WARWICKSHIRE Industrial Archaeology Society

WIAS

NEWSLETTER

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FROM THE CHAIRMAN

Setting the limits

With the Society successfully launching the WIAS database during 2014, it is perhaps an occasion to examine some of the challenges of that task and to give some direction to the next stage. Acting as a contributor has been a very interesting experience, and, on more than one occasion, has really tested the interpretation of the nature and limits of industrial archaeology.

This is not another navel-gazing session about 'what is industrial archaeology?', but some practical thoughts on whether certain sites should or should not be included. The fundamental basis of the survey of sites was to focus on what actually remains today, and there has never been a more effective way of reminding oneself of what has disappeared!

This is most evident in the disappearance of huge chunks of industrial heritage of some of the industries of Coventry. So often, in the place of these once proud manufacturing sites we discover the occasional plaque or isolated building, with the majority given over to housing or retail-park. Interestingly, one of the lasting features is often the company Sports and Social Club building, and the sports field associated with them, albeit a shadow of their former glory. Interesting features, but are they industrial archaeology?

The industrial archaeology of the motor industry is difficult to record, but there are even more issues to discuss over the impact of the motor car upon our landscape, and whether these merit inclusion. Ring roads, car parks, motorway service stations and the country garage are familiar ingredients to us all, but are they industrial archaeology?

At one stage Coventry had the highest proportion of its workforce engaged in manufacturing of any city in the UK, but the service sector now dominates. Retailing is one of those service industries and, despite the decline of high street shopping, many fine examples of historic buildings devoted to retail still exist in the county, often with architectural merit. Several interesting buildings of the Nuneaton Co-operative Society remain in the Nuneaton and Bedworth area, but are they industrial archaeology?

There are also buildings with important structural features that merit investigation by the industrial archaeologist. Alpha House in Coventry, a residential tower block, built in 1962, was one of the first examples of 'jackblock' construction in the UK, with each floor constructed at ground level and then jacked up to the full storey height. It is one of the last remaining examples of such a system in the UK. An interesting building, but is it industrial archaeology?

Architectural merit plus the use of particular (often local) constructional materials represents a powerful case for inclusion. Examples are to be found throughout the county. The Old Bank in Stratford upon Avon is a fine example of Victorian Gothic architecture, built in 1883 for the Birmingham Banking Co to the design of Harris, Martin and Harris of Birmingham. With the town's Shakespearian connections, the bank commissioned a fine Byzantine-style mosaic of Shakespeare over the main entrance, and the set of 15 terracotta panels at first-floor level depicting scenes from Shakespeare's plays. The sculptor was Samuel Barfield of Leicester. An interesting building, but is it industrial archaeology?

The Temperance Hotel and Coffee Tavern in Warwick provides an even stronger case for inclusion. It is a fine red brick building built in 1880, with terracotta panels depicting flowers in the Arts and Crafts style, together with COFFEE TAVERN lettering. It was commissioned by Dale of George Nelson, Dale & Co, gelatine manufacturers of Warwick. The architect was Frederick H Moore of Warwick, who also designed the Nelson Club for the company. Is this industrial connection firm enough to merit the Coffee Tavern's inclusion?

A similar case might be made for the residences of Warwickshire's industrialists. Success in business was often marked by the purchase – or the building – of a house of substance to reflect that success. George Singer's Coundon Court in Coventry might be a case in point – but is the industrial link too tenuous? This, of course, is very different from the situation where a company might provide housing for its workers. The inclusion of housing by Kaye & Co., cement manufacturers, at the Model Village, Southam certainly does merit a listing on the database.

Decisions on these - and other examples – must rest with the database committee. Given the paucity of sites remaining in many industries, the argument for inclusion can be strong. In these circumstances, any contribution will be positively assessed by the committee, and, where possible, will enter the database. As always - if in doubt - please present the site.

