Newsletter

No 162 Mar 2008

The Golden Age of English Clockmaking, page 6.

Eight day longcase movement by "Jn°. Aylwards de Guilford", 12in square dialed with date aperture and seconds hand, movement is plated 6 pillar latched, and dated from around 1690 to 1700. John was admitted as a Guildford freeman in 1683, is reputed to have made the clock over the High Street, and died in 1738, requesting burial in Chobham churchyard.

The signature is visible in the lower picture.

Photos and caption: Hugh Cockwill.

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Contents

Reports & Notices

Details of meetings are reported in good faith, but information may become out of date. Please check details before attending.

SIHG Visits, Details & Updates at www.sihg.org.uk

SIHG Visits

SIHG AGM & Conservation Award Presentation for The Spike
After a brief AGM at 1400 on Saturday 12 July 2008, there will be a presentation and a talk by a representative of The Charlotteville Jubilee Trust. This will be followed by refreshments and a tour of the site The Spike is in Warren Road, Charlotteville, Guildford

SIHG Guided Visit to Reigate Fort
Visit to Reigate Fort, Fort Lane, Reigate on Saturday 17 May, meet at 1030. Map reference TQ 257521 Cost of entry to be advised (The National Trust are still revising some entry fees.) Mark Russell, the National Trust warden who lives at the site, will give a talk on the role of this recently repaired structure, being one of thirteen Mobilisation Centres built between 1889 and 1913 as part of the London Defence Scheme. Although not planned as forts, their main function was as a store for small arms, ammunition and larger weaponry in the event of a foreign invasion.

SIHG Visit to Surrey Hills Brewery
Saturday 21 June. Visit to Surrey Hills Brewery Ltd, Old Scotland Farm, Staple Lane, Shere GU5 9TE Tel. 01483 212812. A small independent local brewery with award winning beers. Minimum number of people in each party 12, maximum 25. Cost £8 per head, to include several tastings.
Names and money (cheques made payable to SIHG) please to Tony Gregory, 3 Scotlands Close, Haslemere, Surrey GU27 3AE) by 14 June.

Archaeological Training Excavation at Downside Mill, Cobham
Saturday 2 to Sunday 10 August. The dig is being run by Surrey Archaeological Society and directed by Tony Howe of the Surrey County Archaeological Unit. For details see page 7.

DIARY April

19 Sat SERIAC: South East Region Industrial Archaeology Society Conference,
University of East London Docklands Campus;
Hosted by GLIAS, the Greater London Industrial Archaeology Society, book now!

DIARY May

17 Sat SIHG Guided Visit to Reigate Fort, Fort Lane, Reigate, see visits above.

SIHG Newsletter No 163 March 2008

DIARY

The 32nd series of SIHG Industrial Archaeology Lectures
alternate Tuesdays, 1930 - 2130, University of Surrey (Lecture Theatre F).
Enquiries to programme co-ordinator, Bob Bryson, meetings@sihg.org.uk.
Maps at www.sihg.org.uk. Free parking is available in the evening on the main campus car park.
Single lectures at £5, payable on the night, are open to all.

Diary Notes: contacts

Amberley Working Museum is off the B2139 between Arundel and Storrington, next to Amberley railway station in West Sussex. Free parking.

Crossness Engines , Belvedere Road, Abbey Wood, London SE2. £4 adults. Visits must be booked in advance either on a Tuesday or Sunday between 0930 and 1530. 020 8311 3711 (no booking by answerphone). Visits commence at 1330. Public steaming days are 1030 – 1630, £5 adults, and booking is not required. www.crossness.org.uk.

HIAS (Hampshire Industrial Archaeology Society) meetings are held at the Underhill Centre, St John's Road, Hedge End, SO30 4AF at 1945; visitors welcome, free parking.

Kempton Great Engines 1100 - 1600. Adults £6, OAPs £5, Children (to 16) free.
Feltham Hill Road, Hanworth, Middlesex TW13 6XH; 01932 765328, www.kemptonsteam.org.

