ASSOCIATION FOR INDUSTRIAL ARCHAEOLOGY

AIA Bulletin

VOLUME 8 NUMBER 3

The National Heritage Memorial Fund has announced a grant of £115,500 to the Ironbridge Gorge Museum Trust to protect the Old Furnace, Coalbrookdale, from further deterioration.

The Furnace was last used in 1818, subsequently became incorporated in foundry buildings, and was partly buried before being excavated and consolidated by its then owners, Allied Ironfounders, in 1959 when it was opened to the public as part of the 250th anniversary celebrations of the coke smelting process. Exposure to the elements has accelerated its deterioration in the last twenty years, particularly of the four cast-iron beams above the fore-hearth.

Since its transfer into the care of the Ironbridge Gorge Museum Trust in 1970 studies have been carried out to determine the best method of conserving the Old Furnace, resulting in the decision to enclose it in a cover building providing protection from the elements and a degree of environmental control. Public areas will be maintained, with viewing platforms inside the building and interpretation of the furnace will be improved, benefitting the quarter of a million visitors who see it each year. Total cost of the building is estimated at £165,000, the National Heritage Fund contribution of £115,500 compliments the Museum's funds and work will start later this year. Other major contributions have come from the Department of the Environment and the National Coal Board.

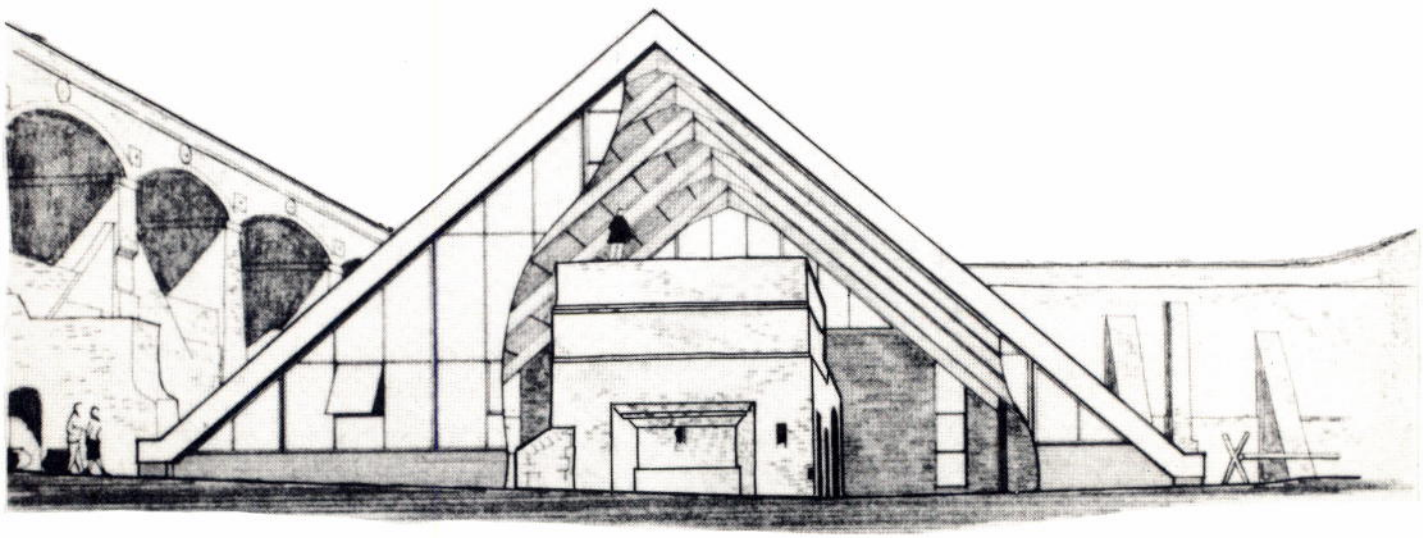
Abbey Tintern Furnace. In April 1979 the Planning Department of Gwent County Council began a 12 month programme of excavation at the Abbey Tintern Furnace (514004) in the Angidy Valley, Gwent. The site was brought to the attention of the Council by Professor D G Tucker, and a team was organised through the Special Temporary Employment Programme of the MSC; a generous grant towards material costs was made by the Welsh Development Agency, and permission to excavate was given by the Forestry Commission as landowner.

The earliest direct reference to the furnace is in 1669 when it was being operated by the Foley Partnership, which also had interests in the associated forges and wireworks in the Valley. It was in operation throughout the eighteenth century and finally went out of blast in 1826, at which time it was used by David Mushet for a series of tests on the viability of smelting wootz ore in a charcoal furnace. Although part of the furnace product was merchant bar iron for the use of the forges in the local area, it would appear that the majority was converted at the nearby Upper Forge to make a high quality osmond iron for the Valley wireworks.

The excavation produced evidence for three phases of industrial activity on the site:

Phase 1 (1669 - 1710?)
The furnace was built on the south bank of the Angidy brook at valley bottom. It was a square structure (24' x 24') of local sandstone and was joined to the natural bank by a solid bridge house (A). To the west, and at the same level as the furnace mouth, the valley slope was broken by a level terrace, 200' long and some 20' wide, onto which was built a rectangular charcoal house (B) and a cobbled yard for the storage of iron ore (C). The brook was dammed half a mile upstream and a trench dug onto the natural, impervious clays to form a leat (D); this was led behind the charcoal house and then carried to the furnace wheel as an elevated launder. Directly to the west of the ore storage area a secondary water course ran north from the main leat towards the river to operate a set of stamps for the treatment of ore and slag (x). Between the wheel pit (E) and the furnace was the bellows house (G), and a small, square cast house (H) stood to the east of the furnace.

Phase 2 (1710 - 1826)
Phase 2 was defined by a massive dumping of slag and building waste north of the charcoal house to effect a horizontal extension of the available working area. The leat was re-routed across this new ground, and was carried on a series of masonry support pillars (J) at an angle of 45° to the line of the wheel. The cast house was increased in length by the addition of building 'L', and another structure (M) was constructed between this and the bellows house. The function of this building could not be ascertained, but the discovery of moulded casting sand in the immediate area suggests that it may have been a secondary cast house