PROGRAMME

December 11 2014
Jeff Burgess:
Leamington's Water Supply.
January 8 2015
Richard Thomasson:
The BAE 146: the last UK-designed civil aircraft.
February 12 2015
Christiaan van Schaardenburgh:
Coventry Shadow Factories.
March 12 2015
Martin Green:
Nooks & Crannies of Warwickshire's Industrial Heritage.
April 9 2015
Jim Andrew:
Housing the Great Exhibition - The Crystal Palace of 1851.
May 14 2015
Sue Tungate:
Matthew Boulton and the Soho Mint: Copper to Customer.
June 11 2015
Members' Evening:
Industrial Archaeology and Agriculture - Strange Bedfellows?

Meeting Reports

September 2014

AGM, AIA Cheshire Conference Report and Members' Evening

In the absence of Martin Green, Peter Coulls chaired the AGM of the Society and gave Martin's report for 2013/14, the 25th anniversary year.

In a year marked by the death of Toby Cave, whose memory will be honoured on a permanent basis, much had been accomplished. Well attended monthly meetings with a wide variety of speakers, the establishment of a database of IA sites in Warwickshire, a comprehensive and well used web-site and plenty of opportunities to develop further are at the heart of the Society.

The treasurer, Victor Lobb, presented a strong financial position with good stewardship arrangements in place. He also outlined the position, following the Society being recognised by HMRC as having Charitable Status, for members to use Gift Aid which would increase the value of their subscriptions to the Society.

A number of topics were discussed, including donations to save the Wedgwood Collection (members to act individually), the use of 'social media' to enhance the appeal of the Society and the possible change of the Society's logo in view of the redevelopment of the old gas works site.

After the formal meeting four members made presentations that again demonstrated the breadth of interests and expertise that are within WIAS.

Brian Redknapp, formerly Senior Engineer in the Coventry City Engineering Department and the first engineer to tackle the city's inner ring road design, celebrated its 40th anniversary with an old promotional video that showed its origins and especially featured Peter Galliford. His eponymous construction company, then a small local business and minute compared to the national contractors, won an increasing number of tenders on the project and was set on its course to become the great concern it is today.

Brian defended the decision to use grade separation rather than roundabouts as brave, and a daunting risk at the time, which had been justified by the low accident rate that has ensued. He also explained that the present work around the access to Coventry Station had been anticipated long ago; the inexorable rise in traffic volumes would require changes to the road layout and at the same time the unpopular pedestrian subways leading to the city centre will be replaced by a more user-friendly bridge.

Chris Barney, hot-foot from the AIA Conference in Chester, gave a whistle stop tour of a selection of the industrial sites laid on for the delegates to visit. Starting, appropriately, at the mainline station and the hotel (for first class passengers, others down the street) still advertising its coaching inn heritage and thence to the Steam Mill (powered by the 8th engine from Boulton & Watt) alongside the Shropshire Union Canal which then flowed 50 feet below the Roman Walls to Taylor's Dockyard still maintaining narrow boats.

Further afield, North Cheshire has major chemical process plants and many notable bridges and viaducts. Site work has begun on a new £600 million Mersey Gateway Project to connect Widness and Runcorn. Fiddlers Ferry power station was visited, it consumes 800 tons of coal an hour at full output with supplies now coming from Russia, Indonesia and several other non UK sources. The rebuilt Anderton Boat Lift linking the River Weaver and the Trent and Mersey Canal has substituted 70 foot hydraulic rams at £1million each for the original cable and counterweight system to raise and lower the caissons.

Older industries were represented by copper mining on the Derbyshire border and silk mills in Macclesfield. Paradise Mill was closed in 1981 but its hand operated jacquard looms have been preserved and the Mill plus nearby Museum are recommended for a visit. Finally, Cheshire's very active salt industry's origins were explored via Murgatroyd's Brine Pump and the Lion Salt Works (the last traditional producer, closed in 1986) with its planned visitor centre.

Martin Woolston, resplendent in a Rolls-Royce Heritage Trust uniform, outlined the work of the team of volunteers at Anstey in restoring the engines and ancillary equipment belonging to the Trust. Other teams undertake similar work at Derby and elsewhere to ensure that the rich engineering heritage of Rolls-Royce and others is not lost for future generations.

