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Nov 2007



A view of
St Pancras
International,
see page 12.

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SIHG Newsletter #160 November 2007 Web Edition

This edition of the Surrey Industrial Group Newsletter has been reformatted so that it is more easily read online or printed out as a PDF. Diary entries have been curtailed to cover SIHG events only.

Other editorial matter is practically as originally published.

Readers are advised that the views of contributors are not necessarily the views of SIHG.

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SIHG Newsletter No 160 November 2007

DIARY

The 32nd series of Industrial Archaeology Lectures

Held on alternate Tuesdays, 7.30-9.30 pm, from 25 September 2007 at the University of Surrey (Lecture Theatre F).
Enquiries to programme co-ordinator, Bob Bryson , meetings@sihg.org.uk.
Free parking is available on the campus in the evening, in the main car park.
Single lectures at £5.00, payable on the night, are open to all.

- 20 Tue *SIHG LECTURE SERIES: Loyal Servants of the East India Company*
Nov by Janet Bateson (RH7 History Group)
- 4 Tue *SIHG LECTURE SERIES: MEMBERS' TALKS*
Dec
- 8 Tue *SIHG LECTURE SERIES: Sites and Surveys - a review of archaeological work in Surrey.*
Jan By David Graham (President of SyAS)
- 22 Tue *SIHG LECTURE SERIES: Portsmouth Dockyard & Industry outside the Wall.*
Jan By Prof. Ray Riley (University of Portsmouth)

Reports and Notices

Exploring Surrey's Past: New Web site launches on 15 November 2007 - www.exploringsurreypast.org.uk.

SERIAC 2007 report by Alan Thomas

The 2007 meeting of the South-East Region Industrial Archaeology Conference (SERIAC 2007) was held in the John Madejeski Theatre of the University of Reading on Saturday 21 April. It was organised by the Berkshire Industrial Archaeology Group (BIAG).

After the welcoming address, the first lecture was given by **Paul Sowan** on *Chalk Mines and Underground Quarries in Berkshire*. There are extensive workings in the chalk, the existence or full extent of which may only have been revealed by the collapse of the ground above. Material was extracted for lime-burning, building stone, hearthstone, brick-making or as flints.

Alan Thomas then spoke on *The Epsom Mental Institutions - History and Services*. From the late 1890s until 1924 five large mental hospitals were built at Epsom, on what at the time was cheap land. At the peak the hospitals held over 8,000 patients. Prior to the building of the second hospital in 1902 it was necessary to find an adequate supply of water and provide sources of power and lighting. It was decided to build an electric power station to provide lighting and power for the water pumps and other motors for domestic purposes. An artesian well was dug and bored to a depth of 550 feet into the chalk, and from a depth of about 60 feet the water was pumped to an elevated tank from which it flowed by gravity to the hospital. A building erected round the well contained the pumps, boilers and electric generators. Generation ceased in 1935 and the building subsequently underwent three conversions, to a hostel for some patients, to a combined hostel and workshop and finally to a leisure centre. After

the final conversion SIHG gave its Conservation Award for 2003 to the developers, the David Lloyd Leisure group.

David Buckley spoke next on the *European Route of Industrial Heritage*. This project is to foster the appreciation of industrial heritage by linking together existing sites with a key site in the particular area as an 'anchor point'; for example the Waltham Abbey Gunpowder Museum is the anchor point for a 'Regional Route' round industrial sites in East Anglia. The scheme is Europe-wide and it is hoped later to extend it World-wide. (Visit www.erih.de)

After an excellent lunch **Dick Greenaway** spoke on *Woodland Archaeology* in the Wessex Area of Outstanding Natural Beauty, covering parts of Berkshire, Hampshire and Wiltshire. Archaeological remains are difficult to find, but for this reason may have been preserved, thus allowing evidence to be found of extractive industries, woodworking, charcoal-burning and iron-working.

