WARWICKSHIRE Industrial Archaeology Society

WIAS

NEWSLETTER

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FROM THE CHAIRMAN

The start of a new season of meetings finds the Warwickshire Industrial Archaeology Society in good heart. Local industrial archaeology and industrial history societies vary considerably in size and activity, with WIAS making the monthly meeting a real focus of its efforts. Attendance figures at these meetings are the envy of many other societies, and a high proportion of those attending are members of WIAS. Long may this continue!

These – and other issues – were highlighted in the AGM held at the start of the September meeting, which included the Treasurer's report on the new subscription system introduced for the 2016-2017 season. With the adoption of the new system, financial outcomes were very much in line with the previous year, despite rises in room hire and speaker fees, with the total of Gift Aid benefit amounting to £228. An important feature of the Society's activities has been the Visits Programme organised by Alain Foote, and the Whittle anniversary trip to GE Rugby and Brownsover Hall (reported in this issue) and the visit to Kempton Great Engines and the London Museum of Water and Steam were both very successful. The Society was also able to make a £250 donation to Warwickshire County Record Office in support of the Healey Archive, fulfilling one of the goals of the Society in supporting local industrial heritage projects. Robert Eyre from WCRO will be speaking on the Healey Archive at the January 2018 meeting. In view of these outcomes, the Treasurer was able to propose unchanged subscription rates for the 2017-2018 season - £16 for an individual and £20 for a joint membership. Guests – averaging 7 per meeting in 2016-2017 – would continue to be invited to make a voluntary donation of £2.50 for attending meetings. These unchanged rates for subscriptions and guest contributions were approved by the AGM.

The Chairman placed considerable emphasis on the role played by the committee and other volunteers in ensuring the smooth running of the Society. John Selby - after many years of service – has decided to take a well-earned rest from committee affairs, with the proviso that he can be co-opted if necessary, whilst Colin Brookes is stepping down for personal reasons. The remainder of the committee were willing to stand for re-election and their election was unanimously approved by the meeting.

After the formal business of the AGM, Chris Barney presented a short report on the AIA Conference recently held at Moulton College, Northampton. Judged to be a very successful Conference, Chris illustrated his report with photographs from a number visits reflecting the diversity of the industrial heritage – the Northampton Boot and Shoe quarter, Phipps' Brewery, the Shuttleworth Collection, Jordan's Cereal Mills and the National Lift Tower. The Conference is the focus of the AIA year for its members, and the 2018 event will be exploring the far North of Scotland with a base at Wick.

Richard King has a wonderful collection of photographs and personal experiences that reflect his long interest in the history of Warwickshire. He presented a short talk on the Henley in Arden to Lapworth Railway, illustrated with photographs taken in the 1960s. These focussed on the fabric of the railway rather than on the trains that used the line, claiming – controversially – that "we see enough pictures of steam engines"! Much of the line has now disappeared completely and Richard's personal recollections, and valuable collection of photographs, plus the care with which he had prepared his material, made an enjoyable and effective contribution to the evening.

To finish the evening the Chairman took a reflective view on the past year, some of which will appear in the next issue of the Newsletter, but he did make a reference to the latest edition of IA News, edited by one of our members Chris Barney. In it there was to be found two articles written by members – John Copping's report on the 'Heritage of Industry' visit to Holland, and John Willock's report on the Whittle Anniversary. It was good to see such a strong WIAS representation in the list of authors!

Listed below is the programme of meetings for 2017-2018. I look forward to welcoming members and guests at these meetings and to the pleasure of sharing our interest in the industrial heritage of Warwickshire and beyond.

PROGRAMME

14 September 2017:
AGM, Chairman's Review, AIA Conference Report and Members' Contributions.
12 October 2017: Nick Holmes
Canals of Lapworth and Rowington.
9 November 2017: Joint Presentation by WIAS and LHG
Ironfounders of Leamington.
14 December 2017: David Brown
Canal Reservoirs.
11 January 2018: Robert Eyre
The Healey Archive.
8 February 2018: Peter Stanworth
Military Head Protection and other members' contributions.
8 March 2018 Tony Boughton
The Stench of Victorian Indecision; engineering (and other) problems in the development of England's sewers.
12 April 2018: John & Linda Burton
The Exhall Colliery Disaster.
10 May 2018: Roger Cragg
Marc Isambard - The Other Brunel.
14 June 2018: Stephen Wass
A Way with Water: water resources and the life of an 18th century Warwickshire park (Farnborough).

Meeting Reports

January 2017: Peter Crowley
A Working Life at Alvis and Beyond.

Peter Crowley has been involved with Alvis and the company's products throughout his working life, and after 56 years he is not yet finished as he continues to work with Red Triangle in Kenilworth where he has been for the last 11 years. Who better then to give a most personal view of Alvis and its very diverse products over the years.

Alvis has been associated with three principle products; cars, aero engines and military vehicles. Peter opened with a pictorial review and reminded the audience of some iconic names: Silver Eagle, Grey Lady, Leonides, Saracen, Scorpion and Stalwart.

