On Her Majesty's Service

0



Times Article 4-12-1963 on Connection fond On Hejpez Raibway with illrustrations Abo Interest Extract, and Les Tucket article in TE Lawrence Soc. News Cetter Wither 2009



Gracking the train Lawrence corrected

John E Dayton

The Gines

4 December 1964.

The Times 4 Docember 1964 13

Tracking the Train Lawrence Wrecked

By John E. Dayton

[Mr. Dayton is managing director of one of the companies rebuilding the Hijaz railway]

The circumstances in which I recently led a small expedition through central Saudi Arabia were unique. When, in 1956, the proposal was made to revive the Pilgrims' Railway destroyed by Lawrence of Arabia, the survey tean necessarily took much on trust. They had, in general, 525 miles of the Hijaz Railway to deal with. They studied the northern parts from Damascus south to the Saudi Arabian frontier, and they also studied the southern section, north from Medina. On the conditions they found at both ends of the derelict line they made reasonable assumptions as to the condition of the middle section. Thus when, in 1963, a British consortium secured the contract for the rehabilitation of the Hijaz Railway, there was no actual documentation or even knowledge of a major stretch of the railway and it was this which we set out to explore.

There are three Arabias: Arabia Deserta, the pure desert area, in particular in the north adjacent to Jordan and Syria; Arabia Felix, in general the comparatively fertile areas of the south, in particular in Yemen; and Arabia Petraea, or the Stony Desert, in the centre of modern Saudi Arabia. We were soon to find how this stony title was justified by geographical fact.

justified by geographical fact. Our starting point was at Hafira, some 20 miles north of Medina; and our destination Mada'in Salih, about 180 miles as the crow flies. But we planned to follow the line, which wound through mountainous country, and at times strike out across virgin desert whenever we could not follow the line. In fact, in many places the line was impassably blocked by blown sand clogging the cuttings. So the overall distance through this *terra incognita* was more than 200 miles.

GUN-COTTON FOUND

The expedition was made in two Landrovers. As leader, I was in the first car, accompanied by Mr. Richard Cruse, a young American with the adventures of Wild West treks well in mind. In the second car were Muhammad (a cook), Hannah (the driver), and Sattam (guide, philosopher and friend, bodyguard, and one-time official executioner). There were no roads—even if the maps showed them. Our track was that of the longabandoned railway, or else dried-up river beds, and was through terrain littered with stones and with a surface in places a fine powder—too fine to call sand.

It took us 100 minutes to traverse the first eight miles—and here we came upon the first major destroyed bridge. Examining the site, we were astounded to come upon a gun-cotton pack with fuse, as used by the saboteurs some 47 years previously. The charge was intact, and was stamped "1916 R.O.P.F." (presumably, Royal Ordnance Powder Factory).

All along the route, at regular intervals, were deserted Turkish strongpoints. Each had a Foreign Legion aspect, and most had a collection of graves and bones, for, as we were later to discover, the Damascus Express loaded with relief supplies never got through to these outposts, whose occupants must have died of hunger in this empty land. Four hours from departure we had made good only 16 miles, to Bwat; and 100 minutes later we had reached Bir Nassif—12 miles on. The way was hedged in by forbidding mountains, great ranges of red, orange and black rock devoid of all vegetation. The temperature was a mere 95°F; a few weeks earlier, at the summer peak, it had reached 152°F in the midday heat; but, of course, there was a sudden drop in night temperature as the sun went down behind the black mountains.

was with surprise that we saw many a bedu with a small Japanese transistor radio strapped to his wrist and going full blast. In the gaol, a falcon was being trained—these birds were stated to be very valuable, costing as much as £2,000, and, apparently, some sort of monopoly of the King.



Pressing north, we came to Jebel Antar, a freak mountain resembling a medieval castle with two turrets. Here we were told, is the abode of the Devil. Anyone daring to climb the mountain would descend, if at all, with St. Vitus dance. It was a black country—black mountains, black stones strewn in profusion across the desert.

On to Istabel, 25 miles distant, then to Abu al-Niam where we encountered true beduin watering sheep at an isolated well. They were long-haired wild-men who were much impressed by Sattam, his rifle, bandolier and long knives. Our log showed 33 miles traversed in 4 hours, before we came to an immense valley of scrub and soft dust—like a woman's face powder.

At Hedieh we found two complete trains still standing in sidings. Their composition was interesting. In front was a flat bogie bearing two large water tanks with a machine gun nest in between. Then came the locomotive, thetender, a box car, and another bogie with water tanks and machine gun at the rear.

Now blown sand clogged the line, and we had to strike across the open desert on a compass course, there being no known life for over 100 miles ahead. However, we had a Beaver aircraft in escort; and we sighted this aircraft just as we reached Madaraj. Here was the blown/up Damascus Express, intact as when wrecked in 1916. This was the supply train that never reached the outposts to the south.

We put out a landing strip—but the aircraft failed to locate it. Therefore, with fuel and water running short, we just had to press on towards Al 'Ulá. By dusk we reached an Omayyad fort at Saura—here there was a great Roman well, 150ft. in diameter, 200ft. deep.

MENACING MOUNTAINS

After a short night stop at Bi el Djedid we broke camp and all day long traversed red sandstone terrain which

LARGE SCORPIONS

After $7\frac{1}{2}$ hours we reached the "city" of Buweira, where there was a police station and a school; 11 pupils all told, and those all boys, for education is not given to girls. By nightfall we had taken coffee with the Emir, and then had a fullscale sheep and rice meal.

Here we sighted the first of the large scorpions and 2-inch spiders which seem peculiar to this desert country. We also saw our first complete ruined train—the locomotive was on its side, and trees were growing through the wagons. It

bjend we tooke each and an an tay long traversed red sandstone terrain which was hemmed in by menacing mountains. This day we only logged 30 miles, and fell into an exhausted sleep just short of Mashed. And the next morning at the station near by our relief was unbounded to find a survey party which had worked down from the north. Our fuel and water supplies were now secure.

We continued though a vast, sandy, plain with fantastic canyon country on either side, heading for Al 'Ulá (population 15,000) and Mada'in Salih. We reached the Nabatean tombs, to find another Petra, a one time trading post now utterly deserted—on the caravan route of pre-Roman times to Yemen in the far south. The only evidence of human occupation was bones and a piece of embalming cloth, but carved in the erections were inscriptions still intact.

At Mada'in Salih station we found the remains of the former repair shop and a First World War locomotive still in its shed. Our destination was a salt lake just north of Mada'in Salih, and on this our aircraft made a perfect landing to take us so quickly to comparative luxury in Amman.

Pictures on page 22.

The Railway Lawrence Wrecked

1. 1.

The Damascus express sabotaged by Lawrence of Arabia in 1916 and referred to in the article on page 13. These pictures were taken during a tour of inspection of the wrecked Hijaz railway





The great Roman well, 150ft. in diameter by 200ft. deep, discovered by the expedition at an Omayed fort at Saura



Detail of damage to the masonry fabric of a large bridge on the Hijaz railway. Near here the expedition discovered a gun cotton pack with fuse left by the saboteurs



PLATE XIX. SERVICE GUNCOTTON SLABS AND PRIMERS. A.G. 95 RGPA RGPA & G PA RGPA 0 Ω IO 4 N 0 600 0 TORPEDO S m 0 0 e 1 00e1 1909 0061 5%×6%×1% 2LB TOX. 6%×6%×1% 2L8.202. SKASSAN ELS. SOL. SX BYSXIN SLB. SOL. SXX SXXIA ZLB. BOZ. BAXSHERIN ILB 402. GPF & PF GPF GPF RGPF RGPF 0 O 9 5 Q U , °°, 000 190 \% \% R 1900 1900 SAX GAXINA ZLB.OOZ SAXSYLXIN ILB. S OZ. 5%×6%×1%+ 1L8.402 BHARBHARM ILB.BOX. STANSTONING ILBOOK CANSTANING 1402 Sustaning 1442 RGPF RGPA U ۲ Z ROPA A ۲ 0 (\mathbf{o}) **0 B 0** 0 0 0 1900 1900 1900 PRIMERF PRIMER G +++ x++++ x14 1LB.802. 5 × 1-05 1LB.80%. 15×1-97202 175×1-375 202. 125×128 102 125×125 102 31×195 802 125 x125 102.



EXTRACTS FROM THE ARCHIVES

The Mills Archive includes the Waltham Abbey Special Collection. This is a collection of around 1500 documents relating in some way, directly or indirectly, to the Mills. The subjects cover a wide range - the early history of gunpowder and later history of chemical explosives, technical texts, personal recollections, newspaper articles, official visits, documents relating to purchase of the Mills, to cite just a few. It is intended from time to time to describe an item from the Collection. The first involves a link between Lawrence of Arabia and the Mills.

<u>Extract No.1</u> Lawrence of Arabia and Waltham Abbey

A major element in Lawrence of Arabia's attacks on the Turkish Army in WWI in what is now Saudi Arabia was the destruction of the railway running through the area known as the Hijaz. The line ran from Damascus in the north for about 500 miles to Medina in the south, which served Mecca. For this reason the Hijaz Railway was also known as the Pilgrims Railway. But it also had great strategic importance as the main supply route for the Turkish forces controlling the area.

In 1963 a consortium of British firms secured the contract for rehabilitation of the Hijaz Railway. They had sent survey teams out from Damascus and Medina, but did not cover the central section, relying on previous knowledge of the terrain. Prior to commencement of the work a director of one of the firms undertook a journey over about 200 miles of the southern part, starting about 20 miles north of Medina. Lawrence had attacked both the infrastructure of the line and the trains travelling it, including the Damascus Express. After the first 8 miles, which took 1 3/4 hours, the party came across the first major destroyed bridge and here to their astonishment they discovered a perfectly preserved guncotton pack complete with fuse. The director reported that the pack had been stamped 'R O P F 1916' and had a stab at what the initials might have stood for - 'Royal Ordnance Powder Factory'. It was a good guess, however it is virtually certain that what he read as an O was a G, giving R G P F, the Mills stamp, as shown in the table. So after 47 years were linked the deceptively rural Mills and the turmoil of Lawrence's war in the deserted wastes of the Hijaz. The wrecking of the Damascus Express ended use of the line and the stations, maintenance buildings and rolling stock were all abandoned, as were the unfortunate Turkish troops manning the isolated guard forts along the line. The group came across an entire wrecked train with trees growing through its wagons and the Damascus Express just as it was on the day it was destroyed. Later they discovered two complete trains still standing in sidings and locomotives in their sheds untouched since 1916.

Les Tucker



580 of Technology Memorandum 15 August 1923 TO: FROM : (Branch and Address) Mr. McLaren Extn. Telephone No. Your ref. : Our ref. : These are the scraps of paper on the Lowrence GC, & better placed with you than with me, I think. The incidental quips about the Baron will no doubt appear in somebody's Memoirs ! Advery

L.H.IRT. S24164 349744 D573182 8,000 Pads 1/69 T&Co. G871. (S16).

Use the reverse for continuation or reply as necessary.

Dear Mr. Roscher,

This is to confirm the advice I gave by telephone regarding your letter to W.O. Librarian which had been sent on to me by Mr. King.

The guncotton slabs are dangerous in their present dry condition, being liable to ignite by friction, impact, spark or flame. Violent combustion or even explosion may result. Inversion in water would render them relatively innocuous, but it is practically certain that the slabs would disintegrate and so defeat your purpose.

The proposal to "carry it back to London well wrapped up" is extremely hazardous. Advice must be given immediately to prevent this and to warn those concerned of the ricks involved in handling this material.

As an alternative to water, to preserve these historic samples, a number of organic liquids could be recommended but few of these are likely to be at hand where the guncotton is now stored. Accordingly, I suggest the use of keresene, as a readily-available liquid which everybody is familiar with and can handle with due care for avoidance of ignition. The slabs should be placed carefully one on another in a suitable-sized lever-lid can and enough keresene (preferably a non-coloured type) added <u>slowly</u> just to cover with an inch to spare, and the lid put on, first wiping around the mating edges to make sure no particles are caught between them. Treated in this way and stored in a cool, ventilated place the material will be reasonably free from hazard and <u>probably</u> will not fall to pieces.

The above remarks, which apply equally to the "yellowish waxy" primers, are intended to meet the immediate needs of the matter. Before consenting to bring this stuff back to London, it would be wiser to obtain more detailed information about the number of slabs and how friable, etc. they are. We can then discuss further action.

As regards the markings, almost certainly they signify R.G.P.F., i.e. Royal Gunpowder Factory which, oddly enough, no longer exists - because the site is now occupied by the Establishment from which I write.

Yours sincerely.

A. LOVECY

for Director Explosives Research and Development Establishment.

W. Edward Roscher Esq., National Geographic Society, 161-166 Fleet St., London, E.C.4.

6, MORTON COURT, CHRISTCHURCH ROAD, READING, BERKSHIRE.

December 5th, 1964.

Den Loney. Vestuday's Times was unusuely rewarding, so, in case you missed the article and photographs, I am sending them to you. You may ease to consect the interpretation of the lettering on the gumenton slabs! Also, in proof that fantasy is not confrict to desait regimes (unless Newcastle counts as one) I have affixed the latest in Barons which no hankt you saw any way. I wonder what the glass electede registers nor. I have settled in comfortably here and am enjoying myself. Hope all goes well at your and . My regards to Dunstan, Batty and Tay on plane. Yours, C.H. J.

TEL. 82621

WAE 201/02

SKO

Sth December, 1964.

Dear Johnson,

Many thanks for your letter with the interesting cuttings from the Times. I very seldom see it and knew nothing of this article. Even now, I don't know whether the slabs were successfully preserved, as "Mr. Marden wisely decided to dispose of them and the Jordan Army were quite glad to have these historic specimens."

I think it would be most appropriate if you would write to the Editor explaining the markings, and in the hope that you will do so I enclose a copy of the letter which was sent (on your behalf as Director, in fact). You may also care to note that an article on "Demolitions under fire" was published by T.E. Lawrence in the Royal Engineers Journal, January 1919, Vol. XXIX No. 1. Incidentally, it seems that our previous correspondence originated from the "survey party which had worked down from the north" as referred to in the Times.

It is good to hear you are enjoying retirement, as is evident from your choice of Reading (i.e. the Times!), and we shall rely on you to keep us posted on the Baronies the glass electrode registered this as one of life's little ionies.

With good wishes from E-one, and seasonable greatings,

A. LOVECY

* 13 Aug 1963,

6, MORTON COURT, CHRISTCHURCH ROAD, READING, BERKSHIRE.

December 15th , 1964.

Dear Lovery. Many tranks for your letter. Full marks for the glass electrode sally ! I have written to The Times, as befits a retried codger, and I need bandly tell you that I drew heavily on the copy of your letter to one Roscher. This was inersitable, you will agree. For the moment 9 am hanging on to all the lits of paper but will later forward them to you with copy of my letter - if the Times accepts it. with good wister (reciprocated) Ja Christmas and 1965, Yours, Ctr. J.

TEL. 82821

THE TIMES

THE TIMES PUBLISHING COMPANY, LIMITED PRINTING HOUSE SQUARE LONDON, E.C.4

TELEPHONE: CENTRAL 2000

December 18, 1964

Private

Dear Sir,

The Editor thanks you for your letter of December 15 concerning "Tracking the Train Lawrence Wrecked". While your remarks have been noted with interest here it has not been possible to make use of them in the correspondence columns. May we also say that Mr. Dayton is away from England at the moment so that it is not possible to draw your remarks to his attention.

Yours faithfully,

Georgen Workley

C. H. Johnson, Esq., 6 Morton Court, Christchurch Road, Reading, Berkshire.

21st December, 1964.

Dear Johnson,

Your letter has just come to hand and I am delighted to know I made the right guess - you may scarcely credit it, but I was a little afraid that you might think me uncivil in not getting on with it myself! Fortunately, apart from the term codger ("queer old person") my considered opinion was identical with yours.

Did you notice that Dayton places his GC slabs only 28 miles N of Medina? - whereas our original information seemed to relate to a place much farther north. Moreover it seems that his slabs were stamped 1916 and presumably intact, whereas in the first story the date was 1915, I think, and certainly some of the slabs were broken.

Apparently Lawrence was just a bit hasty and not entirely methodical in doing this job - what an object lesson to include in any general talk on safety!

In conclusion, let me assure you that I am very glad you found the additional information useful, so please do not hesitate to write in any situation where I could help.

6, MORTON COURT, CHRISTCHURCH ROAD, READING, BERKSHIRE.

December 29 th, 1964.

Dear havery. Many thanks for yours of the 21st. From the enclosed you will see that the 'Times' are not going to publish mine. Please beep it, or destroy, along with the other papers I am forwarding with it. My letter to them may have been are long in relation to the amount of new matter therein. I took tomble and there fore I didn't mult it is some way. I am not beart before but with I had been more neccessful in the E.R.J. E interest. Ant letter to approve ledge this.

TEL. 82821

All the last to you for 1965,

Yours, Ctt. J.

PRO Supply 5/809 vii

Treatise on Service Explosules, HMSO, 1900 LIST OF PLATES.

