ASSOCIATION FOR INDUSTRIAL ARCHAEOLOGY
AIA Bulletin
Volume 9 Number 4 1982

Mainly on the subject of Bridges

Development in Early Iron Bridges. The earliest substantial use of iron in bridges rests with the Chinese in suspension bridges of iron chains, with wooden decks laid directly on the chains. One is recorded as dating from the early days of the Han dynasty (200 BC). However problematical the documentation of such bridges in Asia some of these structures – with as many as twenty chains – certainly deserve the description of 'iron bridges'. Spans are recorded as much as 400 ft, capable of carrying four horsemen abreast.

At the time that wider knowledge of China was filtering through to Europe 'Machinae Novae' (Fausti Verantii c1590) depicted various applications of iron in bridges ,but the real basis of these or any contemporary application is unknown. The Winch footbridge in Durham, 1741, was of the Chinese form but no other 'early' ones have been confirmed in Britain , although an example now exists in Ireland.

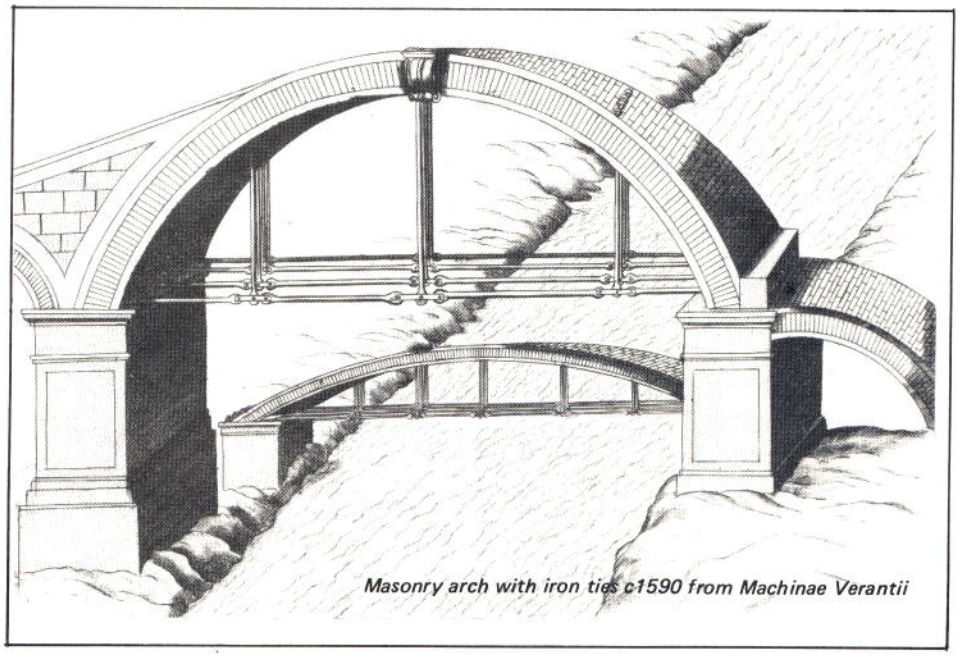
An iron arch bridge was attempted at Lyon in 1755 ,but was apparently abandoned after the casting of one rib as being too expensive. Although there is one reference to there having been several iron bridges before Ironbridge no details were given, and only one record is known, in the ***Leeds Intelligencer*** of 2nd January 1770. This reported on a 72 foot bridge at Kirklees Hall in Yorkshire, and gives the first name which can be associated with anything more than a proposal, in Maurice Tobin, an iron founder of Leeds. This structure has now been given real substance by research[1] which shows the 6' wide arch supported by two posts into the ornamental river which it crosses. These may have been provided to give lateral support to the slender structure rather than to break up the span, but either way it poses many questions as an exercise in ornamental ironwork for the knowledge and experience required in its undertaking.

Within a decade two substantial bridges were under construction, this time by men whose experience was more towards the 'heavy end' of engineering. At Preens Eddy ,not far from the Ironbridge site ,two spans of iron ribs were used to support a wooden deck and the bridge was finished in 1780. Probably the ribs represented the largest units which could be conveniently cast and handled, but at Ironbridge this was not the case. Here the money, knowledge ,and will, came together for the first time under Abraham Darby to provide for an iron bridge that required even the furnaces to be enlarged – and the erection of half ribs weighing nearly six tons.

The development of a design in iron for the Severn span by Thomas Pritchard is now well known, from a segmental iron vault supporting masonry to the multiribbed spandrel structure which is clearly represented in the existing bridge. Pritchard had the better engineering solution in a bridge of relatively low rise, but this was abandoned to provide the stone arch proportions or Ironbridge giving clearance for vessels on the Severn. This form, and its setting, promptly caught the imagination of public and artists, but perhaps inhibited engineers, for the bridge was copied only in a few European examples. Despite this Ironbridge – 'the first built of iron only' as the Coalbrookdale founders described it, with iron baseplates ,iron ribs ,iron connections, iron deckplates and railings and even iron slag for the roadway, was the springing point from which the first stream of iron bridge construction flowed.

A second stream originated with Tom Paine (of the 'Rights of Man' pamphlet). Before succumbing to politics, Paine had produced several models for iron bridges and left his adopted country to obtain backing in England and France. The only results of much original work were a 90 foot arch rib at the Walker family ironworks at Rotherham, and a 100 or 110 foot trial span erected at the Yorkshire Stingo (a pub) in Paddington. Paine's design was a series of short curved wrought iron bars, separated vertically by cast iron connecting pieces, to form arch ribs of very low rise. Had Paine continued to press his ideas there is no doubt that the course of iron bridge construction would have been radically different. His concepts were substantially more advanced than those followed and his arch ribs only slightly removed from girders, while the components of his bridges were small and easily transportable.

There remains of Paine's work his 1788 Patent, and a drawing 'Paine's drawing' in the Science Museum, its provenance not detailed but probably prepared by him in explaining his ideas to the Walkers. A drawing in the Sir John Soane Museum, definitely not by Paine, shows the application of his form of structure to the Wear Bridge site at Sunderland. Before the Ironbridge stream could be carried further by Telford at Buildwas, and Paine's ideas could be reconsidered by Rowland Burdon for the Wear Bridge, a small girder footbridge was built over the Glamorgan Canal at Rhydicar (1794). The 25 foot span beams acted as parapets and supported cross members for the deck at the bottom. This design, which was repeated



Masonry arch with iron ties c1590 from Machinae Verantii

locally, seems to be the earliest iron girder so far noted. 1795 saw the resilient John Nash managing to have an iron bridge of his design fail, and the first of the small bridges cast at Coalbrookdale with circular spandrel infill was completed.

Buildwas and the Wear Bridge were both completed in 1796. The line of development from the Wear Bridge is much shorter than that deriving through Telford and is conveniently dealt with first. At 236 foot span it was only once exceeded by a cast iron arch and when built was exceeded only by the timber bridges at Reichenau and Wettingen (and some suspension bridges in Asia!) Credit for its design has often been accorded to Tom Paine, but he left England hurriedly in 1791 and had no direct part in it. Burdon thoroughly investigated all the possibilities, including masonry. When advised against a 200 foot span in masonry he must have turned to Paine's design, for the Ironbridge solid ribs would have been difficult to apply to a span over twice as long, and he probably had material and models available at the Walkers to study, including the Stingo span.

