

WARWICKSHIRE

Industrial Archaeology Society

WIAS

NUMBER 70 August 2020

PUBLISHED QUARTERLY

FROM THE CHAIRMAN

I could not have imagined that my next Chairman's Notes would be written during the worst pandemic experienced in the UK for many years, with no obvious end in sight. It has been a worrying time for us all, and has exerted its own pressures on the way in which WIAS has functioned during this crisis, and the way it may operate in the future. This newsletter explores that current experience, and outlines plans for the coming months. Inevitably, with an unknown path for the Covid-19 pandemic, all these may be subject to change, although we hope the autumn programme outlined below will stand firm.

As we have previously advised, our committee has agreed with Warwick School that we shall not hold any 'live' meetings at the school at least until January 2021 and, in the meantime, we shall keep the matter of our return under review with the school's management. This also means that the planned programme of meetings from January 2021 must remain provisional, subject to some form of (government/school) clearance about the viability of (?socially-distanced) gatherings of clubs and societies. We will keep the membership updated.

However, we are pleased to announce that we have arranged a series of on-line meetings for the autumn season, using the Zoom system when we would otherwise have been meeting at Warwick School, that is at 7:30 pm on second Thursday of each month, 10th September, 8th October, 12th November and 10th December. We envisage that these meetings will have a duration of around one hour.

Prior to the pandemic, I sense that many of us were not even aware of

the existence of Zoom meetings, but they have become a familiar feature of communication during the crisis. Fear of the unknown – particularly in the world of IT – is familiar to many of us, but I hope the notes for Zoom meetings outlined below – meticulously prepared by Victor Lobb – will ease those fears.

For those without screen access, this is an opportunity perhaps to share the evening of the second Thursday of the month with a friend or neighbour who does have such access.

The details of the planned programme are shown opposite.

Guidance for attendees of WIAS on-line ZOOM meetings.

- You will be sent an invitation by email that will include an invitation link and the allocated **meeting number** and **password**.

- You can request to join the meeting by clicking on the **'invitation'** link in the email.

- This will prompt you to access the process that gives you access to the meeting: please follow the on-screen instructions.

- The meetings are scheduled to begin at 7.30 pm, but to enable all those wishing to join to do so, we shall open the meeting at 7.00 pm. We recommend that you ask to join the meeting as soon as possible after 7.00 pm.

- *As an alternative, you could pre-install and activate a free Zoom account on your PC, tablet, smartphone, iPad etc. Activation is by an email they will automatically send you, and once installed you will have your own personal "meeting room" number. You can then join the WIAS meeting by entering the allocated **meeting number** and **password**.*

- You can use a PC, Mac, iPad or smartphone to participate. Smaller screens limit the number of people that you can see. For example, if you are using an iPad, you may be able to only see nine people at a time, on gallery view. If you have the choice it would seem to be better to use a device with a larger screen (computer, lap-top).

- Zoom's security system places invitees wishing to join the meeting in a **'virtual waiting room'**, from which the host admits them to the meeting.

- In order to improve sound and video quality for the group, the host will **mute** all attendees upon admittance.

- You are recommended to:

1. turn off your video camera so that the focus stays on the presentation and the speaker.

2. set your viewing mode to **'Speaker View'**.

- Attendees are invited to submit questions using the Zoom **'Chat'** facility; the host will monitor and relay these to the speaker.

PROGRAMME

10 September 2020: Informal AGM (formal AGM deferred to 9/9/21) and Roger Cragg talk
The Dale Dyke Dam.

8 October 2020: Alain Foote
Industrial Archaeology Highlights of a round-the-world trip in January and February 2020.

12 November 2020:

John Berkeley OBE
E Crossley & Son, Aircraft Constructors of Banbury.

10 December 2020: Martin Green
Shaping the Fabric of Victorian Leamington Spa: The life and work of G.F. Smith, brickmaker, builder and surveyor.

NEWSLETTER

Meeting Reports

February 2020: Members' Evening

Twenty's Plenty

The first meeting in what will now be our on-going venue, The Halse Pavilion, was enjoyed by all despite some car parking issues. Moreover, it once again highlighted the range of interests and expertise that reside in the membership.

George Sayell and **John Berkeley** opened proceedings with the surprising history of a WW1 aerodrome in Norfolk. Recalling the previous month's talk on zeppelins, Sedgeford aerodrome was built in 1915 as a satellite and night landing site for the RNAS base at Great Yarmouth, especially to intercept zeppelins. Also used as a training base, with high casualties, the aerodrome closed in 1919 but its buildings remained, some featuring in a local archaeology society's survey a few years ago.

A motley collection of aircraft, shown in contemporary photographs, used the base which also became a decoy site during WW2. Of more current interest was the reuse of some hangars by a number of local businesses. One housed a Land Rover dealership and others were found incorporated into light industrial units. The wooden roof trusses seemed to have lasted well. The site is now a chicken farm and inaccessible to the casual visitor. Subsequently, when needing to know the dimensions of a hangar a local contact offered to go and measure one only to find nothing but a pile of rubble. Here yesterday, gone today.

Peter Bolton, before taking us to chew a toffee in Hunnington between Bromsgrove and Halesowen, offered the chairman a possible timing system for future 'twenty's plenty' evenings. Heath Robinson would have quailed before constructing the device used by one Shirley Walloon that ended by igniting a thunder flash! Not in the Halse Pavilion please.

Harry Vincent started Bluebird Toffee, originally known as Harvino, in Hunnington in 1889. The local railway station closed in 1964 but opposite can still be found the elegant headquarters of Bluebird built in 1926 and still used as offices. The words Harry Vincent Ltd are still visible over the portico. Elsewhere other buildings remain including the staff canteen and houses that formed part of the model village built by Vincent after the examples of fellow confectioners Cadbury and Fry. The Blue Bird emblem remains on some ironwork alongside a notice of planning applications for demolition and conversion to housing. The company closed in 1989 when it was bought by Needlers and production was moved to Hull. Needler Bluebird was subsequently acquired by Ashbury and the name has now been discontinued.

John Brace took a typically wry look at the remains of a malt kiln in Alcester. Malting or drying grain to preserve it through the winter is also the process used to prepare the grain feedstock, usually barley, used to brew beer. The Alcester kiln consists of two brick lined pits, one larger than the other, sunk below ground level and linked by a tunnel. The superstructure is unknown. The kiln is probably medieval, possibly with Roman antecedents. It has been moved to its present location in Malt Mill Lane within a retirement complex. Its preservation is a good recommendation for active local archaeology.

John Willock, cradling what looked like a small air

cooled motorcycle engine, looked quizzically at the audience and asked: what is this? Not many knew. It was a Heywood air compressor. The brainchild of a Worcestershire Wizard whose Heywood Company was based in Redditch, the highly efficient two stage compressor was attached to Rolls-Royce Merlin engines, driven from a camshaft, to provide compressed air. On Spitfires this typically operated flaps, air brakes and cocked the eight Browning machine guns, on the Lancaster bomber the brakes. Heywood compressors were fitted to the Merlin engines powering some 22 different aircraft. It was not unique. BT-H compressors were used on Hurricanes and the US Packard built Merlins had Bendix compressors. A simplified description of how the little powerhouse worked, not least the pressures achieved, made it clear that Henry Royce and his successor engineers were not the only ones to whom we should be thankful for providing the tools for Europe's salvation in those far-off days of 1940.

Martin Green next took us on a picturesque stroll off the Foleshill Road by way of Cross and Canal Roads and from the bucolic charms of the Edgewick Poultry Farm to the remains of Alfred Herbert's empire. Not only were machine tools made here but there was a thriving textile business in hosiery and elastic webbing like that found in Leicester. A possible research project mooted the Chairman. Returning to Herbert, Arthur Astrop's review of Coventry's machine tool industry coupled to some aerial views was a handy guide to follow.

A few buildings remain. The single storey laboratory with its glazed brick internal walls and beamed roof is now a car repair workshop, but the nearby office building with Albert Herbert's apartment above it has been demolished. Next door 'Atritor' still makes the powder handling equipment pioneered by Herbert. In a multi-cultural neighbourhood the Lady Herbert Memorial Surgery has survived, possibly housing a car repairer but well-guarded by 'Tiny'! The AH Social Club is now a Sikh Temple but the 'AH 1938' boss remains visible. A Foleshill Trail Leaflet is a good guide for any visit.

ran through the recent changes and improvements that have been made to the WIAS website. This is now a most comprehensive guide to the Industrial Archaeology of Warwickshire with a wealth of information, both current and historical. It more than fulfills the objective of providing any visitor from Mars or Manchester with a suitable itinerary for exploration and education about our very diverse home county.

Martin Wolston ended the evening with a puzzle. A mystery machine, small, hand operated with a hopper that included an agitator. Well made with detailed castings that suggested volume production, it would appear to be something agricultural and dating from around 1886. The various photographs led to a general discussion as to the possible uses to which it could be put. After many plausible suggestions someone asked where it could be inspected. The discovery that it was in the United States put paid to any thoughts of a field trip. We were left with the general idea of the small-scale treatment of something.

Altogether an informative and entertaining evening.

March 2020: Ian Whittle

The Life and Work of Sir Frank Whittle.

Whilst the story of Frank Whittle and the development of the jet engine is probably familiar, to a greater or less extent, to many, hearing the story from the inside was both a privilege and a pleasure.

Ian Whittle, like his father, has flying in his blood. From a flying scholarship in 1952 and a subsequent RAF career, which included flying Meteors and Hunters, he was a pilot with Kuwait Airways and Cathay Pacific before retiring in 1994. He still has his pilot's licence.

Jet propulsion was not invented. It is a natural phenomenon arising from Newton's third law of motion – for every action there is an equal and opposite reaction. In practical applications the turbojet was proposed by Barber in 1791 but, unsurprisingly, could not be built; Elling in 1903 did build a working gas turbine but only achieved some 3% efficiency.

The turbine cycle differs from the familiar Otto cycle of petrol and diesel engines and was described as suck – compress – squeeze – expand – blow. It is achieved by a machine comprising three elements: compressor – combustion – turbine.

By the 1920s the industrial gas turbine promised, potentially, to compete with the established steam turbine but these were heavy pieces of equipment, beyond contemplation as an aircraft engine.

Frank Whittle was born in Coventry in 1907. He seems to have been fascinated by flight from an early age. When he was only four there was a tin toy aeroplane that flew around the gas mantle light. A possible early lesson in action and reaction. Whittle was present, aged 9, when an aeroplane landed on Hearsall Common. And he got so close that when it took off the slipstream blew his cap from his head.

The family moved to Leamington Spa where his father, Moses Whittle, had a small engineering business where the young Whittle developed his practical skills alongside his academic work at Leamington College for Boys. He was an avid reader and made good use of the Leamington Library.

His fascination with aviation led him to join the RAF at 16 as an apprentice. He excelled in mathematics and built many model aircraft. The top five apprentices were offered places at Cranwell, the RAF's officer and pilot training establishment. Whittle was sixth but fortuitously one of the five proved to be colour blind and so he was in. Whilst at Cranwell Whittle wrote a thesis (in 1928) on future developments in aircraft design and proposed the gas turbine as a possible prime mover for its theoretical potential at high altitudes with targets of 40,000 feet and 500 mph. He also qualified as an above average pilot and was posted to 111 Squadron to fly Hawker Siskins.

Whittle continued to develop his theories and others were also working on gas turbines at RAE Farnborough. A sympathetic CO must have caught something of Whittle's enthusiasm and sent him to discuss his ideas with the boffins at the Air Ministry. Their conclusion was not yet, largely due to inadequate materials to withstand the high temperatures and stresses. Nevertheless, it was remarkable access for a newly commissioned Pilot Officer who, prodded by a friend from the Central Flying School, took out a patent in 1930. This development was picked up, notably by the Swedes and then the Germans. At this time Whittle developed other concepts including the high-bypass configuration and reheat.

In 1934 Whittle's patent needed to be renewed but a lack of funds meant it expired. However, the RAF did regard

Whittle as something of a protégée with many inventions and developments to his credit. The question of what to do with him was answered by sending him to Cambridge, after his distinction in the Officer's Engineering Course at RAF Henlow, to read Mechanical Sciences. He graduated with first class honours after only two years followed by a further postgraduate year.

Whilst at Cambridge Whittle was contacted by a former Cranwell colleague, Rolf Williams, who was now an entrepreneur partnered by another ex RAF man J C B Tinling with a view to exploiting Whittle's jet engine concept. An enthusiastic technical report by a consulting engineer, M Bramson, led to funding by the merchant bank O T Falk and the formation of Power Jets Ltd to which Whittle was seconded by the RAF.

Lacking any manufacturing capabilities, Power Jets began an association with B T-H in Rugby, long established steam and gas turbine manufacturers. Simultaneously, RAE at Farnborough revived their activity in the field and the German pioneers, Von Ohain, and Oestrich were active.

With B T-H producing the hardware, Power Jets made considerable progress and an engine first ran on 12 April 1937. Declared 'secret' by the Air Ministry subsequent developments towards a successful flight were not made public.

However, it was known that in Germany the Heinkel He 178 did fly in 1939 but its engines were totally unreliable only giving some six minutes flying time. In the UK, Gloster were tasked with building the UK's first jet-powered aircraft and the Gloster E28/39 powered by a Whittle jet first flew for 17 minutes on 15 May 1941 and was cleared for 10 hours flying time. The jet aircraft had arrived.

In 1941 a Whittle W1 engine was sent to the USA where the National Academy of Science had condemned the gas turbine engine as unsuitable for aeronautical applications. This spurred US development programmes.

Meanwhile, the larger W2 engine was developed for the Gloster Meteor, a twin-engined fighter aircraft and the first operational jet plane. The German Me 262 does not have this distinction. Furthermore, it was most unreliable and killed lots of its pilots.

Ian did not go into the detailed history of the efforts to bring his father's engine into volume production by the Rover car company nor the subsequent successful collaboration with Rolls-Royce before Power Jets was nationalised in 1944.

In the early post-war years several Power Jets projects were cancelled including the LR1 Turbofan engine and the W2/700 reheat engine planned for the supersonic Miles M52 aircraft. Rolls-Royce Nene and Derwent engines (productionised Whittle engines) were sold to Russia with unfortunate consequences. First, fury from the USA where these engines were classified secret; secondly because Russian built copies powered the Mig 15 fighter that caused havoc during the Korean war.

The drawings for the Miles M52 were sent to the USA where they were developed into the Bell X1 and first broke the Sound Barrier.

Frank Whittle, who had suffered three nervous breakdowns before the end of the war, was promoted to the rank of Air Commodore, knighted and granted a gratuity of £100,000. He retired from the RAF and eventually moved to the USA where he died in 1996.

He will be always remembered as the father of the jet engine.

WIAS During Lockdown

The society has continued to function during lockdown and the following article – published in AIA Newsletter 194 – describes some of the issues raised by the experience. Coupled with this go my thanks to all who contributed to the e-mail correspondence and submitted material for the website. It really eased my task of seeking to keep WIAS in the minds of our members and friends. I should particularly like to thank WIAS webmaster who tirelessly loaded information arriving from several different directions at once, and developed the Virtual WIAS link on the website. John Willock, utilising both his expertise and experience, produced several articles on the motor and aircraft industries, and several correspondents took us into previously uncharted territory of ‘offbeat’ TV Channels and YouTube. **Martin Green**

LOCKED DOWN BUT NOT LOCKED OUT: RESPONDING TO THE COVID-19 CRISIS

By Martin Green and Victor Lobb, Warwickshire Industrial Archaeology Society.

One of the great strengths of the industrial heritage movement has been the role played by local industrial archaeology and industrial history societies. Amongst these societies, there is great variety in the nature of the contribution each makes to the cause, whether through meetings, fieldwork and visits, publications (including online), the maintenance and presentation of industrial heritage sites, or simply providing a much-valued opportunity to share mutual interests. Each of these activities usually relies on the dedicated work of enthusiasts (often small in number), and each society's income is largely derived from membership and meeting fees, publications revenue, and visitor charges.

The oft-quoted challenge of an ageing membership with no obvious candidates emerging to take on the responsibilities of running the society has prompted a lot of debate, and let us hope that the recent AIA initiative to overcome this via ‘The Young Members’ Board’ produces the desired response.

To have the onset of the Covid-19 virus on top of these long-term trends has done little to lift the spirits, but all societies have given thought to an appropriate and achievable response, providing some light in the (apparently) unremitting gloom.

Warwickshire Industrial Archaeology Society is perhaps not particularly well known amongst fellow industrial archaeology/history societies, but we are a thriving society, with meeting attendances averaging 60-70 people prior to lockdown. These meetings are our strength, providing expert lectures, together with the (important) social contact amongst kindred spirits, and the history of the society is very much defined in terms of the range of topics covered in these meetings since we were formed in 1989.

So the lockdown came as a real shock, presenting a distinctly unwelcome challenge to the key element of our work. We have a (mainly) elderly membership, several of whom fall into the ‘vulnerable group’ category, so we had to cancel meetings for the foreseeable future. The probability that, if not the restrictions, then the medical advice will discourage attendance at meetings for some months, encouraged us to consider other ways of both maintaining the engagement and enthusiasm of our members, and managing the Society's affairs.

It was notable that attendance at our regular monthly evening meeting in March, shortly before the ‘lockdown’, was around a third less than we would have expected, and we have not held any ‘physical’ gatherings since. Indeed, the regular venue for our meetings may not be available for some time, and may be subject to a level of ‘social distancing’ which would be very different from our usual environment.

Fortunately, the society is also blessed with a committee that remains positive, with a few possessing unquenchable optimism! How could we respond? Were there even any unforeseen benefits that might emerge from this unprecedented experience?

It was soon apparent that the best way to keep in touch

was by email and through the society website, which already had a good following. Initially all members with email were sent updates about what the society was doing. Then the website was updated with new pages, the first providing a series of films, mostly with an IA theme. Members were invited to contribute their own offerings and a short film about a 1937 visit by a family from the USA to relatives in Warwickshire received over 350 viewings in the first 2 weeks. This page proved extremely popular. Secondly a page called ‘Virtual WIAS’ was created to supply information on any subject members cared to contribute. These have been many and various and generated much discussion, some quite lengthy, on a wide variety of subjects, ranging from clutch manufacture in the automotive industry, through brickmaking at Napton, to pie-making in Warwick!

The contributions were mostly received by email and vetted/edited where necessary before being added to the web page. As a result, many new pages have also been created on the society website which at the height of lockdown was receiving over 800 visits per week. Much of this material was not in the nature of ground-breaking research, but rather a means of creating links and offering ideas that might be followed up by visitors to the website.

The committee were also conscious that a small proportion of the membership did not have access to email. To remain as inclusive as possible it has been arranged to add some of the contributions and photos received to an expanded version of the quarterly society newsletter which could then be mailed to these members.

So thoughts turn to what might lie ahead. The likely continuation of the presence of the virus, even if less virulent than previously, throws doubt on the willingness of members to physically gather for a monthly meeting. Will the Zoom lecture soon become the ‘new norm’?

What is the likely impact on membership - and income - in the longer term? How does one decide the annual membership rates for a series of Zoom meetings?

The one thing that the crisis has created is time – time to sort out all those bits of research that lie in box files up in the attic; time to finally scan (some of) those 35mm slides; time to relate work experiences to a wider audience. This has meant that more individuals have felt willing to contribute material – and to comment on pieces that have been posted by others. Long may this continue.

Questions for the future also include attitudes to recreation, and whether our recreational habits - and those of the rest of the nation - change significantly? Will travel horizons be significantly reduced? Could there be a greater focus on the local community, with growth in interest in local history – including industrial history – perhaps encouraged by Walks and associated leaflets? Could this represent an opportunity for WIAS to become more involved in local communities?

Perhaps most significantly of all, the lockdown has encouraged us to think about ways in which the industrial heritage of our area might be brought to a wider audience. This has been a challenging but ultimately a very rewarding experience.

WARWICKSHIRE

Industrial Archaeology Society

WIAS

NUMBER 71 January 2021

PUBLISHED QUARTERLY

FROM THE CHAIRMAN

As I write these notes at the start of a new Calendar Year, the gloomy predictions that the UK is yet to reach the peak of the pandemic make uncomfortable reading. Who would have thought twelve months ago that we would be faced by such a situation?

It is no comfort to those without internet access to hear all the information about Zoom lectures and the like, and we are conscious of the need to keep all informed of what has been happening. Indeed, many categories of individual links with WIAS have developed over the past nine months – those with full internet access who utilise website facilities and Zoom lectures to the full; those with internet access who use it only occasionally; those, perhaps resident outside the area, who have recently discovered WIAS and have enjoyed access to the website and ZOOM lectures; and those without internet access who rely on printed Newsletters such as this one. This has all sorts of implications for the way we operate, as well as making the funding of our operations more complex than in the past. How would we decide on a subscription/donation that would be suitable for all these different categories?

The primary costs for WIAS in a normal year are room hire and speaker fees. The major costs in the current climate are subscriptions of various types (website facilities, AIA, BALH) and speaker fees for Zoom meetings. At the moment these are being met from the 'reserve fund', but the Committee continues to monitor the situation.

The news of the industrial heritage sector is not a particularly encouraging one, and it is interesting

to hear of the efforts of other societies. Some have completely abandoned meetings for the time being, whilst WIAS seems busier than many. Mike Neville, in the recent AIA Newsletter confirmed the rather bleak picture for the sector, although, happily, he highlighted some encouraging signs.

Of these, not least is the first tranche of grants from the Cultural Heritage Recovery Fund to industrial heritage organisations, ranging from £13,200 for the Saltaire World Heritage Education Association to £717,400 for the Arkwright Society, with three industrial heritage organisations receiving grants of over one million pounds: the Black Country Living Museum; Ironbridge Gorge Museum Trust; and the London Transport Museum.

Specific projects have also seen progress. There is news of plans to re-use two important redundant textile mills. – the Lower Dens Works In Dundee and the Barkerend Mills in Bradford, both for residential purposes. Work has commenced on redevelopment of the Horlicks Factory in Slough, a factory built in 1908 to manufacture the patented malted drink, which was sold as a solution to 'night starvation', a condition that many of us seem to have experienced during lockdown!

The project to save Britain's last bell-foundry, Taylor's in Loughborough, has taken a major step forward with the announcement of a £3.45m grant from the National Lottery Heritage Fund (NLHF). Hemingfield Colliery (part of the Elsecar Heritage Action Zone) is one of a number of industrial sites that have been given national

protection as part of a raft of new and updated listings by the Department of Culture, Media and Sport on the advice of Historic England..