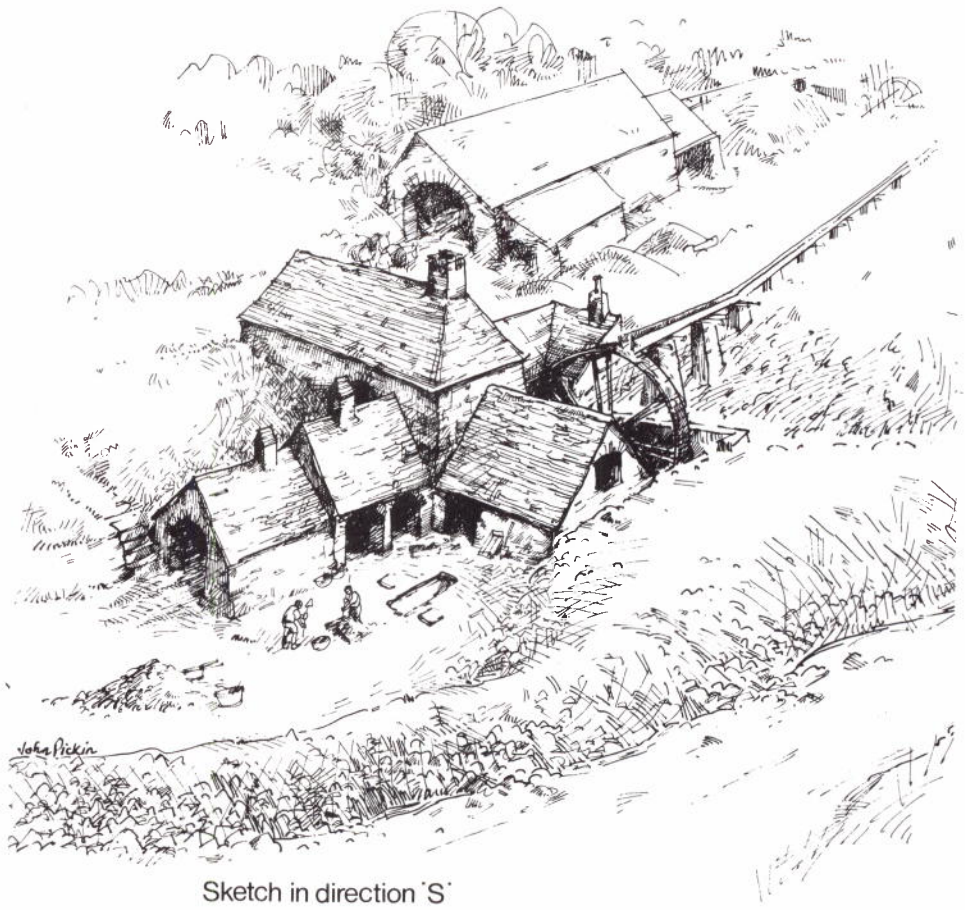
concerned with the production of domestic utensils. Documentary evidence indicates the use of blowing cylinders at the furnace, and structural change within building G, such as the blocking-off of the counter-poise pit for the bellows, is indicative of a change for blowing apparatus to cylinders. Internal destruction of the furnace itself makes it difficult to establish the original lines although it is apparent that stack, bosh and hearth were circular.

Phase 3 (Post 1826)
At some time between the furnace going out of blast and the demolition of the buildings on site, two small bowl hearths were worked. Local tradition maintains that nail-making was carried out at the furnace in the last century, and although there is no archaeological evidence to support this, it is interesting that the slag from the hearths indicates small-scale iron working.

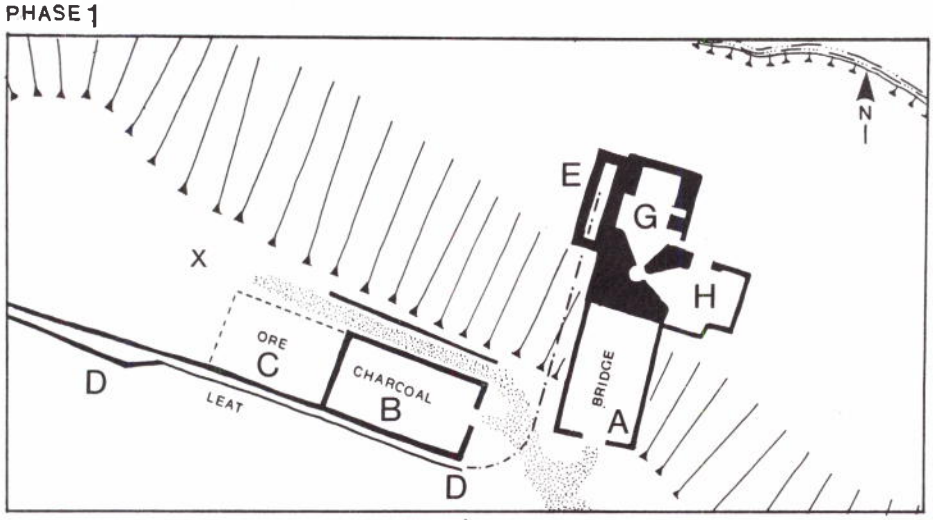
Fieldwork in association with the excavation resulted in the survey of two iron mines at Portskewett and Porthcasseg which supplied ore to the furnace in the period 1670-1684, and the plotting of a number of charcoal clamps and bloomery slag scatters within the Angidy Valley.

Work is now in progress on the consolidation of the various structures and it is hoped to open the site for June 1981. Two interpretation panels, produced jointly by the Council and Newport College of Art, are to be erected on site, and a trail is planned for the valley which will link the furnace with the other industrial remains.

John Pickin

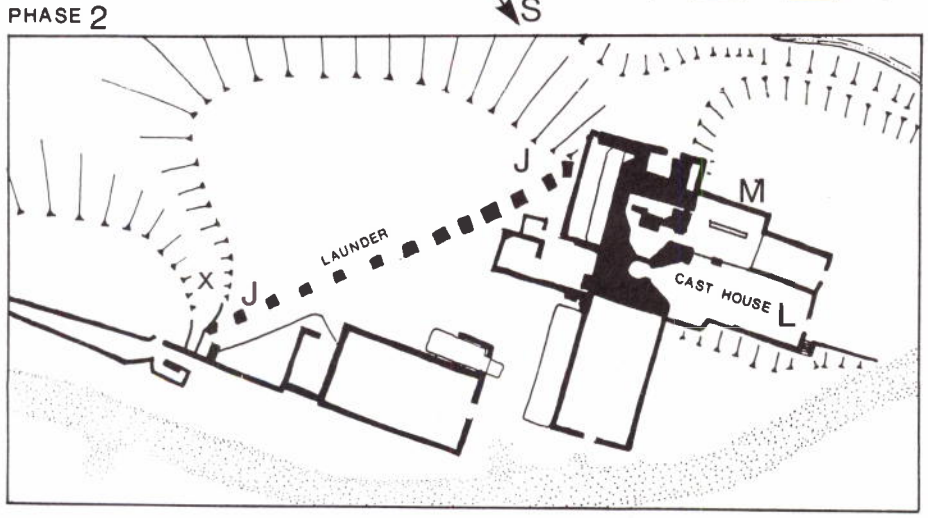


Sketch in direction 'S'



