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.

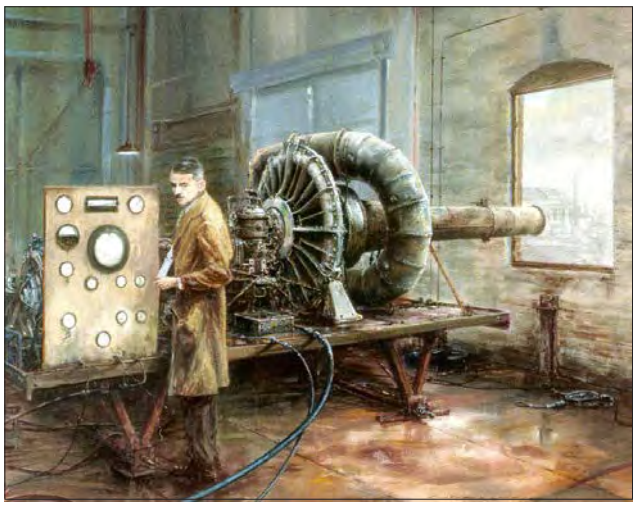
The pumps used were most likely of the deadweight type. The engine only lifted the pump side ready for the next downwards pump stroke. Such pumps were patented in 1663 and are still used in the pottery industry. Pipework was in wood.

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.

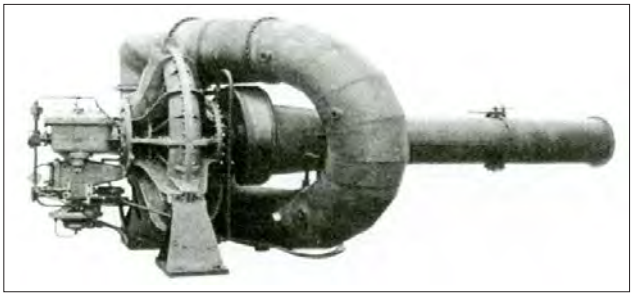
To say that the actual test run on 12 April had its share of problems would be something of an understatement! The electric starter was used to raise the engine speed and with the ignition active, Whittle then began to open the main fuel control valve. Initially, with a low growl, the engine began to 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.



WARWICKSHIRE Industrial Archaeology Society

WIAS

NEWSLETTER

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FROM THE CHAIRMAN

I'm afraid I have to begin this Newsletter with the news of the death on Boxing Day of John Selby, one of the stalwarts of WIAS since its inception in 1989. John was an engineer by profession, but he had a long interest in industrial archaeology and achieved academic qualifications in the subject under the guidance of Professor Marilyn Palmer at the University of Leicester. Over the years, he carried out research into a number of Warwickshire projects notably the Hillmorton yard and the Fenny Compton tunnel as well as working on the ironfounders of Warwick and Leamington Spa. He and his wife Valerie were loyal supporters of the Association for Industrial Archaeology, and regular attendees at the AIA Annual Conferences held at various locations around the country. John had served on the WIAS Committee for many years, where his wisdom and experience were greatly valued. We send our sincere condolences to Valerie and the Selby family.

On a personal note, I worked on many issues with John, and I was pleased that he was able to give a 'members' presentation' on the Kilsby Tunnel at the 2016 AIA Conference, and that his early research on local ironfounders proved such a valuable help to the presentation given at the November meeting (reported elsewhere in this Newsletter). His research on Hillmorton and Fenny Compton had also been handed over to the Society, perhaps for others to work on in the future.

It is also served to emphasise the importance of recording information - in a manageable form - that might be utilised by others. Twelve months ago I (rather boldly) stated that I would seek to get my own material in order, and some progress has been made, but, inevitably perhaps, other events and commitments have interrupted the process.

One particular goal is to try and improve the website's coverage of Warwickshire's industries, so that visitors to the site can find material on the history of those industries or where the material might be found if covered by other authors or organisations. The entry for a particular industry might simply be a short bibliography, or an introductory article, but it would be an indicator of what is available.

This is not the same as the database project. That sought to identify specific sites that remain today, and we feel that this has largely been completed, although there are certainly more sites to identify in Coventry. We are always willing to accept new entries!

The industries project seeks to give an insight into Warwickshire's industrial past, including, of course, many industries and activities that have disappeared. This is clearly an ambitious task which could be an on-going project over several years, but has the great advantage of being flexible, with contributions small or large willingly accepted. We are still working on exactly how the material would be organised, and updates will be provided over the year. The fundamental point is that any material contributed will be a step forward.

There are probably three groups of industries that we would seek to cover:

Extractive industries
Transport industries
Manufacturing industries

and many sub-divisions within these groups.

Each industry might, in the end, be covered by the following categories:

Short introductory history.
Sources: bibliography; websites etc.
Contributions from WIAS members (for example Arthur Astrop's work on machine tools; John Willock's work on the aircraft industry).
Contributions from elsewhere, willingly deposited on WIAS website
Photographs of past industrial activity (perhaps in those collection of slides that many of us have).
Museum and Record Office collections.

Of course, the process would also bring WIAS into contact with the range of societies and groups that concern themselves with industrial history, both local and national organisations. This can only be of advantage to all concerned.

My own experience recently in working with the Leamington History Group on the Leamington ironfounders revealed much mutual benefit, and insight into the different approaches of the two organisations. Long may these contacts continue!

PROGRAMME

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

October 2017: Nick Holmes:
Canals of Lapworth and Rowington.

Nick Holmes presentation dovetailed nicely with that of Paul Baker in February this year. As we have seen elsewhere, the railways often followed the canals which had pioneered the bulk transport requirements of the industrial revolution. Both men are involved with the Rowington Parish Records Group whose on-line photo archive now holds some 5,000 images.

A regular walker of the canals, Nick found himself asking; how, by whom and why were the canals built. The first canal in Great Britain is popularly held to be the Bridgewater built in 1759 but it was preceded by the Tyrone to Dublin and the Sankey from St Helens to the Mersey. By the mid-1850s there were over 5,000 miles of canal and navigable river on the British mainland with another 900 miles in Ireland.

Many towns wanted to be connected to the canal system to facilitate trade and to reduce the cost of bulk materials transport, especially coal. In planning a canal it was important not to upset other companies who could use tolls as a weapon against a competitor.

The initial study in 1792, or possibly earlier, was for a single canal from Digbeth to Stratford with a branch to Warwick.

However, local interests objected because it would take coal out of Birmingham and thereby increase its price. A petition suggested an alternative from Dudley (to take coal from the Dudley and Netherton mines) via Selly Oak and Lapworth, changing the junction from Digbeth to King's Norton on the Worcester canal which was prepared to allow the junction, without compensation, to increase traffic on the new Northern section of the canal.

The Birmingham Canal Company saw this as a threat and persuaded the Warwick company to separate from Stratford and pursue their own line from Digbeth to Warwick. The fallout became worse in 1794 when The Birmingham Canal Company supported the extension of the Warwick canal to Braunston where it would eventually link with the Grand Junction to provide a direct link to London. The Worcester and Stratford Canals opposed the bill. The Birmingham Canal Company then opposed link between the Stratford Canal and the Warwick Canal at Lapworth by presenting a petition against the Bill because it would divert traffic from which Birmingham Canal received tolls. This opposition was unsuccessful, but the Stratford Canal had to pay 11d per ton on all traffic passing through the junction.

Nick then explained the processes needed for building a canal. Unsurprisingly, these were almost identical to those detailed by Paul Baker in relation to the railways. The canals were pathfinders, not only across the countryside but in the forests of the law and Parliament. Suffice it to say that the requirements were a Canal Company whose shareholders were the proprietors of the enterprise, a survey of the proposed route and an Act of Parliament. Each stage had costs, some heavy – an Act of Parliament cost some £3,500 (apply a factor of 100 for today's value). Nonetheless, there was no shortage of potential shareholders anxious for a handsome return on their investment and tempted by initially only having to put up a small percentage of the share value.

The Committee first met in Knowle on 25 June 1793. Land Valuers were appointed as were P H Witton as Clerk Accountant (at £100 plus a house) and W Felkin as Engineer. That this was no casual project is made clear in the minute book that survives in the National Archives.

The committee resolved to rent a house in Bradford Street belonging to a Mr White for £25 for one year provided he:...

" put a skirting board around the room appropriated to the use of the committee, and to put an hearth stone and chimney piece to the same.

To build a brewhouse, privy and wall to make the yard and garden private and entire. To sink a well and put down a pump - to glaze the windows in the room to be occupied as an office "... and later...

"That Philip Henry Witton does provide a bookcase and shelves for the use of the said Company".

Although the Act effectively authorised the compulsory purchase of land, agreement still had to be reached with the landowners on price and this was not always easy. Again, a surviving notebook (in the Birmingham Library) from one of the land valuers details the difficulties in dealing with sometimes stubborn individuals or multiple owners of small plots.

By 1795 the Company seemed to be losing confidence in its engineer Felkin and Witton took on the role whilst remaining clerk/accountant. He also assumed responsibility for drawing and measuring tasks. Witton was an accomplished artist and appears to have been well connected, perhaps falling onto hard times before his appointment as clerk. His artistic ability is attested in a book of paintings of property damaged in the Birmingham Riots of 1791 including the house of Dr Joseph Priestley.

Of more interest to the industrial archaeologist is the collection of his drawings of *'Utensils in Canal Work'* held in the Science Museum Archives. These give fascinating details of the equipment used in building the canals.

Meanwhile, the construction of the canal was proceeding but when nearing completion the money ran out and another Act had to be obtained in 1796 to raise a further £50,000. Nearby, the Warwick and Napton Canal was also nearing completion and Witton's letters to his contractors showed his impatience at any delays.

A joint opening ceremony for the two canals took place in Warwick on 19 December 1799. Although it had been pressure from the Birmingham Canal Company that forced the separate canals, it seems that from the outset both companies were interested in the idea of a link between the two. Hence the Kingswood Junction. Such a link had been first proposed in 1793.

However, wrangles over toll rates and water – was Warwick going to bring water in or take it out? – caused delays but an Act gained assent in 1795, at a cost of £1,267, which included the requirement for the Stratford canal to deliver a 'lock full of water' to the Warwick canal every time a boat passed through the junction. This measure emphasises how important a reliable source of water was to a canal system that had few rivers feeding into it and hence the need for pumping stations – another market for Boulton & Watt engines.

A discussion of the economics of the canals and a review of the arrangements for the wharf at Lapworth, and what remains to see today, concluded a most interesting presentation. The Warwick canal was a commercial success as it joined two others and enjoyed a steady traffic of bulk goods plus fly boats and recreational use.

November 2017: Joint Presentation by WIAS and Leamington History Group
Ironfounders of Leamington.

A large audience (60 members and 15 guests) enjoyed this joint presentation with the Leamington History Group on a subject of great mutual interest. Martin Green, Peter Coulls, Mick Jeffs and Margaret Rushton had spent much time in researching the records (having newspapers available on-line had been a great benefit), walking around Leamington collecting information, photographing and collating the evidence. Their joint presentation was described as a 'work in progress' but clearly they have built very firm foundations.

Martin Green opened from the starting point that any journey for matters relating to Leamington was the work of WIAS founder Toby Cave. The cast iron balconies of his former Portland Street home epitomised the local iron founding abilities. A photographic tour of the town showed how much of such work remains, something for which we can be grateful, to set alongside the records of English decorative ironwork by Daniel Roth and John Harris. Member John Selby has also made a major contribution to the local record with his past research.

Roth's work, although comprehensive in its pictorial coverage, notably omits any names of the manufacturers. Similarly, whilst many of the extant examples on pavements and gutters carry the makers name others are frustratingly anonymous. As for the balconies, canopies and railings, their provenance generally remains elusive.

In the first half of the 19th century most towns had small scale iron foundries producing a wide range of products for local users. The technology had been established and with modest start-up costs, available land and labour, the market grew for cast and wrought iron, helped by the competition from several suppliers. The canals and railways had a major impact by opening further markets to the more entrepreneurial amongst the iron masters.

The range of trades (including: iron founder, ironmonger, whitesmith, tin plate worker, bell-hanger, brazier and brass founder) and goods (including: balconies, verandas, palisading, gates, stove grates and a wide variety of street furniture) produced by local iron founders are well recorded in contemporary directories and advertisements. The latter also enable the local historian to chart the development of businesses and the connections between them.

What remains and where can we find examples? The two best options are to walk the streets and join the National Trust. The former will provide evidence of street furniture and the latter the other Leamington speciality, the 'Kitchener'.

The researcher will soon find that street iron was not just a local product. There are plenty of examples within Leamington of work from Warwick (the next project?) and national iron founders from the Black Country to Glasgow.

An 1838 map of Leamington annotated with the locations of the main local iron founders was a useful introduction to Mick Jeffs who went on to describe the work of three Leamington principals: Flavel, Radclyffe and Grove.

The Flavel dynasty has its roots in the Black Country, William Flavel, who moved to Leamington in 1803, notably invented the 'Kitchener' although whether it was patented or not remains in doubt. He went bankrupt in 1828 but by 1829 was back in business. This pattern seems to have been quite commonplace amongst the thrusting manufacturers of the era and little damage appears to have been caused to their progress.

The Patent Kitchener in the words of an 1829 advertisement afforded: '*the most ready means of performing in the best manner, either separately or at once, all the operations of Cookery – as Roasting, Baking, Boiling, Steaming, Stewing etc, with only one Fire (and that an open one) no larger than what is used in ordinary cooking grates for the Boiling of a single Vessel'.*

Considerable ingenuity had gone into the design and manufacturing benefited from advances in the use of cast iron.

William Flavel had been well respected in the community and his successors became, as often occurred, more and more involved in local civic affairs whilst further developing the business. Flavel brought an unsuccessful action against Harrison for using the Flavel Patent Kitchener name and moved the business to the Eagle works, acquired from Thomas Radclyffe, in 1856, not 1833 as popularly recorded.

Much research into archive material produced many interesting examples of contemporary editorial and advertising material together with photographs of Flavel Kitcheners still in situ at historic locations.

Thomas Radclyffe also manufactured a patent kitchener and was in and out of business with several partners before amalgamating with Flavel in 1902. Radclyffe had sought to develop exports and sent 17 kitcheners to an exhibition in Melbourne in 1888.

George William Grove, whose father was an ironmonger in Grove Street, also produced kitchen ranges, notably the massive installation in Charlecote House together with drain gratings and covers. He too sought exports at the Sydney Exhibition in 1879 ahead of opening a new foundry at the Cape in Warwick in 1880.

Grove had an appetite for litigation and there is evidence of a variety of suits brought by him against fellow tradesmen and even employees on seemingly trivial grounds, a view shared by the judiciary!

Peter Coulls took the story on with an account of the Carter family of Oxford, Leamington, Emscote and Birmingham. Again, surviving examples of commercial stationary offer vivid depictions of the manufacturing processes of the early 19th C.

The local newspapers also charted the ups and downs of the Carters with accounts of works openings and then property sales to meet financial obligations followed by a rebound to greater prosperity. Operations, especially for 'Leamington Kitcheners' moved to Birmingham in 1855.

Martin Green concluded rhetorically. Why Leamington? Flavel was a strong influence with innovative designs that were widely imitated but overall a favourable business environment and good communications systems were fundamental to success. Architectural fashions for decorative ironwork also helped as the town developed.

Martin also touched on the activities of three other local businesses, Hewens, Jenkins and Harrison who all made important contributions to domestic systems. Hewens with a patent regulator that improved the efficiency of the kitchen range, Jenkins with hot water heating (early central heating) and Harrison with further range improvements including the largest field kitchen ever made during the Crimean War '*able to feed 1,000 with a fire no larger than normal'.* He also enjoyed a chequered career but always recovered and finally went to the USA and was granted US patents. The great survivor!

We look forward to the next instalment of such a fascinating history of local ingenuity and success.

December 2017: David Brown:
Canal Reservoirs.

David Brown is a distinguished civil engineer and currently the Principal Reservoir Engineer with the Canal & River Trust with responsibilities across the country. His interest in Industrial Archaeology began when he studied at Durham University and is ongoing.

Whilst concentrating on the Trust's canals and reservoirs in the Midlands, his wide-ranging talk covered the development of the canal system, reservoir engineering and the threats, failures and legislation needed to protect users and the environment.

The Industrial Revolution needed better transport than the traditional packhorse. A horse might carry a couple of hundredweights, but the same horse could pull a barge carrying 50 tons on a canal or river. Hence the development of a canal system to join up the navigable rivers and allow the growth of basic industries, coal and iron and then manufacturing, textiles, pottery and metal.

However, canals had one major problem, water cannot run uphill, so a lock system is needed to cope with gradients and locks need a supply of water – a typical narrow lock will need 25,000 gallons (180 M^3) to refill it.

The heyday of the canal began with the Bridgewater Canal in 1761 and lasted until overtaken by the railway system in the 1850s, although some major works were later, e.g. The Manchester Ship Canal in 1894. Nevertheless, canals continued to be used commercially and increasingly as a leisure resource into the present day.

Water supply was a constant challenge. Rivers and streams could be used in lowland areas, but there was an ever-present challenge from existing users such as water mills whose livelihood depended on those same sources. In upland areas reservoirs had to be created to provide a water supply.

Turning to reservoir engineering, modern concrete dams were preceded by earth dams, usually built with a puddled clay central core and sunk down to bedrock to provide the necessary resistance to leaks.

The principal threat from a dam failure is flooding in the valley below. Spillways are a common feature to minimise this risk but many early examples were too small to be fully effective. High waves can be generated in stormy weather and cause erosion in earthworks that threaten stability. Illustrations included the effects of internal erosion in dams that collapsed (USA in 1976 and Tasmania in 2005).

In the UK, there were plenty of failures with early dams but the worst was near Sheffield in 1864 when the Dale Dyke dam fractured. The reservoir had been first filled the year before. An horizontal crack in the crest of the dam was spotted on the afternoon of 10 March and the dam failed catastrophically the next evening at 11.30pm. The flood reached Sheffield 9 miles downstream killing 244 people en route. More recently, dam failures in 1925 killed 5 at Skelmorlie and 16 at Dolgarrog.

More effective legislation soon followed these last disasters. The Reservoirs (Safety Provisions) Act of 1930 introduced, for large raised reservoirs, *inter alia* statutory inspections, panel engineers, works 'in the interests of safety' and monitoring procedures. An interesting quantification for a large reservoir was 10 Olympic Pools or 5 million gallons/25,000 M^3. The Reservoirs Act 1975 extended the scope with requirements for registration, enforcement authorities and supervising engineers. The Flood & Water Management Act 2010 and Reservoirs (Scotland) Act 2011 added risk not volume, surveillance and maintenance criteria.

The Trust today has responsibility for 72 reservoirs around the country, all of which were built for canal supply. The largest by volume is Killington (3,240,000 M^3 , the oldest is Pebley (1776), the average age is 193 years, the most recent is Winterburn (1891) which is also the highest dam (25M), the longest dam is at Southfield (2.5 km).

Risk Management by the Trust involves Statutory Inspection, Supervision and Surveillance. These involve making local inspection visits two to three times a week throughout the year. Monitoring for water levels, leakage and settlement. Comprehensive emergency planning procedures are in place for each of the Trusts' reservoirs.

Turning to Warwickshire, David outlined the development of the canal system from the Coventry and Oxford canals in 1790 through to the purchase of the Warwick & Napton and Warwick & Birmingham canals in 1927 by the Regent's canal and the formation of the Grand Union two years later.

The early canals had no dedicated water supply but this was soon needed and a large number of reservoirs were built between 1764 and 1811.

The first was Seeswood Pool in 1764 North of Coventry by Sir Roger Newdigate of Arbury Hall and feeding 13 locks, followed by Oldbury, Olton, Stockton, Napton, Wormleighton, Boddington and Earlswood.