Kew Bridge Steam Museum, Green Dragon Lane, Brentford, Middx TW8 0EN; open 1100, 0208568 4757, www.kbsm.org .

Newcomen Society London meetings are in the Fellows' Room, Science Museum,Exhibition Road, London SW7 2DD at 1745.

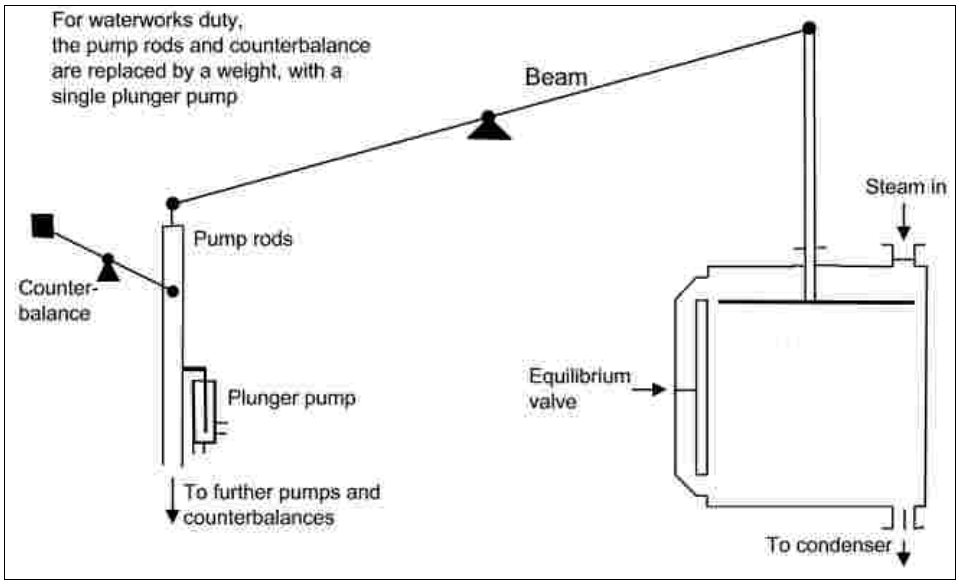
Newcomen Society Portsmouth (Southern Branch), Room 0.27, Portland Building, University of Portsmouth, St James Street off Queen Street, Portsea, at 1830. Free parking from 1630, visitors welcome & admission free.

Rural Life Centre, Old Kilns Museum, Tilford, Farnham, GU10 2DL, weds – sun, 1000 – 1700, £6, over 60s £5, children 5-16, £4, www.rural-life.or.uk.

The deadline for **submitting copy** for the next Newsletter is **two months time**.
Submissions are accepted in typescript, on a disc, or by email to news@sihg.org.uk.
Anything *related to IA will be considered.*
Do, please send in reports / photos of holiday visits or thoughts on local, national or international Industrial Archaeology.
Priority will be given to Surrey-based or topical articles.
Contributions will be published as soon as space is available.
Readers are advised that the views of contributors are not necessarily the views of SIHG.
This edition of the Surrey Industrial Group Newsletter has been reformatted so that it is more easily read online or printed out as a PDF.
Diary entries have been curtailed to cover SIHG events only.
Other editorial matter is practically as originally published.
Many thanks to all who have sent in contributions.
Website: **www.sihg.org.uk**

The Kew Bridge Steam Museum and the Bull Engine

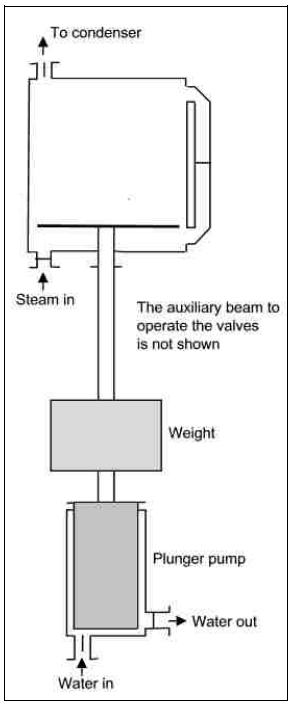
by Alan Thomas



The Kew Bridge Steam Museum, housed in the Brentford pumping station of the Grand Junction Waterworks Company, holds the largest group of Cornish beam pumps in the world, all on their original sites. There are five engines, and in four of these the steam cylinder lifts the pump rods through a massive beam, as seen in the classic Cornish engine-houses. The fifth has the steam cylinder mounted directly above the pump-rod, without a beam. This engine, known as the 'Bull' engine, has been the subject of a restoration programme since September 2000, with the aim of restoring it to full working order. It was set to work in 1859 and was last operated in 1944.