His current project is the restoration of a Rotax starter motor used on aircraft gas turbines such as the Armstrong Siddeley Mamba and Sapphire. This motor used a cordite explosive charge to drive a small turbine which in turn span the main engine up to a speed that allowed the compressor to operate and the engine to fire up.

Early jet engines had a propensity to flame out and, possibly to allow a restart in flight, this particular starter had two chambers for explosive charges. Alternatively, perhaps both were needed for the initial start-up. This dilemma illustrates the difficulties faced by the restorers in the absence of drawings, manuals or other information for the equipment. Clearly, from the component parts on display, this starter motor was a complex piece of engineering and when finished will add to our knowledge of the early days of the jet engine.

Finally, John Barclay gave a glimpse of wartime Lancaster bomber production in Warwickshire with 'the Shirley Secret' that lay behind Ernö Goldfinger's 1955 headquarters building for Carrs Paper Works.

Using a wealth of contemporary photographs we first explored the work being undertaken 10 miles away at the Longbridge shadow factory. Here largely female labour was producing various sub-assemblies for the bomber; front turrets, bomb-aimer positions, cockpits and fuselage centre sections. Conspicuously absent were any rear fuselage assemblies.

These were being produced at Carrs Paper Works in Shirley. A unique collection of photographs taken from a one-off retirement presentation album showed, (again mainly women) producing the rear fuselage complete with rear and mid-upper turrets. The completed sub-assemblies were transported by road to Elmdon for final assembly and testing before delivery to squadrons.

Much recent attention has been given to the visit to the UK of the Canadian Lancaster which has been flying in company with that of the Battle of Britain Memorial Flight. The Lincolnshire Aviation Heritage Centre at East Kirkby has a third surviving Lancaster that has running engines and does taxi runs (air has been seen under the tail wheel on occasions). There is the mouth-watering prospect of this ex-French Air Force machine becoming airworthy and a trio of Lancasters in the air.

There are poor records and details of many of the wartime shadow factories but our knowledge should be increased at the February 2015 meeting when Coventry's shadow factories will feature.

Members' Contributions

Peter Chater:
Hatton Bank and Bank Engine. Memories of the 1940s

Hatton Bank is situated between Warwick and Hatton on the former GWR main line. The distance between the two stations is four miles. Over this distance the track rises about 140 feet. A lot of this gradient is at one in one hundred.

With banking assistance from Warwick, freight or mineral trains can be loaded about one half heavier all the way from London to Birmingham.

The 61xx locomotive shown above would be similar to the engines that were used as the Warwick bank engine.

The engines mostly used were the 41xxs, 51xxs and 81xxs of 2 6 2 wheel formation with driving wheels of 5' 8" diameter.

These engines were built for mixed traffic purposes and quite suitable for this work. They were classified D. They carried 1900 gallons of water and about three and half tons of coal.

Normally the engine was available 24 hours a day. It was brought off Leamington Loco Shed at 5.45 am. and returned at noon for coal and the relief of enginemen. Returning again at 9.00 pm. for same purpose. It was returned to its shed when the fresh loco arrived at Warwick.

At Warwick a water column and ash pit were located at the Bay platform for servicing purposes.

Method of working

A train would run through Warwick station and the driver would stop clear of the Down Bay points.

The signalman would set the road for the bank engine to buffer up to the rear of the standing train. It was not coupled up.

The guard would hand the bank engine driver the tally of his train and then return to his van. The bank engine driver would whistle up two crows and one (a crow is one long, then three short and one long whistle). This could be heard all over Warwick. The train driver on hearing this would reply in the same manner and both engines would start off together.

The bank engine driver would look out for signals. If the train was going towards Birmingham the banker would propel it through to Hatton North Signal Box. If towards Stratford on Avon, it would be stopped at the South Box.

The banker was returned to Warwick to do the same again.