These were then examined in detail and David made good use of two sources available to us all. For detailed maps of many dates The National Library of Scotland has a very accessible website and Google Earth gives contemporary views. Between the two all needs are covered. Site visits also provided photographs of features and details otherwise hidden.

Between these sources we were able to get not only a detailed examination of the individual reservoirs and their histories but a clearer understanding of the work of the Canal and River Trust and the responsibilities of its staff. Not least, we began to get a feeling for the size of an Olympic Swimming Pool.

Details of the relationships between adjacent and competing canals were revealing. For example, in 1797 the Warwick & Napton canal had no water supply and reached an agreement with the Oxford canal to enlarge Boddington reservoir to provide it with water for which it paid a toll of 2/- a ton.

A study of the old maps can show how developments occurred, for example at Olton the Birmingham & Oxford railway first passed over a corner of the reservoir on a viaduct but later this was replaced with an embankment.

The complex layout at Earlswood includes the remains of the pumping station with pictures of the original beam engine which caught the attention of some members.

Questions demonstrated David's exhaustive knowledge of his subject and included issues of reservoir location (choose a valley that won't leak), climate change effects, the pros and cons of dredging (disposal of contaminated sludge is difficult) and the possible use of pumping as a substitute for a reservoir.

Altogether, a most interesting and informative evening with which to close the year.

WARWICKSHIRE Industrial Archaeology Society

WIAS

NUMBER 63 June 2018 PUBLISHED QUARTERLY

NEWSLETTER

FROM THE CHAIRMAN

Perhaps the greatest strength of Warwickshire Industrial Archaeology Society has been the loyalty of its membership, with a high turn-out at every meeting. There are some who have been members since the formation of the Society in 1989, and it is sad to start this Newsletter with some words about one such member who has passed away recently.

Peter Chater's interest in industrial history pre-dated the formation of WIAS, but he fully embraced the Society and remained an enthusiastic supporter over the past 28 years. After a working career on the railways, he developed an unrivalled knowledge of local industrial and transport history, always seeming able to add additional information to any topic under discussion. Woe betide any visiting speaker who did not have a firm grasp of his material – Peter would have no hesitation in putting him right! He was still passing on interesting photographs and comments to me via e-mail right up to his final days.

Over the years, he delivered many talks on a variety of topics, and led several walks for WIAS members, all part of the process of passing on his knowledge to others. He shared his passions with a close group of friends with whom he embarked on many an exploratory trip to sites near and far, building a wonderful collection of slides and other material.

Peter was also a member of other local history groups, and his knowledge and enthusiasm will be sorely missed by all. Our condolences go to his family.

Data protection

Victor Lobb, our treasurer, has taken on the onerous task of investigating the issue of data protection, and – with the aid of a subgroup – to formulate WIAS's response to the issues involved in view of changes in legislation. The Society is indeed fortunate to have someone willing to take on this task, and for the extremely effective way in which he has articulated our response. He writes:

Our committee felt it would be helpful to let all Society members have a summary of a presentation made to our meeting on 10th May 2018. This reported on the conclusions of the committee subgroup that has been considering the application of the new Data Protection Act 2018 to WIAS. Thanks are due to our other subgroup members, Peter Coulls, Sue Hammon for their contribution to our analysis and conclusions.

The new Act replaces the Data Protection Act 1998 and 'enacts' the General Data Protection Regulation EU 2016/679 into UK law. It increases the rights of individuals over their personal data, which is deemed to be 'any information that identifies a living individual', such as name, home address, telephone number, or email address.

Many of us have been 'bombarded' with letters and perhaps emails from organisations informing us of their approach to the requirements of the Act, and, in some cases (necessarily or unnecessarily) requesting our consent to receive further communications from them. There are, however, six lawful bases for processing personal data, three of which are relevant to the Society.

In common with similar membership organisations such as the National Trust, the Society and its members have mutually beneficial interests. These are reflected in the 'aims' of the Society that were approved by HMRC when they recognised us as a 'charity for tax purposes'.

As members of the Society we reasonably expect to receive information on the Society's activities: the lawful basis for this is legitimate interest.

The society has a legal obligation to retain the details of Gift Aid donations for six years.

In addition, a member may wish to contact another member and asks the Society for their contact details. This is not part of the direct relationship that each member has with the Society and so requires the individual consent of the member whose details are sought. We shall invite members to express this consent as part of the subscription renewal process in September.

The safeguarding of personal data is essential. The Society does not:

- Use members' personal data for any commercial purpose;
- Hold any sensitive personal data, such as health records or ethnicity.
- Hold any data on children;
- Publish members' personal data, for example, in a membership list.
- Store or process personal data outside the EU;
- Pass personal data to any other person or organisation (unless the member consents or the Society is required by law to do so);
- Carry out any 'automated decision making' using personal data; or
- Retain the personal data of former members of the Society.

Every organisation that holds personal data must publish a privacy statement. This will be provided to members at our June meeting and sent to those not present. We have kept this as simple as possible, while meeting the requirements of the Act and following the guidelines from the Information Commissioner's Office.

Our committee considers that this approach demonstrates our compliance with the Act.

AIA Conference

The Association for Industrial Archaeology holds an annual conference and this year- as well as supporting the conference in Caithness run by the Scottish Industrial Heritage Society (Friday 22nd June – Wednesday 27th June 2018) - the AIA conference will be held in Nottingham from Friday 31st August to Wednesday 5th August 2018. This is a change to original intentions, and being relatively close geographically makes an ideal opportunity to taste AIA Conferences for the first time. There are lectures and a series of visits to local sites, often with greater access than normally permitted to the general public. Sites include Papplewick and Abbey Pumping Stations, Bestwood Colliery and Clipstone Colliery Winders, the river port of Newark-on-Trent, the Bennerley viaduct, Taylor's Bell Foundry, and Ruddington Framework Knitters Museum. Full details can be found on the AIA website.

Meeting Reports

January 2018 Members' Evening:

A last-minute cancellation, sadly due to a bereavement, by the scheduled speaker whilst giving the Chairman a busy few hours, produced a programme that demonstrated the range of interests of our membership.

Roger Cragg opened with a follow up to last month's talk on canal reservoirs with two examples of dam catastrophes in Europe. Construction of the dam at Malpasset near Fréjus in the South of France was begun in 1952 and completed in 1954. In the autumn of 1959 particularly heavy rain had filled the reservoir close to the top of the dam. The dam supervisor was concerned and wanted to open the relieving sluices but was overruled because construction work on the nearby A8 autoroute might be affected by the consequent flooding.

In the late evening of 2 December 1959 the dam collapsed and 423 people died in the resulting flood. The entire dam wall collapsed with only a few blocks remaining on the right bank. Pieces of the dam are still scattered throughout the area.

The breach created a massive wall of water, 40 metres high and moving at 70 kilometres per hour, which destroyed two small villages, the highway construction site, and reaching Fréjus. Various small roads and railroad tracks were also destroyed, water flooding the western half of Fréjus and finally reaching the sea causing $68 million of damage apart from the loss of life.

The cause of the failure remains unclear, but a tectonic fault is possibly the most likely. Roger had visited the sight in 1973 and his photographs coupled with others and google earth views gave a clear impression of the extant damage. Roger had also visited the site of his second example, the Vajont dam North of Venice.

One of the tallest dams in the world at 262 metres but only 191 metres wide at the top it spectacularly blocks a narrow cleft in the river gorge. It had been proposed in the 1920s but was not built until 1960.

On 9 October 1963, a massive landslide from Monte Toc caused a tsunami in the lake in which 50 million cubic metres of water overtopped the dam in a wave 250 metres high, leading to the complete destruction of several villages and towns, and 1,910 deaths. Evidence had been dismissed and reports concealed regarding the geological instability of Monte Toc and other early warning signs had been reported and ignored prior to the disaster. The dam, which is now open to visitors, remains almost intact and there is still evidence of the impact crater 60 metres deep below the dam. However, there are no plans to bring it back into service.

Martin Green took the opportunity to discuss possible ways forward for the Society. The database of Warwickshire Industrial Archaeological sites is largely complete, although new entries will always be welcome. However, Coventry is under-represented and possibly the opportunities presented by its being the City of Culture in 2021 could be exploited. Was there a role for WIAS?

Elsewhere, a detour off the M40 led him to the derelict site of Fenny Compton Buildings. Between 1958 and 2011 this company produced concrete garages and had sold 500,000 by 2008 but little is known about its manufacturing processes, markets or products giving scope for further research. The site is notionally closed, but not to an intrepid industrial archaeologist with a camera.

A presentation to a U3A audience on the industrial architecture of Warwick resulted in a discussion on the significance of architecture in industrial archaeology. Were aesthetics or functionality important? And where might they rank amongst other criteria? An interesting question. And as always with Martin's presentations, superbly illustrated with examples from around the country.

Peter Bolton recounted some holiday ramblings in Ulster last summer in the 'bandit' country of Fermanagh and South Tyrone. Whilst needing to be circumspect in sensitive areas there was mostly a warm welcome for the traveller with easy parking and open hospitality.

However, there was a purpose to the rambling; to seek out evidence for a lost textile industry. Linen had long been Ulster's main product. The 1891 census showed Belfast as larger than Dublin but by 2009 the linen industry was no more although today there is a slight revival of specialised luxury material.

Caledon is a small village County Tyrone. Today it has a population of some 300 compared with 1,000 in former times when it was home to a thriving mill; but of wool not linen following its conversion from a flour mill.

The mill closed in the 1930s but the mill buildings remained and were utilised by the army during WW2 but then deteriorated until demolished in the 1980s. However, a few mill workers' houses and a small weighbridge hut of some architectural merit remain.

Moving on, a visit to Ballygawley, also in County Tyrone, to find evidence of a linen mill was hampered by lingering memories of recent troubles which restricted photography. Nonetheless, the old mill was recorded but no information as to its present use was available other than that it might be being used as a government flour store.

Tim Clark concluded the evening with an update on his researches into the 18thC worsted mill on Saltisford in Warwick (see Newsletter 59). He is currently investigating the impact of the arrival of this substantial enterprise on the town. If the mill did employ some 500 people, then it would have been the town's dominant employer.

One possible source of information would be the baptismal records of St Mary's, where the father's occupation is given after 1813. Searching the records by possible occupation might give some clues. However, although a preliminary survey has shown several woolcombers, surprisingly no other related trades have been found such as stovers (who bleached the yarn) or firemen/boilermen to run the steam engine.

Another source could be the poor rate assessment books. They show a significant increase in ratepayers between 1805 and 1811 which points to immigration into the parish. Possibly, these incomers were reasonably well paid but some were falling in and out of assessment. However, the mill had been operating, seemingly successfully, since 1796 so the delay of 8 years needs some explanation. Was the mill not as successful as quickly as thought? One complication is that the increase of commercial activity on the canal could also be a cause of migration; there is evidence for coal dealers, sawyers and other tradesmen moving to Saltisford at this time.

Nonetheless, the mill clearly had a substantial impact on Warwick. After 1815 the mill was in steep decline and poverty in the town was appalling with half of the population receiving soup provided by the parish. Clearly a work in progress of great local interest.

February 2018: Peter Stanworth:
Military Head Protection.

Peter Stanworth combined a career as a prominent neurosurgeon with a long-standing involvement with the territorial army. In the latter role he has seen service in many recent conflicts, notably in Afghanistan, Iraq, Kuwait and Kosavo. He pioneered life-saving operations under battlefield conditions, receiving the OBE for the development of neurosurgery in the armed forces..

80% of head injury mortality on the battlefield divides equally between penetrating injuries and haemorrhage. However, in comparison with the diffused brain damage caused by, for example, head impact on a windscreen in a car crash, the more local damage from a penetrating wound has a greater chance of being successfully treated.

The study of wound ballistics shows that energy transfer is the key factor. As a missile passes through tissue it transfers its energy to a variable degree depending on its state. A bullet does not follow a straight flight, it can yaw, it can precess and it can combine both in nutation. As a result wounds can be much more severe than they would be if the bullet flew straight.

High-speed photography of test firings into a gelatine block showed how a tumbling bullet created massive damage, and left the block travelling backwards. Similar findings had been achieved some time previously by test firing into a clay block and taking plaster casts of the resulting cavities.

Such wounds, caused by the cavitation creating a large volume of dead tissue, are usually badly contaminated, become infected and lead to gangrene if not treated promptly. Some real-life photographs were not for the faint-hearted.

Having outlined the problem, Peter moved to a discussion of the solutions for providing adequate head protection for the soldier on the battlefield.

Prior to WW1 no thought had been given to the matter but static trench warfare with air-burst shrapnel shells soon showed up the limitations of the cloth, felt or leather headgear worn by infantrymen at the outbreak of the war. No protection whatsoever was offered against the new weapons then introduced. A photograph of an air-burst shrapnel shell over the trenches graphically illustrated the problem.

An early answer, in 1915, was a French produced simple domed metal skull cap to be worn under a cloth cap. Not very comfortable and providing little protection. It was soon replaced by the Adrian helmet which was patterned on the French fireman's helmet. However, this was much more complicated to manufacture, involving some 70 separate processes.

By the summer of 1915 there was considerable disquiet in the British Parliament. In July Members noted that the value of these French *'Callottes Metalliques'* had been considerable. By November it was the importance to the troops of not being in possession of steel helmets – no French soldier was without one. Happily, by June 1916 the supply of steel helmets had very nearly reached the number asked for within the zone of shellfire in France.

This first helmet, the Brodie Mk 1 with its familiar shallow domed crown and wide all-round brim formed in a single pressing was designed to protect the wearer against shrapnel bursts above the trenches. It was popularly called a 'tin hat' or a 'battle bowler'.

The Type A helmet was made from mild steel and had a leather liner and single chin strap. It was not particularly comfortable to wear and with only single strap not very stable. Mild steel was used in preference as a hardened steel had a tendency to shatter when impacted causing more serious injury.

The later Type B helmet used 'Hadfield' steel, a manganese alloy developed in Sheffield (during later questions it emerged that this alloy had been used for railway lines to counteract excessive wear on curved tracks). It had work-hardening properties that enabled it to better absorb impacts from bullets or shrapnel. The helmet weighed 0.6 Kg and had an improved and more comfortable liner. It was first delivered with a shiny steel finish which was quickly changed to the familiar dull khaki!

WW2 saw little change. The Hadfield helmet continued in service, it was slightly modified in 1940 with the Mk ll version which enjoyed an improved liner and an elasticated chinstrap. It was in use throughout the war. However, in 1944 the Mk lll 'Turtle Helmet' was introduced. Developed after an Medical Research Council study, it was deeper and provided some 38% more protection, particularly at the side of the head. These helmets were fitted with a permanent net to hold camouflage materials. A photograph of a prone rifleman outside Caen in 1944 showed the head protection it offered without interfering with the handling of the rifle.

By the mid-1950s the limitations of these designs were becoming clear. Their weight to protection ratio was poor, they were uncomfortable and unstable (single chinstrap) and they were incompatible with the other equipment that was increasingly being used – head-phones, respirators and ear defenders.

These new requirements were met with the Mk Vl Helmet. This was designed to fit closely to a human head. It gave the best ballistic protection within the specified weight limit (1.15kg) thanks to the concept of energy transfer and reduction and its construction from 22 layers of ballistic nylon. It improved impact protection (closed head injury) because the force was distributed over the whole area of the head through an improved liner. It accommodated ear protection, earphones and respirators and was more stable and comfortable in use thanks to a 3-point chin-strap/harness. It also featured a permanent camouflage covering. This helmet was initially manufactured by Courtaulds in Coventry and cost £60. It was later made by British Aerospace.

The next major change came in 2009 with a new composite material, Kevlar, replacing nylon. Few details have been released but protection against impact penetration has been improved and weight has been reduced. The new helmet is manufactured by Morgan Advanced Materials in Coventry. Whilst Peter could photograph the premises the only technical information available is on their website, and that gives little away. However, photographic evidence from a training exercise involving a grenade explosion showed the protective properties of the helmet which enabled the soldier to survive the accident relatively uninjured.

Members were able to examine Peter's MkVla combat helmet and to compare it with a captured Iraqi one leaving little doubt as to which one was preferable.

As always, the post-talk discussion produced additional information, one has been referred to above but another tantalising one was the existence of a wartime factory in Leamington making helmets. Location and details are unknown, but any information will be gratefully received and publicised.

March 2018 Tony Boughton:
The Stench of Victorian Indecision.

Tony Boughton is an engineer who took an MA degree subsequent to his retirement and he took a forensic approach to his subject, which formed part of his degree course.

Victorian engineers, both civil and mechanical, faced many issues due to the explosive growth of urban populations arising from the industrial revolution. Not the least was the stench and health problems that resulted from a 'flush and forget' attitude to sewage disposal. 'Not our problem' was the watchword.

Whilst most in the audience were familiar with the process of urbanisation, a series of graphs emphasised its scale and speed; England and Wales quadrupled city populations between 1801 and 1911 with some cities growing at a far greater rate. Contemporary illustrations and cartoons were used in the presentation to good effect.

Living conditions were terrible and marked by disease. Deaths from cholera peaked in 1848/9. Physicians from London and Bristol, Drs John Snow and William Budd, identified the probable sources of the outbreaks, which ran contrary to the popular 'miasma' theory of disease transmission. On Snow's advice the handle from a public pump in Soho was removed and cases of cholera quickly subsided.

A cartoon depicting a drop of London water (Punch in 1850) was particularly memorable as was the quote from chemist's letter to the Times in 1828 *'The Thames water which is conveyed into my premises has never been in a state fit for domestic purposes. Even during the cold season, it abounds with animalculae and in the summer months it is often intolerable; so full of insects, and emitting such a foetid smell, as to render it totally unfit for any human necessity.'.*

Against this background Tony examined the response of the civil authorities to the problem. At first, the eight independent London districts appointed their own officers (Commissioners of Sewers), but there was no uniformity of systems and each Commission carried out its work often with disregard for neighbouring districts.

The situation was improved somewhat in 1847 with the creation of the Metropolitan Commissioners of Sewers (MCS). Members were nominated by the Government but had different views with no consensus. At this time all London's house and street refuse was discharged into the Thames, and with similar systems being adopted in provincial towns widespread river pollution was becoming a serious issue. However, the MCS had many changes of membership and there was minimal progress in carrying out works of any magnitude.

In 1856 the Metropolitan Board of Works was formed incorporating the work of the MCS. It was the first example of a scheme of local self-government. London was divided into 39 districts, the ratepayers elected members to form the board which had control over drainage, paving, lighting and other improvements.

There are three key players in the history of London's sewers; Edwin Chadwick, Sir Robert Rawlinson and Sir Joseph Bazalgette. Chadwick produced an important report on sanitary conditions and favoured fast flowing pipe-based sewers. Rawlinson's experiences in the Crimean War, where he had substantially reduced fatalities, wanted pipe and brick sewers, whilst Bazalgette disliked pipes. He was supported in this view by the failure of a pipe-based system in Croyden in 1852 (fractures in unsound ground).

Punch, as always, had some hard-hitting cartoons which usually featured a foul-looking Father Thames. Such comments probably encouraged wider government interference. Palmerston's Liberal government of 1855/8 was criticised for its slowness whilst its Conservative successor eventually gave the Metropolitan Board of Works (MBW) independence and a brief to get on and sort out London's problems. The 'Great Stink' of 1858 was probably the last straw that precipitated action and work commenced on the main drainage system in 1859.

The description of the development of London's intercepting sewerage system was well illustrated by material culled from contemporary sources. The scale of the undertaking was enormous and well shown by the site plan of the pumping station, outfall and sewage reservoir at Crossness together with a photograph of the reservoir interior wherein a group of top-hatted Victorian worthies were dwarfed by their surroundings.

