence and hopefully later responses will be included.

Regarding Steve's comments on the postwar use of the Quinan stove, its siting at Waltham Abbey was certainly a complete anomaly in manufacturing terms once Bishopton was established. By the late 1930's the powers that be would have concluded that it was only ever going to function as a building and system test bed for guncotton drying for cordite manufacture at Bishopton rather than as a component of any manufacturing at Waltham Abbey and that if, as it did very successfully, perform this function then leaving it merely for miscellaneous use after that was a small price to pay.

Now of course it has become a unique surviving artefact of the 20th century explosives industry. Whether drying guncotton for cordite manufacture was the correct route to follow is another matter, see below.

As David points out, my use of the word 'entirely' in relation to the wet mix process for cordite paste removing the need for drying was misleading - I should have written something to the effect 'when a system of cordite manufacture had been evolved which avoided the use of guncotton in the dried state'.

David notes ' The Quinan process involving moving hot air may have been evaluated as a means of increasing the throughput'. In a History of Chemical Engineering published by the American Chemical Society an article appears entitled 'The Role of Chemical Engineering in providing Propellants and Explosives for the UK Armed Forces'. In this it is stated:

> *The principle of preparing warm, dry, filtered air and forcing it through fluidised beds of guncotton restrained from escaping by covers of special fine cloth was a brilliant solution well ahead of its time.* ***It probably increased the output of the cordite factory*** (not specified) ***by 50% by reducing the throughput time.*** (my 'bold type').

The implication of this for wartime production does not need any explanation.

Wet Mix v Dry Mix

Any discussion of the Quinan guncotton drying system leads inexorably to consideration of the two systems of producing cordite paste, a mix of nitrocellulose and nitroglycerine - dry mix using dried guncotton or wet mix using a wet nitrocellulose slurry.

The Quinan drying system was devised because Abel's original cordite patent, which set the scene for Government cordite manufacture, called for dry guncotton in the mix. Dry guncotton was a very hazardous material and Nobel in his method had avoided it. Later events at Bishopton demonstrated the dangers of handling dry guncotton. There were two serious explosions in 1941 and 1943. It is evident that by the late 1930's a significant segment of opinion had arisen which said ' wet - good, ' dry - bad '. For example again quoting the Role of Chemical Engineering article, ' Developments did occur in the manufacture of solventless cordite and a feature of this at the RNCF Holton Heath was the overdue adoption of the principle of wet mixing of NC and NG as originally employed by Nobel. The dryimg of guncotton with its attendant risks therefore was eventually abandoned by the government factories at the end of World War II'.

That the controversy was in the forefront of official thinking on explosives at the time is indicated in the Proceedings of the Court of Inquiry into the explosion on 20.4.1940 in No.2 Mixing House at Waltham Abbey. Under the heading Observations No. (iv) reads :-

> *In view of this explosion and the two previous recent explosions at Waltham Abbey and Ardeer, the Court is of the opinion that full consideration should be given to the relative merits of the wet mix process and the method in use the R.G.P.F.*

Evidence given by Mr.P.G.Knapman, Superintendent of the Factory, and Dr. Rotter, Director of Explosives Research, Research Department shows that the matter was by no means clear-cut.

Mr.Knapman

> *With reference to the Wet Mixing Process he had given it a lot of thought,*
> *but said that if it was introduced you remove the risk at one point and put it on at another, he was not sure which was the bigger risk.*

Dr. Rotter

> *A great deal had been said recently about the substitution of a wet mixing process for the present dry paste mixing. He was not sure whether the Court was the proper body at which the relative merits of the two processes should be discussed, but he was clear that while the wet mixing process had some advantages it had also certain undesirable features which rendered its immediate adoption of very doubtful desirability. It was not clear to argue that the process which had been found satisfactory for cordite S.C. would be equally so in the case of cordite W as there were important differences in the character of the materials. He understood that a unit of plant was being fitted up at Ardeer to try out the wet mixing process and advocated that its further adoption in Government factories should be postponed until after experience had gained.*

Les Tucker

QUINAN STOVE

It is not that I have a bad memory through age you understand; I've always been thus afflicted. So the following is offered on the understanding that I am happy to be corrected.

The Quinan stove on P1 section was used for drying NC for two main purposes:

(i) For single based compositions, mainly NCNM, which was used in an aircraft ejector release unit (to eject wing fuel tanks from the Buccaneer aircraft?). NCNM was developed following incidents with the double based propellant that had been previously used in this application. This had given rise to NG distillation through temperature cycling (low temperatures at high altitude followed by high temperatures due to aerodynamic heating) and resulted in unplanned ejections. For many years P1 produced all the NCNM required for service use.

(ii) Richard Wallace, who was then the Principal in charge of gun propellants section, did not really trust the wet mix process to give him the required accuracy of composition in a finished propellant. Hence he introduced the following procedure: for a required 50/50 NG/NC ratio in a finished propellant he would order a paste made to a nominal 52/48 NG/NC ratio. After analysis of NG/NC ratio by the main lab the required amount of dry NC was added at the incorporation stage of manufacture. The dry NC of course coming from the Quinan stove. This practice carried on after Richard's retirement and hence Steve Bell, as the then superintendent, would have authorised it. Bad luck Steve, nice try. The group who made solventless compositions did not use this procedure. Perhaps it was something to do with the fact that it was they who operated the wet mix process!