Oxford's Rewley Road Swing Bridge – mentioned by Liz Woolley in her December talk to WIAS - carried the railway over the Thames. It is believed to be the earliest moving railway bridge in Britain to retain its original mechanism. Thanks to the Oxford Preservation Trust, who have raised over £900,000 for the project, it is to be restored.

True to form, it was not long before Derek Billings had sent me photographs from the 1980s of the Swing Bridge, captured during one of his Tuesday sorties to venues near and far accompanied by Peter Chater and others. This is an element of lockdown that I have sorely missed. Research at home has its place, but the experience of the site visit, perhaps the odd (innocent) trespass, and the opportunity to take photographs is something I eagerly anticipate post-Lockdown.

By then, of course, we shall be able to meet up again, and the gatherings at Warwick School can continue. I do hope all will avoid the virus in the meantime, and if any of the non-internet members have ideas about how we can better keep in touch, please let me know.

PROGRAMME

14 January 2021: David Skillen
The Bentley Boys

11 February 2021:
Margaret Ingham

*The UK's Forgotten Transporter
Bridge and the Campaign to Save It.*

11 March 2021: David Fry
*Eighteenth Century Coventry
Silkmen: Masters of the City's
Industrial Universe.*

NEWSLETTER

Meeting Reports

September 2020: Roger Cragg

The Dale Dyke Dam

Roger Cragg has given many talks over the years, but this was a notable first – a Zoom presentation under lockdown. Precedents that we can only hope will be temporary but likely to be with us for some time to come.

Following on from his earlier talk (January 2018, Members' Evening, Newsletter 63.) about two continental dam disasters, the Dale Dyke Dam failure of 1864 was in England, and the country's worst ever in terms of fatalities.

To the East of Sheffield, the Dale Dyke runs into the Loxley River and thence into the River Don flowing through the city. Eight miles away the Dale Dyke was dammed by the Sheffield Waterworks Company to form a reservoir.

An earth embankment dam with a puddled clay core, 500 feet wide at its base, 12 at its top (perhaps too narrow?) and 95 feet high, it stretched 418 yards across the valley to contain some 3.2 million cubic metres of water. There was a 64-foot spillway and two 18-inch discharge pipes laid under the dam. Significantly, the controlling valves were on the downstream ends; a design fault that would prevent inspection once the reservoir was filled. The embankment itself was formed in material, some 400,000 cubic yards, from within the reservoir site; it was porous, thus placing a undue reliance on the clay core. This core, at only 12 feet thick at the base tapering to 4 feet at the apex was perhaps too thin as well.

Construction began in 1859 with a planned completion time of 2 years but problems with ground water and the puddled clay core delayed completion by some 3 years. Not least of the problems was the need to extend the core to a depth of 60 feet to bedrock.

By Friday 11 March 1864 the reservoir was almost full with the water level only inches below the spillway. Heavy rain and melting snow had made significant contributions. On that day, John Gunson, the resident engineer, decided to visit the dam. A strong westerly wind was forecast, and he wished to check the dam although there was no suggestion that he thought there was any danger to the structure. He made an extensive tour of the works but did not walk along the top of the dam as the strong wind was blowing spray over it. He left the site at about 5.30 pm.

Shortly afterwards, at about 7.00 pm, a navy walking along the dam noticed a horizontal crack across the outer face of the dam about 10 feet below the crest. Gunson was summoned back, arriving about 10.00 pm. In the meantime the outlet valves had been opened in order to reduce the water level but at around 30,000 gallons a minute it would have taken 16 days to empty the reservoir!

On his arrival, Gunson ordered that a gap be blasted in the spillway wall but damp gunpowder would not ignite. An inspection of the crack was carried out and it did not appear to have worsened. However, it was then noticed that water was running over the top of the dam and into the crack. This report is difficult to reconcile unless there had been some settlement of the dam crest or that the waves were particularly violent. Whatever the cause, the water rapidly eroded the dam crest and complete failure swiftly followed. The time was 11.30 pm, the worst possible time with most people in bed.

Contemporary engravings showed a gap about 300 feet wide and 80 feet deep, some 25% of the embankment, torn in the dam. The released wall of water, up to 50 feet

high, rushed down the valley at a pace estimated at 30 mph carrying with it large boulders up to several tons in weight and obliterating everything in its path. Luckily, a few people living very near the dam had been warned and had left their homes for higher ground and survived although houses and farms were destroyed. Those living further down the valley, mostly in bed and asleep, had no prior warning.

Photographs showed the extent of the damage and destruction. Houses, factories and mills destroyed by the deluge in the valleys of the Dale Dyke and the Rivers Loxley and Don. By the time the water reached Sheffield the wave was still about 20 feet high and enormous damage was caused to premises along the Don and even the Midland Railway station was inundated before the flood dissipated on the East side of the city.

The final death toll is still uncertain but the official sources indicate 238 but others are slightly higher. 111 buildings were destroyed, 293 seriously damaged and 4,267 damaged or flooded. Livestock losses of 700 added to Britain's worst dam disaster.

The massive clean-up began at once as did the inquest, which was adjourned until 23 March, whilst the Government was requested to appoint an Inspector to assess the works and give evidence. An eminent Civil Engineer, Robert Rawlinson was appointed and later joined by Nathaniel Beardmore. The coroner, the Jury and later Rawlinson visited the site ahead of a two-day hearing where only five witnesses, all engineers, were called. The five were: John Leather, the designer of the dam; John Gunson, the Resident Engineer; Thomas Jackson, a local Civil and Mechanical Engineer; Rawlinson and finally Beardmore.

Hard questions were asked regarding the design and construction of the dam, especially around the puddled clay core, the twin outlet pipes and the way the main body of the dam had been laid down and compacted, or not depending on individual viewpoints. Rawlinson was particularly critical regarding the outlet pipes lying on the puddled clay, possibly leading to settlement and leakage, placing the valves downstream, lack of compaction and an inadequate spillway.

The jury's verdict was damning, and had far reaching consequences: "We find that...in our opinion, there has not been that engineering skill and the attention to the construction of the works, which their magnitude and importance demanded; that, in our opinion, the Legislature ought to take such action as will result in a Government inspection of all works of this character; and that such inspection should be frequent, sufficient and regular...".

Rawlinson's final report to Parliament reiterated his criticisms. However, there has been no agreed answer for the dam's failure although all the factors outlined above play their part. Unfortunately for the Waterworks Company, a clause in its constitution obliged it to pay compensation as a result of its activities. It paid out £275,000 in compensation, and after rebuilding its costs amounted to £422,380. New shares and mortgages were needed and an unwelcome 25% increase in the water rate was finally agreed for a period of 25 years.

Perhaps of greatest importance was the jury's recommendation for the frequent inspection of dams and reservoirs but this was not taken up by Parliament until after a further failure in 1925 at Dolgarrog led to the Reservoirs (Safety Provisions) Act of 1930.

October 2020: Alain Foote

Industrial Archaeology Highlights of a round-the-world trip in January and February 2020.

For our second Zoom talk Alain Foote took us far from Warwickshire with glimpses of IA in far distant places seen on a round-the-world cruise enjoyed just before the Covid clamp down. Across the Atlantic to the Caribbean, through the Panama Canal, up the West coast to San Francisco and across the Pacific to New Zealand before flying home. Quite a trip to remember.

Barbados does not spring to mind for its IA but the sugar plantations needed efficient transportation and power to drive the crushing mills. The St Nicholas Abbey Heritage Railway with its museum and rum distillery uses rolling stock from many sources including locomotives restored in the UK. A ride on the footplate provided interesting video material.

The Morgan Lewis Windmill was built to drive one of the many sugar crushing mills on the island. Gifted to the Barbados NT, it remains one of the two working sugar windmills in the world. Whilst touristy now it evoked uncomfortable thoughts of the past.

Curacao is home to an unusual pontoon bridge crossing St Anna Bay. Hinged at one end while at the free end two diesel engines drive it open and shut. Now pedestrian only it is known as the swinging old lady.

The city's maritime museum is housed in an old colonial mansion and covers more than 500 years of maritime history. The eclectic collection includes models, artillery pieces and ship's figure heads.

From Curacao the transit of the Panama Canal provided much of technical interest. The electric mules running beside the canal only provide lateral control and braking in the locks, the ship's main propulsion system is used for forward motion. Again, we enjoyed some excellent and informative video footage. A large container ship using one of the new locks gave an indication of scale. Towards the Pacific exit Herman the German, a giant floating crane now used for lock gate maintenance was a long way from its original WW2 origins of U-Boat maintenance and then 50 years work in the Long Beach Navy Yard in California.

The cruise up the Western seaboard ended in a misty San Francisco where WW2 maritime history was recalled with the restored Liberty Cargo Ship, SS Jeremiah O'Brien, and the Baleo Class submarine, USS Pampanito.

The former was one of the 2,710 Liberty Ships produced by the US during the Second World War. She was built in 56 days in 1943 at the New England Shipbuilding Corporation in South Portland, Maine. She made 4 round trip convoy crossings and 11 English Channel crossings to support the invasion. Taken out of service in 1946 she was mothballed until 1979 when she was acquired for preservation. She was restored to sea going condition in time to take part in the 50th anniversary of the D Day Landings.

The Pampanito's keel was laid down in March 1943, she was in service until 1971 and turned into a museum in 1975.

Another dockside point of interest was the Pier 43 Arch leading to a decorated hoisting tower for loading and unloading rail cars on and off ferries. It was built in 1914 to serve the Belt Railroad.

Elsewhere, visitors could enjoy tours on a Mack Fire Engine, examine a steam powered 1912 motor bike or ride on an F Line Streetcar.

Even shrouded in mist, the Golden Gate Bridge has to

an abiding memory of San Francisco. Until 1964, when it was overtaken by the Verrazano-Narrows Bridge, it had the longest suspension bridge main span in the world at 4,200ft.

After crossing the Pacific, landfall was made in Auckland where the Museum of Transport and Technology (MOTAT) provided many examples of New Zealand's industrial heritage.

MOTAT is based on two sites. MOTAT 1 is centred around the site of a beam engine house that originally provided Auckland's water supply whilst MOTAT 2 (some 2km away) houses a large aviation collection and a demonstration railway. The two sites are linked by a dual gauge tramway.

The Western Springs Pumping Station was commissioned in 1879. Prior to its construction Auckland had suffered water shortages and losses from fires but enjoyed substantial benefits thereafter. The Woolf Double Compound engine was built by John Key & Sons of Kirkcaldy and the pumps served Auckland until 1910 when adequate water from the Waitakere Ranges became available.

MOTAT 1 also houses a wide and interesting collection of engines that are regularly steamed whilst outside are the heritage trams used on the link to MOTAT 2, home to the Sir Keith Park Memorial Aviation Collection. Park will be always recognised for his leadership in the Battle of Britain but his gallantry in WW1, when he won two MCs and a DFC, may be less well known.

The collection, amongst many other interesting exhibits, includes two Short flying boats, a Sunderland Mark V Flying Boat that served with NZAF and a Solent Mk IV, once used on the iconic Coral Route from Auckland to Fiji. A MkVII Lancaster, was built in 1945 but which didn't see war service, instead she passed to the French Navy as a maritime patrol aircraft.

Another railway experience was on the narrow-gauge Driving Creek line at Coromandel running through tropical rain forest to Eyefull Point with views over the coast.

Moving on to Napier, The Hawkes Bay Museum of Technology's Faraday Centre is housed in the original power station for the city's tram system. It is another remarkable collection of artefacts, including one of the English Electric Fullagar diesel engine and generator sets. Napier was also hosting an Art Deco Festival at the time with plenty of suitably restored cars to examine.

The Glenbrook Vintage Railway provided another footplate ride from Glenbrook to Waiuku and a workshop visit on the way to the Kauri Museum at Matakoho. This museum tells the story of the Kauri tree. Providing strong, straight-grained timber with few branches, it was valued for ship's masts, as a construction material and for high-end furniture. The museum contains a working replica of a sawmill plus many other mechanical items.

Finally, The Auckland War Memorial Museum, housed in a neo-classical building, has three principal collections: Documentary Heritage, Natural Sciences and Human History. Perhaps of most interest to WIAS members was the oldest extant RR Merlin engine (a sectioned model F from 1937) and a Mitsubishi 'Zero', reckoned by many as one of the most capable fighter machines flown in WW2.

Clearly, a trip to remember and a welcome relief from lockdown blues.

November 2020: John Berkeley OBE

E Crossley & Son, Aircraft Constructors of Banbury.

John Berkeley had talked briefly at an earlier meeting about the aeronautical ambitions of members of the Crossley family. In this presentation he gave the full and fascinating history of E Crossley and Son: Aircraft Constructors of Banbury.

As always with John's talks it was liberally illustrated with a wealth of contemporary photographs and punctuated by telling anecdotes.

The story began in Stockport, Greater Manchester where the Crossley Brothers (William and Francis) founded an engineering company in 1857. Two years later the worldwide manufacturing rights for the gas and oil engines invented by Otto and Langen were acquired.

Crossley prospered but their sights were set on further diversification. Crossley Motors was formed in 1906 and quickly made its mark, with high quality vehicles.

With the outbreak of the First World War, the Company was well-placed to respond to entirely new challenges. Many Crossley products saw service in just about every theatre of war. And not just cars; by 1917, Crossley Motors had been selected to establish National Aircraft Factory No.2, with contracts to build De Havilland DH.9s and DH.10s.

In 1920 Crossley Motors acquired a controlling interest in the Avro company, which was later sold to Armstrong Siddeley Motors. These encounters with aviators and aircraft had their effect on the Crossley family. William Crossley's second son Eric moved South to develop the family's farming interests in Oxfordshire and set up home at Tadmarton House, near Banbury.

His son Michael, after leaving Eton in 1930, had taken an aeronautical engineering course at the Chelsea College of Aeronautical and Automobile Engineering at Brooklands during which, at the age of 20, he obtained his Royal Aero Club certificate and worked for a while for the flying club.

The Flying Flea was a curious episode in the explosion of light aircraft design in Europe in the interwar years that captured the public imagination. In 1934 a Frenchman, Henri Mignet published a book, *'Le Sport de l'Air'* in it he claimed that *'if you can nail together a packing case, you can construct your own aeroplane'*. And he proceeded to give detailed plans and instructions to build Le Pou de Ciel or Flying Flea. Many enthusiasts on the continent and in England (where 3,000 copies of the first translation sold within weeks) began to build these tiny tandem-winged machines, including many in the Midlands.

Surely, amongst the most unlikely Flea builders were a father and son team of Old Etonians on their country estate, who could very easily have afforded to purchase their own aeroplanes and yet that is what Eric Crossley and his youngest son Michael began in 1935.

At Tadmarton House there was a row of single storey wooden buildings near to the main house and the sign on the door of one of these said it all: 'E Crossley & Son, aircraft constructors, Workshop Foreman A. Edwards'. (nothing is known about him and it may have been a tongue-in-cheek joke!).

At nearly sixty, Eric could have been taking it easy, yet photographs show him playing an active and, quite possibly, leading part in the project. Indeed, it was in his name, rather than Michael's, that their aeroplane was eventually registered with the Air Registration Board in March 1936 as G-AEFF.

Meanwhile, following a brief career as an assistant

director at Elstree Film Studios, Michael had joined the RAF on a short-service commission. Although Eric continued work on the Flea, three fatal accidents occurred early in 1936 and wind tunnel tests showed the design to be seriously flawed. Many Flea builders simply gave up and with the cancellation of its registration it had always been assumed that construction of the Crossley's aircraft had simply been abandoned like many others.

Despite the setback, Eric consoled himself with the purchase, in January 1937 of a Kronfeld Drone, a type of powered glider, and gained his Royal Aero Club certificate. Michael was determined to press ahead with another homebuilt project and, almost immediately, set to work on a project of his own, a single-seat, high-wing, all-wood cabin monoplane, presumably to be built at Tadmarton.

The first construction drawing, showing the general arrangement of the fuselage, was dated November 1936, just a few months after the official withdrawal of Permits for all Flying Fleas. The small machine was appropriately named the Crossley Tom Thumb.

After serving as aide-de-camp to the Governor of Aden, Michael returned to Britain when other more serious events arose. He re-joined 32 Squadron, flying Hurricanes in the battle for France and then the Battle of Britain. Shot down twice he totalled at least 20 'kills'.

The squadron was now officially recognised as Fighter Command's most successful unit, with 102 enemy aircraft to its credit. Michael was promoted to Squadron Leader and CO. When the unit was relocated north to be 'rested' he was the highest scoring 'ace' in Fighter Command with a DFC and DSO.

He was having a good war, highly regarded, yet with a wry, sense of humour, well shown in his diary where a printed label was completed as follows: "Full name: 32(F) Squadron. Private address: Biggin Hill. Business address: Anywhere South of the Thames. Occupation: Discouraging Nazis."

In June 1941 Michael was posted to the British Air Commission in the USA to evaluate and test fly the North American Mustang for the RAF. Apart from the Mustang he also flew twelve other American types.

Returning to the UK he commanded various units before leaving the RAF as a Wing Commander in 1945. He and his father then decided to emigrate to South Africa and the partly completed Tom Thumb was sold to Corrie Hanbury in Coventry. Hanbury's application for some birch plywood led to enquiries as to whether he or Crossley were approved designers and had the aircraft been inspected during its construction.

Frustrated, Hanbury eventually gave the plane away and later it was gifted to the recently established Midland Aircraft Preservation Society where it was misidentified as an ABC Robin. This was an understandable mistake, there were many similarities. The only Robin built (and later scrapped) was at Brooklands when Michael was studying there. It had a striking colour scheme and there would have been ample opportunity for detailed examination.

John also wondered whether Michael might have flown the Crossley-built Flea from the private aerodrome at Tadmarton. It would have been a great temptation.

It is also to be hoped that someone will complete his little aeroplane, one of the oldest surviving home-designed and homebuilt ultralight aeroplanes in Britain. That would be a fitting tribute to an outstanding airman and the Tom Thumb would remain the sole product of Banbury's aircraft industry.

WARWICKSHIRE

Industrial Archaeology Society

WIAS

NUMBER 72 March 2021

PUBLISHED QUARTERLY

FROM THE CHAIRMAN

ONE YEAR ON ...

It is a year ago that the Committee was agonising over whether to hold the March 2020 meeting of WIAS at the Halse Pavilion, Warwick School, with Ian Whittle talking about the life and achievements of his father, Sir Frank Whittle. Very few of us dreamt that we would still be under lockdown conditions in March 2021, and the intervening twelve months has indeed been a challenging one for the Society. With the hard work of the few and positive response from the many, we have managed to sustain regular monthly meeting via Zoom, whilst the extent of e-mail contact and frequency of website visits has given WIAS a greater public presence.

You will note at the end of this piece that these Zoom meetings continue into the summer, and that the opportunity has been taken to book some speakers from outside Warwickshire. We remain conscious that those without internet connections have been disadvantaged, but were left with little alternative.

Thoughts now turn to the way ahead – I hesitate to use the term ‘road-map’! Without wishing to repeat points made in previous Newsletters, we are now faced with a number of different categories of contact with the Society and we are keen to learn the views of these different groups. The monthly meeting held at Warwick School has always been the bedrock of the Society, and the most obvious option would be to return to this format for the future, beginning, hopefully, in September 2021. We

do have to consider, however, that some might have found the Zoom option preferable to an evening out in the month particularly during the harshest winter months. We would also hate to lose those supporters who might be unwilling or unable to travel to Warwick, so perhaps the regular e-mail contact would be a feature to be retained and to be encouraged.

Our survey seeks to explore these views and I do hope you will be willing to complete the survey either online or by post. Any survey or poll with a low turn-out is of very limited benefit, and may even be counter-productive. Your views are vital to us in taking the Society forward. We have regarded the project as ‘blue-sky’ thinking within the committee so feel free to fully express your views and suggestions. You may have ideas that we have not considered, and fresh observations on existing patterns and procedures or new initiatives could mark a new direction for the Society.

We shall then, of course, have the unenviable task of plotting the route forward, and of deciding the relative weight to attach to the various views expressed. As a precautionary measure, discussions have been taking place with Warwick School and a number of speakers remain on the list of potential invitees, whether for Zoom lectures or in-person meetings.

WIAS is, of course, not alone, and evidence and experience from other societies – whether in IA or local history - produce much the same sort of conclusions. Indeed, the AIA Newsletter contains a

section which recounts the efforts of Berkshire IA Group to deal with the Covid crisis and some examples of the efforts of other Societies to do likewise.

WIAS has clearly done well with its long-established website and regular e-mail contact. Whatever happens, the internet will continue to be the most valuable mechanism for spreading the word of WIAS’s existence and of our work.

One personal example illustrates this. I was invited by the Old Warwickian Association (the Old Boys of Warwick School) to give a ZOOM talk entitled ‘Warwickshire’s Industrial Heritage and Warwick School’ and I related how Industrial Archaeology had been encouraged at the School from the 1960s, and that, from 1989 right through to the present day, it had been the home of WIAS. I relayed information concerning the Society’s website and the following day, from a daily average of 85 visits, we had 269 visits, with 218 first time visitors.

I – and the Committee – very much look forward to reading your responses, and to taking the Society forward into the 2021-2022 season.

PROGRAMME

11 March 2021: David Fry
Eighteenth Century Coventry Silkmen: Masters of the City’s Industrial Universe.

8 April 2021: Dr Mike Nevell
The Salt Archaeology of Cheshire.

13 May 2021: Dr Ray Wilson
Gloucestershire’s Industrial Heritage.

10 June 2021: Dr David Eveleigh
The History of the Kitchen Range.

NEWSLETTER

Meeting Reports

December 2020: Liz Woolley

The Industrial Architecture of Victorian and Edwardian Oxford.

Report by Martin Green

The restrictions of lockdown allowed the Society to explore the possibilities of Zoom lectures on sites that might lie beyond the Warwickshire boundary. Such was the case in the invitation made to Liz Woolley to speak on the industrial architecture of the City of Oxford.

Not many of us will have considered this aspect of the city's history and fabric, and it was a delight to witness the extent to which Liz had explored the industrial buildings and their history, wonderfully illustrated by some excellent photographs, drawings and maps. She provided something for everyone's interest with a focus on the remaining sites in the city, giving context both to industrial history and architectural styles.