Whilst we have plenty of information on the contractors involved in the building of the contemporary railway network similar information is sadly lacking for London's sewage system. We do know that the contractors reported to Bazalgette and that there was a Royal Commission in1888 to investigate 'favouritism' but other knowledge is absent.

The Prince of Wales turned on the steam engines at Crossness in April 1865 and Punch praised the return of 'Father Thames' to good health. We are fortunate that some of these temples to Victorian engineering have survived and indeed, as at Crossness, been restored to their former glory.

For the next part of his presentation Tony turned to events in Warwickshire and Warwick and Leamington in particular. We have had other presentations on the local water supply (see Newsletters 40 and 54) but this was the first examination of the disposal issues. And pretty complex they were!

We do not know what Queen Victoria thought of the town on her visit in 1838 but she was sufficiently impressed to authorise its designation as a 'Royal Spa'. However, it was not until 20 years later that an improvement and sewerage plan was prepared by the town surveyor. The work included widening, straightening and deepening the Leam, moving the weir and altering the island and adding embankments, promenades and parks. The works for the sewage plan required intercepting sewers and a new sewage works.

All this required considerable investment. Lord Warwick offered loans and land but required certification by an inspector from the General Board of Health in London. The river improvements and the new sewage works were opened in June 1862 and Robert Rawlinson was appointed to carry out the inspection. A lengthy legal process ensued and one which could have been written by Dickens so tangled did it become. Eventually a settlement was reached, strangely not disadvantageous to Lord Warwick.

Tony concluded with a review of the ongoing demands for better works in London and the other industrial conurbations and various technical innovations. Notable amongst these was Isaac Shone's pneumatic sewage ejector used in the Houses of Parliament and elsewhere. The Lancet in 1887 commended the system but pertinently commented *"Our legislators have shown themselves alive to the importance of 'passing it on.' Let us hope they will turn their attention to the recipients of it and take unhappy Barking and poor Father Thames into their kindly consideration."*.

The Victorian engineers met many of the challenges presented to them but the legislative and planning considerations were no less onerous then as now and often delayed progress. That the practice of dumping London's excess waste into the North Sea by 'sludge boats' continued until 1998 shows that old habits can die hard.

WARWICKSHIRE Industrial Archaeology Society

WIAS

NEWSLETTER

NUMBER 64 September 2018 **PUBLISHED QUARTERLY**

FROM THE CHAIRMAN

Programme, Projects and Procrastination

We launch a new season of meetings for the Warwickshire Industrial Archaeology Society at the start of the 30th year of the Society's existence. The programme seeks to meet the aims of the Society in researching and recording the industrial heritage, combining a mix of local topics with a number of issues taken from further afield. It also utilises the interests and talents of members in delivering presentations, with space reserved in January for a series of short talks to fill the evening.

Producing this programme is getting no easier as the years pass by, and these difficulties highlight some of the debates explored in these pages on previous occasions. What strikes me is that much of the basic research has been done, but there remain opportunities to deepen our knowledge of particular industries, firms, sites, and to consider the possibility of widening our scope of interest. The danger of the latter is that we morph into another local history society, and that we lose the focus of the Society which must remain firmly upon our industrial past.

There also seems a case for seeking to bring a range of disparate resources together to try and produce a guide to the various industries that make up Warwickshire's contribution to the industrial past. Take the extractive industries, for example. There seems to be no simple guide to these industries – and what remains of their activities – which might act as a launchpad for research by future generations. It would be good to hear of the geological background, including a consideration of the particular qualities of the available resources for economic activity in the county. What geological features have produced the rock so valued by the roadstone industry? What are the various features of clays make them suitable for different types of brick? What are the differences between river and glacial sand and gravel? Why has Warwickshire become such a centre for the cement industry? What were the characteristics of Warwickshire coal?

These are relatively easy questions for the expert to answer but to have them co-ordinated by an organisation such as WIAS strikes me as being a very worthwhile project – and something that might attract the participation of new members.

From this could develop histories of the various industries concerned, if only as a guide to what has already been written, and what is available via the internet.

At another extreme, one considers the huge amount of material that has been written on the motor industry, and the daunting prospect this must be for the newcomer to the subject. Could WIAS play a role in writing an introduction, and point individuals to suitable texts, particularly those that focus on surviving parts of the industry. Focus might be less on the minutiae of particular models and more on the place of these industries in the county's industrial heritage How did Coventry's motor industry fit into the midland, national and international picture? How important were these industries in reviving the British economy in the 1930s? Did these relatively modern industries create communities that still have a substance and presence in the city? How might we define Coventry's 'motoring heritage'?

I am often offered talks that cover topics which step outside our primary focus of the industrial heritage … talks on cinemas, the architecture of banking premises, the development of the tourist industry, for example. I have offered a polite 'no thanks' on the basis that they do not meet the aims of the Society. Is it time to re-consider this? I remain sceptical.

And then to the most difficult point … all this sounds very fine, but who is going to do the work? We can talk for hours, but how and when can we get it done? Perhaps someone reading this feels that he or she might like to get involved, and help bring a more co-ordinated framework to the industrial heritage of Warwickshire. It would serve (and occupy) the Warwickshire Industrial Archaeology Society well over the next decade and beyond.

PROGRAMME

13 September 2018
AGM and Chairman's Lecture.
11 October 2018: Robert Eyre
The Healey Project.
8 November 2018: Duncan Frankis
Birmingham Brassfounders: a Fierce Cartel.
13 December 2018: Roy Smart
Another Icarus: The Rise and Fall of Percy Pilcher and the Art of Flying.
10 January 2019:Members Evening:
Twenty's Plenty. Short Presentations, each lasting less than twenty minutes.
14 February 2019: David Fry
Forgotten Foleshill.
14 March 2019: Anthony Coulls
The Legacy of the Stockton and Darlington Railway.
11 April 2019: Peter Bolton
Stanley Mills, Perthshire: Textile Milling in Good and Bad Times.
9 May 2019: Rupert Fisher
Birmingham Jewellery Quarter:Real Jewellery for the World and his Wife.
13 June 2019: Chris Barney
The Redditch Needle Industry.

Meeting Reports

April 2018: Lynda Burton & Rob Everitt
The Exhall Colliery Disaster.

The Society aims to address the industrial archaeology of the entire county of Warwickshire, and there has been a sense that insufficient attention has been paid to the northern area of the county and its extractive industries, especially coalmining, on which several local communities depended. This talk on the Exhall pit disaster of 21 September 1915 had the potential to broaden members' understanding of the coal mining industry in the north of Warwickshire.

One of the scheduled speakers, John Burton, was unable to attend as he was recovering from a recent operation. His place was taken by Rob Everitt, who accompanied John Burton's wife Lynda in a shared presentation. They took the novel approach of alternately reading excerpts from official reports and contemporary newspapers without any supporting slides; they also brought several photographs of the pit and its surroundings.

The facts of this mining incident were straightforward.

There were 375 men and boys working underground at the time of the incident. At around 2.10 am, Charles Garner, a maintenance employee, had climbed below the winding gear mechanism of the down-shaft in order to lubricate a recently installed bearing, taking with him an open-flame paraffin lamp holding about a pint of oil. It was not certain how this lamp came to be upset and dropped into the wheel-race, where it set fire to the pitch-pine cladding of the shaft; this cladding may have been impregnated with oil, so accelerating the spread of the fire.

Charles Garner attempted to recover his paraffin lamp but he was beaten back by the flames. It was reported that he shouted sufficient warning so that the pit's resident firefighting team were soon on the scene and extinguished the fire within three minutes of their arrival. The winding gear was not seriously damaged, but the fire had produced a great amount of smoke.

This prompt warning also enabled Israel Marshall, the overman, to immediately adjust various doors and vents to prevent the flow of smoke through the mine workings. The colliery manager, Mr. C. F. Jackson, ordered that the ventilation fans should be stopped as these would otherwise have spread the smoke and put the lives of many more miners at risk.

The mine had a telephone system and this was used to warn men in the workings.

As a result of these actions, survivors were able to leave the pit through the ventilation / emergency shaft that was approximately half a mile from the downshaft in which the fire had occurred. Some had to walk up to two miles to the emergency shaft and it was estimated that it took 1 1/2 hours to vacate the mine workings. It was reported that one miner had wrapped a muffler around his face in a successful attempt to limit his inhalation of smoke. Five miners rescued had suffered badly from smoke inhalation and were taken to Coventry and Warwickshire Hospital.

By 2.00 pm it was possible to start the recovery of the fourteen miners who had died; eleven of the fourteen were married and the youngest casualty was a boy of 14. What followed was a typical example of the cohesion and mutual support of the mining community. Reports indicated that 'the strong helped the weak' and many miners came from adjacent collieries to help with the rescue.

News of the tragedy spread quickly and an estimated 200 people gathered at the mine, including worried family members. Newspapers reported on the sad vigil of women awaiting news of their loved ones. The full extent of the disaster was realised by midday, but this could only be confirmed after the escaping miners had been accounted for.

It was reported that several survivors had been traumatised by their experience.

The inquest was hastily arranged to be held at Bedworth Parish Offices for the purpose of formally identifying those who had been killed. Because of the limited extent of the damage, the charred overhead winding gear, it was possible to resume working in the mine within a few days. It was a sad fact that miners were only paid if coal was produced and so they shared the commercial imperative of the mine owners to resume production.

The loss of life in such a close-knit community was especially poignant, as this occurred during the First World War when it was likely that families within this community had experienced more than one bereavement.

The adjourned inquest was resumed at County Hall in Coventry, and reports were read of the evidence given during these proceedings.

The jury decided that the dislocation of the lamp was an accident and that the victims had died from smoke inhalation and carbon monoxide poisoning. They commended the actions of the surviving miners in seeking to help and rescue their colleagues.

It was concluded that the fire would have been far less serious if wooden guides had not been used in the shaft. They recommended that no lights with naked flames should be used in or near upshafts or downshafts.

Very soon after the incident, a relief fund was opened for family dependents and a wide range of donations were made, including from other miners. The local paper even listed the contributions from these businesses, employees and other individuals.

The dependents of those killed claimed and were granted a range of compensation payments by the mine owners.

Funerals were held over four days, including a Sunday, and several local events were postponed on these days.

The recitation of long extracts from the contemporary press and inquest evidence was a challenge to both the speakers and the members and guests, and the talk might have benefitted from some visual representation of the layout of the pit and its shafts and tunnels, together with some photographic evidence. The inclusion of several eyewitnesses' statements, sometimes conflicting as to their opinions about the action of others in responding to the emergency, added a personal interest to the talk.

Local Bedworth historians have been able to contact descendants of thirteen of the fourteen victims, and in September 2015 a memorial to the victims was erected in St. Giles' Meadow, Exhall.

The site of the Exhall pit is now almost totally obliterated by the Bayton Road industrial estate: only a few fragments of original wall remain.

May 2018: Roger Cragg

Marc Isambard - the Other Brunel.

It is, perhaps, invidious to attempt to rank two gifted and trend-setting engineers, especially a father and son, but Roger Cragg gave us a provocative and illuminating portrait of the other Brunel – Sir Marc Isambard – 'The Greater Genius' according to one biographer.

Marc Isambard Brunel was born in Normandy in 1769 he always wanted to be an engineer. After 6 years in the navy he met Sophie Kingdom in Rouen but had to flee revolutionary France for the US leaving her behind. Marc soon showed his twin aptitudes for making friends with influential people and his wide-ranging engineering interests, which included canal design and construction and architecture.

Taking American citizenship in 1796 he was appointed Chief Engineer for New York and became involved in the design of housing and commercial buildings, the redesign of the waterfront and a cannon foundry.

At a dinner hosted by Alexander Hamilton, a close adviser to George Washington, Marc first became aware of the problem of the supply of ship's pulley blocks. In 1799 he resigned and sailed for England with a letter of introduction from Hamilton to Lord Spencer, the Navy Minister.

However, on arrival he first met up with Sophie who had escaped from imprisonment in France and was in London. They married in 1799. In the same year he filed a patent for the 'Polygraph' a duplicate writing and drawing machine before turning his attention to manufacture of ship's blocks.

This brought Marc into contact with Henry Maudsley, one of the leading mechanical engineers of the time. A ship's block comprises four parts: a body, a sheave, a metal 'coak' or bush and an iron pin holding the sheave in the block. Marc designed a series of machines that enabled high volumes to be produced by a small, unskilled workforce.

Maudsley manufactured models of the machines for Marc to use in his negotiations with the authorities. These were helped by his contact with Lord Spencer through whom he was able to demonstrate the working models to the Lords Commissioners of the Admiralty. In 1802 Marc's machinery, built by Maudsley, was approved for Portsmouth dockyard. Unsurprisingly, it took some years to get his money out of the Admiralty.

As an offshoot from the block making project, Marc developed high speed log-sawing machinery which in turn led to the setting up of sawmills at the Portsmouth and Chatham dockyards and a private venture sawmill in Battersea.

In April 1806 Sophie gave birth to their third child, Isambard Kingdom.

A further example of Marc's genius was his recognition of the poor footwear of the soldiers fighting in the Peninsular war. He designed a suite of machines for making army boots which was patented in 1810 and turned out 400 pairs a day.

Seemingly well established, Marc's fortunes nose-dived in 1814 (his business acumen had never matched his engineering abilities) when a fire destroyed the, probably underinsured, Battersea sawmill leaving him hard-pressed by his creditors. His position was made worse when his bankers failed and in 1821 he was arrested for debt and imprisoned.

Happily, Marc's fortunes were restored thanks to an approach by the Tsar of Russia to design a bridge over the Neva. This spurred some of his influential friends to press the government to ensure his continued residence in Britain and a grant of £5,000 allowed his release from prison.

Marc's greatest project, which dominated his life for 17 years, was the Thames Tunnel. There was a great demand for improved crossings of the river. Earlier attempts to drive tunnels from Gravesend to Tilbury and from Rotherhithe to Limehouse had been abandoned but Marc saw things differently.

His observations of the Toredo worm's attacks on ship's hulls led him to conceive a tunnelling shield which would support the excavated tunnel whilst the lining was built. He was granted a patent in 1818 for 'forming drifts and tunnels underground'.

Marc's concept for the Thames was to sink a 50' circular shaft at Rotherhithe from which the tunnel would be driven to Wapping to meet a second shaft. Plans for a 'great descent' to permit wheeled vehicles through the tunnel was never built.

Marc was simultaneously very active in promoting the tunnel and in 1824 a committee was instituted and a subscription list opened and rapidly filled including the Duke of Wellington amongst its members. In an unusually short time, less than six months, an Act was passed for 'Making and Maintaining a Tunnel under the Thames'.

Roger gave us a very full and well-illustrated description of how the shafts were sunk and the shield worked before dealing with the practicalities of the project. Starting in 1825, progress was slow and much less than that needed to complete the tunnel in 3 years. Young Isambard was now assisting the resident engineer whose health soon failed in the foul atmosphere leaving IKB in control.

Water ingress was a constant problem due to the tunnel being too shallow with the river bed close to the top of the shield. In May 1826 the river broke into the workings but luckily no one was drowned. Using a diving bell Isambard with others was able to plug the hole and clear the works but a second breach in July required similar remedial action. The foul air was an ongoing problem causing much illness and several deaths.

In January 1828 there was a more serious flood, 6 men were drowned and IKB had a lucky escape. The river bed was plugged once more and the workings cleared but funds had now run out. A further Act to raise funds was passed but massively under-subscribed. As a result the workforce was laid off and work suspended. The tunnel remained moth-balled for 7 years until the Treasury released funds to allow work to continue using an improved shield designed by Marc and manufactured by Rennie. In November 1841 the shield broke through into the Wapping shaft.

Within 24 hours of the opening ceremony in March 1843, 50,000 people had paid 1 penny to walk through the tunnel and within 15 weeks over 1 million had used it. However, the income was insufficient even to pay the interest on the Treasury loan and no dividend was paid to shareholders. Even Marc (now Sir Marc) only collected £1,000 not the £5,000 promised when the tunnel opened but this was all that the company had!

The tunnel remained used only by pedestrians until purchased by the East London Railway Company in 1865 and extended to unite the Great Eastern and the London, Brighton and South Coast railways. It now forms part of London's underground system and so we can still travel through Sir Marc's greatest work.

Sir Marc survived several strokes before dying in December1849 soon to be followed by Sophie and then Isambard. He was a remarkable man, certainly a great genius or was he the greater genius?

June 2018: Stephen Wass

A Way With Water: Water Resources and the Life of an 18th century Warwickshire Park (Farnborough Hall)

Stephen Wass, after a career in teaching, has latterly turned to industrial archaeology and notably to the technology used in gardens. His talk combined two themes; the need to understand the sense of continuity in a given location and that past engineering achievements were either under-rated or neglected.

His current work with the National Trust on water technology had arisen from doctoral research at Oxford that led to an appreciation of the scale of the activity that had taken place at Farnborough Hall in the past.

First, it is necessary to understand the landscape and here Farnborough is interesting. There is evidence on the site of Mesolithic hunter gatherer activity with plenty of flint tool artefacts but nothing else of note until the early middle ages when a Saxon foundation is probable.

Early archaeological research around the church had revealed open spaces suggesting that buildings had been taken down, possibly, to improve the view from the Hall. The usual demolition detritus of clay pipes and pottery was found.

Further earthworks in the bottom of the valley indicated the possible site of a moated medieval manor house and gardens. A moat probably assisted drainage, was a defensive device and, not least, demonstrated status. Fish ponds, of which there is also evidence, were important to Medieval village life.

Moving forward to Tudor and Stewart times we saw the Manor House relocated to the site of the present Hall and the creation of a small park in the valley with fish ponds, terraces, an enclosure wall and some earthworks. The uses of some of these features is obscure but perhaps to encourage pleasant perambulations in a delightful natural setting.

Nearby, a trackway of unknown date connects the Church with a 'Holy Well' and several water mills are recorded on the stream.

Georgian times saw a huge transformation of the landscape with much water engineering used to create a parkland of pleasure for the benefit of the Holbeach family who had returned from ten years in Italy with classical enthusiasms. These were fulfilled with the help of the gentleman architect Sanderson Miller, of whom more later.

An amphitheatre was created in a loop of the pool. This structure had precedents found at Claremont and Chiswick and most likely was used as a vantage point overlooking the newly dug water feature of the oval lake.

These projects, together with others, show the considerable amount of engineering that was undertaken at Farnborough Hall – not to mention much labour in their creation in the days of shovel and barrow. These works are evidence of conspicuous spending and at a rough estimate, 100 men would have needed 100 days to dig out the lake. This could have occupied the estate workers and others between seed time and harvest.

Throughout the presentation Stephen made good use of early maps overlaid with details of the features being discussed together with careful drawings of the excavations. These were particularly useful in relation to the oval pool which has echoes of the Colosseum in Rome in its shape. It seems to be unique with no similar structure known which begs the question, why?

Another major feature that has been the subject of research and reconstruction is the Cascade which tumbles into the river below the oval pond. With a yew tree behind it has a striking effect and is fed by an inverted siphon. Earlier ideas about its use as a feature on the walk from the Hall to create a romantic atmosphere are now somewhat discounted.

A further example of hydraulic engineering at Farnborough is the Serpentine River running south from the oval pool and shown on old estate maps.

Again, the purpose of this highly engineered and well-constructed feature is far from obvious. It is not navigable and clearly took a lot of work to create. Several sluices with mitred gates are included along its length which contain intermediate stretches of water. It seems to be more than a landscape feature but there are no clues as to its real function.