ABBEY TINTERN FURNACE

0 25m



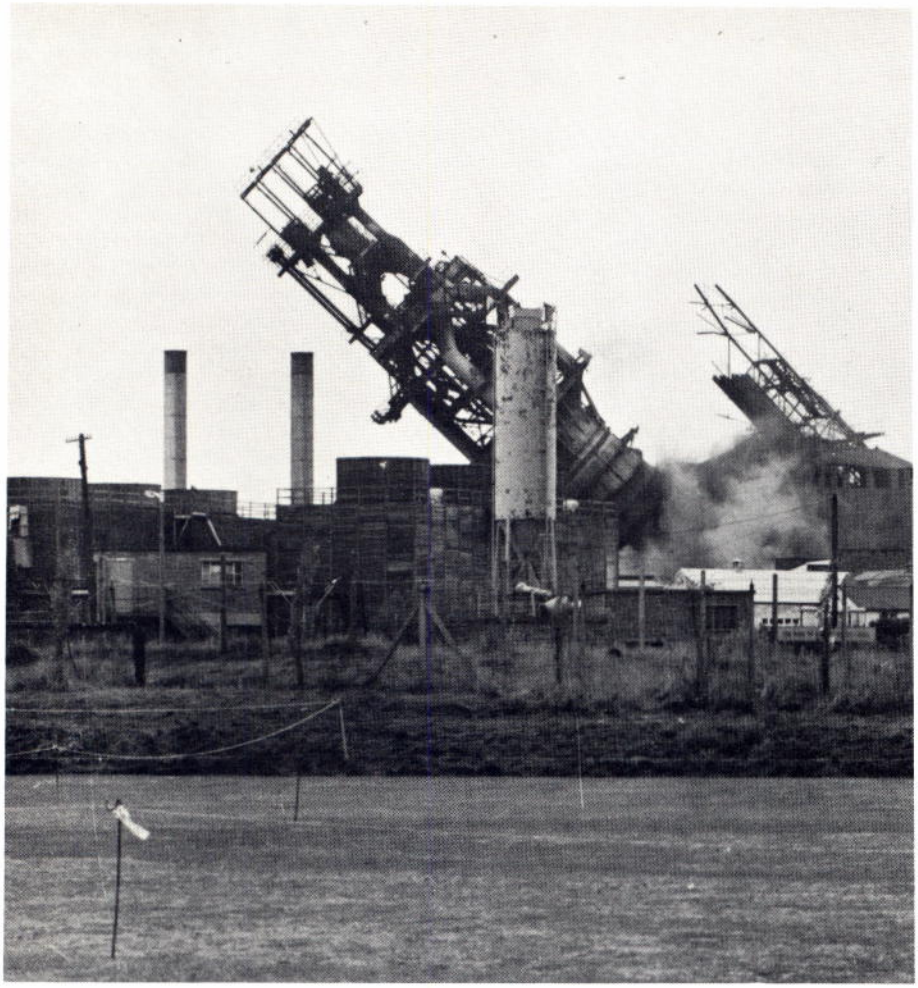
The Last of the Last Black Country Furnace. On 5th October 1980 a Wolverhampton Express and Star photographer took the historic picture shown above, and an era in iron-smelting history came to an end.

The blast furnace illustrated is Elisabeth, built by Stewarts and Lloyds at Bilston, near Wolverhampton, commissioned in 1954, relined in 1960, 1963, 1967, 1971 and 1976 and demolished by the British Steel Corporation in 1980. She was not only the last blast-furnace remaining in the Black Country, but was built on a site adjacent to that chosen by John Wilkinson for his Bradley Ironworks in 1766. The late Reg Morton has written 'By 1966 some 200 years after Wilkinson and Bickley, one furnace; Elisabeth, existed on the site of the British Steel Corporation in Bilston. This represents a period of 200 years continuous coke blast-furnace operation which must surely be the record for any works in the world.'

On the occasion of the fifth 'blowing-in' ceremony in 1971,when the furnace was lit by Miss Elisabeth Saul, maintaining the tradition that a blast-furnace should always be lit by a member of the female species, BSC Special Steels Division published a small booklet to commemorate the event and Reg Morton wrote a brief history of the Bilston site. By kind permission of his widow, Mrs Audrey Morton we are reproducing part of this.

Iron Making in the Black Country. Prior to 1709 all pig iron was made in blast furnaces using charcoal as a fuel. Many attempts were made to use coal or coke, the most notable being the efforts of Dud Dudley who in 1618 achieved some measure of success.

In 1709 Abraham Darby I succeeded in smelting Shropshire iron ore with coke at



Coalbrookdale and as a market for iron castings was available, his process became a commercial success. At Coalbrookdale ample water power was available to drive the water wheels, which operated the leather bellows providing the air blast for the furnaces. The River Severn, navigable to beyond Shrewsbury, was a natural avenue for transport.

In contrast the Black Country contained no natural waterways, and very few streams were available to provide sufficient water to operate water wheels. It did, however, contain the famous 'Thick' or 'ten yard' coal seams. Below the 'ten yard' coal, 'Gubbin' ironstone lay in strata with various clays, whilst at a deeper level the ironstone measures included such ores as New Mine ironstone, Blue Flats, Gubbins and Balls etc.

In addition limestone outcropped in Dudley and Walsall areas, and fireclay and sandstone were generally well distributed.

Thus all raw materials required for a major iron industry were at hand and frequently outcropped. The one limitation was the shortage of water for power, and this was finally overcome with the introduction in 1766, by John Wilkinson, of the steam engine for blowing the furnace and providing power for other iron-making operations.

The emergence of Wilkinson as a South Staffordshire ironmaster was in no small measure due to the experience of smelting with coke that he obtained in his works at Broseley and Bersham. These works had been previously owned by Abraham Darby and both were using coke as a fuel but were powered by water wheels. With the aid of the steam engine Wilkinson overcame the problem when in 1766 he purchased pasture land at Hall Fields, near Bilston where he developed his Bradley Ironworks. The increase in blast due to the application of the steam engine to blowing cylinders, provided higher bosh temperatures and the ability to operate the furnace with burdens containing more limestone, thus enhancing sulphur removal and permitting the higher sulphur containing carbonate ores associated with the thick coal to be used.

Because of the low coking quality of the thick coal the availability of good furnace coke still remained somewhat of an obstacle to rapid development, and this restriction was removed by Wilkinson in 1772 when he succeeded in working his furnace with raw coal as a fuel. The use of raw coal in the blast furnace continued in many parts of the country into the present century. Wilkinson's innovations in the production of iron were obviously of great significance to his own works and fortune, as they were to the iron trade as a whole.

Price - a local Bilston Historian - says "In the year 1768 an act was obtained for making a navigable canal from Birmingham to Bilston . . . Blast furnaces for the smelting began to be erected about this time in this Township, the first of which was that belonging to the late John Wilkinson Esq. near the Fireholes and called the Old Furnace", and he continues by saying that another furnace was being built at the other end of the town by John Bickley Esq. This furnace was on the present site of the British Steel Corporation, Bilston Works. Later two additional furnaces were added.

Little is known of the furnaces at the time of Bickley, but they passed into the ownership of John Jones, a prominent Black Country ironmaster.

When Alfred Hickman took over the Works in October 1866 the furnaces, known locally as the 'Hot Holes' were in a very run down state. They were worked on hot blast and blown by a Lilleshall beam engine known as the 'Level Handed Engine' which was built in 1849. The engine was still available, as a reserve for work as late as 1950, which illustrates the excellence of this type of engine. The air blast was heated in stoves fitted with cast iron pipes and fired by burning small coal in hand operated stoke holes.

During the period 1866 to 1873 the old brick furnaces were dismantled and new iron-cased furnaces built in their place. The air blast was still blown by the old level handed engine, but new firebrick lined Cowper stoves had replaced the old cast iron type. The tops of the furnaces were closed by a cup and cone arrangement which enabled the waste gases to be taken off and used for heating the Cowper stoves and waste heat boilers, and in later years for operating gas engines.