Many English towns and cities experienced rapid expansion in the second half of the nineteenth century, and Oxford was no exception. This placed considerable pressure on the provision of public utilities, and gas, water and electricity all experienced considerable investment. The gas works was an early example, founded in 1818, in St Ebbe's (an area to the south-west of the city centre) on the north bank of the river Thames. Successive improvements and extensions were made to the site, including a fine Retort House built by F.J.Evans, who later achieved far greater fame with his designs for the gasworks at Beckton, Woolwich. Extensions on the south bank necessitated a spur from the railway directly into the works, and the Thomas Hawksley designed railway bridge that crosses the Thames is the only remaining evidence of the site. The history of Oxford's railways is, of course, a fascinating topic of its own, including the surviving Rewley Road Swing Bridge. Perhaps Liz might turn her attention to this for us in a future presentation?

Another river-located site was the Electricity Works at Osney, relying on a plentiful supply of water for cooling, and the works established in 1892 remained in operation until the 1960s. The fine river frontage remains and is now being converted to serve the expanding needs of the Saïd Business School.

The adequate supply and treatment of water was another consequence of the city's expansion, and a number of initiatives were taken, including Lake Street Waterworks located in Hinksey. Like most waterworks, it first employed steam power, initially using beam engines and later compound vertical and horizontal engines. The design of waterworks and their setting were often used by water companies as a public expression of purity, improvement, confidence, and reliability, and the Lake Street works reflected this. What is now Hinksey Park began life as the grounds of the Lake Street Waterworks. The classically designed pumping station has become the South Oxford Community Centre.

Turning to industry, Liz emphasised that nineteenth century activity in Oxford focussed on local rather than national or international needs, with the product mix reflecting these requirements. Brewing played a significant role, and several important brewing interests developed in the city. On such example was Morrells Lion Brewery which was significantly developed from the 1870s onwards under the direction of (the splendidly-named) architect Drinkwater. All the buildings constructed were of similar style, and the façades of some of the buildings, the chimney and the waterwheel were retained when the brewery closed in 2002, with the site being developed for housing.

Regrettably none of the buildings of the Swan Brewery, the Eagle, or Phillips's Tower Brewery survive, but some small elements of the huge Hanley's City Brewery operations previously centred on Queen Street remain, if converted to other uses e.g. the premises housing Modern Art, Oxford in Pembroke Street. Hanleys were famous for brewing beers that were advertised for family use, including the 'Intermediate Family Ale'!

Access to river, canal and railway transport links have had a powerful influence on industrial location in Oxford, and the Jericho area of the city was adopted by many given the adjacent Oxford Canal facilities. One such firm was established at the Eagle Foundry by William Carter in 1825. (This was the same Carter who came to Leamington Spa and helped to establish the Eagle Foundry on the Warwick & Napton Canal, still functioning today as Rangemaster). The Oxford foundry was taken over by W. Lucy and, after initially concentrating on decorative ironwork and agricultural machinery, turned its attention to the construction of bookshelves and document storage systems for government offices, universities, museums and libraries. Lucy's remains in business today following considerable diversification and expansion in the UK and overseas. A last vestige of the old Eagle Ironworks remains in the form of factory gates adorned with stone eagles.

Very aware of the nature of her audience, Liz then turned her attention to steam-power and the John Allen Steam Ploughing Company in Cowley, with some wonderful illustrations of the firm's products. Sadly little remains of the complex today except for a gabled end wall with a rather forlorn plaque in Rymers Lane 'THE OXFORDSHIRE STEAM PLOUGHING COMPANY: ENGINEERS with the date 1909, together with some housing specifically built for company employees.

Given the importance of the river, the boat-building department, the rental fleet and the pleasure steamers of Salter's Boatyard were responsible for a large number of craft seen on the Thames. The firm played a key role in the development of the pleasure-boating industry, as well as providing the design and construction of the highly specialist racing boats, some of which were used by the Oxford University crew in the Boat Race. Their premises on Folly Bridge, adjacent to the Head of the River pub originally operated as Knights Boatyard before the Salter Brothers took over in 1858.

Turning to food production, Liz looked briefly at Oxford sausages, and then to the (listed) marmalade factory of Frank Cooper, a brand name familiar to us all. The splendid frontage of the building on Park End Street survives largely intact, now converted to a restaurant 'The Jam Factory' (housing arts centre, café and restaurant). It was originally sited outside two railway stations and a goods yard, with all the advantages that this provided for goods transport, and for sweet-toothed rail passengers (and others) to receive a regular fix!

Finally, moving into the twentieth century, Liz explored the origins of the Morris Motor Works, and the surviving example of the garage and offices on Longwall Street built in 1910, prior to their move to Cowley.

The evening was a real pleasure and undoubtedly opened many eyes to the surviving industrial heritage of the city of Oxford. We hope that WIAS may be able to include a walking tour with Liz at some stage to see these sights for ourselves.

January 2021: David Skillen

The Bentley Boys.

David Skillen entertained us a year ago (January 2020, Newsletter 69) with the history of Germany's Zeppelins – Giants in the Sky. Tonight, with many evocative and contemporary photographs, he told the story of a group of British (and one French) Giants of Motor Racing in the inter-war years. More precisely, Bentley Motors and its drivers, the Bentley Boys, from 1920 to 1930.

To begin with, without Walter Owen Bentley, always known as WO, there would have been no story to tell. Born in London in 1888, the youngest of nine children, he was from an early age fascinated by things mechanical and especially steam power. It is not surprising, therefore, that he left school early to go to Doncaster as a premium apprentice at the locomotive works of the Great Northern Railway.

David took us through WO's transition from steam to petrol before, during and after WW1. A chance encounter with an aluminium piston in France was important as was the development of his renowned BR1 and BR2 radial engines which powered some of the best fighters flown in the war.

Demobilised, WO founded Bentley Motors and set about producing a sporting car that would build upon his now considerable experience in high performance machinery. The first engine, a 3 litre four cylinder, burst into life in October 1919 in a mews off Baker Street to the distress of the lady nursing a sick person next door. A happy sound to die to was the irreverent comment of one of WO's team.

It soon became apparent that the Bentley was something special and for a small company with limited resources, racing might well be the best way of promoting the car. And so began the legend.

The first big race was the Isle of Man TT in 1922 where WO drove one of the three cars which won the team prize.

David introduced the 'Bentley Boys' through the 24-hour races at Le Mans. Many other successes were enjoyed, notably in long distance races at Brooklands and circuits where long straights and few corners allowed the Bentley's speed and reliability to triumph, but it was the long summer days and nights on the 'Circuit Permanent de la Sarthe' where Bentley dominated the 1920s.

The first of the 'Boys' was John Duff whose privately entered car set many records at Brooklands in 1922. He approached the works with a view to some support at the first Le Mans race in 1923. WO was more than sceptical but eventually agreed to prepare Duff's car and provide support at the race.

At the last-minute WO crossed over to see the race. By nightfall he was a convert. Duff and co-driver Clement (who headed the experimental department and was the only professional driver in the team) finished fourth and set the fastest lap. They went on to win the race in 1924, setting the scene for the further triumphs to come.

Planning for future races meant recruiting a suitable team of drivers. Fortunately, amongst its wealthy customers there were plenty of the talented and willing only too glad to be given the opportunity to race such a superlative machine.

These men with money, who had survived WW1, also held it a duty to live life to the full. Later known as the 'Bentley Boys', David sketched the biographies of the most prominent and their major races.

Dr JD Benjafield, was a Harley Street consultant (whose wife happened to own Claridges Hotel) and had bought a car after a high-speed demonstration at Brooklands by the ebullient Bertie Kensington Moir who ran the Bentley pits on many occasions. 'Benjy' went on to drive for Bentley at Le Mans from 1926 to 1929, winning in 1927, and many other races. A steady and reliable driver who enjoyed a party.

Sir Henry 'Tim' Birkin was wealthy and totally ruthless towards his cars. He shared the winning Bentley in 1929 with Woolf Barnato but his love affair with the supercharger, which was an anathema to WO (who preferred to build a larger engine for better performance), was unhelpful. He did win Le Mans again in 1931 but driving an Alfa Romeo after Bentley ceased racing. He died, not while racing, but of an infected mosquito bite in 1933.

Woolf (Babe) Barnato was central to the Bentley story. Son of Barney Barnato, who made a fortune in South African gold and diamonds, he was fabulously wealthy. A superb sportsman he excelled in all he took up, not least motor racing. With Bentley he started the Le Mans race three times 1928/29/30 and won each time. He gave fabulous parties at his country estate 'Ardenrun'. His wager to race the Blue Train' from Cannes to London in a 6 ½ litre Bentley was typical of the man – and he won handsomely. When Bentley Motors was in severe financial difficulties in 1926 Barnato came to its rescue and as a result was involved in it eventually passing into the hands of Rolls Royce in 1931.

Bernard Rubin, a wealthy Australian was a friend of Barnato's and his co-driver in 1928. In 1930, Glen Kidston partnered Barnato. Another tough adventurer and naval officer he was later killed in an air accident.

These men and several others created and sustained the Bentley story with their hedonistic life-styles, a corner of Grosvenor Square was known as 'Bentley's Corner', and glamorous girlfriends. The story was told of WO being invited to meet 'the most wonderful woman' on three separate occasions by three different men – WO says that she and he knew each other pretty well by the end of the third meal!

Tim Birkin's pursuit of supercharging, funded by Dorothy Paget, gained much publicity for the 'Blower Bentley' but little success although Birkin had some monumental tussles, notably with Mercedes' driver Caracciola at Le Mans in 1930 when both cars retired hurt.

To finish, David brought the Bentley story up to date with WO's work with Lagonda after a spell at Rolls Royce following their purchase of Bentley Motors and the post WW2 badge engineered cars leading up to the VW buyout. A Bentley raced again at Le Mans in 2001 and in 2019 the 'Rue des Bentley Boys' was unveiled at Le Mans.

For those who might be interested, 12 replica 4 ½ litre Blower Bentley cars are being built at £1.8 million each.

February 2021: Margaret Ingham

The UK's Forgotten Transporter Bridge and the Campaign to Save It.

With only 18 examples, and every one different, ever built in the world, transporter bridges would be an interesting specialist subject for Mastermind. And Margaret Ingham would surely be a short priced favourite to win.

Whilst centered upon the now unused Warrington Transporter bridge and the efforts to preserve this forgotten relic, Margaret opened many members' eyes to a little-known subject in industrial archaeology. Chairman of the Friends of the Warrington Transporter Bridge, Margaret, a retired IT specialist with the Atomic Energy Authority but with no claims to be either an engineer or an historian, has clearly inherited her father's interest in the industrial revolution.

Waterways were industrial highways plied by tall ships to some distance from the ocean. In a number of places, this conflicted with the need to transport people and material from one bank to the other without a lengthy detour. Various solutions were adopted depending on the local terrain, swing and high-level bridges, for example. However, a cheap and practical solution was found in the transporter bridge where a lightweight lattice girder, mounted on piers high enough to give sufficient clearance above the water, allowed a load carrying gondola suspended from a trackway to pass from bank to bank.

In 1905, an earlier, and at 1,000 feet span, the largest, British transporter bridge had been built at Runcorn spanning both the Mersey and the Manchester Ship Canal. In the list of the 18 transporter bridges, the Warrington bridge, built in 1916, is the youngest. Photographs of the extant 8 bridges showed the variations on the basic concept that had been built.

A 180° loop of the Mersey in Warrington encloses an area known as 'The Tongue' on which Joseph Crossfield & Sons established a soap works. In 1899 the company was prosecuted for contaminating the river – 150 tons of calcium carbonate were being discharged into it every week. Eventually the company decided to find an alternative use for this sludge and built a cement works upstream of the bend in the river and required some means of transporting material across to another site on the far bank.

A light railway ran around the site serving existing jetties but it was decided to build a new transporter bridge adjacent to the cement works. Design proposals were made in 1913 and the bridge became operational in 1918. The methods of construction were illustrated with photographs of the Runcorn bridge – another example to give 'elf 'n safety' nightmares. The finished bridge differed slightly from the original proposals, mainly in the profile of the main beam which was flat rather than having a slightly bowed top. The Warrington bridge was never used for passengers, only for raw and finished materials carried in rail wagons.

The bridge was built by the famous bridge builders Sir William Arrol & Co., to a design by William Hunter, of rivetted mild steel plates and angles. It has an overall length of 103 metres. Double steel cantilevers on each tower support a span of 61 metres with a clearance of 23 metres at high water. Originally designed to carry railway

trucks up to 18 tons it was converted to road vehicles in 1940 and upgraded to a 30 ton weight limit in 1953.

A series of archive photographs from the 1920s through to the 1960s showed how the bridge functioned. The cable suspended gondola was driven from a cab on its roof and rather flimsy looking gates protected the open ends. Probably because of WW1, women painters were photographed working on the new bridge and giving a sense of its size. Another view from the gondola floor clearly shows its rails and the approach to the twin piers on the abutment. Current photographs detail the remains of locating clamps and rail tracks and a possible walkway along the riverbank with views back to the bridge. Another wartime relic is the fire-watcher's chimney-like shelter on one end of the bridge.

A small steam ferry used to ply across the river, in the 1950s it became known as the 'African Queen' but there was never any sign of Bogart or Hepburn.

Margaret's personal connections with the Bolton Steam Museum gave useful insights into the locomotives used around the site, one had been named 'Persil'. The Friends have hopes of someday running trains there again.

The bridge has had a succession of owners since it was built by Crossfields who then became a subsidiary of Lever Bros and subsequently Unilever. It ceased to be used in about 1964 and in 1976 Unilever wanted to demolish it. After considerable local comment the bridge became a Scheduled Monument and Grade II* Listed and was acquired by Cheshire County Council on a 50-year lease. Because of its poor condition it is on the Heritage at Risk Register. Meanwhile, ownership of the site on the Tongue has passed from Unilever to ICI and now to INEOS. It is hoped that the lease will be extended.

The Friends of Warrington Transporter Bridge was formed in 2015 to act as the independent voice of the bridge. FoWTB is liaising with other interest groups to safeguard the bridge's industrial heritage status but has no intention of seeking ownership.

The Council is supportive of the project to improve the condition of the bridge but there is no point in attempting to repaint before serious restoration is undertaken. One major problem would be the prevention of debris falling into the river – adding to the already high potential costs.

If anyone is contemplating a visit, be aware that the site is infested with giant hogweed that can deliver a nasty sting to the unprotected.

Margaret's involvement with the WTB has led to several interesting and rewarding trips to other sites under the auspices of the Association of Transporter Bridges, notably, to Argentina, Spain and Germany as well as the other sites in the UK. Building on the examples of others, there are now information boards at Warrington and the Friends have hopes for a visitor centre at some time. On the subject of building, a local Meccano enthusiast built a large-scale working model of the bridge which he bequeathed to the Technical College.

The Friends of WTB clearly have a challenge on their hands. It is to be hoped that they will be successful.

WARWICKSHIRE

Industrial Archaeology Society

WIAS

NUMBER 73 September 2021

PUBLISHED QUARTERLY

FROM THE CHAIRMAN

Covid restrictions forced the Association for Industrial Archaeology to transfer its Annual Conference from a week-long in-person experience to a series of online lectures. The session on September 18th. is to be a one day seminar on the theme: "The impact of Covid-19 on the industrial heritage sector", and one of the lectures is to be delivered by a local society. This caused me to speculate upon how Warwickshire Industrial Archaeology Society might have presented our experience had we been given that responsibility. In fact, Victor Lobb, Peter Riley and myself had already provided a piece for the AIA Newsletter in which we described the way in which we had switched to the Zoom facility for our meetings, enabling WIAS to go over the border to Oxford, Warrington, Cheshire and Gloucestershire, as well as learning more of the history of the kitchen range, plus staying closer to home with the Coventry Silkmen.

What occupies me now is whether some of the changes to the way the Society operated in Lockdown might have been a temporary emergency, in highly unusual circumstances, or whether some might become long-lasting – even permanent.

We had the advantage of the responses to our Survey in which it became clear that the 'in-person' meeting was a very important ingredient to many, and that a Zoom-only Society would not be welcomed, unless absolutely necessary. The supporters who have really been disadvantaged during the pandemic have been those with no computer access, and this remains one of our biggest concerns. Set against this has been the fact that we had spread our message as a result of having Zoom lectures, and that visitors from anywhere in the country (and beyond) could tune in to hear the latest WIAS lectures. It would be a great shame to lose these contacts.

After a great deal of heart-searching, the committee has decided that the time is not yet right for a return to in-person meetings, and the AGM and Chairman's talk on 'The diversity of Warwickshire's industrial heritage: Chains, Caravans and Corsets' on September 16th. at 7.30pm will be a Zoom presentation.

Once we have assessed that it is safe to do so, we will be experimenting with the in-person lecture at Warwick School (with all the usual features such as refreshments and bookstalls once we are given the all-clear from the School) being simultaneously transmitted to a (restricted) Zoom audience. This 'narrowcasting' could be an enormous bonus to our viewing numbers and would permit the WIAS message to reach a much larger audience. It would also help those who are having trouble in travelling to Warwick School because of health or mobility issues. Once the system has been established, only members and those who had made a suggested donation of £3 for each lecture would have access to the talk, thereby restricting the audience.

This will be an experiment, and will be trialled at our first in-person meeting. Full details of the arrangements will be circulated in due course. For the first in-person meeting the Zoom invitation will be sent to all our members, former members and supporters (on the 'WIAS Circulation List) with no charge, and no-one will be charged for entry to the in-person meeting. Assuming no problems, this will be the pattern for the remainder of the season, with free entry to the meeting and free access to the Zoom link for members with the £3 donation operative from subsequent meetings both for visitors to the in-person lecture and access to the Zoom link.

Also as part of these arrangements, we are pleased to confirm that there will be no change to subscription rates for season 2021-2022. These

remain at £20 for an individual; £26 for a couple living at the same address. These can be paid at meetings or cheques can be sent to:

WIAS Membership Secretary
17 Knightcote Drive, Leamington Spa, CV32 5FA
Cheques are payable to "Warwickshire Industrial Archaeology Society"

Full details can be found on the WIAS website under the CONTACT tab, including the facility to pay by bank transfer.

This Newsletter represents the permanent record of the Society's meetings and an initiative that emerged from Lockdown was the idea of a more temporary occasional publication with news, topics and references etc. identified by members. This is the WIAS Monthly On Line Edition (or MOLE), to be published at the start of each month. Contributions are always welcome. No analysis of the Lockdown experience would be complete without thanks to those who made donations to the Society over this period, to the Officers of the Society, and to the membership and our wider list of supporters who have maintained the impetus of the Society during the most difficult of times. Can I place on record my sincere thanks to the WIAS community as a whole for the contributions you have made in sustaining interest in, and concern for, the industrial heritage of Warwickshire and beyond.

PROGRAMME

PROVISIONAL

16 September 2021:
AGM followed by **Martin Green**
The Diversity of Warwickshire's Industrial Heritage: Chains, Caravans & Corsets.

14 October 2021: Roger Cragg
The Oxford, Worcester & Wolverhampton Railway.

11 November 2021: Allan Jennings
The Bonniksens and Leamington Aerodrome.

9 December 2021: Laurence Ince
The Thames Iron Works.

NEWSLETTER

Meeting Reports

March 2021: David Fry

Eighteenth Century Coventry Silkmen: Masters of the City's Industrial Universe.

David Fry has given us several talks on aspects of Coventry's history (February 2019, Forgotten Foleshill NL66 and January 2014, Industrial Coventry in Old Postcards NL51). His meticulous research and discovery of historic documentation was again evident in the story of the 18th Century Coventry Silkmen – who were indeed Masters of the City's Industrial Universe.

The story poses a number of questions. Why did silk ribbon weaving come to Coventry? Who were the Coventry silkmen, what did they do and what status did they enjoy? More provocatively, did Coventry's 18th C ribbon trade mark the start of the Industrial Revolution?

One problem facing the researcher into those early days is the paucity of information. Whilst the 19th C onwards is well documented, examination of prior times needs some experience.

It is relatively simple to find reasons for a silk ribbon industry arising in Coventry. There had existed a tradition of textile production since medieval times. The population could easily accommodate and master a single hand loom. It was a sufficient distance from London to have lower labour costs, but near enough for transport not to be a problem for a light, high value product (there already existed a comparable product, watches) moving by road in the absence of water transport. There was also a significant non-conformist business class with ready access to capital.

Turning to the people, we were introduced to the Bird family. Prominent in the trade, their family history provided continuity over several generations through their wills, property and some contemporary comment.

But first, what did the silkmen actually do? They were merchants who firstly buy raw silk, usually in London and arrange for the silk to be 'thrown' into threads (Sherborne in Dorset was one centre) and brought to their Coventry warehouses. Other storage was located in the Spitalfields area of London. There were usually not be more than a dozen silkmen at any one time and in Coventry often fewer. They hired undertakers to distribute the thread to weavers' homes where it would be woven into ribbons.

It was a patrician trade. Silkman apprenticeships were more exclusive than banking and cost up to £200 (£20,000 today). Lines of credit that could last for more than a year were commonplace.

Silk ribbons were a high fashion item. Complex designs were created by skilled weavers on simple hand looms. Examples can be seen at the Herbert Museum but for the facts behind the finished product it is necessary to examine the few available historical documents.

Some key features are common to most of the historical accounts. The trade was introduced by a Mayor of Coventry in the early 18th C. He employed a number of Huguenot silk weavers who had fled persecution in France. In 1746 a Coventry silk manufacturer is recorded as employing some 2,000 workers. The Spitalfields Act of 1773 forced silk production out of London, leading to Coventry becoming the ribbon weaving centre of the UK.

A number of books have been published on the subject, notably: *A History of Coventry Textiles* by Alice Lynes in 1952 and *Silken Weave* by Jenny Dodge in 2007. Both authors identify Thomas Bird as the founder of the industry in about 1703 and this is supported by others.

However, David's meticulous research has thrown up some problems. Poorly referenced secondary sources repeat earlier assertions, there are contemporary references to silk but few to ribbons which are produced on hand not broad looms and there are few local newspapers or surviving business records.

Burial records have been useful. The records at St Michael's Church for 1705 – 7 covering 300 burials list 32 silk weavers and only 19 weavers (assumed to be in the wool trade). Probable evidence for a greater prominence for silk woven products.

The first physical evidence for a Coventry woven ribbon dates from 1761. Part of the Herbert collection, the ribbon commemorates the Coronation of George III. It is patterned and could only have been woven singly, not on an engine loom. It also incorporates silver metal thread.

Further evidence about Coventry is found in an account book of a certain de Brissac which contains references to ribbon patterns and designs sold to a Mr J Bird of Coventry in the 1760s. Such commissioning of complex designs shows the continuing importance of the Bird family in Coventry and its links to the Spitalfield silk trade.