Members' Contributions

John Willock:
Willans & Robinson at War; An Update on the Archive in the County Record Office.

As Alain Foote, Peter Coulls and I have started to delve more deeply into the Willans and Robinson (W&R) archive we have become aware of the diversity of its products, particularly during the First World War. Military contracts show widely differing requirements for war *matériel*, from shrapnel shells to aero engines, tank tracks to submarine conning towers.

Of particular interest were instructions for W&R to machine cast iron cylinder liners and cylinder heads for the French designed 80 and 110 hp Le Rhône rotary aero-engines used in many allied aircraft, especially fighters and scouts, including the renowned Sopwith Pup and Camel, Nieuport 11 and Avro 504K. W.H. Allen & Co of Bedford was the British licensee for Le Rhône and it is possible that W&R supplied finished parts to them directly. The Rhône was noted for its particularly smooth running qualities, due mainly to its unusual use of slipper-ended connecting rods and thrust blocks, retained in a series of concentric annular tracks. This obviated imbalance arising from piston acceleration that occurred between cylinders when conventional master and articulated rod type assemblies were used, as was the case in all other types of rotary aero-engines.

Other contracts relate to the complete manufacture by W&R of the French /Swiss Salmson (Canton-Unne System) radial; as well as the supply of components and special tools. W&R had considerable experience in the manufacture of the water-cooled Salmson under licence from the British agents, Dudbridge Iron Works of Stroud. In fact W&R was the primary producer in this country, holding the sole British Empire manufacturing rights for this rather complicated engine. The ability to machine precision components for the Salmson engine undoubtedly helped with the Rhône contracts. Unlike the Rhône, the Salmson was not a premier power plant, being far too cumbersome with its cooling radiators, for lighter aircraft use. It, nevertheless, powered at least fourteen different types of production and prototype allied aircraft. Only one example of a Salmson engine exists in the UK, a W&R manufactured Model M9, exhibited in the Science Museum.

We have also examined a large number of wartime orders from the Admiralty, for the supply of winch engines, parts and castings, including the provision of the necessary jigs, fixtures and tools for their manufacture. These particular contracts, occasionally marked "Urgent", were split between a number of companies, including Napier, Belliss and Morcom, Mirrlees Watson & Co and Armstrong Whitworth. Initially, it was thought that the winch engines were required for ship-borne use, possibly for minesweeping. However, a number of them seem to have been selected for truck mounting, posing something of a puzzle. Although uncertain, it is

possible that the truck-mounted winch engines were for use with observation balloons, possibly on the Western Front. We have been unable to locate any drawings and specifications for these engines and associated winches. Until more evidence becomes available we cannot be sure of their exact form and intended use.

Observation balloons were used by both sides in the conflict and were vital in the artillery battles, spotting and reporting the fall of shot, as well as providing general battlefield intelligence. Filled with hydrogen, observation balloons were prime targets and highly vulnerable to attack from marauding aircraft using incendiary ammunition.

If threatened it was necessary to winch the balloon down very quickly. This could be accomplished in minute or so. Even so, the average life expectancy of a balloon on the Western Front in 1918 was only about two weeks. All too frequently they were shot down in flames, with the observer having to resort to his fairly unreliable parachute to descend to earth! Thus the high speed winch and its associated engine was a vital piece of war equipment.

W&R were also requested, via the Ministry of Munitions, Department of Mechanical Warfare, to manufacture large quantities of what are called "Tractor Links" in the contracts. Although not actually specified as such, these almost certainly refer to caterpillar track links for the revolutionary new weapon, the tank. The contracts involved the production of thousands of link stampings, their associated ferrules and the assembly of same.