Stephen Capel-Davies spoke on six *Civil Engineers in the Thames Valley in the 18th and 19th Centuries*. These were John Smeaton (the first person to call himself a civil engineer), William Jessop, John Rennie, I. K. Brunel, John Hawkshaw and Joseph Bazalgette.

Finally **Martin Andrew** spoke on the *Information Explosion and the 19th Century Printing Industry*. Industrialisation and universal education created a great de-

(Continued on page 4)

Lecture 1 - 25 September 2007: The Life and Works of Thomas Telford
by Dr Michael Bailey (Past President Newcomen Society) report by Celia Gregory

Although Thomas Telford, 1757-1834, had the honour of being one of only two engineers buried in Westminster Abbey, his achievements are much less well-known than those of other eminent engineers such as the Stephensons and Brunel. Dr Michael Bailey's aim in his illustrated talk was to increase our knowledge about this remarkable man.

Telford was born and educated in Dumfriesshire. On leaving school, he was apprenticed to a stonemason and soon progressed from building stone walls to rebuilding estate workers' houses. He eventually became a journeyman stonemason, constructing the bridge across the Esk at Langholm. In 1780 he went to Edinburgh to study a wide range of works. Buildings like Holyrood House sparked his interest in architecture and in 1782, aged 25, he travelled on horseback to London to widen his knowledge and make a career as an architect and planner.

Telford carried a letter of introduction to a merchant in London who put him in touch with Sir William Chambers and Robert Adam, then working on Somerset House. They employed Telford on this project for two years, giving him much practical experience. From there he went to Portsmouth Dockyard to build a house for the commissioner. He also gained knowledge of the dockyard itself, which was invaluable later when he undertook dock and harbour projects in Wales, Scotland and at St Katherine's Docks, London.

In 1787 Sir William Pulteney, MP for Shrewsbury, invited Telford to make improvements to Shrewsbury Castle. While these were being carried out, John Howard, the prison reformer, asked Telford to submit better plans for a proposed new prison. We were shown photos of the impressive entrance to Shrewsbury Prison which Telford designed, and of his octagonal church of St Michael's, Madeley and the almost square St Mary's, Bridgnorth.

While working on these projects, Telford was promoted to surveyor of Shropshire. His first task was to rebuild strategically placed bridges over the river Severn and its tributaries, one of which was the elegant cast iron bridge at Buildwas. His civil engineering career flourished as he became involved with the construction of canals in the county. At Pontcysyllte, Telford carried the canal over the wide Dee valley by means of an aqueduct, consisting of a wide cast-iron trough with a towpath, built

on eighteen embedded stone pillars, a "wonder of Wales".

From Shropshire Telford returned to Scotland, where for the next twenty years he was involved with the construction of the Caledonian Canal. We learnt how the war with France in 1801 adversely affected trade and how it was thought politically expedient to have a safe inland waterway, the building of which would provide much



The road above Nant Ffrancon on the Holyhead Road.

needed employment in the Highlands. We were shown Google aerial maps of the area, and also Telford's map of the east end of the canal, showing the tidal lock at the Moray Firth entrance. The work presented many engineering difficulties which Telford had not anticipated, and was eleven years late in completion. During this time he was also advising Count Van Platen on the Gotha Canal in Sweden which was to link the North Sea to the Baltic. This involved plans for 53 miles of new canal. Unfortunately, the Gotha

Canal, like the Caledonian Canal, never achieved the commercial success hoped for.

Another phase of Telford's career in Scotland was to supervise the building and improvement of the road system in the Highlands. The economic benefits to the region were considerable. Trade with England improved, and land and property values increased as areas became more accessible. A diagram of Telford's new roads in cross-section showed their aptness in coping with the Scottish climate. Telford completed the communications network by improving roads in the Lowlands and working on many bridges, some of stone and some of iron. He was careful to blend the structure into its background, as we saw from representative photos.