The Bird dynasty were not the only silkmen in Coventry, there were others and all were wealthy, but only a few such merchants could flourish at a time. Research into wills showed that only 23 silkmen left wills at the Prerogative Court of Canterbury and 12 at the Diocese of Lichfield & Coventry over the whole of the eighteenth century. Almost 10 of the former are accounted for by various generations of the Bird family.

Other evidence of wealth comes from court reports, a death sentence for stealing ribbons worth £1,500 (£150,000) from a Coventry warehouse and evidence of substantial bequests - £4,000 (£400,000) to an unmarried daughter.

Returning to the Bird family, whilst much wealth and property was passed down the family frequently there are bequests for several thousand pounds to outsiders. Regarding property, that which passed from William to his son Richard before 1711 included: the premises in High Street, near Broadgate, lands in Exhall, Foleshill and Keresley including the manor of Newlands, the Horseshoe Inn at Spon End with several tenements and lands there and the house in Little Park Street originally occupied by Lady Bridgeman. Later, three of the best properties in the street, and in Coventry, were owned by Birds.

In 1742 a coat of arms was granted to Thomas Bird confirming his status in the city. Obituaries were fulsome, his described him as one of the most eminent silk manufacturers in England employing over 2,000 workpeople.

Finally, David explored the London end of the trade showing the locations in Cheapside and Spitalfields that exist today and pondered the fate of the Coventry Silkmen. References tail off from the beginning of the 19th C, London silkmen set up warehouses in Coventry and deal directly with the undertakers. Post Napoleonic wars disruptions don't help and factory operations develop by the 1840s.

As to whether the Silkmen started an industrial revolution: Coventry grew substantially with much employment in the ribbon trade but this remained craft, home working, not mechanised and with no new technology. Great wealth created for a few, little change for many.

April 2021: Dr Mike Nevell*The Salt Archaeology of Cheshire..*

Mike Nevell, introduced a large (52) zoom audience to Cheshire's Salt Archaeology. As a practicing archaeologist and author, associated with the University of Salford and the Ironbridge Gorge Museum, we could not have had a better guide.

Speaking in front of a painting from the Salford Museum of a 19th C open pan salt works, Mike introduced us to the 2 ½ thousand year history of Cheshire salt and especially the most recent centuries.

There is evidence from earlier times of salt usage amongst Neanderthals but the exploitation of England's inland salt fields dates from the iron ages and it grew rapidly during the Roman occupation with increasing requirements for food preservation and flavouring.

Initially, saline springs provided the brine that was heated in clay pots to leave a sludgy mass that dried into crystals. Such very coarse pots, which are porous, were also used for transporting the salt. Dating to around 500 BCE, they are frequently discovered.

Rock salt deposits are widely distributed in the British Isles, but the substantial ones under the Cheshire plain were conveniently placed for use by a growing population. It seems likely that Cheshire salt was exchanged and controlled by the Iron Age elite as evidenced by the widespread pottery finds, sometimes accompanied by dateable coins.

As with other natural resources, exploitation under the Romans led to the growth of the salt towns of Nantwich, Middlewich and Northwich. Salt production reached several thousand tons a year. This required developments in manufacturing technology. Notably, the adoption of lead salt pans, the use of which continued into the 17th C. More fragments of these lead pans have been found in Cheshire than anywhere else. Inscriptions are often found that provide evidence for dating and ownership. The Lion Saltworks Trust, of which more later, has recreated Roman salt pans and evaporation hearths.

The salt industry had an impact on the local landscape. Notably, extensive coppicing to provide fuel for all year-round production.

Excavations in Nantwich unearthed the largest brine tank yet found, dating to 114 CE and built from reused timber. Elsewhere in the town are medieval salt houses from the 11th, 13th and 16th centuries, all close to the River Weaver. Production in Nantwich peaked in the 16th C.

The introduction of iron pans improved production rates and reduced the health risks from using toxic lead. A good description of the process is found in Agricola's *De Re Metallica* of 1556 which was used as the basis for the reconstruction of an iron salt pan as used in Nantwich in the 17th C.

Apart from the introduction of iron pans, the other driver of increased production was the discovery of extensive rock salt beds in 1670 at Nantwich by the Smith Berry family when prospecting for coal.

Descriptions of the development of the processes for extracting salt highlighted the natural advantages in Cheshire. Not least was the source of cheap and abundant fuel from the overlapping Lancashire coal field and the proximity to waterborne transport for a bulky material.

The production boom was fueled by demands for food preparation and preservation, from the textile industry for

bleaching and dying and especially from the burgeoning chemical industry's need for soda. Output reached several million tons a year by the mid-19th C. Figures from the River Weaver Navigation records show that some 3 or 4 tons of salt were carried for every ton of coal.

This traffic led directly to the construction of the Anderton boat lift linking the Weaver with the Trent & Mersey Canal. Liverpool thus opened up as a major port for salt exports. Incidentally, more recently there was considerable local objection to the restoration of the 'pile of scrap' into which the lift had been allowed to deteriorate.

Cheshire's open pan salt works were characterized by low buildings and tall chimneys in a flat landscape. These were evocatively shown in a series of historic photographs.

Some buildings, such as the Middlewich Brine Pump House have been restored under the aegis of the Middlewich Heritage Trust but the structures over the open salt pans were always regarded as sacrificial to the corrosive atmosphere and temporary. Consequently, few have survived.

The brine pump introduced the later technical developments for extracting salt from the underground beds. Water is pumped in and brine extracted. This allowed the development of more distant works, such as in Runcorn and the Vacuum Salt Works at Weston Point.

Today, there is still a salt industry but one largely utilizing pumped brine whilst rock salt is mined for use on roads. The mines with their extensive caverns are used for storage, notably for archives.

What is the heritage position today?

The Lion Salt Works, now a council-run museum, is the only survivor of the Cheshire open salt pan industry. The first connection of salt with this site was in 1781, a shaft was sunk some 100 metres deep to access the rock salt deposits. The first Boulton and Watt steam engine in the Northwich area was installed there. The business passed through several owners until the site was declared a scheduled monument in 2002.

Subsequently there has been considerable archaeological work undertaken to restore buildings and recreate the processes used. Not least has been the investigation of the canal and rail links that were fundamental to the development of the salt industry. This work was well illustrated and emphasized the unique nature of the site which would be well worth a visit.

Close by the Lion Salt works is another site that has been studied for some five years by Mike and his team. The Ollershaw Lane Salt Works today is marked by two large ponds where the ground collapsed into an underlying mine in 1929. The archaeological work has uncovered a variety of remains around the ponds including salt pan houses, tramways, a warehouse and flue and the canal arm that served the works.

Industrial sites have always been of interest to a wide variety of people. In the 18th C many were tourist attractions and this curiosity continues to the present – not just amongst industrial archaeologists. Mike's work with Ironbridge has included a survey of the Weaver valley for a possible heritage trail and investigating the potential for the Cheshire salt fields more widely.

We now have another reason for visiting the Northwest when conditions allow.

May 2021: Dr Ray Wilson
Gloucestershire's Industrial Heritage.

Another Zoom presentation gave a further opportunity to trespass into another county. In Dr Ray Wilson, a well-travelled physicist and long involved in the county's industrial archaeology, we had an exemplary guide to the industrial heritage of Gloucestershire.

Gloucestershire is not often thought of as an industrial county, but in fact it has been home to a very rich and interesting range of activities. The county divides naturally into three parts. The westernmost, beyond the River Severn, is the Forest of Dean where mineral extraction dates from ancient times. East of the Severn lies the Vale country centered on Cheltenham and the Cotswolds where sheep brought great riches and long-lasting industries.

The illustrations of the Gloucestershire heritage often crop up in the county's tourism brochures but the origins are mostly industrial. Typical are the ponds that fed the leat of the Park End Ironworks or the overgrown quarries from which much prized sand stone was extracted. Coal was often the reward for the 'free miners' of the forest.

At Whitecliff there is a now restored charcoal fired furnace that produced iron from local ore and limestone. The Cinderford Ironworks in the 1880s could easily be mistaken for one in South Wales due to its size.

Across the Severn is 'The Devil's Chimney'. Frequently used in brochures it is an industrial monument featured in a sketch which shows the chimney alongside a ropeway that was built to transport stone quarried at the top of the hill down to the tramway linking Cheltenham to Gloucester and its docks.

Excavations at the docks in the 1980s uncovered some flanged rails on stone sleeper blocks which have been incorporated in today's display of the old tramway and its rolling stock.

Also in the docks is a plaque commemorating their opening in 1991; the photograph we saw is notable for featuring the Rev. Awdrey of Thomas the Tank Engine fame who was President of the Gloucestershire IA Society for many years.

Transport in one form or another features widely in the county and amongst the many examples are the 1860s station at Nailsworth, whose stone detailing matches a nearby church suggesting that the same masons worked on both buildings, and the original Severn railway bridge built to bring coal to Sharpness Docks, which was damaged in 1960 when two tankers collided on a foggy night and then brought down two spans. It was never repaired.

Turning to some smaller canals we saw evidence of restoration work on the the Cotswold's canals; notably the Stroudwater.

A plaque on the Dudbridge Lock Bridge marks a watershed moment in 1991 when the County Council recognised that canal restoration was possible. Bridges have been sympathetically treated to meet modern transport loads, not just flattened out.

A surviving crane from the 1850s, originating in Preston, and installed on the canal, is a good example of the growing industrialization of the County brought about by the railways.

Moving east we came to Brinscombe and the Thames and Severn canal. Brinscombe Port arose at the junction of the Severn and Thames traffic because of the different sizes of barge on the two systems. Little now remains of

the port basin but some of the buildings illustrate adaptive reuse of old ones.

A good example of which is an old salt warehouse. Supplies from Droitwich were housed in a centrally heated building now over 200 years old. The 'round house' cottages for the canal linksmen who walked a stretch of canal keeping it in a good state of repair now have new owners. Adjacent to the one shown was more recent accommodation used by artist Damien Hirst, one of three locations he uses in the County.

One of the gems in the County is the Sapperton Tunnel on the Thames & Severn. Opened in 1789 it was then the longest canal tunnel in the UK. It has been blocked for many years but may possibly be opened up.

Returning to the Gloucester & Sharpness there are some ten bridge-keepers' cottages of classical design now restored and occupied.

Continuing the transport theme, toll houses are a reminder of the cost of providing overland transport with examples at Butter Row, Stroud, Pike Cottage and Thomas Telford's unique (?) toll house with a booth on the opposite side of the road at his bridge in Tewkesbury.

Telford also built an elegant masonry bridge on the road out of Gloucester (the A40) to Ross-on-Wye but miscalculated and on removing the timber shuttering the centre sank by 8 inches, increasing to 10 soon thereafter. Nonetheless, the bridge stood and was in use until a new crossing was built in the 1960s.

Moving on to manufacturing, Ray commented on the usefulness of company letter headings, especially the liberally illustrated Victorian variety. The Walker family of Stroud's Dunkirk Mill provided a good example entwining social with industrial history.

Cam Mills near Dursley still weaves the cloth for all the championship snooker tables and the Woolpack Inn at Slad (Lawrie Lee's local) has a sign that well illustrates how packhorses carried local wool to the docks.

A sketch map showed that some 200 wool mills lined the rivers around Stroud, Nailsworth, Dursley and Wootton-under-Edge. (Members might recall Ian Macintosh in his Stroud Scarlet waistcoat talking about Stroudwater Textiles in November 2012 see NL 47.)

Many mills have been converted to other uses, often housing, which has preserved the structures. The important iron-framed King Stanley Mill from 1813 has been in limbo for several years but is now due for reuse as housing. The iron work will not form part of the development. Brinscombe Silk Mill prepared silk for weaving, sending thread to Cash in Coventry amongst others.

The Chalford Stick Company still produces walking sticks using traditional machinery as does Hooper turning out skittles and wooden balls for coconut shies.

Elsewhere Gloucester has seen boat builders exporting river craft to South America and aircraft by Gloster of first jet flight fame. Pins and pianos have been produced and printers can enjoy the time capsule to be found at the Severnside Press. At Stonehouse could be found a paper and bag mill as well as a brickworks that boasted the tallest chimney in the county. Brewers cannot be forgotten and the now lost maltings in Stroud were notable.

Our journey through the wide and rich heritage of Gloucestershire ended with the Hampton car. It was made in Stroud but had its origins in Hampton-in-Arden.

WARWICKSHIRE

WIAS

Industrial Archaeology Society

NUMBER 74 December 2021

PUBLISHED QUARTERLY

FROM THE CHAIRMAN

As we have sought to chase a rapidly moving target, the attempts of WIAS to outwit the Covid 19 Virus have been thwarted once more. How many of us expected that we would still be battling with Covid at the start of 2022? I had hoped to present an encouraging prospect to you all, with 'in-person' meetings resumed in the normal pattern of the second Thursday of the month in the Halse Pavilion, Warwick School. Sadly, this will not be the case. With the ever-rising number of cases at the end of 2021, plus the unwillingness of our speaker to attend in-person meetings, we have been forced to convert our meeting on January 13th. into a Zoom presentation.

This has caused a further period of reflection – and several extra committee meetings! What happens next? How far ahead can be plan? Has the WIAS world changed permanently in any way?

One thing that has emerged, of course, is that we have a changing audience and membership. There are various categories included in our 'Circulation List' and 'Postal List', and – without one-to-one conversations – it is difficult to know precisely how they feel about the future. One group that does concern us is the one comprised of members and supporters with internet access who, for one reason or another, choose not to access the Zoom presentations. The most vociferous of the 'non-Zoomers' suggest we should press on regardless, but they do not have responsibility for the decision, something that the leaders of many organisations (including the government!) have found a real challenge. For me personally, although the decisions made are those of the Committee, I will be identified with that decision, which adds a considerable load.

We would really like to involve the 'non-Zoom' group if at all

possible, and we have discussed within Committee how this might be best achieved. Perhaps you know one of them and could offer help and encouragement - even the possibility of sharing a session to show how easy it is.

Taking a broader, longer-term view, many societies such as ourselves are thinking in terms of a (permanent?) loss of support with in-person meetings perhaps only achieving half or two-thirds of previous attendances. We sincerely hope we will not be in that position, that we can restore numbers, and will do all in our powers to make the evenings an interesting and enjoyable experience.

The WIAS Survey carried out two years ago placed great emphasis on the in-person meeting, but attitudes may have changed in the meantime. Two years have passed, personal circumstances (such as health, mobility, capacity to drive) may have altered, plus the emergence of a reluctance to join social gatherings - a new phenomenon associated with the Covid restrictions.

So this page would normally carry details of all the meetings to be held January – June 2022. This is currently impossible, and we can only update on a month-by-month basis.

Despite all this, we can still approach the New Year in positive state of mind. The period of Lockdown has seen some major additions to the WIAS website and visits to the site are regularly between 300 and 400 visits a week. A number of articles have been submitted, with John Willock heading the field in this respect. From personal experience, the act of committing ideas to paper can be very rewarding, and those contributions – possibly only very short articles or comments – will arouse interest out there in the wider world via the internet. For three months, August-October 2021, we also experimented with

the WIAS MOLE - a Monthly On-Line Edition, which sought to gather together snippets of news, notices of events etc, together with a Postal Edition for those without access to the internet.

We would like to think that WIAS is not seen as something merely for monthly entertainment and interest, but an opportunity to contribute to the knowledge of the industrial heritage of Warwickshire and beyond on a regular basis. I feel confident that WIAS can emerge from the experience of the past two years with renewed vigour to cope with the challenges ahead, and on that theme, I would like to finish by repeating two paragraphs from my Chairman's report delivered in September:

Season 2020-2021 has been a unique experience for us all, and I want to pass on my thanks to the whole WIAS community for keeping the WIAS engine pumping. I have greatly admired the staying power of the WIAS members and supporters over this trying time. When I read of the experience of other societies, I feel proud that we have maintained activity at such a high level, whether through Zoom Meetings, website entries, articles produced, or e-mail correspondence. The hand of WIAS has also reached out beyond the boundaries of the county both in terms of speakers and Zoom participants.

As the Treasurer will confirm, with an income flow curtailed, but expenses such as speaker fees and various subscriptions still going out, the extremely generous series of donations made to the society enabled us to just about 'break even' over the year, and I cannot thank you enough for the contributions made. A MOST SINCERE THANK YOU TO YOU ALL.

I do hope we can look forward to a successful year for the Warwickshire Industrial Archaeology Society in 2022.

Martin Green

NEWSLETTER

Meeting Reports

June 2021: Dr David Eveleigh

The History of the Kitchen Range.

Report by Chris Barney

David Eveleigh began his talk with a 1788 cartoon by Rowlandson showing a party of well lubricated individuals in front of a log fire, and he quoted from William Combe's, 'Tours of Doctor Syntax', "At our last inn they used a wood fire as most of the kingdom did when wood was plenty, a common cook here would not know how to manage a coal fire." This makes clear the distinction between those parts of the country which relied upon coal and those who clung to wood or peat and how this was fundamental to the development of the kitchen range. Hearth cooking survived in parts of the south-west until into the 20th century.

Wood was also the fuel for the brick bread ovens where a fire was lit inside the oven. The smoke came out of the door and, hopefully, went up the chimney. The bricks would retain the heat after the fire was swept out and the loaves inserted before sealing the door.

In areas like the Black Country good coal was available and this had been used for cooking, right back at least as far as mediaeval times. However, coal is a very demanding fuel and cannot be burned on an open hearth, it needs to be kept together in a compact mass and raised above the hearth. Inventories describe forms of iron baskets but, exactly what these were, we do not know, but our speaker was able to illustrate a mid 19th century cottage which, for cooking, had just a simple grate with iron bars set between hobs or low plinths.

In larger houses there were wider grates, sometimes described as roasting ranges, equipped with adjustable cheeks which could be moved inwards to confine the coal while the joint rotated on a spit in front. From the late 18th century local ironmongers were making such grates and adding a closed oven at one end and a hot plate at the other, each heated by its own fire.

We were shown several pictures of such arrangements including from a house in Bristol untouched for many years, a basement kitchen with a lineup of a wash boiler, a range with a side oven, an independent oven and a hot plate; four separate fires.

These were the precursors of the more convenient consolidated kitchen ranges and our speaker speculated whether the development of the tall, terraced town houses in places such as Clifton and Leamington as well as London may have provided the impetus for its development.

The first to patent a kitchen range with an integral oven was Thomas Robinson, in 1780, but Farey, writing in 1813, stated that cast iron ovens were being made by 1778 and set beside the grates to be heated when a small damper in the flue was drawn and how, 10 years later, small iron boilers were also included, an arrangement patented by Joseph Langley in 1782. A clever development of the boiler was to make it L-shaped so that it continued around the back of the grate. Thus even when the fire was compressed, part of it would be in contact with the boiler.

From the 1840s there was a growing interest in ranges for the working classes and several 'cottage' ranges were

on show at the 1851 Great Exhibition. Our speaker showed a photograph of a typical Birmingham made range, taken in Bristol, minutes before the house was demolished for redevelopment. Another photo, taken in 1995, showed a small range in use where it was still the sole means of cooking and David recounted how he had been invited to return for a Sunday roast dinner – his only experience of an actual range cooked meal.

In 1799 an American, Benjamin Thompson, Count Rumford, designed a closed stove, criticizing the waste of fuel in British kitchens, "More fuel is frequently consumed in boiling a kettle than, with proper management, would be sufficient to cook a dinner for 50 men." His writing influenced manufacturers such as George Bodley of Exeter who took out a patent in 1802 for a 'closed' range using dampers to direct the heat over and around an oven for roasting on one side and underneath an oven for baking on the other side. This was promoted as being more efficient and generating less smoke.

An advertisement from 1829 showed William Flavel's 'Patent Kitchener' with registers or dampers able to direct the heat to where it was required. As early as 1833, JC Loundon reported that, "open ranges had been entirely laid aside in favour of kitcheners in villas around Leamington." With prizes in 1851 and 1862 the Flavel Kitchener became the Flavel Prize Kitchener, although many other manufacturers were also producing them. Besides economy, an important advantage of the closed range was that the clean space above could be used for drying towels or heating plates. Jenkins', Improved Patent Kitchener allowed the fuel to be fed from the bottom, thus improving the fuel economy and reducing smoke.

This economy had a price; you could no longer sit in front of a cheerful open fire and meat roasted in an oven was described as 'soggy'. Manufacturers such as Harrison of Derby made closed ranges which could be opened to reveal the fire for spit roasting. An example was Benjamin Wright's patent 'Lichfield Range' of 1865.

Very few substantive innovations in the kitchen range took place after this although, particularly in Scotland, smaller 'portable' ranges were manufactured which did not require building in; thus making them tenants' property.

Besides the major manufacturers selling ranges country wide and exporting them, particularly to English speaking countries, our speaker emphasised there were numerous small foundries supplying local markets and there were distinctions such as Black Country ranges which did not have a boiler and needed a kettle or an urn on the hotplate, while the 'Yorkshire' ranges always had an oven higher than the fire which even allowed the floor of the oven to be used for frying.

David finished by showing an example of an early 20th century Cornish range which he described, enthusiastically and justifiably, as exquisitely decorated.

With the introduction of gas, the market for ranges diminished rapidly and was finished by 1939.

September 2021: Martin Green

Industrial Heritage: Chains, Caravans & Corsets.

The Diversity of Warwickshire's

After chairing the AGM, Martin Green moved on to explore three industries that have made their mark on the history of the county, but thus far had escaped the attention of the lecture programme of WIAS. They proved to be fascinating, occasionally surprising, stories that fully merited the Chairman's research.

The manufacture of chains is the best known of the three, and much has been written about the development of Coventry Chain and its eventual absorption by Renold Chain. The best source for material on this history can be found in Basil Tripp's *'Renold Chains: A History of the Company and the Rise of the Precision Chain Industry 1979-1955'*.

Martin preferred to concentrate on the origins the industry in Coventry, and it is perhaps no surprise that these lay in another of the city's famed industries, that of watchmaking. The Hill family were a renowned watchmaking family business, founded by William H. Hill, but his grandson Alick Sargeant Hill joined the Coventry Machinists, a fledgling bicycle company in Coventry. Sent to oversee operations in Philadelphia, Alick met his American bride, but also realised the potential in the bicycle chain business and purchased some machine tools appropriate to the task. On returning to the UK he set up Coventry Chain in Dale Street, Coventry in 1896.

The years at the turn of the century were times of much innovation and experiment and the block chain, bush roller chain and inverted tooth chain came onto the market, with intense competition from Renold Chain in Manchester and Brampton Bros. in Birmingham. Chains were being utilised in a wide range of activities – cycles, motorcycles, motor vehicles, aircraft, and a host of industrial applications requiring transmission of power or conveying.