In the Soane papers there is an account from Mr Foulds (later concerned with the construction of London Bridge) in the sum of five guineas 'To Sunday attendances to meet Dr Hutton and Mr Soane at Lambeth and Scotland Yard to examine the model of a bridge 200 feet span and to give his opinion thereon', dated January 7 1793. Fould did not get paid for eighteen months but a copy report, probably his although not credited reads – 'I shall venture to make some observations on my friend Thos Paine's Patent Iron Bridge' and goes on to criticise the insufficient quantity of iron, the corrosion of wrought iron in a marine environment (!?) recommending cast, and the low rise. These were precisely the measures which were adopted on the Wear Bridge and to facilitate them Burdon determined on a voussoir construction (an invention to which his associate Wilson later confirmed he had no claim). All of these were in fact retrogressive steps, but taken by Burdon apparently on the basis of much expert opinion, and Paine's wrought iron bars which might have contributed to a major step forward were used as strapping for Burdon's voussoirs.[2] Circles were used in the spandrels making the bridge almost a large second generation Coalbrookdale bridge except for the short voussoirs, and lacking the iron deck plates of its predecessor.

Thomas Wilson took up the system, but was singularly unfortunate or inept in his abutments for bridges at Yarm and Staines failed, but an 1810 bridge at Tickford, Newport Pagnell, remains as a testimony to his efforts to establish himself as a bridge engineer.

At Buildwas, Telford adopted the solid rib system from the Coalbrookdale bridge with variations which, unwittingly, brought him closer to the early design by Pritchard. When he later saw these designs Telford realised ,and acknowledged ,the original contribution which they had made. In using a rise which was much less than that at Iron bridge Telford came into disagreement with its founders. He was already moving from dependence on the ironfounders' ideas and for the iron aqueduct at Longdon-on-Tern also in 1796 he employed the Ketley iron works. This was completed only a month after a very similar smaller structure for the Holmes aqueduct near Derby, for which William Jessop was probably the engineer.

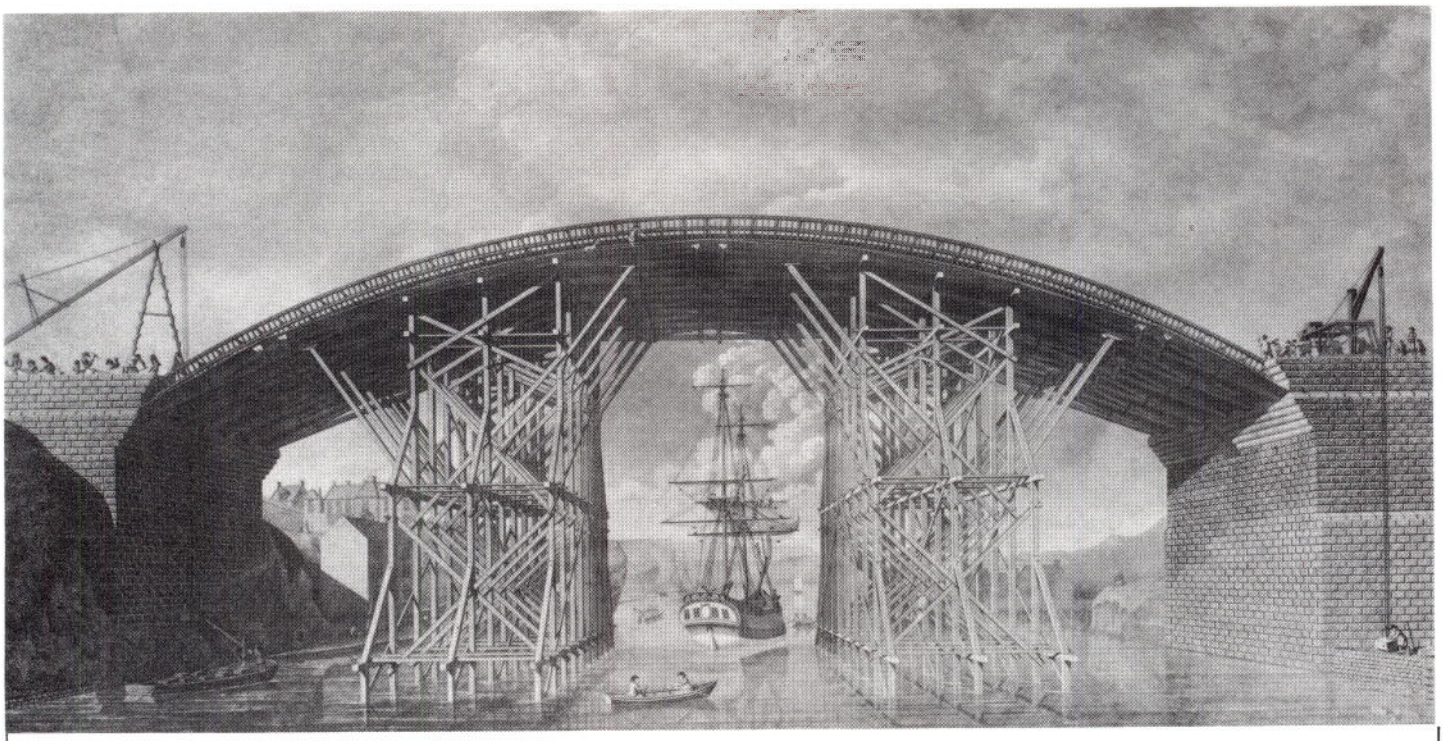
At this time Telford had designed a cast iron structure for Cysylte, remarkably similar to the form of the later railway viaducts. What reasons determined the final form of Cysylte are not known but its 1805 arches for the aqueduct were much in advance of equivalent spans up to that time.

In a second design for the 600 foot span proposal for London Bridge (1801) Telford's fully worked out ideas can be seen. This was the arrangement which typified his later bridges , Bonar Bridge in 1812 being the first of these . The 'lattice' arch ribs were made in units as long as the isolated location allowed. They were braced together not only by diaphragms at the end of each unit, but also by case lattice units across the extrades of the arch. In addition bracing between the spandrels up to the iron deck plates level ensured that the design could have been used with confidence for the spans entertained for London and the Menai Straits.

Thus in 30 years from Ironbridge ,Telford had refined the iron arch virtually as far as it was possible to go. The line of development which was basically through the Walker foundry ceased about the same time. The firm itself was ruined by Rennie's Southwark Bridge (1819) which was in some respects closer to Telford's practice.

The next step involved going back to wrought iron. This had already been taken by Finlay in 1801 in suspension bridges, and the advance to Menai was even more rapid. The use of a suspended deck with an arch was suggested in 1796 (it was also depicted on a Roman medal). It was adopted by George Leather with the Monk Bridge over the River Aire in 1827 allowing the broader application of the arch form.

Only the humble girder bridge had failed to make such progress. Its time was just beginning.