The largest single road-building project that Telford undertook was the London to Holyhead Road, initiated by Sir Henry Parnell, M.P., who eventually secured the appointment of a Parliamentary Commission in 1815, four years after Telford submitted a report on the work to be undertaken. The practical work on sections of the route was put out to contractors. Seven turnpike trusts were amalgamated and taken over by the Commission in 1819. Gradients through mountainous country had to be modified, in places the rock blasted away to make a pass. Bridges were constructed over steep river valleys, the most notable being the Waterloo Bridge over the river Conway at Betws-y-Coed and the Conway suspension bridge. The major problem was to cross the Menai Straits,

(Continued on page 4)

Annual General Meeting 2007 and Presentation of the Conservation Award for 2007 for the Restoration of the Lovelace Bridges by the Horsley Countryside Preservation Society *report by Alan Thomas*

The Annual General Meeting was held on Sunday 15th March in the Great Hall of Horsley Towers, in East Horsley. After presentation and acceptance of the Chairman's and Treasurer's reports the Officers and committee were elected. The present Officers, having indicated their willingness to continue, were re-elected. The committee members retiring in rotation after three year's service were Glenys Crocker and Tony Gregory, and having indicated their willingness to continue, they were re-elected.

Conservation Award 2007

The commemorative plaque was presented to Des Hollier, Chairman of the Horsley Countryside Preservation Society, by Professor Alan Crocker, President of SIHG, in the presence of the Mayor and Mayoress of Guildford, Councillor and Mrs Mike Nevins, in recognition of the restoration of the bridges built by Lord Lovelace in his forest to the south of East Horsley. Further details may be found in the article *Lord Lovelace and his Bridges* in the May 2007 issue of the *Newsletter*.

The presentation was followed by illustrated talks by Peter Hattersley (Horsley Countryside Preservation Society) and Andrew Norris (SyAS/SIHG) describing the history of the bridges and the work done to date, principally the restoration of Stony Dene bridge. The HCPS provided transport to take people to see Stony Dene bridge.

Displays were mounted by the HCPS of various fragments of the bridges, some yet to be reinstalled, notably the nameplate of Stony Dene, and by the SIHG illustrating all the conservation awards made to date. This year's is the 25th.

In addition to the 22 members of SIHG present, many members of the HCPS also attended. The venue was appropriate because the unusual roof structure of the Hall was designed by Lord Lovelace himself, and the restoration project was inaugurated there in 2003 by the Lord Lieutenant of Surrey (Mrs Sarah Goad). □

(Continued from page 3)

which Telford achieved by constructing the Menai suspension bridge a hundred feet above the tideway. This was completed in 1826. He also planned tollhouses to make travelling efficient.

In Telford's later years he helped with the planning of the Liverpool and Manchester Railway, in spite of being a canal man. For the Trent and Mersey Canal he supervised the building of a new Harecastle tunnel with a towpath to supplement James Brindley's tunnel which had no towpath and involved "legging". His last canal, incorporated in 1826, was the Birmingham and Liverpool Junction Canal, which brought much opposition from landowners. The route had to be changed to go over a long embankment. The heavy clay soil kept collapsing which caused great difficulties.

The lecture ended with a resume of Telford's achievements. He pioneered the drawing up of contracts for work on specific sections of a project. He employed trustworthy assistants to whom he was able to delegate work. He improved the status of the Institute of Civil Engineers and became its first president. He encouraged research into different methods and materials and left a valuable collection of books and documents to the Institution. With such a busy life, Telford never married.

This was a fascinating lecture, copiously illustrated and much enjoyed. □

SIHG is a group of the
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Group Patron: David Shepherd OBE,
Group President: Prof AG Crocker FSA

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mand, not only for books but for advertising, stationery, catalogues and all the ephemera associated with commerce and industry. Printed text was supplemented by pictorial images. Wooden presses were superseded by iron, leading to the development of the hot-metal process.

After the lectures two visits were offered. One was to the *Department of Typography and Graphic Communication* of the University of Reading, led by Martin Andrew. The department contains a museum of printing presses and equipment, some being working examples, and a collection of ephemera illustrating the development of type fonts and illustrations.