It is important to note that in a Cornish steam pump the steam cylinder, pump rods and pumps form a single piece of machinery, in which the steam cylinder cannot operate without the pumps connected. This is unlike pumping equipment comprising a rotatory engine driving one or more pumps through a crankshaft, where the engine can run by itself without the pumps being connected. Several examples of this latter type of machine can be seen at the Museum: all have been imported from elsewhere, and were not part of the original equipment, unlike the Cornish engines.

The Cornish principle is illustrated above. In a deep mine, for which this type of pump was developed, several plunger or force pumps at different levels in the mine were operated by the falling mass of the pump rods. These were typically made of timbers some 25cm - 30cm square and weighed in aggregate many tons - so much so that the total mass exceeded that necessary to operate the pumps, and counterbalances were fitted at different levels to ensure that the plunger rods did not descend at an excessive speed. A counterbalance was usually installed at the surface, to provide an accessible means of fine adjustment of the descent speed: further counterbalances were installed at lower levels where necessary.



The purpose of the steam cylinder is to raise the pump rods, and then to let them fall at a rate determined by their effective mass, allowing for the counterbalancing. Steam is admitted to the cylinder above the piston, which is forced down (with the assistance of a vacuum under the piston) and raises the pump rods attached to the other end of the beam. The steam is cut off early in the stroke so that further movement is caused by the expansion of the steam. The cut-off point is adjusted so that expansion ceases just before the piston strikes the bottom of the cylinder. At this point the equilibrium valve opens, and steam passes through the equilibrium pipe to equalise the pressure on both sides of the piston, which thus rises under the weight of the pump rods. Apart from imparting a slight braking action, the steam cylinder has no control of the rate at which the rods descend. The point at which the equilibrium valve closes again is judged so that sufficient steam is trapped above the piston to provide a cushion to prevent the piston striking the top of the cylinder. The exhaust valve is then opened to the condenser, causing a vacuum to be created below the piston. Further motion stops until steam is admitted above the piston, either under the control of the driver or automatically through a timer called the cataract (presumably because it is a water clock). The Cornish pump is essentially a one-shot device, and the pumping rate, in gallons per minute, is adjusted to the required number of strokes per minute by appropriate setting of the time delay provided by the cataract.

The settings of the inlet, equilibrium and exhaust valve events are made manually by the driver for particular steam conditions and load. Incorrect settings may cause the piston to strike the top or bottom of the cylinder, or the beam to strike its stops, possibly breaking the castings or even damaging the building. On the other hand, too cautious an approach could lead to the pumps not making full strokes and thus giving less output. The driver therefore needed to be skilled, and for this reason purchasers of Cornish engines often hired Cornishmen to drive them. These engines are sometimes derided as primitive, but in fact they are ideally suited to their task of mine pumping, and for their day were very efficient. The specification for the 90-inch engine (the diameter of the steam cylinder) at Kew Bridge works out to a thermal efficiency of about 16%, including the boiler. For waterworks duty there were no heavy pump-rods, and instead a massive weight was placed between the end of the beam and a single plunger pump.