Alvis was founded in 1919 by Thomas George John. Its first products were stationary engines, carburettors and motor scooters. Production was moved to Holyhead Road in Coventry in 1922 when George Thomas Smith-Clarke left Daimler and joined Alvis as Chief Engineer and Works Manager. Smith-Clarke was accompanied by William M. Dunn, who also left his job at Daimler to become Chief Draughtsman at Alvis. This partnership lasted for nearly 28 years and was responsible for some of the most successful products in the company's history.

The cars incorporated many advanced features including front wheel drive, aluminium pistons and the first all synchromesh gearbox and they enjoyed a deserved reputation as a racing car where success always provided good publicity.

The exploits of Major Maurice Harvey in the 1920s were recalled with photographs, press cuttings and some fascinating video clips of racing at Brooklands and Le Mans. No health and safety regulations then! Sadly, Harvey suffered ill-health and later took his own life. However, the straight-eight, 1,500cc double overhead camshaft engined front wheel drive race car that he drove so successfully survives and is currently undergoing a rebuild.

Unfortunately, attempts to create a production front wheel drive car were commercially unsuccessful. Nonetheless, the cars produced by Alvis during the inter-war years were popular amongst a discerning, and wealthy, clientele. Usually large engines in smaller cars were provided as a running chassis to specialist coachbuilders for bespoke bodies. Popular builders were Charlesworth in Coventry, Van den Plas (a lovely short chassis 4.3 tourer from 1939 was shown, 12 survive from 14 built) and Bertelli (later owned by Red Triangle). A 4.3 Chassis in the late 1930s cost £950 before the cost of the coachwork.

In the mid-1930s Alvis management saw the need for diversification from expensive motor cars and, with rearmament gathering pace, moved into aero engines. Initially building a French Rhône radial engine under licence to meet the Air Ministry's dictum 'no foreign engines, only British'. These engines were produced in a new factory, also on the Holyhead Road where armoured cars were also built. Alvis were eventually responsible for operating eight shadow factories in the Coventry area, mainly involved in the overhaul and repair of Rolls Royce Merlin engines. Sadly, the original car factory was bombed and destroyed in 1940.

Post war the company restarted car production with the TA14, a good, reliable machine of which some 4,000 examples were built, some of which were shown lined up outside the factory. The TA14 was developed into the TA21 with a six-cylinder 3 litre engine also known as the Grey Lady and finally as the TC21 100. Very up-to-date for the 1950s. Celebrity owners included Prince Philip and Douglas Bader.

At the same time the aero engine business continued to develop, notably with the 9-cylinder, 550hp radial Leonides which sold well for use in both fixed wing and especially helicopter applications. Examples being the Bristol Sycamore and Percival Pembroke.

The third leg of fighting vehicles also flourished with the six-wheeled (all driven) Saracen with its armoured hull and good cross-country performance. Variants included the Saladin and Salamander fire crash tender for the RAF.

After this overview of the Alvis history Peter's presentation took on a more personal note as he recounted his own working life with the company which he joined in 1960. With three job offers to choose from he decided that the Alvis apprentice scheme looked the most interesting and it was a choice which he never regretted.

His wide-ranging experiences as an apprentice included once having to collect the founder, T G John, from the station. Some difficulty with the crash gearbox led to him hitting a post but consequently a synchromesh gearbox was developed! Alvis apprentices were given responsibilities too and at 19 Peter was building engines for the TC21 cars. Later, he joined the team that built the last 100 cars before production stopped.

Peter then moved over to the fighting vehicle side and his contemporary photographs gave a real flavour of the products and their production. Amongst these the story of the Stalwart stands out. Started as a private venture, its 5 ton payload and excellent cross country performance was enhanced by its ability to float. Equipped with a water propulsion system by Dowty it was a most versatile vehicle and 1,500 saw service with the British army.

A video showing a Stalwart soaring off a high bank into water and then manoeuvring like an armoured boat was a highlight of the evening. The identity of the intrepid test driver who made the first attempt was not revealed.

Alvis also developed some tracked vehicles and a fully featured test track was built at Baginton after the use of the Allesley by-pass for 20 to 40 mph acceleration timing was stopped following an incident with a dairy lorry!

The design parameters for the Scorpion family of Jaguar-powered tracked vehicles were interesting, in that they were defined by the hold dimensions of the Air Force's workhorse transport, the C130 Hercules.

However, military demand was slackening and attempts to re-enter the aerospace industry also faltered. A wing flap actuator for Boeing proved too costly to produce and lost money. The acquisition of Unipower offered such products as a bridge builder and airfield crash tenders but in 1999 production in Coventry ceased and was moved to Telford.

Peter had no wish to move home and fortuitously an opportunity arose with Red Triangle in Kenilworth who are the custodians of all things relating to Alvis cars and welcomed Peter's encyclopaedic knowledge of the marque. Alvis owners' rallies and the exciting prospect of a revived 'continuation series' of the pre-war cars are keeping him occupied and in touch with his working past.

Whilst the Alvis car now has a new lease of life, the Alvis name might last longest in the aluminium window frames of Portcullis House in Westminster where the Company's skills in welding difficult materials won it the contract.

February 2017: Paul Baker
The Lost Railway: Lapworth to Henley in Arden.

Paul Baker has always been interested in history and has been investigating local matters with the Rowington Parish Records Group. Anyone who might have thought that there was not much to discover in the history of a 3 ½ mile stretch of railway that operated for a scant twenty years from 1893 would have been very wide of the mark.