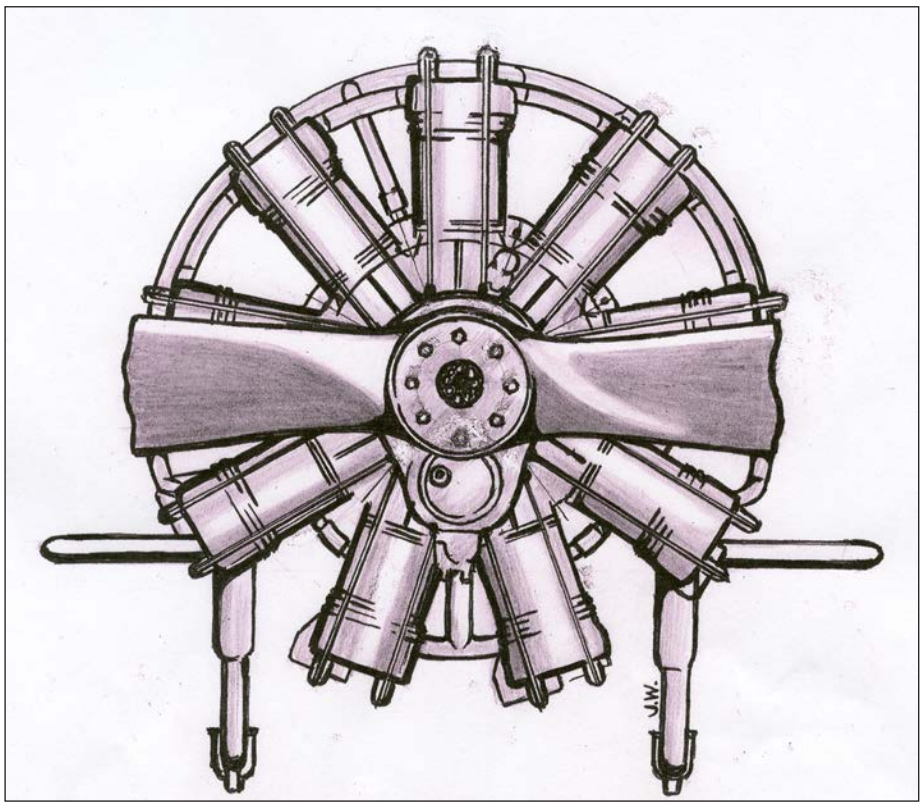
In 1915 Harry Ricardo formed "Engine Patents Ltd" and was requested by the Royal Naval Air Service to appraise and modify the Daimler sleeve valve engine, then being used in the first British tanks. The original engines were unreliable, underpowered and emitted large quantities of oily exhaust smoke, a good target marker. To overcome some of these limitations, Ricardo designed a totally new 150 hp engine which resulted in large orders for which W&R supplied patterns and castings.

A contract dating from 1917 yielded information on a stationary diesel engine supplied to the Agua Santa Nitrate Railway Company in Chile to supplement its power requirements for the mining and processing of nitrates. As nitrates are a constituent part of explosives, it can be reasonably surmised that the British military was interested in increasing the output of this vital war material from its South American source. Further research is required into this interesting piece of military history.

The company was also involved with the production of submarine conning towers, code named "Lighthouses". Other naval orders included boiler ash expellers, the erection of two sets of marine turbines with reduction gear for a destroyer being built in 1918 by Hawthorne Leslie & Co, Newcastle-upon -Tyne, and several diesel engines for the submarines service. Diesel engines for the Admiralty seem to have been ordered under the coded pseudonyms of "Oilers" and "Bearers" in order to disguise their intended purpose!

All the above examples illustrate the manufacturing expertise of Willans and Robinson on a complex and disparate range of military products during WW1. Quite an interesting departure from their rather better known line of Central Valve Engines, Steam Turbines and Condensers!

The writer would like to thank the Warwickshire County Record Office for their co-operation in the preparation of this article.



Members' Contributions

Alwyn Sparrow:
The Cape Road Goods Yard, Warwick.

Originally opened in 1892, it's now over fifty years since this site closed, with the petroleum depot lasting only a few more years. Very little remains.

I remember this yard in its latter days as a busy place, located off Cape Road adjacent to the road bridge. Apart from general freight, the main goods were domestic coke, coal & bulk petroleum. Parcel traffic was dealt with from the Leamington Goods yard.