There was, however, one structural weakness which sometimes caused disaster. On the upstroke of

(Continued on page 5)

(Continued from page 4)

the pump rods the top of the beam is in tension, a duty for which cast-iron is unsuitable. Wrought-iron would be better, but the elaborate fabrication needed would be very expensive, so the manufacturers relied on using very heavy cast beams. This was not sufficient in some cases, and the beams occasionally broke, which sometimes could cause the top of the shaft to be obstructed, with disastrous results, perhaps trapping the miners as well as flooding the mine. At Kew Bridge two of the engines suffered cracked beams: fortunately the beams are double in both cases, and only one half broke, thus avoiding complete collapse. This happened to the largest engine at the museum, and one of the largest ever built, the 100-inch, installed in 1871. The crack was repaired, and can still be seen. The other engines at Kew Bridge had been fitted with wrought-iron straps around the beams, more suitable for taking tension, but these were not fitted to the 100-inch engine until after the breakage.

On looking at one of these spectacular engines, with beams weighing tens of tons, one may ask the question 'why not invert the steam cylinder and place it directly on top of the pump, thus avoiding the need for a beam and the associated structure?'. This thought occurred to one Edward Bull at the end of the 18th century, although James Watt had proposed a similar configuration earlier in that century. Bull made a number of engines, but fell foul of James Watts's patents and was obliged to cease manufacture.

He died shortly after, but when examples of this type of engine were made in the 19th century, they were named 'Bull' engines in his honour. The principle is illustrated on the right.

One would think that engines of this kind would be ideal for waterworks service, in avoiding not only the cost of the (fragile) beam and its supporting structure, but allowing the building itself to be smaller. However, although a few were installed in waterworks and for other pumping duties (such as at the Severn Tunnel), they were always less popular than the beam engines. The reason for this is not known, but after the questions of accessibility for maintenance and, in mines, obstruction to the top of the shaft, it appears that they were more difficult to control. As everything else is identical, it seems likely that the inertia of the beam slowed down the reaction of the engine to changes in valve timing, making it easier to adjust the settings and give less risk of damage.

A Bull engine by Harveys of Hale, Cornwall, with a 70-inch steam cylinder was installed in 1856. It operated from 1859 to 1944, although it appears that latterly it was used in a standby role. Each stroke delivered 236 gallons ($1.062m^3$) at a maximum rate of 6.5 strokes per minute. It is the largest surviving Bull engine, and the only one in its original engine-house.

The restoration project was lengthy because of the very worn condition of the machine, and the difficulty of access - for example, it was necessary to construct a special boring bar to rebore the cylinder of the air pump, which could not be removed from its position under the engine. The pump finally steamed under control of its cataract on 4 November 2007. ☼

Archaeological Training Excavation at Downside Mill, Cobham

Members who attended the lecture by David Graham, President of the Surrey Archaeological Society (SyAS), at the University of Surrey on 8 January will remember that he invited us to become involved in an archaeological training excavation at Downside Mill, Cobham (TQ118583), sometime this summer. It has now been decided that the dig will take place from Saturday 2 to Sunday 10 August. It will be directed by Tony Howe of the Surrey County Archaeological Unit, which is based in the same building as the Surrey History Centre at Woking. I understand that funding for the project will be provided by the County Council and SyAS.

In November 1998, SIHG organised a one-day conference on this mill and in 2000 published the proceedings in a book, edited by Glenys Crocker and entitled Alexander Raby, Ironmaster. Raby occupied the mill from 1770 to 1806. Previously it had been a corn mill and a paper mill and after Raby left it became a flock mill and then a saw mill. In the 1890s it was used for generating electricity, by about 1925 for storage and in the 1990s the surviving buildings were converted into offices. The cover of the book is a reproduction of a detailed, coloured plan of the mill, watercourses and neighbouring buildings, which has been dated to about 1798. It shows five waterwheels, three at a complex of buildings labelled “Forge, Tilt, Iron Foundery, Cutting House, Break House and Women's Shop' and two at a second complex labelled 'Mill and Copper Foundery”. The first complex survives but the second has been demolished and this will be the site of the excavation.

During the first season of excavations it is likely that only the foundations of the later buildings on the site will be investigated but it is anticipated that the excavation will be continued for several years, which should enable information to be deduced about earlier structures including perhaps the corn mill and paper mill.

Members who are interested in taking part in the excavation are invited to contact me so that I can put them in touch with the organisers.