A visit was also offered to the *Museum of English Rural Life*. This has recently been rehoused under a project funded by the Heritage Lottery Fund, a public appeal and the University of Reading. □

SIHG Officers

Chairman & SIHG Lectures Organiser:
Robert Bryson, meetings@sihg.org.uk
Secretary: **Alan Thomas**, info@sihg.org.uk
Treasurer: **Robin Turier**
Membership Secretary & Newsletter Editor:
David Evans membership@sihg.org.uk

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Sheffield Ramblings *by John Day*

One of the buildings we looked at during our perambulations around the old steel quarter was West Gun Works, bearing on its end wall a blue plaque. This said it was the site of the world's leading gun barrel forge and that it had produced 'The Woolwich Infant'. Having been an apprentice in the Royal Arsenal, Woolwich, I was well aware that there was a pub of that name opposite the main gate. It is still there and is now a very well known 'gay' establishment. The pub took its name from a big gun (for its time) built in the ordnance factory. The name became used for any big gun; even a big Norfolk punt gun of 2 inch bore.

Mark Firth and his younger brother Thomas set up their own business in Charlotte Street in 1842; later to be joined by their father Thomas, who had been head melter at Sanderson's crucible steel works. Business boomed and they moved to larger premises in Saville Street in 1852. These were the Norfolk Works where there were crucible furnaces, the largest rolling mill in Sheffield and two Naysmith steam hammers. In 1863 two larger hammers were installed, presumably those used to forge the parts for the Infant. Four years later they produced the forgings for an eighty ton gun. The works are now occupied by Gripple Ltd who make wire joining and tensioning products.

The earliest guns were cast, but soon they were made by shrinking hoops over a bundle of bars., hence the name barrel for the long hollow piece. As the temperature needed to cast iron became obtainable, guns were made of that material as well as bronze. The first English cast gun was made by Ralph Hogge in Buxted in 1543. In the middle of the nineteenth century a lot changed in gun design, to a large extent by the adoption of armour to warships. This resulted in bigger and more powerful guns being pitted against thicker and stouter armour. With a solid metal gun, the stress in the barrel, particularly at the breech end, is at maximum at the bore and virtually nil at the outer surface. As a result, merely casting the barrel with more metal round the bore does little or no good. The idea of using steel was not too good, as the steels pre Bessemer were a bit variable and tended to be brittle. Not only that; wrought iron is fibrous and has its strength in line with the fibres. So the idea came of using a relatively thin steel barrel (for minimum wear due to its hardness) covered by hoops of wrought iron. Obviously, the easiest way to make the hoops was to roll a coil. A greater benefit was the opportunity to shrink one coil on another and so put a compacting stress on the outer part of the inner coil and the inner part of the outer coil, which caused the explosive stress to be shared throughout the thickness.

Earlier on I referred to the 'parts' of the Woolwich Infant, because the barrel was made up of a toughened steel 'A' tube, a cascable (the knob at the end), a double coil breech piece, a double coil 'B' tube with a single coil. The 'B' tube extended to the muzzle, over these was a triple coil and a trunnion ring. The outer diameter of this 90 inch long triple coil, over the breech end, was 55 inches. The double coil 'B' tube extended another 39 inches and the solid 'B' tube extended the total length to 195 inches. The first gun was completed in February 1871 as a 700 pounder (the weight of the shot) of 11.6 inch calibre. Experiments showed that this calibre was unsuitable for the combustion of 120 pounds of pebble powder, so the calibre was increased to 12

inches, which became the calibre of the fifteen guns made. Later guns, of which many were made, had a calibre of 12.5 inches to take a 800 lb shell fired by 130 lb of powder from a 230 inch long barrel weighing 38 tons.