Business success encouraged Hill to seek larger premises, and he moved the company to Spon End early in the 20th century and expanded the works in 1907. The Spon End site became a well-known landmark, and remnants of that site can still be seen today, including the War Memorial.

The First World War necessitated co-operation in production amongst previously competing firms, and again a major injection of capital (partly funded by Daimler) boosted Coventry Chain's capacity to supply war needs. The company was facing up to some of the realities of the post-war world when sadly Alick Hill died in 1921.

Alick Hill (like his father and grandfather before him) was Mayor of Coventry, and took on senior roles on the Boards of other well-known local firms – Thomas Smith Stamping Works and Bluemel Bros. There is no doubt that the success of Coventry Chain relied heavily on the entrepreneurial skills and personality of its founder. Other factors identified by Martin as contributors to success included readily available capital and the utilisation of business connections; careful monitoring of materials used and standards of workmanship; and effective advertising in a buoyant growing market.

Secondly, Martin explored the caravan industry. It, too, had origins in one of Coventry's better known trades. Brothers Leslie and Clifford Dawtreys both worked for SS (later Jaguar) Cars. Younger brother Clifford was something of a restless, unorthodox, imaginative innovator with Leslie the more dedicated technical designer. In his spare time whilst working at SS Cars, Clifford began designing caravans, and managed to persuade a few colleagues to help him. This began to occupy too much of Clifford's time, and he was dismissed from the company.

Undeterred, Clifford launched his own Caravan Company and embarked on a career that saw a whole series of innovative designs covering materials used, production techniques, suspension, exterior appearance and internal

fittings. Some of the models produced became iconic examples of British caravan design. Indeed, the front cover of Roger Ellesmere's *'British Caravans Volume 1: Makes Founded before World War II'* is illustrated with three of Dawtreys' designs.

Unfortunately, innovative design did not always bring business success, and Dawtreys had a succession of different operations, re-inventing himself several times. He began in the old Meteor Works in Coventry with Airlite Caravans but this failed in 1938, only for Coventry Steel Caravans to rise from the ashes in Quinton Road, Coventry. War damage forced him to move out of the city, temporarily to Leek Wootton, and then after the war to Warwick, where he occupied the old Corn Exchange building (long since demolished). This was to be the home of Coventry Knight Caravans, which went through a number of models, with potential uses for the mobile home explored to the full (e.g. shop, bank, surgery). Much coveted remaining examples of these models have now achieved iconic status.

In later years, he was keen in developing the facilities of the mobile home. The complex internal fittings and facilities of the Falstaff Knight 1950 were described as "making other mobile homes look like empty furniture vans".

The Warwick business moved to Newport Pagnell, but Dawtreys stayed in the area, ever eager to launch new models. Very sadly, the stress of running the business ended in him committing suicide, such a tragic end for a wonderful innovator, justifiably earning his reputation as 'The Caravan King of the Midlands'.

Thirdly, Martin looked east to Leicestershire, although there were important Warwickshire connections. William Symington moved from Lanarkshire to Market Harborough in 1830 to set up a grocery business, and three years later brother James established a draper's shop in the town, next door to brother's store. James met Sarah Gold of Warwick, the two were soon married at St. Mary's Church, Warwick, and Sarah moved to Market Harborough to share the drapery business with James and to add 'corset stay manufacturer' to the list of services provided.

It was James's son Robert who really developed the business and with his brother, William Henry, established 'R & W.H.Symington'. Corsets became a real speciality, and the business grew from strength to strength, with the firm's buildings eventually coming to dominate the centre of the town, many of which survive today. The fine main building in Adam & Eve Street has been converted into a hub for Harborough District Council, and houses the Symington collection of artefacts.

Symingtons manufactured corsets both under their own name and for others, and had great success with the 'Liberty Bodice'. Expanding demand meant that satellite factories were deemed necessary, and this is where the Warwickshire connection is made. After considerable local debate, it was agreed that the firm could set up in the town of Rugby. The corset factory was established in Spring Street in 1881, and the frame of the building exists to this day. It has recently been renovated and converted into housing under the name of 'Symington House'.

With the shifting pattern of demand and fashion, the development of new materials, and the challenge of overseas competition, times became very tough for the UK textile industry, and Symingtons were taken over by Courtaulds in 1967, and the Rugby site was eventually closed, finishing its days manufacturing ladies' swimwear.

Martin managed to squeeze a great deal in the time available, but revealed to us all that his time under Lockdown had not been wasted, and gave us fascinating insight into three Warwickshire industries.

October 2021: Roger Cragg*The Oxford, Worcester & Wolverhampton Railway.*

Roger Cragg has entertained us on many occasions with clear explanations of engineering achievements – and some disasters – and the personalities behind the events. But the extraordinary, convoluted and arcane events surrounding the Oxford, Worcester and Wolverhampton Railway may well have eclipsed those earlier talks.

As Roger said, the planning, construction and early operating days of this short railway includes intrigue, double-crossing and generally nefarious dealings that involved some of the most famous names in railway history.

The depressed conditions in the 1830s and 40s had caused a considerable decline railway expansion. In particular, a gap had opened up between the lines to the West and the North although some proposals for filling the gaps had been made. The GWR reached Oxford in 1844, reviving interest in schemes for northern routes which it actively pursued.

This was also the time of the “Gauge War” and several competing schemes were put to Parliament including the Oxford & Rugby, the Oxford, Worcester & Wolverhampton (both Broad Gauge) and the London, Worcester & South Staffs Junction railway (Narrow Gauge). The O&R and the OWWR were approved but the L&SSJR was rejected; a victory for the Broad Gauge.

The four lines authorised, with their varying gauges, and receiving their Acts, were: The Oxford and Rugby, The Birmingham & Oxford, The Oxford, Worcester & Wolverhampton and The Birmingham, Wolverhampton, and Dudley.

No gauge was specified for the B&O and the BW&D and therefore under the Gauge Act they would have had to be of narrow gauge but in 1847 the GWR obtained an Act to purchase both Companies and to use the Broad gauge. The LNWR attempted to frustrate this by buying up large numbers of B&O shares and allocating them to its employees in small packets enabling them to pack the shareholders’ meeting. However, the subsequent protracted court proceedings ended in victory for the Great Western.

Consequently, the Broad Gauge was set to obtain two separate routes from Oxford into the West Midlands (and possibly beyond) via the O&R/B&O/BW&D and also via the OWWR, both routes ending up at Wolverhampton from where the Great Western was poised to extend the Broad Gauge to Shrewsbury and the Mersey.

Turning to the Oxford, Worcester & Wolverhampton Railway, Roger highlighted a few points from the 1845 Act authorising the railway which were to have severe repercussions. These were: powers to lease or sell the railway to the GWR who was to appoint six out of the 16 Directors, the gauge was such as to permit the railway being operated continuously with the GWR i.e. Broad Gauge, the railway was to be built to the satisfaction of the Engineer to the GWR i.e. Brunel and if the OWWR failed to complete the line within the time allowed then the GWR was empowered to take over the line and complete it, exercising the functions of the OWWR Company and furthermore, must do so if called upon by the Board of Trade. The cost of the line was estimated by Brunel at £1.5m, raised to £2.5m in 1846.

The route of the OWWR as proposed in 1844 started at a junction with the GWR route north of Banbury but it was soon agreed that the junction should be nearer to Oxford at

Wolvercot. The route then runs generally north-west, following the valley of the River Evenlode through Charlbury, Shipton under Wychwood and Adlestrop to Moreton in Marsh. After Moreton the Cotswold escarpment is pierced by a half mile tunnel at Mickleton, near Chipping Campden. At Evesham it crosses the River Avon three times in the space of 3½ miles before turning North to Worcester, Droitwich, Kidderminster, Stourbridge, through the Dudley tunnel to Tipton, Coseley and finally, to Wolverhampton. A total distance of 89 ¼ miles ending in a very complex arrangement of junctions.

Apart from the two major tunnels at Mickleton and Dudley and two large viaducts at Kidderminster and Stourbridge the OWWR was not a particularly spectacular railway - its fascination rests in the political machinations which accompanied its construction and early days of operation: always under the, sometimes baleful, presence of the GWR.

Work, under Brunel’s supervision, and to his revised £2.5m estimate, began in 1846 with the tunnels at Dudley, Worcester and Mickleton and by the next year it was reported that the whole line was under construction from Tipton to Charlbury. However, financial problems arising from under-capitalisation soon arose. A further £1m was approved but was difficult to raise.

By 1849 all the money had been spent but not a mile of railway opened. Work was suspended and a Committee of Investigation reported that a further £1.5m would be required. Eventually, the Commissioners of Railways stepped in and ordered the GWR to complete the line but this ended in Court. And this was only the beginning: if the engineering of the line had been complex, it was nothing to the legalities that followed.

Some of the events turned comical. For example, the Commissioners’ report included the comment that much needed to be done but between Evesham and Stourbridge the railway was nearly ready except for the provision of track and stations!

Despite new Directors and even more capital raising, progress was slow. There were seemingly interminable disputes, often in court, over the gauge to be built on different sections of the line. Eventually, to the chagrin of the GWR, only a small amount of broad gauge was laid down. OWWR often hiding behind a promise to ‘eventually’ build broad gauge as stipulated in their original Act.

Another event was the notorious ‘battle of Mickleton tunnel’. Disputes with the contractors led to the occupation of the site whereupon Brunel arrived with an ‘army’ to evict the occupiers. Magistrates read the Riot Act which cooled matters for a few days until the losing contractor’s men clashed violently with Brunel’s. After much fighting, arbitration by Robert Stephenson and William Cubitt succeeded just as troops sent from Coventry arrived to restore order.

Eventually the line was completed but no money was left. Rolling stock had to be assembled from wherever possible and the sobriquet ‘Old Worse and Worse’ was swiftly earned. The cautionary tale of the Round Oak accident; described by the investigator as ‘decidedly the worst railway accident that has ever occurred in this country’ tells it all.

After further management and name changes and mergers what had become the West Midlands Railway amalgamated with the Great Western thus turning full circle. Congratulations are due to Roger for unravelling such a complex and long drawn-out saga in so entertaining a way.

WARWICKSHIRE

WIAS

Industrial Archaeology Society

NUMBER 75 March 2022

PUBLISHED QUARTERLY

FROM THE CHAIRMAN

MIXED EMOTIONS

It is almost exactly two years since we last met in an 'in-person' meeting and a great deal has happened in that time, not least the fact that we have lost members from within our midst. The latest in this line is Keith Rogers, a loyal WIAS supporter for many years, who died on Friday February 25th. 2022. Many of you will have known Keith, and his great knowledge and boundless enthusiasm for steam and transport heritage was regularly demonstrated over the years., usually accompanied by that infectious sense of humour. He will be missed by many, and we shall include a full tribute to Keith on our website in due course, but for the moment our condolences go out to family and friends.

Set against this and other recent losses, plus the general mood of gloom imposed first by the pandemic and then by the security situation in Ukraine, there has become an even stronger need for us to try and re-establish some of routines that gave us pleasure prior to Lockdown. Monthly meetings that were once part of our regular diary may have slipped off the schedule and I feel we would all gain by reviving that social contact.

Nor should we aim at a simple repetition of what went before. We need to embrace the new environment. Changing circumstances have necessitated a revision of way that we do things, not least in the nature of WIAS meetings, and we have embarked on our first hybrid meeting. Such a meeting is delivered in person but is also simultaneously transmitted to a invited Zoom audience. Masterminding this process is Victor Lobb, and I would wish to record publicly the Society's thanks to Victor for picking up – nay, seizing – this particular gauntlet, whilst others wavered. We hope there will be no teething troubles, but ask for understanding. I have volunteered

to deliver the first hybrid talk so hopefully any difficulties can be ironed out without causing embarrassment to the speaker!

One of the impacts of Lockdown, of course, has been the emergence of a new audience and a new membership – 29 have joined during the "Zoom Era". The website has received a surge in visits, the spread is increasingly international, with requests made to two WIAS authors for permission to access their research. Long may these contacts develop!

A timely reminder of the continuum that is the industrial archaeology movement was provided by the Spring 2022 Edition of 'IA NEWS', the Newsletter of the Association for Industrial Archaeology. This was for many years edited by our own Chris Barney, with his successor Pat Bracegirdle unfortunately having to withdraw from this new role because of ill health. The new editor will be the familiar figure of Dr. Michael Nevell, an extremely experienced and knowledgeable industrial archaeologist, who has spoken to WIAS via Zoom on the Cheshire Salt Industry.

This was the 200th. Edition of IA NEWS, and contained photographs of – and articles by – some of the grandees of the industrial archaeology movement, reflecting on the achievements made. Despite our relatively modest national profile, WIAS has an important role in this movement, with our regular monthly meetings providing the focus of activity. Prior to Lockdown – and during the two-year period itself – our meeting attendances brought many admirers, and I do hope our 'hybrid' meetings can be just as successful, both for those attending in person or online. I feel we are entering what is likely to be a new era for the Warwickshire Industrial Archaeology Society.

VISITS

Naturally enough, the Society's Programme of Visits had been completely curtailed over the past two years, and it is a relief to announce that this is about to be re-launched, under the careful stewardship of Alain Foote. At the moment, the planned visits are listed below, with more to follow.

Contact details for Alain are:

Alain Foote, WIAS Visits Secretary.
Email:alain.foote@outlook.com,
phone 01788 810113 or 07801 774277.

PROGRAMME

One of the issues we will face in the future is how best to 'mix' the pattern of talks now that we have a wider Zoom audience. We must remember that we are the Warwickshire Industrial Archaeology Society, and need to address topics related to the county as a main priority. We also hope to have talks in the future that may be of a more general interest, attractive to supporters of the industrial heritage regardless of geographical location.

10 March 2022: Martin Green

Glover, Eagle, Boon - and Glover Again: The Changing Industrial Landscape of Warwick 1880 - 1920.

14 April 2022: Eric Woodcock

Silent Servants - The Long Story of Electric Vehicles in Britain.

10 May 2022: VISIT

A Guided Tour of the Victorian Industrial Buildings of Oxford. Led by Liz Wooley.

12 May 2022: Allan Jennings

The Bonniksens and Leamington Aerodrome.

9 June 2022: Andrew Baxter

The Edgehill Light Railway.

10 June 2022: VISIT

A Guided Tour of Sandfields Pumping Station, Lichfield.

July/August VISIT

Visit to the W O Bentley Memorial Foundation, Wroxtton, Nr Banbury.

NEWSLETTER

Meeting Reports

November 2021: Dr David Gwyn

The Welsh Slate Industry

In July 2021 UNESCO recognised the Welsh slate landscape as the UK's latest World Heritage Site. The status recognised the region's 1,800-year history of slate mining, its people and culture, and its role in 'roofing the nineteenth-century world'.

Dr David Gwyn had played a major role in achieving this recognition which was the culmination of some twelve year's work. His review of the archaeology and history of the Welsh slate industry was, therefore, much anticipated and was another example of the extended reach of zoom presentations from beyond the borders of Warwickshire.

In keeping with the idea of 'roofing the world' an opening slide of New Amsterdam in the late 17th C showed a church with a light blue roof amongst surrounding clay tiles which could indicate the early exportation of Welsh slates. Unprovable but not impossible. But a hundred years later nearly half of New York was roofed with Welsh slate.

And not only New York; the global reach of Welsh slates stretched from Westminster Hall in London to the Faculty House of the University of Sydney via many cities and towns around the world.

Slate enjoys excellent weight to value properties which greatly improves its export potential. This in turn benefitted the Welsh quarries. In 1793 the UK output of roofing slates was some 45,000 tons of which 55% came from Wales. A hundred years later in 1898 output had reached 640,000 tons, 77% coming from Wales and accounting for about one third of the world demand for roofing slates. Say some 13 million terraced houses.

This output, however, did not provide huge employment. At the height of production, the workforce was only some 16,000 and today, as we well know, the industry is but a shadow of those days. It is also an ancient one, with evidence of the Roman use of slate.

Slate has many uses other than for roofing; claddings, tank linings, snooker table beds to name but a few. For over 100 years, most children in England and Wales learnt to read and write using a writing slate rather than an exercise book. An interesting conundrum lies in the well-known painting of the death of Nelson. At the bottom of the picture is a writing slate; presumably an established means of communication on board. The words are indistinct but if anyone is visiting the Walker Art Gallery in Liverpool, perhaps they can have a go at an interpretation. England expects...?

Over the years some 400 quarries have exploited three veins of slate in Wales. Cambrian deposits in the north, Ordovician in mid-Wales and Silurian in the north-east. The result has been some striking effects on the landscape; from the stepped galleries of the open quarries to the spoil heaps. Slate extraction is always wasteful with 90% left on-site.

Whilst always a relatively small industry, it has been very well recorded. A local map of 1769 holds the earliest mention of a slate quarry. A scattered group of workings which were taken over by one Richard Pennant, a landowner in England and Wales and also of a sugar plantation in Jamaica whose profits he reinvested in Welsh slate at the Penrhyn quarry. A contemporary painting shows the stepped galleries – and the working conditions for the miners. Nonetheless, Pennant did capitalise the industry to

a much greater extent than hitherto.

Stepped gallery quarries were not the only type; deposits in the valley floors could be accessed but had added transport costs and costs were always the enemy of the industry. The exploitation of this natural resource had considerable social effects. What had been scattered farming communities found themselves home to increasing numbers of miners and their families in rapidly growing towns.

Whilst the open-air quarries are spectacular, it is the underground ones that provide rich pickings for the industrial archaeologist with many artefacts remaining in place – equipment, rail and tramways, rolling stock and even a simple privy set beside the wall of a tunnel. Taken together, the rail system at Ffestiniog from workface to dockside totals some 200 miles of track.

Waterpower was most important to the slate workings. Despite some reliability issues, drought and frosts especially, it was much cheaper than coal for a low margin industry. Water was also employed in water balance lifts, one of which provided a school-boy David with an unexpected introduction to industrial archaeology! Returning many years later he found little had changed.

Much of the machinery required in the industry was produced locally. A good example being the largest waterwheel in the UK (the Laxey wheel on the Isle of Man is bigger, but the IoM is not in the UK) at what is now the National Slate Museum.

The industry was mechanised – but only up to a point. The basic tasks of splitting and trimming to size are a traditional and unchanged craft although circular saw tables for roughing out large blocks can be found.

The fortuitous location of the main slate veins close to the coast was instrumental in the growth of the industry. Early on pack horses and carts were used but there are few images of them. One, however, is a painting of 1832 by Thomas Letts (the eponymous diary publisher). Only one canal, the Llangollen, carried slates but the great legacy has been the narrow-gauge railways, many of which continue to operate as heritage lines. The narrow-gauge railways serving the Himalayan hill stations and tea plantations are their successors. Aerial ropeways of various types were also developed.

Quarrymen emigrated taking their skills with them. A large mural in a school in New York State shows many facets of a slate works which was known to employ Welshmen alongside other Europeans. France has a large slate industry located along the river Loire where very similar working practices can be found although there is no evidence of Welshmen working there.

Inevitably, the growth of the industry brought great social change. From early housing, similar to the rural population, often with an adjacent smallholding tended by wives and daughters, grew the rows of terraced houses found today. Interspersed are larger houses and especially the Chapels, large and small, for the various denominations characterised, perhaps unfairly, as '*the narcissism of non-conformity*'. The folk art of slate carving flourished widely.

Welsh slate is the product of a relatively small industry but one with a wide reach that has now been recognised as being of global significance by UNESCO. We had an exemplary guide to take us through its history.

December 2021: Dr David Eveleigh

Bogs, Baths and Basins

The chairman of an Old Time Music Hall would have greatly enjoyed introducing this cornucopia of closets. Dr David Eveleigh had given us the history of the kitchen range in June 2021 (Newsletter 74) and now introduced us to domestic appliances of another kind.

It may be hard to imagine but when *A Christmas Carol* was published in 1843 virtually no house in Great Britain possessed a bathroom. Marley was dead, and probably unwashed.

The plans for a town house in 1819 show no bathroom although there was a water closet. In these circumstances, how did people manage? Washstands in bed and dressing rooms were complemented by chamber pots. The ceramics industry enjoyed plentiful opportunities for decorations although plain, utilitarian wares probably dominated.

A plan of town houses in Bristol show courtyards, in a corner of which was a 'necessary house' or privy. The sociable 'two-seaters' (even up to six were known) are a thing of the past but such privies were in use until the 1930s. They had no water supply or drainage, simply a void or cesspit below. Dwellings alongside rivers might have a cantilevered structure discharging directly into the river and dependent on the tides for disposal.

In the slum neighbourhoods of the large cities conditions were dire, a report stated that in Bethnal Green 50 water closets served a population of 80,000 and 15 or more families had to share one facility. The inevitable result was recurrent outbreaks of cholera leading to the Chadwick report of 1842 and a revolution in water treatment and sewage disposal.

Contrary to popular opinion, Thomas Crapper did not invent the WC. The first patent was granted to Alexander Cummings in 1775 for improvements (such as the S-Bend trap) on earlier designs. Indeed, by the mid-18th C the very best houses boasted WCs. Joseph Bramah soon produced a better version, selling some 7,000 by the 1790s. Crapper, who started his own works in 1860, benefitted from their efforts.

A review of alternative designs showed up some disadvantages. The pan closet was popular but inefficient as it did not self-clean. Plumbers had the unpleasant task of periodically dismantling the mechanism for cleaning.

This, however, was only the beginning of the problem. Where did the flushed waste end up? The exit pipe often ended in a tank or cesspit outside the property. Poor sealing and leaks could easily lead to contamination of adjacent basements that were often used as kitchens. In terraced houses the night soil men who cleared the pits had to traverse the house with their loads.

The local water wells, were also often contaminated leading to cholera and Dr Snow's findings which spurred the search for a solution to replace the discharge onto street or into river. Punch cartoons of the time show a very angry Father Thames introducing his three children Diphtheria, Scrofula and Cholera to the City of London.

The solution was one of Victorian England's great civic achievements. Following the 1st Public Health Act of 1848; a comprehensive sewage system sought to link every WC to a safe disposal point. London exemplified this with the work of Sir Joseph Bazalgette in creating the city's sewage

system. Much of this remains to this day and we can enjoy those great pumping stations such as Crossness as his monuments.

This move towards a water-borne sewage system was an achievement, but how far down the social scale did it reach? Plans for typical artisan houses in Bristol show a sewer in the road and a scullery and water closet in the yard. The latter would not have housed an expensive Bramah or Crapper device but most likely a hopper closet flushed by a pipe from the scullery sink waste. Not a very efficient flush. An example in Bristol, albeit with a cistern added, was in use until the early 2000s by an elderly lady until her death.