East view of the cast iron bridge over the River Wear at Sunderland 1796

1 Northcliffe D: A preliminary report on the Kirklees Iron Bridge of 1769 and its builder (Yorkshire Archaeological Society 1979).

2 Ruddock, Ted: Arch Bridges and their Builders 1735 – 1835 (Cambridge 1979).

Alan Butcher ***Science Museum***

Paine's 1788 drawing from the Science Museum

Pont-y-Cafnau: the first iron railway bridge and aqueduct? In the modern Merthyr of shopping precincts and car parks remains Pont-y-Cafnau or 'the bridge of troughs' (SO 0376 0713), a delightful and unique combined aqueduct and tramroad bridge of cast-iron set in a secluded site just below the confluence of the Taff and the Taff Fechan. Since surveying and recording the structure in the course of our work on the 'Industrial Survey' of Glamorgan for RCAM we have become aware of its considerable importance in a national context, and since the retirement of Douglas Hague from the Commission, Steve Hughes has continued research into its history and to its influences on better known bridges.

This iron bridge was built between January and June 1793 to carry an edge-railway and a water-channel taking limestone and water-power respectively to the Cyfarthfa Ironworks. A contractor could not be found to build the railroad nor would the Glamorganshire Canal Company agree to do so. It therefore fell unexpectedly on the Cyfarthfa Works management under Richard Crawshay to construct this overdue line. To carry this over the River Taff, Watkin George, the chief works engineer, seems to have adapted a king-post roof truss design. The main frame cradling the possibly secondary water-trough is held together entirely by the use of mortice and tenon and dovetail joints (Watkin George was a former carpenter). The bridge span of 14.2 metres (47 feet) is identical to that of the long gone 'old forge' roof at Cyfarthfa that Watkin George probably reconstructed at the same time.

A second stage of the 'old forge' reconstruction was roofed by cast-iron trusses with a central circular bracing fulfilling the function of a king-post over arched cast-iron collar-beams. The influence of its design can still be seen in the 7.5 metres (24'5") span of the arcades supporting the roof of the Crawshays' Treforest Tinplate Works Blacksmiths' Shop (ST 0877 8800) of 1833.

The Shropshire ironmaster William Reynolds sketched Pont-y-Cafnau in 1794 and in March 1795 Telford records with reference to Longdon-on-Tern Aqueduct that its 'Principles of construction and the manner in which it should be executed were referred to Mr William Reynolds' and himself. In the same month Reynolds was testing to destruction what appears to have been an erection of iron-beams based on the form of Pont-y-Cafnau. The design of Longdon-on-Tern Iron Aqueduct was basically of (mock-) timber inclined supports as observed on Pont-y-Cafnau supporting a flat (mock-) masonry arch composed of wedge-shaped sections (voussoirs). This was entirely appropriate as the deck was designed by Thomas Telford the mason, and the supports seem to be based on the earlier design by Watkin George the carpenter. Longdon-on-Tern was of course to be the prototype for the spectacular Pont-Cysyllte aqueduct near Llangollen..

In 1795 the railroad carried over Pont-y-Cafnau was extended twice more over the Taff on a line from the main Cyfarthfa Works site to the Glamorganshire Canal. A second bridge was cast from the Pont-y-Cafnau patterns and erected over the Taff at the main works site. (It is particularly poignant that this may have been demolished as late as the 1960s.) A third bridge then carried the railroad back over the Taff to the canal basin on the lower Cyfarthfa Works site. A sketch of 1798 shows this third span to have been a slender cast-iron arch both supporting and suspending a deck (ie a 'through-arch' bridge) in the manner of Telford's more elaborate Buildwas Bridge. This arch spanned about 16.5 metres (54 feet) and the reason a third set of Pont-y-Cafnau castings was not used may have been because the bridge already existed to give access to ironworks land acquired in 1783.

Watkin George may also have been responsible for the 7.3 metres (24 feet) span (ST 0489 0520) with mortice and tenon joints that until recently stood over the dry bed of the Glamorganshire Canal at Rhyd-y-Car in Merthyr. A bridge at this point was erected to link Cyfarthfa Ironworks land sometime between 1790 and 1814. The Crawshays were by a large margin the biggest shareholders on the canal and by 1800 Watkin George was already associated with the canal's engineering. The open parapets of Rhyd-y-Car each form a rectangular truss internally divided into a triangular framework by struts anchoring the frame to an integral segmental arch. This bears a family resemblance to the parapet-trusses (with through-arches) on the lower Cyfarthfa Works site. By 1813 a bridge somewhat resembling the Rhyd-y-Car Bridge also existed over the narrower Morlais Brook.

The fish-bellied deck-beams and a section of one of the parapet-trusses of Rhyd-y-Car Bridge were recently smashed by heavy lorries despite its being a 'listed' monument. Fortunately John Owen, the manager of British Steel's Dowlais (Merthyr) Foundry has now rescued this bridge and hopes to re-cast the missing sections.

Watkin George's 'Old Iron Bridge' (SO 0472 0616) was a road bridge over the River Taff in Merthyr town and was built in 1799-1800 with funding provided by Richard Crawshay. Despite many protests and its status as a Scheduled Ancient Monument, this bridge was broken up in 1960 and its incomplete remains rest in at

Pont-y-Cafnau 1793

least two 'dumps'. George's increasing familarity with iron is illustrated in this bridge: the principals of the 20.1 metres (66 feet) span arch were bolted together. There were only four mortice and tenon joints in the structure which were used to house two cross-braces on the cantilever supports at each end.

Watkin George had entered the Cyfarthfa Works as a carpenter from Pontypool and in 1807 left as a partner with £30 – 40,000 in his pocket. He then assumed the role of entrepreneur with his own tinplate works.

Other iron aqueducts and both railway and road bridges of an early date were to follow in Merthyr. Some remain largely unrecognised with plates and struts protruding from spoil-tips and 'reclamation' landscaping. On the line of the Pynydarren Tramroad stood an early wrought-iron lattice girder bridge which last year mostly disappeared into the Morlais brook below. This tramroad of 1799-1802 was largely constructed by Richard Hill, master of the nearby Plymouth Ironworks . The first positively-dated lattice girder bridge was built elsewhere 40 years later.