Using the story of this minor line in the Midlands Paul painted a picture of the railway mania of the late nineteenth century that showed that nothing is new!

With a station at one end of Henley-in-Arden high street and running to Lapworth, the line was first proposed in 1845 but finally opened in 1894. Short, without a tunnel or other obvious problems; what happened?

By way of background, it was noted that The London & Birmingham Railway opened in 1838 and formed a branch from Coventry to Leamington in 1844. The Great Western Railway (GWR) opened a branch to Oxford in 1844 but Midland manufacturers wanted an alternative route to London. Consequently, the GWR sponsored two further lines; the Oxford to Worcester & Wolverhampton and the Oxford and Birmingham Railway in 1845.

This expansion took place at the time of the 'Railway Mania' that had gripped the country. Rising dividends from railway companies and falling gilt yields led to a dramatic rise in railway company shares. The GWR share price doubled between February 1844 and July 1845. Does this sound familiar?

In 1846 some 272 Railway Bills were sent to Parliament and the authorised capital of the railway companies reached £132 million or 27% of GDP. Inevitably, the bubble burst but railways continued to be built with mileage rising from 6,000 in 1851 to 9,000 in 1861.

Within this, the Birmingham & Oxford Junction Railway was engineered by I K Brunel as part of his strategy to extend his broad-gauge network. An auction prospectus for a land sale shows the proposed line with a branch to Lapworth thus making it a real prospect.

However, a cash-strapped GWR dropped the project. Stratford upon Avon failed in a legal challenge and decided to go it alone in 1857 but was met by objections from Henley-in-Arden. The Hatton to Stratford railway opened in 1860 which made Henley realise that it must organise its own railway.

In the archives of the Shakespeare Birthplace Trust can be found a number of original papers relating to the project. These include: names from the petition of 1857, the Petition to Parliament in support of the bill, the Shareholders listing, an initial list of subscribers and the Directors listed in the Act of Parliament. Included are many well-known names from the community, land agents, farmers, solicitors and tradesmen all demanding 'we want a railway'.

As they were to find, much more was involved if their desire was to be fulfilled. If you wanted a railway you needed a lot of supporting material.

This included a Railway Company, a surveyed route; with comprehensive plans of the proposed line, a Book of Reference, a list of landowners and their tenants, notices to land owners and tenants affected who must say if they are for, against or neutral, plans have to be deposited with Parliament, Local Assizes and Parish Councils and objections can only be made to the Railway Committee in Parliament. Finally, a Parliamentary Bill has to be submitted.

Once passed, the Bill becomes an Act, and in this case it received Royal Assent in June 1861. The approval brought with it a long list of statutory powers, powers of compulsory purchase, a time limit for construction, capital and borrowing powers, specific charges for goods & passengers and named the Directors. There were problems from the beginning, not only in raising the money but in finding someone to build the railway.

Just why Thomas Brassey, the greatest railway contractor of the age who had built over a third of the British rail network and much overseas, was interested in such a miniscule project is unknown but in 1861 Brassey and Field, who had built several local lines in the West Midlands, were awarded the contract to build the line.

What could go wrong? Well, in the event, plenty! Construction did not begin until March 1864 following a protracted dispute over land purchases. Then the cost of construction was badly under estimated and a second Act was needed to raise an extra £4,000. Work was suspended over the winter of 1864/5 and some subscribers were unable to meet subsequent calls on shares. The Warwickshire Savings Bank reported account closures and there were problems in paying Brassey and Field.

The AGM in 1865 reported further delays. There was still no agreement over the land purchases, the opening was delayed until February 1866, the Company attempted to pay Brassey & Field by shares & debentures but in June 1866 work stopped on the line and Powers were transferred to the GWR under the Consolidation of Powers Bill.

These matters need to be seen against the collapse of the railway boom. GWR had problems which would have prevented it building any further branch lines without the panic in the City following the fall of Overend & Gurney in May1866 and the ensuing bankruptcy of many contractors and railways. Bank rate was raised to 10% amid scenes reminiscent of the collapse of Northern Rock.

But all is not over for the little line. Brassey sued it for £12,000 but he died in 1870 and Field applied to wind up the company. The rating authority seized the rails to offset unpaid debts and the Court of Chancery tried to make the Directors pay £2,000.

None of this seems to daunt the protagonists of the line and the same local people attempted to do it again through a new company. A share prospectus was issued in July 1893 and Robert Turner appointed as contractor. The line was opened in June 1894 – 35 years late but to great celebrations and some 300 passengers were carried on that day.

However, the future was already doubtful. The direct line from Stratford upon Avon to Birmingham was running, the GWR had bought up land for a route that would bypass Hatton and with no prospect of running a profitable service or paying dividends the directors tried to arrange a buyout by GWR who went on to develop other mainline services between Birmingham and Bristol whilst absorbing a number of local lines.

The final closure came in 1915 and in 1917 the track was lifted and sent to France. Today, Google Earth allows the faint outline of the track to be seen. Only 3 ½ miles long but a fascinating examination of Britain's Railway Mania that has many parallels with today.

March 2017: John Frearson

Nelson's and Kaye's: Two Warwickshire Cement Companies.