Other alternatives included a trough system of dubious efficiency and variations on the dry conservancy principle that used earth, difficult to source in the inner city, or the more plentiful ash from grates. In the late 1800s we find a simple pail system, colloquially the 'bucket and chuck it' was collected regularly by the local authority.

So much for domestic provision. What about public convenience? An early example is found in the Crystal Palace that housed the Great Exhibition in 1851. George Jennings, a sanitary engineer won a sub-contract to provide 'refreshment rooms' or toilets in the Palace. Jennings made a lot of money from the contract, perhaps originating 'spending a penny'. He also pioneered the provision of public urinals, initially the products of two Glasgow ironfounders, and an improvement of the hopper closet that became known as the wash out closet from its use of two water traps. An intricate potting challenge for the ceramics industry with all channels incorporated into a single pedestal. It also led to some very extravagant Victorian decoration and flamboyant sculpting.

Around 1880 a 'hygiene movement' arose that emphasized cleanliness and thus the development of sanitary ware that embodied clean uncluttered forms without nooks and crannies to harbour dirt. Two-gallon cisterns mounted high above the pedestals ensured a powerful flush.

A pervading thread through this history has been that the 'lower' classes were unable to master technology and things had to be made simple for them. Hence the simplicity of some of the devices described above. This led to the tipper closets found in many northern cities. The overflow from the scullery fed into a hopper that when filled tipped to flush the system – surprising an unsuspecting user!

The simple cottage closet that developed from the one piece wash out concept became the dominant design, winning out over the complicated mechanical devices of Bramah et al. No moving parts and hygienic efficiency triumphed. The late Victorians enjoyed a riot of decorative designs but from Edwardian times white was best.

Baths and basins completed the evening. From the portable tub filled by jug that could be adapted to incorporate a shower system we advanced to coal and gas heated baths and the wall mounted gas geyser that discharged into the bath below. The kitchen range was adapted to provide hot water circulating around the house and the fixed bath became more elaborate, especially when incorporating a shower. The introduction of the coloured suite from the US in the 1930s brought this fascinating journey to an end.

January 2022: Anthony Coulls*Brass, Steel and Fire*

Anthony Coulls needs no introduction. Over the years he has introduced members to many aspects of railway history but Brass, Steel and Fire or a century of model trains was the freedom of the sweet shop for many.

An exhibition celebrating the model locomotive was planned for the National Railway Museum at York with a transfer to the Science Museum in London. The century was to run from 1810, when the first model locomotives were built by individuals, and 1910 after which came the commercial manufacturer.

The exhibition was to explore the what, why, where, when and not least, the who behind these early models. It was also felt important that it should not be just a collection of models but should connect the general visitor to an exhibition that would be the first of its kind.

The first model builders were not usually producing a miniature version of a real machine (few of which existed at the time); rather they were developing a concept that might or might not be realized in practice. Alternatively, they were using craft skills for their own satisfaction and pleasure in an age that was expanding its mechanical knowledge at a great rate. Soon these models were being used for selling ideas and demonstrating potential products in markets around the world.

The first model illustrated was once described as a representation of Hackworth's *Sans Pareil* of Rainhill Trials fame. It clearly is not that, and exhaustive research traced it to being the handiwork of a North-Eastern clockmaker in 1808/10 as a concept twin cylinder steam vehicle for William Hedley.

The range of people producing these early models was considerable and encompassed a Nottingham lace weaver, coal miners, youngsters and established engineers. Not all the models were successful, but ideas were developed, such as the compressed air powered locomotive, which was never adopted in England but later found an application in US mines.

The exhibition also examined the places where these models were made, bearing in mind that this was before the time when drawings and castings were available. Every part had to be fabricated by the builder who did not always have access to extensive workshop equipment. One edition of *The Young Engineer* from 1905 even suggested that a model workshop could be installed in the parlour '*provided care was taken not to get oil on the tablecloth and thus incur the vexation of the maid*'. The exhibition also included examples of hand tools and a lathe used by these early modelers.

Sometimes these modelers went on to produce full size examples as the industry developed and elsewhere scientific instrument makers such as Chadburn Brothers in Sheffield and Negretti and Zambra in London added working locomotive models to their ranges.

Assembling the exhibits needed visits to, and negotiations with, public and private collections around the world together with specialist dealers and agents. Valuable lessons were learned in handling international negotiations, dealing with customs and excise and insurance issues.

The collection in Istanbul housed in the The Rahmi M.

Koc Museum, was amassed by the founder of the domestic appliance group, BEKO. An avid transport enthusiast, he reputedly bids for anything interesting that comes up for sale. A Ransomes & Sims 'garden' locomotive was one item borrowed for the exhibition.

Nearer to home was the Robert Guinness steam museum collection housed in a former chapel in Dublin. The chapel was previously attached to the brewery but was taken down and rebuilt in Guinness's own grounds. The collection had been offered to the Science Museum but as only a few items were of interest the offer was turned down.

Hard choices had sometimes to be made with the selection of exhibits. If several examples of the same locomotive were made by different makers, the choice could come down to personalities. The Stirling Single selected bore the maker's plate of H J Wood, who happened to be Sir Henry (Promenade Concert) Wood's father.

The smaller size machines were designed for play and enjoyment in a domestic setting. This can cause some problems – raising steam using methylated spirits as fuel is smelly, messy and fiery. One solution was the hot bar locomotive, where a metal bar was heated in the fire and when nearly red hot inserted into the boiler where it produced steam for a limited period. These small machines could run on rails or had adjustable wheels for free running around if a large enough space was available. Chesterman of Sheffield produced such locomotives.

The early models were not based on working locomotives but as these evolved true copies began to be made. At the same time, there arose an increasing range of generic models produced for the pleasure of enthusiasts young and old, but in those early days, certainly ones with deep pockets.

Soon the interest spread, hastened by the growth of the railways and a good example was the County Durham community of model makers (with links to the temperance movement) which has lasted to the present day with the annual Shildon Show drawing some 12,000 visitors a day.

At the other extreme, in 1890 a Bank of England officer commissioned £10,000 model railway with exquisitely detailed rolling stock. The search for potential exhibits revealed that domestic collections today are equally impressive. The ultimate lounge display was long on content but short on soft furnishings.

Anthony concluded his presentation with a detailed review of the two exhibitions and their content. The careful selection of models in display cases was balanced with more accessible material on benches with seating if appropriate to allow a much more intimate experience. After all, an objective of the exhibition was to foster a sense of participation for the visitor.

The exhibits ranged from the oldest working model steam engine in the world through to the ultimate apprentice piece via experimental models made to test concepts such as rack and pinion designs. The literature serving the model engineering world has always been there but is still developing today and enjoyed its place in the display.

Putting together this unique exhibition had clearly been both a challenge and a most satisfying experience. It was a privilege to share in it.

WARWICKSHIRE WIAS

Industrial Archaeology Society

NUMBER 76 July 2022

PUBLISHED QUARTERLY

FROM THE CHAIRMAN

'Trying to satisfy most of the people most of the time'

After a period of crisis, the return to something approaching normality is usually a cause for relief and reassurance, but it may also bring a recognition that life has changed over the intervening period. This is the situation in which WIAS finds itself in the summer of 2022. The desire to restore a pattern of meetings that was the backbone of the society has been complicated by the developments over Lockdown with the emergence (and acceptance) of Zoom online lectures and a widening of the membership and support for WIAS well beyond the boundaries of the county. To meet solely in Warwick every month is an unacceptable way in which to serve this new community, whilst at the same time the value of live meetings is highly valued by many. So the case seems strong for the hybrid option, with a simultaneous live and online Zoom broadcast. Unfortunately, hybrid meetings have not proved easy to implement and the Committee has been working hard to try and rectify this. Every option seems to contain an element of compromise – hence the desire to satisfy most of the people most of the time with our plans for 2022-2023.

There will be 10 meetings over the year from September 2022 to June 2023 (inclusive). Seven of these meetings will be held in the Halse Pavilion, Warwick School, and will be hybrid meetings. These will cover September-November 2022 and March-June 2023. The three winter months of December, January and February will be Zoom only meetings. This will mean that members will not have to go out on a Thursday evening on the darkest, coldest months of the year. It will also enable us to attract speakers from outside our area.

The Halse Pavilion will continue to be our venue for live meetings, and the special dispensation with

regard to parking arrangements has been confirmed. We are also working hard on ensuring that the screen available will give better viewing options for all those attending the meetings. Thanks to our excellent relationship with Warwick School, there will only be a very modest rise in the hire fee for the Pavilion, and so we are able to announce that subscriptions can remain at current levels, subject to confirmation at the AGM. I am also pleased to report that all members of our committee are willing to continue in post for 2022-2023. This does not mean that there are no roles for members willing to contribute to the workings of the Society. You may, for example, be an expert in IT, have been hiding your light under a bushel, and could contribute to the work of the Hybrid Team. Ever since 2008, Mike Hurn the Newsletter editor has (almost single-handedly) produced the Meetings Reports (3 per issue) that are the backbone of the Newsletter. It would be great if some under-utilised quills out there might be available to produce an occasional report of a meeting which would ease the regularity of Mike's task. Running a bookstall might also be one of your unfulfilled ambitions ...

Another option, of course, is the research of topics of particular interest to members that might be spread to a wider audience either by an entry on the website, a contribution to 'Twenty's Plenty', or the preparation of material for a WIAS Meeting in 2023-2024. You will notice from the Programme below that one of the meetings is described as a 'WIAS Presentation'. What this means is that a small group are working on developing the story of N.C. Joseph and The Aluminium Works in Stratford upon Avon, as well as that of the sister factory of Stratford Produce Cannery. This will include exploring the Archive at the Stratford Birthplace Trust which holds a good deal of information on Stratford Produce Cannery. We have a year to put this together but we hope it will be a suitable record of firms that contributed so much to the industrial

history of Stratford upon Avon.

June 2024 will mark the 35th Anniversary of the Warwickshire Industrial Archaeology Society and it would be good to mark this in some way. This could range from a celebratory evening in the Halse Pavilion or Bridge House Theatre, to a Day Conference, to the production of a short film on Warwickshire's industrial heritage. My experience of this is that grand schemes often end in more modest outcomes but we have two years to think about this, and any ideas (and offers of help) would be very welcome.

I look forward to the new season and the opportunities for exploring the industrial heritage of Warwickshire and beyond with members and supporters of WIAS.

PROGRAMME

8 September 2022 (live/hybrid):
AGM and Peter Coulls

The Photographs of Derek Billings.

13 October (live/hybrid): David Fry
Coventry Canal: 5 1/2 Miles of History.

10 November (live/hybrid): Chris Clack
Harry Ferguson: Man of Vision.

8 December (Zoom): Dr Kate Round
The History of Stourbridge Glass.

12 January 2023 (Zoom): Dr Ian West
Advancing the Work of Prometheus: the Impact of Artificial Light in the Workplace and Beyond.

9 February (Zoom): Alan Hill
Water as a Mechanical Agent.

9 March (live/hybrid): Twenty's Plenty
including: Stuart Thomas - Lydney Products.

13 April (live/hybrid): Peter Hoath
A View of Computing History - 22,000 Years in 60 Minutes.

11 May (live/hybrid): Max Hunt
Herbert Austin and the Longbridge Story.

8 June (live/hybrid): A WIAS Presentation

The Aluminium Works, SONA and Stratford Produce Cannery.

Additional Zoom Meetings may also be placed in the calendar.

NEWSLETTER

Meeting Reports

February 2022: Roger Cragg
The Manchester Ship Canal.

Roger Cragg has taken us to many parts of the civil engineering spectrum over the years and this, perhaps the zenith of Victorian achievement, gave him plenty of opportunities for exploration.

Whilst the scheduled cruise along the canal from Seacombe to Salford takes some six hours, we accomplished it in less than an hour. The combination of terrestrial photography with Google Earth views gave a very clear understanding of the journey.

The rivers Mersey and Irwell have long provided a water route between Manchester and the sea but until the 18thC the Mersey was not navigable above Warrington and was obstructed by fish weirs below. Attempts during the 17thC to change this were unsuccessful but an Act was finally obtained in 1721 to make the Mersey and Irwell rivers navigable between Warrington and Manchester and the waterway was opened in 1736.

The Mersey and Irwell monopoly between Manchester and Liverpool was disrupted by the Duke of Bridgewater's desire to transport his coal into Manchester. His refusal to pay exorbitant tolls led to the Bridgewater canal and competition. Eventually, the Bridgewater's trustees acquired the Mersey & Irwell in 1844.

Another rival appeared with the opening of the Liverpool and Manchester railway in 1830 supported by local interests who considered that the waterway charged too much for a poor service.

Several unsuccessful proposals for a canal to take large ships into Manchester were made in the early 19thC, but the railway's dominance was reinforced in 1872 when a railway-controlled company purchased the canal and river navigations from the old Bridgewater trustees.

However, the Manchester merchants never lost sight of the idea for a ship canal and a pamphlet arguing for one was issued in 1882. The proposal met opposition from the Port of Liverpool and the railway interests but after two failed bills an Act was obtained in 1885 for a locked canal of 36 miles from the Mersey at Eastham to Manchester. The estimated cost was £6,311,137 plus £1,710,000 to purchase the Bridgewater Navigation Company as the canal would use the line of the River Irwell.

A contractor, Thomas A Walker, was appointed but he died as work was about to begin and progress was delayed by problems with his executors but eventually, in 1890, the work was taken over by the Manchester ship canal company. The canal was finally completed and opened on 1 January 1894 by Queen Victoria. The final cost at £14.3 million was an overspend of 71%.

The inland port of Manchester became one of Britain's most important, reaching third place in 1952 with 11 million tonnes of cargo handled. By the 1960s trade had declined steeply and few ships now pass above the oil refineries at Stanlow. Many of the docks in Manchester have been filled in and developed and others now form part of the new Salford Quays development.

Turning from the history, Roger went on to describe the canal and its principle features. The 36-mile-long canal was built for ships 600 ft long and 65 ft beam. It had a bottom width of 120 ft and the depth of 26 ft. There were

five sets of locks on the main canal, in all but one two lock chambers of different sizes were provided. In some cases, additional gates were provided to enable the lock to be operated in a shortened condition. The total rise of the locks above the river is 56 ft 6 in. As originally built, the canal had three connections with the river Mersey. These are all now disused. There were eight swing bridges including the famous Barton swing aqueduct carrying the Bridgewater canal over the Manchester ship canal at the site of James Brindley's pioneering masonry arch aqueduct of 1760.

Starting at Birkenhead, the first six and a half miles of the waterway is the tidal river Mersey with good views of the Liverpool waterfront. At Eastham one enters the canal proper via one of three locks. The larger of which is the biggest in Britain.

Immediately beyond Eastham is the town of Ellesmere Port where the Ellesmere canal joins the ship canal. At the basin is the Boat Museum. Beyond Ellesmere Port the huge Stanlow oil refinery stretches for some 2 miles along the canal.

The ship canal follows the South Bank of the river Mersey for many miles. Just before Runcorn, the river Weaver enters the canal from the South. The Weaver is a major waterway navigable for nearly 20 miles until it joins with the Trent and Mersey canal by way of the Anderton lift.

At Runcorn there are two magnificent bridges. One, carrying the railway, has three 305 ft wrought iron lattice girder spans. The second carries the road from Runcorn to Widnes and its 1,082 ft main arch is the longest steel arch in Britain. It replaced the 1905 transporter bridge.

After the narrowest section of the ship canal, it proceeds in a straight line for the next 11 miles passing through the outskirts of Warrington. Further on the Ship Canal passes under the M6 motorway which crosses it by way of the Thelwell viaduct

A mile so further on the river Mersey becomes part of the canal as far as Irlam. Along this section of canalised river there are several notable bridges including the Warburton high level bridge. Just above the junction with the Mersey come the Irlam locks. From here to Manchester the route is formed from a canalization of the river Irwell.

After Barton locks, and passing under the M60 motorway and the Barton swing bridge, comes one of the most remarkable structures on the canal, the Barton Swing Aqueduct. The Bridgewater canal carrying the Duke of Bridgewater's coal into Manchester had to cross the river Irwell. James Brindley's three-arch masonry aqueduct successfully carried boats across the river until 1893 when the construction of the Ship Canal required its demolition. The swing aqueduct replacement has an iron trough 235 ft by 18 ft, holding 1,500 tonnes of water.

Nearing the final destination at Salford Quays the centenary bridge, a new lifting bridge, replaces an earlier swing bridge. After Mode Wheel Locks there are two last bridges, a new swing footbridge and a lifting footbridge linking the Lowry complex to the Imperial War Museum.

Today the canal ends at Salford Quays where the area has been transformed in recent years. It is home to the Lowry shopping centre, the Lowry Gallery and the BBC. Something for everyone at the end of a fascinating journey.

March 2022: Martin Green

The Changing Industrial Landscape of Warwick 1880 - 1920: Glover, Eagle, Boon - and Glover again.

The historic town of Warwick is not characterised by a heavy industrial presence, but important exceptions exist, and Glovers is one such example. The Glover family were wheelwrights from Sherbourne, and the two sons of William Glover senior embarked on careers in wheeled transport – James into coachbuilding and William junior into his father’s wheelwright business (est. 1830) in The Saltisford, the Glovers’ home for many years to come. They developed expertise in a range of carts and wagons, with ‘Glover’s Prize One-horse Cart’ featuring heavily in advertising. The product range expanded rapidly and, for example, in 1861 Glovers won the prize at the Warwickshire Agricultural Society Meeting at Stratford for ‘the best assortment of agricultural implements for working heavy clays in the county’. Not only this, from early days, Glovers adopted the role of agent for many renowned UK suppliers, from the agricultural implements of Ransomes & Sims of Ipswich to the products of Lawes, Chemical Manure Co., including Peruvian guano.

This expansion necessitated two major changes – William Glover formed a new partnership with his sons – Thomas Commander, John William, and James William (with James taking the leading role), and he expanded premises to include Brooke House, fronting The Saltisford. This provided both production facilities and showroom.

Other buildings that experienced changes in function over time were the Hat Manufactory in Wallace Street, later (1866-1874) the Phoenix Foundry, and eventually part of Glovers. The four-storey Worsted Factory, later the Warwick Brewery, also became part of Glovers works, and proudly exhibited ‘GLOVERS WAGON, CART & IMPLEMENT WORKS’ across its parapet. This landmark building was demolished in the 1970s to make way for the Sainsburys supermarket and car park.

William Glover died in 1881 and his obituary focussed on three elements – his strong personal qualities; his raising of the Glover profile in the world of agriculture engineering; and his sense of public duty. The latter is exemplified by his 30 years on the Town Council 1854-1874 and his role as captain of the Warwick Volunteer Fire Brigade, culminating in a successful campaign to secure the town’s first Shand Mason steam fire engine in 1872.

These qualities were taken even further by his son, James William, who was a member of the Town Council for 35 years, and for 12 years on the County Council, serving as mayor 1897-1901. He was a long-standing member of the Warwickshire Agricultural Society and the RASE, becoming a highly respected figure in the agricultural world, with contacts in high places – including royalty.

The Glover star was in the ascendancy – what could go wrong? There then came the chance to diversify via the purchase of the Packmore Works operated by Lampitts, a millwrighting firm with operations in Oxfordshire, Gloucestershire as well as Warwickshire. Glover believed in the viability of the business and the site was purchased in 1887, with James Watts recruited as manager. Shortage of funds necessitated a fresh issue of shares in 1891 and the launching of a public company in 1899, but all seemed set fair.

What these developments meant was that Glovers effectively operated from two sites – The Eagle Works in The Saltisford which focussed on wagon and cart manufacture;

and The Packmore Works where the engineering and foundry facilities were concentrated. Glimpses from the Packmore’s catalogues revealed the huge range on offer – an iconic hay barn at Ashorne House Farm, the railings at Rugby livestock market, cast iron mileposts, and a child’s iron ‘safety’ swing. The Eagle catalogue gave us the familiar range of carts but also an important inclusion of machines designed for ‘municipal use’ – road sweeping, watering and sanding, and the collection of rubbish, slop and dust. This was an important shift of emphasis.

Sadly, it could not last. Was it that the Packmores was a step too far? Were Glovers trying to satisfy too many needs? Was the ever-increasing competition from home and abroad responsible for the continued run of losses? In a desperate attempt to stem the tide, the Packmores site was sold, but done so at a loss of £13,500 (a hefty figure in 1907). The Watts family subsequently tried to make a go of it, but they soon went into liquidation as well.

There was nothing left to do other than go into voluntary liquidation with premises, plant and machinery, stocks and ‘goodwill’ all up for auction in 1908. At approximately this time a headline appeared in the Warwick Advertiser ‘INTERESTING DEVELOPMENT IN WARWICK’, which recorded the establishment of ‘The Eagle Oil Engine Company’ by Ernest Bradley of Kidderminster and Thomas Greves of Warwick.

Greves was working for Eagle and soon left the new business to set up on his own in Coten End, whilst a second Bradley brother, ‘Charlie’, joined Eagle. The Eagle company quite quickly took on much of the business of Eagle, and also completed a large numbers of orders for Glover, as revealed by the Order Books in the Warwickshire County Record Office.

Three further names came to the fore: W.T.Green took over the former Glover’s Moor Street, Birmingham depot, and opened a second one at Cherry Street, Warwick; one of Glover’s employees F.H.Sims established his own agricultural engineering business – also in Moor Street – and this marked the 1908 beginnings of Sims Garden Machinery, now in Stratford; and finally Warwick’s brief flirtation with the tractor was embodied in the launch of the Boon tractor, the brain child of John Devereaux Boon an employee at Eagle. Joining him in this venture was R. Guy Palmer, a pivotal figure in the history of Eagle Engineering. Palmer quickly rose to the position of managing director of Eagle, absorbed Boon’s business, and sold it to Ransomes in 1920 where Boon’s project quickly disappeared.

Meanwhile the Glovers were not abandoning the industry, and a new company – James Wm. Glover & Sons - rose like a phoenix from the ashes in 1908, with premises in the Corn Market, Warwick prior to a move to the old foundry site at St.John’s, Coventry Road in 1910. This was the final home for Glovers, with modern housing now replacing the works. The business was taken on by William James, for brother Ernest took employment in the firm of Hinde’s Brushes (a connection via marriage), and brother Leonard was tragically killed in The First World War.

So Glover success peaked at the start of the twentieth century, with the demise generating a whole range of new initiatives. These initiatives make up the next stage of that story and we were promised Part 2 to complete the picture!