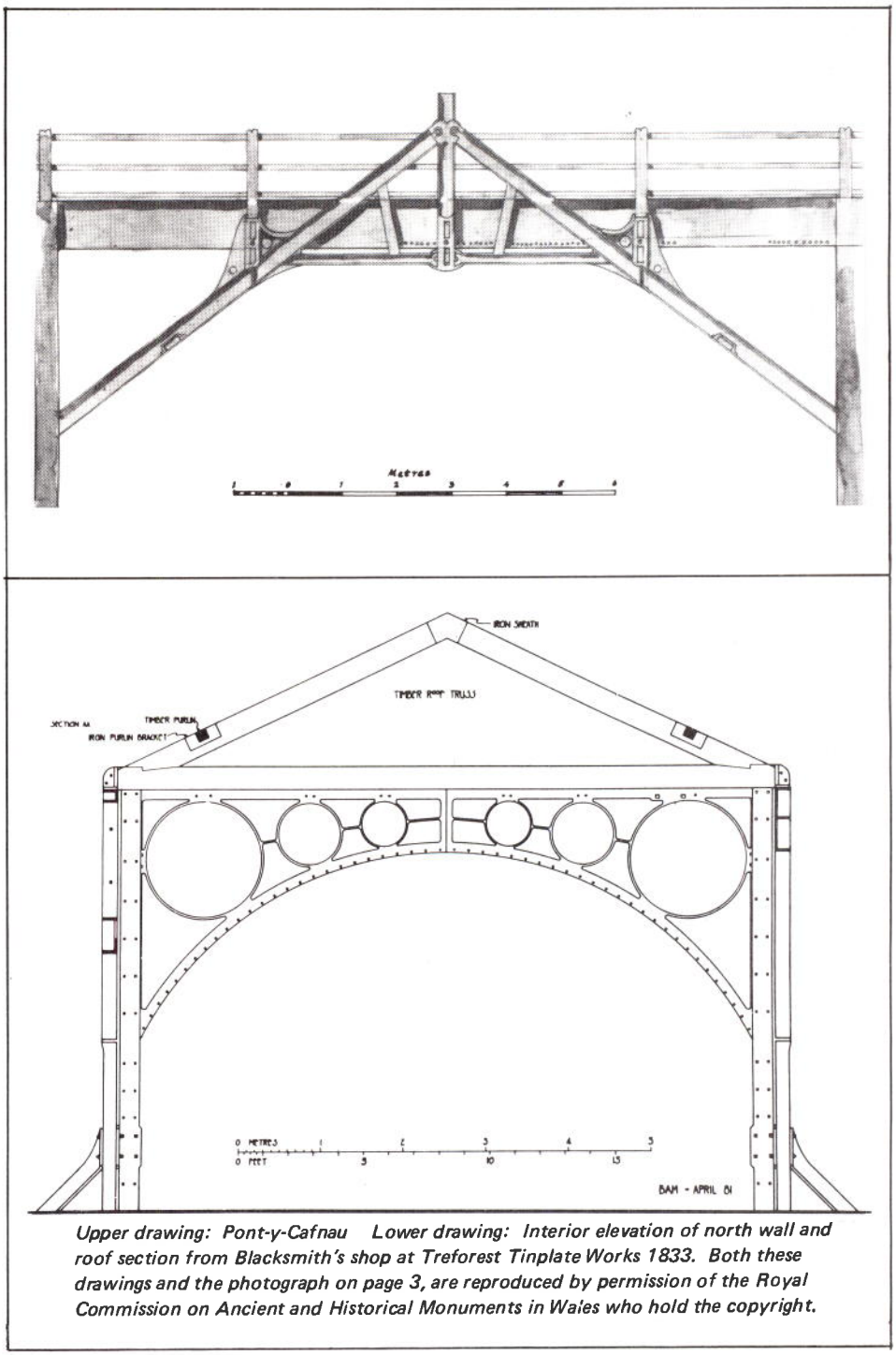
Merthyr Tydfil was the world's major centre of iron production in the first half of the nineteenth century though a modern visitor or even resident could be excused not being aware of this. Cyfarthfa was claimed to be the world's biggest ironworks but the whole of south Wales contributed to the area's dominance of British iron-production and other early iron railway bridges were in use near the smaller ironmaking concerns as well. Dr M V Symons in his recently published book on early coal mining in Llanelli shows that one if not two iron railway bridges were built there in 1798-1802.

All these 'discoveries' tend to prove the old archaeological maxim that the distribution of early discoveries tends to reflect the distribution of detailed archaeological and historical research. For the moment the known sequence of iron railway bridges built after this date seems to consist of the demolished Carron Waggonway Bridge of 1810 and the extant bridges at Aberdare, 1811, and Gaunless, West Auckland, the latter designed in 1822 and the Stockton and Darlington Railway. These three bridges have all been and still are separately claimed as the 'world's first iron railway bridge'. Various theories for the inspiration of the idea of using iron for these latter structures can be claimed. Aberdare for example is just over the hill from Merthyr Tydfil. It is almost certain that in 1819 an associate of George Stephenson accompanied one of his railway locomotives to South Wales and that George Overton who engineered the Penydarren Tramroad carried out the first survey of the Stockton and Darlington: their reports may have helped to germinate the idea of the Gaunless Bridge.

The supporters of the Merthyr Heritage Trust are trying to retain the few remaining material manifestations of their grandparents' skills and craftsmanship and hope to re-erect the Rhyd-y-Car Bridge together with a truss of the recently discovered (Pont)Morlais Bridge over the newly excavated Canal Basin outside Joseph Parry's house at Merthyr. It is also hoped to raise enough money to re-erect and 'stick back together' the formerly scheduled 'old iron bridge' over the Taff and members are urged to support the Merthyr Heritage Trust which is based at Joseph Parry's house, 4 Chapel Row, Georgetown, Merthyr Tydfil. Tel (0685) 73117,

Many thanks to Gordon Rattenbury for drawing our attention to the extant Merthyr tramroad bridges and for putting at our disposal his detailed research on the Merthyr tramroads. Thanks also to Professor A W Skempton for drawing to our attention to William Reynolds' sketch of Pont-y-Cafnau and to the Commissioners of Ancient Monuments in Wales for allowing us to release details of these structures in advance of full publication.

Douglas Hague and Stephen Hughes



Upper drawing: Pont-y-Cafnau Lower drawing: Interior elevation of north wall and roof section from Blacksmith's shop at Treforest Tinplate Works 1833. Both these drawings and the photograph on page 3, are reproduced by permission of the Royal Commission on Ancient and Historical Monuments in Wales who hold the copyright.

Chepstow Bridge. Work began recently to strengthen the 1816 cast-iron road bridge over the Wye at Chepstow, which although adequate for the traffic of the time when J U Rastrick completed it 163 years ago is now barely strong enough for modern heavy lorries. The bridge is listed Grade One, and Ove Arup and Partners have advised the Welsh Office on the most sensitive and unobstrusive means of strengthening the bridge's thin compression members, once adequate but now found to be very unstable in buckling. In 1889, a year after assuming responsibility for the bridge from the Quarter Sessions who had hitherto administered it, Monmouthshire County Council spent £723 on inserting steel ribs under the three existing cast-iron ribs of the central 112 ft span. These will be fortified and new buckling restraint provided in the course of the latest works, at an expected cost of £200,000 or ten times what the Bridgnorth firm of Hazledine, Rastrick and Brodie charged for completing the bridge in 1816.