In 1876 No.4 furnace was built and in 1883 No.5 and 6 were erected. Thus by 1895 visitors from the Iron and Steel Institute noted 'The blast furnaces which are in two groups, are among the largest in the district, being 65 feet high, 18 feet in the boshes, and 9 feet in the hearth, working with closed tops and Cowper hot blast stoves'.

The types of iron made included mine, made wholly from native ore: part mine, a mixture of ore and tap cinder from puddling furnaces, and cinder pig, made entirely from tap cinder. The grades of pig iron included Nos.1, 2, 3, and 4 foundry iron, and forge iron.

In the early years of the nineteenth century it was thought that the supplies of raw materials on the South Staffordshire plateau were inexhaustible with the result that mining and smelting techniques were often wasteful. In 1860 ores were calculated to last a further 40 years and by this time many of the best seams had been worked out or serious flooding made them too dangerous to mine. Hickman's awareness of this problem led him to ensure supplies of raw materials by purchasing ironstone deposits near Banbury in 1887, and additional coal mines in the Bedworth district of Warwickshire.

In 1919 the Company purchased Lloyds Ironstone Holdings at Corby, later to be the site of Corby Works.

When Alfred Hickman died in 1920 he was succeeded by his second surviving son, Edward Hickman, and in 1920 the works were acquired by Stewarts and Lloyds Limited. By this time the blast furnace plant had been in operation some 50 years, and whereas no major reconstruction to keep up with the rapid advance in blast furnace design had been carried out, only minor modifications were made.

In 1920 a report by C G Atha for Stewarts and Lloyds Limited recorded and stated that the blast furnace plant was the most antiquated section of the Bilston works, consisting of five small hand filled furnaces located on a very congested site. To his mind there was no possibility of improving the plant in its present state and it would be folly to attempt it. Nevertheless, the furnaces continued in production until the building of the present Elisabeth furnace.

To sum up, in 1766 the first Black Country coke blast furnace was established at Bilston and shortly afterwards a furnace was built on the site of the present British Steel Corporation Bilston Works. By 1860 some 200 furnaces were operating in the Black Country with as many as 153 in blast at any one time.

Vogel Honoured. In a nation as vast as the USA, it would be presumptuous to attribute credit to any one individual for having established the study of industrial archaeology on a national footing. But despite the vast distances and the wide variety of industries to be studied, ranging from the highly automated car assembly plants of Detroit to the remains of gold mining in Alaska, the shipyards of Massachusetts to the Boeing assembly plants of Seattle, there is a greater degree of co-operation at a national level between industrial archaeologists in the USA than in the much smaller nations of Europe. The thriving national society runs a lively annual weekend conference each year whose site visits are a model of efficiency and enterprise. Other national symposia devoted to specific topics are organised from time to time by the Society for Industrial Archaeology, which has spawned a number of regional 'chapters' bringing together SIA members in a particular region.

The American Society of Civil Engineers recently honoured one who has done more than most to establish the high reputation that industrial archaeology in general and the SIA in particular, enjoy in North America. Robert Vogel, Curator of Mechanical and Civil Engineering at the Smithsonian Institution in Washington DC received the ASCE's Civil Engineering History and Heritage Award for 1979 at a ceremony in Atlanta, the citation recording his 'long and distinguished career in civil engineering history and preservation and his pioneer efforts in industrial archaeology'.

Robert is a native of New York City and received an architectural degree from the University of Michigan in 1954. Since 1957 he has worked at the National Museum of History and Technology, a constituent museum of the Smithsonian Institution and the principal national museum of Science and Technology, recently renamed the Museum of American History. When the national ia Society was established in 1971 Robert launched the bi-monthly Newsletter and continued to edit it with flair and lively good humour until 1980. It is still acknowledged as the best of its kind anywhere.

Robert has had wide experience as a consultant to a variety of Federal and State organisations responsible for identifying, recording and preserving historic structures and sites. Those who attended our own conference at Keele in 1974 will remember his eloquent presentation of the tape-slide sequence **Working Places** produced by the SIA to convince local authorities and property developers of the good sense of adaptively re-using historic building. **Working Places** was so successful that it has since been turned into a cine film and sold extensively.

With his extensive international knowledge of the subject, Robert has served on the Editorial Board of **Industrial Archaeology Review** since its inception. He has made special studies of Roebling's Delaware and Hudson Canal Aqueduct, and his field work has led to the identification of several previously unrecorded mid 19th century railway truss bridges.

Philadelphia in 1876 played host to a great Centennial Exhibition to mark 100 years of the American Republic. A century later the Smithsonian Institution in Washington honoured the Bicentennial with a remarkable re-creation of that Philadelphia Exhibition, having succeeded in tracing many of the original exhibits. A film was made by the Smithsonian's own film unit, with Robert cast as the designer of the Exhibition. His evident familiarity with the French curve in his hand is a tribute to his early architectural training.

Portland Cement. An American member of the AIA has written asking whether he can be put into contact with anyone in this country studying the Portland cement industry. He has been researching a site at Jamul, 20 miles inland from San Diego, California, where there are vertical cement kilns similar to the early German continuous-fired 'Schachtofen'. His preliminary findings were published in the **Journal of San Diego History,** 1979, 25 (4) and anyone with information about this industry or interested in American practice should write to David C Burkenroad, 3169 Bremerton Place, La Jolla CA 92307, California, USA.

'First Iron Boat' Project, Helton Tarn. In September 1979, the Windermere Steamboat Museum initiated a search for the 'first iron boat' at Helton Tarn.

The boat was reputed to have been built in 1750 under the auspices of John Wilkinson, to carry peat from Helton Tarn down river to his foundry at Castlehead. The boat was in use for only a short time, probably because peat was an unsatisfactory form of fuel for the furnace. Wilkinson had even built a short canal for the boat, which may have been built on the lines of eighteenth-century canal barges. If so, then the dimensions of the boat would have been about 10' x 6', with squared ends and weighing 3 - 5 tons. (There is definite proof that John Wilkinson built a metal boat in 1787 of 22 tons, 70' x 6'8½'', at Ironbridge).

Local reports placed the 'first iron boat' in Helton Tarn. The search for the boat was made possible by the kind permission of Capt. Stanley and Mr Cavendish and the patience of their farmers.

A proton magnetometer and an underwater version were used (loaned to the museum by Professor Hall of Oxford). The magnetometer measures any disturbances in the earth's natural magnetic field, which iron can affect locally, up to 15 metres. The search took place over a period of six months, following a regular grid pattern. The tarn and surrounding area were scanned but unfortunately results proved negative. The search may now be extended to the river and canal at Castlehead which Wilkinson used for his early peat-carrying trials, and preliminary arrangements have been made for an aerial reconnaissance survey. The Windermere Steamboat Museum is, however, resigned to the possibility that oral tradition may be at fault on the subject of the boat having survived. Far more likely is the notion that thrifty 19th century farmers would have cut her up to re-use the versatile wrought iron for other purposes. But with the discovery some years ago of Laird's first iron boat the **Lady Lansdowne** lying submerged in the upper reaches of the Shannon, there is still a possibility that Wilkinson's much earlier vessel may also have survived if its last resting place was sufficiently secluded.