John Frearson's meticulous research into archive material found in a wide variety of places gave context to the history of these two companies and the families behind them. As a chemist and archivist of Rugby Portland Cement, John was on home ground tracing the history of lime and cement in central Warwickshire.

Starting with the chemistry of limestone and the early process of kiln roasting to produce quicklime to which water was added to produce slaked lime and lime putty, we learnt that most of it went to improve agricultural land. It had been discovered that liming the land helped to release the goodness in manure and that ground limestone was not sufficiently soluble.

The use of lime putty to make mortar was limited as there were comparatively few high-status brick and stone buildings in those early times but agricultural leases often required tenants to lime their fields.

The Stockton and Southam area lies on rich beds of Blue Lias Limestone laid down in the Jurassic Period (huge Ichthyosaurus and Pleosaurus fossils were found at Stockton and Harbury) which is particularly accessible and of high quality. The lime and limestone industry around Southam grew rapidly after the canals came, in 1773 to Rugby, and in 1799 to Southam, and facilitated the import of coal to fuel the kilns and then to transport the product to wider markets. The digging of a private arm of the canal by Tomes & Handley in 1819 further improved access until the opening of the Weedon to Leamington railway line in 1895.

Old maps show many lime works, four between Long Itchington and Stockton alone and seven known works along the canal. Records of lime production can be found before 1740.

Turning to the businesses that worked the quarries and processed the limestone, John showed many examples of contemporary commercial stationary from mid-Victorian times. Fortunately, much has been well preserved and the detail to be found in the engraved letterheads gives considerable insight into the actual buildings, wharves, canal boats and people involved. These illustrations juxtaposed with today's remains bring the latter to life and into their proper perspective.

Early photographs too showed much of working conditions in the quarries, as always highly precarious! A group of quarry workers looked more than tough enough to work there.

Further light is shed from sale and auction documents where land details and plant descriptions enhance our knowledge, whilst sales ledgers and account books have preserved the commercial record and are a tribute to generations of careful clerks.

The success of the various operations set up to exploit the natural resource of the blue lias beds depended upon the technical and commercial expertise of the owner/manager and several families tend to dominate as an examination of the early days of lime production at Nelson's and Kaye's showed.

Charles Nelson & Co at Stockton arose from the manufacture of gelatine, for which lime is needed, in the 1830s by George Nelson, Dale & Co in Warwick. In 1844 George Nelson started to produce his own lime. George died in 1850 and was succeeded by his eldest son Charles who in 1856 was listed as a 'manufacturer of Portland cement' trading as Charles Nelson & Co. In 1868 he was listed as a 'blue lias lime and cement manufacturer' and in 1870 he entered into partnership with two London lime and cement merchants. Thomas Blyth of Southam and William Blackstone of St Pancras. Charles also died young in 1877 aged 43 leaving a widow and ten children.

However, in 1867 Charles had expanded the business by taking the lease of No. 10 Paddington Wharf and adding a fleet of canal boats to provided transportation.

Meanwhile, in Southam and Long Itchington another dynasty was emerging from the Hollis and Oldham families which led ultimately to Kaye & Company. This history is well documented in plans, deeds of arrangement and commercial material that gave a clear idea of a growing business eventually led by Captain Arthur Lister-Kaye.

After a military career in the Royal Artillery, during which he served throughout the Crimean War, he married and settled at the Manor house in Stretton-on-Dunsmore. As a social aside, he facilitated the romance between Alice Wilshire, a miner's daughter from the Rhonda Valley and Patrick Bowes-Lyon, son of the 14th Earl of Strathmore. The couple were married in Stretton and Alice became an aunt of the late Queen Mother.

Returning to cement and chemistry, the demands of Victorian expansion required increasing quantities of Portland cement rather than lime mortar and the local companies developed appropriate technologies from the mid-1800s.

Increased production needed better transport and both Kayes and Nelsons used steam locomotives within their works. Some of these locos survive at Statfold Railway in Tamworth. Their names: Jurassic, Triassic and Liassic recall the source of the companies' activities. A fleet of Sentinel steam wagons were also used for road deliveries.

Not all the records are cheerful. The early 20th century saw the rise of Trades Unions and industrial unrest. There was unity on the owners' side as well; a letter from Lister-Kaye advised that two quarrymen were being sacked because they were 'union men' and requesting that they should not be employed. Not surprisingly, Kayes suffered a quarrymen's strike in 1912. Nonetheless, a 1916 photograph showed a group of determined ladies wielding picks and shovels, no doubt in aid of the war effort. Nelson's appears not to have suffered industrial unrest until a strike in 1923/4.

Moving into the post war period we saw the expansion of both the Kaye and Nelson operations together with the creation of the model villages of company owned housing. Interestingly, copies of the tenancy letters have survived, as have the letters of termination on the day of leaving employment. Rents in 1940 were 5/6d a week, inclusive of rates. Also of interest were a series of illustrations of advertising ephemera from smokers' companions to paperweights.

In 1934 Kaye & Company went into receivership and became part of the Rugby Portland Cement Company who had already acquired an interest in Charles Nelson and were to bring several other cement companies into the group through the 1930s under the leadership of Halford Reddish.

The Company's war effort included the sponsorship of a Spitfire appropriately named 'Crowncrete' after one of the product lines.