Skeldergate Bridge to be Strengthened. A 100-year old road bridge over the Ouse in the centre of York is to be strengthened and refurbished by York City Council at a cost of £355,000. The bridge has five masonry spans topped by a superstructure of cast and wrought iron. The cast iron is in perfect condition, despite settlement in one of the bridge piers totalling about 2 inches. But the wrought iron is

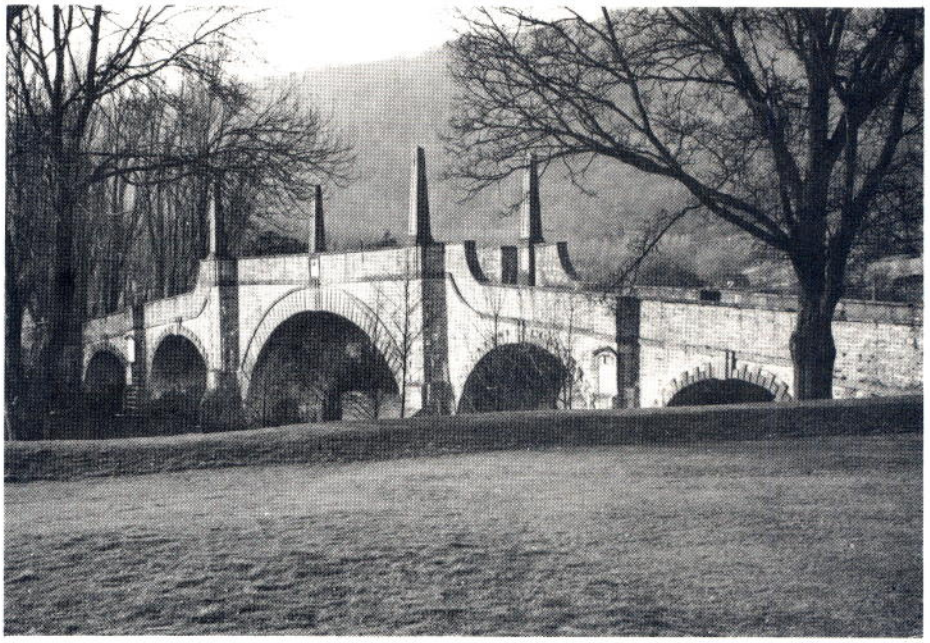
extensively corroded by winter salting and the sulphurous fumes from the nearby railway locomotive works and some straps and ties will have to be replaced. The bridge was built with one lifting span to permit the passage of tall-masted ships, but this 30 ft span was locked down about 8 years ago. A new waterproof concrete deck will be laid right across the bridge to prevent the ingress of moisture and salt to the ironwork beneath the foot paths which flank this important link in York's inner road system.

Embattled Stamford Bridge. A recent report in **New Civil Engineer** drew attention to the uncertainty over the future of the 134 year old railway viaduct at Stamford Bridge, built by J C Birkenshaw as part of the York and North Midland Railway. The viaduct is recognised as one of the earliest surviving examples of wrought and cast iron used in combination to form a railway arch. The central span across the Derwent is flanked by fourteen brick arches carrying the approaches. There are plans to make the viaduct a feature of a recreational area, but cost of repairs required to make it safe may lead the North W old District Council to conclude that their purchase of the structure from British Rail for £1 did not represent such a bargain after all.

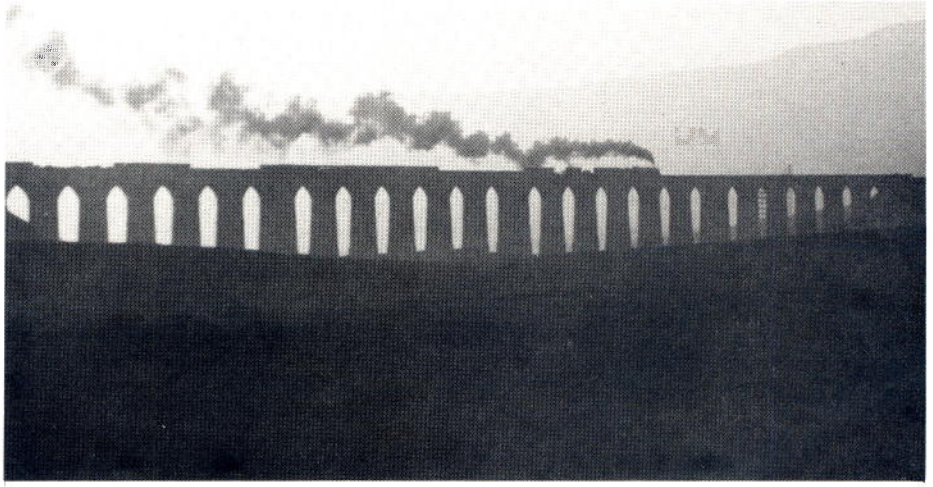
Wade for It. The bridge designed by William Adam to cross the River Tay at Aberfeldy was one of a series of fine bridges built as part of a strategic network of roads by General Wade to make remote parts of Scotland readily accessible to the military in times of unrest. It has stood now for 2 years short of 250 years and continues to bear a considerable volume of road traffic using the A9 trunk road to and from Perth. There were some misgivings, however, when the Highways Department of Tayside Regional Council approved plans for an American company to convey up to 100,000 tons of barytes ore each year across the bridge on its way to the North Sea oilfield where the dense ore is used to add weight to drilling mud. Dresser Minerals plans to mine the ore in a remote area north-west of Aberfeldy, creating 80-110 jobs for up to 20 years. The Regional Director of Roads had testified that the bridge, a scheduled Ancient Monument, shows no indication of deterioration which would affect its ability to cope with the traffic, but will it take an accident to one of the heavy lorries hurrying across the Aberfeldy Bridge laden with barytes to reverse this decision? By then the damage will already have been done.

Clouds over Ribblehead. The Settle and Carlisle Railway, opened in 1875 to provide the Midland Railway with a direct line into Scotland independent of the L & NWR, abounds with superlatives. It was one of the most expensive lines built in England, in terms both of financial cost and of the lives lost from accident, disease and exposure. It has the highest station in England (Dent, 1,145 feet above sea level) and is celebrated as the most scenic line in the country. It boasts more civil engineering structures than most lines of comparable length; in its 72½ miles and no less than 16 viaducts, mostly of local Pennine limestone ,for they pre-date the era of reinforced concrete which came to the aid of the builders of the West Highland Railway some twenty years late.

Although the Midland Railway ensured that the line was built throughout to the highest standards, more than one hundred years of exposure to the severest weather in Britain (the line was blocked for no less than 8 weeks during the severe winter of 1947) have taken their toll of the masonry structures. At Ribblehead is both the longest and the highest viaduct on the line, ¼ mile long and 165 ft high. It took five years to build and the pier foundations go down 25 ft into the moor. The wind at this exposed spot can be ferocious; the railwaymen's anecdote of a man blown off the top of the viaduct, through an arch and back onto the viaduct may be apocryphal, but there is no doubt that its maintenance against wind and driving rain is a major headache. British Rail reckon to spend about £100,000 per year on this one structure alone and the Divisional Civil Engineer, Alan King feels that the 24-arch viaduct has reached the end of its economic life. With the Settle and Carlisle providing an important diversionary route to and from Scotland, it is important that the route should be kept open, and a decision is expected later



Top picture: Stamford Railway Viaduct. Picture by John Edgington NRM
Middle picture: Wade's Bridge, Aberfeldy. Crown Copyright RCAHMS
Bottom picture: Ribbleshead Viaduct. Picture by Peter Semmens



this year on whether a new viaduct will be built, at an estimated cost of £4½ million, rather more than the total cost of the whole of the line when it was completed in 1875. Civil engineering techniques may have changed in the intervening 105 years, but the weather at Ribblehead has not, and tenderers for the new viaduct would do well to look back into the records of the Settle and Carlisle's building before they make any sanguine estimates of the time required to complete a new viaduct here on the roof of the Pennines.