Rotherhithe Renaissance. It is seven years since plans were first put forward for restoring buildings in the St Mary's Conservation Area in Rotherhithe and turning them into a Brunel exhibition, craft workshops, and community arts facilities. The opening of the restored engine house in August marked major progress. The former junk yards between the tube station and the river have been landscaped. The engine house has a display on the history of tunneling, and the Brunel Exhibition Project is beginning to collect items of industrial archaeological interest, including a steam hammer and a Rennie pumping engine. The project is keen to draw in more members as the work of restoration proceeds.

Most of the warehouses in the surrounding area are back in use or under restoration and at least 150 craftsmen work in the area. Hope (Sufferance) Wharf, which was converted, initially by the Industrial Buildings Preservation Trust into workshops, is now a demonstration project in Urban Renaissance Year.

There is still a great deal to be done if the area is to become a living reminder of dockland's history. The possibilities are being pursued of mooring historic boats alongside, and creating facilities for other small museums, including restoration facilities.

Finally, Nicholas Falk, who has been involved from the beginning, is now part owner of a 1910 motor yacht called Diana, built by Ramsey's of Shipley, which will be operating on the Thames soon. He is keen to find out more about the boat or its builder's history. He is also looking for any appropriate items from the period, including galley fittings, a dinghy and furniture. If you can help, write to him at Urban and Economic Development Ltd., 359 The Strand, London WC2R OHP, tel 01 379 7525.

Suffolk Industrial Archaeology Society. A meeting is to be held on Thursday June 25th, to promote an industrial archaeological society for Suffolk. The curator of the Abbot's Hall Museum at Stowmarket has given permission for the meeting to be held there at 7.30 pm. All those interested in such a society are invited to attend, or let John Jones know of their interest at Hines Farm, Middlewood Green, Earl Stonham, Stowmarket, IP14 5HQ, telephone Stonham 448.

Industrial Archaeology and Agriculture.
Agriculture is an industry and its buildings have always reflected this fact. Farming, romantically, may be considered a way of life, as dedicated as that of the arts and, often, as unrewarded. But, its buildings enclose storage and production space as specifically as within any other industry. Only, perhaps, the petro-chemical industry may be seen as being more precise to function - and that is a newcomer to the industrial scene. It is not for nothing that the Ministry of Agriculture terms buildings as **fixed equipment on the farm** within its advisory leaflets. To the modern farmer, equipment is either mobile or fixed, preferably the former.

It is true there have always been model farms, particularly those on the great estates of the 18th and 19th centuries. Some of these will be dressed in style, whether Classical or Gothick. You have only to read Loudon to understand that some early Victorian 'country gentleman' might seek architectural embellishment. But the buildings nearly always would be practical and functional, tight to an industrial requirement.

Farm buildings provide an unbroken record of industrial evolution across at least five centuries. A few exceptions, particularly the Tithe Barns, go back to the Normans and survive intact. Within the last decade, farm archaeology has begun to come into its own both in terms of excavated foundations and of researched field systems, even into prehistory. Farm archaeology is likely to be come a subject in its own right, requiring its specialists.

The surviving stock of farm buildings can be looked at within a number of specific disciplines. They are a feature of landscape, of course, giving colour and identity to its form for the artist. Equally, they are part of our literary history both in terms of the famous diarists, such as White, or correspondents, such as Paston. The foundation of the Board of Agriculture in 1793, later evolving into our present triple Ministry of Agriculture, Fisheries and Food, generated a group of scientific observers probably still unequalled - Young, Marshall and Latham.

A serious study of the legacy of farm buildings demands to be undertaken at three specific levels. They are a prime example of vernacular architecture. Equally, they are an essential part of agrarian social history. The Vernacular Architecture Group and the British Agricultural History Society tend to work independently of each other. I should like to see a Liaison Committee between them to link building within these disciplines. But, to the AIA, they still tend to be a neglected subject. All the main books on industrial archaeology within the last two decades, understandably, concentrate attention elsewhere. This tends to be for two reasons. Fieldwork is less researched. Second, since farmsteads are still used, in many cases internal fittings get obliterated every generation and petty change destroys much general evidence.

It might be claimed, with some justification, that the traditional industrial process is simple. Storage, within a barn, is a simple enclosure of space without mechanical aids for handling materials. Even stock buildings are not much different, just lower in headroom and narrower in span. Therefore, the study of industrial mechanics, which partly is what industrial archaeology is about, is best undertaken within rural life museums rather than in the farmstead. This is true, but an over-simplification. Mills, originally driven by water and later in history by wind, are a subject in their own right. Indeed, they have their own International Molinological Society. Many of these mills, driven by natural energy, are on farms - some even being within the steading. But, equally, glass converts natural energy for our use as much as any mill. Harnessing the sun through glass, which was known to the Romans, has a respectable history in its built form - from the early stoves of Renaissant gardens, to the 18th C orangeries, which provided Vitamin C to beat the scurvy, to Paxton's Great Stove at Chatsworth to house the giant waterlily - Victoria Regia, or to our automated, revolving glass towers.

Glasshouses, perhaps, challenge the definition of industrial archaeology. At the most direct level, the farmer is a photo-synthetic engineer. Cultivation is the science of harnessing the sun's energy to soil nutrients, via seeds, to provide organic food. If we could increase the efficiency of this an iota above the prevailing 0.07 per cent, we could set the world free from starvation. This is an industrial, chemical process and farm buildings need to be considered in relation to and as part of it. However, their long history equally reflects a transition from manual to mechanical power.

At the simplest level, farmers always have used gravity to assist materials handling. Many buildings include cunning innovation, often exploiting site contours, to this end. Harnessing animal power to simple, and sometimes complex, machinery has a long tradition and has generated its own building types, the gin-gang. Kenneth Major has written an excellent book on the subject.

Steam power, probably, had more direct influence on the design of farm buildings than in any other industry. Eventually, it led to the demise both of the great barns and of the rick yards - those romantic symbols of traditional landscape. The influence of gas, diesel and electricity have all left their evolutionary mark both on the design and the equipping of farm buildings. The tractor, with all its attachments, though recognised as an inefficient machine, eventually destroyed that other romantic symbol of the steading - the courtyard. Tractors like linear buildings and gaps between them. Now, the computer is creating new patterns of building layout and design.

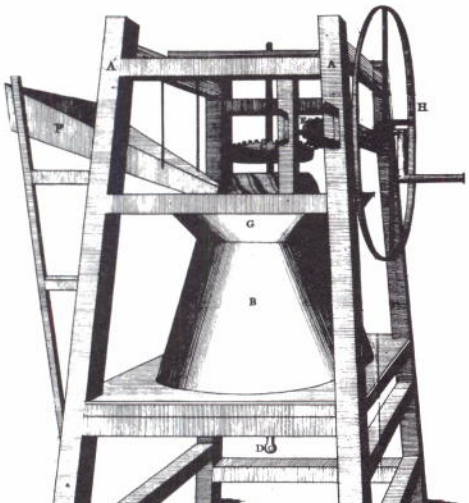
Farm buildings, beloved for their vernacular tradition, were perhaps the first industry to take to prefabricated buildings (excepting the Medieval numbered timber frames). I have still to trace both when and where the first Dutch barn was built and also the oldest surviving example. The study of prefabrication within the farm has to be considered as its own subject. The Lunt granary, alone, shows how the Romans packaged their granaries, as much as any modern firm, for 'instant' delivery and erection.