PLATE.	Subject.				To face Page.
· I	Apparatus for Refining Saltpetre				30
II	Apparatus for Burning Charcoal				33
III	Apparatus for Refining Sulphur				34
IV	Incorporating Mill				38
V	Breaking-Down Machine				39
VI	Gunpowder Hydraulic Press			•	40
VII	Granulating Machine				41
VIII	Glazing Barrels				43
IX.	Horizontal Finishing Reels				44
X	Wooden Skeleton Finishing Reel				47
XI	Prismatic Powder Machine				48
XII	Cam Machine				49
XIII	Cotton Waste Teasing Machine				69
XIV	Cotton Waste Drying Machine			·	69
XV	Centrifugal Acid Extractor				70
XVI	Beating Engine				71
XVII	Poacher				72
XVIII	Guncotton Hydraulic Press				73
XIX	Service Guncotton Slabs and Primer	s			73
XX	Nitro-Glycerine Factory				75
XXI	Nitro-Glycerine Washing Tank				79
$_{\rm XXIII}^{\rm XXII}\}$	Incorporating Machine for Cordite				90
${}_{\rm XXV}^{\rm XXIV}\}$	Press for Rifle Cordite		••••		91
$_{\rm XXVI}^{\rm XXVI}$	Reeling Gear for Rifle Cordite				92
XXVIII	Cordite Hydraulic Press				93

WASC 1536-29



Treatise on Service Explosives HMSO 1900

Plate XIX Service Guncotton Slabs and Primers

WASC 1536









WASC 580-20 ============ Photo Credits 2 photos of damage to the Hejaz Railway wasc_580_17 (IMG_3802.JPG) wasc_580_18 (IMG_3803.JPG) 1 photo of T. E. Lawrence's Brough Superior motorcycle wasc_580_19 (IMG_3748.JPG) photos by -Jeremy Wilson, Managing editor, T E Lawrence Journal published on -The weblog of T. E. Lawrence Studies http://blog.telstudies.org/2008/05/25/t-e-lawrenceexhibition-at-dorchester-museum-june-2007/ http://www.telstudies.org/images/IMG_3802.JPG http://www.telstudies.org/images/IMG_3803.JPG

These are photos taken of 2 photos and the motorcycle on display at -T. E. Lawrence exhibition at Dorchester Museum (June 2007)

T.E. Lawrence Studies

The weblog of T. E. Lawrence Studies

« Blue plaque unveiled at Myrtle Cottage, Hythe

Additions to www.telawrence.info »

T. E. Lawrence exhibition at Dorchester Museum (June 2007)

Originally posted on the T. E. Lawrence Studies list on 23 June 2007. Images linked from this post open in new windows.

Derek Norwell, one of the main contributors to the telawrence.net project, stayed with us last night. This morning he drove me across to Dorchester (40-miles from here) to look at the T.E. Lawrence exhibition at the Dorset County Museum.

The exhibition, which runs from 16 June to 29 September, is called *The Man and the Myth: Lawrence of Arabia*. A publicity flyer reads: 'Soldier, scholar, hero, recluse... from exploits in Arabia to quieter times in Dorset, T E Lawrence continued to reinvent himself. The Man and the Myth explores his extraordinary life story through photographs, letters and personal effects.' I had no idea what to expect.

Unlike a previous Lawrence exhibition held at the museum some years ago, this one occupies the museum's main room for temporary exhibitions. In the past I have visited art shows there. It is quite a big space, as the photographs show. By comparison with the Imperial War Museum's densely-packed exhibition *T.E.Lawrence, The Life, the legend* (1985-6), the room seemed airy. Also, we arrived soon after opening-time, before the summer tourists.

General view of the exhibition room seen from the entrance The right-hand wall seen from the entrance

The journey round the exhibition is shaped - to some extent - by a number of wall panels that provide an outline biography. Topics include:

'Early years' (photo)
'Family and Oxford'
'The Arab Revolt'
'Lawrence the celebrity'
'Lawrence the soldier and airman'
'Lawrence the writer'
'Clouds Hill'
'Death of the man - birth of the legend'

The panels seemed to me to strike the right balance between text-length and illustration. They are supplemented by captions for the individual exhibits.

As you walk in, the first thing you see is a Brough Superior motorcycle. This, it turns out, is not one of Lawrence's Broughs. Nevertheless, it makes a powerful statement - as Lawrence's did. A Brough Superior is a Brough Superior, whoever it belongs to. Astride a Brough Superior, Lawrence was no ordinary aircraftman.

Brough - front view Brough - rear view

The organisers have assumed that most people will start circulating round the room from left to right. So the first panels on the left-hand wall cover Lawrence's background and youth. There is a showcase containing the two volumes of *Crusader Castles* (Golden Cockerel Press, 1936) followed by material from the Palestine Exploration fund on the Sinai survey. This includes photographs and facsimiles, but also some original items including plans.

The approach has been to show interesting sample material, not to be comprehensive. That doubtless reflects the space and resources available, and the relative ease of borrowing exhibits from some institutions, but not form others. Thus Lawrence's archaeological work is represented by the Wilderness of Zin expedition, rather than photographs or materials from Carchemish.

The next case contains wartime material brought back to England by V.D. Siddons, who first served in the Hejaz as member of 'C' Flight, 14 Squadron RFC. Material from the collection is normally on display at the Bovington Tank Museum, where it is on longterm deposit.

After the Siddons showcase the layout of the exhibition leaves visitors with several options. Ahead, to the left, is a children's activity area. Children are invited to dress up in Arab costume and look in a wall mirror to see whether they look like Lawrence. Next to that is a deep sand box, from which you can dig up archaeological finds. Opposite, in a kind of tent, there is a low table with a colouring pad and map-jigsaw. There were no children during our visit, but I assume the museum would not give up so much space if these features were unpopular.

The children's area reminded me of another thing: few children were expected to visit the IWM's exhibition, even though they paid no entry fee. The IWM is normally packed with parties of school children but, as Lawrence is not on the National Curriculum, teachers had no incentive to show them the exhibition. At Dorchester, however, children come in to the museum with their parents. So they may get a wider education.

Leaving the children's area aside, where should the visitor go next? As the Siddons material is wartime, maybe it is logical to go to the war photographs displayed along the right-hand wall. Some at least of these come from the Pearman lecture slides. A few years ago I gave a talk presenting the slides at the Museum. They include some interesting images not present in the Imperial War Museum photo collection. Here is a picture of damage to the railway, and another (apologies for the reflected ceiling lights showing in the photos).

The central showcase contains a mixture of material, including the Museum's most unusual Lawrence-related object, a lock of his hair cut off when he was a small child and later given away by his mother.

A peninsular showcase at the far end of the gallery contains books by Lawrence and facsimiles of some letters to a distant cousin (mis-described in captions as his aunt). This error is one of only two I noticed (though I did not read all the exhibit captions). The other was a statement on the panel about Lawrence as a writer that claimed that *The Mint* was his first attempt at writing after the war. True, Lawrence wrote the Uxbridge notes on which Parts I and II of *The Mint* are based in the autumn of 1922, four years before he issued the subscribers' abridgement of *Seven Pillars* - but before he went to Uxbridge he had completed the polished 1922 version of *Seven Pillars*, which many regard as his greatest literary work.

A final item is the wooden bier that carried Lawrence's coffin from the church to the graveyard.

I hope the description and photographs above will give a fair impression of the exhibition. Summing up is not so easy.

The exhibition is not addressed to people who already know a lot about Lawrence. Its main audience will be the museum's general visitors, many of whom know almost nothing about the subject. For this audience, I think it probably does a good job. If you have paid £6 to visit the Dorset County Museum (well worth visiting in its own right) the Lawrence exhibition, which has no additional entry charge, should be an attractive bonus. You could spend an enjoyable half hour or so viewing the exhibits and their captions, and might learn quite a lot.

That said, the range of exhibits does not represent all Lawrence's significant activities. I don't recall seeing any exhibits, for example, that reflected his lifelong interest in fine printing, or his work on the revision and production of the subscribers' *Seven Pillars* - even though much of his work on the latter took place at Clouds Hill nearby.

A visitor more knowledgeable about Lawrence's biography might find the exhibition a little thin. Lack of resource - and possibly the cost of insurance - left gaps that could easily have been filled. There is certainly space to spare. Moreover, the exhibition does not fulfil the promise implied by its title. The myth is hardly touched upon, except briefly in a wall panel as the 'birth of a legend'.

My recommendation would be to look at the exhibition if you are in Dorchester and intend to visit the Museum anyway. However, it is probably not worth travelling any distance specially to see it.

There is, incidentally, a range of Lawrence-related articles in the museum's shop.

Jeremy Wilson

This entry was posted on Sunday, May 25th, 2008 at 06:22 pm and is filed under Events. You can follow any responses to this entry through the RSS 2.0 feed. You can leave a response, or trackback from your own site.

Leave a Reply

You must be logged in to post a comment.

T.E. Lawrence Studies is proudly powered by WordPress Entries (RSS) and Comments (RSS). Lawrence, Cairns and the origin of crash helmets

September 03, 2008

Lawrence of Arabia is dead, long live the crash helmet: I just found this fascinating article from a 2002 edition of Neurosurgery that tells how a brain surgeon who unsuccesfully operated on Lawrence of Arabia after his fatal motorcyle crash was inspired to research and design crash helmets that now save thousands of lives.

T.E. Lawrence, better known as Lawrence of Arabia, was a hero of the First World War who worked as a covert agent leading a revolt against the Ottoman Empire in the Middle East and was immortalised in the 1962 film.

Lawrence was also a fan of motorbikes. In fact, he's pictured on one in the image on the left. Sadly, his interest eventually led to his death after a motorcycle crash in Dorset.

The Neurosurgery article tells the story of Hugh Cairns, a young neurosurgeon who attempted unsuccessfully to save Lawrence's life as part of the surgical team who treated him.

His experience led him to research the benefits of early crash helmets on Army motorcycle riders during the Second World War, finding that they were one of the major life-saving factors.

He later went on to use his knowledge of how the brain becomes damaged during impact to design and test various types of crash helmet that could best protect against these forms of injury.

Cairns' work was a major influence on both the legal system, that has mandated helmets in many countries, and the design of the headgear itself - preventing thousands of fatal brain injuries in the process.

Link to article on Lawrence, Cairns and the origin of crash helmets. http://www.scribd.com/doc/5449203/Lawrence-of-Arabia-Sir-Hugh-Cairns-and-the-Origin-of-Motorcycle-Helmets

Link to PubMed entry for article. http://www.ncbi.nlm.nih.gov/pubmed/11844248 1: Neurosurgery. 2002 Jan;50(1):176-9; discussion 179-80.

Lawrence of Arabia, Sir Hugh Cairns, and the origin of motorcycle helmets.Maartens NF, Wills AD, Adams CB. Department of Neurological Surgery, The Radcliffe Infirmary, Oxford, OX2 6HE, England. maartensniki@hotmail.com

When Colonel T.E. Lawrence ("Lawrence of Arabia") was fatally injured in a motorcycle accident in May 1935, one of the several doctors attending him was a young neurosurgeon, Hugh Cairns. He was moved by the tragedy in a way that was to have far-reaching consequences. At the beginning of the Second World War, he highlighted the unnecessary loss of life among army motorcycle dispatch riders as a result of head injuries. His research concluded that the adoption of crash helmets as standard by both military and civilian motorcyclists would result in considerable saving of life. It was 32 years later, however, that motorcycle crash helmets were made compulsory in the United Kingdom. As a consequence of treating T.E. Lawrence and through his research at Oxford, Sir Hugh Cairns' work largely pioneered legislation for protective headgear by motorcyclists and subsequently in the workplace and for many sports worldwide. Over subsequent decades, this has saved countless lives.

Personal Name as Subject: Lawrence TE Cairns HW

* * *

PMID: 11844248 [PubMed - indexed for MEDLINE]

Lawrence of Arabia, Sir Hugh Cairns, and the Origin of Motorcycle Helmets

Nicholas F. Maartens, F.R.C.S.(SN), Andrew D. Wills, M.R.C.S., Christopher B.T. Adams, M.A., M.Ch., F.R.C.S.

Department of Neurological Surgery, The Radcliffe Infirmary, Oxford, England

WHEN COLONEL T.E. LAWRENCE ("Lawrence of Arabia") was fatally injured in a motorcycle accident in May 1935, one of the several doctors attending him was a young neurosurgeon, Hugh Cairns. He was moved by the tragedy in a way that was to have far-reaching consequences. At the beginning of the Second World War, he highlighted the unnecessary loss of life among army motorcycle dispatch riders as a result of head injuries. His research concluded that the adoption of crash helmets as standard by both military and civilian motorcyclists would result in considerable saving of life. It was 32 years later, however, that motorcycle crash helmets were made compulsory in the United Kingdom. As a consequence of treating T.E. Lawrence and through his research at Oxford, Sir Hugh Cairns' work largely pioneered legislation for protective headgear by motorcyclists and subsequently in the workplace and for many sports worldwide. Over subsequent decades, this has saved countless lives.

(Neurosurgery 50:176-180, 2002)

Key words: Head injury, Hugh Cairns, Lawrence of Arabia, Motorcycle helmets

Traumatic injuries are a major worldwide public health concern and remain the leading cause of death in children and adults under 45 years. As a consequence, 142,000 lives are lost and 62 million people seek medical attention each year in the United States (8, 9). This places enormous strain on health care resources. In 1988, the total United States health care cost for injuries was estimated at approximately \$170 billion (12). Despite the enormity of this problem, there has been characteristic delay in preventive and control efforts to reflect its magnitude.

The association of a traumatic head injury in a polytrauma victim remains the leading cause of mortality and morbidity. Although the advantages of adequate head protection during combat has been appreciated for more than 2000 years (1, 5), the public sector has been very slow to adopt similar measures and impose and maintain adequate legislation in this regard. The 1975 rescission of laws mandating the use of safety helmets by motorcyclists in the United States, resulted in a 40% increase in motorcyclist fatalities (10, 13). Although the forces motivating introduction of adequate head protection have undoubtedly been numerous, landmark events and subsequent studies and reports have been required for institution of such measures (2-4, 8-10, 14). One of these landmark events was the death of a motorcyclist in the Dorset countryside in England on May 18, 1935 and the subsequent involvement of a young Australian neurosurgeon.

T.E. Lawrence

Colonel Thomas Edward Lawrence, famous by the pseudonym "Lawrence of Arabia," was one of the most romantic and enigmatic figures to emerge from the First World War. Known to his family as "Ned," he was born in Wales in 1888, the second of five illegitimate sons to Sir Thomas Chapman, an Anglo-Irish Baronet, and Sarah Junner, a governess to his four legitimate daughters. The couple eloped, adopting the name Lawrence, and settled in Oxford, where Ned attended school at City of Oxford High School for Boys. He was awarded a Meyricke Exhibition to study history at Jesus College and gained First Class Honors in his final examinations, in part through a notable thesis on Crusader Castles, which necessitated a tour through Syria and Palestine. During a period as an archaeological assistant at the Hittite city of Carmesh on the River Euphrates, he was responsible for managing and motivating the locally recruited workforce. His success in the latter role, without help from military discipline or colonial authority, was to prove invaluable.

When the First World War began in 1914, Lawrence was posted to Military Intelligence in Cairo where he became an expert on Arab Nationalist movements. After a fact-finding mission to the Hedjaz region of Saudi Arabia, where Sherif Hussein of Mecca had revolted against Turkish imperial rule, the quality of his reports and his empathy with Arab leaders led to his long-term role as British liaison officer in the Arab Revolt. He served with the forces of Emir Feisal. Their guerrilla warfare collaboration led to the successful disruption of the Turkish supply lines, the prevention of their withdrawal from Medina, and the stunning capture of Akaba and Wadi Itm. His great achievement was unifying the fierce and suspicious Bedouin people against their Turkish oppressors. These amazing exploits culminated in his triumphal entry into Damascus, clad in Arab garb, at the head of a great body of tribesmen (*Fig. 1*).

Until the war ended in 1919, Lawrence was virtually unknown to a British public numbed by the horrors of European trench warfare. At that time, an American journalist, Lowell Thomas, toured Britain with a lavish lecture series outlining his accomplishments. His romantic accounts of Bible-land victories rapidly transformed T.E. Lawrence into a popular hero.

After a brief spell at the conclusion of hostilities, during which he unsuccessfully advocated and promoted Arab independence (1919–1922), he returned to Oxford and a fellowship at All Souls College. There Lawrence began work as an author, and he produced the hugely acclaimed *Seven Pillars of Wisdom* (7). In 1923, after assisting Churchill as an advisor and being instrumental in the creation of the Kingdom of Trans-Jordan (later Jordan), he drifted into a perilous state of mind. He joined the Royal Air Force under an assumed name and 12 years later retired to Clouds Hill in Dorset.



Lawrence loved speed. His motorcycle (one of many)-a Brough Superior, given to him by his friend, George Bernard Shaw-had power and acceleration that outstripped its handling and braking characteristics (Fig. 2). On May 13, 1935, he rode his motorcycle through the South Dorset countryside. He wore no helmet, which was not unusual except during a race. As he returned to his cottage, he swerved to avoid two boys on bicycles and pitched over the handlebars, landing in front of his machine and fracturing his cranium. He was taken to Bovington Camp Military Hospital in a coma, where the best specialists in the country were rushed to save him. One of them was the young neurosurgeon Hugh Cairns. Lawrence died 5 days later, without regaining consciousness, at the age of 47 years. This motorcycle accident was to have major ramifications for thousands of future motorcyclists. Hugh Cairns was profoundly moved by the tragedy of this famous First World War hero dying inexorably at such a young age from severe head trauma. Having been powerless to save Lawrence, Cairns characteristically set about identifying, studying, and solving the problem of head trauma prevention in motorcyclists.