There are similar examples around the country, including a boat house and angling pavilion on an artificial lake at Enville Hall in Staffordshire and the pond and temple at Chiswick which show leisure pursuits; angling, boating and possible swimming. There is a tantalising picture in a Holbeach scrapbook in the Warwickshire Record Office of the Peerless Pool in London showing swimmers.

The constituents of the serpentine river were in a very poor condition several years ago and have been carefully surveyed and recorded. Again, the illustrations of this work clearly indicated the amount of time and effort that has been put into understanding these unique features of our local industrial heritage.

Whilst sponsored by the Holbeach family the architect and engineer of much of the work was one Sanderson Miller. An unusual character, Miller, who lived at Radway, was more of a social equal than an employee of the numerous local families for whom he created classical follies, towers and arches and, in many cases, water features. He was also a pioneer of the Gothic movement.

Miller worked at Upton House, Wroxton Abbey, Arbury, Honington, Hagley, Wimpole, Sudbury and Enville Halls, Alscot Park and Wotton House.

Other later buildings at Farnborough that have been the subject of attention are the Dairy (with graffiti), the Snob's Tunnel and a Summerhouse above the Cascade.

More recently archaeological work has unearthed fire pits in the amphitheatre which could be the attributed to travellers or tramps, a rock and roll tribute tree on which are carved the names of Eddie Cochran, Duane Eddy and Cliff Richard & the Shadows. An old apple store was the depository for a collection wine bottles of doubtful vintage but no fruit!

Today, The National trust and Natural England are committed to a £500,000 programme of restoration work at Farnborough which will be heavily dependent on a volunteer workforce for logistics, surveying, metal detecting, excavation, photography, historical research and report writing. Progress reports should be available from the National Trust.

Stephen not only revealed much about the engineering ingenuity that was exercised in the pursuit of pleasure of which many may have been unaware but also showed that practical industrial archaeology is alive and well. It was a most entertaining and informative evening on which to end the year's programme.

WARWICKSHIRE Industrial Archaeology Society

WIAS

NEWSLETTER

NUMBER 65 December 2018 **PUBLISHED QUARTERLY**

FROM THE CHAIRMAN

THIRTY YEARS ON - WHERE NEXT FOR WIAS?

September 2018 marked the start of the thirtieth year in the existence of the Warwickshire Industrial Archaeology Society, and, as a follow-up to the AGM, and I felt it might be an appropriate occasion to offer a few thoughts on where the Society might go next.

At the AGM we were able to report a good year for WIAS, with membership and meeting attendances maintained, finances in good order (thanks to the prudent stewardship of treasurer Victor Lobb), plus the successful continuation of the other ingredients that make up the Society - website, database, newsletter and visits.

Thanks were delivered to all those concerned, together with those who act in a voluntary capacity at meetings running bookstalls and serving refreshments. The monthly meeting remains the essence of the Society, both in terms of talks given, but also as a means of contact between kindred spirits, and we are grateful to the membership (and visitors) who support these occasions.

Turning to prospects for the future, I felt it would be appropriate to reinforce some of the elements that contribute to the importance of the industrial heritage in a rapidly changing society. It plays a vital role in the formation of local, regional and national identities, and can be valuable as a source of economic potential, particularly in the creative re-use of industrial buildings. As a subject – as well as giving great pleasure to those who study it – it has the capacity to embrace professional experts and amateur enthusiasts alike, many of whom will have very different skills and experience, with community involvement a real possibility.

As examples of creative re-use, three sites *(see overleaf)* in the city of Wolverhampton were chosen – the conversion of the old GWR Low Level Station, the Chubb Lock-making premises, and the Springfield Brewery. This latter example is of particular interest as some of the remaining buildings are to be converted into premises for the University of Wolverhampton.

The pace of change – and the importance of recording – were illustrated by a brief history of the Websters-Hemmings brickworks *(see overleaf)* in Coventry. WIAS had organised a visit to the site several years ago, and WIAS member Jim Powell, who very sadly died recently, passed on to me some of the slides taken on that occasion. It was a pleasure to be able to show these slides, and it demonstrated how important such recording can be in view of the current conversion of the site to housing.

My interest in – and collection of – named Warwickshire bricks is the source of amusement amongst many, but it is the lasting physical remains of an extractive industry that was very significant in the county. Perhaps there should be a co-ordination of these brick samples from other sources, and a permanent display created – rather than lying in my cellar! Beyond this, there could be a case for the publishing of the research that was carried out by our first Chairman Lyndon Cave (and others) on the brickworks of Warwickshire. Much of the northern part of the county has been covered by Peter Lee and others, but what about the brickworks of the Warwick and Stratford districts and Coventry? Or, narrowing that down, to publish (website or booklet) on individual brickworks e.g. Webster-Hemmings.

So, the work of WIAS continues, but can new ventures be incorporated into the mix? Suggestions might be to work more closely with other groups and societies; to step over the boundary ropes and explore sites slightly further afield (e.g. Birmingham); to expand the interpretation of 'industrial' to include the service sector; and to add an architectural dimension to the recording of sites.

One example of working more closely with other groups has been the project with Leamington History group to record and publish a book on 'The Iron-founders of Royal Leamington Spa in the nineteenth century'. Michael Jeffs, Margaret Rushton, Peter Coulls and myself, ably assisted by the research of Richard King, have almost brought this project to fruition, with the book to be published in the spring of 2019. It has been very interesting to experience the different approaches of the two groups, but we hope the final outcome will be of interest to the membership of both groups and the wider public.

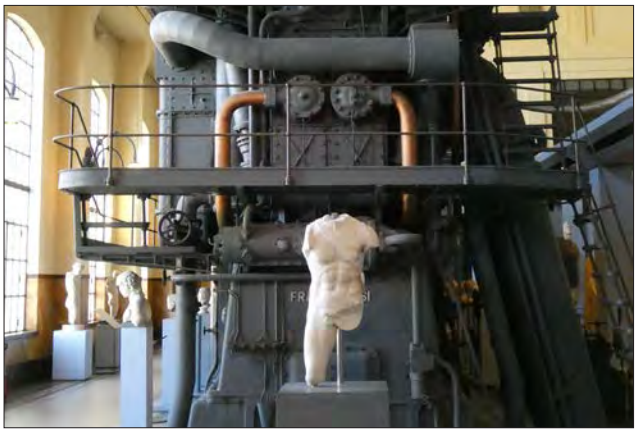
Turning to more controversial areas, might the service sector be incorporated in our studies? Pressure for this come from some of the changes in that sector, particularly the disappearance from the high street of the independent department store, the post office, and the bank. Many of these buildings are of interest architecturally as well, witness the brick and terracotta of the Old Bank (now HSBC) in Stratford upon Avon. No doubt, the steam-buffs and petrol-heads amongst us will recoil at the prospect of looking at such sites, but the thought is worthy of consideration!

PROGRAMME

10 January 2019:Members Evening:
Twenty's Plenty. Short Presentations, each lasting less than twenty minutes.
14 February 2019: David Fry
Forgotten Foleshill.
14 March 2019: Anthony Coulls
The Legacy of the Stockton and Darlington Railway.
11 April 2019: Peter Bolton
Stanley Mills, Perthshire: Textile Milling in Good and Bad Times.
9 May 2019: Rupert Fisher
Birmingham Jewellery Quarter:Real Jewellery for the World and his Wife.
13 June 2019: Chris Barney
The Redditch Needle Industry.

Meeting Reports

Former Chubb Lock and Safe Works, Wolverhampton



The meeting of classical and industrial archaeology at Museo Centrale Montemartini, Rome

Former Springfield Brewery, Wolverhampton

Otto Wagner stations in Vienna: Karlsplatz

Former GWR Wolverhampton Low Level Station

Otto Wagner stations in Vienna: Hofpavilion Schönbrunn

Websters Brickworks, now demolished.
Photograph courtesy of Jim Powell.

Traditions continue at 'De Porceleyne Fles', Delft

November 2018: Martin Green and Alain Foote

Retention in Rome, Restoration in Vienna, Resilience in Delft and The Ferrybridge Centenary.

Unfortunately the planned November Meeting had to be cancelled because the speaker was ill, but the Chairman and Alain Foote stepped into the breach.

This slightly unusual title took us on a journey to three European cities, and an examination of how particular industrial sites had been treated in those cities. First on the agenda was Rome and the destiny of the redundant power station in Ostiense in the south of the city. In the early 1900s, there was a debate locally on the need for a publicly-owned power company to break the monopoly of the existing Anglo-Italian company. A public body was formed, the Azienda Elettrica Municipal (AEM), and a site was chosen between the river Tiber and the Via Ostiense. The site was outside the tax zone, had good transport links and a supply of water from the Tiber, and there was room for potential future expansion. It opened in 1912, with steam turbines as the primary source of power, with diesel engines added later. The plant eventually became obsolete and there followed a long debate about what should happen to this huge site, with a long campaign of RETENTION for the machinery. In 1997, the Musei Capitolini needed a home for sculptures during a re-fit, and it was decided to store them in the power station but as an exhibition 'Machines and the Gods', in the newly named Museo Centrale Montemartini This involved placing the sculptures and mosaics alongside the redundant machinery – a meeting of classical and industrial archaeology *(see opposite)*. The event was so successful it was decided to make it permanent. As a bonus, the oldest surviving rail carriages in Italy – those of Pope Pius IX – were added to the collection in the Museum.

It is very unusual to allocate the design of an entire rail transport system to one architect, but that was the responsibility accorded to Viennese architect Otto Wagner, one of the leaders of the 'Secessionist' movement in Vienna at the turn of the century. The Wiener Stadtbahn was developed 1894-1900, partly elevated, partly on street level, and partly underground. It covered 84 km., with 36 stations and 2 termini, with Wagner and his 70 assistants preparing 2000 drawings for the project. Parts of the system have been retained in the city's current underground rail system. There was a danger of some being lost, but a campaign of RESTORATION brought many elements back to their former glory. The Karlplatz station and the station built specifically for the use of Emperor Karl Joseph at Schönbrunn *(see opposite)* are outstanding examples, although the Emperor only used it once, preferring to travel by horse-drawn carriage to the Palace Schönbrunn. Both externally and internally, they are wonderful examples of successful restoration.

Visitors to Delft are likely to bombarded with potential opportunities to purchase the famous Delft Blue pottery from various retail outlets. What is probably less well known is the history of 'De Porceleyne Fles', its ability to survive huge fluctuations in the prosperity of the industry, and its capacity to develop many different styles and colours over the decades to sustain demand for its products. Founded in 1653, the firm has shown a remarkable RESILIENCE over this very long period of time. Fortunately, the history is recorded in an excellent exhibition at the pottery in Delft, which is combined with the opportunity to see current employees at work *(see opposite)*. In addition, a serving of Dutch apple cake on Blue Delft plates, with tea out of Delft Blue cups, make the perfect end to a visit on a cold winter's afternoon!

Alain Foote attended the recent celebrations for the centenary of the power station at Ferrybridge in Yorkshire. This large complex has had an interesting history, not always as its owners and operators would have wished as Alain's account made clear.

Ferrybridge is where the River Aire is crossed by the Great North Road on a bridge designated a Grade 1 ancient monument. Work on the power station started in 1918 with the purchase of land from the Marquess of Crewe. Construction began in 1924 and the two Brown Boveri 20MW turbo alternators, then the largest in the country, came into service in 1927.

Construction of the Phase 2 extension began in 1937 and came into operation in 1939. Its design followed the original with precautionary structural modifications against air raids. Capacity increased from 40 to 130 MW with two 42.5 MW English Electric turbo alternators built in Rugby. The new boiler house was twice the size of the original and increased coal demand to 330,000 tons a year.

A further 45 MW English Electric turbo alternator installed in 1950, together with additional boilers, increased site capacity to 170 MW. This was further extended in the late 1950s by 300 MW with the construction of Ferrybridge B and planning for a third, much larger plant.

Ferrybridge C, on-stream in 1966, with 2,000 MW was delayed by the collapse of three of its eight 375 ft cooling towers in November gales. A combination of factors was involved but essentially a serious underestimation of wind loadings in the initial design was to blame.

In 1976 Ferrybridge A, the original part, was closed; the turbines removed, and the buildings converted into offices, a training academy and a heavy engineering workshop for the overhaul of power generation equipment that operates to this day.

Ferrybridge B closed in 1992 and Ferrybridge C in 2016 after more than 200,000 hours of generation But a new chapter of renewable generation was already beginning at Ferrybridge.

In July 2015 Ferrybridge Multifuel began operation on the land to the west of the Ferrybridge C site. Multifuel Energy Limited (MEL) is a joint venture between SSE and Wheelabrator Technologies Inc.

The plant can generate around 68 MW of low carbon electricity using a range of fuel sources, including municipal solid waste, commercial and industrial waste and waste wood. The plant takes material from across Yorkshire and the wider region. Phase 2, a second similar plant is now under construction with a planned output of 90 MW.

Earlier this year SSE announced that it is planning to demolish the C station and build a new 2000 MW Combined Cycle Power Station on the site, Ferrybridge D.

Those 100 years have seen many changes at Ferrybridge but electricity generation on the site looks set to continue for some time to come.

October 2018: Robert Eyre
The Healey Project

Healey and Warwick are inseparable. Robert Eyre's comprehensive and informative presentation clearly showed that the important Warwick Healey Motor Company Archive is in good hands and will be a most valuable source of information for motor enthusiasts and industry historians in the future.

The use of source material throughout the presentation, and especially the reminiscences of former employees captured in the oral history project, showed again how important it is to preserve the material that allows a business to be understood by those who never knew it when it was active – and when all physical evidence of factory or workshop has been lost.

We can be doubly thankful that the Healey family wanted this archive to remain in Warwick and that it was possible to raise the necessary funds for its acquisition, in which WIAS played a small part.

Donald Healey was a Cornishman, who had a keen interest in things mechanical, especially cars and aeroplanes. He left school early to join the Sopwith Aeroplane Company where flight testing at Brooklands introduced him to fast and competitive motoring. In 1916 he joined the fledgling RFC as an air mechanic and soon gained his wings. In the Home Defence squadron, he fought zeppelins before a spell instructing. He was invalided out in 1917 after a forced landing whilst flying night bombers in France and finished the war checking aircraft components for the Air Ministry.

Returning to Cornwall he studied automobile engineering (by post and by opening a garage) and developed his interests in electronics and radio (by starting the Perranporth Radio Company making radio receivers).

His reputation as a competitive driver grew and he made important contacts in the developing motor industry. His early successes were in European rallies, most notably a win in the Monte Carlo Rally in 1931 with an Invicta, and also with Triumph and Riley cars.

In 1933 he sold the garage business and moved with his family to Warwickshire to join the Triumph Company, becoming technical director responsible for car designs including the Southern Cross and Dolomite 8.

At the start of WW2 Donald Healey was involved with aero engine carburettors at Triumph before moving to Humber for the development of armoured cars. It was at Humber that he met two key members of the future Healey Motor Company, Ben Bowden (chief body draughtsman) and Achille 'Sammy' Sampietro (previously a chassis designer at Talbot).

The three Healey sons all served with the forces during the war, John, the youngest with the RAF; Geoff, the eldest with the Army in the Middle East and Brian with the Navy, including the Arctic Convoys. Donald himself also served part-time with the Air Training Corps.

Post-war, and whilst still working at Humber, Healey, Bowden and Sampietro spent their weekends designing a small sports car. Healey's contacts with Riley produced the engine and the source of the prototype body. The chassis was built by Healey and Sampietro with occasional help from Geoff when on leave, allegedly using tools designed for cement mixers.

The first production car body was built by Westland Engineering of Hereford and known as the Healey 2.4 or Westland Roadster. Donald Healey left Humber in 1946 to form the Donald Healey Motor Company. Another wartime aircraft business, Elliotts of Reading built the saloon version of the car known as the Healey Elliott. These two cars were the main products until 1950 and examples are still running today.

The cement mixer anecdote is supported by the fact that Healey rented space from Benford Ltd (who made cement mixers) in the Cape area of Warwick. Later an ex-RAF hanger was acquired and the site developed into the Cape works where all the 'Warwick Healeys' were developed. Most of those buildings have now gone but an Austin Healey restoration business is, today, on the same site in Lock Lane.

The more sporting Healey Silverstone and a refined 4 seat saloon by Tickford replaced the earlier models and a search for a larger American engine to replace the Riley unit led to a chance meeting on a trans-Atlantic liner with the head of the Nash Kelvinator Corporation and the Nash Healey. Nash provided engines, a much-needed cash injection and access to the US market, where all the Nash Healeys went until the 1954 US recession ended their sales.

But by this time, Donald Healey and his team (strengthened by Gerry Coker as body engineer and Barry Bilbie as chassis designer) had their sights on a much more ambitious project. A faster, lighter and less expensive sports car powered by an Austin engine originally developed for that company's ill-fated A90 Atlantic convertible.

The Healey 100 (for 100 mph) with prototype bodywork by Tickford was first shown at the 1952 Motor Show. An instant success story, with the legendary deal struck in a day with Leonard Lord, the BMC chairman, to put the car into mass production that is now a part of motoring history. And a major export success story with over 80% of sales in the USA.

The subsequent history of the Austin Healeys through the muscular 100-six and 3000 is well known. Continuing export sales of the 'Big Healeys' (reaching 90% by the 1960s) were bolstered by an active competition programme, especially in the gruelling long-distance European rallies which brought fame to many drivers. Competitive activities over many years had also included high speed records at Bonneville which boosted the cars' image in the USA.

The Frog-eyed Sprites and later Spridgets launched in 1958 to meet the need for a smaller, lower cost fun sports car were much loved and enjoyed many competition successes.

In 1963 the Cape Road site was sold, and the Company moved management, sales and competition activities to the former cinema in Coten End, since demolished and now a retirement home. The demolition on 13 January 1988 strangely coincided with Donald Healey's death in Cornwall.

Whilst cars were Donald Healey's foremost interest the Company tried some diversification into sporting boats for water-skiing and experiments with wind power generation.

The upheavals in the British motor industry and US regulations ended production of Austin Healeys in 1968. An association with the main US distributor attempted to revive the brand with the Jensen Healey coincided with the 1973 oil crisis. This, plus labour problems coupled to component shortages and inflation led to closure in 1976.

The Healey archive at the CRO is now catalogued and can be found online within 'Warwickshire's Past Unlocked' on the WCRO website and any additional material or contributions to the oral history project will be welcomed.

WARWICKSHIRE WIAS
Industrial Archaeology Society

NUMBER 66 March 2019 **PUBLISHED QUARTERLY**

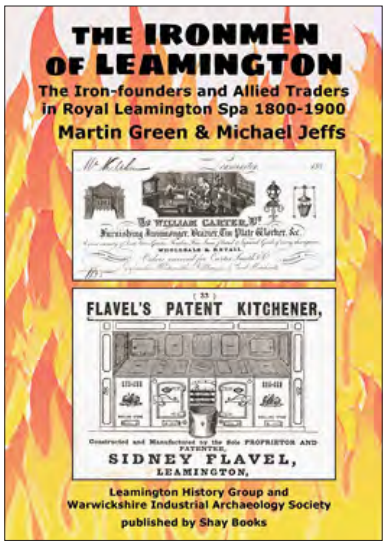
NEWSLETTER

FROM THE CHAIRMAN

Going into print

Initial enthusiasm quickly dampened, a long hard slog in the middle, and an ever-advancing finishing line disappearing into the distance ... Not some sort of Orwellian nightmare but an accurate description of the challenging experience of seeking to produce a book for the very first time. Newsletters, online articles and Facebook entries hardly prepare one for the demands of publishing a 200-page book.