Finally, we learnt of a chalk slurry pipeline from Dunstable to Southam that was built in the 1960s and the decision in 1996 to replace ageing and less efficient works at Chinnor, Southam and Rugby with a new plant at Rugby which was commissioned in 2000 with a production capacity of 1.4 million tons of cement a year.

The industry's consolidation continued with the takeover of Rugby Cement by RMC in 2002 and then in 2006 CEMEX acquired RMC. Nonetheless, cement production remains in Rugby and the story continues.

April 2017: Richard Williams

The Immense Historical Significance of the Cast Iron Cooking Pot.

Richard Williams briefly explored the historical significance of the humble cast iron cooking pot at the Members' Evening in June 2016. He now expanded on that topic, using a metallurgist's eye to examine an important matter at the heart of industrial archaeology – the connection between Abraham Darby's moulding patent and the use of coke; its significance, the prior art and thence the birth of the Industrial Revolution.

The Industrial Revolution's roots lie in a few key conjunctions. In 1709 coal meets iron in Coalbrookdale; in 1712 steam meets coal in Dudley; in 1720 iron meets steam in Coalbrookdale and in 1742, again in Coalbrookdale, the trinity are united emphasising the historical importance of that small Shropshire town.

Darby's only patent in April 1707 arose from his stated aim 'I only want to make pots'. Large numbers of cast iron cooking pots were being imported and Darby contended that his process would be cheaper than anybody else's, not least because 'I use sand only, no clay'.

It seems that Darby was unaware at the time of his patent application that coke iron would be particularly suitable for casting thin-walled cooking pots although the metallurgy is confusing.

An examination of 18th century blast furnace technology showed that two very different forms of iron could be produced; white or grey. White, which was of little use for castings but good as wrought iron and grey, which was excellent for casting but poor for wrought iron.

So, when was white or grey iron produced? Depending on the carbon content there is a chemical tendency towards greyness but the physical contribution during the casting process is critical. Slow cooling promotes grey but fast cooling promotes white iron. These factors are particularly relevant to cooking pots with their thin wall thickness. In a cold mould the casting will solidify very quickly and will solidify white if the chemistry is wrong; a high silicon content is needed for a grey casting.

An exhaustive analysis of 400 years of the history of a Liège foundry made in 1948 by René Evrard and Armand Descy showed up the correlation between wall thickness and carbon equivalent whilst an examination of Chinese moulding technology showed the use of heated moulds to produce grey iron.

Of the three museums in Liège, one was helpful in establishing how the local foundry had cast its popular cooking pots, examples of which were on display. The visible parting line showed that it had been loam moulded and some early illustrations depicted the technique. Most importantly, these moulds could have been heated for hot casting.

Having established the importance of moulding technology to the finished product, Richard examined at some length the different processes and products.

A simple unbellied pot, probably cast using a one-piece green sand moulding is the oldest known coke iron casting dated to 1714. It is certainly iron but no analysis has been allowed. An examination of the pot shows no parting line.

Turning to the bellied pot, a two- or three-part mould is required and the tell-tale parting lines enable the exact technique to be established. The Iron Bridge Museum has a dedicated iron moulding box used for making fully bellied pots. The simple moulding process for casting in legs and ears for a carrying handle were explained. Similar pots are still made in South Africa with their ears moulded on a vertical parting line.

Having established the methods in use Richard turned again to French reports for some theory. Further research provided a 1761 publication by the French Académie Royale describing 'Arts and Techniques' in which it was stated (referring to moulds) that… '*they also need to be hotter or colder depending on the quality of the cast iron that will fill them. Finally, the mould must be hotter or colder depending on the thickness of the pieces that are being moulded'.* Other French encyclopaedias carry similar comments but no other record has been found. However, it is clear that moulds were regularly heated.

Coke iron is naturally greyer than charcoal iron, largely due to its much higher silicon content. It will have spent longer in the furnace and have a higher average temperature, not to be confused with hearth temperature.

Darby's patent of 1707 noted the use of sand only, no clay in the mould. A sand mould cannot be heated, the metal has to be poured cold. Hence the need to use coke but Darby did not actually smelt with coke until 1709 at Coalbrookdale. The implication is that he knew exactly what he was doing but how did he know?

In 1665 Dud Dudley, the unpopular bastard son of the Earl of Dudley, knew of the different types of iron and wrote of them in *Metalum Martis.* The patent history and development of the coke smelting process is reasonably documented and begins in 1692 with Thomas Addison's patent application and the probability of Shadrach Fox's attempts at Coalbrookdale the following year. Addison used coke at Cleator, in 1694 as, probably, did Downes in 1695 elsewhere in Coalbrookdale before moving to Gwendraith where Chetle had been working on his patent and was later joined by Downes. By 1701 Thomas and Shadrach were working at Wombridge and in 1703 Darby set up Cheese Lane and takes out his patent in 1707.

Roger Downes was a sand moulder who worked originally in brass and sold Darby patterns in 1708 when Darby moved to Coalbrookdale and there smelted iron with coke the following year. He was later joined by Downes.

What are the consequences of Darby's achievements? He seems not to have been a technical innovator but he was commercially astute and saw opportunities which others did not. Being able to produce a cheaper (half the existing cost) high quality cast iron cooking pot opened many markets which he exploited to the full.