Sir Hugh W.B. Cairns

Hugh William Bell Cairns was born in Port Pirie, South Australia, on June 26, 1896. He was the only son of a Scottish father and an Australian mother. He was brought up in Adelaide, where he did well in high school and at university. During the First World War, he served in the army, first in the ranks and then, after qualifying in Adelaide in 1917 at the age of 21 years, with a commission in the Australian Army Medical Corps. He experienced active service in the Middle East and in France. Cairns then attended Balliol College, Oxford as



FIGURE 1. Dressed in full Arabian garb, "Lawrence of Arabia" in Damascus at the end of his successful campaign against the Turks in 1917.



FIGURE 2. Lawrence astride his Brough Superior motorcycle in 1935, the year of his death. Helmets were rarely worn. He owned several of these powerful machines, and the one pictured is the motorcycle involved in his fatal accident.

178 Maartens et al.

a Rhodes Scholar in 1919 and rowed in the Oxford boat in 1920. He worked first as an anatomy demonstrator and then as house surgeon at the Radcliffe Infirmary before going to the Royal London Hospital in 1921. In the same year he took his FRCS examination. As an operator, he was distinctly slow and he was intelligent rather than especially clever, but he was alert, inquiring, and utterly dependable: a strong man for whom nothing was too much trouble (11). After deciding on a career in the new field of neurosurgery, he was sent to Boston on a Rockefeller Traveling Fellowship in 1926, through the insight of George Riddoch. There he received training as assistant to Harvey Cushing, on whom he was to religiously model his operating style for the remainder of his career. Trainees then came from abroad to learn the skills Cairns had brought back with him (6). Having earned a great reputation, he was appointed to the two principal London neurological hospitals at Maida Vale (1931-1934) and Queens Square (1934–1937). After coming into contact with Lord Nuffield, he later became the first Nuffield Professor of Surgery in Oxford and founder of the neurosurgical unit there at the Radcliffe Infirmary (Fig. 3). When the Second World War intervened, Cairns became the Ministry of Health advisor on head injuries and consulting neurosurgeon to the Army with the rank of Brigadier (11). Aside from other notable achievements, such as initiating the first clinical trials of penicillin for Howard Florey and devising and training the mobile neurosurgical units deployed in the Second World War, Cairns is best remembered for his work on the prevention and treatment of head injuries (2–4, 6). As a result of his work, the death rate for in the British army from such injuries was lower than in any other army.



FIGURE 3. Cairns as the first Nuffield Professor of Surgery in Oxford and founder of the neurosurgical department at The Radcliffe Infirmary.



FIGURE 4. Graph showing monthly totals of motorcyclist fatalities in Great Britain from 1939 to 1945 from figures issued by the Ministry of War Transport. Events influencing death rates were: *a*, outbreak of war; *b*, preparation for a German invasion; *c*, crash helmets were made compulsory for army motorcyclists; and *d*, preparation for the Normandy invasion.

During the Second World War, Cairns recognized the unnecessary loss of life among the dispatch riders of the British Army, even before the actual start of hostilities. The importance of this was compounded by restricted radio communications and the introduction of blackout regulations. In 1941, his first and most important article on the subject was published in the British Medical Journal. He observed that 2279 motorcyclists and pillion passengers had been killed in road accidents during the first 21 months of the war, and head injuries were by far the most common cause of death. Most significantly, however, Cairns had only observed seven cases of motorcyclists injured while wearing a crash helmet, all of which were nonfatal injuries (2, 4). His 1946 article on crash helmets charted the monthly totals of motorcyclist fatalities in the United Kingdom from 1939 to 1945 (3). The obvious decline in the number of fatalities took place after November 1941, when crash helmets became compulsory for all army motorcyclists on duty (Fig. 4). His article concluded: "From these experiences there can be little doubt that adoption of a crash helmet as standard wear by all civilian motorcyclists would result in considerable saving of life, working time, and the time of hospitals" (3). Regrettably, not until 1973, 32 years after his first scientific article on the subject, were crash helmets made compulsory for all motorcycle riders and pillion passengers in the United Kingdom.



FIGURE 5. Designs of the two types of helmets in use by British army dispatch riders. *A*, a vulcanized rubber helmet; *B*, a pulp helmet.

the associated morbidity and mortality. In addition, their work also included an analysis of the pathophysiology, mechanisms of injury, and investigation of the various designs and materials used in the construction of helmets and the relative protection these afforded (*Fig. 5*).

CONCLUSION

The evolutionary design of the protective helmet for motorcycle users, begun by Cairns in Oxford during the Second World War and originally concerned with the helmets worn by the dispatch riders of the British Army, has expanded into research on all types of helmets for civilian and military personnel. It may be said that the death of "Lawrence of Arabia" fueled Cairns' lifelong passionate interest in the prevention of head injuries to motorcyclists, and that with his demise, the story of motorcycle helmets began. As a result, during the decades, countless lives have been saved.

Received, April 17, 2001.

Accepted, July 9, 2001.

Reprint requests: Nicholas Maartens, F.R.C.S.(SN), Neurological Surgery, The Radcliffe Infirmary, Oxford, OX2 6HE, England. Email: maartensniki@hotmail.com

REFERENCES

- Blackburn TP, Edge DA, Williams AR, Adams CBT: Head protection in England before the First World War. Neurosurgery 47:1261–1285, 2000.
- 2. Cairns H: Head injuries in motorcyclists: The importance of the crash helmet. **Br Med J** 2:465–483, 1941.
- 3. Cairns H: Crash helmets. Br Med J 2:322-324, 1946.
- 4. Cairns H, Holbourn AHS: Head injuries in motorcyclists, with special reference to crash helmets. **Br Med J** 1:592–598, 1943.
- Carey ME, Herz M, Corner B, McEntire J, Malabarba D, Paquette S, Sampson JB: Ballistic helmets and aspects of their design. Neurosurgery 47:678–689, 2000.
- Fraenkel GJ: Hugh Cairns: First Nuffield Professor of Surgery University of Oxford. Oxford, Oxford University Press, 1991.
- Lawrence TE: Seven Pillars of Wisdom. Garden City, Doubleday, Doran & Co., 1936.
- National Center for Health Statistics: Current Estimates from the National Health Interview Survey, 1985. Washington, DC, U.S. Government Printing Office, 1986.
- 9. National Center for Health Statistics: *Advance Report of Final Mortality Statistics, 1985.* Washington, DC, U.S. Government Printing Office, 1987.
- National Highway Traffic Safety Administration: A Report to the Congress on the Effect of Motorcycle Helmet Use Law Repeal: A Case for Helmet Use. Washington, DC, U.S. Department of Transportation, 1980.
- 11. Obituary: Hugh William Bell Cairns. Lancet 2:202-203, 1952.
- Public Health Service: *Healthy People 2000: National Health Promo*tion and Disease Prevention Objectives-Full Report with Commentary. Washington, DC, U.S. Department of Health and Human Services, 1991 (NIH Publication No. PHS91-50212).
- Selby-Green J: *The History of The Radcliffe Infirmary*. Banbury, Image Publications, 1990, p 106.

 Watson GS, Zador PL, Wilks A: The repeal of helmet use laws and increased motorcycle mortality in the United States 1975–1978. Am J Public Health 70:529–585, 1980.

COMMENTS

This splendid, brief historical vignette outlines an important contribution to the prevention of head injuries among motorcycle riders. That it was prompted by the death of a fascinating historical figure makes it all the more interesting. Colonel Thomas Edward Lawrence ("Lawrence of Arabia") has left many legacies, and this one may be the most important of all.

> Edward R. Laws, Jr. Charlottesville, Virginia

The authors very nicely summarize not only the astute powers of observation but also a trait that characterized Sir Hugh Cairns throughout his career in London and subsequently at Oxford. Cairns' perseverance—as documented by the 32 years it took for the wearing of motorcycle helmets to be made compulsory—was a trait recognized by all who knew him. Having had the opportunity to have part of my training at the Radcliffe Infirmary in Oxford with Mr. Joe Penybaker and Mr. John Potter, both students and disciples of Cairns, I experienced firsthand the identical technical lessons he acquired from Cushing and passed on to all of his students. The stories of his tenacity and perseverance as well as his international clientele were legendary.

I think that the single most important part of the article is its description of the profound ramification of Cairns' emotional distress regarding the death of Lawrence and his determination to do all that he could to prevent the head injuries that he had observed in motorcyclists in the war as well as in civilian life. The compulsory helmet laws that were promulgated in the United States and in many countries in Europe on the basis of Cairns' work have saved countless lives. The authors have performed a service to neurosurgery by bringing these facts to light in such a clear and succinct manner.

Joseph C. Maroon Pittsburgh, Pennsylvania

This well-written and well-illustrated historical article is of great interest. It contains much data about motorcycle accidents in the 1930s and 1940s and early crash helmets. It contains a clear lesson for today's reader because of the epidemic of motorcycle injuries occurring in Africa and Asia.

David G.T. Thomas *London, England*

This article reports a most remarkable story on two important figures in the history of medicine. Sir Hugh Cairns is certainly well known to the neurosurgical community, and his contributions have been well documented. I was certainly not aware of his association with Lawrence of Arabia and even less so of the introduction of the helmet for motorcycle riders. It is truly a treat to read this history and learn how these

180 Maartens et al.

important individuals intermingled and, even more important, contributed to modern legislation regarding motorcycle helmets. The authors quite clearly describe the decline of head injuries in motorcycle riders after the introduction of the helmet. It is interesting to note that several American states are currently considering rescinding mandatory cycling helmet laws because some motorcyclists consider it an invasion of their personal rights. One could argue that Lawrence might be still alive and contributing to the world today if only he had worn a helmet on the day he rode over a hill and then swerved to avoid two children.

> James T. Goodrich Bronx, New York

Photograph of Spiegel and Wycis performing an early stereotactic procedure. Courtesy, Time-Life Warner.



Telegraph.co.uk

Lawrence's hated 'Iron Camel' limps into retirement

By Harry de Quetteville in Damascus Published: 12:01AM BST 29 Oct 2005

It survived sabotage attempts by T E Lawrence and bands of Bedouin tribesmen, but after a century of transporting passengers across Arabia, the celebrated Hijaz railway appears to have reached the end of the line.



Click to enlarge

Related Articles

Pope Benedict XVI visits Jordan mosque in effort to heal Vatican's rift with Islam

Israel demands Pope Benedict XVI condemns Holocaust deniers

British airline 'sorry' for deleting Israel from map

More than 200 Mecca mosques 'face wrong direction'

Built in 1900 to link Damascus with the Muslim holy city of Medina, its 1,000 miles of track was long-regarded as the zenith of Ottoman power and engineering skill. In the 1962 film Lawrence of Arabia, a white-robed Peter O'Toole leads Arab tribes in attacks on the railway as it ferries Ottoman troops to the fronts of the First World War.

Today, however, the magnificent rolling stock that once included the sultan's personal railway car, resplendent with wood panelling and plush armchairs, has been reduced to a single dilapidated railway carriage. All that remains open of the original line is a truncated section from Damascus to the Jordanian capital, Amman and even that is facing the axe.

Jordanian officials have complained that the "tedious and snail-paced" service has become financially unsustainable, and the railway that both Lawrence and the Ottomans once considered crucial looks set to close forever.

In Damascus, Syrian officials say that the journey - which takes only couple of hours by car but is a day-long test of endurance by rail - has been shunned by all but a handful of passengers.

"It's very old and not many people use it now," said Adnan Ebesh, the deputy manager of the Hijaz Railways. "In the past we used to run more trains on this line but now we use it for goods mostly."

The Hijaz, named after the north-west section of the Saudi peninsula that was its ultimate destination, opened in 1908 after 6,000 Ottoman navvies struggled in searing heat and shifting desert sands to get it laid. In its heyday, it ferried pilgrims to Medina in modern-day Saudi Arabia, shortening the desert journey once made by camel from two months to a mere 55 hours.

The new mechanised pilgrimage became known as the "Women's pilgrimage" - for those not up to the rigours of the more traditional voyage. But to the desert Bedouin tribes that lost the pilgrims' custom the so-called "Iron Camel" became a source of resentment and financial ruin.

They were the first to target the railway line, with one uprising in 1910 brutally suppressed by the Ottomans after a tribe robbed and killed passengers on one train, and ripped up a section of the track. Lawrence then capitalised on Bedouin resentment of the railway to lead them in an audacious campaign of sabotage during the First World War. By then, pilgrims using the line were far outnumbered by Ottoman troops, deployed to the Arabian peninsula.

Such was Lawrence's accuracy with explosives that the price of tickets for seats at the back of the train, away from the locomotive, was said to have cost several times more than those at the front. The wrecks of locomotives still lie near sections of long abandoned track in Saudi Arabia.

In Damascus, the landmark Hijaz station, with its stain glass windows, is also in mothballs. The tracks that once stretched into the distance behind it have been ripped up, and now books are sold in the area in front of the shuttered ticket counters.

The last of the Hijaz trains leave from a station a few miles outside the centre of Damascus, where Majid

Mattar, the station manager, sells tickets for about £2. "People can look at the view on the train, they can relax and have a picnic," he said. Haitham Mohamed, a regular passenger, said: "It's cheaper and more fun than the car."

But while Mr Mattar boasted that the train took a mere "four to five hours", in practice the diesel engine that has replaced the steam locomotives of yesteryear usually takes about twice that. A typical journey from Damascus to Amman now takes up to 12 hours.

"We left at eight in the morning and arrived at about 5pm," said Anne McMullan, from Belfast, who took the trip this week. "It blew the horn almost the whole time to warn people off the track. Once a whole market had to move off as we came through.

"I can see that it's very expensive to run it for so few people but it will be a terrible shame to close it completely."

© Copyright of Telegraph Media Group Limited 2009

http://www.telegraph.co.uk/news/worldnews/middleeast/syria/1501835/ Lawrences-hated-Iron-Camel-limps-into-retirement.html

Plaque at Pole Hill By Maggie Radcliffe

A memorial plaque in honour of Lawrence's association with Pole Hill, Chingford was unveiled on Tuesday 29th April. Society member Maggie Radcliffe took up the idea of a plaque and contacted Guy Osbourne, Conservation Officer for Waltham Forest Council, with responsibility for Heritage Plaques.

Fortunately Guy is an admirer of Lawrence and liked the idea. However it had to be pursued tenaciously through many committee meetings last year, often with the Corporation of London as they now own the land. During early 2007 Guy had to submit formal requests with text to the Corporation before they would discuss it at committee level. Many problems were raised but eventually, after over a year of negotiations, it was finally approved.

With the plaque ready, the only problem left was a rainfree day! The forecast was not too promising but Guy decided to try for 29th April and fortu-



Maggie Radcliffe & Guy Osbourne

nately the rain held off for a brief ceremony attended by Guy, Maggie & Tony Radcliffe, Rae Woods and friend. They were rewarded with a brilliant shaft of



sunlight lighting up the plaque just after it was fixed.

The plaque below is for Rev John Pound MA, Astronomer Royal, and relates the story of the Greenwich Meridian which passes 19 feet to the east of the pillar, erected in 1824. Greenwich Observatory and the rest of the London skyline can be seen from the hill.

The plaque was funded by Waltham Forest Council from a fund for Heritage Plaques.

The T.E. Lawrence Society Newsletter No. 85 ~ Page 4
TELAWRENCE (Lawrence of Arabia) 1888 - 1935

Until conveyed to the Corporation of London in September 1930, 18 acres of land at the top of Pole Hill was owned by T E Lawrence, the famous soldier, writer & scholar. It was here that he originally intended to erect a house with his friend Vyvyan Richards in which to print fine books including his classic "Seven Pillars of Wisdom". This never came to pass, although until 1922 Richards lived here in a hut called "Cloisters"



Symposium Photographic Competition

The winner is Maggie Radcliffe whose study of a lectern in St John's Chapel impressed the committee. She has achieved a good composition despite the difficult lighting conditions. Maggie wins a copy of *Setting the Desert on Fire* by James Barr. The runners up are on page 9.



Contents

Society News	3
T.E. Lawrence and the Hejaz ~ A Very Explosive Railway	4
Briefly with Lawrence in Normandy	8
Symposium Photographic Competition Runners Up	9
A schoolgirl's view from the past	10
Letters	11
T.E. Lawrence Society Library	12
A Flecker Society?	13
Collectors' Corner, Events	
News, New Books	15

Newsletter Contributions

All contributions are welcome, although we cannot guarantee to use them. If they are to be included in the next issue, either send by post to **TELS Newsletter** at the address below to arrive by **1st May 2009**, or e-mail to:

newsletter@telsociety.org.uk

We also like to include photographs of members' activities; either post original prints with an S.A.E. if you would like them returned, or send full resolution digital photographs by e-mail attachment.

Please note that all contributions are subject to editorial amendment.

Ž

The T. E. Lawrence Society Newsletter Editor: Carol Darbyshire

ISSN 0950 950 X

is published quarterly by:

The T.E. Lawrence Society, P.O. Box 728, Oxford OX2 9ZJ (Registered Charity no. 297940)

Copyright © 2009 The T.E. Lawrence Society and contributors.

The views expressed by contributors are their own and not necessarily those of the T.E. Lawrence Society.

Society Visit to Shaw's Corner

Saturday 16th May 2009





Lawrence was a regular correspondent with the Shaws, in particular Charlotte Shaw. Their letters add up to almost twice the total length of Lawrence's correspondence to any other recipient. It was not until after Charlotte's death in 1943 that GBS realised the depth of their friendship, "...I realise that there were many parts of her character that even I did not know, for she poured out her soul to Lawrence."

Lawrence was a frequent visitor to the Shaw's house in Ayot St Lawrence, Hertfordshire so it is fitting that the Society should pay a visit to their home.