The A6 Chapel-en-le-Frith and Whaley Bridge by-pass and its effect on the industrial archaeology of the Blackbrook Valley, Derbyshire. Early in 1983, construction is planned to start on the Chapel-en-le-Frith and Whaley Bridge bypass. This will replace that part of the A6 in north-west Derbyshire which forms part of the trunk route for vehicles travelling between Stockport and Chesterfield, Sheffield or Derby.

Proposals for the bypass have a long history. It was first approved by Derbyshire County Council in 1951 and a line (substantially that of the present proposal) first appeared on the County Development Plan in 1958. Investigatory work however, did not commence until 1970 and the Line Order was published in 1975. Following public exhibitions and inquiries, the proposal was finally given Ministerial approval in Autumn 1981.

The new road will be a dual two-lane carriageway, 7.3 km (4½ miles) long, approximately 90 ft in width and, at 1978 prices, costing £11 million. For approximately 6.2 km of its length it is situated on the south side of the Blackbrook valley, a tributary valley of the River Goyt. The effect of this new road in a narrow, secluded valley with its attendant construction problems and earthworks will be, for the inhabitants, catastrophic. For industrial archaeologists deep concern arises over the serious implications for the physical remains of the Peak Forest Canal, Bugsworth Basin, and Peak Forest Tramway.

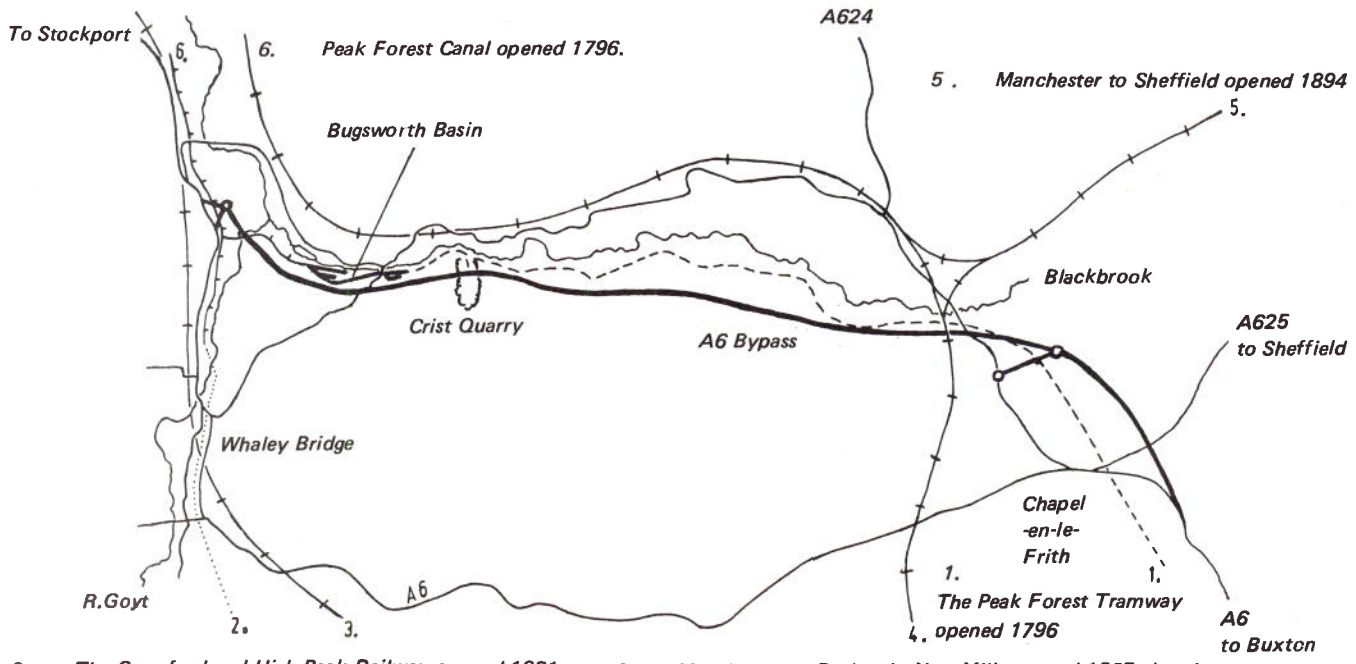
The Peak Forest Canal and Tramway were a joint venture designed to bring limestone from quarries at Dove Holes near Buxton to kilns at Bugsworth (now known at Buxworth) and along the canal route, linking with the Ashton and Huddersfield Canals at Dukinfield near Ashton-under-Lyne. Coal was also carried in the opposite direction (from the Ashton region and, after opening in 1832 of the Macclesfield Canal (which joins the Peak Forest Canal at Marple), from the Poynton collieries. In addition, a coarse sandstone for building was obtained from Crist quarry at Bugsworth, where a branch of the tramway penetrated the quarry via a tunnel. A half mile branch of the canal was also built to Whaley Bridge where in 1831 it linked with the newly-completed Cromford and High Peak Railway.

The Peak Forest Canal at Bugsworth terminates in a complex of former basins, warehouses, lime kilns and a vast network of tramway sidings which together served as a transfer point with the Peak Forest Tramway (opened 1796). Brian Lamb has calculated that there were 6500 yards of sidings springing from the main feeder tramway and these allowed large numbers of waggons to be dealt with. In the 1880s, says Lamb, 600 tons of limestone and lime were loaded into 30-40 narrow boats every day.

The Peak Forest Tramway was a double line (after 1803) of 4 ft 2½ ins gauge and five miles in length. In that distance it climbed 500 ft up to Dove Holes, of which 200 feet is accounted for by the great inclined plane at Chapel-en-le-Frith. Waggons were horse drawn in the sidings and up the tramway. Trains of loaded waggons ran downhill by gravity and controlled by the primitive and dangerous technique of sprogging the wheels. At Chapel Milton near Stodhart Lodge, the tramway ran under the road (A624) by means of a single line tunnel one of the earliest tramway tunnels. This has since been destroyed by a road improvement scheme but the eastern portal of the tunnel still stands in the grounds of Stodhart Lodge. The line of the tramway today in the Blackbrook valley can easily be followed on foot, being marked by stone sleeper blocks. Near Chapel Milton it has been covered over with tarmac to serve as a test track for the nearby Ferrodo brake lining works.

At its western end the bypass will be carried over the River Goyt and Peak Forest Canal (twice) by an embankment. A roundabout and link roads will connect it to the existing A6. These earthworks will dramatically alter the character of the River Goyt floodplain at this point.