Alan Crocker, 6 Burwood Close, Guildford. Surrey, GU1 2SB; 01483 565821; alan@glfd.freeserve.co.uk ☼

SIHG Lecture 4. - Tuesday 6 November 2007

The Golden Age of English Clockmaking

by David Thompson,

Curator of Horology British Museum London

Report by Keith Sorrill

The change in fortunes of England and more particularly London in acquiring the art and mystery of domestic clock and watch making from its early dependence on immigrant makers to the highly developed and innovative craft as it stood at the end of the 17th century when London was, without doubt, the centre of the Horological World, forms the meat of this presentation.

Evidence of the numbers of Clock and Watch makers in London in the first half of the sixteenth century is sparse except for a group of eleven Huguenot clockmakers of whom six were employed making clocks for Henry VIII's palaces. The great astronomical clock at Hampton Court comes from this time. The main centres for European clockmaking were then in the Southern Germanic states, in Flanders and in France.

The influx of Flemish and Dutch Watch- and Clockmakers in the last quarter of the 16th Century was a result of the Spanish occupation of the Netherlands. They brought their skills to England, broadened its makers to watch making and varied domestic clocks from the one type, the Lantern Clock, previously made mainly by the Blacksmiths who also made the larger Turret church clocks. A profession of clock- and watch maker emerged separate from the metallic Blacksmiths domination and diversification into musical and more ornate clocks and watches became more common. The new profession wanted to control their own trading and break from the Blacksmiths' Company and a petition was lodged with James I in 1622, being granted a Royal Charter for the establishment of a Livery Company of their own in 1632, the Clockmakers' Company, which survives to this day. Robert Grinkin and Edward East were leaders in the establishing of this Company.

The new Profession grew and prospered over the next few years with London the centre helped by the end of the ravages of the Civil War. The watch element particularly was expanding and getting wide acclaim. However, the wider domestic acceptance of clocks was held back by the poor time keeping of the clocks being produced. However, a revolutionary event occurred, one which is more perhaps more important than any other in the progress towards accurate timekeeping until the introduction of quartz technology in the 20th Century.

In 1656 a Dutchman, a physicist and astronomer of renown called Christiaan Huygens brought the concept of a pendulum controlled clock into reality. There had been earlier work by the great astronomer and mathematician Gallileo Gallilei but never completed. Huygens himself was not a clockmaker, but he employed another Dutchman Salomon Coster to make the first clocks with pendulum control which from the start achieved a high level of timekeeping accuracy. The first clock made by Coster is now in the Booerhave Museum in Leiden. Huygens was able to obtain patents for the new clock in his native Netherlands, but not in the rest of Europe.With no patent on the clock, very soon production started in all the clockmaking areas of Europe with England to the forefront led by Ahasuerus Fromanteel who sent his son over to Holland to work and learn from Salomon Coster. Fromanteel can also claim one of the first forays into "retail selling", published an advertisement in 1658 stating the availability from him of clocks "that go exact and keep equaller time than any now made".

Two changes took place around 1660. Firstly, many types of wood were used in replace of the previous metal owing to the increased weight of the new clocks. Then a new style of clock emerged: the Long Case Clock, Fromanteel being amongst the first of the London makers. Both 30 hour running and 8 day were produced. The strength of the London and English clockmaking profession gaining in know-how resulted in many new and innovative improvements to clock performance; a change to the pendulum bob shape; shutter maintaining power to ensure running whilst being wound; the Anchor Escapement from William Clement, Joseph Knibb or Robert Hooke replacing the verge escapement. The name of Thomas Tompion must now come to the front. He arrived in London in 1771 and soon established a high reputation which he maintained over many years to become known later as the father of English clockmaking. He is buried in Westminster Abbey.

In 1675 a Royal Warrant was obtained for the establishment of the Greenwich Observatory to be designed by Sir Christopher Wren with John Flamsteed as the first Astronomer Royal. The establishment needed extremely accurate time measuring clocks and three regulator, year going, clocks were installed in the famous Octagon Room. Two of these were the work of Thomas Tompion and can still be seen today. Using these clocks and the famous telescope Flamsteed was able to produce Tables for the Equation of Time.