Of all the aspects of WIAS's efforts over the years, the one area where we have not been prolific has been in the field of publishing. This has been fully compensated by the other aspects of our work, and of course the one feature that does have a long history is the publication of this Newsletter – the main piece of evidence documenting the work of the Society over time. We continue to be enormously grateful to the editor Mike Hurn for maintaining this record.



The Society has produced several 'Occasional Papers' over the years – Arthur Astrop on 'The Rise and Fall of Coventry's Machine Tool Industry'; John Willock on 'The Rise and Fall of Coventry's Airframe Industry' as well as 'The Stone Pipe Company of Guiting Power, Gloucestershire 1805-1815'; and a number of papers and pamphlets from John Brace on a range of topics, many water-related. Peter Chater also produced a series of 'Industrial Walks' in Warwickshire, using his encyclopaedic knowledge to telling effect. Of course, WIAS members have written for other organisations and publishers, but the specifically WIAS publications have been on a modest scale.

The advent of the internet would seem to make the case for fewer hard copies of publications, with information easily deposited for viewing by the largest possible audience. So a decision - in combination with the Leamington History Group - to publish a book was a brave step. The topic was 'The Iron-founders of Leamington Spa' and followed research by myself, Michael Jeffs, Margaret Rushton and Peter Coulls. Members Richard King and Dr. Richard Williams also made significant contributions, as did the photography collection of Derek Billings.

More than this, what it did was to enable much of the research carried out by members who are sadly no longer with us –Lyndon (Toby) Cave, John Selby and Peter Chater – to be transferred into a manageable format. Boxes containing hand-written notes, bundles of old-style printer paper pushed out on some of the early computer systems, and even collections of that mainstay of research in earlier years - the record card, could be sifted, checked for accuracy, and placed into a spread-sheet that was to prove the bedrock of the material we unearthed.

So the eventual publication is a reflection of more than just the efforts of the research group and we hope members will feel that the effort has been worthwhile. What may not be evident will be some of the tribulations we had to face in the process - the breaking of the budgetary constraints, the differing approaches of authors, the choice of illustrations, the trade-off between deadline dates and the quest for perfection all reared their ugly heads on more than one occasion.

Eventually, however, the book emerged and it will soon be on sale. Needless to say, no home should be without one! An additional bonus, of course, is that WIAS will now have something to advertise the work of the Society, with book sales available at Exhibitions, Conferences etc. It also fulfils one of the basic functions of the Society – to promote the research into and publication of aspects of Warwickshire's industrial heritage.

PROGRAMME

14 March 2019: Anthony Coulls
The Legacy of the Stockton and Darlington Railway.
11 April 2019: Peter Bolton
Stanley Mills, Perthshire: Textile Milling in Good and Bad Times.
9 May 2019: Rupert Fisher
Birmingham Jewellery Quarter:Real Jewellery for the World and his Wife.
13 June 2019: Chris Barney
The Redditch Needle Industry.
12 September 2019:
AGM and Chairman's Lecture.
10 October 2019: Peter Coulls and Alan Jennings
The Warwick and Leamington Tramways.

Meeting Reports

December 2018: Roy Smart

Another Icarus: The Rise and Fall of Percy Pilcher and the Art of Flying.

Roy Smart is an ex Fleet Air Arm pilot with wide ranging interests outside of aviation. He is also a powerful speaker who had a different approach to Industrial Archaeology from some of our other visitors.

Those who were expecting to learn about early attempts at heavier than air flight, whilst ultimately well satisfied, might have wondered at the musical travelogue opening and the excursion into art history that followed. Perhaps the clue was in the sub-title of the talk; the art of flying.

The island of Crete, the labyrinth, Daedalus and Icarus's escape were followed by contemporary politicians (and their spouses) and the West's penchant for turning away from disaster elsewhere in the world.

However, we then moved to Stamford Hall, near Lutterworth and the scene of Percy Pilcher's fatal flight on a stormy September day in 1899. Pilcher's friendship with the Hon Adrian Verney-Cave, heir to Lord Braye, then owner of Stanford, had led to Pilcher using the Hall as a base for his experiments with flying machines.

Percy Sinclair Pilcher was a prolific inventor and pioneer aviator. He was born in Bath in 1866. On the death of his father his mother took her young family to live in Germany where she also died. Aged thirteen, Pilcher returned to England and a place aboard HMS Britannia, with a sea-going career ahead of him.

This career was short-lived, aged twenty he resigned from the Navy with no money or career but apparently determined to pursue his dreams of flight with which he had been obsessed from childhood.

There are plenty of examples of flight in mythology which probably spurred man to attempt emulation. From hot air balloons and man-carrying kites to Reichelt's fatal attempt to fly from the Eiffel Tower we moved, via another flight of fancy, to Sir George Caley, 'the father of aerial navigation', who explored the mathematical principles behind flight and Otto Lilienthal's experiments from his man-made hill in Germany. These pioneers established the need for control of lift and lateral stability if safe untethered flight was to be achieved.

By now, Pilcher 'a pale serious fellow with a razor-sharp brain', was an apprentice in a shipyard on the Clyde and working with the University of Glasgow testing ship's hull contours. Living with his sister Ellen, they were a popular and sociable couple.

During his naval career and on the Clyde, Pilcher would have had plenty of opportunity for studying the flight of birds, especially when soaring or gliding. Pilcher's inventiveness led to a substantial number of patented inventions. Notably in the fields of signalling, captive balloons and kites and soaring machines. He also had an extensive correspondence with Lilienthal whom he visited to see his experiments at first hand.

Ellen's sewing skills were employed in the construction of Pilcher's first machine, the 'Bat'. This machine followed Lilienthal's method of control by the pilot shifting his body weight in counter-intuitive movements. A major problem was that the pilot's legs dangled below the machine which had a landing speed of some 25 mph!

Studies of birds landing by flaring out and effectively stalling were instructive but difficult if not impossible to replicate with the control technology available. Nonetheless, Pilcher made his first flight at Cardross in June 1895. An initial crash was followed by a flight of some 50 yards, three feet off the ground and lasted for 10 seconds.

This success led Pilcher to consider powered flight although many were expressing concern for his safety as he appeared to be heedless of the risks he was running. He certainly seemed to have no sense of fear and ignored all thoughts of possible consequences from a fall. These concerns grew after Lilienthal's death in an accident.

The unsolved problem remained the inherent instability of an aircraft with no control surfaces that the pilot could use effectively. Pilcher's experiments were also much hindered by a lack of funding. Pilcher used public demonstrations to generate public interest and, hopefully, financial contributions.

In 1897, in a demonstration to scientists and the press, Pilcher attained an altitude of some 70 feet, and generated useful coverage in the influential *Pall Mall Gazette*. There was also the occasion of the first flight by a woman in a heavier than air machine by Pilcher's cousin Dorothy Rose.

Pilcher's friendship with Adrian Verney-Cave then led to the move to Stanford Hall. Pilcher had built two other gliders after the Bat and a fourth, the Hawk with which he set a new world distance record of 250 metres in the grounds of Stanford Hall.

At the same time Pilcher began collaborating with Walter Wilson, an Irish engineer with a similar naval background, on several projects. First, to produce a small light powerplant for an experimental tri-plane being developed by Pilcher in 1898, well before the Wright Brothers efforts in the USA. Another was the Wilson-Pilcher motor car. In each case the engine had a flat cylinder configuration. The car, which contained many innovative features, was not produced until after Pilcher's death but retained his name. Wilson went on to be the co-inventor of the tank in WW1 and later the self-changing gearbox that bears his name.

The tri-plane concept arose from the need to generate more lift to cope with the extra weight of the engine and ancillaries. The vicious circle of more weight needing a larger wing leading to yet more weight was broken by an American pioneer Octave Chanute who proposed stacking two or three wings one atop of the other to generate greater lift without a weight penalty.

With the triplane and engine complete, Pilcher planned a demonstration at Stanford Hall on 30 September 1899. However, a broken crankshaft prevented a powered flight, which would have been the world's first. Not wanting to disappoint, and on a wet day, Pilcher eventually took off in the Hawk. The launch used horse traction with a Dutchman's purchase giving a 5:1 advantage. During the launch the Hawk's tail collapsed, plunging Pilcher 60 feet to the ground. His legs were broken but he was alive. Sadly, he died two days later at the age of 32. The inquest returned a verdict of accidental death and the comment that 'he lost his life perfecting what might have been of some use to the world'. However, Pilcher's pioneering achievements were soon overshadowed by the Wrights and he slipped into obscurity.

In 2003, the BBC Horizon programme commissioned research work at Cranfield University into Pilcher's design which showed that it was more or less workable and had he been able to develop an engine he would probably have been the first to fly a heavier-than-air machine with some degree of control. A Cranfield-built replica incorporated wing warping controls as a safety measure and flew successfully in a sustained flight of 1 minute and 25 seconds compared with the Wright's 59 seconds. Surely vindication of Pilcher as a great pioneer of aviation.

Memorials to Pilcher are to be found at Eynsford in Kent, where he made many of his early flights, and at Stanford Hall.

January 2019: Members' Evening

Twenty's Plenty.

Chris Barney, who usually reports on the AIA Conferences, opened an informative and thought-provoking evening with a review of the restoration projects that the AIA has sponsored. Starting in 2009, this work was initially made possible by an anonymous donation of £30,000 with the possibility of future contributions to follow.

In the first year four projects were sanctioned, and the subsequent publicity led to further requests. Usually, a contribution of up to £20,000 can be made if this is a major part of the project cost.

The original benefactor has, to date, donated £80,000, which also benefits from Gift Aid relief, and a total of over £500,000 has been raised for a wide variety of projects including boats, mills, buildings and machinery.

In 2018 there were 27 applications of which 8 were chosen. These were:

A 1951 Morrison's electric coal lorry at the Ipswich Transport Museum (£7,000).

The unique roof structure at Sudbury Gasworks (£15,500).

Murgatroyd's Brine Pumps for the Middlewich Heritage Trust (£17,000).

The 1877 Horse Tram Cabmans' Shelter at the National Tramway Museum, Crich (£20,000).

The Gas House, Economiser House and Barn at Coldharbour Mill, Devon (£20,000).

The Gothick Pumphouse and Waterwheel at Croft Castle, Herefordshire (£20,000).

A 1947 Leyland Bus at the South Yorks Transport Museum (£10,000).

A 1910 Clark Chapman vertical steam winch at the Hollycombe Working Steam Museum, Liphook (£19,600).

These and the earlier projects greatly enhance our industrial heritage.

George Sayell took us away from Warwickshire to the Norfolk village of Dersingham near to Sandringham and the arcane subject of the duck decoy, elaborate structures around a pond used for many years to trap migrating birds for food and commercial exploitation.

George used a 16th century illustration supplemented a local magazine *'Village Voice'* and an 1886 book by Payne-Gallwey on *'the construction, management and history of Duck Decoys'* to generally describe the Dersingham 5-Pipe decoy, built in 1820, and its operation. Tame ducks were trained to lead their wild brethren into the pipes and subsequent capture. Simple and efficient with no damage to the prey. The Decoy remained in operation until 1870.

Being in the neighbourhood, a site visit was needed after Google Earth clearly showed some evidence of the Decoy's existence. There were the usual site difficulties of fences, notices and gates but undeterred George pressed on and found a surprising amount of 'industrial archaeology'. Not only the clear evidence for the existence of the 'pipes' but notably the remains of the iron hoops in reducing sizes that had supported the netting above them. Now all recorded and an example of how a primitive food gathering activity developed into an efficient and profitable cottage industry coincidental with the Industrial Revolution.

If not, strictly speaking, industrial archaeology, **John Berkeley's** contribution, liberally illustrated with contemporary photographs, both entertained and educated in equal measure.

Following Hitler's invasion of the Sudetenland/ Czechoslovakia substantial numbers of the Czech army fled the country; some West to join the French Foreign Legion, others East via Bulgaria, the Black Sea and Palestine to the South of France where some 5,000 joined the French Army. The latter marched North but by the time they reached Paris all was over. Retreating again this group was eventually evacuated by the British and came to Warwickshire.

In Leamington Spa Harrington House, now the Spa Centre, became their HQ. Detachments were located in many surrounding villages and country mansions. Winston and Clementine Churchill visited the contingent at Walton Hall and a government official commented elsewhere that it was not possible to tell the differences in rank amongst the Czechs.

However, they soon made themselves at home. Within a month a concert was held in the Regent Cinema and there was a weekly dance at the Parthenon in Bath Street. Any aircraft that crashed locally was usually guarded by a detachment of Czech soldiers.

The Czech soldiers who came to Warwickshire are not forgotten. There are several memorials, most notably the 1968 fountain in Jephson Gardens, now restored, where a wreath is laid annually.

Alain Foote's runs ashore in Tallinn and Riga whilst on a Baltic cruise produced two unexpected examples of industrial archaeology. The Tallinn Energy Discovery Centre is housed in the former Tallinn power station, which curiously retains a gas holder very reminiscent of our one in Warwick.

The power station, opened in 1924, was the first plant in the world to run on shale oil. Blown up in 1941 by retreating Russian troops but rebuilt in 1949, today it is used as a science centre, primarily for children, with many interactive displays using elements of the old machinery and other installations. Well sectioned machinery and a 'hot bulb' engine are highlights.

In Riga, an indoor market is housed in a structure created from two old German Zeppelin hangars. 787 feet long, the market covers some 778,000 Ft^2 and is home to more than 3,000 stalls. All the elements of the structure are exposed to view although most eyes will be on the huge variety of merchandise on sale below.

Martin Green visited Ironbridge to see the newly restored bridge celebrate its 240th anniversary. We have become used to Martin's superb photo essays recording so much of our industrial heritage, but this was a masterclass. Sunshine was a bonus but his patience in waiting for the right shot without intrusive people was remarkable. So too was the blend of long shot with detailed closeup. The Ironbridge is an icon for the industrial archaeologist and its restoration has now been worthily recorded.

Peter Coulls concluded the evening with a selection of serendipitous discoveries made at National Trust properties.

Wicken Fen has a relocated windmill, formerly used for drainage to allow turf digging, and the remains of a brick kiln and the brickmaker's cottage.

Anglesey Abbey has an unusual mill. The Lode Mill was originally a corn mill which was converted to grind cement from clinker produced in on-site bottle kilns. After lying unused for many years, it has been converted back to grinding corn.

At Acorn Bank can be found the remains of a black powder explosive store connected with a gypsum mine and a watermill having an unusual, if not unique, triple-wheel configuration.

Aberdulais boasts the largest (27 ft dia.) waterwheel producing hydro-electric power. The well-preserved site also includes evidence of copper working, fulling and corn milling and a tin-plate works.

February 2019: David Fry
Forgotten Foleshill

David Fry has an infectious enthusiasm for Coventry's past which he conveys through deeply researched material illustrated from a remarkable collection of old postcards. Indeed, it seems curious to us today that so much of ordinary, everyday life was recorded during the early days of photography and preserved as a postcard – unlike today's ephemeral digital images. David last spoke to the Society in January 2014. See Newsletter No. 51 for further comments on this early use of photography.

Forgotten Foleshill traced the development of Coventry's largest parish. It lies to the North of the city with the Foleshill Road, which starts South of its boundary, running up the spine and Stoney Stanton Road to the East providing the main arteries, later supplemented with a canal and railway. Early maps overlaid with information were very helpful to understanding the pattern of growth.

The parish measures some 4 miles by 3, it is open with no centre but comprises many hamlets; two Heaths, five Greens, two Fords a 'Bury and a Paradise. Pre-1700 agriculture with a little mining was the principle activity. From 1700 to 1890 ribbon weaving dominated to be superseded by factories for a variety of industries up to the present day.

Lower Foleshill lies South of the parish but the early industrial development was in Bishopsgate Green, the area between the Foleshill Road and the canal South of Cash's works. Memorable names included: The Standard, Daimler and Riley Motor Cos., O'Brien's Cycles and Coventry Eagle, together with other smaller works (many cycle makers) and a run of old ribbon weaver's cottages. On the west bank of the canal was Coventry Power Station.

Why did Foleshill become Coventry's main industrial suburb? Another useful map showed how the old city centre was largely surrounded by Lammas lands and commons leaving only a corridor to the North open. Fortunately, the turnpiked Foleshill and Stoney Stanton roads and then the Coventry canal and railway provided the necessary transport links to support industrial development. And in the case of stretches of the canal, additional allotments for the residents.

As well as the larger businesses that were established, there were considerable opportunities for supporting services. These ranged through wharfs, warehousing and boat-building to retail outlets and especially pubs. Some of these activities remain to this day.

Turning to the railways, Foleshill once boasted two lines. In 1851 the Coventry to Nuneaton line opened joined in 1914 by the Coventry/Gosford loop. There were also a number of industrial lines serving individual factories including; Webster Brick & Tile, Courtaulds, The Ordnance works, Longford gas works and Longford power station. Pictures from the *Coventry Graphic* showed what a useful additional source of information was this publication.

As might be expected, the population grew substantially. From 3,000 in 1801 (600 houses, up from 150 in 1700) to 7,000 in 1831 (1,500 houses). The population remained at this level until 18881 and then grew slowly to 8,700 in 1891. In 2011 it totalled some 20,000.

During the 18th and early 19th centuries the main industrial activity was silk ribbon weaving in the home using a single hand loom. An example of such a loom can be seen in the Herbert Museum and a contemporary photograph showed a weaver at work in (probably, because a wooden floor is shown) an upstairs room in a cottage.

Another evocative illustration was of a complete workshop where a handloom was complemented by spinning wheels and other machinery used for sorting the skeins of silk onto the quills. The floor of the workshop was tiled and so a ground floor, not a top shop as shown above.

The 1851 Board of Health map (another useful tool for the industrial archaeologist) shows development just off the new Stoney Stanton road. Again, postcards show a larger type of topshop on Harnall Lane West suitable for engine or Dutch engine looms. Expansion of the industry came from 'engine factories' where one engine powered several units.

Another most useful source of information has been photographs taken by the Coventry City Architects Department prior to the demolition of properties in the Parting of the Heaths area. These show the rear elevations that would have been inaccessible to the general public.

Coventry has seen many industries develop, thrive and then die. In the 1860s a decline in the demand for ribbons led to diversification exemplified by Cash's move into 'frillings' for children's dresses and name tapes and the development in Middle Foleshill of the Courtaulds operations with the advent of synthetic fibres. Views of Foleshill Road/Lockhurst Lane in were interesting for the trams needed by an expanding workforce. And, of course, for the mighty chimney that dominated the skyline for many years.

The *Coventry Evening Telegraph of 21 August 1947* is worth quoting at length:

"The present generation will scarcely believe that it was a real old country road with meadows on either side bordered with high hedges and tall trees from Cash's Lane to Little Heath.

What a picture in May and June, the hedges covered with hawthorn blossom with the wild rose and honeysuckle and crab apple blossom all along the highway.

One could stand at the General Wolfe and look north and south for a straight mile, the entire view being pleasant country".

Returning to Middle Foleshill, the development of the Great Heath Estate allowed David to show aspects of domestic and manufacturing enterprise. Frisby's Bakery used a Morrison Electric delivery van and the nascent motor industry was represented by Van Raden (electric ignition manufacturers) and Payne & Bates Motor Engineers.

Moving North to Little Heath and Longford we saw views of the large gas holders at the Longford Gas Works, Alfred Herbert's Edgwick Works (the largest machine tool factory in the UK and illustrated with the late Arthur Astrop's sketched layout) and Courtauld's Little Heath works (the largest rayon manufacturing operation in the UK). A political note was struck with a visit in 1948 by Hugh Gaitskell, then Minister of Fuel and Power, accompanied by City dignitaries.