The wrought iron for the coils was rolled to about 4 inches thick and some 24 feet long. The section was slightly trapezoidal in order that when the hot bar was wound round a mandrel, narrow side inwards, the spreading of the inside and the narrowing of the outside, natural to such a process, left no space between the coils. The bars were scarf welded, under a steam hammer, to give the length needed for the coil, something like a couple of hundred feet. Sand was used as a flux as it turned into liquid silica that flowed out under the hammer pressure thus preventing scale formation. The bar was fed through a long reverberatory furnace with a chain hooked in a punched hole. When the end with the hole arrived at the furnace end, it was cooled and the hole was used for a pin at one end of a slightly tapered mandrel. The mandrel was power driven to form the coil. The longest bar coiled at Woolwich measured 270 feet and was heated in a furnace 190 feet long. The second and third coils were formed using the inner coil, when cold, as the mandrel.

The coil was then put upright in a furnace and brought up to welding heat, a bright white hot, quickly put on its end under a hammer and given a few smart blows to weld it into one piece, fluxing sand being thrown at it. The bore was sized by being hammered on a hardened mandrel. Before the coil was removed from the hammer, water was thrown over it, which forming into steam, blew off the black scales. If a black spot was left, it showed a bad part. The coils for the 'B' tubes were then faced and formed spigots and recesses on what were to be adjoining ends. These were made a shrink fit and heated for assembly before welding. Seeing that Firths claimed to have forged the Woolwich Infant and the Arsenal claimed to have built it, I can but presume that the separate forgings were machined, inside and out, in the Royal Gun Factory.

Rolling the coils for the later 80 ton and 100 ton guns must have been quite a spectacle. I, illegally, watched the forging of a pretty big lump, from the crane track, in the Heavy Forge and that was worth seeing. As an apprentice in the Blacksmith's shop, my forge backed onto a steam hammer that bore the words Naysmith and Patricroft. Sadly, this bit of history was scrapped when the Arsenal closed. Sand was still being used as forge welding flux in my time.

I used to live in Sheffield during the time my father was responsible for the installation of the BTH turbo-generators in the Rotherham power station. This was the largest in the empire in 1923, and warranted opening by the Prince of Wales. He made a speech and closed a switch to start the power station generating. Actually, all the switch did was to ring a bell to tell a very young John to open the turbine steam stop valve with the help of his father's 'man Friday'. All that seems to be left of the power station are the two cooling towers, by the side of the motorway, and their future is in the balance. □

St Pancras International by Gordon Knowles

The rebuilt St Pancras station is due to become operational on **14 November 2007** following the departure of the last international train to Paris from Waterloo the evening before.

The original Midland railway station was designed by W H Barlow who produced a visually striking building. He had worked with Joseph Paxton on the Crystal Palace for the Great Exhibition in 1851 and used a similar approach. The train shed had a huge slightly pointed cast iron arch soaring 100 feet above train level and was 689 feet long with a clear span of 249 feet. At the time it was the widest cast iron span anywhere in the world. The roof was erected using wooden scaffolding running on rails, moved as necessary by an army of workmen with crowbars in time to the beat of a gong, like the slave rowers in a Roman galley. This scaffolding weighed over 1,000 tons and carried cranes and lifting jacks.

The roof itself consisted of iron plates on a grid of girders, the ribs being tied to the platform deck mounted at first floor level. The deck is supported on 688 iron columns founded on brick piers, the number of these determined by the intended use of the undercroft, namely the storage of beer in barrels brought in from Burton-on-Trent, by the Midland of course. The spacing was determined by the length of the standard beer barrel. The wagons carrying the beer reached the undercroft by a hydraulic lift. The roof girders came from the Butterly Company, also served by the Midland. It was intended that the roof would bear inscriptions of the names of the major towns and cities served by the railway. In the end they were omitted from the design.

Tying the ribs to the platform deck was intended to ensure that the internal configuration would be as flexible as possible and proved its worth when the tracks were eventually electrified in the 1960s. The catenary was hung directly from the arch without the need to use gantries, as have been used at King's Cross, Liverpool Street and Paddington.