More seriously, the bypass will cut through the southern margin of the Bugsworth Basin. In addition, the stone road bridge over the entrance to the upper canal basin will be demolished, being too narrow for construction traffic. It will be replaced by a new bridge. For over 15 years the Inland Waterways Protection Society has laboured to rescue the Bugsworth Basin and eastern terminus of the Peak Forest Canal from neglect and dereliction, clearing out the basins of mud, vegetation, and rubbish, and relaying and repointing the stonework. It is ironic that this work should be so threatened since it seems



LINE OF THE CHAPEL-EN-LE-FRITH AND WHALEY BRIDGE BYPASS IN THE BLACKBROOK VALLEY, DERBYSHIRE

inevitable that construction work will destroy much, besides seriously jeopardising the future of what is a scheduled ancient monument whose restoration to date has been of such service to industrial archaeologists. The published Statement of Case does not give much cause for optimism. Although it states that the proposals do not prejudice the future restoration and development of the canal basin on the lines recommended by the Canal Basin Working Party, it goes on to say that 'it is unlikely that the necessary capital for its (the Report's) implementation will be forthcoming in the foreseeable future'.

East of the basin, the bypass cuts through Crist Quarry by a 88' deep cutting. Further east, it impinges on the Peak Forest Tramway in two places. Another spectacular cutting will mark its progress through the embankment immediately south of the Chapel Milton railway viaduct. This viaduct records a later episode in the fascinating transport history of this area. Opened in 1864, it carries the former Midland Railway line across the Blackbrook valley **en route** from New Mills **via** the Peak District dales to Derby and London. The Peak Forest Tramway runs under the southernmost arch. The writer has already made a photographic record on slides of the proposed route of the new road and will make a contrasting record when construction is completed. Meanwhile, there is less than a year in which to enjoy the Blackbrook valley as it now is. Anyone interested in a visit is invited to contact Derek Brumhead.

References

D Ripley *The Peak Forest Tramway.* The Oakwood Press, 1972.

B Lamb *The Peak Forest Canal and Tramway:* a discourse in maps. Published privately ,1973.

C Hadfield and G Biddle *The Canals of North West England. Volume II.* David and Charles, 1970.

Departments of Environment and Transport. London — *Inverness Trunk Road (A6) Chapel-en-le-Frith and Whaley Bridge Bypass. Statement of Case.* n.d. but c. mid-1978.

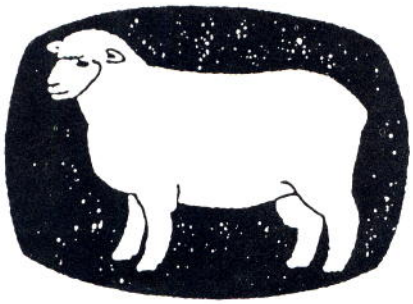
Derek Brumhead
North Hulme Centre
Jackson Crescent
Hulme
Manchester
M15 5AL

Foden Historic Vehicles for Science Museum. The Road Transport Collection of the Science Museum has been enriched by the acquisition of three historic Foden vehicles from Sandbach Engineering who now manufacture Foden vehicles. They are the 1906 Foden compound steam traction engine 'Pride of Leven', the 1916 Foden 5 ton steam lorry 'Pride of Edwin' and the first Foden diesel lorry of 1931. These vehicles mark three of the most important phases in the Foden company's history and illustrate some of the major developments which have taken place in commercial vehicles.

They join the rapidly expanding collection of commercial vehicles at the Science Museum's Outstation at Wroughton Airfield, near Swindon,

Foden have been in business for over a hundred years, at first making industrial engines, portable agricultural engines and threshing machines. Following the successful introduction in 1887 of their compound traction engine the company expanded into the growing market for self-propelled vehicles. Their first steam lorries were made in 1899 and the 5 ton lorry, which remained in production until 1923, set the pattern for the overtype steam lorry and enabled Foden to become the world's largest makers of steam road vehicles. They sold their first diesel engined lorry in 1931. Powered by a Gardner 5L2 engine, it marked the beginning of the rapid change-over from steam to diesel traction, Foden delivering their last steamer in 1934. In the post war period Foden lorries were noted for their advanced supercharged two-stroke engines and 12-speed gearboxes, a sectioned example of which will be on exhibition at Wroughton.

Coldharbour Mill Uffculme



Coldharbour Mill. Wool processing was brought to the village of **Uffculme in the Culm valley in Devon** by Thomas and Sarah Fox, who bought the old grist mill there in 1797 . The enterprise expanded and at its peak employed over 300, with concentration on the production of fine worsted yarn. The mill was finally forced to close in April 1981, adding further to what was already a high level of unemployment in the area.

The efforts of a number of local people to save the mill and its machinery from extinction, create employment and provide a viable tourist attraction has resulted in the formation of the Coldharbour Mill Trust. The project is financed by loans from the parish, district and county councils, matched by grants from the Development Commission. The Science Museum has also made grants towards the purchase of historic machinery. At a critical time in the purchase, the National Heritage Memorial Fund came to the rescue with a bridging loan. Restoration and conversion is being carried out as part of a Community Enterprise Scheme supported by the Manpower Services Commission.

Amongst much interesting machinery, the mill has an 18 ft breast-shot iron waterwheel, a cross-compound steam engine by Pollit and Wigzell, built in 1910, and several other engines and pumps. Steam was provided by two Lancashire boilers. A 'find' of particular interest has been a 6 ft long 'waggon' boiler, probably dating from the early 19th century, which was being used as a cold water cistern. It is believed that this is the only **original** wagon boiler that exists in the UK and the trustees would be glad to have details of any others known to members (and of other small early boilers in need of a last resting place).

Dobby and Jacquard looms have been brought in from Fox's mill at Wellington and are being set up at Coldharbour, so that, in due course, all the principal wool processes from combing to weaving will be seen by visitors in authentic surroundings. Meanwhile, offers of support should be directed to the Hon Secretary of the Friends of Coldharbour Mill, Miss Rachel Hitchcock 1 Markers, Uffculme, Devon Ex 15 3DZ.

A Breath of French Air. Twenty British delegates, most of them AIA members, were among more than 250 people who conveyed in Lyons in 14 September, immediately following the AIA Norwich Conference, for the Fourth International Conference for the Study and Preservation of the Industrial Heritage. This event brought together specialists from 22 countries as far apart as St Lucia and Japan, the majority coming predictably from Western Europe. France as the host country was able to field a particularly strong delegation amounting to almost half of those present, and the theoretical bias of most of the papers read to the various specialist groups reflected the fact that whereas IA in Belgium, the Netherlands and Britain draws its strength from local societies, the more formalised nature of French society links IA predominantly with University faculties and with the appropriate arms of local and provincial government.