Finally, David followed the developments along the Stoney Stanton Road. Two tram depots were located in Foleshill, at Priestley's Bridge and at the junction with Lythall's Lane. The Ordnance factory in Red Lane was important and pictorially well recorded. Aviation fans were intrigued by the unsuccessful Ordnance Aeroplane and 'boy's toys' were provided by the large naval guns being transported by rail. Ironically, a substantial extension to the factory was built by a German contractor just prior to WW1.

Postcards are not simply utilitarian, in David's hands they bring forgotten Coventry to life.

WARWICKSHIRE Industrial Archaeology Society

WIAS

NEWSLETTER

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FROM THE CHAIRMAN

A new season is upon us and the programme of meetings for 2019-2020 is listed below. The programme seeks to satisfy the wide range of interests that exist within the society, and is fairly liberal in its interpretation of 'industrial heritage'.

As the Chairman's report to the AGM will reveal we continue to have well-attended meetings – well in excess of those achieved by similar societies – and we hope that we can continue this into the coming season. The February meeting provides an opportunity for members to make their own short presentations - always an enjoyable evening with an often surprising range of interests revealed.

One such presentation from past Members' evenings was by Peter Stanworth on the water tower in his garden. The tower was constructed in the 1930s, but had not been used for about 70 years, and problems over falling pieces of concrete persuaded Peter that he needed to take remedial action. Not many societies will have members with such a garden feature, and, faced with a demolition cost of at least £40,000, Peter decided to convert the water tower to a holiday let. Under the headline 'The Quirkier the Better for Britain's Staycationers', The Daily Telegraph of Saturday 29 June 2019 featured this conversion. I must admit that when I first heard of his plans, my reaction was one of rather cautious optimism, but, after a few false starts, a really imaginative design by local architect Martin Smith has seen the project come to fruition. The result is stunning and a wonderful example of adaptive re-use of an industrial building.

Fortunately, the possibilities raised by adaptive re-use seem to be higher on the agenda for developers than in earlier decades where the wrecker's ball held sway. Adaptive re-use seems to have become the focus of much of the current effort in the preservation of the industrial heritage. So few sites/buildings can survive as industrial museums (with a commercial viability) and the alternative can easily lie with adaptive re-use. The Association for Industrial Archaeology is very much at the forefront of this movement, and has an annual award for the best adaptive re-use building in the UK. The 2019 award went to The Engine Shed, University of Northampton Students' Union. It is a Grade II listed building and had been unused for over 15 years. The Midland Railway operated the building as a running shed to service steam locomotives on the Northampton to Bedford Line, later used by the LMS, and then by British Rail Engineering, as a workshop. It closed in 1998 and remained empty and vandalised until bought by the University in 2014. The project has ensured a viable, and productive use, for the Engine Shed as the new Students' Union, an iconic element of the Waterside Campus site of the University of Northampton. Let's hope that at least some students – whilst they sip their coffee and mull over the post-Brexit world – might be inspired to investigate the heritage of the building and the associated railway system!

Both these projects are relatively small-scale. Larger sites often carry more problematic issues, not least in terms of cost. Historic England has been much involved exploring the issues raised by the adaptation of old industrial buildings, including the Lancashire textile industry. It commissioned Oxford Archaeology North to carry out a survey - 'The Textile Mills of Lancashire: the Legacy' - and this can be downloaded from the Historic England website https://historicengland.org.uk. There are a number of other publications on this website that will be of interest as well. One of the mills considered is Holmes Mill in Clitheroe which has been converted into hotel, bistro, brewery and food hall – with a cinema to come – but with the retention of some of the redundant textile machinery. I had the pleasure of staying at the hotel recently, and sipping local Bowland craft beer surrounded by a Clayton and Goodfellow Cross-Compound Engine of 1910-1911!

Moreover, adaptive re-use is not simply a UK feature – a quick browse on the internet reveals examples throughout the world of adaptive re-use planned or enacted. It would be good to hear from members of any buildings they come across – at home or abroad - that have demonstrated how an industrial building might be adapted for an alternative use.

PROGRAMME

12 September 2019:
AGM and Chairman's Lecture.
10 October 2019: Peter Coulls and Alan Jennings
The Warwick and Leamington Tramways.
14 November 2019: Brian Ellis
The Geological Background to Warwickshire's Industrial Activity.
12 December 2019: Ian Pogson
The Life and Engineering Achievements of Dr. Frederick Lanchester.
9 January 2020: David Skillen
Giants in the Sky - the Zeppelin in WW1.
13 February 2020: Members' Evening
Twenty's Plenty.
12 March 2020: Ian Whittle
The Life and Work of Sir Frank Whittle.
9 April 2020: Paul Rabbitts
Bandstands - History, Decline and Revival.
14 May 2020: Mike Bunn
Fetch the Engines: a History of the Warwickshire Fire Service.
11 June 2020: Peter Hoath
A View of Computing History - 2,000 Years in 60 Minutes.

Meeting Reports

March 2019: Anthony Coulls

A String of Pearls - The Legacy of the Stockton and Darlington Railway.

A talk by Anthony Coulls always contains some gems and 'a string of pearls' was no exception. The Stockton and Darlington Railway is part of the DNA of Industrial Archaeologists and this review of the present evidence for its existence 190 years on added to our knowledge.

In 1825 the history of wheeled vehicles running on rails was some 220 years old. However, the S & D R was a seminal moment in that it combined all the former elements with the game changing introduction of the steam powered locomotive.

The S & D R was born out of the South West Durham coalfield around Bishop Auckland. Traditionally, pack horses with panniers had carried the coal to the ports of Teesside but after the journey often only rubble and dust remained much reducing its value.

Elsewhere in the country canals had resolved the bulk transportation problem but although proposals, including one by John Rennie, had been put forward for South West Durham, none were pursued. Welsh engineer George Overton advised using a tramway and surveyed a route from the Etherley and Witton collieries to Shildon and thence north of Darlington to Stockton. The proposal was supported by the Quaker Edward Pease and well backed but failed due to opposition from land-owners.

There were plenty of short tramways operational in England but following the failed proposal Pease and his moneyed friends in Darlington, notably Jonathon Backhouse, thought a steam locomotive should be considered and sought the advice of George Stephenson. Stephenson and his son Robert surveyed a route, in part following Overton, in six weeks with a view to using steam power. Thus, the S & D R would be the first public railway designed from the outset to use steam.

Whilst the route from Shildon via Darlington to Stockton is mainly level, the Witton Park colliery is located in hilly country. Stephenson's plans for this part of the route used inclined rope-worked tramways, locomotives were never envisaged. Shildon would be the junction of the two systems.

There is, surprisingly, considerable remaining evidence of the tramway but very little of the collieries which were worked out by 1853 when the tramways were abandoned. Today, Witton Park Farm lies in peaceful, rolling hills but nearby can be found evidence of the track and infrastructure.

At the bottom of the descent from Witton is Phoenix Row a run of cottages on the gable end of which are the witness marks of a tallyman's hut.

Beyond Phoenix Row the substantial earthwork of the Everley incline can be followed up to the site of the engine house which was demolished in 1975. The engineman from 1825 was Thomas Greener, who was acquainted with George Stephenson. When Stephenson was made chief engineer he brought Greener with him to lay the rails. Greener commenced his work at Stockton in May 1822 and then moved to Etherley. Once the line was opened for traffic, Greener was appointed engineer in charge of the engine at Etherley. Accomplished in arts and crafts, he made a model of the tramway and engine which is still in working order.

He was replaced at Etherley by his brother John in 1826. John was prominent amongst the local Methodists and often spoke on the Bishop Auckland circuit. He also taught several working men to read. He accidentally fell under one of the beams of the engine when it was in motion in 1843. The engine house soon ceased working. Perhaps Greener's death was a factor in its closure. The engineman's house survived until the 1980s, remaining in use and belonging to the S & D R, with its distinctive number plaque H5.

The track leads to the site of the important bridge over the River Gaunless. Only the abutments remain of what was the earliest iron railway bridge in the world. Fortunately, the bridge itself can now be seen in the National Railway Museum in York.

Beyond the Gaunless comes the Brusselton incline, now a scheduled ancient monument and much restored by an active community group. The stone sleeper blocks for much of the incline have been exposed, rising to the remains of the engine house and the few pit houses remaining after the removal of the village in the 1950s under Schedule D authority. Thence the tramway drops to near Shildon where it meets the railway proper and a simple obelisk carries the brief inscription*: 'Near this site the Stockton and Darlington Railway Company on the 27th September 1825 ran the first passenger train drawn by a steam engine'.*

Shildon was the first 'railway town' and a template for those that followed such as Swindon. It is a fitting site for the present Railway Museum.

From Shildon to Stockton the present railway follows the line of the original. Consequently, there is little or no evidence of the track but there are a number of 'Pearls' along the route.

The first is the house occupied by Timothy Hackworth. Hackworth, a devout Methodist, was the manager who made Stephenson's locomotives reliable and pioneered many subsequent railway practices. He notably introduced the spring-loaded safety valve that prevented abuse by press-on drivers.

Just outside the museum is the Soho Shed, a former ware-house built with a Roman-style hypocaust, subsequently bought by the railway and used as a paint-shop.

Heighington Station is now the Locomotion One public house. It was here that the engine 'Locomotion' was first put onto rails and run under its own power.

Further on we come to Darlington's North Road Station which now houses a Museum for the S & D R. Nearby are several other later buildings.

Also here are the Hopetown Carriage Works, used for the manufacture and maintenance of railway carriages; in the early days using techniques found in contemporary Stage Coaches. On the other side of the North Road lies the Goods Shed now used for the restoration of rolling stock by the S & D R Preservation Society. A substantial area of open grassland adjacent to the Carriage Works is heavily contaminated and so safe, for the time being, from development. Perhaps not so safe are other original buildings such as a run of lime cells, currently up for sale.

The last major feature before the Fighting Cocks Inn is the now restored bridge over the River Skerne built in in a Georgian classical architectural style.

At Stockton, alongside an old railway building, a slightly more elaborate memorial than at Shildon has a family group waving farewell whilst a 45-year-old panel for the Stockton Railway Heritage Trail marks the Tees-side wharf where the line ended.

Indeed, a string of pearls well worth remembering.

April 2019: Peter Bolton

Stanley Mills, Perthshire: Textile Milling in Good and Bad Times.

Peter Bolton's review of Stanley Mills in Perthshire (1784-7) added to the remarkable list of substantial manufacturing enterprises, already brought to our notice, which were initiated at the end of the 18th century and which flourished at a time of revolutions and international war. These manufactories were often located in previously rural locations but possessing a workforce, waterpower and the possibility of transport links to the outside world.

Similar textile operations include Arkwright's Cromford Mill (1783), Greg's Quarry Bank Mill (1784), Dale's New Lanark (1786) and Catrine (1787) Mills. Other more local examples are the Stone Pipe Company at Guiting Power and the Parkes, Crompton and Brookhouse worsted spinning mill in Warwick.

Stanley Mills, whose sheer scale still astounds the visitor, are located some 5 miles North of Perth in pastoral countryside on the banks of the River Tay. The river initially supplied both power and transport. The former later came from a gas engine but steam was never used at Stanley.

It is strange that a cotton mill was established in the relatively dry climate of eastern Scotland compared with one on the island of Arran which enjoyed five times the rainfall. Furthermore, the nearest east coast port, Glasgow, was at least a five-day journey for the mule trains bringing raw materials in the early days.

As with many other enterprises in the early days of the Industrial Revolution, Stanley Mills owed its existence to an aristocratic landowner seeking to improve the return on his capital. The Fourth Duke of Athol was such a man. One attempt at diversification, planting spruce trees, failed when the Napoleonic wars ended and with them the demand for such timber.

Another project involved the removal of the village of Old Blair which obstructed the 'tidying up' the landscape around the family castle. The inhabitants were offered land at Stanley where the factory was soon to be established. If the factory should fail, those thrown out of work would be dependant on the ratepayer funded poor law. Since the Duke was the principal rate payer there was an incentive for the project to succeed.

The Duke was not alone in the project. George Dempster, MP for the Perthshire boroughs, had taken the waters at Matlock Spa whilst returning from London and had met Richard Arkwright and visited his mill at Cromford. At the time Arkwright was having his patents challenged and Dempster persuaded him to come to Scotland in retaliation. There he met David Dale of New Lanark. Dempster's interest was not purely commercial; he was concerned at the social upheavals being caused by the highland clearances and sought some means of mitigating the damage.

Investment criteria in the 18th century were very different from today and as described by Peter was gambling with the odds stacked against you, perhaps, not so very different to investing on the stockmarket today. The results were often similarly unfortunate. At Stanley the money ran out by 1800 and the mill was sold off in instalments. Dempster built other mills and one in Sutherland burnt down. In 1813 Dale was bankrupt with debts of £40,000. The post Napoleonic wars years were difficult ones with many business failures and bankruptcies. Richard Arkwright was one of the lucky ones and always managed to get out in time but in those less protected times bankruptcy was accepted as a fact of life.

Returning to the Stanley Mill, the initial workforce was mainly highlanders from Old Blair. Ex agricultural workers with no experience of industry or factory life and their totally different ethos. The training programme was unusual, to say the least. The new workers marched, in highland dress and accompanied by bagpipes, to Arkwright's Cromford Mill for training. Echoes of Bonnie Prince Charlie came to the surprised Cromford workers.

Arkwright was setting new standards for factory organisation and management with separate departments, the head of each selected his own people who in turn had a say in who was to be head. The result: a team that could work together.

The mill workforce was predominantly female and juvenile. The 1834 Factory Act specified a minimum age of nine. There were school facilities, but a 14-hour day left little energy for education. The men took the supervisory roles or those requiring strength and any spare time was occupied with small holdings to help support their families.

Turning to the details of the mill and its location on the river Tay, the fastest flowing river in the UK. Water scarcity never stopped the mill although a rise of only three feet did flood the wheel pits; up to fifty days in a bad year.

A series of pictures showed the present state of the wheel pits and interiors. The buildings had been well laid out with large windows giving good lighting. Iron framing was used but the structure was not fireproof; the original candle lighting must have been a potential hazard until gas lighting was installed. An interesting heating system fed warm air throughout the buildings.

A series of business initiatives and investors kept Stanley Mills afloat when others failed. It was an unlikely survivor, not least as it was never steam-powered. A number of niche markets were developed. Notably webbing for drive belts that were becoming widely adopted as industrialisation spread. Another outlet was for military webbing. Although the demand fluctuated, the British army was active in many parts of the world throughout the Victorian years.

Perhaps the most successful product was the endless, two cm wide tape used in the production of cigarettes.

Indian independence and heavy duties led to a collapse in demand and other new products were needed. These included brake linings and outer casings for hoses. However, nothing could prevent the arrival of man-made fibres and the acrylic revolution was a disaster with production moving out of the UK to Italy, Switzerland and Germany.

In 1989 the Mill finally closed and in 1990 it was subject to vandalism and declared structurally dangerous. However, it has been saved by Scottish Heritage and its restoration has included a variety of domestic accommodation and a museum. An oral history project is an important piece of work being undertaken and former worker's case histories feature in the current displays.

In the last years of the mill's working life many workers came from Poland and Germany and were housed in hostels built nearby.

Stanley Mills deserve to be better known as part of our industrial heritage. Being north of the border is a poor excuse.

May 2019: Alain Foote

Metropolitan Vickers and Trafford Park.

Following a late cancellation by the expected speaker, Alain Foote stepped in with another of his immaculately researched and illustrated reports. This time on the Metropolitan Vickers operations at Trafford Park, Manchester.

The story begins with an American, George Westinghouse, who at the age of 23 took out his first patent for railway air brakes, the foundation of his fame and fortune, and set up the Westinghouse Air Brake Company quickly followed by the Westinghouse Machine Co. and the Westinghouse Electric and Manufacturing Co. where he developed the transformer to the point of commercial use.

In 1889 he set up the Westinghouse Electric Co. Ltd. of London with the substantial capital of £1,500,000 to sell and install Westinghouse products in Great Britain. In 1899, Westinghouse bought 130 acres of land that was part of what was to become the Trafford Park Industrial Estate, the first industrial estate in the world.

The works were planned on a colossal scale and a complete factory laid out for the manufacture of steam and gas engines, steam turbines and every product of electrical engineering. Work started slowly in mid-1900. Westinghouse was dissatisfied with the progress of the British contractors and engaged a Canadian contractor to complete the work in a shorter timescale. Mechanisation and improved practices increased, for example, a bricklayer's output from 500 to 1,500 bricks a day.

The scale of the huge machine shop was well illustrated in a photograph showing a train delivering material inside and dwarfed by its surroundings. Manufacture started in 1902 with over 3,000 employed by the year end.

Trafford Park at that time was open countryside and lacked any housing or amenities. Trafford Park Dwellings was established to build a 'village' for the workforce near to the factory and 700 houses were built by 1904. A unique community was created with its own shops, churches, library, working men's club, police station, clinic, hotel, schools and wash house. In 1914, a works school, the first in the country was established and by 1916 this was attended by 330 apprentices.

By the end of 1914 one third of BW's workforce had enlisted. The armaments produced included shells, bombs, fuses, mine-sweeping paravanes and aircraft magnetos. A Bosch magneto had been salvaged from a crashed Zeppelin and sent to the works where a production line was set up to manufacture these in large numbers. By May 1917 the number of workers had increased to 8000, of whom nearly a third were women. By the end of the war, 3519 men had joined up with 304 losing their lives.

In 1917 a British holding company was formed to buy out the American shareholdings. Finance was provided by the Metropolitan Carriage, Wagon and Finance. However, in 1919 that company, including British Westinghouse, was acquired by Vickers and the British Westinghouse Company became known as the Metropolitan-Vickers Electrical Company.

An example of diversification was the experimental radio station in the research department that became the first Manchester station of the nascent BBC – call sign 2ZY.

The post WW1 decade saw a huge expansion of the facilities at Trafford Park and the beginnings of the consolidation of the electrical industry in Great Britain. The control of M-V passed from Vickers to the International General Electric Company, then Associated Electrical Industries (AEI) was formed, M-V continued to trade as Metropolitan-Vickers but with financial control vested in AEI. A new arrangement for exchange of patent rights and manufacturing information with GE of America was put into place.

The decade also saw plenty of technical and commercial innovation; a 500 kW thermionic valve for the Rugby Radio Station, the first electron microscope and a technical agreement with Russia for turbines (interrupted by a show trial in that paranoid time). Employment at Trafford Park also continued to grow.

The rearmament programme saw a huge new factory built for the new Avro Manchester bomber. Powered by two RR Vulture engines (which proved unsuccessful) the Manchester evolved into the famous Lancaster of which over 1,000 were produced at Trafford Park.

Early in 1937, arising from a Government request for high power valves, M-V made the first radar transmitters for the chain of stations around the coast of Great Britain. Much of equipment, based on these early radar developments, was made in Trafford Park as was a wide variety of other war matériel.

Post war recovery led to much reorganisation, especially for steam turbines and large electrical machinery. The list of activities in the 1950s includes: Automation, Control Gear, Gas & Steam Turbines, Generating Plant, Guided Defence Weapons, Instrumentation, Motors, Nuclear Power, Radio & Electronics, Scientific Apparatus, Switchgear, Traction Equipment and Transformers.

The final part of Alain's presentation was liberally illustrated and full of detailed descriptions of the ground-breaking developments in steam and gas turbine powered electrical generating plant that had been made by M-V.

The company was also involved in the development of aircraft jet engines, especially of the axial flow configuration. Such engines first flew in a Gloster Meteor in November 1943. An M-V Beryl engine was chosen by Donald Campbell for his Bluebird record attempt in 1955. M-V continued turbojet development with the last flight engine design being the F9 Sapphire, the design of which was handed to Armstrong Siddeley in 1947. M-V then concentrated on gas turbines for power and naval propulsion applications. An M-V gas turbine of 1948 was the first ever gas turbine generating set to run in parallel with the British National Grid System. It was installed in the Trafford Park Works Power Station to smooth out peak demands on the local supply.