The Regent Oil company had a depot within the yard serving road tankers. Warwick Gas Works was also accessed through the yard to their own siding on the other side of Cape road.

The yard access was controlled by a four lever ground frame housed in a small cabin which was electrically released from Warwick Station signal box.

I also remember the three wheel Scammell Mechanical Horse lorry working out of the yard with deliveries There was a fixed crane for unloading the rail wagons which was listed as having a six ton lifting capacity.

The main activity I recall was the coal merchants who frequented the yard each working day. Arthur Hunt and Vic Dillow were a couple of well known merchants. They often had their own private wagons.

The Wagon Repairs Limited hanging wall map came from Arthur Hunt so he may well have owned his rail vehicles at some time.

I possess the weighbridge ticket book for the period 9th September 1940 to 4th October 1940, during which time two hundred tickets were issued for loads of coke & coal. Interestingly, some of which were destined for Budbrooke Barracks.

The yard weighbridge invoice book

The ground frame name plate

The site today & surviving artefacts

The yard today is an industrial site which was developed in the 1970s. Some images of items including the base of the crane, which survives to this day, are shown here.


The surviving crane base

Arthur Hunt's Wagon Repairs Limited wall map

Meeting Reports

October 2014: Peter Grenfell
The Ford Foundry, Leamington Spa

A large audience – including several former Ford employees – attended the October meeting to hear Peter Grenfell talk on his years at the Ford Foundry, Leamington Spa, 1974-1996. When Peter arrived at Ford it was a second-hand, Second World War foundry, and yet by the time he left it was one of the most up-to-date foundries in Europe, perhaps even the world.

From the outset, Peter made it clear that his focus would be on what actually happened inside the foundry, and this necessarily included a fair degree of technical detail. This report cannot possibly do justice to that detail, and we hope that – in time – the Society may be able publish a fuller document that will satisfy both the interested enthusiast and the technical expert.

Peter divided his talk into several sections. Looking first at the nature of foundry working; then the history of the site prior to the arrival of Ford; followed by the state of the foundry on Peter's arrival in 1974. The latter part of his talk concentrated on the three key developments in the 20 plus years he had been there: the electric melt; the DISA flaskless mould lines; and the two major flasked lines.

Peter explained that the essential function of a foundry is simple - it takes scrap metal, heats it (to about 1500^0 C) so that it becomes liquid, pours this into moulds, which are subsequently allowed to cool and the product extracted. Iron is melted in cupolas. Steel was made by taking cupola melted base iron and passing it through Tropenas converters (similar to Bessemer's invention, except that the air is blown in the back and across the surface of the metal).

The mould lines were continuously moving iron pallets, with steel boxes ('flasks') in which the moulds were made. The task of making accurate moulds, to carefully pour metal into them, allow them to cool, and extract the castings on a continuous basis is very difficult indeed. The sand also needs to be re-used, so rubber conveyer belts added to the mayhem, ferrying the sand back to be mixed to the right consistency before returning to the moulding machines in a noisy, dusty operation.

In the fettling shop the castings have to be cleaned by shot blasting to remove all burnt sand. The edges are trimmed and the feeder stubs removed on a large grinding machine. In the core shop the moulds that had required cores would have these removed.

A particular feature of the Ford foundry was that it also had a machine shop, not ideally placed in the middle of the foundry, and which was later transferred to the Queensway estate.

With a background in electrical engineering, the move to Ford from a quiet electronics lab was quite a shock to the young engineer. The Plant Manager demonstrated the nimblest of footwork in showing Peter this gigantic, noisy, dusty plant with molten iron running around on the floor and sparks flying everywhere, with people seemingly sure of exactly what they had to do, usually with no protection at all. What a modern Health and Safety Inspector might have made of it defies belief!