We will meet at the Royal Oak, Langley for lunch at 12 noon. This is about eight miles from Shaw's Corner. Two course lunch is $\pounds7.95$, other options are available. Own transport to the house for 2pm, though we will try to arrange lifts for those without cars.

Please note that we need a firm idea of numbers to make arrangements. If you are interested, book your place by contacting Ian Heritage, either by tel: 020 7333 6349 (daytime), e mail hon.secretary@telsociety.org.uk or write to the Society address opposite. Normal admission to the house is £5.20 but we may qualify for a group admission price of £4.20. National Trust members are free.

• Have you remembered to renew your membership?

• Apologies for the lateness of this Newsletter due to unforeseen circumstances.

New Treasurer

Mr Philip Neale, who gave a lecture on the Garnetts at the Symposium, has kindly agreed to become the new Treasurer. Mrs Pat Kennedy, who has served on the committee for many years holding various posts, notably ten years as membership secretary, is stepping down. We thank her for the many years of service to the committee.

We welcome the following new members:

Ms E. Carrington, Southampton Mr J. Geoffrey, Barrow in Furness Ms K. George, Ellesmere Port Mr W. Gillie, Ontario Mr A. Hamilton-Haywood, Exminster Mrs T. Jenkins-Teague, Weymouth Mr F. Laroulandie, Aixe sur Vienne Mr C. Paul, Dunsfold Mr L. Roberts, Philadelphia Mrs E. Woodthorpe, London

T.E. Lawrence and the Hejaz - A Very Explosive Railway by Les Tucker

"We were interested in the Hejaz Railway" ~ so began a commentary written by Lawrence for the Royal Engineers in 1919 on his leadership of the campaign to destroy the Hejaz Railway ~ *The Royal Engineers Journal*, Vol. XXIX, No.1, January 1919. All quotations in the following are from this commentary.

A key element in Lawrence's campaign against Turkish Forces in WW1 was the sabotage and eventual destruction of the infrastructure of the Hejaz Railway. Fundamental to this was the availability of effective explosives \sim self evident but often forgotten. This article elucidates the explosives employed by Lawrence and traces their origin.

The Hejaz Railway was built over the period 1900 – 1908 running from Damascus to the holy city of Medina. The toil involved in constructing it in searing heat over a terrain much of which consisted of shifting sands, can only be imagined. Its main commercial function was the transport of pilgrims and it became known as the Pilgrims Express. It symbolised Ottoman technical superiority and fulfilled an important strategic role in reinforcing Turkish rule by facilitating communication, transporting troops etc. With the outbreak of war this function became paramount.

The Railway was also known colloquially as The Iron Camel. It was an object of hatred to the Bedouin tribes. The provision of services to the pilgrims ~ camel transportation, supplies and goods for the arduous cross desert journey, was the principal source of their income and the Railway had made substantial inroads into it, as many pilgrims opted for the soft technological option of the Railway.

When he arrived Lawrence therefore came to a situation of seething unrest. What he had to do was to unify and channel this resentment into a coordinated action which would further the interests of the British and the Bedouin \sim not an easy task when dealing with a number of tribes and factions given to mutual suspicion and feuding. However his task was aided by the neat dovetail of the British strategic aim of destroying the main Turkish war transport artery and the Bedouins' aspiration to eliminate the source of their economic woes and over-throw Ottoman rule.

What explosives did he use and what was their origin? At this point we have to move forward 47 years to an amazing piece of luck which lay in the forlorn remnants of the Hejaz Railway. On December 4th 1964 an article appeared in the *Times* written by the Director of a consortium of British firms, which had won a contract to examine the possibility of rehabilitating the Hejaz Railway. Prior to commencement of the work he undertook a journey over about 200 miles of the southern part, starting about 20 miles north of Medina and the article was a description of this journey. After the first 8 miles, which took about 1³/₄ hours, the party came across the first major destroyed bridge and here, to their astonishment they discovered a perfectly preserved pack of guncotton complete with fuze. The writer reported that the pack had been stamped 'ROPF 1916' and conjectured as to what the initials might have stood for. His guess was 'Royal Ordnance Powder Factory' \sim a brave try, but what he didn't realise was that the letter he had read as an O was almost certainly a G, giving the reading 'Royal Gunpowder Factory'.



Diagram showing marking on Guncotton slabs and primers, including RGPF and date

It was thus confirmed that the explosive had originated in the Royal Gunpowder Factory, which was situated in the small market town of Waltham Abbey in Essex \sim which brings us back to our starting point 47 years previously.

What was guncotton and what was the history of the Factory? Guncotton was one of a group of the chemically based explosives which had supplanted gunpowder at the end of the 19th century as the main explosive for military and for extensive civil use in applications such as mining, quarrying and infrastructure projects in general. Guncotton was produced by the action of a process termed nitration on the cellulose cotton to produce an explosive employed by the military for filling mines, the warheads of torpedoes and for demolition, hence the term guncotton. The Royal Gunpowder Factory, (previously the Royal Gunpowder Mills), had been founded in 1787 after purchase of the establishment from a private owner. Under the visionary leadership of Lt. Gen. Sir William Congreve and later his son, also Lt. Gen. Sir, of rocket fame, the Mills became a centre of excellence in explosives production, introducing quality control and scientific method and this lead continued over 200 years of Government production and later after WW2 into its function as a research centre.

The significance of guncotton in the campaign is confirmed in Lawrence's words "Our explosives were mainly blasting gelatine and guncotton." Waltham Abbey was the main producer of WW1 guncotton, confirmed by the pack. We thus know that guncotton which moved from the deceptively tranquil surroundings of the Factory, down the Lee Navigation to the River Thames and on to an Ordnance depot somewhere in the Middle East to complete its journey on the back of lurching camels, was a significant element in the eventual destruction of the Hejaz.



Royal Gunpowder Mills Guncotton Factory ca. 1900

Does anything in his commentary to the Engineers reveal any-

thing of Lawrence's thoughts on the War? ~ unlikely in a technically based piece. However there is one description which suggests a wry laconic attitude to the realities and two phrases which are quite out of keeping with the general technical tenor of his commentary.

The first concerns running towards the point to be demolished, under fire. It has to be remembered that the effort on the Hejaz was directed to demolition rather than large scale destruction of enemy personnel. After a rather hair-raising description of how they manhandled blasting gelatine into 50lbs. bags, Lawrence describes the run to the bridge etc. "The impact of a bullet may detonate a sack of it, but we found in practice that when running you clasp it to your side, and if it is held on that furthest from the enemy, then the chances are that it will not be hit, except by the bullet that has already inflicted a mortal wound on the bearer." Which seems to put the importance of the explosive a little bit higher than the bearer!

The second is a description of the appearance of demolished rail tracks: "The appearance of a piece of rail treated by this method is most beautiful, for the sleepers rise up in all manner of varied forms, like the early buds of tulips." A surprising departure from the technical.

The third concerns the use of armoured cars: "An armoured car is very useful in bridge demolition. To hold the explosive and the artist." The use of the unwarlike word artist is startling. Could one, indulging in a highly fanciful piece of textual analysis, suggest that in demolishing the Hejaz Lawrence found a kind of peace, far from the mud of Flanders, which eluded him after the War?

In WW1 the Royal Gunpowder Factory at Waltham Abbey produced the guncotton which was a major element in Lawrence's explosives resource, providing him with a safe, reliable and effective means of pursuing his strategy of negating the Hejaz Railway, a process which led on to the capture of Aqaba, playing a leading part in eventual sorely needed victory in Palestine.

Following Governmental reorganisation, the Explosives Research Centre which had operated on the Gunpowder Factory site from 1945 closed in 1991 and its activities transferred to Fort Halstead. Following extensive refurbishment, the site reopened in 2001 as a major interpretative centre devoted to the history of

gunpowder and later propellant explosive manufacture, including rocketry. In recognition of its origins, the centre has the title 'Royal Gunpowder Mills'.

Full information is obtainable from the Royal Gunpowder Mills website: www.royalgunpowdermills.com

As a postscript :

There is a further dual Lawrence connection with Waltham Abbey. The first is geographical. On Pole Hill Chingford in Forest land there stands a Meridian Monument obelisk on which in 2008 Society member, Maggie Radcliffe and Guy Osbourne succeeded in placing a plaque commemorating the Lawrence connection with the site, (see Spring 2008 Newsletter). The monument overlooks the Lea Valley and the Factory. Did it ever occur to Lawrence looking over the Valley that it was the origin of the Hejaz guncotton ?

Secondly in WW2 the Hill was an AA gun site using cordite filled shells. Although the Waltham Abbey Factory ceased production in 1944 there is a strong possibility that, at least at the time of the intensive air raids on London in the early 1940's this cordite was produced at the Factory.

Les Tucker, Honorary Archivist Royal Gunpowder Mills, Waltham Abbey

I will be glad to answer enquiries, technical or otherwise. The contact e mail address is: info@royalgunpowdermills.com



Guncotton workers with beating (pulping) machinery 1917. During WWI the staff of the Factory increased from a pre-war level of around 1,200 to a peak of around 6,200. Of this around 3,200 were female, recruited for the duration from North London and surrounding areas—a major social phenomenon

Briefly with Lawrence in Normandy by Ronald Knight

In June 2008 my wife and I spent a few days on a package coach tour in France, centred on the town of Evreux, which lies on the plains of Normandy. A hundred years ago it would have been ideal cycling country, as Lawrence would have found out when he toured there in 1907 with his father.

Unfortunately, the ravages of two world wars left their mark (the Somme battlefield is not so far distant), and the modern processions of juggernauts and cars on the roads to and from the neighbouring ports of Calais, Dieppe and Le Harvre make long-distance cycling nigh on impossible. Evreux is not now the small town that Lawrence visited, with its new housing and commercial suburbs. The centre may still have some recognisable features, including its cathedral of Notre Dame.

Lawrence wrote to his mother on 11th August 1907 from Evreux "Where there is a fair cathedral, with the most exquisite stained glass, all old and of a glorious scheme of gold and red. The effect is magnificent and makes a poor building look splendid." (Garnett *Letter 7*). But according to the cathedral's *Guide* some bays of the nave and the one under the towers, were rebuilt after the fire of 1940 caused by German bombing, severely damaged the west end. The spire also had to be rebuilt. Some of the stained-glass windows also suffered at the same time. Other windows were destroyed by a hail storm in August 1983, with their restoration having since been undertaken.

In contrast to its somewhat internal run-down appearance, the cathedral's crowning glory now is its new magnificent futuristic state-of-the-art Quoirin organ. We were lucky to be inside when an organ lesson was being given. We had a brief conversation with the organist afterwards with, fortuitously, a French-Canadian visitor acting as interpreter. At the time of writing this organ can be seen and heard on the website www.disques-triton.com.

We also spent some time at Rouen, visited by Lawrence in July 1908 and November 1910. Here again the cathedral and its immediate surroundings had suffered subsequent war damage, which has since been repaired. He was probably pleased to have seen the life-size effigy there of England's king Richard I, who was responsible for some of the Crusader Castles he was studying. He commented further in the above letter: "Richard I must have been a far greater man than we usually consider him: he must have been a great strategist and a great engineer, as well as a great man-at-arms. It is time Richard had justice done to his talents."

Whilst travelling to and from Calais, we passed the Crecy battlefield which Lawrence also visited in 1908. During our daily journeys around the countryside, we saw signposts pointing the way to other nearby Lawrence associated locations, e.g. Lisieux, Les Andeleys, Rheims which unfortunately were not on our itinerary. Following Lawrence had only been an incidental bonus to the trip which was really to enable my wife to visit Monet's garden at Giverney.

Symposium Photographic Competition Runners Up



2nd place: Charles Eilers. The Effigy at St Martins on the Wall, Wareham.



3rd place: Betty Lee. Clouds Hill. Betty added a sepia tone to give a more historic feel to the picture, sadly we can only reproduce in b&w in the print newsletter.

A schoolgirl's view from the past

The essay reproduced in part below was written by a 14 year schoolgirl, Irene Lord, in April 1935, just one month before the death of T E Lawrence. Irene moved firstly to Arras, France with her parents in 1928 and in 1931 to Ypres in Belgium. Her father held a position with the British Legion, organising visits for the bereaved to First World War cemeteries. Irene was educated at the Eton Memorial School in Ypres, which was built by the old boys of Eton in memory of their comrades who fell on the fields of Flanders. Irene is the mother in law of the Chairman, Peter Leney, and the essay was recently discovered among her personal papers. She will be 90 in December. She wrote the essay after a talk on TEL given by the headmaster.

Ned Lawrence is still alive, as he fought in the Great War in Arabia. When a boy he lived in Ireland with his parents, they lost their money, so went to Wales.

Lawrence went to Oxford College, and when he leaves the College he has to write a long original essay, so Lawrence decided to travel to Palestine to write his essay. When he went to Palestine he dressed like an Arab, spoke Arabic and lived like an Arab for a year while he wrote his essay. When he left College he became an archaeologist and went on an island in the Persian Gulf to dig for old coins and pottery.

Lawrence was a very small man, five feet three inches tall, and weighed a hundred pounds. When he asked to join the British army in 1914 they told him to go home, because he was too small, but finally they took him because he told the Generals which was the best way to go in Arabia to make an attack on the Turks. Because he was so clever in this way they made him a Lieutenant. Although Lawrence was a Lieutenant he had no respect for the Generals, he never saluted them, he dresses as he liked, never polished his boots or his buttons, he was not punished because he was too valuable to the army.

The Arabs believed that Lawrence was sent by Mohammed so they obeyed his orders. Lawrence was a Christian, he was the only one among hundreds of Mohammedans, the Arabs knew he was a Christian, but loved him so much that they did not kill him as they would have done if he had been someone else.

Auda was the Robin Hood of the desert. He had thousands of men under his command, he had a great number of valuable things, but gave a lot to poor people. He always at all times of the day had a huge pot of food ready for beggars. Auda decided to build a palace, he captures fifty men to build it. The roof was so large that they had not enough wood to cover it, so Auda ordered his men to cut down the Turks telephone poles for the roof. The word Auda means "Father of Flying". Auda proved to have had the right name, because Lawrence took him in one of the British aeroplanes, he was so fascinated that at the end of the war he had one himself.

Lawrence decided to capture the town of Akabah which is on the Gulf of

Akabah. When he and his Bedouins were not too far from Akabah they came across a well which had been filled in with bricks by the Turks. Lawrence and the Arabs worked hard clearing the bricks away and so got their water. The Arabs were so vexed at this mean deed that at the next village they came to they massacred everyone of the Turks.

Lawrence spread out his Bedouins so that the Turks would think he had a huge army. He kept the Arabs behind rocks and told them to snipe at their enemies. Lawrence soon got tired of the Arabs sniping so he charged down on the Turks who were dying of thirst because Lawrence was guarding an oasis. As he rode down on the Turks his rifle was knocked out of his hand, a bullet went into his camels head and Lawrence was thrown off. The Arabs surrounded the Turks and made them prisoners. They wanted to torture the Turks, but Lawrence said no, he said that if they let them free, they would go to the other Turks and tell them how kind the Arabs were, and then Lawrence would have the Turks joining him, which they did. Lawrence now had extra men to feed and they were short of food. So Lawrence pushed his army to Akabah hoping to get food there for them, but he was unlucky because the Turks had not enough food for themselves.

Many camels were killed for meat and water. The Turks gave in and the Arabs took possession of Akabah.

Late News

Maurice Jarre composer of the haunting soundtrack to the David Lean film *Lawrence of Arabia*, died on Sunday 29th March at his home in Los Angeles. He was 84 and had been suffering from cancer.

Jarre wrote more than 150 scores for a wide range of films, but it was his music for *Lawrence of Arabia* in 1962 which gave him his first big break and won him his first oscar.

Born in Lyon in 1924, Jarre originally studied engineering at the Sorbonne, before switching to music and enrolling at the Conservatoire de Paris. After leaving he served as a percussionist, at one point under Pierre Boulez. He was asked to score for a short documentary and it was this which brought him to the attention of *Lawrence of Arabia* producer, Sam Speigel.

The composers Malcolm Arnold and William Walton had already turned down offers to write the film score, then Khatchaturian and Benjamin Britten were also approached but were unavailable. Broadway composer Richard Rogers began writing but Lean disliked his efforts, so it finally fell to Jarre to write the whole score. By this time the film had been half finished and Jarre was under enormous time pressure, but he succeeded in writing two hours of music, for a 100 piece orchestra, in six weeks. He achieved this feat by working continuously and sleeping for 10 minutes every three hours.

Jarre went on to collaborate with Lean and then with some of the best known names in Hollywood, but the theme to *Lawrence* remained his favourite.

A Flecker Society?

T. E. Lawrence Society Library

Newer members may not be aware that the Society has its own collection, which is housed by kind permission of Oxford County Council, in the Oxfordshire Studies Library. This is on the first floor, above the general lending library right in the heart of the city, in the Westgate Shopping Centre. The library complex is a quiet oasis in the bustling commercial centre.

The Society's collection contains all the *Journals* and *Newsletters* from its 24 year history and research by members over the years, including Ronald Knight's detailed Chronology of Lawrence's life. Ronald has managed to piece together an almost week by week account of Lawrence's whereabouts and events in his life, using letters and biographies and it was kindly presented to the Society along with copies of Ronald's printed research. There are also press cuttings from the early days of the Society of Lawrence interest and all the well known biographies. The author of a recent one ~ James Barr, used the library for his research on *Setting the Desert On Fire*.

The collection is for reference only and is contained in locked book cases, readers must sign for access. It is available to all members.