M-V was also involved with the development of computers and built the first commercial computer to use transistors. It also developed rail traction equipment for diesel electric locomotives, building on its earlier pioneering work in the field.

Transformers, switchgear and scientific instruments continued to be important product lines but, over-optimistic projections by the CEGB in the 1960s led to the eventual consolidation of the UK's electrical industry and the rationalisation of production.

This process continued so that by the turn of the century all activity at Trafford Park had been transferred to other sites with substantial loss of local employment. The iconic main office block was demolished in 2002.

Today, little remains. Only the Trafford Park Hotel, St Antony's Church, some shops and a Heritage Centre where the original foundation stone, two Westinghouse War Memorials and sundry other artefacts serve to remind visitors of former glories.

WARWICKSHIRE WIAS
Industrial Archaeology Society

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NEWSLETTER

FROM THE CHAIRMAN

It was a pleasure to launch the new season of meetings at the WIAS AGM on 12 September 2019, and to be able to report that the Society was in good shape, with a series of successful, well-attended meetings over the 2018-19 season. Sadly we had lost a number of long-standing members during the course of the year, and membership numbers were slightly down, but the finances were in good health (under the prudent stewardship of treasurer Victor Lobb), and the members of the committee continue to carry out their various responsibilities in a highly effective way. WIAS is indeed fortunate to have such a hard-working group at the heart of the Society.

Thanks were also expressed to the membership for their continued support at meetings. Our attendances continue to be the envy of other industrial history/ archaeology societies. We believe that the essence is to try to provide a range of topics, some more technical, others of a more general interest, and to utilise the expertise of external speakers and members of the Society. Should you hear a speaker who you feel would be suitable for a WIAS evening, never be afraid to pass on details to myself or other members of the Committee. Similarly, you may have something that you would like to convey to the Society, either in the 'final quarter' of a meeting, or as part of the Members' Evening 'Twenty's Plenty' in February 2020.

One of the decisions recently taken in Committee has been to try and take WIAS's industrial heritage message to a wider audience, and as part of this process, the Committee designed a roller banner to act as a focus of any stand we might be manning at a history fair or festival. Its first outing came at the Leamington History Day held on 28 September at the Parish Church, Leamington Spa. The event was organised by the Leamington History Group, with Margaret Rushton at the helm. Margaret is, of course, a WIAS member, and a member of the (greatly valued) refreshments team at WIAS meetings. Sadly, due to a hip replacement operation, I was unable to attend but members ably supported by Roger Cragg, John and Janet Willock and Chris Barney, together with an early-morning delivery of books for the bookstall by Mike Hurn and Victor Lobb, all stepped in to assist. It proved to be a very successful day.

WIAS stalwarts; Chris Barney, Roger Cragg, and Richard King. (photos: Margaret Rushton)

Below: The WIAS Stand at the recent Leamington Local History Day. Note the new freestanding WIAS display banner in the foreground .

My immobility has given plenty of time to catch up on a variety of WIAS matters. To improve my e-mail connection with the membership I have adopted a new e-mail address wiaschairman@gmail.com. Should anybody reading this wish to be included in the WIAS circulation list please contact me on that address. I was also fortunate to be lent a number of DVDs and booklets by Derek Billings, including one on an Open Day at Southam Cement Works with valuable footage of the plant in operation. It is members such as Derek who have been at the core of the membership for many years, and long may this continue.

As well as the programme of meetings, Alain Foote is also planning a number of visits for the Society, following last year's successful programme which included sites as varied as Taylors Bell Foundry in Loughborough; the unique Fawley Hill Railway Museum; and Crossness Pumping Station.

I very much look forward to another successful year for the Warwickshire Industrial Archaeology Society.

PROGRAMME

12 December 2019: Ian Pogson
The Life and Engineering Achievements of Dr. Frederick Lanchester.

9 January 2020: David Skillen
Giants in the Sky - the Zeppelin in WW1.

13 February 2020: Members' Evening
Twenty's Plenty.

12 March 2020: Ian Whittle
The Life and Work of Sir Frank Whittle.

9 April 2020: Paul Rabbitts
Bandstands - History, Decline and Revival.

14 May 2020: Mike Bunn
Fetch the Engines: a History of the Warwickshire Fire Service.

11 June 2020: Peter Hoath
A View of Computing History - 2,000 Years in 60 Minutes.

Meeting Reports

June 2019: Chris Barney
The Redditch Needle Industry.

Needles are nothing new. Indeed, examples can be found amongst the earliest of man-made tools, especially in the more temperate climate zones. As soon as animal skins were seen as a possibility for clothing, a means had to be found to join smaller pieces into a useful whole. Bone needles and animal sinews provided the answer.

Chris Barney has been studying the Redditch Needle Industry for some time as part of an MA Degree course in West Midland's History and shared his findings with us.

The earliest examples of metal needles are found in Tudor times. Immigrant Spanish artisans began to supplant the efforts of the local blacksmith to supply a much-appreciated domestic item.

Whilst the manufacture of a pointed shank was relatively simple (drawing out a wire and hammering on an anvil), producing an eye to take the thread was not and required considerable skill and some specialised tooling.

There seems to be no obvious reason why the district around Redditch became the centre for needle manufacture. A possible influence was the local Catholic Throckmorton family (Coughton Court) who were sympathetic to the Catholic refugees from Europe and probably supported the development of a cottage industry organised by a factor. The river Arrow also provided power for the watermills that are found along it from Alcester to the north of Redditch but especially near to the latter town.

The earliest written evidence relating to needle manufacture is an illustrated volume by Diderot dating to 1730. This shows, perhaps idealised, the various processes involved. Well dressed artisans in well-lit workshops might not have been found in every cottage but the manufacturing stages were. Cutting wire to length, flattening one end ready for the eye and punching it out over a block of lead before cleaning it out, then filing a point before hardening and tempering are clearly shown. As are the subsequent stages of packing quantities of needles with abrasives and oil preparatory to scouring back and forth for many hours under a heavy weight; repeated with successively finer abrasives washed out and dried in warm sawdust between each scour.

By the early 1800s there were some 20+ companies in and around Redditch and mechanisation was emerging. The first operation to use a power source was point grinding. This soon became a hazardous task, albeit well paid. With no dust extraction and poor-quality grinding wheels silicosis and exploding wheels meant that most point grinders were dead by the age of 30. Paradoxically, when primitive dust extraction was introduced there were strikes over reduced pay. Some idea of the early working conditions was shown in a series of photographs of machinery that has been preserved.

There is a world-wide demand of some three needles per head of population. This is reflected in the growth of Redditch production from 5 million per week in 1800 before any mechanisation to 50 million in 1850 with some mechanisation to 70 million in 1939 with automation. This growth led inevitably to the consolidation of the industry into larger factories and the emergence by the late 1920s of three large groups: Abel Morrall, William Hall and Milwards.

Many early needle makers also made fishhooks, and some moved into fishing tackle more generally. Most notably, Samuel Allcock who by 1869 offered an enormous range to the burgeoning recreational fisherman. In 1930 Halls and Milwards merged to form the English Needle and Fishing Tackle Co Ltd.

Another significant innovation was the sewing machine developed by Singer. The very different needle required by the machine was a problem for the Redditch manufacturers with the requirement to make a needle with a reduced shank achieved by swaging. So much so that Singer made and supplied needles for his machines. An early example of profiting from the ongoing supply of a consumable part of the original sale.

Some Redditch needle manufacturers opted to develop new products. Herbert Terry turned to spring steel products, amongst which was the iconic Anglepoise Table Lamp. Ladies hair fashions needed Kirby Grips to the tune of over 20 million a week! Gramophones had an enormous demand for needles that had only a limited life if precious records were not to be damaged.

Moving to the commercial aspects of the industry, it was noted that in 1930 Hall and Milward had sales of £425 million with a substantial proportion of exports. America imported rather than made needles and Redditch supplied some 50% of the world demand; some commentators put the proportion even higher. Germany was the main competitor with France and Italy offering a lower quality product. Germany exported mainly eastwards to Russia and China, but various wars curtailed German sales to the advantage of the Redditch factories.

Research into the archives unearthed some interesting material. One condition in a contract required the agent to provide a replacement horse, at his own expense, if the one used by the salesman should 'happen to die or be taken lame or blind or by any other accident be rendered incapable of travelling'. In another instance 'When I was fifteen I went out alone, travelling mostly in the North and in London. I carried my stock with me in the gig and used to sell from that.'

Redditch was well represented at the Great 1851 Exhibition. John James showed specimen needles and fishhooks. William Bartlett showed needles and fishhooks of every description. William Boulton included surgical needles and fishing spears. Henry Hemming had an assortment of sea and river fishhooks and Abel Morrall 'not only had specimens of needles but also had on show machinery for their production. Elaborate displays were created for this and other exhibitions and as point of sale material. Variations on the conventional needle eye, such as the 'Calyx' double eye, were tried with varying success.

Further examples of commercial correspondence from the archives showed the extensive export markets that were developed and the quantities involved. Whilst sales were mainly direct in the UK, overseas they were predominantly through agents. Senior management made regular annual sales trips.

From the mid 1920s trade became harder, although rearmament boosted military demand, but after the war the need for new plant to improve export potential was a financial burden when competition from lower cost countries such as Italy and especially China increased. Despite consolidation, plants were closed and today, only small quantities of specialised needles are made in Redditch but otherwise the industry has ceased to exist.

September 2019: Martin Green
Chairman's Lecture.

The Chairman gave us his thoughtful and thought-provoking views about 'the way forward' for industrial archaeology with the subtext of 'where next for the industrial heritage'. Happily, he saw positive options in an uncertain world. As always with Martin's talks, this one was lavishly illustrated with memorable photographs.

At first glance the odds seemed to be stacked against the industrial archaeologist. Is it a one generational subject? Expertise and experience are being lost as memories fade. Funding is always an issue and there are many alternatives for precious leisure time. The pace of change is rapid. Nonetheless, there are challenges and opportunities to be exploited, both for our Society and for individual members.

Members could have greater involvement with the Society's presence at local events such as the recent local history day. More could be done to publicise our activities and develop our website to build upon splendid efforts. There are plenty of opportunities to research Warwickshire's industries and to preserve records, working experiences and the like. We could support our industrial museums more. Enthusiasm and curiosity are important but perhaps inexperienced, incomplete, inconclusive research is better than having none at all.

By way of example, brief research showed that one small Leamington building links milk, raffia, supercars and rocking horses. The building lies between Gunnery Terrace and Guy's Cliffe Road. No longer in single occupancy, Gunnery House is commercial offices and a domestic dwelling fronts onto Guy's Cliffe Road.

In the 1880s it was home to the Stoneleigh Dairy run by the Hoddinott family with a farm at Stareton, hence the name. A contemporary photograph of a sign written delivery van provides the evidence. The business was sold in 1919 and the sales particulars noted that: The building occupied an excellent position, highly suitable for conversion into motor garage or factory, had frontages to Guy's Cliffe Road of about 30ft. and to Gunnery Terrace of about 33ft. 6ins, and a total depth of about 101 ft. 6 ins.

Subsequent occupants included the Auto Sheet Metal Company offering radiators, petrol tanks, panels and wings and in 1927 J P Emerson employed 84 girls making raffia products. Supercars were fairground dodgems and in the 1970s Leamplas was producing glass fibre rocking horse replicas of carousel animals. After further use by a removals company, in 1985 the building was converted to offices. The unanswered question is: what was it originally built for?

Links with other organisations are important. These could include other industrial archaeology societies, local history and family history groups, national organisations – particularly the Association for Industrial Archaeology (AIA) and other organisations with general concern for conservation e.g. Historic England and The National Trust.

The last named has helped the cause of IA with its rebranding of the north Cornwall Levant mines as 'the Tin Coast' and introduced mobility aids and virtual reality tours for those who cannot access the mines.

Future AIA Conferences will be held in Liverpool (2020), Dublin (2021) and the Black Country (2022). For each conference the organisers produce a comprehensive review of local IA. For example, that for Somerset Textiles included one of the very few remaining weavers of horsehair – John Boyd & Co of Castle Cary operating since 1837.

Coming closer to home, Warwickshire is badged on its borders as 'Shakespeare's County'. If we were ever to host an AIA Conference perhaps 'The Transport County' would be more appropriate? Warwickshire has early roles in the canal and railway history of England, including the unique features of the Stratford canal. It is the home of important components of the cycle, motorcycle and car industries, and their ancillary trades. It has made significant contributions to the aircraft industry. It is home to 3 nationally recognised museums.

Photography and Industry is a subject close to the Chairman's heart. His recording of the contemporary scene is exemplary and has illuminated many a talk to the Society. He drew our attention to the work of John Myers and a recent publication 'The End of Industry'. Examples from the book, grimy black and white landscapes and portraits, recalled the not so long-ago realities and preserved them.

There have to be questions raised as to the long-term viability of industrial museums. Sources of funding are difficult in many cases, but curators do not always help their own cause when exhibits are 'dumbed-down' with inadequate or over simplistic explanations. The content of bookshops often reflects the same lack of appreciation of the need to educate the visitor or to reflect the true significance of the museum's purpose. Are too many such museums a poorly shared experience?

There are honourable exceptions. At the Helmshore and Queen Street Mills in Burnley the National Trust is working with partners including Lancashire County Council, Heritage England, the National Lottery Heritage Fund and Arts Council England to help find a future for the mills.

Industrial Museums can also provide opportunities for sharing the experience with other groups. The iconic Papplewick Pumping Station has hosted a 'Steampunk Weekend'. An extraordinarily garbed group, captured by the camera, represented this subgenre of science fiction or fantasy that incorporates technology and aesthetic designs inspired by 19th century industrial steam-powered machinery. The pumping station itself is an example of all that an industrial museum should be.

Elsewhere, there is the adaptive re-use of industrial buildings. Not always an easy task. The scale of the buildings and site together with their specificity can be daunting. And with scale comes higher costs. Issues of environmental protection and health and safety will become more not less onerous. Sometimes only partial conversion or attention to the fabric of the building or only its facade are possible. Holmes Mill in Clitheroe provides a good example of what is possible as does member Peter Stanworth's elegant conversion of his water tower into unusual holiday accommodation.

We are in a period of some important anniversaries. 250 years ago, in 1769 the Birmingham canal opened delivering coal into the heart of the city. The Canal & River Trust has appropriately celebrated the event and many visitors have enjoyed the experience of the now restored canal system with its many examples of former industry and engineering ingenuity.

2019 also saw the 200th anniversary of the death of James Watt. 175 years ago the Leamington (Milverton) to Coventry railway opened and, perhaps, most significantly the first meeting of the Warwickshire Industrial Archaeology Society, on 17 November 1989, was addressed by Barrie Trinder on the subject of 'our industrial heritage'. Full circle?

October 2019: Peter Coulls and Alan Jennings

The Warwick and Leamington Tramways.

Book launches at WIAS meetings are in vogue. With the *Leamington and Warwick Tramway* Allan Jennings and Peter Coulls have recorded the relatively short but fascinating story of public transport between the two towns from 1881to 1930.

Allan Jennings opened with a review of the introduction of passenger transport using light horse-drawn carriages running on rails into the UK. Such methods were not new, they had been used in industry for many years.

However, it was an American, George Francis Train, who introduced a horse-drawn tramway for passengers at Birkenhead in 1860. The next year Train opened the first, short-lived tramway in London, the first of three routes. None prospered and soon closed mainly due to the obstruction caused to other road users from rails laid proud of the road surface causing havoc to carriage wheels. The development of grooved rails set flush to the road surface a decade later allowed the street tramway era to begin.

In 1880 Leamington, population 23,000 and Warwick, population 12,000, were not obvious candidates for a linking tramway. However, Leamington's spa waters were being heavily promoted and gave resort appeal, two main railway lines ran through the town and it was a long walk between the two town centres.

The distance was short and the line, in different configurations, only lasted for some fifty years. But, in that short span of time the company went through most, if not all, of the experiences that made up the history of Britain's tramways. It fought for recognition, had disputes with the local authorities began running with horse traction, experimented with road transport, was taken over and electrified and eventually abandoned.

The first proposal for a line was put forward in 1870 and objections began; one of the main ones being that the proposed line down the Parade in Leamington would be detrimental to its acknowledged elegance. On the other hand, improved transport for workers in Leamington living in Warwick would benefit the former's economy.

The proposed route ran from a terminus in Avenue Road, Leamington, up the Parade along Warwick Street to Milverton Station and then along Emscote Road to Coten End before ascending Smith Street, through the Eastgate into Jury Street and High Street terminating near to the Warwick Arms Hotel. Once established, the journey time from end to end was 35 minutes.

After a close vote and a lively public meeting, the decision to proceed was made and the appropriate application to Parliament was made. In June 1879 the Tramways Order Confirmation Bill granting the Provisional Order was passed through the House of Commons without objection and the next year The Leamington and Warwick Tramway and Omnibus Company Ltd was formed.

As might be expected, progress was not straightforward. Twenty-five tenders for the work were received. The lowest was accepted but the deal fell through as did the next but at the third re-tender John Fell of Leamington's bid was accepted and construction work began in June 1881. Weather permitting, the building was straightforward although several alterations were necessary.

These included raising the road surface of the Emscote Road canal bridge to lessen the gradient over its crest and widening the Portobello bridge. In Warwick the steepness of Smith Street and High Street presented a problem and 'pull up' horses were needed to assist loaded trams up these sections as they were in the Parade and over the canal bridge.

The Eastgate at the top of Smith Street turned out to be too low for the double deck trams that had been bought to pass through with passengers on the top deck and so the line was re-routed around it. This error only came to light during the Board of Trade inspection of the route when it was completed in October 1881. The tramway depot and stables were in Coten End.

Throughout the description of the route much use was made of old postcards and material drawn from the local papers and official documents. Apart from satisfying nostalgia it once again showed how many sources of material are available to the diligent researcher. Not least was the quote describing the trams as 'Wackrill and Bright's Rattlesnakes'. From other sources it seems that the tram ride was far from being smooth and silent. Nonetheless, customer demand grew, and further tram cars were bought. The original fare was 3d for the full journey.

Progress meant electrification and in 1905 a card was issued in loving remembrance of the Leamington and Warwick horse trams. But in contrast, the Warwick Advertiser declared that 'unwept, unhonoured and unsung the tramway system is about to be relegated to the limbo of the past'.

The move to electrification had begun in 1897 when the newly formed British Electric Traction Company made an approach that was completed in 1899. Peter Coulls took over to describe the conversion to electric traction. There was much discussion about the aesthetics of the proposed poles for overhead wires. The track would need altering for a revised gauge to bring uniformity with the rest of the country. A power station would have to be built. New rolling stock was required.

Amongst the modifications needed to the track was the lowering of the road surface under the railway bridges at Milverton and Emscote Road. These changes are still observable today.

The redundant horse trams had to be disposed of, one can be found in the museum in Crich, two others were found in Yarningale Common in 1984 and a further two have served as sports pavilions.

Whilst the conversion was underway, a double-deck horse drawn omnibus service operated.

Some accidents happened, happily with few fatalities. One spectacular derailment ended with a runaway tram buried in the Castle Arms Hotel opposite the Eastgate and has been the subject of a highly detailed model reconstruction of the scene.

Many contemporary illustrations were used to describe the electrification and subsequent operations. Notably, the history of the Emscote Power Station which supplied power for domestic customers as The Midland Electric Light & Power Company well as to the tram system. After some 50 years it closed in 1973, by which time it was the smallest in the Midlands. The tram depot was located alongside the power station and its surviving buildings were recorded by Anthony Coulls in 1997. Tesco now occupies the site.