After a day in Lyons the conference split into four groups for two days of site visits. Those fortunate enough to get on the Franche Comte trip were rewarded with visits to two of the outstanding sites of Europe, the Royal Saltworks at Salins where brine was pumped from 750 ft by waterwheels working in a magnificent Romanesque undercroft and the equally remarkable planned city laid out at Arc et Senans in 1775-9 by Claude-Nicolas Ledoux to take advantage of a local abundance of firewood for the evaporation of brine piped in wooden treetrunks from 15 miles away. Others saw iron and steel-making sites which have been linked as an eco-museum in and around Le Creusot in Burgundy, early hydro-electric power stations in the Alps and mining sites in the upper Loire valley. Coaches then conveyed delegates to Grenoble, dramatically situated where the Isere sweeps through a gorge in the foothills of the Alps, and owing its 19th c growth to the abundant electricity available when the first penstocks were built in 1869 to bring down abundant Alpine water to spin turbines. Grenoble is a thrusting dynamic city attracting a high calibre workforce from all over France because of its proximity to year-round ski slopes, and the working sessions of the Conference were accommodated at the School of Electrical Engineering on the campus of the ancient (1339) but highly-technological University. Topics for group study were again angled towards developing industrial archaeology as an academic pursuit, although architects from several European countries, France included, provided evidence of a remarkable growth in confidence on the part of public authorities in converting historic industrial buildings for new uses.

The General Assembly of an international organisation with a triennial meeting cycle and of which this was only the second formally-constituted meeting could hardly be expected to despatch its business swiftly and conclusively. When the International Commission for the Conservation of the Industrial Heritage convened officially at Grenoble, it was faced

with electing a new Board for the next triennium as well as receiving reports from the various Working Groups, and sessions of the Commission spread over two days. Prof Ted Sande (USA) an early President of his national Society, stood down as Chairman of ICCIH and was succeeded by Professor John Harris (UK).. Wrangles over voting procedures reflected the dismay of nations with the largest delegations at having one vote only, a procedure adopted at the previous Congress in Sweden to prevent the host country for any Congress from dominating the proceedings.

The Commission, which has resolved not to seek affiliation to UNESCO, ICOM or ICOMOS until the advantages of such links become more apparent, did not debate any specific issues beyond its own future activities, and British hopes that this young organisation would make its voice heard in a practical manner were disappointed when a motion deploring the recent deliberate and insensitive destruction of the Pont des Arts over the Seine was reduced to a bland and emasculated formula for transmission to the municipal authorities in Paris.

For anyone who doubted the prospects for practical industrial preservation in France, our confidence was rekindled by a second series of site visits to 18th and 19th c iron-making sites in northern Burgundy. The highlight was undoubtedly the water-powered complex near Montbard established in 1769 by the Comte de Buffon at the hamlet of the same name for the production of wrought and cast iron by charcoal smelting from locally available ores. In the absence of convenient canal facilities, most ore at that time had to be brought up by horse and cart from Dijon, a journey of 3-4 days but the abundance of local peasant labour and sound foundry techniques helped to keep the foundry competitive until 1867 when the growth of demand made the advantages of coke-smelting overwhelming and the charcoal-fired furnaces at Buffon went out for the last time. The buildings were used for cement manufacture until 1916 and have survived in private ownership. Sensitively restored by the British-born owner and his French wife, who are proud to look after this internationally-important shrine of early French ironmaking, the Buffon forges are becoming acknowledged as of major importance in the history of iron-making.

The French nation, with its tradition of reliance on the State in identifying and preserving the national heritage, has come to a recognition of industrial archaeology rather later than some of her European neighbours, where 'self-help' is more accepted as an agent for change. The British contingent at the ICCIH meeting in France came away thoroughly enthused by what their hosts had revealed for them among the hills of Eastern France; a range of sites many of which must rank among the Top Twenty in Europe. It was encouraging to note a growing acceptance of the role of the amateur enthusiast in a discipline which, in France, is still very much the preserve of the academic researcher, with very little being published other than with the backing of University or Government funding. If the French Government Tourist Office ever chooses to promote its industrial heritage with the same enthusiasm that is being shown by some of our own Tourist Boards, then our neighbours across the Channel can expect a growing invasion of visitors looking for some of the multitude of industrial treasures about which they are so modest.

Obituary — Dr William Gerwyn Thomas, Assistant Keeper in the Welsh Industrial and Maritime Museum (formerly the Department of Industry, National Museum of Wales) since 1963, died at University Hospital of Wales, Cardiff on 26 November 1981.

Gerwyn Thomas was born in the Amman Valley in 1925 and was educated at the Amman Valley Grammar School, Ammanford and the University College of Wales, Cardiff, where he was awarded BSc (Mining) in 1946.

The cover of the last Gerwyn Thomas publication. Available from the National Museum of Wales, Cardiff CF1 3NP at £1.20 inclusive of postage and highly recommended.

He was brought up in a coal mining family (his father was a colliery manager) and began his working life as an apprentice mining engineer. He gained his Colliery Manager's Certificate; subsequently he became an Assistant Manager at a colliery near Ammanford. In 1949 he became a lecturer at the National Coal Board Divisional Mining and Machinery Instruction Centre at Pengam in Gwent, this post giving him the opportunity to extend his knowledge of the bituminous and steam coal areas.

In 1952 he was appointed to the Department of Mining and Minerals Engineering at the University of Birmingham, becoming a senior lecturer in 1956 and gaining a PhD in 1961.

In 1963 he was appointed Assistant Keeper in the newly-formed Department of Industry at the National Museum of Wales where his wide experience of coalmining in Wales enabled him to plan, collect items and develop the mining gallery.

Soon after joining the department he organised the first course in IA for the Extra-Mural Department, University College, Cardiff and as a result of these lectures, the South East Wales Industrial Archaeology Society was formed. He became its first Secretary and remained so for three years.

His Museum duties took him to collieries throughout Wales and the closures in the 1960s placed a heavy burden of responsibility on his shoulders in collecting and recording. His efforts in this respect resulted in the in situ preservation of a number of coal mining sites in South Wales.

He was deeply involved with the collection of some of the exhibits now on display in the Welsh Industrial and Maritime Museum particularly with the ***Sea Alarm***, the last coal fired steam tug in the Bristol Channel. In later years he was partly responsible for the establishment of Big Pit, Blaenafon as a preserved mine museum and his last publication was a booklet simply called ***Big Pit.*** Other publications included ***'The Coal Industry in West Glamorgan'*, Glamorgan Historian,** Vol VI, 1969, pp 201-227; ***'Coal Mining in Wales'*, Amgueddfa — Bulletin of the National Museum of Wales,** No 3, Winter 1969; ***'Coal Industry'*, Neath and District — a Symposium,** edited by Elis Jenkins, 1974, Chapter 9, pp 166-196 and ***Welsh Coal Mines,*** published by the National Museum of Wales 1977.

Gerwyn Thomas was Welsh-speaking and a member and sidesman of Llanishen Church, Cardiff. He was very much a family man and is survived by his wife Pamela and sons Owen and Gareth. His ability and expertise will be sadly missed by all industrial archaeologists.

AIA Bulletin
ISSN 0309—0051.

Is published by the Association for Industrial Archaeology. The AIA was established in September 1973 to promote the study of Industrial Archaeology and encourage improved standards of recording, research, conservation and publication. 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 national level, to hold conferences and seminars and to publish the results of research. Further details may be obtained from the Membership Secretary, Association for Industrial Archaeology, The Wharfage, Ironbridge, Telford, Shropshire, TF8 7AW England. Telephone 095-245-3522.