Late News

Alda De Franceschi has sent notice that an Anglican service will be held in remembrance of **Prince and Spratt**, the aircrew who died in the plane crash Lawrence survived in 1919,(see *NL* 86) in the Chapel of the Protestant cemetery in Rome on Tuesday 19th May at 11 a.m. This is for the 90th anniversary of the crash and it is also co-incidentally the 74th anniversary of Lawrence's death.

I have had the idea of starting a Flecker Society for some time, ever since finishing my biography of James Elroy Flecker. I have asked Flecker's nephew if he or his family had any objections to my idea and he said that he did not. I was further encouraged in the idea after attending the TEL Symposium in 2008, when I was told that TEL Society members (knowing of the Flecker/Lawrence friendship) would be interested in joining as founder members of the Flecker Society. The Alliance of Literary Societies is also on the case.

I hope that Peter Snow, the TV presenter and broadcaster and a Flecker fan and with whom I have had email contact, would also join. Peter Snow said on air that he would have liked to have staged a production of *Hassan* at the Regent's Park Open Air Theatre. That might be a bit ambitious compared with the aims of the Flecker Society, which would be (to start with) just to keep Flecker's work alive. A definitive edition of Flecker's poetry does not exist, at present. I hope that a meeting of Flecker fans and perhaps also those of Ronald Firbank (another friend of Flecker's) making a Flecker/Firbank Society would take place first of all, if sufficient people would like to get in touch with me. I hope that then there would then be enough founder members to get the Flecker Society, up and running. Contact details are;

Heather Walker, 144C, Southwark Park Road, London, SE16 3RP. Telephone 020 7237 5912 or email walht@aol.com



At Last...

Margo Robertson and Raymond Van Haelst finally meet during the Friday coach trip to Moreton cemetery at the 2008 Symposium. Margo and Raymond had been corresponding for many years, being long time members of the Society.

Collectors' Corner

Eight letters from Lawrence, containing mainly technical details sold for nearly three times their estimate in November last year. They were written to Flight Sergeant Clarke and had remained in the family until they were sold by Henry Aldridge Auctioneers in Devizes, Wiltshire, UK, for £11,000 ~ well above their £4,000 estimate. The letters have not been made public before.

They were written between April 1932 and November 1933 to Fl. Sgt. Clarke, who was based at RAF Plymouth. Many contained technical jargon about boat engine parts, although he makes several jokes at the Navy's expense about how the RAF was doing its work.

But he also wrote about his love of books. In one letter he lists some of the titles he read in 1933, which was described as a "vintage year for books". He wrote: "*Tarka [the Otter]* is an extraordinary book: too much worked over, but magnificent. There have been three good books already this year ~ *The Book of Talbot* by G. Violet Clifton, *Log of the Sea* by Riesenburg, [and] *Captain Bottell* by James Hanley" and then he added a further book "and an account of his boyhood by a [Blasket?] Islander, translated from Gaelic". He continues "…I'm sorry to say there's another book on me coming out, a study by Captain Liddell Hart of my military significance in the fields of strategy and tactics. Woof!"

In another letter, (26/3/33) he said: "Lately I have been spending money on my cottage. All my books are there now ... when my building operations are over and paid for I must get busy filling the shelf gaps."

The letters also mention his motorcycle, "The old bike is running like a new one".

Events

The Making of the Modern Middle East Conference at Christ Church. Oxford, Sunday 6th September—Friday 11th September is part of the college's Conflict Series. There will be three days of lectures including a T.E. Lawrence lecture given by James Barr (author of *Setting the Desert on Fire*, and speaker at the Society 2008 Symposium). Other speakers include Sir Mark Allen, Prof. Avi Shlaim, Abdel Bari Atwan, Dr Jennifer Dueck, Dr Eugene Rogan and Fawaz Gerges.

The programme has two non lecture days when there will be a walking tour of Oxford (including a visit to Jesus College to see the John portrait of Lawrence) and Waddesdon Manor, home of the Rothschild Archives.

A full programme can be seen at www.chch.ox.ac.uk (under events tabs), or see flyer sent with the Society *Journal*. Prices are £895 for the full 5 night programme including accommodation at the college and meals and £745 for non-residential delegates (including meals).

News

We are sad to report that **Staff Sergeant Dave Burt**, who managed the Old Schoolhouse tea rooms at Moreton, Dorset, has been killed in a car accident. On 21st February, he was returning from a regimental dinner at Bovington Camp when his car veered off the road and hit a tree. No-one else was involved. Dave and his wife Elaine, had hosted Society events at the Tea Rooms, including an AGM and were about to retire to Cyprus when the accident happened.

Maggie Radcliffe has posted two items on the **blue plaque** she helped organise at Pole Hill on the website chingfordwarmemorial.co.uk click under news tab.

Country Life magazine (25th March) has an article about the rhododendrons in Clouds Hill garden. See www.countrylife.co.uk

The National Trust has re-opened **Clouds Hill** for the 2009 season. Opening times are Thursday-Sunday, 12-5pm.

New Books

These details are provided for information only and should not be regarded as endorsements or recommendations.

Hugh Elmes: From a Camel to a Brough

Recollections of Wareham and Lawrence's life in Bovington using material from Alex Dixon's *Tinned Soldier* with permission from Jonathon Cape by Dorset author.

Self published, price £4.99; p&p for UK 50p, overseas £1.50; contact Hugh on sue.elmes@btinternet.com or phone 01929 552603.

Priya Satia: Spies in Arabia: The Great War and the cultural foundations of Britain's covert empire in the Middle East

At the start of the twentieth century, British intelligence agents began to venture in increasing numbers to the Arab lands of the Ottoman Empire. Satia argues that violence and culture were more closely allied in imperial rule than has been recognized. It tells the story of an imperial state dependent on equivocal agents groping through a fog of cultural notions and mass democracy towards a new style of "covert empire" centred on a brutal aerial surveillance regime in Iraq. T.E. Lawrence is mentioned throughout the book.

Publishers: Oxford University Press (US); April 2008; price £29.99; 472 pages; ISBN 978-0195331417

Andrew Norman: The Enigma Explained

In this book, with a rather ambitious title, Dr Norman seeks to explain the personality change that Lawrence underwent during WWI. He presents a searching yet sympathetic portrait of an extraordinary figure.

Dr Norman was a family G.P. until he changed his career to a writer. He has an impressive output of titles, mainly psychoanalytical studies of historical figures. If anyone wishes to write a review of the book, please contact me at the address on page 2. Comments and reviews of other new titles are also welcome.

Publishers: The History Press; Jan 2009; Price £15.99; 160 pages; 32 b&w illustrations; hardback; ISBN 978-0752448589

David Murphy: The Arab Revolt: Lawrence sets Arabia Ablaze

The book examines the Revolt, describing and analysing the background and events of the uprising. Breaking the process into several broad phases, the author examines the initial capture of coastal towns like Jeddah, followed by the raids on the Hejaz Railway, the seizure of Aqaba and the northward push of the Arab Army at Gaza, Jerusalem, Megiddo and Damascus. Finally, the book describes how a local Arab rebellion grew to form a major part of Allied operations in the Middle East, as Arab tribesman who were merely troublesome raiders developed into a force which could oppose brigade-sized Turkish columns by 1918.

This is a completely new book containing more material than Osprey's 1989 volume *Lawrence and the Arab Revolts*. It includes several photographs from the GARP excavations in Jordan and a substantial section covering the 'Legend of Lawrence'. It also includes some good isometric plans of the battles of Tafilah and Ma'an, and dramatic coloured artwork. Particularly striking is a drawing of Lawrence at Aqaba, mounted on a camel and looking down sternly at a group of surrendering Ottoman soldiers.

Publisher: Osprey Publishing; November 2008; price £14.99; 96 pages; paperback; ISBN 978-1846033391

Rupert Willoughby: Reading and its Contribution to World Culture

Written by an enthusiastic inhabitant, this is about the town of Reading in southern England (not the popular pastime), and its place in history. It includes a chapter on Lawrence, describing not only the loss of his *Seven Pillars* MS at Reading Station in 1919, but also his family connections to the town. The Museum of Reading possesses a cast of Kennigton's bust, together with his sketch of Sherif Ali ibn el Hussein for *Seven Pillars*.

Publisher: Rupert Willoughby; Nov 2008; Price £8.99; 72 pages; paperback; ISBN 978-0953442850

T.E. Lawrence and the Hejaz - A Very Explosive Railway

⁶ We were interested in the Hejaz Railway ⁶ – so began a commentary written by Lawrence for the Royal Engineers in 1919 on his leadership of the campaign to destroy the Hejaz Railway – *The Royal Engineers Journal*, Vol. XXIX, No.1, January 1919. All quotations in the following are from this commentary.

A key element in Lawrence's campaign against Turkish Forces in WW1 was the sabotage and eventual destruction of the infrastructure of the Hejaz Railway. Fundamental to this was the availability of effective explosives - self evident but often forgotten. This article elucidates the explosives employed by Lawrence and traces their origin.

The Hejaz Railway was built over the period 1900 – 1908 running from Damascus to the holy city of Medina. The toil involved in constructing it in searing heat over a terrain much of which consisted of shifting sands can be imagined. Its main commercial function was the transport of pilgrims and it became known as the Pilgrims Express. It symbolised Ottoman technical superiority and fulfilled an important strategic role in reinforcing Turkish rule by facilitating communication, transporting troops etc. With the outbreak of war this function became paramount.

The Railway was also known colloquially as The Iron Camel. It was an object of hatred to the Bedouin tribes. The provision of services to the pilgrims – camel transportation, supplies and goods for the arduous cross desert journey, was the principal source of their income and the Railway had made substantial inroads into it as many pilgrims opted for the soft technological option of the Railway.

When he arrived Lawrence therefore came to a situation of seething unrest. What he had to do was to unify and channel this resentment into a co-ordinated action which would further the interests of the British and the Bedouin – not an easy task when dealing with a number of tribes and factions given to mutual suspicion and feuding. However his task was aided by the neat dovetail of the British strategic aim of destroying the main Turkish war transport artery and the Bedouins' aspiration to eliminate the source of their economic woes and overthrow Ottoman rule.

What explosives did he use and what was their origin? At this point we have to move forward forty seven years to an amazing piece of luck which lay in the forlorn remnants of the Hejaz. On December 4th.1964 an article appeared in the *Times* written by the Director of a consortium of British firms which had won a contract to examine the possibility of rehabilitating the Hejaz Railway. Prior to commencement of the work he undertook a journey over about 200 miles of the southern part starting about 20 miles north of Medina and the article was a description of this journey. After the first 8 miles, which took about one and three quarter hours, the party came across the first major destroyed bridge and here to their astonishment they discovered a perfectly preserved pack of guncotton complete with fuze. The writer reported that the pack had been stamped ' ROPF 1916 ' and conjectured as to what the initials might have stood for. His guess was ' Royal Ordnance Powder Factory ' – a brave try but what he didn't realise was that the letter he had read as an O was almost certainly a G, giving the reading ' Royal Gunpowder Factory '.

It was thus confirmed that the explosive had originated in the Royal Gunpowder Factory, which was situated in the small market town of Waltham Abbey in Essex - which brings us back to our starting point forty seven years previously.

What was guncotton and what was the history of the Factory. Guncotton was one of a group of the chemically based explosives which had supplanted gunpowder at the end of the 19th century as the main explosive for military and for extensive civil use in

applications such as mining, quarrying and infrastructure projects in general. Guncotton was produced by the action of a process termed nitration on the cellulose cotton to produce an explosive employed by the military for filling mines, the warheads of torpedoes and for demolition, hence the term guncotton. The Royal Gunpowder Factory, previously the Royal Gunpowder Mills, had been founded in 1787 after purchase of the establishment from a private owner. Under the visionary leadership of Lt. Gen. Sir William Congreve and later his son, also Lt. Gen. Sir, of rocket fame, the Mills became a centre of excellence in explosives production, introducing quality control and scientific method and this lead continued over 200 years of Government production and later after WW2 into its function as a research centre.

The significance of guncotton in the campaign is confirmed in Lawrence's words ' *Our explosives were mainly blasting gelatine and guncotton* '. Waltham Abbey was the main producer of WW1 guncotton, confirmed by the pack, and we thus know that guncotton which moved from the deceptively tranquil surroundings of the Factory down the Lee Navigation to the Thames and on to an Ordnance depot somewhere in the Middle East to complete its journey on the back of lurching camels was a significant element in the eventual destruction of the Hejaz.

Does anything in his commentary to the Engineers reveal anything of Lawrence's thoughts on the War – unlikely in a technically based piece. However there is one description which suggests a wry laconic attitude to the realities and two phrases which are quite out of keeping with the general technical tenor of his commentary.

The first concerns running towards the point to be demolished, under fire. It has to be remembered that the effort on the Hejaz was directed to demolition rather than large scale destruction of enemy personnel. After a rather hair raising description of how they manhandled blasting gelatine into 50lbs. bags Lawrence describes the run to the bridge etc.

The impact of a bullet may detonate a sack of it but we found in practice that when running you clasp it to your side, and if it is held on that furthest from the enemy, then

the chances are that it will not be hit, except by the bullet that has already inflicted a mortal wound on the bearer.

which seems to put the importance of the explosive a little bit higher than the bearer!

The second is a description of the appearance of demolished rail tracks:

The appearance of a piece of rail treated by this method is most beautiful, for the sleepers rise up in all manner of varied forms, like the early buds of tulips.

A surprising departure from the technical.

The third concerns the use of armoured cars:

An armoured car is very useful in bridge demolition. To hold the explosive and the artist.

The use of the unwarlike word artist is startling. Could one, indulging in a highly fanciful piece of textual analysis, suggest that in demolishing the Hejaz Lawrence found a kind of peace, far from the mud of Flanders, which eluded him after the War?

In WW1 the Royal Gunpowder Factory at Waltham Abbey produced the guncotton which was a major element in Lawrence's explosives resource, providing him with a safe, reliable and effective means of pursuing his strategy of negating the Hejaz Railway, a process which led on to the capture of Aqaba, playing a leading part in eventual sorely needed victory in Palestine.

Following Governmental reorganisation, the Explosives Research Centre which had operated on the Gunpowder Factory site from 1945 closed in 1991 and its activities transferred to Fort Halstead. Following extensive refurbishment the site reopened in 2001 as a major interpretative centre devoted to the history of gunpowder and later propellant explosive manufacture, including rocketry. In recognition of its origins, the centre has the title Royal Gunpowder Mills.

Full information is obtainable from the Mills website <u>www.royalgunpowdermills.com</u>. I will be glad to answer enquiries, technical or otherwise. The contact e mail address is <u>info@royalgunpowdermills.com</u>

As a postscript :

There is a further dual Lawrence connection with Waltham Abbey.

The first is geographical. On Pole Hill Chingford in Forest land there stands a Meridian Monument obelisk on which in 2008 the Society succeeded in placing a plaque commemorating the Lawrence connection with the site - Spring 2008 Newsletter. The monument overlooks the Lea Valley and the Factory. Did it ever occur to Lawrence looking over the Valley that it was the origin of the Hejaz guncotton ?

Secondly in WW2 the Hill was an AA gun site using cordite filled shells. Although the Waltham Abbey Factory ceased production in 1944 there is a strong possibility that, at least at the time of the intensive air raids on London in the early 1940's this cordite was produced at the Factory.

Les Tucker Honorary Archivist Royal Gunpowder Mills Waltham Abbey

1st March 2009

Waltham Abbey Guncotton - Lawrence's Explosive

A key element in Lawrence's campaign against Turkish Forces was the sabotage and eventual destruction of the infrastructure and rolling stock of the Hejaz Railway. Fundamental to this was the demolition explosive guncotton. This article elucidates the origin of the guncotton used by Lawrence and traces the history of this material.

The Hejaz Railway, built over the period 1900 – 1908, ran from Damascus to the holy city of Medina. The toil involved in constructing it in searing heat over a terrain much of which consisted of shifting sands can be imagined. Its main commercial function was the transport of pilgrims and it became known as the Pilgrims Express. It symbolised Ottoman technical superiority and fulfilled an important strategic role in reinforcing Turkish rule by facilitating communication, transporting troops etc. With the outbreak of war this function became paramount.

The Railway was an object of hatred to the Bedouin tribes. The provision of services to the pilgrims – camel transportation, supplies and guides for the arduous cross country journey, was the principal source of their income and the Railway had made substantial inroads into it as many pilgrims opted for the soft technological option of the Railway. In 1910 this resentment erupted into an uprising against Ottoman rule, which was ruthlessly suppressed.

When he arrived therefore Lawrence came to a situation of seething local unrest. What he had to do was to unify and channel this resentment into a co-ordinated action which would further the interests of the British and the Bedouin – not an easy task when dealing with a number of tribes and factions given to feuding and mutual suspicion. However his task was aided by the neat dovetail of the British strategic aim of destroying a major Turkish war transport artery and the Bedouins' aspiration to eliminate the source of their economic woes and overthrow Ottoman rule. To do this he needed an effective demolition explosive – fundamental but often forgotten in accounts of the campaign. At this point we have to go forward forty seven years.

In 1964 an article appeared in the Times¹ written by the director of a consortium of British firms which had won a contract to examine the possibility of rehabilitating the Hejaz Railway. Prior to commencement of the work the director undertook a journey over about 200 miles of the southern part starting about 20 miles north of Medina and the article was a description of this journey. After the first 8 miles, which took 1 ³/₄ hours, the party came across the first major destroyed bridge and here to their astonishment they discovered a perfectly preserved pack of guncotton complete with fuze. The director reported that the pack had been stamped ' ROPF 1916' ' and conjectured as to what the initials might have stood for. His guess was ' Royal Ordnance Powder Factory ' – a brave try but what he didn't realise was that the letter he had read as an O was almost certainly a G giving the reading ' Royal Gunpowder Factory '.