Other facets of the subject, which have an industrial context, are drying and ventilating crops and, in the latter case, stock. The Romans

used heated warm air to dry corn. Many buildings, of course, have elaborate designs to harness natural ventilation. At a different level, I am intrigued as to the built form, let alone the organisation, whereby Joseph stockpiled corn enough to feed a whole nation over seven lean years. Effluent too, is a subject in its own right. The history of the midden to the early Victorian slatted floors, to our own biogas activities is that of industrial innovation to harness a resource.

There are many issues. I suggested we needed liaison between the BAHS and VAG. Of course, we need AIA there too! Archaeology below ground is essential for farm building historical study. But, that above ground is fascinating not only for what we can see and deduce with our own eyes but also because of the records waiting to be studied. On many great estates - especially those with resident agents - the farm office often retains detail drawings and accounts going back centuries rather than decades. The speed of change in the industry is so great that both sources of evidence - building and document - are being destroyed at ever increasing rates. **Now** is the time for fieldwork. But, disciplinary procedures are ragged to non-existent. Of course in relation to education (Vol 7 No 2) the subject has great potential as the rapid growth of farm museums as places of entertainment, if not of research, demonstrate.

John Weller ARIBA



William Winlaw's Patent Mill, June 1785

Ice-House Survey. Ice-houses were shadily-situated buildings used to maintain a supply of ice gathered in the winter for domestic purposes throughout the rest of the year. They were usually built partly or wholly below ground to maintain an even temperature, and are often found on large estates dated from the 18th and 19th centuries. A survey of surviving ice-houses throughout Great Britain is being compiled, and participation by AIA members is particularly invited. The organisers have printed a number of standard survey sheets listing the most important data for each ice-house. Almost 400 have already been notified, but it is hoped that further submissions will be made before the Survey is terminated in September 1981. Copies of the survey sheet are available from Mrs Shirley Ross, The Elms, Everton, Sandy, Beds.

Sheffield Members. AIA Bulletin 8/2 carried a note from Stuart Smith concerning the possible formation of an IA group in Sheffield. This produced an instant reply from Mr M J Tilley, Hon Secretary of the Sheffield Trades Historical Society, who is himself an AIA member. We print the gist of his letter below and notes which he also enclosed giving some indication of the activities of his Society.

The Sheffield Trades Historical Society was formed in 1933 and has a membership currently totalling 211. The fact that we do not use the term Industrial Archaeology in our name does not preclude us from the discipline as the information which follows will show.

Current activities include weekly restoration work at Wortley Top Forge, monthly excavations at Rockley Blast Furnace, whilst attendances for the monthly Winter Lectures and four Summer Visits usually average between 30 to 45. We have an active Publications Committee and a very successful Steam Weekend was held at Wortley Top Forge last year and we are to hold regular such events each year.

From the start, the society has urged that industrial museums should be established. Subsequently their aims extended into South Yorkshire and the record to date is a proud one; and the following would probably now have disappeared without the campaign waged by the Society:

(a) **Shepherd Wheel** - a small cutlery grinding mill repaired and equipped for public inspection.

(b) **Abbeydale Industrial Hamlet** - now fully restored and open to the public.

(c) **Rockley Blast Furnace (1652)** - (and the later Newcomen Engine House) restored.

(d) **Wortley Top Forge** (17th Century) at present under restoration.

The Society has also assisted in the setting up of spring knife workshops at York Castle Museum and was instrumental in preserving on film the manufacture of Wortle Plates for use in the now-obsolete method of wire drawing.

The Society is anxious to encourage research into the earlier history of industry, for which there is considerable local scope, and the lectures which are given at monthly intervals during winter provide opportunity for presentation and discussion of the results. Visits to places of technical and historical interest are made during the summer. Our ***News Review*** which is published from time to time provides a medium for the wider circulation of items of current interest.

Mr Tilley will be delighted to supply further details and membership application forms from Caudwell's Mill, Rowsley, Matlock, Derbyshire DE4 2EB.

A Pinner Miscellany, a booklet produced by the Pinner Local History Society which contains some varied pieces of research undertaken by members in the last few years. Although there is little of industrial archaeological interest in the publication, there is a very useful article on farming in Pinner during the nineteenth century and others on the development of Pinner as a residential area. Further details from Pinner Local History Society, 121 Eastcote Road, Pinner, Middlesex HA5 1ET, price £1.20 plus 35p postage and packing.

Restoration of Cromford Mill. In 1979, the site of the world's first successful water-powered cotton spinning mill, built by Richard Arkwright in 1771, was bought by the society which takes his name, the Arkwright Society. Since then restoration work has been in progress, and the site was opened to the public at Easter, 1980.

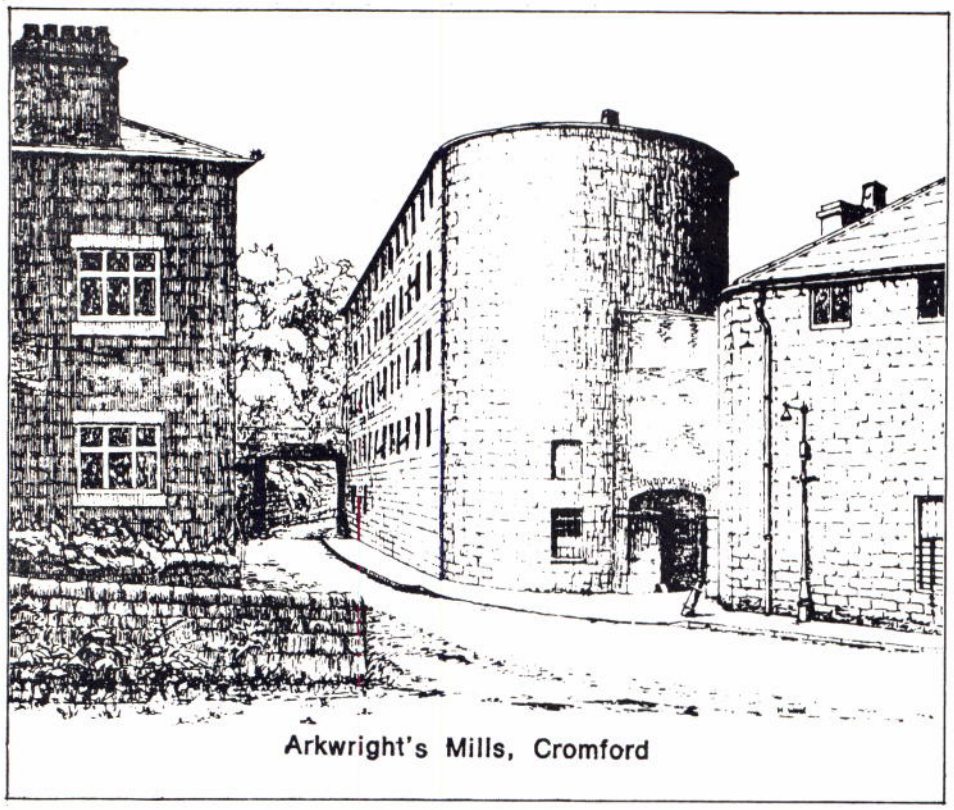
The buildings had been continually used for industrial purposes for two hundred years, and therefore the renovation plan is no small task; but the impression of the site as it must have appeared in Arkwright's day is beginning to take shape.