David Thompson hoped that his detailed presentation would provide a better understanding by his audience of the excellence of English clockmaking at that time and perhaps generate an ongoing interest in the subject as great as his own. ☼

Members' Talks - 4 December 2007

Motorcycle Plus 60

by *Roy Johnson*

Way back in 1947 as a student I was running a 1936 Royal Enfield model "G" motorcycle. This bike had been laid-up throughout the war years and although a "runner" was somewhat sad.

The Triumph Twin … a "sixty year old dream machine"

In the immediate post-war years the motorcycle Mecca on the south coast was Littlehampton due to its extensive sea-front inter-land, large car park and permanent funfair. The era of more up-market Brighton, a destination for "mods and rockers" was still some years away. Venturing south for sea and sun on a Sunday (Saturday was still a work day) was a risk happily taken with many like-minded travellers on old machines always ready to help a stranded two-wheeler with hopefully plenty of daylight hours to repair a puncture, mend a broken chain or even replace the ever frequently occurring fractured spokes. In fact, excursion repairs were part of the romance of the post-war motoring if not always appreciated by your pillion passenger.

However, during the week as a student it was prudent to use my pass and travel by train to college for both financial and reliability reasons. A major drawback of the three train journey to Guildford Tech from the wilds of Hampshire was an inability to stay for after hours social gatherings. My old machine's unreliability, particularly in the dark, made my alternative travelling method somewhat precarious. Typically being stopped and reprimanded by the village constable for having no lights and walking miles after forced abandonment on other occasions.

At about this time a giant auction of military equipment, including motorcycles, was to be held at an RAF airfield in Oxfordshire (RAF Benson?). A fellow student and I set off at dawn on my aging Royal Enfield determined to make our bids. Within the arena of massive Nissen huts there was enough equipment to start WWIII and the auctioneers were galloping through the lots at breakneck speed. Two teenage inexperienced students clutching just forty pounds each, some in large white fivers were left bemused and shattered by the knocking down of lots in batches to the big London dealers who were there to outbid any trivial single lot competition. Returning home despondent and dejected my parents rallied round and put up the funds for me to buy a new motorcycle if it was possible in austerity time of "export-only" Britain.

I tried dealers in Farnham and then Aldershot with the determination of a teenager with money to burn to buy my dream of a "Triumph Twin". The nearest I got to my first choice was in the latter town where a cash deposit might secure a Triumph in, say, three months time!

Three months is like a lifetime when you are seventeen so the alternative suggestion from the dealer that the new Royal Enfield model "G", with all its chrome, shining in the window was available there and then. The purchase was done and to be honest the well proven, if somewhat stayed, model with whose ancestry I was actually very familiar proved to be the right choice, serving me reliably through National Service and many college years beyond.

Now to finish the story and explain the title of this saga, which I had clearly told before, I was alerted by a friend to a part finished project of a Triumph Twin from that very year when I had been disappointed. It has taken many months and a carefree approach to the cost but at last a few weeks ago I became the owner of a "sixty year old dream machine". ☼

Recording Factory Closures

A good opportunity to record the history & to rescue traditional papers & machinery!

If you hear of a factory which is about to close, please report it to us; contacts on page 3.

Leatherhead Aviation Services (part 2)
by Peter Tarplee

The crash at Slough and his injuries caused Chapman to give up his aviation business, the company ceased trading in August 1922 and the aerodrome at Malden Rushett reverted to farmland. After the demise of Leatherhead Aviation Services Mr Chapman and his family moved to a tiny cottage, with no electricity or running water, between Beaconsfield and High Wycombe. In 1930 he came to Byfleet where he worked for Hawkers and Brooklands Aviation. In 1943 he moved back to his sister's at Aldwincle before finally settling in Speen in Buckinghamshire where he died in 1965.

The DH 6 had been sold to Mr JV Yates of Croydon in May 1922. With all his interest and pioneering work in aviation it is rather sad to read in an article published around 1949 that William Chapman looked back on his life and said "I have almost forgotten it all and I can tell you I often wish I had had nothing to do with any of it".