The article ultimately came to the attention of the Director of the Explosives and Research Establishment (ERDE) at Waltham Abbey. In an exchange of correspondence with the National Geographic Society² it was confirmed that the letter O should indeed have read G and therefore the guncotton would have originated from the Royal Gunpowder Factory at Waltham Abbey. ERDE was the research establishment concerned with the development of explosives for the Armed Forces which in 1945 commenced operations on the site which had under the title Royal Gunpowder Factory

until closure in 1944 supplied and developed explosives for the Armed Forces. Gunpowder had been almost entirely supplanted in military use by the new chemical explosives, including guncotton, from the latter part of the 19th century but the Factory had been supplying gunpowder to the Crown from 1787 and previously under private ownership and the term gunpowder was not lightly abandoned in titling and in fact it survived in various forms until closure.

The Royal Gunpowder Manufactory, later Factory, was the creation of the then Major, later the first Lt. Gen. Sir William Congreve, Deputy Comptroller of the Royal Laboratory at Woolwich, who in 1787 in a remarkable exercise of diplomacy persuaded Pitt to reverse his opinion that Governmental powder manufacture should be ' privatised ' and instead sanction the purchase for the Crown of the privately owned mills at Waltham Abbey. Congreve was one of the first in a long line of technically able artillery officers responsible for many improvements in artillery equipment and procedures. He was a man of immense energy and vision, a hundred years ahead of his time, and has not perhaps received the recognition which he merits. His avowed intention was to create a centre of excellence with standards to which private suppliers to the Government would have to aspire. He enforced the application of scientific method to gunpowder manufacture at a time when it still owed more to alchemy than science and could be regarded as one of the founding fathers of quality control and assurance. This policy was continued and extended under his son, also William and later Lt. Gen. Sir. Put simply the mission of the Factory was to put into the hands of the proverbial man in the trenches and at the gun the safest, most reliable and effective explosive to put him in the best possible position in attack and equally importantly defence and this policy was tirelessly pursued, largely unknown to the outside world, in over 200 years of service to the Crown.

From its first development by the Chinese and later discovery by the West gunpowder, based on the natural products saltpetre, sulphur and charcoal, for over 600 years reigned as the sole civil and military explosive in Europe. Then from the middle of the 19th century everything changed. Science, particularly the new science of organic chemistry, began to put glittering visions before manufacturers' eyes of the profits which could be made by rearranging molecules and synthesising previously costly to make natural products. This process was instituted by the synthesis of textile dyes (William Perkin the discoverer as a student at age 18 of how to synthesise the colour mauve by 26 had made a fortune and retired at 30 a millionaire), closely followed by chemical explosives, both civil and military. In the civil application the attraction was to the mining, guarrying and construction industries in general. The new explosives gave more power, less bulk at less cost - a powerful combination in the fiercely competitive Victorian scene growing at an exponential rate. For the military the attraction was the same with in addition the possibility of finding the Holy Grail – smokeless powder. For a century the Generals had been calling without success for a powder with more power which did not obscure their and the troops' vision and gave away positions when fired. Now their call would be at least partially answered.

The first of the chemical explosives was the material which came to be known as guncotton. To be able to trace its development it is necessary to make a brief exposition of the characteristics of chemical explosives and the process of manufacture.

An explosion is a very rapid chemical reaction, normally oxidation – combination with oxygen. It was discovered that the introduction of the molecular nitro group (NO_2) served as an internal source of oxygen for the oxidation of the carbon and hydrogen 'fuel 'atoms in carbohydrates such as cellulose or the fats such as glycerine and created the conditions for a more powerful explosion – this arose from the relatively unstable attachment of the oxygen oxygen and nitrogen atoms of the nitro groups.

On firing the less stable oxygen-nitrogen linkages undergo sudden disruption and the simultaneous union of the atoms of carbon and hydrogen with those of oxygen acccompanied by liberation of an enormous amount of heat energy leads to instant production of a very large volume of gaseous product with explosive effect. The mode of introduction of the nitro groups is the process termed nitration. This involves treating the parent organic compound with a mixture of concentrated nitric and sulphuric acids, the nitric acid bearing the nitro group and the sulphuric acid acting as a dehydrating agent facilitating the removal of water formed in the process.

As with many scientific discoveries, in guncotton a number of scientists performed some basic research which did not of itself produce a useable result then later one or more arrived at a discovery which produced a practicable entity. In 1838 Pelouze treated paper and cotton and various other materials with strong nitric acid, producing highly flammable materials. Then in one year 1846 no less than three scientists independently discovered what came to be known as guncotton. The first was Christian Friedrich Schonbein, Professor of Chemistry at Basle, who took the work of Pelouze forward by using a mixture of nitric and sulphuric acid to nitrate the carbohydrate fibrous cotton cellulose producing the nitric ester cellulose trinitrate or nitrocellulose, later called guncotton. Only two months later Rudolf Bottger, Professor at Frankfort, made the discovery and then again independently Professor Otto of Brunswick. Bottger and Schonbein heard of each others' work and grasping the potential decided to co operate and patent the product. Reflecting its twin application, development of guncotton then went two ways – civil and military.

On the civil side events moved with remarkable rapidity. The mining world was quick to grasp the potential and in the same year 1846 Schonbein travelled to Cornwall, then a thriving centre of mining, to demonstrate the revolutionary new product of science. Interest was such that he had not got as far as Cornwall when he was intercepted by members of the British Association, eager to hear of the discovery. The mine owners were vitally interested but at Schonbein's demonstration some of the gunpowder experienced miners were more sceptical. The new material had a rather fluffy appearance and looked as though it could hardly shift a pebble. One of their number offered to sit on a trial hole when it was fired in return for suitable refreshment at the local inn. He was dissuaded and was markedly quieter after the demonstration³.

The path of chemical explosives development was however rarely smooth. Again with remarkable speed John Hall & Son of Faversham obtained manufacturing rights, built a factory and were offering guncotton with a claim that 4 ounces of guncotton equalled 24 ounces of gunpowder. Regrettably in 1847 the truth of the old saying 'more haste, less speed 'was demonstrated at Faversham when a huge explosion destroyed the factory with 21 deaths. Commercial manufacture of guncotton ceased for some years.

The dangers of guncotton had been imperfectly understood - the ease with which it would ignite when dry and the inability of manufacturing methods to totally remove small residual impurities such as acid which could lead to spontaneous ignition. However its potential was too great to be ignored and efforts to identify and find a solution intensified.

On the military side the same problems prevailed. There were others additional to these. Military explosives had two roles – either as the propellant for projectiles, shells, or as an explosive filling or demolition agent. It was discovered that in spite of efforts to moderate its power guncotton was just too powerful for the guns currently in use. To use it as a propellant would have damaged the guns. Baron von Lenk, an Austrian artillery officer had been an assiduous promoter of the possibilities of

guncotton as a propellant, persisting in experiment after many set backs, but the Austrian authorities finally tired of the uncertainty and barred him from further activity in Austria. Undeterred he continued outside of Austria.

At this point Sir Frederick Abel enters the scene. Abel occupied the post of Chemist to the War Department.and was the key man in Government science. Abel was a man of considerable ability and influence both as a scientist and administrator. He also enjoyed high standing in society and was prominent in the arts world. He regarded the production of guncotton as a practicable propellant as a personal goal. Llike von Lenk his search was in vain, which must have been a considerable professional disappointment. However he continued with strenuous efforts to deal with the dangers of ignition from the dry state and from the lack of stability arising from residual impurities in order that guncotton could be employed in other functions.

The rest of the military story is of dedicated experimentation eventually succeeding in eliminating the problems to the point where it could enter service. Abel conducted his laboratory scale experiments at the Royal Laboratory at Woolwich and used the Gunpowder Factory at Waltham Abbey as the centre for larger scale trials.

The crucial development in Abel's thinking was the realisation that impurities were surviving washing because of the tubular structure of cotton fibre in which they could lurk. To combat this he introduced, after centrifugal action and boiling had removed the bulk of the acid after nitration, a procedure of pulping the cotton in a beating engine similar to the method employed by the paper industry for rags followed by stirring in water then as a final precaution against any acid retention agitation in an alkaline solution. By 1865 Abel was sufficiently confident to take out a patent for this process.

The problem of dry state ignition was solved by a combination of discoveries. Firstly if moistened guncotton became very strong and easy to transport and crucially was not prone to spontaneous ignition. However this then created the problem of reluctance to ignite when required. This was solved by Abel's assistant, E.O. Brown, who discovered that a range of chemicals existed, the most common being fulminate of mercury, which could be incorporated in a 'detonator ' inserted into a slab of guncotton which when fired provided a shock powerful enough to trigger detonation of the guncotton (it was customary to press military guncotton into slabs). A bonus which was discovered was that wet guncotton in fact produced a more powerful reaction than dry when fired.

The point had now been reached where a material had been developed which although still not useable as a propellant was markedly superior to gunpowder as a demolition agent and as an explosive filling in certain types of munition – mines and torpedoes and

the way was clear for progress to regular production of guncotton at Waltham Abbey – firstly in buildings converted from a saltpetre refinery in 1872 producing 250 tons per annum then from 1890 in a purpose built factory on land purchased to the south of the existing site.

For ease of handling the Factory pressed the moist guncotton into slabs of varying weights. which were embossed with the initials RGPF and the date, as illustrated in the Table (Plate XIX Treatise on Service Explosives, HMSO, 1900 PRO Supply 5/809). The safety of working with moist guncotton is apparent from the fact that the slabs had holes pre drilled to receive detonators or in the case of torpedo charges were cut or turned in a lathe to the shape required to fit the torpedo charge case. Demolition charges were packed into satchels, also stamped RGPF and the

date – which brings the story back to a pack lying mutely in the sand for forty seven years whilst around it history moved on.

Waltham Abbey was a sleepy market town and an outsider would have had difficulty in recognising what kind of installation lay beyond the fence within the dense alder plantations which surrounded the production buildings of the Factory. The deceptive sense of tranquility would have been increased by the sight of powder boats moving slowly along the waters of the canal system. And yet there was a very real connection between the product which moved out from this tranquil setting and momentous events in the outside world.

Under Sir Frederick Abel's leadership Waltham Abbey produced the guncotton which provided Lawrence with the safe, reliable and effective means of pursuing his strategy of negating the Hejaz Railway, a process which led on to the capture of Aqaba, playing a leading part in eventual sorely needed victory in Palestine. Lawrence expected nothing less and he probably hardly gave a thought to the reliability of his explosive. Perhaps the scientists preferred it that way. The time to start worrying was when the users did start to think about it.

- ¹ THE TIMES December 4th 1964, p.13, Issue 56186 Waltham Abbey Special Collection WASC 580
- ² LETTER signed by Mr. A. Lovecy for Director ERDE to Mr. W.E.Roscher of The National Geographic Society Waltham Abbey Special Collection WASC 580

³ BRYAN EARL 'Cornish Explosives ', The Trevithick Society 1978 , p.137

Following Governmental reorganisation, the Research Centre closed in 1991. Following extensive refurbishment the site re opened in 2002 as a major interpretative centre devoted mainly to the history of propellant explosive manufacture. In recognition of its origins, the centre has the title Royal Gunpowder Mills.

Full information on the Mills is obtainable from the Mills website www.royalgunpowdermills.com

As a postscript: There is a further Lawrence connection with the Waltham Abbey Factory, albeit rather tenuous. Lawrence for a time used a cabin on Pole Hill, Chingford overlooking the Lea Valley and the Factory. During WW2 the Hill housed an Anti-Aircraft gunsite. It is possible that the cordite used in shells fired from there came from the Factory.

Les Tucker Hon. Archivist Royal Gunpowder Mills, Waltham Abbey (13th November 2008) Talk delivered to the AGM of the T.E.Lawrence Society at the Royal Gunpowder Mills 26th. September 2009 by Les Tucker

Guncotton - The Wider Perspective

Welcome to the Mills.

Before the talk itself I'll give just a brief introduction to the early history of the Mills and its connection with this building.

Waltham Abbey area was a natural source of water power from the River Lea and its tributary streams. Our first knowledge of a mill on the site comes from a map of 1590 which shows a cloth fulling mill – a process which opened the fibres and changed interwoven threads into fabric, on a constructed watercourse which came to be known as the Millhead Stream. It is not exactly clear who constructed the stream – monastic origins from the Abbey have been suggested, in which case it was a considerable feat of engineering for the time. The location was just north of this building and the base brickwork of subsequent mills is still clearly visible on what is called the Millhead.

Water mills were readily adaptable to whatever product was the most profitable at the time. In the 17th. century the Hudson family owned the mill which was converted first to ' oyle ', producing oil from crushed seeds for lighting, leather production etc., then later to gunpowder reflecting ever growing demand as the Nation defended its expanding trade routes and became embroiled in conflict, mainly with the Dutch at that time.

In the 18th. century the mills were purchased by William Walton. Successive generations of Waltons ran the business successfully, expanding its facilities including the building of new mills by the great engineer Smeaton. An engraving of 1735 shows the progression of production up the Millhead Stream in what was a considerable industrial facility. A historian writing in 1770 described it as the most complete in England. In fact the Mills could be regarded as one of the first factories in Britain, although some would argue that the Royal Dockyards qualify for that title. William built administrative offices and this is the building directly across from us, now called Walton House.

In 1787 at the instigation of Major William Congreve the Crown purchased the Mills from the Waltons for £10,000, initiating 200 years of Government production of gunpowder and chemical explosives at Waltham Abbey.

At the time of purchase Congreve was Deputy Comptroller of the Royal Laboratory at Woolwich. This reflected his reputation as a technical expert in the Royal Artillery, as well as being a field commander, developing a range of improvements to gun carriages etc. With this background he had been the officer chosen to report on the condition of the Fleet's gunpowder at Plymouth after increasing concern had been expressed about the performance of British powder compared to French in the wars fomented by Louis XVI. Congreve issued a damning report and later achieved a remarkable diplomatic triumph in persuading Prime Minister Pitt to abandon plans to sell the Government gunpowder works at Faversham to private interests and instead keep Faversham and purchase Waltham Abbey.

In the ensuing two years Congreve embarked on an ambitious programme of refurbishment and new building costing more than three times the purchase price. He was a visionary well ahead of his time who deserves better recognition in the country's technological history than he has had. Up to that point the production of gunpowder had owed more to alchemy than science. At Waltham Abbey Congreve changed all this. His avowed intention was to create a centre of excellence producing material of a quality to which private suppliers to the Government would have to aspire and his correspondence to the Mills shows a steady stream of instructions and rules applying for the first time scientific method and quality control. He was particularly keen on ingredient purity and careful measurement to ensure uniformity of performance and to further this he ordered the building of a new material mixing house and alongside a saltpetre melting house. The building we are in is the Congreve was later able to stand back and analyse the benefits of the Waltham Abbey purchase and retention of Faversham. On the financial side, always dear to the Government's heart, he demonstrated that between 1783 and 1809 these actions compared with purchase from outside suppliers had saved the Government the grand total of $\pounds1,045,494 - 10 - 61/4$.

With this background it is not surprising that Congreve's son, also William, having made his career as an inventor, became famous as the developer of a military rocket system, the Congreve rocket, employing Waltham Abbey gunpowder. It is doubtful whether many Americans know that the reference to rockets in their national anthem refers to the Congreve rocket.

Turning now to the talk.

In my previous article for the Newsletter I focussed on one specific instance of the use of guncotton as a demolition agent – the destruction by Lawrence of the Hejaz Railway. Guncotton was the product of science and the history of the Mills is the history of one aspect of Government science. Inventions tend to be regarded as almost bolts from the blue but it can be argued that implicitly all scientific development draws also on the past. To-day therefore I would like to take a broader view and give an overview of the scientific historical process in which guncotton ultimately developed, with particular reference to organic chemistry - hence the title of the talk.

It might be useful to give each stage a sub title and I have called the first of these ' Everything '

1. Everything

Why Everything. We have to consider society in the 18th. century. Inevitably the first phase of the Industrial Revolution comes to mind. Arising from a complex set of circumstances first in Britain at an ever increasing pace the nation turned from a mainly agricultural economy to one dominated by manufacture and its supporting activities – mining, transport systems etc.,

All this brought society into closer touch with the natural world. To turn the water wheels water had to be more closely controlled, the land had to be altered to accomodate the canals, tunnels had to be made, the earth had to be broken to yield up minerals, metals, coal and to create massive infrastructure projects – ports, harbours, railways and so on. Overall the riches of Nature had to be unlocked. But if this was necessary then Nature had to be better understood. At first this desire for understanding took the form of a surge of enthusiasm amongst the higher echelons for ' collecting ', objects of interest which could be displayed and reflect your scientific ability. But what to collect. When Peter the Great asked the philosopher Leibniz what it would be best to collect the philosopher replied *All significant things and rarities created by nature and man. Particularly needed are stones, metals, minerals, wild plants and their artificial copies, animals both stuffed and preserved*

The answer it seemed was virtually everything.

2. <u>The Rise of Science</u>

As the 18th. century progressed the interest in Nature percolated down through society. The collection of everything became more refined and there was a growing interest also in natural phenomena such as electricity. Society turned to scientists for increased enlightenment and interest in science became highly fashionable with scientists such as the glamorous Humphry Davy attracting large numbers to public lectures.