Richard Arkwright came to Derbyshire in search of a site where water could be used to power his recently invented spinning machine, later to be known as the Water Frame. In partnership with Jedediah Strutt of Belper he built his first Cromford mill in 1771. This mill is still standing, although two of the five storeys were destroyed by fire. In 1776 following the successful operation of the first mill, a second mill was built, a huge seven storey building. Unfortunately, this was burnt down in the last century and only the foundations and an outer end wall remain. The machinery in the mills was powered by the waters of two local streams and Arkwright used these to their maximum effect by building an elaborate system of dams and water courses. Parts of the water courses on the site have been exposed, and water can be seen rushing into a basin in the middle of the mill yard. It was at these mills, in the heart of rural Derbyshire, that the Factory System was really established. Arkwright employed mainly women and children, and seems to have found many willing hands from the surrounding villages. His adverts were directed towards more specialist groups; he particularly wanted to attract weavers with large families; he would then have employed the weavers' children in the mills while their fathers wove the yarn at home.

Arkwright built housing for his workers. These homes, which were pleasant and well-built unlike many later purpose-built ones in the industrial north-west, are still present in Cromford village today. A community grew up in this way around the mills. Apart from workers' housing there was a hotel, a market and various small shops. Parts of the village were developed in the 1770s, but the major growth seems to have been around 1790.

To help the public understand the work which is going on at the site, Information Boards at strategic points explain the uses to which the two hundred year old buildings were put, and the system of water courses. There is also a small exhibition of photographs, copies of original documents, paintings, plans and so on. Guided Tours are available by advance booking. A shop on the site sells souvenirs, books and Arkwright Society publications.

Restoration work is planned to continue over the next few years, and it is envisaged that the site will eventually become a permanent education and recreation centre for both short and long-stay visitors. A cottage on the site is now available for holiday letting, and is ideal for anyone interested in studying the history and industrial archaeology of the area. Holiday bookings can be made by contacting the Mill Manager's house, Wirksworth 4297. The Arkwright Society hope that the whole venture will promote a greater awareness of the important position Arkwright's Cromford mills held in the Industrial Revolution.



Arkwright's Mills, Cromford

The Chelmsford Industrial Museum Project. Frederick Roberts has supplied the following note:-

The Industrial Revolution of the early 18th century virtually passed Essex by. A Hanoverian visitor, travelling through the County in 1761, described it as a "well-kept garden". It was, and still is, primarily an agricultural area. Nevertheless, in the latter part of that century, improvements in farming methods caused some change, however slow. Iron foundries began to appear to assist in the manufacturing of more sophisticated agricultural machinery.

But a veritable explosion took place at the end of the 19th century, centring on the county town Chelmsford, until then a sleepy little market town in a farming area. It had its first iron foundry in 1793. The Eastern Railway reached it in 1843. But who could have foreseen that within the last thirty years of the century it was to become the birthplace of three industries of national importance, and one of world importance?

In 1858, the son of a local Quaker farmer founded Christy Brothers, firstly to make agricultural machinery, in particular mills for making animal feeding stuffs required to keep alive in winter the valuable livestock produced by the new breeding methods. Then, in 1878, R E B Crompton, electric power station genius, set up his works in the town, and laid the foundations of the country's heavy electrical engineering industry. Ten years later Ernst Gustav Hoffmann brought his American patent to Chelmsford to start the pioneer British precision ball-bearing manufacturing plant. Finally, in this particular chain of events, a young Italian in 1897 made an old warehouse in the town "the first radio factory in the world", as a plaque on the building testifies. His name was Guglielmo Marconi.

From Marconi's first practical application of Maxwell's electro-magnetic waves sprang the whole era of electronics, leading to radio, television, radar, space communications, computors and micro-processors. It may be fairly claimed that Chelmsford is the Ironbridge of the "Second" Industrial Revolution, the beginning of the age of the electron.

The "Chelmsford Pioneers" of the 1880s are therefore well worth studying. Attempts are now being made to start an industrial museum and study centre in Chelmsford to serve students and members of the public. A Steering Committee has been set up to define objectives and possibly to issue a consultative document. On the Committee are represented the town's historic industries, the Engineering and Civic Societies, the Area Education Office, and the County Inspectorate of Schools (Craft, Design and Technology). Several meetings have already taken place, and slide lectures have been given in different parts of the County. At the same time attempts are being made to form an Essex IAA to stimulate interest in industrial archaeology throughout the County.

Horizontal Wells. In his book of this title, published in 1874, Joseph Lucas advocated the use of almost horizontal subterranean galleries driven along the strike of permeable strata – the Upper Chalk and the Hythe Beds of the Lower Greensand – to collect water and run it out into reservoirs. This is quite distinct from the use of headings to extend the water-tapping capacities of ordinary (vertical) wells.

It is not known if any such horizontal wells, or anything similar, were ever seriously considered or made, apart from modified versions made, and still operating, at Folkestone, and proposed but apparently not proceeded with at Reigate in Surrey. The Terlingham Tunnel, at Folkestone, is driven into the escarpment of the North Downs, rising gradually and following the direction of the dip of the beds. It is 540 yards long, and has strike-headings of 95 yards and 59 yards at a point 455 yards from the entrance. A number of 2½" diameter holes are driven upwards through the tunnel ceilings, every eight feet, to a height of 20 to 25 feet to tap the chalk aquifer. This tunnel currently yields from 30,000 to 200,000 gallons per day, although it is now beginning to collapse internally.

The proposal for Reigate was to utilize the abandoned galleries of an old hearthstone mine in the Upper Greensand bed underlying the chalk of the North Downs. These following both the direction and the inclination of the dip, down under the hill, and consequently a series of mains was suggested to connect the ceiling bores with an external reservoir. Although subsequent visitors to the hearthstone mine report seeing sections of iton main, and the scheme's proposer undoubtedly did have a small waterworks business in operation in the area until bought out by the East Surrey Water Company in 1906, it is not clear that work was ever started on the scheme.

The Reigate scheme is described in an article ***Upward Boring for Water*** printed in ***Water*** 2, 256-265 (1900) and also in ***The Quarry*** 5 (8), 331-344 (1900) and was put forward by one George Taylor who subsequently worked the hearthstone mines and formed The Reigate Mines Ltd. In the article the Terlingham tunnel is described (it was made during the 1890s) and held up as supporting evidence for the scheme's feasibility. Neither the East Surrey Water Company

Marconi's wireless factory, 1897

nor the Folkestone and District Water Company now possess any detailed information about these works and schemes. Perhaps AIA members can suggest where further information might be found, or know of similar proposals or working tunnels elsewhere?