His first bicycle was a 48in penny-farthing, his first motorised vehicle was a Beeston 2¼hp tricycle, his first motor cycle was a 1¼hp Werner and his first car was a 3½hp Gladiator. So he was truly a pioneer of all types of transport even before he took up flying.

Surrey Flying Services

Chapman had often operated from Croydon Airport and two of his pilots, Mr WJ Grant and Capt. AF Muir were founders of Surrey Flying Services. This company was based at Croydon and gave "round the airport" flights for five shillings (25p) and flights over London for one guinea (£1.05). Their aim was to stimulate public interest in flying and promote the idea of air transport as safe and enjoyable. Surrey Flying Services operated at Croydon throughout the inter-war years but services were suspended during the war and in 1951 it was taken over by Freddie Laker.

De Havilland DH 6

In 1906 Geoffrey de Havilland (1882-1965) was designing some of London's first buses for the Motor Omnibus Construction Company but his interest in flying meant that he gave this up to design his first aeroplane, as well as its engine. He opened a workshop in Fulham where he built the plane which he attempted to fly in 1909. A year later he made an improved version which he flew successfully. At this time he became a designer and test pilot at the HM Balloon Factory, later to become the Royal Aircraft Factory. He left in 1914 to become Chief Designer with the Aircraft Manufacturing Company Ltd. (Airco) at Hendon where he was responsible for a series of aircraft used during the war. These ranged from the DH 1 reconnaissance plane to the DH 9A day bomber.

After the war Airco was sold to Birmingham Small Arms Co. Ltd (BSA) whose directors soon decided to close down the aeroplane making business. Rather than continue with BSA designing cars, de Havilland set up his own company, the de Havilland Aircraft Company Ltd, in 1920 which operated from Stag Lane in Edgware until a new site was acquired in Hatfield in 1930 where de Havilland developed a large modern aircraft factory. His company at first made mainly civil aircraft and the firm continued until it was absorbed into the Hawker Siddeley Group in 1960.

The DH 6 was a 2-seater trainer, also used for coastal patrols, which was introduced in 1917; a total of about 2,500 were made by a number of different companies. Because of its primary use as a trainer the DH 6 was designed to be easy to fly, although it was found to be difficult to pull out from dives at over 100mph.

The plane used by Mr Chapman of the Leatherhead Motor Company was G-EANU and its Certificate of Airworthiness was issued on 17 December 1919. It was one of a batch of 150 in Contract A.S. 22909 ordered from the Kingsbury Aviation Company Ltd, Kingsbury, Middlesex. It was one of over 50 which were sold for civil purposes as being surplus to military requirements. It was powered by a Curtiss OX-5 engine instead of the usual RAF 1A engine. The plane, which operated from Chessington, was finished in blue livery with polished brass turnbuckles and engine cowling.

The two-bladed propeller in Leatherhead Museum (see cover of issue 161)is 8ft long made from 5 laminations of wood glued together and shaped. Around 100,000 wooden propellers would have been made between 1914 and 1919 by some 35 aircraft makers together with another 30 firms who specialised in making wood products. Among the latter was Betjemann & Sons Ltd of 36 Pentonville Road, London, N1 who made the propeller for Mr Chapman's plane, which now forms part of our museum collection. It was donated by Mr Finch of Eastwick Road, Bookham and had been stored in Luff's Garage in Kingston Road, Leatherhead, the successors of Mr Chapman's Leatherhead Motor Company.

Acknowledgements

I have received much help from Doug Hollingsworth and Brooklands Museum, and from the Croydon Airport Society through Peter Skinner, their Archives and Artefacts Co-ordinator, who also provided some useful photographs of G-EANU. Much helpful material was obtained from the papers deposited with the Society by Mr Tony Pearce of Byfleet, a grandson of Mr Chapman, who also provided much of the family information and some photographs.

Additional reference was made to the following:

Byfleet Review
De Havilland Aircraft Since 1909 by A J Jackson
Those Fabulous Flying Years by Colin Cruddas
Surrey Aeronautics and Aviation 1785 - 1985 by Sir Peter G. Masefield ☼