This interest was by no means confined to males. In the growing middle classes science attracted many enthusiastic female followers and a number of publications presented science to a female audience. To cite a random example : A very popular publication entitled ' Conversations on Chemistry ', written by a Mrs. Marcet presented the subject in the form of conversations between a young lady Caroline and her tutor Mrs. B ------ . One sentence was particularly prophetic.

To-day, Mrs.B-----, I believe we are to learn the nature and properties of CARBONE. This substance is quite new to me.

3. <u>The Triumph of the French</u>

This scientific ferment produced a desire for some kind of order. Scientists were no longer content with random discovery of new materials and phenomena. But to create order there had to be some form of accepted universal mechanism within which all discoveries could be expressed in a uniform way.

At this point we come to Antoine Laurent Lavoisier.

Lavoisier was an eminent French scientist occupying many important positions within the administrative machine, including head of the French Governmental gunpowder organisation. As such he was responsible for many of the improvements which led to the superiority of French gunpowder over British, leading ultimately to the Congreve report. He was the son of a lawyer and himself a lawyer but his passion in life was chemistry which he devoted to the service of the state.

In the 18th century the concept of phlogiston held sway as a theoretical framework.

One of the main elements in scientific investigation was the nature of combustion. Phlogiston theory held that burning bodies give something off – a kind of essence of fire, they do not absorb it. Linked with this was a concept of negative weight. Lavoisier considered that this was wrong and in a series of experiments relying on fine measurement demonstrated that in combustion a gain in weight was involved. Matter can be transformed but not eliminated – conservation of mass. Linked with this was the identification of oxygen. Phlogiston had led to many false premises and chemical dead ends. Now it was demolished and replaced by what became known as the French theory which opened the way forward. One writer described Lavoisier as the founder of chemistry with a workable theory and emphasis on experimental rigour.

To celebrate his triumph in 1788 Lavoisier commissioned a painting of himself and his wife.

Lavoisier was a fiercely ambitious man. He materially advanced his ambitions in one fell swoop by one simple act – he married.

His bride was Marie – Anne Paulze. She brought to the marriage a formidable list of attributes. Firstly she was a noted beauty. Secondly she came from one of the wealthiest families in France, base on a leading position in the iniquitous French tax system of tax collection agencies or Fermes. Lavoisier had hiself purchased one of these agencies. Thirdly she was keenly interested in science. Fourthly she was already an accomplished society hostess. There was a further rather startling aspect to Marie. In the face of all this she was just thirteen years of age.

So keen were the Lavoisiers on science that on most working days they spent two hours on science before work and three hours in the evenings and all Sunday, which they called their jour de bonheur – day of happiness.

The couple became known for their glittering social events, all of course designed to advance Antoine's career. Included in the entertainment was a tour of the gunpowder works and its amazing machinery.

In the meantime Lavoisier continued to profit from his tax agency. At the peak he was earning from it the equivalent in to-day's terms of ± 12 million per year.

After the Revolution he continued in the service of the State, but in 1794 his past caught up with him. Apart from being a member of the hated tax system he had made two ultimately fatal errors. He had spoken disparagingly of a scientific paper written by a young scientist named Jean_Paul Marat. Marat became one of the most notorious and vengeful members of the National Assembly. Secondly Lavoisier, to curb smuggling had ordered the building of a city wall around Paris – which did nothing to endear him to the citizenry.

He was arrested on trumped up charges and condemned to the guillotine. At his trial the judge made one of the stupidest statements

ever made by a public body: ' The Republic needs neither scientists or chemists '.

Within a few months Marat was dead, assassinated, and 18months later Lavoisier was posthumously pardoned.

Marie survived and married another prominent European scientist.

4. The Rise of the Atom and the Molecule

Lavoisier had made immense strides, but chemistry still needed a universal tool with which to analyse materials and express their characteristics.

Here the emphasis shifted from France to England, when around 1808 John Dalton postulated a theory which ranks as one of the greatest scientific concepts of all time - his atomic theory.

One prominent scientist when asked if you were asked to reduce scientific history to one important statement what would it be replied 'All things are made of atoms.'

What Dalton did was to take this concept and construct a universal way of expressing their size and how they fit together, including the idea that the basic working arrangement of atoms is the molecule, which has a minimum 2 atoms. Thus for example adding 2 atoms of hydrogen to one atom of oxygen gives a molecule of water. Chemical reactions involve the rearrangement of molecules.

The theory and the concept of molecular weight thus lent itself to formulaic expression, which is the basis of all modern chemistry.

There were many disputes and mistakes along the way but the theory was sound and the basis for a universal system of chemical analysis was established.

In complete contrast to Lavoisier, Dalton was an unsophisticated homespun character, born into a poor Quaker household, with little formal education. But fate gave him a formidable intellect which he devoted to science, publishing a huge range on a wide variety of topics ranging apart from his atomic work on for example colour blindness, meteorology, the properties of air and gases.

5. <u>The Rise of Organic Chemistry</u>

A feature of chemistry up to the 19th century was that it was far more advanced on the inorganic side - the mineral than on the organic – the study of natural products. The secrets of Nature had still to be unblocked. This was about to change. Armed with results of the atomic theory and so on scientists could now move on. They knew they were on to something big but didn't know exactly what and some were even overawed by the prospect. In 1835 Friedrich Wohler wrote

Organic chemistry just now is enough to drive one mad. It gives me the impression of a primeval forest full of the most remarkable things, a monstrous and boundless thicket, with no way of escape, into which one may well dread to enter.

But it must have been a heady time too for scientists. With new techniques and theoretical frameworks there were boundless opportunities for discovery. That noted philosopher Jeremy Clarkson recently mused on that time, saying:

You couldn't go for a walk on any cliff top without bumping into a man in a frock coat muttering and making notes

and recounting an imagined conversation between two scientists after work:

Anything happen to-day ? No, pretty boring really. In the morning I invented a new steam engine and in the afternoon a new way of keeping time. And you Nothing much. I came up with a new way of tunnelling Then designed the pressure cooker.

Scientists were staggered by the discovery that the foundation of almost all the rich diversity of Nature appeared to be founded on one mundane element – carbon. This seemed inexplicable but

inescapable, to the extent that the term organic chemistry ultimately came to mean the study of compounds containing carbon.

A new chemistry requires a strong champion and here we encounter Justus von Liebig. Liebig had a passionate interest in chemistry and after gaining experience in various private laboratories determined to teach the subject. In 1824 he obtained a post in the University of Giessen, later becoming a professor. From this base he developed a school of chemistry which attracted young chemists from all over Europe and they in their turn began to return to their home countries and spread the gospel of the new science.

Liebig had an immense body of work to his credit, both in organic and inorganic chemistry. For the last 35 years of his life he devoted himself to the study of the animal and vegetable life process, particularly relating to agricultural improvements.

One of Liebig's most able pupils was August Hofmann, who gained an appointment as lecturer at the newly founded Royal College of Chemistry in London. He proved himself to be an inspirational influence on his pupils.

A vital aspect of the atomic theory was the concept that chemical reactions involve the rearrangement of molecules. Hofmann was adept at guiding his students in projects which explored these rearrangements to their fullest extent, with such success that some of his pupils became great names in the history of organic chemistry and we will return to this.

6. Guncotton

In the meantime in the outside world the long road to molecular manipulation on a large scale started to come to fruition when Christian Schonbein announced that he had discovered that by treating cotton with nitric and sulphuric acids an explosive effect was produced. He had rearranged the molecules in such a way that when activated a violent reaction occurred. Organic chemistry had transformed what had been an innocent white fluffy material into the most powerful explosive then known, about five times as powerful as gunpowder. The new material ultimately came to be known as guncotton.

Explosives development and application can go two ways - either to the civil area for a whole range of applications - from mining, tunnelling through to in modern times oil exploration and even the remote triggering of reactions in space vehicles, or to the military either as propellant of some form of projectile or for demolition. Schonbein had patented his discovery and it excited intense interest with its obvious economic benefits as a potential replacement for gunpowder in mining, particularly initially in Britain. This led to the British manufacturer John Hall of Faversham taking up manufacturing rights and building the first guncotton factory in the world.

In the military field the idea was initially taken up by the Austrians in the shape of Baron Lenk, who embarked on a series of experiments to determine its use as a propellant. Lenk's experience was not a happy one. In spite of the most determined efforts he failed to produce guncotton suitable for that application and his experiments were fraught with accidents. Guncotton was powerful, too powerful for the capability of guns at that time.

In 1865 the Austrian Government finally gave up in despair and banned any further attempt to introduce guncotton into the Austrian military set up.

To tinker with Nature chemically can sometimes be dangerous and what Lenk failed to achieve was a way of eliminating acid hotspots.

Acid was essential to manufacture of guncotton but once used it has to be totally eliminated from the material. This is done by a combination of boiling and washing in water and alkali. What was not initially realised was that because of the tubular construction of cotton fibres even after the most thorough washings deep within the material there still lurked small pockets of acid waiting to cause havoc in storage and use.

At this point Frederick Augustus Abel comes on to the scene. Abel had been one of Hofmann's most outstanding students at the Royal

College and had been quickly recognised as a rising star. After an appointment as Professor of Chemistry at the Royal Military Academy at Woolwich he became the first Chemist to the War Department. Abel expanded his Department to one of significant influence in the growing Government scientific establishment.

Rather surprisingly the Austrian Government had made available to the British Government the report on their guncotton research and Abel commenced a study of the material and particularly how to eliminate the acid. The problem proved extremely difficult and only after a lengthy period of dogged experimentation at the Royal Laboratory at Woolwich and Waltham Abbey did Abel feel confident enough to patent his method, in 1865 and build the first guncotton factory at Waltham Abbey. It must be remembered that explosives experiment unlike other materials carries an inbuilt element of risk which increases the complexity.

A crucial part of Abel's method was that it had to be capable of industrial scale production - scaling up from the laboratory to volume production can be difficult. Later land was purchased to the south of the existing site at Waltham Abbey and a larger guncotton factory was constructed in 1888 on what became known as the South Site, amongst other things materially adding to employment in Waltham Abbey.

Abel was a gentleman scientist and extremely urbane man who moved in the highest social circles, including friendship with the Prince of Wales. As well as his explosives work he conducted many other investigations into important civil matters such as dangerous dusts in coal mines, improvements in the quality of steel, the potential of electric power, devising quality and safety tests for the petroleum industry. Abel's talents were not confined to science. He also occupied influential positions in Arts bodies such as the Society of Arts and the Royal Academy of Music.

Abel was quite keen on money and did not shrink from lobbying his political masters when he considered he was not being paid enough. Some amusing correspondence exists between Abel and a colleague Dewar of vacuum flask fame in which Dewar says after all our primary aim is the advancement of science not monetary reward to which Abel replies vigorously correcting him.

Whilst Abel was struggling with the problem of acid in the outside world by a combination of a chance discovery when attempting to synthesise the malaria drug quinine, dogged perseverance and some amazing pieces of luck another student of Hofmann, William Perkin had discovered how to rearrange the molecules and synthesise the textile dye colour mauve and translate it into industrial production. Perkin made the initial discovery when he was 18 and such was the demand for his product that by 26 was a millionaire.

This together with guncotton ushered in the creation of an entirely new and important part of the economy - the organic chemical industry as the men of capital realised that by paying scientists to tweak molecules a lot of money could be made.

What happened to guncotton in the 20th century ? Did it gradually become just a scientific curiosity. By no means. It was the basic demolition agent of the British Army in both World Wars and after, with Waltham Abbey producing hundreds of tons The Americans particularly perfected it as a propellant and to this day it is still in use in several explosive applications.

Two postscripts :

Perkin attempted to synthesise quinine. It was a further 80 years before the industry was successful. Schonbein made another major discovery - the fuel cell.

So the long road from Schonbein to the Hejaz was complete. But perhaps we should think further back to that long forgotten philosopher who when asked for advice on what to collect and study replied: ' Everything '.

Les Tucker

26-09-2009

T.E. Lawrence Society AGM

Guncotton -The Wider Perspective

Presented by Les Tucker











Lt. Gen. Sir William Congreve Sr.




The Lavoisiers 1788



29 200 My dear mabel See in this days times the astounding announcement that the Austrian foremme The employment of Gun botton in the artitlery & Engineer Lownos - Do you - hbel by

Austrian Letter

know any thing of this

The hustran would

be the lash service from

which to expect sinch

a more

My dear Mabel Jowsfarthfully

J.F. Burgoyne



WALTHAM ABBEY SEWAGE FARM.

South Site Guncotton Factory circa 1905

TOWN MEAD



Sir Frederick Abel

FIG. 23. SIR FREDERICK ABEL, K.C.B., F.R.S.

Prince of Denmark Letter

206 bens that they sime) Marlborough House. The Concert afterwards. been Them, but my Pall Mall. S.W. 13 Feb : 1900 Sabaho you well A course one star, take care That there my dear hi hederich Thairs Kirthes are not 13 at duriner He Mine of Wales as the Onine Montes deries me tray that Prive Charles Lo zu the superstituis of Dennerch and in that point . much like to dive H. n. H. hopes that Lith you tomore , you will be good of you would kindly cumple to let three ask him, and go 5 the have Stars ared

Frederick Abel Career Summary

and has , by his dumpfe & practical advice a advidance contributed quetly to the improved affection from and to the solution of difficulties connected with its manufacture, Strage de Has also careint admany scientifie and prechical investigations, of substantial value to the starvier. Thus, his experiments on the application of electricity to the explosion of minus, he, - commenter in 1855 , assultit in the investion of the first afficient Service electric Frige and Sun tubes , and in the fus . feeling to Athes from time to fime, to mark the increasing requirements of head " infiniting, Submarine mining and havad deriviers . The foundation of the this ting system of defice by distrution mins he was laid by the work ore in the church as Departure again, har abel's user ches & practical labors courset with explosion compounds furnished the Service with the only permanents and practically efficient form of guin cotton (where Firewary & France to have worthed an anidation of the English mil I a haval Service 1 - busides other valuable materials & appliances of this class . By Ineign Provers, In abel is regarded as one of the highest authorities on the above subjects .- In comegin with the supply of mean aries of the partie quality to the Some of all Stations (s. g. Water, Fords, waterprof other Clothing illumine along & charter to infecting agents) - ales with the sold him of definations and Existing out of the wide dematic variations, in the Eucline The abel has also rendered mainy important survices.

In addition to the ground lutice, of which the above is an orothine, the following are illustrations of special Sawiers performent by tune -

The has deroit, on is serving, in councy in with the Way

The arouance Salet Jour - from 1855. sucht the first hait forweither was appointed. These afterwants associated with that forw - afforder constant anistance to it is repating upon a 14 promountally missistance to it is repating upon a 14 promountally missistance to it is repating upon a 14 promountally missistance to it is repating upon a 14 promountally

on matters allating to Explosives - construction of Juns 1.

- The Royal Engineer former first as descusse, at for several glars part as member. Corne is on the Interior to of Senal Armon tartridges (during the Indian Prenting). Corne is on the application of Roschatte to U.O works and Tometing.

in Brouge as material for 100 1019 - 15 Suprovenueto

- Ley which the first improvements in Powder (1858) - Ley which the first improvements in Powder for laye sifled guins a 1: smell and ware con the out

Concert on explosive Substances (1869 up to appointment of Ordinence Course of Sk concerption with this work In Abel is the frint Author with Captain a hotle, of a Series of elebrate residents on the action of first Supporter, to, which have been x are being published by the Royal Society).

theuks work this subject, before apprinter of the 1" Form

Committee on Suncotion 1863-1868 I hadden construction almost exclusively, the experimental work consucht with this courts).

War Office & Admiralty form " on Floating Obstructions - 1863 - 1868 - which lair the form detion to the present system of Define by Submarine mines. - Special letter of thanks (vote from Commin itself) for Services readered on this Commit

Stores in the provision of Submarin ming

thanks officially been der. for dervices account to this (a Cour in on the Storage & Transport of Sucharrin,

Low is on the Color of Muiforus and Accounts (The Experiments carries on by this Come wore devised & constructure by the dow) "how is on Deluce of Pharmal Tomail



William Henry Perkin

SECRET - DISCREET

14.16. Nitration Processes: The starting-material for nitration, cotton linters or cotton waste, which has already been heated with dilute sodium hydroxide under pressure to remove grease and other impurities and to reduce its viscosity to the required degree, is passed, before nitration, through several dusting and teasing plants and then through mechanical driers, after which the moisture content is less than 0.5 per cent. The oldest method of nitrating cellulose was to plunge it into mixed acid contained in earthenware pots until no more could be easily wetted with acid and to leave it immersed until nitration was complete. This process is still in use in at least one factory with cops (rejected portions of spun cotton) as the starting material, because the relatively uneven product, nitrated without any agitation, has specially valuable qualities for the production of blasting explosives, but for every other purpose has been superseded by either the mechanical or displacement process. The properties of a nitrocellulose of given nitrogen content vary appreciably with the method used to make it.