April 2022: Eric Woodcock*Silent Servants - the Long Story of Electric Vehicles in Britain.*

In Eric Woodcock we had an ideal guide to the surprisingly long history of electric vehicles in the UK and elsewhere. With a background in the commercial vehicle world at Leyland, Eric was involved with the development of some modern examples of battery powered vehicles.

The early years of the 20th C saw a transformation in urban transportation as the horse gave way to other means, steam, petrol and electric propulsion. Companies such as J Lyons and Harrods led the way with fleets of local delivery vans serving an ever-expanding market and, incidentally, providing a mobile advertising hoarding for their businesses.

These companies benefitted from the American experience. New York had 1,500 electric taxis and some 10,000 battery powered delivery vehicles. Harrods' management visited the USA in 1911, saw the potential and purchased a fleet of US-built vehicles. The company was helped by its integrated operations that included an electricity generating plant that not only provided power to the store but was able to cope with the demands of charging the delivery fleet's batteries.

The Harrods' fleet was rebuilt in the 1930s and remained operational until the 1960s. 300,000 miles was a not uncommon lifetime mileage for a single vehicle. A publicity photograph showed the fleet lined up outside the Houses of Parliament – who could arrange to close off Parliament square today for a photo-op?

But it was in municipal applications that electric power really made its mark. Local electricity generating plants, as with Harrods, provided charging facilities. An interesting technology developed for local refuse collection vehicles was a roadside control system that allowed the operator to walk alongside whilst manoeuvring the vehicle.

In Glasgow in the early 1920s, a cassette battery system was developed that allowed a battery pack to be easily swapped for a freshly charged one. A dropped frame design was also developed that facilitated loading. This fleet was in service from 1926 until the 1960s. Vehicles operated an 18-hour day and a 'virtuous circle' saw the electric refuse collector deliver to a sorting centre where metals were sold for processing, residual waste was incinerated and the clinker sold for aggregate, the incinerator generated electricity that recharged the refuse collector – with any surplus electricity sold on. In 1939 this fleet collected some 160,000 tons of waste and generated nearly 40 Mw/Hrs of electricity.

Unsurprisingly, Birmingham was home to a major electric vehicle manufacturer – Electricars Ltd. Formed originally by an association in America between General Motors and Edison (used for its name in the Electrical Industries) and initially importing vehicles but soon manufacturing themselves, Electricars specialised in municipal and industrial vehicles.

The late 1930s saw the apogee of the electric municipal vehicle. In 1938 92% of Birmingham's waste was collected by them; and they continued in service until the 1970s. Their demise was caused by the increase of not very combustible dirty waste and the rise of the National Grid which led to the loss of local generating plant.

The next generation of electric vehicles were much smaller and lighter. Large companies, such as Harrods could maintain its rather idiosyncratic fleet and elsewhere the market developed for local deliveries such as dairies (milk floats), bakeries, coal merchants and laundries.

A supplier to these markets was Midland Vehicles Ltd of Upper Grove Street, Leamington Spa. No sign of the business remains but illustrations of the chassis showed an interesting low floor design with pannier battery packs.

The war years saw little change in the pattern of use for battery powered local delivery vehicles, providing generating capacity existed. However, the post-war development of suburban housing schemes with limited access to shops did lead to the rise of the 'mobile shop'. A number of commercial vehicle body builders entered the market with innovative designs of battery powered vehicles. These became a familiar sight on the new estates.

The ending of retail price maintenance and the emergence of the supermarket coupled with increasing personal mobility as car ownership spread in the 1960s led to the demise of the friendly 'mobile shop'. Nonetheless, the use of battery powered milk floats continued for some time. A number of design variations arose, usually intended to facilitate the driver/operator's access to the cargo space. An industrial platform chassis was used by a car dealer in Shrewsbury as the basis for a tiller steered milk float popular with United Dairies.

By the late 1960s only three manufacturers remained and despite attempts to revive earlier concepts, a steady decline in the demand for the morning 'pinta' on the doorstep led to the demise of the milk float.

This trend did not mean that interest in electric traction ended. Whilst the earlier manufacturers of battery powered machinery had tended to be peripheral to the main Motor Industry the increasing awareness of the downside risks of fossil fuels, pollution, cost and vulnerability of supply, aroused the interest of larger companies.

Lucas, a major producer of batteries, launched a project based on the Bedford CF light van. This greatly interested Bedford and 400 vehicles were built. In a separate exercise, 20 BL Sherpa vans were produced for Royal Mail. However, the mid-1980s were not a good time for the British motor industry and it had become clear that little progress could be made using the traditional lead acid battery technology – the available energy density was simply inadequate to provide an acceptable payload capacity or operating range.

Little changed in the next twenty years but the arrival of the Lithium-Ion battery with its potential to transform the energy density position was a game changer.

The London Taxi Company in Coventry has developed an electric version of the Black Cab and electric versions in many car ranges are proliferating but progress on the commercial vehicle front is lagging.

Modex in Coventry had hopes for the volume production of a light van with 2,000 vehicles a year envisaged but after producing 400 fell into administration in 2011. Arrival, Russian-backed and with a technical centre in Banbury, has a possible client in delivery company UPS for its attractive modular design but no large unit is in sight. It seems that local delivery services will remain the most likely users of battery powered vehicles for some time to come. Longer distances and larger payloads will require other technologies. Hydrogen is a possibility.

In 1919 Commercial Motor magazine wrote 'The electric vehicle can never expect to do much more than to supersede the horse, unless some revolutionary system of electric power storage is brought forward.' We are nearly there and it is heartening to look at a map of the West Midlands and to see how much of the work has been and is located on our doorstep.

WARWICKSHIRE

Industrial Archaeology Society

WIAS

NUMBER 77 April 2023

PUBLISHED QUARTERLY

FROM THE CHAIRMAN

The 77th. edition of the WIAS Newsletter will be the last to be edited by Mike Hurn. He is handing over the computer keyboard after 15 years as editor, having produced 45 Newsletters over that period. The Newsletter is primarily a record of all the meetings held by WIAS, and Mike's ability to accurately reflect the content and flavour of these meetings, whilst at the same time adding his own editorial style, have always made these reports a pleasure to read - as well as being a most valuable record for the Society. I am sure you would wish to join with me in offering our sincere thanks to Mike for all his efforts over the past 15 years. He should be very proud of what he has achieved in creating a lasting record of the activities of WIAS.

From the Editor

First, an apology. The reports in this Newsletter should have appeared much earlier. They should also have been longer. However, for various reasons I was unable to produce them sooner.

I hope that, as presented, they will be a sufficient reminder to members of the meetings which themselves were a mixture of live, hybrid and zoom that reflected the strange events of the last few years.

Secondly, this will be the last Newsletter that I shall write for the Society. My first, Issue No. 32 in December 2008 seems a very long time ago and it is with much regret and no little sadness I have had to decide to stop.

It has been a privilege to have been able to make some contribution to the Society and to support Martin's tireless efforts to promote Warwickshire's Industrial Heritage.

I am sure that my successor or successors will continue to record the Society's activities for many years to come. I hope, too, that I will be able to read them, and to attend the occasional meeting as well.

Mike Hurn

May 2022: Allan Jennings

Bonniksens and Gordon Evans

The story of the Bonniksens and Gordon Evans as told by Alan Jennings illuminated a number of strands in local history that may well have been little or unknown to many in his audience.

The lives of a Danish horologist and inventor and his aviator son (who owned an airfield) together with an ex-Chindit illustrator of talent came together in a fascinating story with many local connections. The story only came to light when Alan met the daughter of Gordon Evans who asked him to examine some papers found in the loft.

Julius Edward Bonnicksen was born in Kenilworth in 1896. At the outbreak of WW1 he was visiting relatives in Germany and was interned. He escaped to Denmark and thence to the UK where he joined the RFC, later the RAF.

Amongst the wealth of documentation unearthed was his application for a permanent commission which listed his extensive military career. He ended the war with the rank of Major with an OBE and Italy's Silver Medal for Valour. His interest in aviation lasted for the rest of his life.

In 1930 he bought 30 acres of land off Harbury Lane to use as an airfield and founded the South Warwickshire Light Aeroplane Club, later the Royal Leamington Spa, Warwick and District Light Aeroplane Club.

Contemporary photographs charted the development of local flying including the visits of Sir Alan Cobham's National Aviation Day with its associated entertainments. Visitors suffered long delays on crowded roads. Details of the aerodrome and its facilities came from the AA's airfield map. The wide variety of aircraft possessed by Club members showed how popular flying had become amongst the better-heeled.

The aerodrome was requisitioned in 1939 for use as an emergency landing ground. A notable emergency landing was by an 'Ensign' that blocked the road.

Turning to Gordon Evans, we learnt of a lifelong enthusiast for all

things to do with aviation coupled to a talent for drawing. An engineer, he worked at the aerodrome as a maintenance mechanic. His duties included shepherding sheep off the field for landings and take-offs. He learnt to fly in 1939 under a government scheme. He never spoke about his wartime activities but amongst his memorabilia are sketches of a jungle scene and a Chindit cloth badge that suggest an interesting, but unrecorded, episode together with detailed drawings of RAF aircraft.

The aero club never reformed after the war and Gordon worked at Flavels in Leamington for over 25 years. However, he never lost touch with light aviation and found an outlet for his artistry through cartoons and humorous illustrations for the 'Moth' a magazine devoted to the evergreen training aeroplane.

Alan concluded with some details about Bahne Bonnicksen, Julius's father. A Danish horologist who came to England to further his education and became naturalised in 1910. He settled in Coventry and is known for two particular inventions. First, the Karrusel watch wherein a tourbillon mechanism is replaced by another patented design and particularly for an isochronous speedometer that was particularly accurate and welcomed by the new motorist. The rights to the speedometer were sold to Rotherams but cheaper versions of speedometers soon dominated the market.

But for an attic find and a chance meeting we might never have learnt of these three men's contributions to Warwickshire's history. Such is serendipity!

PROGRAMME

13 April (live/hybrid): Peter Hoath
A View of Computing History - 22,000 Years in 60 Minutes.

11 May (live/hybrid): Max Hunt
Herbert Austin and the Longbridge Story.

8 June (live/hybrid): A WIAS Presentation

The Aluminium Works, SONA and Stratford Produce Cannery.

Additional Zoom Meetings may also be placed in the calendar.

NEWSLETTER

June 2022: Andrew Baxter
The Edge Hill Light Railway.

It is tempting to ask why waste an evening on three and a half miles of railway that was regarded as a dead duck from its inception? In the event we learned a lot and some members subsequently enjoyed a scramble amongst the remains on Edge Hill.

So why such a railway? The demand for iron and steel during WW1 soared and some 30 million tons of iron ore lies just South of Edge Hill. In 1917/18 German POWs laboured to extract it, building the no longer existing German Bridge in the process.

Planning for a mineral railway to link the ironstone quarries with the Stratford and Midland Junction Railway near to Burton Dassett began in 1917 and construction of the EHLR started in 1919. The line operated only from 1922 to 1925. The demand for iron fell off a cliff and with it the fortunes of the EHLR.

Andrew Baxter is a consulting engineer who has lived near Edge Hill for some 50 years and knows the area intimately. His researches have unearthed a wealth of pictorial evidence which he used to great effect together with maps and layouts of the various junctions. The OS map of 1935 shows the line from its junction with the SMJR (near to the M40) to Edge Hill near to Ratley. Two miles from the junction there was a rope-worked incline up the escarpment to be followed by three branches serving different parts of the ore field which were never fully completed. Subsequently, the development of CAD Kineton covered part of the route.

To avoid the time and cost of an Act of Parliament the EHLR was built under the 1896 Light Railways Act which limited it to 12 tons/axle, 25 mph maximum and 8mph on bends. Thus, only requiring light weight rails and modest bridges, no gates or grids and standard gauge.

Most of what remains today relates to the rope-worked incline, which was also the most interesting part of the railway. A great deal of thought and detailed design work had been given to making its operation as simple as possible. It was a balanced cable railway with up to six wagons having a payload of 60/70 tons. A passing loop used a three-rail system so no points or operator gave a cost saving.

When the line closed much equipment was left where it stood as evidenced by several photographs. Notably a steam excavator was left at Ratley for some 25 years as were 3 locomotives abandoned in the lower sidings.

What remains today? Some rails are in place and the complex Burton Dassett junction remains. There is evidence of the bridges that once spanned Gosport Lane and Arlescote Lane, but more can be seen at the top of the incline. The cable brake drums have yet to be discovered but there is evidence of the signal box. In Ratley Lane the remains of a bridge and a hump in the road mark the end of the line.

the extensive photographic record used by Andrew includes a remarkable collection of maps detailing the routes, both as planned and, with many illustrations, of the track as built from the junction through the sidings to the ropeway plus the bridges. There are also enough examples of rolling stock and locomotives to delight the enthusiast. (visit Andrew's website www.ehllr.rocks to view them).

As the members who visited the site can attest, these photographs made it much easier to envision the working railway. Especially over a beer at The Castle.

September 2022: Peter Coulls
The Photographs of Derek Billings.

After the AGM for September 2022 the members were treated to a presentation by Peter Coulls entitled 'The Photographs of Derek Billings'. Peter had been given access to Derek's considerable slide and digital collection by Pat his widow and Sarah his daughter, both of whom were in the audience.

Peter started by explaining how his friendship spanning some forty years had started with membership of the now defunct Warwickshire Steam Engine Society. The families had holidayed together in various parts of the country but more often than not Tywyn in mid Wales was the preferred location.

Derek was a printer by trade having worked for A. Tomes Ltd in Bedford Street, Leamington Spa. On one of their holidays in Norfolk Peter described how delighted Derek was when they discovered that the town square in Fakenham had been paved with printer's type blocks. Derek's father was employed as a driver for the Midland Red, establishing a lifelong interest in all aspects of that Company.

He had the ability to take photographs of everyday scenes, thereby literally providing a snapshot of the common place activities lost forever. He was photographing industrial buildings and processes with examples shown of the Ford Foundry when molten metal was being poured, not witnessed by many unless you were an employee.

Peter went on to describe their shared passion for traction engines and fairgrounds. As an example he would pick up Derek in Whitnash about 5.30 am to drive to the Great Dorset Steam Fair, arguably one of the greatest gatherings of the range of steam traction engines and their variants in the country. The early start was to enable them to park up close to the in gate usually before it opened. Once inside the priority was to go for a full English breakfast to set them up for the day.

Derek was a diligent researcher prior to visiting an area, he would remember items of interest he had read about, as testified when on holiday in Norfolk in the town of Thetford, we were taken to see a bridge manufactured by Charles Burrell and Sons, more usually associated with building traction engines.

Cornwall provided Derek with a range of locations whereby he could indulge his interest in industrial archaeology, photographing engine houses, stationary steam engines and other subjects of industrial interest.

Peter recounted the story of how Derek had been taken on a mystery trip to Dorridge Station, before revealing that as a 70th birthday present he was to ride behind 'Rood Ashton Hall' to spend sometime in London, needless to say Tower Bridge was on the agenda.

Their shared interest in the Talylyn Railway was shown along with images of museums, canals and historic buildings. Derek was very proud of having his photographs of the demise of Cherry Orchard Brickworks in Kenilworth published in a booklet entitled '*Kenilworth's Last Brickworks*'.

Peter concluded by thanking Pat and Sarah, hoping that his talk had demonstrated the passion that Derek had for photography and the subjects he chose. The evening had certainly been a delight for the audience, from a unique collection of photographs, and was a suitable testimony to a lifetime's interest in transport and industrial heritage (and much more besides). It also demonstrated the bond that existed between Peter and Derek and their families and the obvious pleasure they had derived from times together, with camera always at the ready.

October 2022: David Fry*The Coventry Canal: 5 1/2 miles of History.*

It is always a bit of a surprise to learn how much history can be uncovered along a short stretch of an old railway or, in this case, a canal. David Fry has uncovered a great deal of Coventry's history over the years and shared his discoveries with us. His research is meticulous and his use of a wide range of materials, especially old postcards, is exemplary.

His last talk to the Society dealt with the Foleshill district of Coventry and he commented in his introduction that the canal was an integral part of the district – he could not get away from it.

The Coventry Canal, a hidden history in plain sight, is but five and a half miles long stretching from the Canal Basin in Coventry to Hawkesbury Junction and the Oxford Canal. From its inception in 1769 the canal had a major impact on the development of North Coventry. Sadly, there is little visual material to be found about the early years but plenty for the later ones.

The development of the Canal Basin was elegantly shown in a sequence of overlays onto an aerial view. Some of the warehouses from the 1770s remain and what were once thought to be lime kilns are, in fact, the coal vaults for the gas works.

An 1809 map of the whole 38-mile-long canal allowed the detailed examination of the canal route in North Coventry, its relationship with the road system, notably, with narrow lanes and small bridges, and its impact on communications and settlement patterns. Newspaper illustrations of the old bridges at Cash's Lane, Alderman's Green Road, Foleshill Road and Black Horse Lane were instructive.

Where the canal crossed main roads commercial opportunities arose. At the Foleshill and Stoney Stanton Roads arose wharves, boat and wood yards, pubs (such as the Prince William), shops and workers' cottages.

It was at Longford that one of the clearest impacts of the canal on the Foleshill district can be seen. Lady Lane to Exhall was blocked requiring a new road, pubs and non-conformist chapels sprang up, smithies, yards and wharves surrounded the original junction with the Oxford Canal.

Many old photographs showed the changes along Sydnall (Station) Road to Hawkesbury in the late 18th and early 19th Centuries.

The second half of the 18thC saw the value of the canal to the expansion of Coventry's industry away from the city centre and the domestic systems of the ribbon weaving industry. Cash's Kingfield factory, Wilkins brick and lime works, the Cotton Mills at the Canal Basin are but a few examples.

The rise of a variety of other engineering industries at the turn of the century really boosted the use of the canal both for transport and for water extraction. Where the canal loops around the Foleshill Road we find the Daimler works with its powerhouse then the Coventry Electricity Station and various cycle and car manufacturers before Cash's factory, many with water extraction licences. Elsewhere, Nelson's Cement Works, Courtaulds, the Ordnance Works, Longford Gas Works and finally Longford Power Station added to the load. The last alone had a contract with the canal company for 111 weekly boatloads of coal.

Britain's canals were nationalised as British Waterways in 1948 but with the creation of the Coventry Canal Society in 1957 and with the Canal and River Trust superseding British Waterways in 2012 it has new friends and perhaps another future.

November 2022: Roger Cragg*The London & Birmingham Railway.*

The lingering effects of the Covid outbreak required a re-shuffling of the WIAS programme of speakers for November 2022, and Roger Cragg kindly stepped into the breach with a talk on the earliest railway to enter Warwickshire – the London and Birmingham Railway.

Roger began his talk by describing the lengthy process of selecting a route for the line. This process started in 1820 when Sir John Rennie surveyed a westerly route vis Oxford and Banbury. Later proposals were for routes further to the east. At this stage the aim of the two companies involved was to terminate the line in east London, close to the docks. George and Robert Stephenson were engaged to design a route and by 1831 a line had been fixed passing through Leighton Buzzard, Bletchley, Rugby, Coventry and terminating at Curzon Street in Birmingham. By this time, it had been decided that the London terminus would be at Hampstead Road, just north of the Regent's Canal. Later an extension south to the present terminus at Euston was adopted although this would require a steep gradient down to Euston.

The London & Birmingham Railway Company secured an Act of Parliament in May 1833 and construction of the line began in early 1834. Roger illustrated a tour of the route of the railway using many of the contemporary drawings of the construction of the line by John Bourne. Thirty contracts were let for the 112.5 mile line but due to the pioneering nature of the work, in eight cases the Contractor failed and the work was taken over and completed by the Company. Although the total tender price was £1.7 million, the final total cost was £2.3 million, much of the extra cost being due to the engineering difficulties at the 1.5 mile long Roade Cutting and in particular, Kilsby Tunnel (2416 yards) where the tender price of £99,000 became a final cost of £290,000.

The line was opened in stages, from Euston to Boxmoor in July 1837, Euston to Tring in October 1837 and between Rugby and Birmingham in April 1838 but was not finally opened throughout until September 1838, the delay being due to the aforementioned problems at Roade and Kilsby.

Roger highlighted two architectural glories of the line, the two terminal stations at Euston and Curzon Street. Unfortunately, the Euston building did not survive the rebuilding of the station in the 1960s but happily the original building at Curzon street has survived and is now preserved.

The original train service was nine trains daily in each direction, the fastest trains taking 5 hours and the slowest 8.75 hours. Train control was by the time system with 'policemen' stationed at intervals along the line to give flag signals to the train drivers. The early locomotives were very small, being of 0-4-0 or 2-2-0 wheel arrangement. A locomotive works was established at Wolverton, the half-way point along the line. Later this became a carriage works after the London & Birmingham became a part of the London & North Western Railway in 1846.

Roger concluded by reminding members that the line still formed a major part of the West Coast main line.

As usual, Roger's talk was characterised by careful preparation, attention to detail and his own intimate knowledge of features of the line. It provided insight both for the heavily committed rail observer as well as the more general enthusiast. The Society was indeed fortunate to have such an able speaker on such an important topic.

December 2022: Dr Kate Round*The History of Stourbridge Glass.*

The Red House Cone, built in 1790, is the only surviving intact example of a working glass oven. Once there were 30 along the 'Crystal Mile' between Stourbridge and Wordsley. Today, it is the focus of a visitor attraction opened in 1980 and rated one of the best small museums in the country. A new museum on the former site of Stewart Crystal, the White House, is now complete. It replaces the Broadfield House and other collections, bequests and gifts totalling some 10,000 items of which 2,000 will be on display covering all types of glass from studio pieces to large industrial equipment.

Kate Round is an engineer who found a retirement interest in the Glass Museum and its outreach programme and so was well equipped to lead us through the history of Stourbridge glass.

Glass makers came to the area for familiar reasons. Fuel (of which copious supplies are needed) and raw materials were readily available. Other compatible but not competitive industries were established locally and could be a source of suitable labour. Finally, the nearby canal and river systems provided their usual benefits.

WIAS has sometimes pondered the merits of leaving our county but never thought that 8th century BCE Assyria would feature. However, the history of glass needs to start somewhere, and it was there. The Alabastron or vase of Sargon II was made by enslaved artisans, possibly Israelites who were, nevertheless, happy to move to new places. They had a mobile skillset and their descendants migrated West to found the glass industries in Persia, Murano, Bohemia, Moravia, Russia and further west.