The earliest occupant of the rail-side site was the iron-founder Radclyffe & Co in 1881, subsequently joined by the Imperial Stove Company, and in 1902 the site came into the ownership of Flavel's, the well-known Leamington stove manufacturer. Their occupancy lasted until 1939, and Ford purchased the site in 1940. They installed a steel making facility which consisted of two cupolas, three converters, an overhead crane, and an arc furnace with a mechanised mould line. They were then able to make Bren gun carrier track links in steel, and several other war-related components, including bomb casings.

With the return to peacetime production, emphasis shifted to agricultural machinery, before developing the ability to produce a large range of parts for Ford vehicles ranging from brake drums and discs and flywheels to lorry and tractor parts. It was generally recognised that any Ford car driving around would have at least five parts made in Leamington Spa!

The first of the significant developments was the new Electric Melt opened in 1975. It consisted of three furnaces each of 9MW electrical power and 30 tonnes capacity. They were mains frequency coreless induction furnaces (transformers, with the metal as a single turn secondary, for electrical engineers). Space does not permit a detailed explanation of these, but it represented a more efficient, cleaner and quieter method of heating the metal. A fourth melter was added in 1979, thereby ending cupola melting.

The second development was the introduction of the DISA plant in 1982. DISA Dansk is a firm near Copenhagen that developed moulding lines that did not use steel boxes but used only sand. The block of sand is created in a special chamber, with the two halves of the pattern plate on the outside. A mould was made every ten seconds, it took three seconds to move the line, so that left only seven seconds for the accurate pouring of the metal! The steady hand of man was replaced by auto-pourers. So, potentially, one could sit back and watch perfect moulds appear on their own. The whole plant was monitored by a computer (something of a novelty for 1984).

The last major project was the replacement of the old lines with new bigger conventional flasked lines, No.6 (1988) and No.7 (1989). The latter line made SG iron, iron with a small amount of magnesium added, which made it more ductile like steel (important for certain car components), but the addition of magnesium was a tricky process and Ford developed their own individual method, now widely used in the foundry industry.

Peter left Ford in 1996, and a new DISA machine was subsequently added, together with an updating of the fettling shop. However, rumours began to emerge of the potential closure of the foundry as it no longer fitted the Ford model for production facilities. Some blamed the unions, but closure began to seem inevitable, and the last pour took place on 13th July 2007.

Peter gave a fascinating account of the real world experience of life in a foundry, and quite clearly loved the demands of the job. He responded enthusiastically to a range of questions after the meeting, and it was good to share the knowledge with other former Ford employees in the room.

To end the evening, the Chairman showed some photographs of the derelict Ford site and its eventual demolition, together with a reference to the Foundry Wood Project which is keen to keep alive the heritage of the Ford Foundry and the associated railway.

November 2014: Bob Booth (Chairman of the Bournville Society)
Cadburys and Bournville

Bob Booth, chairman of the Bournville Society and a member for 28 years, entertained a large attendance, which included 18 visitors, with the history and development of Bournville by the Cadbury family into the forerunner for the 'Garden Cities' that were to come.

Over the years we have heard much about the Quaker contribution to the Industrial Revolution, but this has been largely biased towards the 'Industrial'. The social history aspects have not been so well covered. Bob amply redressed the balance with his wide-ranging review of Bournville, the estate and its services together with some insights into the employment practices and the amenities provided by an enlightened and paternalistic family ownership.

From the opening pictures of a group of the building staff in 1922 and the tallest Maypole in the country there was little doubt that those who lived and worked at Bournville could count themselves fortunate. Especially when compared with conditions only a few miles away.

Frequently in the presentation, illustrations from the early years of the 20th century were followed by a contemporary view of the same building or landscape. The passing years have not done many favours. The former sense of spaciousness and ease has been lost although it is still much better than in other nearby neighbourhoods.

The Quaker Cadburys chose Bournville as the site for their new enterprise because of its proximity to the canals and the developing rail network. Early buildings included housing for a fire brigade; cocoa beans can spontaneously combust! There has been a rumour that Leamington or Warwick were considered as possible locations but no evidence has been uncovered in support.