Mechanical nitration gives the most uniform product and is tending to supersede all other methods. In it cotton linters are generally used. The nitrator is usually an elliptical cylinder holding about 1,800 lb of mixed acid, with its axis vertical, in which rotate two paddle stirrers on vertical shafts. Mixed acid and linters are added concurrently, and after about 30 minutes the mixture of nitrocotton and spent acid is discharged through a bottom valve into a centrifuge in which the acid is spun off. The acid-wet nitrocotton is removed from the centrifuge basket and drowned in water. The displacement process was introduced in 1905 at Waltham Abbey as an improvement on the old rudimentary nitration in open vessels. The displacement pans are generally shallow cylinders of earthenware or stainless steel, about 3 ft. 9 in. in diameter and 12 in. in with a central bottom outlet connected to a siphon pipe. ttom, in sections of the same material as the perforate

down ins perature

in, a s and a]

linters, is

n, is lai cuired te

ste or

he charge ted cotto

the plate Nitration is arrowed to go on for an hour or more and the acid is then displaced from the pan by running water on to the upper layer continuously, so that the acid level falls and the acid finds its way out through the siphon. To minimise the heat of diluting the acid in contact with the nitrocotton, it is usual to cool the displacement water, to 4° C for guncotton or to 20° C for other varieties. The acid-free nitrocotton removed from the pan, is ready for stabilisation. As a consequence of the downward travel of a layer of hot diluted acid, the fibres nitrated by the displacement process are slightly denitrated on the surface and on account of this show appreciable difference from other nitrocottons in their behaviour to gelatinising agents. Table I summarises the conditions found suitable for the large scale production of the principal explosive types made from linters cotton.

TABLE T

Conditions of Nitration of Linters Cotton to Explosives Nitrocelluloses

Nitrocotton	1. 12	S %	R	t C	Time <u>min</u>	Ac1d	
	N K					% HNO3	% H2 ⁰
Mechanical Nitration					1		
High nitrogen guncotton 'Pyro' nitrocotton	13.4 12.45- 12.65	< 10 > 95	71.5 43	20-22 35-38	30 25	24 21	7 16.5
Displacement Nitration		1.5					
Norman guncotton Propulsive soluble N/C	13.1 12.2	< 15 > 95	28 28	14-20 14-20	80 80	23, 5 23, 5	8 15
Nitrating without stirring N/C for blasting explosives	12-12. 2	> 97	28	15	60	23.5	16
S = % so R = weig	luble in Ether ht ratio of mi	-Alcoh	ol id to c	otton.			
(20488)	SECRET - DIS	SCREET					072.4

SECRET - DISCREET

14.17. Stabilisation: Nitrocellulose retains after nitration certain impurities which render it liable to spontaneous decomposition, and cannot be washed out in water. These impurities are either small quantities of the nitrating acids or of cellulosic substances formed from them. Their amounts depend on the conditions of nitration. Stabilization therefore can be regarded as the completion of the nitration process.

From 1847, when a disastrous explosion took place at Faversham, where guncotton was being made under the original Schönbein patent, until about 1865 when Abel's classical researches had solved the problem, the removal of free and combined acid could not be accomplished, and the manufacture of nitrocotton in England was held back. Abel's solution was the process of long boiling in water, followed by pulping of the fibre, which is still the basis of stabilisation for all nitrocelluloses used for explosives⁵⁹. Of the many investigations published later, only those of <u>Robertson⁶⁰</u> can now be regarded as important. He discovered that a preliminary acid boil of about twelve hours was effective in decomposing a cellulose compound which is in all probability an acid cellulose sulphate; alkaline treatment has a less useful effect. Other ideas were advocated: sulphonitric esters of cellulose, nitrous esters, nitric esters of hexoses or bioses, and nitrate esters of oxy- and hydrocellulose were supposed to be present, but none of these has been shown actually to exist in unstable nitrocellulose.

In modern practice all explosives nitrocelluloses are given a first boiling with acid water (about 1 per cent HNO,) and are then boiled for various times with slightly alkaline water. Guncotton is the most difficult to treat. In proportion as the nitrogen content is reduced, stabilisation is easier to carry out. Although satisfactory methods of stabilising were worked out from 1865 onwards for all types of nitrocellulose, it is only rec

use al th

is reduced in a few hours to a figure which decreases only very slowly as the time is extended to 120 hours. In a series of such washed materials containing from 9.5 to 13.5 per cent of nitrogen, the total sulphate can be estimated, and the total free acidity determined by titration of the acetone solution. For the high nitrogen guncotton, total acidity stated as H_SO, is the same in amount as the total sulphate; for the lower nitrogen-materials the total acidity is about half the sulphate; for the intermediate members of the series the ratio of the two varies with the nitrogen content, tending to unity as the guncotton composition is approached. Assuming that none of the acid given up to the acetone solution is nitric acid, the results can be explained only by the hypotheses that guncotton contains free sulphuric acid and hardly any other impurity, whereas the less nitrated products contain an acid ester R.SO.H, the free acidity of which is one half of its total acid value. Guncotton, for instance is found in this way to hold 0.69 per cent of free sulphuric acid and practically no acid ester; a nitro-cotton of 10.2 per cent has no free acid but 0.52 per cent of acid ester. The amount of retained sulphuric acid of either kind varies in the same sense as the sulphuric acid fraction of the bath. From guncottons made in nitrating baths of low sulphuric (and consequently of high nitric) acid content, the included sulphuric acid is more readily removed and a short boil is sufficient. But if no sulphuric acid at all is used, simple washing is not quite effective. There appears to be present in such highly nitrated products a cellulose oxidation product that can be removed only by alkali and the prevalent method is appropriate. On the other hand, the first acid boil which is necessary to stabilise the less nitrated products would appear, on these grounds, unnecessary for gun-cotton, though it is always used.

In view of the fact, which has been well established, that sulphuric acid does not penetrate the ordered regions of the cellulose structure during the nitration process⁶², some explanation is needed of the presence of acid cellulose sulphate and occluded sulphuric acid. The ester is easily accounted for by the entry of the mixed acid as a whole to the intermicellar regions and

(20488)

of on the once med⁶



MIXING ACIDS BY COMPRESSED AIR.



Oven For Drying Cotton

OVEN FOR DRYING COTTON. The Cotton Passes into the Oven on the Right of the Picture.









Moulding



MOULDING GUN-COTTON DISCS.



Machine for Pressing Gun-cotton Discs.

RGPF Guncotton Section 1918





Two Guncotton Workers



The End

Exhibition at Waltham Abbey

At a recent exhibition on the First World War at Walton Abbey Museum, the contribution of the local Gunpowder Factory was an important link. Society member Maggie Radcliffe arranged for a mention of Lawrence and his connections to the Gunpowder and his ownership of Pole Hill, in the display. The relevant passages read;

Waltham Abbey Gunpowder Factory supplied explosives to many fronts during the war. After the 1963 discovery of a guncotton pack along the Hijaz Railway (in what is now Saudi Arabia) some claim that Waltham Abbey explosives were supplied to T.E. Lawrence in his campaign to destroy the main Turkish supply route.

T.E. Lawrence, better known as Lawrence of Arabia, had purchased land in Chingford, Essex and visited the area frequently. In 2008 a plaque was placed on the Greenwich Meridian Obelisk at Pole Hill, Chingford in honour of Lawrence's associations with the area.



The display panel in the First World War Exhibition

Maggie managed to get a mention of Lawrence in the text...

Waltham Abbey

The Royal Gunpowder Factory at Waltham Abbey, Essex, had been producing gunpow since the 17th century. Before war was declared, Waltham Abbey made a third of the government's yeardy production of gunpowder. In the first twelve months of the war the factory's production doubled from 70 tons to 140 tons per week.

From April 1916, women were employed in the factory. By March 1918 a total of 3,108 we were employed, around half of the factory's total workforce.

Valtham Abbey's Gunpowder Factory supplied explosives to many fronts during the war. shor the 1963 discovery of a guncotion pack along the Hijaz Railway (in what is now Saul stabla) some claim that Waltham Abbey explosives were supplied to T.E. Lawrence in his TE Lawrence is here.

E Lawrence, better known as Lawrence of Arabia, had purchased land in Chingford, Seex and visited the area frequently. In 2008 a plaque was placed on the Greenwich Weridian Obelisk at Pole Hill, Chingford, in honour of Lawrence's association with the a

The Royal Small Arms Factory in addition to the vast quantities of asimumition required, operations on the western frant created the need for new types of weaponry. The Royal Small Arms Factory in Ended





Maggie Radcliffe, Tony O'Conner, curator of Waltham Museum and Eleanor Laing M.P.

The T.E. Lawrence Society Newsletter No. 90 ~ Page 6

THE DAILY TELEGRAPH | SATURDAY, JULY 31, 2010



WASC 580

Recognition for explosives expert who taught Lawrence of Arabia

By Richard Alleyne Science Correspondent

HE WAS a mentor to Lawrence of Arabia, a maverick explosives expert who played a pivotal role in the Arab insurgency against the Ottoman Empire.

But the part that Major Herbert Garland, a British scientist turned soldier, played in the First World War has been largely ignored, left in the shadow of his famous brother-in-arms. Now the Royal Society of Chemistry

(RSC) is to commemorate the army officer who wrecked his health leading the Arab rebellion before dying forgotten and almost penniless in Gravesend, Kent, aged 38. Richard Pike, the chief executive of

Richard Pike, the chief executive of the RSC, said Major Garland was a very rare and "courageous soldier" who was admired by TE Lawrence for his daring and cleverness. "I am pleased that we are remembering him now, even if it is nine decades after his rather lonely death, far from the desert where his reputation should have been made, as it was with Lawrence, who had learned so much from him." he said.

Major Garland, born in Sheffield, had worked in Cairo as superintendent of a government explosives laboratory. He was intrigued by metallurgy and in 1913 was elected a Fellow of the Chemical Society (the forerunner of the RSC), which later awarded him a £10 grant to research ancient Egyptian metals.

research ancient Egyptian metals. At the outbreak of war, along with Lawrence, he joined the Arab Bureau, a group of intellectuals and businessmen whose "mission was to collect every possible bit of information about



Major Herbert Garland, left, taught TE Lawrence and the Arab rebels how to use the mines that derailed Turkish trains, above

Turkish and German influence in the Middle East and act on it in the field". Despite once blowing himself up with explosives and suffering severe shock, he joined Lawrence and Arab rebels to attack the Hejaz railway, one of the main supply lines of the Ottoman Empire.

supply lines of the Ottoman Empire. He developed the mines and taught Lawrence and the rebels how to use them in their guerrilla campaign that acted as a diversion, allowing the British to take Damascus and bring down the Ottoman Empire.

His final act in the war was at Medina, the last place to be surrendered by the Turks, in late 1918, when he was responsible for overseeing the surrender. Arabian leaders rewarded him with the Order of Al Nahda. Lawrence, who died almost 75 years ago, mentions Major Garland in his book, *Seven Pillars of Wisdom*, concerning the desert revolt, upon which the Oscar-winning film *Lauvence of Arabia* was based and which made great play of the derailing of Turkish trains.

He writes that Garland "had years of practical knowledge of explosives" and "his own devices for mining trains and felling telegraphs and cutting metals".

He said "his knowledge of Arabic" enabled him "to teach the art of demolition to unlettered Bedouin in a quick and ready way".

quick and ready way". "His pupils admired a man who was never at a loss," wrote Lawrence. "Incidentally, he taught me how to be familiar with high explosive. Sappers handled it like a sacrament, but Garland would shove a handful of detonators into his pocket with a string of primers, fuse and fusees and jump gaily on his camel for a week's ride to the Hejaz railway."

In a letter, Lawrence lauds Garland's expertise and says his contribution to the campaign was greater than his. "Garland is much more use than I could be," he told a diplomat.

"He digs their trenches, teaches them musketry, machinegun work, signalling, gets on with them exceedingly well and always makes the best of things and they all like him too."

Major WA Davenport, who commanded British officers in Arabia, wrote after Major Garland's death: "No man worked harder for the success of the operations than Major Garland, and it was only due to dogged pluck that he worked on as long as he did in the Hejaz."

Garland of Arabia: the forgot ten story of TE Lawrence's brother-in-arms

He was a mentor to Lawrence of Arabia, a maverick explosiv es expert who played a pivotal role in the Arab insurgen cy against the Ottoman Empire.

By Richard Alleyne (http://www.telegraph.co.uk/journalists/richard-alleyne/) , Science Correspondent Published: 6:00PM BST 30 Jul 2010

But the part that Major Herbert Garland, a British scientist turned soldier, played in the First World War has largely been ignored, airbrushed from history in the wake of his more famous brotherin-arms.

Now the Royal Society of Chemistry is to finally commemorate the army officer who wrecked his health leading the Arab rebellion before dying forgotten and almost penniless in Gravesend aged just 38.



Herbert Garland was a maverick explosives expert who played a pivotal role in the Arab insurgency against the Ottoman Empire



Major Garland was admired by TE Lawrence for his daring and cleverness.

Dr Richard Pike, chief executive of the Royal Society of Chemistry (RSC), said he was a very rare and "courageous soldier" who was admired by TE Lawrence for his daring and cleverness.

"I am pleased that we are remembering him now, even if it is nine decades after his rather lonely death, far from the desert where his reputation should have been made, as it was with Lawrence, who had learned so much from him," he said.

Major Garland, born in Sheffield, had worked in Cairo as superintendent of a government explosives laboratory.

He was also intrigued by metallurgy of ancient artefacts, and on 15 May 1913 he was elected a Fellow of the Chemical Society (the RSC forerunner) which later awarded a £10 grant to research ancient Egyptian metals.

At the outbreak of war, he joined the Arab Bureau along with Lawrence, a group of intellectuals and businessmen whose "mission was to collect every possible bit of information about Turkish and German influence in the Middle East and act on it in the field".

Despite once blowing himself up with explosives and suffering severe shock, he joined Lawrence and Arab rebels to attack the Hejaz railway, one of the main supply lines of the Ottoman Empire.

He developed the mines and taught Lawrence and the rebels how to use them in their guerrilla campaign that acted as a great diversion allowing the British to take Damascus and bring down the Ottoman Empire.

His final act in the war was being sent to Medina, the last place to be surrendered by the Turks, in late 1918. He was responsible for the overseeing of the surrender of the key town to the allies.

But while Lawrence of Arabia, who died almost 75 years ago, refers to him briefly in his book, Seven Pillars of Wisdom, the full achievements of Garland have not been revealed until now.

Lawrence alludes to Garland in his book about the desert revolt, upon which the multi Oscar-winning film Lawrence of Arabia was based and which made great play of the derailing of Turkish trains.

He writes that Garland "had years of practical knowledge of explosives" and "his own devices for mining trains and felling telegraphs and cutting metals".

He said that "his knowledge of Arabic" enabled him "to teach the art of demolition to unlettered Beduin in a quick and ready way. His pupils admired a man who was never at a loss".

"Incidentally, he taught me how to be familiar with high explosive," Lawrence adds.

"Sappers handled it like a sacrament, but Garland would shove a handful of detonators into his pocket with a string of primers, fuse, and fusees and jump gaily in his camel for a week's ride to the Hejaz railway.

In a letter, Lawrence writes at one point that Garland contribution to the campaign was greater than his.

"Garland is much more use than I could be," he tells a diplomat.

"For one thing he is senior to me and he is an expert on explosives and machinery. He digs their trenches, teaches them musketry, machine gun work, signalling, gets on with them exceedingly well and always makes the best of things and they all like him too."

A Major Davenport, who commanded British officers in Arabia, wrote after his death: "No man worked harder for the success of the operations than Major Garland, and it was only due to dogged pluck that he worked on as long as he did in the Hedjaz."

© Copyright of Telegraph Media Group Limited 2010

Maj Herbert Garland

Birth: Death:

Soldier, Diplomat and Museum Conservator. During World War I he worked with the Department of Ordinance in the Egyptian Army, serving in campaigns against the Ottoman Turkish Empire in the Arab Peninsular. In 1916 he joined Colonel T E Lawrence in organising Arab soldiers into an effective guerrilla force with the aim of destroying Turkish railways. In 1917 he became the first British advisor to help the Arabs successfully derail a Turkish train. The techniques he taught the Arabs played an important part in their future military success, and resulted in his being awarded the Order of the Nile. He was also presented with the Order of the British Empire. In 1919 he was appointed director of the Arab Bureau in Cairo, where he produced a report detailing Emir Ibn Saud's connection with the Wahhabi occupation of Kurma, and edited "The Arab Bulletin", a journal founded by Lawrence. In later years he became superintendant of laboratories at the Cairo Citadel Museum, where he specialized in the cleaning and conservation of ancient bronzes. He was an authority on the subject and his writings were published after his death in the book "Ancient Egyptian Metallurgy" in 1927. Lawrence's famous book "The Seven Pillars of Wisdom" is dedicated to him and his fellow officer's memories.

1880

1921

Inscription:

In loving memory of Major Herbert Garland OBE MC FCS 1880-1921 lost but found in 2004.

Burial:

<u>Gravesend Cemetery</u> Gravesend Kent, England

Created by:_js Record added: Dec 10, 2008 Find A Grave Memorial# 32102064



Added by: Chris Mitchell



Added by: js



Added by: js



There are 2 more photos not showing... Click here to view all images...

> Photos may be scaled. Click on image for full size.









- LEVENG ARAMINE OF NADOR NEEDERT GARLAND D.H.S. M.C.F.C.S. See, 460 HAVE NOT LODGE OF 184

QUESTION Where and what is used by Peter O'Toole in the film Lawrence Of Arabia

FURTHER to the previous answer, a Brough Superior was an expensive machine but was a 'bitsa', with virtually nothing but the frame made in-house, the bikes merely being assembled in the factory.

The engine was usually a JAP, (John Alfred Prestwich, of Tottenham), the front forks Castle and the gearbox a proprietary make, including one from a Norton International. Even when George Brough designed his own gearbox, he couldn't make it himself and had to get a specialist firm to doit.

Likewise the petrol tank. I wouldn't denigrate what was obviously a fine machine for its period, but it has always amazed me the adulation bestowed (and the price charged) on what was basically a motiey collection of bits.