So the industrial revolution's genesis began and was further developed with the application of steam to allow higher temperatures which improved the conversion to wrought iron. Later on the introduction of the puddling furnace brought coal to wrought iron and by the mid-19th Century Great Britain was making more iron than the whole of Europe.

And all because of the humble cast iron cooking pot.

May 2017: Chairman's Evening

An Evening of Short Presentations Co-ordinated by Martin Green.

The chairman opened the evening by remarking how serendipitous a database research day could be. Wanting to investigate the water tower at Burton Green he discovered that the owner was WIAS member **Peter Stanforth** who proceeded to discuss the pros and cons of its ownership.

His tower was one of two locally, one supplying Coventry and one, his, Kenilworth. It had a capacity of 20,000 gallons, was built on four legs in four sections of reinforced concrete with a domed concrete cap. Local reports indicated that the tank was leaking and the interior is in poor shape. There is a 4" cast iron, asbestos clad outlet pipe and a similar one for delivery. A telephone wire linked a control box and convertor to the Harbury Control centre.

What of the future use for the water tower? The concrete is spalling, wire reinforcement is rusty and the structure is dangerous. Demolition would cost some £50,000, repair some £35,000 and razor wire fencing about £1,000. A change of use might be possible to a garden lounge or holiday accommodation for which plans have been drawn up and even a fire escape procured. Watch this space.

Dennis Crips then turned his forensic eye onto the Castle Bridge in Warwick which might have a ghost and a mystery if a painting by a French artist in 1793 is to be believed.

The bridge was needed for the development of Warwick Park and alternative sites further upstream were also considered. As for the design, a single span wide enough (36 feet) to allow two traffic lanes plus pedestrians and of masonry construction was prescribed but concern was expressed over the failure of a similar bridge at Pontyprydd in 1776.

Perusal of the Corporation Accounts for the period gives details of stone extraction from Edmonscote Quarry and its transportation by the river to St Nicholas Meadow and the erection of a temporary bridge. Timberwork figures prominently, eg two men sawing and assisting to fix centres for the bridge. This centre work, being ephemeral, was Denis's Ghost and similar to that shown in contemporary illustrations for London's Waterloo Bridge.

Returning to the French painting, the mystery refers to the relieving vaults flanking the central arch. Excavations in 1992/94 found vaults in a different position to those shown in the painting. The subsequent report by Sharman-Harvey to WCC concluded that even if the assumptions were faulty, the end result was acceptable. After all, no inspection had been made in 250 years and as no structural problems were evident the bridge remained safe for our use.

John Willock and **Alain Foote** spoke about Sir Frank Whittle and the birth of the jet engine. A full report of the 80th anniversary celebrations they had organised is to be found on page 8 but they took this opportunity to give more of the background to the story.

Whittle's first patent was granted on 16 January 1930 and in October that year Whittle approached British Thompson-Houston, as a turbine manufacturer, for assistance in the development of the engine. BT-H were not interested nor could the necessary £60,000 be raised before the patent lapsed. A subsequent, more successful, approach to BT-H led to the formation of Power Jets and work on an engine began. Contemporary photographs of various component parts helped to show just how revolutionary Whittle's concept was. However, the early tests proved to be somewhat hair-raising and in 1937 BT-H banned any further tests as being too dangerous and Power Jets moved to Lutterworth to continue development.

At this time only one engine existed and this was subject to much modification in development before its first flight in May 1941. The original Gloster-Whittle E28/39 aeroplane now resides in the Science Museum in London. The 50th anniversary is commemorated with a plaque at BT-H and there is another in Rugby Museum.

Turbine work continues at the Rugby works with large fan blade testing taking place not far from where that first jet engine burst into life 80 years ago and changed aviation history.

Peter Bolton took advantage of a holiday in Argyllshire to explore the remains of a charcoal-fired iron furnace at Bonawe some 10 miles East of Oban.

The furnace was opened in 1752 by a Cumbrian Ironmaster, Richard Ford. He was drawn to Bonawe largely because of Argyll's extensive forests which guaranteed an almost endless supply of charcoal. Two acres of woodland a day was needed to keep the furnace fuelled and plenty of water was available for powering the bellows although the waterwheel went for scrap in 1941. Iron ore was imported from Furness in Cumbria and limestone from nearby Ireland using a jetty on Loch Etive.

Evidently only a small workforce of 20 or so was needed for the iron works but many more must have been involved in the production of charcoal and the handling of the other raw materials. The works produced pig iron (up to 700 tons a year) and cannon balls.

Many of the original buildings are preserved and one cast iron lintel is dated 1753. The charcoal and iron ore stores are substantial structures with gothic arches. The works buildings are not the only ones well preserved, the workers' housing also provides insights into the domestic conditions of the time. The iron workers' wives contributed to the family income by producing linen.

The ironworks were successful for over 100 years and Bonawe outlasted all of the other Scottish ironworks that used charcoal as fuel. However, demand slumped as coal succeeded charcoal and the works finally closed in the 1870s.

John Brace brought the evening to a close with another of his discoveries amongst the British Pathé archives. This time he explored some early high-altitude flights from the 1930s.

In 1936 the Bristol Aeroplane Company introduced its Type 138 high-altitude research aircraft, a large single-engine, single-seat monoplane, equipped with a retractable undercarriage and a supercharged Pegasus engine.