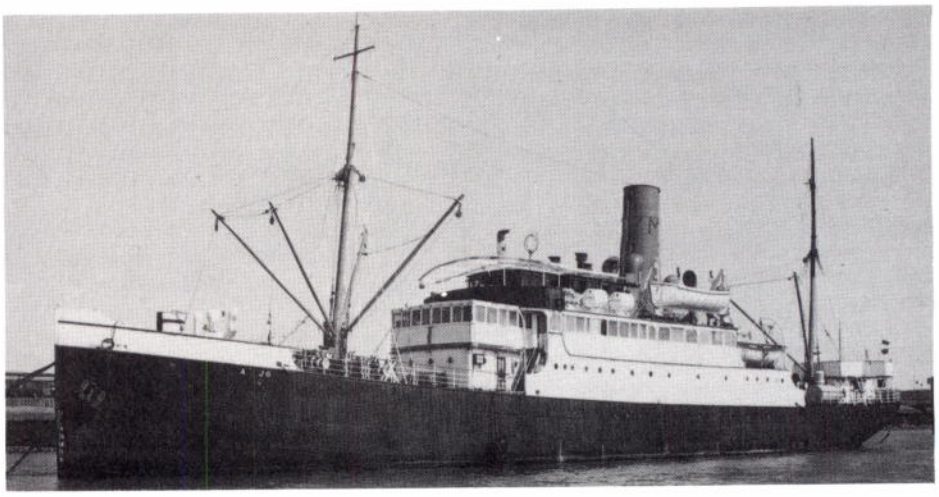
Paul W Sowan ***Subterranea Britannica***
96a Brighton Road
South Croydon
Surrey CR2 6AD.

cabins with crested linen and table-service, and the ship was navigated from an open bridge. With a few concessions to modernity including radar and modern life-saving equipment the ***Viera Y Clavijo*** still retained her 100 A1 classification with Lloyds when she was withdrawn from the Canary Island service and acquired for preservation in Holland. The 222-ft steamer was moored at Zierikzee at near the Zeeland Bridge and opened as a maritime museum, exhibiting model ships and steam engines, during the winter of 1978-79,

handbook. **Oxfordshire Potters** is divided up according to geographical areas and illustrates the preserved kiln at Nettlebed. In general the wares are of a simple earthenware, timless in quality but of great interest. Both publications and many others are obtainable from the Department of Museum Services, Oxfordshire County Council, Fletchers House, Woodstock, Oxford.

Tri-Tanic. A Californian marine insurance

Design a Poster for the Association and help to make the AIA even better



AIA Poster. Whenever industrial archaeologists meet there is almost always someone who knows someone else who is 'interested in IA' and would probably join the AIA if only they knew . . . we've all experienced this sort of thing. To try and promote ourselves a little better the Council have decided to arrange a poster competition, in the hope that members will help to produce the kind of pictorial or graphic image which will attract attention and persuade non-members to at least ask for further information. It is not our intention to produce a large poster, which would be expensive to print and difficult to display, but a modest production in one or two colours, probably litho-printed or silk-screened, and incorporating somewhere in the design the AIA logo.

Finished artwork is not necessary, the ideas are much more important, and these should be sent to Stuart Smith at the AIA offices, The Wharfage, Ironbridge, Telford, Shropshire TF8 7AW. The last date for receipt of entries is 4th September 1981 and the competition will be judged by Kenneth Hudson and Robin Wade DesRCA FSIAD. There will be an appropriate prize.

Scottish Veteran Scrapped. There are precious few pre First World War passenger steamships surviving in use, and each autumn sees the demise of one or two more as the results of summer operating seasons are totted up and the sad conclusion is reached that the costs of another refit or winter lay-up can no longer be met. A recent and important casualty was the Tenerife-registered passenger and cargo liner ***Viera Y Clavijo*** which for decades maintained a regular service between Spain and the Canary Islands. Built in 1912 in Dundee by the Caledonian Shipbuilding and Engineering Company, this remarkable veteran retained steam power for all her cargo-handling and auxiliary machinery as well as her triple-expansion main engine of 995 ihp; passengers were accommodated in teak-panelled

a small admission charge being used towards the costs of retubing the oil-fired Scotch boilers to bring them up to Dutch inspection standards. The venture was not widely publicised, and evidently finance became a crucial factor. Plans to move the vessel to another mooring in the Grevelingen Lake were shelved, and breaking-up began late in 1980. The National Maritime Museum at Greenwich and the Maritime Trust were able to inspect the steamer in her last weeks but could do nothing to save her. A sister ship ***La Palma*** was recently reported to be up for sale in the Canary Islands; her Hartlepool origins would make her an appropriate candidate for preservation in Britain.

Shavings. The Early American Industries Association which was established in 1933 is actively concerned with the collection and documentation of old tools. Its international membership contributes articles to a quarterly Journal entitled 'The Chronicle'. 'Shavings' is the title of their more frequent Bulletin which contains many items concerning hand tools both of American and English origin. They have reprinted a considerable number of catalogues and tool books of interest to the English readers. For further information about the Association please contact the Editor, Mr Daniel B Reibel at Old Economy, Ambridge, Pennsylvania, 15003, USA.

The Clay Industries of Oxfordshire. Oxfordshire Museums Service have produced two booklets of considerable interest to the industrial archaeologist. They both concern the clay industries and are titled **Oxfordshire Brickmakers** and **Oxfordshire Potters** respectively. The 'brickmakers' pamphlet discusses the industry before 1600 and then details the manufacturers between 1600 and 1825. The nineteenth and twentieth centuries form the main section of the book and there is a very useful section on the manufacture of bricks. Of particular note are the textual illustrations and diagrams together with the full presentation which makes this an excellent

broker has approached Harland and Wolff's ship yard at Belfast with a proposal to build no less than three full-size replicas of the ***RMS Titanic*** at an estimated cost of £200 million each "in order to bring back luxury and glamour to the passenger liner business". Each of the three ships would be named after the White Star liner which sank in 1912 after collision with a North Atlantic iceberg, and would convey passengers between Southampton and New York at a cost, for a couple, of £4,000-£8,000. Naval architects Rosenblatt of New York have been commissioned to prepare designs, and Harland and Wolff have been approached for help with ensuring the authenticity of the replicas. James Beasley, chairman of insurance brokers Transit Risk of San Diego, plans to have ***Titanic*** ready to sail from Southampton in April 1985, with the other two entering service in the two succeeding years. Harland and Wolff are responding cautiously so far to this bizarre proposal..

AIA Bulletin

ISSN 0309–0051.

Summer 1981

AIA Bulletin is published by the Association for Industrial Archaeology. The Association was established in September 1973 to promote the study of Industrial Archaeology and encourage improved standards of recording, research, publication and conservation. It aims to assist and support regional and specialist survey and research groups and bodies involved in the preservation of industrial monuments, to represent the interest of Industrial Archaeology at a national level, to hold conferences and seminars and to publish the results of research. Further details of the Association and its activities may be obtained from the Membership Secretary Association for Industrial Archaeology, The Wharfage, Ironbridge, Telford, Salop TF8 7AW England (095–245 3522).