Glass makers operated in family units with skills and knowledge passing from father to son but not to daughters. Of great importance to Stourbridge were Les Gentileshommes Verriers of Lorraine. These noble glassmakers had close ties with Bohemia and enjoyed considerable privileges in France but were, like other skilled craftsmen, Huguenots and thus had to flee Catholic France for religious freedom in England and hence to Stourbridge.

Glass making techniques have little changed over the centuries, as the comparison of a set of tools from the 1930s on display in the Red House Cone with a drawing of 17th C glassmakers tools showed. But we learned much about the hot side, pot making, blowing and moulding, followed by the cold side decoration by cutting, engraving and etching. We were introduced to the unique interior of a glass cone with its central furnace surrounded by the pots holding the molten glass about whose simple constituents of sand, soda or potash, calcium and lead oxides we also learnt.

Moving on to decorating a whole other set of skills came into focus. Engraving and cutting use broadly similar techniques – the glass vessel is presented to a cutting wheel fixed to the bench. The size and composition of the wheel varying with the desired finish. Highly skilled craftspeople include a few ladies. Intaglio work is similar to copper wheel engraving and produces 'sunken pictures' of great delicacy. The Portland Vase of Roman origin featured long lost techniques that took six years to rediscover. It was copied in glass by John Northwood after Wedgwood's ceramic version. Further stunning cameo pieces followed.

Stourbridge now has a Glass Quarter, The Red House Cone, The Ruskin Glass Centre, factories and studios and an International Festival of Glass. There is no shortage of talent to carry the story onward.

January 2023: Dr Ian West*Advancing the Work of Prometheus: The Impact of Artificial Light in the Workplace and Beyond.*

Our present society takes much for granted. Artificial daylight at the touch of a switch is regarded as normal in much of the world. It is not that long ago when life was very different for everyone.

Ian West, with his industrial background and as a key figure in Industrial Archaeology, was the ideal guide to the latter day Prometheans who introduced artificial light both industrially and domestically.

Life was governed by the light of the sun. After dark activity was very limited. Candles or oil lamps were for the wealthy. Fears of the darkness, whether rational or not, abounded. The working day was dawn to dusk and people went to bed at sunset.

Early efforts to improve lighting used 'intensifiers' for candles. Glass globes clustered for lace makers in Olney and a goldfish bowl filled with water in Cumbria are examples. Such methods would have had adverse effects on eyesight and with the Craft Guilds influence little work was done at night. Furthermore, candles were expensive and taxed. Hence, 'not worth a candle'.

Unsurprisingly, the Industrial Revolution saw developments in artificial light technology. Around 1775 the French 'Argand' oil lamp found favour amongst the wealthy and was used in works such as the Cromford and New Lanark Mills. However, light output was low and only suitable for lower grade work and maintenance tasks. Moreover, there was a considerable fire risk with cotton dust and machine oil which led to refusals to insure the risks.

Early experiments in gas lighting were led by Lebon and notably by Murdoch then working for Boulton and Watt in Redruth and Leigh at the Salford Twist Mill. The cost was half that of Argand with less risk. The process for producing coal gas was developed which included the valuable by-product of tar. B&W sold some 20 installations. Winsor demonstrated gas lighting in the Lyceum Theatre and Clegg built gas plants and an early gas holder. A gas holder (not a gasometer) was needed to smooth the output. Early ones were housed in buildings, which could be a danger, and Warwick's example is now the only survivor in the UK.

The use of gas for street lighting was widespread and improved safety; by 1948 there were over a thousand public undertakings in Britain and over 2,000 private gas works. Notable restorations can be found at Sudbury Hall and Ditherington Flax Mill.

Despite these advances, the evidence is inconclusive as to the improvements in productivity from extended working hours at the same time as the Factory Acts were reducing children's hours.

Domestic adoption came later as costs and pollution dropped and with the crucial invention of the incandescent gas mantle to give better light. The pre-payment gas meter helped the introduction of the gas cooker.

Electric light followed slowly. Only the wealthy again could install the necessary plant – such as Armstrong at Cragside, Swan's incandescent bulbs were instrumental and within 25 years over 500 country houses had their own plant. Gas lighting was pioneered in industrial settings whilst electricity was led domestically.

The debate over individual or centralised plants with distribution networks is for another occasion as is the 'current war' in the USA between Westinghouse, Edison and Tesla. Perhaps, one day, Ian will enlighten us.

WARWICKSHIRE Industrial Archaeology Society

WIAS

NUMBER 78 June 2023

PUBLISHED QUARTERLY

FROM THE CHAIRMAN

The end of a season is always an opportunity for reflection and this is particularly relevant for 2022-2023, with an assessment of the new arrangements adopted for meetings, and the retirement of two long-serving officers of the Society.

As announced earlier, Sue Hammon will be finishing her duties as Membership Secretary, a role she has fulfilled with great efficiency and minimal fuss for many years. It has been very re-assuring to know that membership issues have been in such safe hands. I would like to place on record my own personal thanks and those of the Society for her long commitment to the task.

Looking ahead, gone are the days of a solely in-person or postal communication for membership, with increasingly membership traffic utilising online options. This has caused the committee to consider exactly how the role of Membership Secretary should be defined, and how this might be related to the movement of money handled by the Treasurer. The Society will be kept fully informed over what arrangement are established.

Postal deliveries have now also largely disappeared for this Newsletter, with online publication becoming the norm. Chris Barney has agreed to take overall responsibility as editor, with Mike Hum still assisting with format and layout. The Newsletter is essentially a record of the meetings of the Society, a valuable component of any archive of the Society's work over the years. We are always on the look-out for willing volunteers to write up a meeting, perhaps on a topic that particularly interests you. Are there any frustrated scribes out there?

Many of you will be aware of the roller-coaster ride that has characterised the Society's attempts to cope with the demands of live audiences and the needs of a growing number of online members and supporters. The so-called 'hybrid' option has been tried and rejected by many societies but we

have been very fortunate to have an IT team that does not give up easily! In Victor Lobb and new member David Daniel WIAS has indeed been fortunate to have had two dedicated experts who have overcome a whole host of difficulties, not least an occasionally wayward internet connection in the Halse Pavilion. My sincere thanks go to them both for remaining calm in adversity, with no problem fazing them, particularly when the Chairman was looking very worried indeed!

There are also several other tasks completed by members of the Committee to ensure meetings run smoothly, from the reception table to the provision of refreshments, and I am sure you would wish me to place on record thanks to all those involved. A society is only as strong as the willingness of its members to take on responsibilities.

Having reached a successful formula the committee plans to continue the arrangements into next season, with 7 'hybrid' meetings in September-November; March-June, and three Zoom only meetings in the winter months of December, January and February. The first meeting in September will be the Society's Annual General Meeting, followed by members' contributions, so if you have anything that you might like to bring to a wider audience, please let me know so that I can fit it into the programme. This Newsletter also normally carries the forthcoming programme but this is still in provisional form so it will appear in the next edition, and will, of course, appear on the website in due course.

I am always on the look-out for speakers for the season's programme so please send in any ideas you may have. I have visited several society meetings both locally, further afield, and online, in the hope of finding speakers that might be suitable for WIAS, but the task seems to be getting more difficult, as confirmed by my links with other IA societies. I have been asked by several other IA groups for speakers that have been a success at WIAS, and this

is more difficult that it sounds given the nature of topics covered, the fee charged, and distance to be travelled. Not everyone wants to hear about Warwickshire - although I have given an online talk 'An introduction to Warwickshire's Industrial Heritage' to Gloucestershire Society for Industrial Archaeology and have been booked for a similar venture over in Leicester for the Leicestershire Industrial History Society in the Spring of 2024. All part of the process of spreading the WIAS message!

The other ingredient of the Society's activities over the past season has been Alain Foote's excellent series of visits, and I have had the pleasure of enjoying several of them. It has been really good to meet members in less formal environments such as a stroll along the Stourbridge Canal or amongst the Refuse Collection Vehicles of Dennis Eagle rather than taking the Chairman's seat at WIAS Meetings!

We have all different experiences of the impact of Covid, but I would like to think that WIAS remained a point of contact for many when the Lockdowns occurred, and that we have remained on your radar. One element often mentioned is diminished mobility and a caution about travel and public meetings and we do hope that the winter break with Zoom-only meetings plus the hybrid option for the rest of the season has helped to ease some of these issues. I look forward to welcoming you to WIAS meetings - either online or in person - for season 2023-2024, not forgetting, of course, that June 2024 represents the 35th. Anniversary of the Society - surely a cause for some sort of celebration!

PROGRAMME

14 September 2023 (live/hybrid)
Annual General Meeting followed by Members' 'Twenty' Plenty': An opportunity for members to deliver short talks on topics of particular interest to them, lasting up to 20 minutes.

NEWSLETTER

Meeting Reports

March 2023: Twenty's Plenty

Members' Evening

The March meeting was the occasion for the return to the Halse Pavilion and another outing for the hybrid arrangements that had been carefully modified over the winter months by the IT team of Victor Lobb, David Daniel and Peter Riley. The evening was a collection of short talks – with a maximum time of twenty minutes – and the items chosen revealed the diversity of interests and range of experience possessed by our membership.

The evening opened with a presentation by **Stuart Thomas** on a site in Lydney, Gloucestershire and the establishment of a plywood factory during the war years. This had emerged after a talk to WIAS by Ray Wilson of the Gloucestershire Society for Industrial Archaeology, and Stuart's own experiences of contact with the later occupants of the Pine End Works site, up until closure in 2001. Stuart has produced a paper for GSIA on the subject.

This factory made a vital contribution to the war effort with the plywood utilised for the Mosquito aeroplane. Stuart's focus was on the factory and he outlined the (rather stringent) criteria for the choice of location – the ability to produce aircraft plywood 24/7; to be located west of a line from Southampton to the Wash; outside any built-up area; to offer a reasonable supply of labour; to provide access to existing engineering facilities, preferably with an aircraft bias; to be waterside and served by more than two ports capable of discharging vessels of 10,000 tons or more. It was the first UK factory with a reinforced concrete barrel roof (no skylights, incendiary-proof) and he showed an aerial photograph demonstrating the scale of the plant on the 14 acre site. The factory produced large, flat (approx 35 feet long) 3-ply plywood sections, 1.5-2.00mm thick, mainly of Canadian birch. The fuselage was then sent on to various locations to be assembled as Mosquito aeroplanes, including the 1,066 built by the Standard Motor Company, Coventry.

Throughout his talk, the audience could not have failed to share in Stuart's enthusiasm for the subject, nor his regret at the eventual demise of the site, with demolition in recent years.

This was followed by a presentation from **Mike Raine** entitled 'Heavy Lifting in Venice'. This was also a new experience in terms of technology, with Mike delivering his talk online from home, with slides being changed in the Halse Pavilion with the necessary prompt.

Mike has been a regular visitor to Venice over the years, and something that left a distinct impression upon him was the hydraulic crane in the Arsenale. The Arsenale naval dockyard is a little off the tourist route but is accessible during the biennale, the alternating arts and architecture festival held in the city. Mike took us through the history of the Arsenale, and its role in developing and supporting the powerful Venetian navy, earning the description in some quarters as 'the first factory in the world'. The buildings of the Arsenale are as elegant as many better-known locations in Venice, and the hydraulic crane is a notable landmark. Mike linked this with the talk by Alan Hill on hydraulic power, and presented photographs of the crane from every angle. It was built by Armstrong Mitchell on Tyneside, erected in 1883, and is the only surviving example of its type.

The crane rests on a base built of brick and Istrian stone which contains the hydraulic pumping system originally steam driven with its own boiler, but later converted to electric

power. One unusual feature that Mike highlighted was the hydraulic lift cylinder connected to the jib, with a 160 ton capacity. He also provided close-up shots of the crane revealing the extensive use of hot riveting, a technique familiar to workers on the Tyne.

His talk provided another enticement to visit Venice, and it was good to be able to enjoy Mike's presentation without him having to make the journey to the Halse Pavilion.

Mick Jeffs is one of the main contributors to a recently published book 'Global Leamington'. It is the latest publication from the Leamington History Group, and looks beyond the familiar stories of the development of the Spa to highlight international connections and the emergence of the multi-cultural community that characterizes the town today. Mick took as his theme some of the products made in Leamington that found their way into international markets. Leaving aside the familiar exports of kitchen ranges by firms such as Flavel, Grove and Radclyffe, he selected the carriages manufactured by Mulliners. There were several members of the Mulliner family involved in this type of business, one branch going on to be supplier of bodywork for Rolls Royce and Daimler, but Henry Mulliner set up in Leamington, with production facilities in the Chapel Street/Packington Place area of the town. They were renowned for their phaetons, and exhibited at Vienna and Paris, with successful export orders to follow.

The firm Henry Griffiths & Son originated in Birmingham and came to Leamington in 1920 (encouraged by generous terms offered by Leamington Borough Council), establishing a factory on the Tachbrook Road. Their factory became a very familiar landmark, and their products developed a strong reputation, both in domestic and overseas markets. The factory closed and has been demolished, the only remnants being the names of roads built on the site – Sapphire Drive and Emerald Way.

After seeking to explain the origins of the unusually-named Kigass, Mick described the development of the firm from its formation in 1924. It has occupied various sites in Leamington before moving to its current home in Montague Road Warwick. It has been involved in auto and aero components for nearly a century, under the guidance of four generations of the Wardman family. Exports have played an important part in the firm's history, and prides itself in the extremely high level of precision of its products.

Finally, Mick brought us right up to date with an illustration of the number of firms involved in the Computer Games industry in Leamington, highlighted by a display at the Leamington Art Gallery entitled 'Silicon Spa'. This set Mick wondering what the interest of industrial archaeologists might be in the future – cast-off examples of early Spectrum and Commodore computers, perhaps?

Several members of WIAS have enjoyed the benefits of an apprenticeship, and **George Sayell** took us back to 1961 and his English Electric apprenticeship experience. The particular example he concentrated upon was a period at Crossness where he assisted in the installation of English Electric diesel engines. After explaining the role of Crossness as the termination of Bazalgette's southern outfall sewer before release in to the Thames Estuary, he went on to describe his personal experience on the site. His fellow employees seemed wedded to the task at hand,

working long hours, and rarely returning home. Health and Safety precautions were almost non-existent, and some of the tasks required of a young apprentice were quite challenging. It tested George to the full, but he rose to the task, realising the importance of the project.

He became familiar with all elements of the site, and he realised that the old Crossness cast iron engines had become seriously neglected, despite their historical importance. It was this experience that first aroused George's interest in industrial archaeology, and no-one in the audience could have been left without fully understanding George's passion for engineering.

Chris Barney began his talk on 'Motive power in the Agriculture Industry' with examples of what he was not going to talk about. These included the modern monster tractor ("they always seem too big for the job"), through earlier versions, back to Traction Engines, and even to horse-drawn farm machinery. His focus was to be on oxen.

He analysed the relative merits of oxen over horses – cheaper to buy, equip and feed; required less care and attention; less liable to injury; well suited to the simple task of pulling heavy loads; and had some value as meat once they reached old-age. Admittedly, they did need time in the day to rest, and much patience was required in the training of an ox, particularly in engineering a turn.

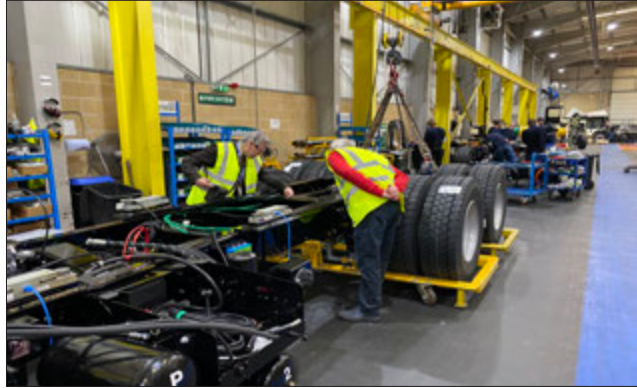
In the end, the greater versatility of the horse, the smaller size of fields following enclosure, and the advent of steam ploughing saw the end of the oxen era, but Chris showed some excellent examples of oxen at work, including hauling bales of wool in Australia, with which he had a distant family connection. Most surprising was a 1797 painting - presumably legitimate – recording the hauling of a windmill uphill for 2 miles by 86 oxen!

Chairman **Martin Green** concluded the evening with a visit to the Liverpool Docks, and after a brief look at the well-known Royal Albert Docks, took the story further north up the Mersey to a group of docks built slightly later. These included Stanley, Collingwood, Salisbury and Bramley-Wood docks. The main focus was on Stanley Dock with its access inland to the Leeds and Liverpool Canal and outward via the Collingwood and Salisbury Docks to the Mersey. Renowned civil engineer Jesse Hartley built the north and south warehouses in Stanley Dock in 1848, but these were to be dwarfed by the Tobacco Warehouse built in 1901, designed by A.G.Lyster. Half the dock had to be filled in to accommodate what was the largest brick warehouse in the world, with its 14 storeys, 30,000 panes of glass and 27 million bricks.

The area was suffering from relative decline but has recently undergone considerable change under conservation initiatives, with the conversion of the north warehouse to The Titanic Hotel, and the ongoing conversion of the Tobacco Warehouse into luxury apartments. More dramatic has been the decision to allow Everton Football Club to fill in the Bramley Moore Dock for its new state of the art football stadium. Progress on the scheme has been rapid, but sadly contributed the decision by Unesco to remove World Heritage Status from the Liverpool Docks. Despite these changes, Martin argued strongly that Liverpool still remained a fascinating city to visit for its dock, transport and industrial heritage.

Society Visits

Amongst the excellent series of visits organised by Alain Foote, were those to Dennis Eagle in Warwick on 22 March with 15 members and on 19 April to Stourbridge when 10 members enjoyed the Stourbridge Glass Guided Tour and a walk along the canal.



February 2023: Alan Hill*Water as a mechanical Agent.*

Water has been the single most useful source of energy known to man. Such was the introduction from Alan Hill to an absorbing presentation. Alan, with a background in industry and academia and a long interest in Industrial Archaeology, was an excellent guide.

Illustrations of waterwheels are found in Roman mosaics and there are earlier examples in China. Milling corn or other cereals was the dominant use and cascades of up to eight wheels are known in Roman Spain. Harnessing water in this way remained the most important source of power until the 19th century. The arrival of steam introduced the first rival but even in 1830 the two were equal; thereafter, steam forged ahead.

Some spectacular examples of waterwheels have survived. On the Isle of Man, the great Lady Isabella Wheel at Laxey with its remarkable push/pull rod mechanism operating the mine pumps is the largest ever built. An alternative to increasing the diameter is to increase the width of the wheel as on the Kennet and Avon canal at the Claverton Pumping Station near Bath and by the French at Marly sur Seine.

Harnessing tidal power is a perennial issue. Tidal mills have been quite widespread and a half mile long barrage in Brittany was for a long time the world's largest.

Returning to the Isle of Man a water turbine supplanted the great Laxey wheel giving greater efficiency and power.

Water power has generated electricity since the 1870s and North Wales was one of the earliest places and included pioneering pumped storage schemes. Today, hydro-electricity provides some 20% of the world's primary electricity.

Water-balanced engines use gravity to lift materials in a number of situations from coal mines to quarries and in other industrial situations. Funicular railways, often take seaside visitors to local observation points from Scarborough to Hastings via Aberystwyth, Lynton-Lynmouth and Saltburn.

Water pressure or hydraulic engines used a column of water to power a pump before the introduction of Boulton and Watt's steam engines whose mechanism they foreshadowed. Trevithick was an advocate of these robust and widely used machines.

The hydraulic ram engine, named after its hammering noise which recalled two rams butting, was simple, robust and fully automatic. A large ram engine could lift water to 1,000 feet and they were popular in country houses and remote districts and are still widely used in developing countries.

Joseph Bramah and William Armstrong were the great protagonists of hydraulics for industrial applications. Bramah in 1802 envisaged using water to operate machinery creating high pressures by small movements. Effectively, hydraulic leverage as in a hydraulic press.

Armstrong's invention of the hydraulic 'devil' or 'jigger' converted linear to rotary motion and led to the

first hydraulic crane in 1846. Using domestic water mains pressure at 30/40 psi (today 10 psi) these cranes helped the 19th century expansion of docks around the UK.

The huge lock gates at Grimsby docks weighed 75 tons and were operated by manual capstans. To meet the need for more power, Armstrong built a 200' hydraulic tower (resembling a campanile) with a steam engine to pump water into the tank at the top. This pressure opened the gates in 2 minutes.

Poor foundation conditions meant that such towers could not always be built, and this led to Armstrong's development of the hydraulic accumulator. Such a device giving 700/800 psi would have needed a water tower some 1,600' tall.

These developments, starting in Kingston upon Hull, fueled the rapid expansion of hydraulic power. London soon had some 30 large hydraulic pumping stations between Tower Bridge and Blackwall Point. Usually operating at 700/800 psi but Liverpool and Glasgow experimented with higher pressures of 1,200 psi.

Tower Bridge was, perhaps, the most iconic example of a hydraulic machine.

Distributed power from a central source was a logical development and the London Hydraulic Power Company operated 184 miles of hydraulic mains around the capital. Powered by 5 pumping stations plus accumulators it was for some 50 years a major source of power for passenger lifts, cranes and hoists, theatre machinery in Drury Lane, a cabaret platform at the Savoy and much more, notably, the 750 ton central platform at Earls Court in 1930. Elsewhere, Kirkaldy's Testing and Experimental Works used 6,700 psi in a tensile testing machine.

This distributed hydraulic power was unfamiliar to many and resulted in much discussion including its vulnerability during the blitz, answer, not much. How were users charged? By a metering system, and what was the subsequent use of the network after its closure in 1977? It was unused until Mercury Communications (now C & W) used it as ducts for the first cable TV network.

Other applications of hydraulics are found in swing bridges and lock gates. The Anderton Boat Lift and Newcastle Swing Bridge are good examples. A coffin lift at a crematorium and powering a pipe organ are others.

The great forces exercisable through hydraulics were used to finally launch Brunel's Great Eastern at Millwall, incidentally also launching Birmingham's Richard Tangye's hydraulic jacks' business. The great box sections of the Britannia and Conway bridges were lifted into place and the Eiffel Tower's four legs are levelled by hydraulic jacks.

Armstrong's leading position in the technology found many applications in his warships, notably for powering the great turrets, their guns and ammunition handling.

Whilst many in the audience were aware of plenty of examples of the use of water as a mechanical agent it was not until Alan Hill showed the overall range and utility of the medium that its true usefulness to such a wide range of applications could be fully appreciated.