Some 4,000 houses were demolished to make way for the station approaches through Camden, Somers Town and the Old St Pancras churchyard. It was estimated that 32,000 people were displaced this demolition and a further 20,000 by the station itself. Construction took four years, 6,000 men and 100 steam cranes being employed. The total cost was £435,882. St Pancras opened for traffic on 1 October 1868 with six platforms; a seventh was later added to cope with the increased traffic. Platforms 2 to 7 were of uniform length although numbers 6 and 7 were curved towards their outer ends. Number 1 platform was much shorter being up against the western outer wall of the station. Much of the station has been recently rebuilt during its adaptation for use by Eurostar trains.

As well as the main line terminus there was another, normally unseen, line, which ran under the station; this was the connection to join the widened Metropolitan lines to Moorgate. This underground section was permanently full of smoke and steam before electrification, even though the locomotives were fitted with condensing gear. Pity the signalman who spent his entire shift in the signal box in a hole in the wall, access to which was by a 46 foot deep staircase from the main station.

In 1966 British Rail published proposals to demolish

the station and divert all traffic into King's Cross; this raised a great public outcry and it never happened. Instead, lines as far as Bedford were electrified – the so-called 'Bedpan' scheme. Since September 2003, the first section of the Channel Tunnel Rail Link (CTRL) has been in operation. With trains reaching 186 mph, it is the fastest route in Britain. On 14 November 2006 the CTRL was renamed High Speed 1 (HS1). Over £10bn has been invested in new international stations at Ebbsfleet, Stratford and the refurbished St Pancras.

St Pancras now has six underground lines and seven mainline services. Midland Mainline operate from platforms 1 to 4 and Eurostar from platforms 5 to 10. From 2009 the new services to Kent will run from platforms 11 to 13, until then they will be unoccupied. When Southeastern's domestic high speed services come into use in 2009 journey times will be 37 minutes from London St Pancras to Ashford and 1 hour to Canterbury.

In addition to the new rail services there are other new features for travellers and visitors. There is a world-class brasserie, a gastro-pub (sounds ghastly but, I hope, isn't) and the longest champagne bar in Europe. There are four commercial centres, the 'Arcade' has a mix of independent and boutique retailers, the 'Circle' offers high street brands, both food and clothes. 'St Pancras Market', where the old station meets the new, has fresh produce stalls and the 'Eurostar Lounge' has a range of shops and cafes. The old German Gymnasium hosts a permanent visitor centre and currently a temporary display of the new station.

The new station at Ebbsfleet International, off the M25/M20, now has services to Paris in two hours. It is between Dartford and Gravesend and has 8,000 parking places. It is designed for travellers from the south east, replacing Waterloo and, to a large extent, Ashford. The latter will now only have two stopping services to Paris each hour. Whether Ebbsfleet will prove as convenient as Waterloo for us in Surrey is questionable, particularly if you don't like driving on the motorway system. Stratford International will open in 2009, seven minutes from St Pancras, well in advance of the 2012 Olympics.

As to the magnificent Midland Hotel alongside the station at St Pancras, that is another story. Suffice here to say that the 500 bedroom hotel, designed by George Gilbert Scott and completed in 1876, has had a chequered life. It cost £437,355 to build and when opened was said to be "the most sumptuous and best conducted hotel in the Empire".

By 1935 the London, Midland & Scottish Railway Company (LMS) found it unprofitable and closed the hotel, converting it into offices. It has stood empty for many years; the then chairman of British Rail, Sir Peter Parker, described it as a "crumbling infrastructure". In 1996 the exterior was cleaned, vastly improving its appearance to the outside world. It is currently undergoing a major overhaul and in due course will re-open as a luxury hotel, some very expensive apartments included.

Even if you are not planning to travel by Eurostar a visit to the 'new' St Pancras is well worthwhile. You can even treat yourself to a glass of champagne at the 'longest bar in Europe'. ☐