The Cadbury family name is first found in Devon, Somerset and Dorset in the 16th Century. In 1794 one Richard Cadbury was the first to settle in Birmingham as a draper. His son, John, was sent to Leeds to learn the tea retail business and in 1824 he began as a coffee and cocoa nibs roaster and dealer of tea, in Bull Street, Birmingham. An abstainer, he had interests in the temperance and abolition of slavery movements. In 1831 he took a warehouse in Crooked Lane Birmingham, married and had three sons Richard, George and Henry. In 1847 he moved to Bridge Street, Birmingham with a business selling cocoa as a pure health and homeopathic drink. A contemporary engraving of the Bridge Street factory shows a substantial operation.

At that time, as now, raw cocoa beans came in bulk from African growers. The early attempts to produce a palatable drink were not very successful and, apparently, tasted badly due to adulteration. Cadbury persisted and with the Quaker belief that quality spoke for itself developed a 'cocoa essence' that was widely advertised and sold well. The advertising material was notable for its early use of colour.

Simultaneously with the development of the Bournville factory the Cadbury Quaker paternalism blossomed with the creation of the Bournville Estate and its rapid development. Some 144 acres were rapidly filled with housing and recreational facilities. This development was vested in the Bournville Village Trust set up in 1900 and separate from the factory. Later on, the Trust developed other similar ventures.

From the outset, only half of the housing was set aside for Cadbury employees but stringent criteria were, and are, applied to all applications for a tenancy. However, works transport was provided to supplement the local bus and train services.

Employment at Bournville peaked at around 10,000 of which some 8,000 were female. 'Girls', who never worked nights, left employment on marriage but with a bible as a parting gift.

Much of the character of Bournville, its houses, its amenities and not least its recreational spaces is due to the work of the architect William Harvey, who was much influenced by Voysey and thus created an 'arts and crafts' community. Notable buildings apart from the domestic housing include a 48 bell carillon (now with a visitor centre), the largest sports pavilion in the country in the midst of 90 acres of sports fields (now sadly reduced to 40 after more house building), schools, a Quaker Meeting House, Church of England, Roman Catholic and Serbian Orthodox churches.

Considerable attention was paid to landscaping and the creation of substantial pools for boating and fishing. A large outdoor Lido fed by natural springs is no longer in use but may well be rebuilt. Indoor swimming baths, separate ones for men and women, were also built and everyone had to learn to swim. The architectural historian Pevsner noted the girl's baths which sadly is now used as a storage facility.

A slight downside to the Quaker benevolence was the absence of a cinema, a chip shop and, unsurprisingly, a pub.

Amongst the illustrations were some watercolours by E. Wallcousins of various buildings that had been used as postcards. The dining block was particularly impressive and remains so today. Its basement provided changing rooms, youth club rooms, a library, doctors' and dentists' surgeries and a Concert Hall seating 1050. A fountain and statue was given by the workers in 1933 to commemorate the firm's centenary. It was also interesting to see some of the bomb damage suffered in the 1940s and how the buildings had been restored to their original designs.

Elsewhere on the estate can be found buildings built as convalescence homes and for holiday accommodation together with a number of Cadbury family homes now used for various community purposes including a residential Quaker Centre. Not to be forgotten were infant and junior schools, the School of Art and the Day Continuation School, originally intended for young Cadbury employees.

Apart from the architecture, a recently discovered illustrated booklet shines light on Cadbury's industrial activities and shows the company as being in the forefront of administrative technology, and with its apprentices being so well regarded that they were often poached by other employers such as the Austin Motor Company.

Moving to the present day, Bournville continues to develop and its new housing will include state-of-the-art eco features and by 2017 there will be purpose built retirement facilities.

Today's Cadbury employees, even under the new American ownership, continue to work in 'the factory in a garden'. And, it is, perhaps, no surprise that Ebenezer Howard took forward the Cadbury ideals into his own Garden Cities – 'neither town nor country but with the benefits of both'.