The last electric tram ran on 16 August 1930. It was replaced by a bus service, which is another story.

WARWICKSHIRE WIAS
Industrial Archaeology Society

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NEWSLETTER

FROM THE CHAIRMAN

For those with a willingness to travel to different parts of the country, the three-month period April - May - June 2020 seems a particularly busy one for events and conferences with an industrial heritage theme. The nearest at hand is probably the 51st. South Wales and West of England Regional Industrial Archaeology Conference (quite a mouthful!) to be held on Saturday April 4th. 2020 at the Elim Conference Centre, West Malvern, Worcestershire. The draft programme includes talks on 'The Industrial Archaeology of Croome Park, RAF Defford, and the Museum of Jet Flight'; Stephen Ballard, Canal and Railway Engineer'; 'The Magic of Malvern Water: the Springs of Malvern and the Water Cure'; and 'The Industrial Archaeology of Worcester's Shrub Hill Station'. Further details of this and the other conferences can be found on the AIA Website www.industrial-archaeology.org.

My attention to this cluster of events was drawn by the information supplied in edition 192 of the Association for Industrial Archaeology's Quarterly Newsletter IA NEWS. The excellent publication has blossomed under the editorship of Chris Barney, one of our members, and he has decided to hand over the reins after September's publication No. 195. Sincere thanks are due to him for his all his effort and innovation during his time as editor, including keeping the Warwickshire flag flying!

Seeing all these conferences, and their programmes, once again raises the prospect of whether WIAS could ever host a Day Conference / Study Week-end on local - Warwickshire, Coventry, Solihull - industrial heritage. Perhaps we could even share the responsibility with adjacent Oxfordshire, with alternate hosts each year. Ambitious? Unrealistic? Probably both, but worth keeping on the agenda for consideration by those taking the Society forward in future years. Speaking of the future, we are always willing to welcome volunteers onto the Committee, perhaps with a view to taking on a position of responsibility at some stage in that future. It is a rewarding experience to be involved in the management of a society run entirely by volunteers. Other opportunities exist for those preferring to carry out research on the industrial heritage of our area, with the possibilities of publication either on the website or in printed form.

Member George Illingworth with one of thirty model fire engines he has built from Meccano on display at The London Model Engineering Exhibition recently held at Alexandra Palace.
Photo: Meridienne Exhibitions Ltd.

The highlight of the Conference season is of course, the AIA Annual Conference, being held this year at Hope University in Liverpool, and hosted by the Merseyside Industrial Heritage Society This not only looks at Liverpool itself, but takes a wider view of the past industrial activities of Merseyside, and includes visits to Warrington, Runcorn, St. Helens, Ellesmere Port, and the ports and industries of the Flintshire Coast. Add to this an evening visit to the top of Royal Liver Building with panoramic views of the city and docks, a ride on an historic Wallasey tram, and a ferry across the Mersey and the trip will be complete! One of the pleasures of the Conference is to be in the company of so many enthusiasts for the industrial heritage, from the interested amateur to the full-time professional, and full details can be found on the AIA website.

Sadly, I write these notes with the threat of Coronavirus potentially endangering the chances of some of these gatherings taking place. We seem to be moving into unchartered territory. What remains certain is that a virus-free WIAS website will always be worth visiting! Indeed, if we are all confined to barracks, what better way to spend the time than to contribute to that website by writing an article that has been on your mind for ages, or to upload that (unique) collection of photographs, or to relate your own work experiences as a 'satellite' article in the 'Warwickshire Industries' section?

PROGRAMME

12 March 2020: Ian Whittle
The Life and Work of Sir Frank Whittle.
9 April 2020: Paul Rabbitts
Bandstands - History, Decline and Revival.
14 May 2020: Mike Bunn
Fetch the Engines: a History of the Warwickshire Fire Service.
11 June 2020: Peter Hoath
A View of Computing History - 2,000 Years in 60 Minutes.

Meeting Reports

November 2019: Brian Ellis

The Geological Background to Warwickshire's Industrial Activity.

Brian Ellis's talk had its roots in the remarks made by the Chairman at our 2018 AGM (see Newsletter No. 64) when he proposed that it would be useful to have a guide to the various industries that made up Warwickshire's contribution to the industrial past and took the extractive industries as an example. There was no simple guide that might be the foundation of future research. What geological features have produced the rock so valued by the roadstone industry? What are the various features of the clays that make them suitable for different types of brick? What are the differences between river and glacial sand and gravel? Why has Warwickshire become such a centre for the cement industry? What were the characteristics of Warwickshire coal?

Martin suggested that these were easy questions for an expert to answer and in Brian, a leading member of the Warwickshire Geological Conservation Group, we certainly had an expert to review the role of geology in Warwickshire's extractive industries.

WGCG was founded in 1990 to raise awareness of, and to conserve the many rock exposures dotted around the county. It has published a series of pamphlets and town trails but perhaps its most visible work is the geology wall at the Brandon Marsh home of the Warwickshire Wildlife Trust which was used as a guide throughout the presentation.

The tectonic plates of the earth's crust move over a 250-million-year cycle; 650 million years ago Warwickshire was located 60^{o} South near to today's Falkland Islands. The plate movements account for the variety of rocks found in the county.

The oldest are located north of Nuneaton in the Hartshill Country Park in the Nuneaton/Hartshill Ridge and form the basis for the roadstone industry and its spectacular quarries. These sandstones and diorites were formed following the break-up of a supercontinent and the creation of a major ocean wherein were laid down the sandstones and shales. These harden through age, compression and the constant folding process during tectonic drift. The hard diorites come from the intrusion of hot igneous rocks into the softer rocks and the combination has the desirable qualities of low water absorption, impact, abrasion and skid resistance needed by the aggregates industry but also render them unsuitable for buildings. Extracted, crushed and graded Warwickshire's roadstone provided much of the material used in building the midlands motorway network.

Coal is formed in a very different environment. Tropical swamps populated by tree ferns and early coniferous forests were found when Warwickshire was part of an equatorial delta. Think the Amazon delta today. Swampy islands, lakes and forests that were constantly changing and sinking leaving layers of rotting vegetation to be compressed into what we call the coal series; peat/lignite/bituminous/anthracite. The economic value depends on its position in the series. Unfortunately, Warwickshire's coals fall at the poor end. The predominance of steam and domestic coals coupled to shrinking markets doomed the local pits. However, there is still plenty left should things change. Coventry colliery should have produced smokeless fuels but the 'Homefire Plant' was not a commercial success with disease and compensation costs contributing factors.

Cement is a better story for Warwickshire. Heating limestone (calcium carbonate) mixed with silicates, found in clays, to around 1450^{0} C forms calcium oxide or quicklime. Our local deposits of blue and white lias provided this raw material. The rocks were formed under a tropical sea and are found in a narrow strip between Rugby and Southam and are evident in the landscape as hills. The blue and white lias found in the same quarry, albeit in layers of different thicknesses, provided the ideal raw material. The white lias is now largely exhausted and chalk slurry is now imported into Rugby as a substitute. Only one working blue lias quarry remains at Southam so there is a potential problem for ongoing cement production in the county with implications for future investments. There is no demand limit but the era of an advantageous geology has passed. White lias did have a use as a building material and for lime production before the cement industry began.

The most important extractive industry in Warwickshire today is that of sand and gravel. These are the products of depositions in rivers during various phases of the ice age and post-glacial events. We have three types in the county. At Bubbenhall there are inter-glacial deposits, in Meriden, Berkswell and the Blyth valley we see over-deepened river valleys with subsequent infilling, and the Avon valley has post-glacial terraces. The materials found in these locations are very variable and thus have different end uses. The industry is continually looking for new deposits, such as those near to Hampton Lucy, to develop, sometimes to local objections.

Probably the most ubiquitous industry utilising the natural geology is that of brick and tile manufacture. The clays, which are the basis for bricks and tiles, are the products of the weathering and redistribution of rocks and are widespread throughout Warwickshire. In the pre-industrial era there was widespread domestic and artisan manufacture to meet local demands. Early maps show many local brick pits and kilns. Later industrial-scale manufacture was more controlled.

The geology of the 'clay minerals' and the chemical characteristics of sheet silicates have significance for the ceramic industries and affect the colour of bricks, especially where there is an iron constituent. The geological formation, principally the Mercia Mudstones (the most widespread formation in the county), influenced the location of brick pits. Another important clay is 'Etruria Marl', a flood plain deposit of considerable uniformity and purity suitable for the manufacture of high strength and low water absorption heavy clay ware, including high-quality facing and engineering bricks, pavers and roofing and floor tiles. Its high but variable iron content allows the production of a wide range of fired colours. The Kingsbury Brickworks is on this outcrop and is being extended by its Austrian owners. Sadly, much of Warwickshire's extractive industries are also now in foreign ownership.

Closing on a more cheerful note, a retired engineer recently digging out a fishing lake in an area of Wolston Clay made the chance discovery of a deposit of puddling clay and so may enjoy more than relaxing with rod and line in the future.

December 2019: Ian Pogson

The Life and Engineering Achievements of Dr. Frederick Lanchester.

Frederick Lanchester, born 1868, was a polymath and engineer who made important contributions to automotive engineering and to aerodynamics. He co-invented the development of operational research. Bordering on genius he is revered by many as Britain's Leonardo da Vinci. His name, and many personal artefacts are preserved at Coventry University, the successor to the Lanchester Polytechnic named in his memory. The University's Lanchester library was opened in 2000. Like much of Lanchester's own work, apparently regardless of convention, its distinctive appearance comes from the building's energy efficient specifications, making use of light wells and exhaust stacks to draw air through the building, providing natural ventilation.

Ian Pogson is an automotive engineer, a Lanchester fan and a trustee of the Lanchester Trust. The Trust was set up in 2010 to promote the innovative work of the three Lanchester brothers, Fred, Frank and George. This work is amplified by the Lanchester interactive archive based in the Lanchester Library and readily accessible online at lanchesterinteractive.org. Chris Clark, chairman of the Trust has published three books on Lanchester from which Ian frequently quoted during his talk.

The Lanchesters were a talented family headed by an architect and surveyor married to a teacher of maths and latin who produced 8 successful children. Apart from Fred, Frank and George who founded the motor business, they included a prominent suffragette, a Hollywood actress, another architect, an artist and an auctioneer's clerk.

Fred, the visionary genius, Frank, an ambassador for the company and the industry, together with George, a designer and artist formed the Lanchester Company in 1899 to enter the burgeoning motor industry. Fred and his brothers had built their first 5 horsepower car in 1895. Its specification was remarkable in many ways and included: pneumatic Dunlop tyres, the first car so equipped. Ackerman, or caster steering. A chain driven rear axle with half-shafts. The first rear differential with 4 bevel gears. Lanchester's own wick carburetor and a patented sparkplug or ignitor. The engine had balanced, lightened connecting-rods, counter-rotating balanced crankshafts, the first magneto and the first oil scraper piston ring. The torsionally rigid, steel tube chassis was another first.

His wide-ranging interests in vehicles and engines as well as in other fields are evident in the following highlights of his career. His first all-wheel drive patent in 1904. The patented torsional vibration damper in 1910. The patented disc brake invention in 1902. Pioneering work in turbocharging and fuel injection with patents in 1902 and 1923. The first all-British motorboat in 1894. He published papers and books detailing the first scientific principles of flight and theorised about the principles of colour photography before it was a reality with patents in 1895.

He also wrote on ophthalmology. He queried Einstein's results on Relativity and put the differences down to translations. He devised the military strategies that underpin business management courses still taught today. *"Aircraft in Warfare"* in 1916 was way ahead of its time and its *'Lanchester's Power Laws'* were later used in the USA and Japan for business strategies and operational research after WW2.

He was much interested in flight and presented a paper in 1894 to the Birmingham Natural History and Philosophical Society entitled *'The soaring of birds and the possibilities of mechanical flight'* based on years of experiments with flying models. He produced designs for a heavier than air machine in 1897 some four years before the Wright Brothers efforts.

Returning to Fred's earlier career, it is remarkable that he failed to obtain any formal qualifications despite gaining scholarships to several institutions. His first employment in 1888 was as a Patent Office draughtsman for £3 a week. About this time he registered a patent for an isometrograph, a draughtsman's instrument for hatching, shading and other geometrical design work.

He soon moved on to join the Forward Gas Engine Company in Birmingham where he became works manager and invented and patented a pendulum governor to control engine speed and subsequently a pendulum accelerometer for recording the acceleration and braking of vehicles. He simultaneously rented a nearby workshop for conducting his own experiments with engines. This work led to a series of patents, some of which he sold to other engine builders.

An early engine was installed in a boat built in his garden and this was followed by the 1895 car described above and the formation of the Lanchester Engine Company in Birmingham to manufacture cars for sale to the public. This company went bankrupt in 1904 but was reformed as the Lanchester Motor Company. Lanchester, disillusioned, resigned from the company in 1910 but remained as a consultant and technical adviser whilst his brothers continued to run the business.

Lanchester now became a technical consultant to the Daimler Company in Coventry where he was involved in a number of engine development programmes including the Daimler-Knight double-sleeve valve engine as well as work on early petrol-electric vehicles and tanks.

Lanchester continued to work with Daimler until the Wall Street crash in 1929. At the same time the Lanchester Motor Company was bought by BSA, the owners of Daimler and moved to Coventry. The Lanchester cars had enjoyed a good reputation, regarded by some as a rival to Rolls-Royce. Daimler continued to produce cars under the Lanchester name until 1956.

Lanchester, throughout his life, had many interests, both in engineering and outside. A far from exhaustive list would include the work of the Lanchester Laboratories into sound reproduction, radio, telephones, microphones and speakers. His wartime work on armoured vehicles and weapons. The design, development and manufacture of machine tools such as gear hobbing machinery. The use of jig-built components for ease of manufacture and subsequent servicing. Coil-sprung independent suspension in 1908 and in 1927 the first, true, direct-coupled hybrid car, rather than one with electric motors on wheel hubs. The encouragement of students of all disciplines *"glad to be of service to a man who has good stuff in him"*. Fred was also an accomplished singer and piano-player.

It is sad to reflect that Fred's technical genius was not matched by commercial acumen and that none of his business associates seemed able to deliver him financial security. He died in straitened circumstances in his Birmingham home in 1946. Fortunately, The Lanchester Trust is ensuring that his achievements will not be forgotten.

January 2020: David Skillen

Giuants in the Sky - the Zeppelin in WW1.

David Skillen bills himself, correctly, as an entertaining and informative public speaker. He also seems to have the knack choosing apposite titles for his talks. Giants in the Sky succeeded on all counts.

Opening on a sombre note with gravestones marking the resting places of the crews of four Zeppelins destroyed during WW1 David noted the qualities and skills of the captains and their crews.

First, however, he looked at the early days of lighter than air machines and the eponymous Count Ferdinand von Zeppelin. Zeppelin, who had visited America as a military observer during the Civil War, is recorded as witnessing an observation balloon flight during the siege of Fredriksburg.

After retiring from the military Zeppelin began to develop his ideas for lighter than air rigid airships and obtained a patent in 1895.

The primitive early ships were built near Friedrichshafen on Lake Constance. All followed the same basic concept of a skeleton formed from duralumin tubes covered with a fabric outer cover. Inside were bags, lined with goldbeater's skin, filled with hydrogen. Each bag needed the membranes from 50,000 cows for the goldbeater's skin! Outside the hull were located gondolas containing engines driving propellers and separately a control car for the crew. At the rear were rudders and elevators to control the ship.

LZ-1 first flew in 1900. The costs of development threatened closure, but funding from a national lottery enabled work to continue and by 1910 passenger carrying flights were being made by Deutsche Luftschiffahrts-AG (DELAG), effectively the world's first airline. By mid-1914, DELAG had carried over 10,000 fare-paying passengers on over 1,500 flights.

A number of experimental ships were built and several suffered damage or were wrecked, usually on landing or when tethered to the ground. Some exploded when hydrogen ignited. This was an ever-present danger until helium could be substituted but this was not until after the zeppelin era had passed.

David used contemporary photographs to show the development of the zeppelins and their construction. Particularly interesting were a couple of paintings showing the crew on the flight deck, one of which included a machine-gunner looking for an attacker. The clothing of the crew members looked appropriate for polar explorers.

An idea of the size of the later airships was given in a slide that showed the Hindenburg airship of 1936 to the same scale as the liner Titanic. The airship is only a few feet shorter. Another sense of scale is given by the two enormous sheds built at Cardington in Bedfordshire to house Britain's airships.

For many people 'Zeppelin' means the air raids along the east coast and especially on London during WW1 that caused much anxiety but little real damage or loss of life amongst the population.

However, the first wartime involvement was over the North Sea on reconnaissance for the navy. Count Zeppelin had returned to military service and had held discussions with Grand Admiral Tirpitz (he of the forked beard) and von Strasser the head of the Naval Air Service about their deployment.

The Royal Navy's response was to create its first aircraft carriers by mounting platforms on suitable ships or barges. Hazardous for the pilots and a steep learning curve; albeit successful, as bombing raids on the zeppelin sheds destroyed 3 airships. However, this gave von Strasser the excuse to get the Kaiser's permission to bomb England in retaliation. The first raid on Kings Lynn and Great Yarmouth was a primitive affair and hampered by navigational errors.

The first zeppelin destroyed in the air was downed over Belgium by bombs dropped on it by R A J Warneford. The zeppelin crashed onto a convent and two nuns were killed. Warneford was awarded the Victoria Cross but was killed in a flying accident two weeks later.

Further sporadic raids caused little real damage but much consternation amongst the population at large. In October 1915 a zeppelin commanded by Heinrich Mathy, regarded as probably the best zeppelin captain, carrying the largest bomb yet at 300kg, reached London and caused widespread damage amounting to one sixth of the total inflicted by bombing raids during the war. One memorable illustration showed two little girls flanking an unexploded bomb and another showed panic in Trafalgar Square with zeppelins overhead. A recruiting poster proclaimed that *'it was far better to face the bullets than to be killed at home by a bomb'*.

Anti-zeppelin measures were introduced, policemen on pushbikes could give warnings and anti-aircraft guns mounted on lorries formed a mobile defence system. Not all crashed zeppelins caught fire and code books that were rescued were of great assistance to the admiralty code breakers of Room 40.

Meanwhile, Germany was building larger ships, but the British were using incendiary and explosive ammunition, some produced by Brock, the firework maker. This ammunition enabled W Leefe Robinson to down a zeppelin in flames over North London for which he too received the VC. The crew of the zeppelin were buried with full military honours by the RFC.

The zeppelins became increasingly vulnerable to British aircraft and AA fire and losses, including the most experienced captains, mounted. In an attempt to counter the losses Germany introduced the 'height climber' craft with a ceiling that exceeded that of their attackers. However, conditions for the crews were terrible and bombing accuracy worse than ever. Germany also introduced new heavy bomber aircraft that were potentially more effective.

A notable zeppelin flight in 1917 was the 95 hour passage to resupply German forces in South East Africa. The mission was unsuccessful but did demonstrate the endurance capabilities of the craft. Von Strasser, who had persisted with zeppelins, was killed when the ship that he was flying in was shot down.

In 1919 the remaining zeppelin fleet was scuttled but subsequently much larger ships were built both in Germany and England for long distance passenger traffic. The current thinking being that aeroplanes would never be suitable for trans-atlantic service. Germany did introduce a timetabled service to the USA and South America. It was very costly and uncomfortable (unheated) but otherwise luxurious.

After the horrific destruction of the Hindenburg at Lakehurst NJ in 1936 all airship development ceased. Simultaneously, the aeroplane began to show its true potential for passenger transport.