The first flight to reach 50,000 feet was on 28 September 1936, piloted by Sqn Ldr F R D Swain and amongst other data an outside temperature of -56° C was recorded. Italy then briefly captured the altitude record before Flt Lt M J Adam on 30 June 1937 flew the 138 to 53,937 feet. During this flight the cockpit canopy suffered a major crack but the pilot was protected from injury by his pressure suit and helmet and brought the aircraft safely to ground.

The film clips showed plenty of detail of these pioneering flights, the aircraft and the equipment but were, perhaps, most notable for the laconic and understated comments by the pilots about their achievements. Stiff upper lip, old thing! Perhaps a portent of what was to come a few years later.

Altogether a most successful and entertaining evening with several contributions left over for a later occasion.

June 2017: David Hulse

Thomas Newcomen and the Engine that Changed the World.

David Hulse must surely rank as a modelmaker without compare and unique amongst Industrial Archaeologists. He has produced 1/16th scale (3/4" to 1') models of the eight most important engines that powered the Industrial Revolution. They are well beyond museum quality and indeed will eventually have a permanent home in the Black Country Museum.

Unusually, the speaker's introduction was in the form of a ten-minute video that show-cased his background, his workshop and the range of his skills. By profession a design engineer with a career in the ceramics industry at Royal Doulton, David says that he had always been making something.

Against this background he set about creating his extraordinary models for which every single part has been handmade, using techniques that match the original processes.

For example, the bricks were fired using the same atmospheric conditions which would have been used to fire the original bricks almost three hundred years ago. This is called reduction firing because when firing clay using coal, a great deal of oxygen is needed for the combustion process; this prevents the carbonaceous materials present in all clays, from being burnt cleanly away into the atmosphere. The heat required to fuse the clay together to form the solid ceramic then fires the clay into the variety of colours, found in the building bricks of the early 18th century.

151,000 individual bricks have been produced. The first 10,000 were made by hand but a unique machine (5 ½ ton pressing spray-dried powdered clay) was designed and built to produce the balance. The first bricks were fired in the garden but the bulk were fired in an electric kiln with coal at the bottom in saggars holding 3,000 bricks.

All the woodwork is constructed using fine grained Japanese Oak cut by hand to simulate pit sawing. The large pieces of wood have been adzed to their final size just as the craftsman would have done in the 18lh century. Similarly, every metal part used in these miniature engines has been made by hand forging. Window panes are made from microscope slip covers defaced to create a bullseye. The true to scale figures populating the models were specially created by the Art Director at Royal Doulton.

The model of Newcomen's first engine is built from 42,300 bricks laid with specially blended mortar in Flemish Bond, and 3,800 ceramic tiles were needed to complete the roof. work on the miniature began in 1981 and was completed in 1987 after 6,300 hours of construction and study. It stands 42" high and weighs 102 kg. The aim was to recreate in miniature, as near as possible, how the engine would have looked when first built.

David's talk concentrated on Newcomen's first engine, built in 1712 and the world's first commercial engine. He used the model to illustrate both the engine's features and the techniques he had employed in its construction.

Thomas Newcomen, was born at Dartmouth in 1663/64 and after an apprenticeship as an ironmonger, began selling tools to the Cornish mining industry. On his visits to the mines he began to think what a great financial reward there would be if a mechanical means could be developed to remove the flood water from the mineral mines and so to be able to extract the ore from below the natural drainage level of the mines.

With his lifelong friend and assistant John Galley Thomas Newcomen experimented for many years, trying to harness the power of steam for practical use. All this experimentation came to fruition by the year 1712 when he was able to demonstrate to the world, the first steam engine pumping water from a coal mine near to Dudley Castle in South Staffordshire. For some reason, Newcomen never patented his engine.

This engine is recorded on a print made in 1719 by a Wolverhampton file maker Thomas Barney. A legend attached to this print says that this "fire engine' made twelve pumping movements in each minute and, for each movement brought ten gallons of water from the mine workings, one hundred and fifty feet below to drain safely away at the surface. The miniature has been constructed from a careful study of this engraving, as nothing remains of the original engine.

However, it is widely regarded as the biggest technological advancement made by one man. Marten Triewald published a short description of the atmospheric engine in Stockholm in 1734.

Photographs of the model highlighted the important features of the engine. More than that, they constantly demonstrated the exquisite workmanship devoted to every part, large or small. Only a small part of the detail can be covered here but the most interesting are described below.

The boiler, surrounded by bricks, has a copper base and a lead dome operated at atmospheric pressure. It was fed from a large header tank.

The cylinder had a diameter of 21" and a stroke of 7' 10". Its maker is unknown but probably it was cast at a local bell foundry. the bore was most likely not machined but was hand-finished using files and scrapers

A surprising amount of mechanical automation was devised by Newcomen. A 'snifting' valve (its noise sounded like a man with a cold) drained non-condensed air from the cylinder through a 6" pipe whilst the 'scoggen' a weighted lever worked a stop blocking the water injection valve shut until more steam had been raised.

The wrought iron railings protecting stairways were modelled on those found at Callington Church in Cornwall.