Everyone, down to the most inexperienced process worker, appreciated the extreme hazards with dry NC and regarded the Quinan stoves as our most hazardous process. In fact, even now, I am surprised at how disciplined and knowledgeable our process workers were at Waltham Abbey. I have visited MoD sites all over the country and have never yet come across one as fortunate as we were with our workforce.

My memory, faulty as it is, tells me we had a dry mix room complete with NG burettes and a lead mixing table at N549. It was never used of course, other than for storage. I think our main concern, had we been asked to use it, would have been NG headaches. We had a great deal of plant on P1 which was never used; clearly when the site had been set out it was envisaged that we would have a much wider remit than we in fact had in the end. Just two that spring to mind are the ball powder plant and the alcohol dehydration plant for single base propellant manufacture.

Peter Stone
12/03/04

A FEW RANDOM COMMENTS

Dick Doe's comments on guncotton boiling and vat water (June 2003) prompted a reply at the time but I was recovering from cataract operations, but bettter late than never!

You were not quite right about the 'boils' Dick. The first was strongly acid, the second mildly so and the third about neutral. The indicator we used was methyl orange which has a rather subtle colour change and requires experience in its use. This experience held me in good stead when, later, after the war, I took my BSc practical exam and we had a titration using methyl orange. Looking around the hall I could see other candidates desperately seeking the end point by adding more and more indicator, which only makes matters worse. I felt very smug.

While on the subject of indicators I must mention nitrecake (Dec 2003) which we had to check before disposal to confirm an acid content of less than 3%, but this time using phenolphthalein as an indicator. This solution we made up ourselves and, as the substance is the active ingredient in a proprietary laxative we handled it with some care!

The same issue (Dec 2003) mentions the Explosives and Chemical Products factory at Great Oakley. When I retired from government service I became a consultant to that company (eventually transferring to the parent company EXCHEM) which enabled me to complete my 60 years in the 'bang business'. The company own nearly 1000 acres of land adjacent to the factory and it is farmed intensively, so PARFRY is not so outlandish after all.

Jim Jeacocke

TOUCH BYTE

We thought you might like this:

ELINGSH

Aoccdring to rscheearch at an Elingsh uinervtisy, it deosn't mttaer in what oredr the ltteers in a wrod are, olny that the frist and lsat ltteres are at the rghit pclaes . The rset can be a toatl mses and you can sitll raed it wouthit a porbelm. This is bcuseeae we do not raed ervey lteter by ilstef, but the wrod as a wlohe.

However, it's no fun to type it!

Beryl and Tony Barratt

Tried putting the above through my spell checker

According to research at an Elingsh uinervtisy, it doesn't matter in what order the letters in a word are, only that the first and last letters are at the right places. The rest can be a total mess and you can still read it wouthit a problem. This is bcuseeae we do not read every letter by ilstef, but the word as a whole.

- as you can see it doesn't catch everything! Ed.

DON'T FORGET
DEADLINE FOR THE September 2004 ISSUE:
15th August 2004

I sent this poem, by Jenny Joseph, to an acquaintance

WARNING

When I am an old woman I shall wear purple With a red hat which doesn't go
and doesn't suit me And I shall spend my pension on brandy And summer gloves
And satin sandals, and say we've no money for butter
I shall sit down on the pavement when I'm tired And gobble up samples in shops and
press alarm bells AND RUN MY STICK ALONG THE PUBLIC RAILINGS
And make up for the sobriety of my youth.
I shall go out in my slippers in the rain And pick the flowers in other peoples gardens
And learn to spit.
You can wear terrible shirts and grow more fat And eat three pounds of sausages at
a go, Or only bread and pickle for a week
And hoard pens and pencils and beermats And things in boxes
But now we must have clothes that keep us dry
And pay our rent and not swear in the street
And set a good example for the children
We must have friends to dinner and read the papers

But maybe I ought to practise a little more now?
So people who know me are not too shocked and surprised
When suddenly I am old and start to wear purple

Jenny Joseph

and got this by return. Ed.

When I am old (Part 2)

When I am an old man I shall wear red socks And a sombrero and sit and snooze
in the sun And I shall spend my pension on gin and tonic with ice And a saddle for
my horse Which I shall ride across the sierras
And I shall say sorry but no more direct debits or decorating Or cutting the grass
every Sunday And visiting people I don't care for And looking at their holiday
snaps or videos.
I shall own a silver sports car And fly along country lanes at 120 miles an hour
With the top down. And pick up hitch hikers. But only if they are beautiful, Or
bohemian ladies in purple.
You can give up ironing And worrying about the children And what anyone thinks
We could get up at eleven and go to bed after midnight And learn to go white water
rafting While smoking cigars
I think I should start to learn now

It sounds fun