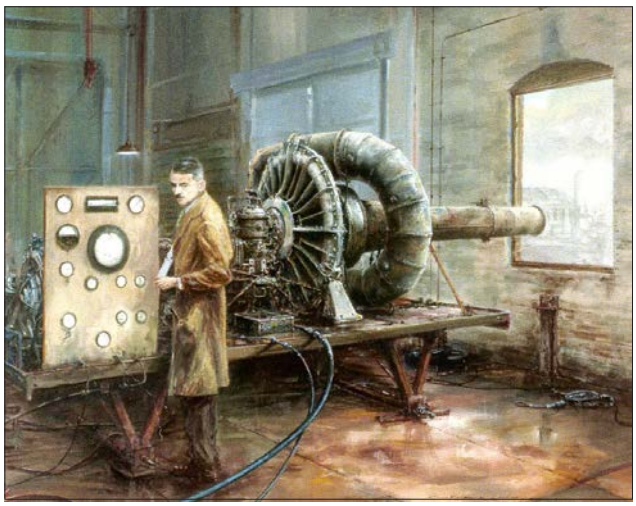
The pumps used were most likely of the deadweight type. The engine only lifted the pump side ready for the next downwards pump stroke. Such pumps were patented in 1663 and are still used in the pottery industry. Pipework was in wood.

Newcomen's essential layout for engines endured for the next 200 years. Others may have made great improvements but they all stood on his shoulders.

David Hulse provided us with a most interesting evening. He is a 'hands on' engineer and model maker who has also undertaken an enormous amount of research in order to ensure the accuracy of his models. It was often difficult to realise that his illustrations were not of the original machine. Painters of miniature portraits are often regarded as exceptional craftsmen but on the evidence of this evening David Hulse has to be rated amongst the greats.

A Celebration of 80 Years of the Gas Turbine Turbojet

Report by John Willock



The Original Whittle Jet Engine by Roderick Lovesey
Courtesy of IMechE Archive

On 12 April 2017 the Warwickshire Industrial Archaeology Society organised a celebratory lunch at Brownsover Hall, former wartime headquarters of Power Jets Ltd, to commemorate the 80th anniversary of the world's first operational run of a gas turbine turbojet engine by Frank Whittle at the British Thomson-Houston Works, Rugby on Monday 12 April, 1937. Following a visit to GE, Rugby (current occupants of the BT-H site) and to the spot as near as possible to where the test took place, the lunch was attended by Ian Whittle, Sir Frank's son and Sir Alastair Dudley-Williams Bt, son of Sir Rolf Dudley-Williams, one of Power Jets original backers.

Exactly 80 years ago today, on 12 April 1937, a steam turbine assembly hall at the British Thomson-Houston works at Rugby resounded to a previously unheard sound, the ear shattering whine of a totally new form of aircraft propulsion unit - the gas turbine turbojet. At the controls of the revolutionary engine on that day was its inventor, Flt Lt, Frank Whittle, a serving RAF Officer. It was the practical outcome of an original concept formulated by Whittle some seven years previously, but rejected as impractical by his mentors at the Air Ministry.

The engine, designated the Whittle Unit (WU), was mounted on a test truck situated on a gantry structure above the main steam turbine assembly hall, with the jet efflux pipe projecting through a window from which a pane of glass had been removed. As a safety precaution thick sheet steel screens had been erected on either side and above the engine, to contain any debris that might be expelled from it in the event of a catastrophic over-speed failure. Additionally, also for safety reasons and not without a degree of resentment, no senior personnel from BT-H were allowed to be present at the first test run.

To say that the actual test run on 12 April had its share of problems would be something of an understatement! The electric starter was used to raise the engine speed and with the ignition active, Whittle then began to open the main fuel control valve. Initially, with a low growl, the engine began to accelerate. But instead of obeying Whittle's control of the fuel supply, the speed began to rise with the growl changing to an alarming whistling shriek, described in Whittle's notes as sounding like an air - raid siren. Ominous large patches of red heat also started to appear on the combustion chamber casing, and Whittle watched with horror and disbelief as the speed rose - the engine was totally out of control.

All those present except Whittle made a rapid retreat, taking cover wherever they could! Whittle observed the engine speed peak at 8,000 rpm and then, with immense relief, watched it begin to drop. The shriek died down to a reluctant growl and ceased as the engine came to a standstill. The personnel who had absconded, sheepishly returned to their posts. Later Whittle confided in his notes, "Needless to say, this incident did not do my nervous system any good at all",

So this was the world's first somewhat eventful run of a turbojet engine. It was to be the precursor of many more alarming tests. A considerable amount of further development work was required to bring the unit to a state where it could be installed and flown in an aircraft. This condition was not attained in Britain until 15 May 1941, when the experimental Gloster-Whittle E28/39 piloted by Gloster's chief test pilot, PEG (Jerry) Sayer, successfully flew at RAF Cranwell, Lincolnshire.

Today we take air travel by jet powered aircraft very much for granted, with all the benefits that it has bestowed upon mankind in improving communications and shrinking our world. That giant leap forward was initiated on this day exactly eighty years ago by a Warwickshire man, whose creative genius came to fruition in his own native country.

A wartime photograph of Frank Whittle at Brownsover Hall, Headquarters of Power jets Ltd. and the first complete engine - the Whittle Unit (WU). Courtesty of GE.