

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:

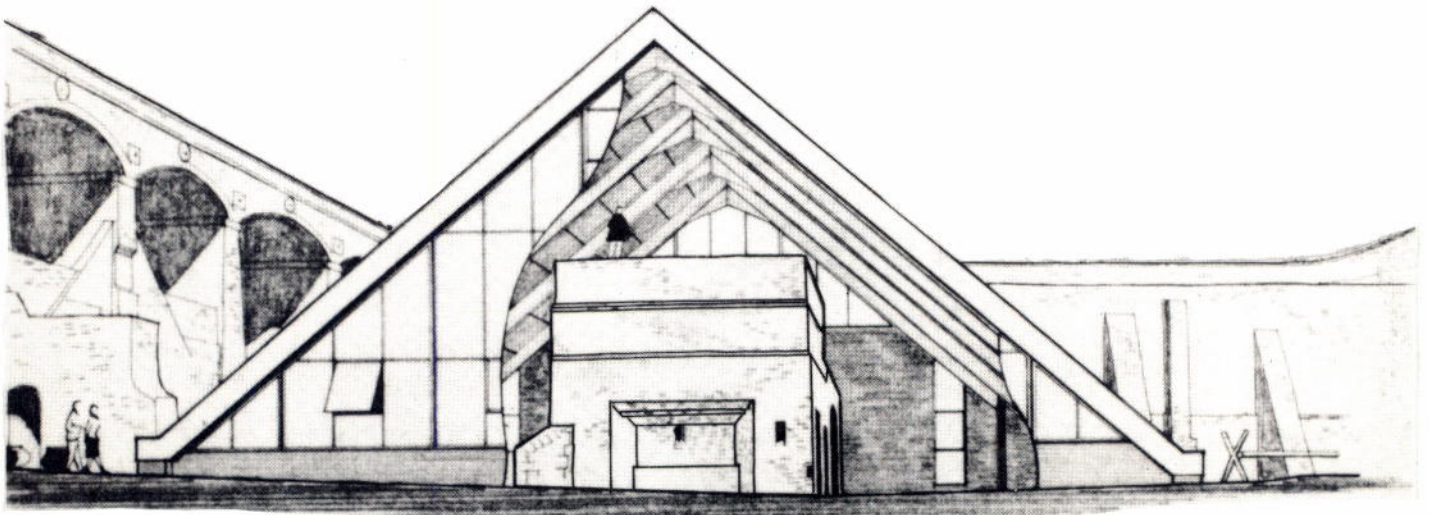
Phase 1 (1669 - 1710?)

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.

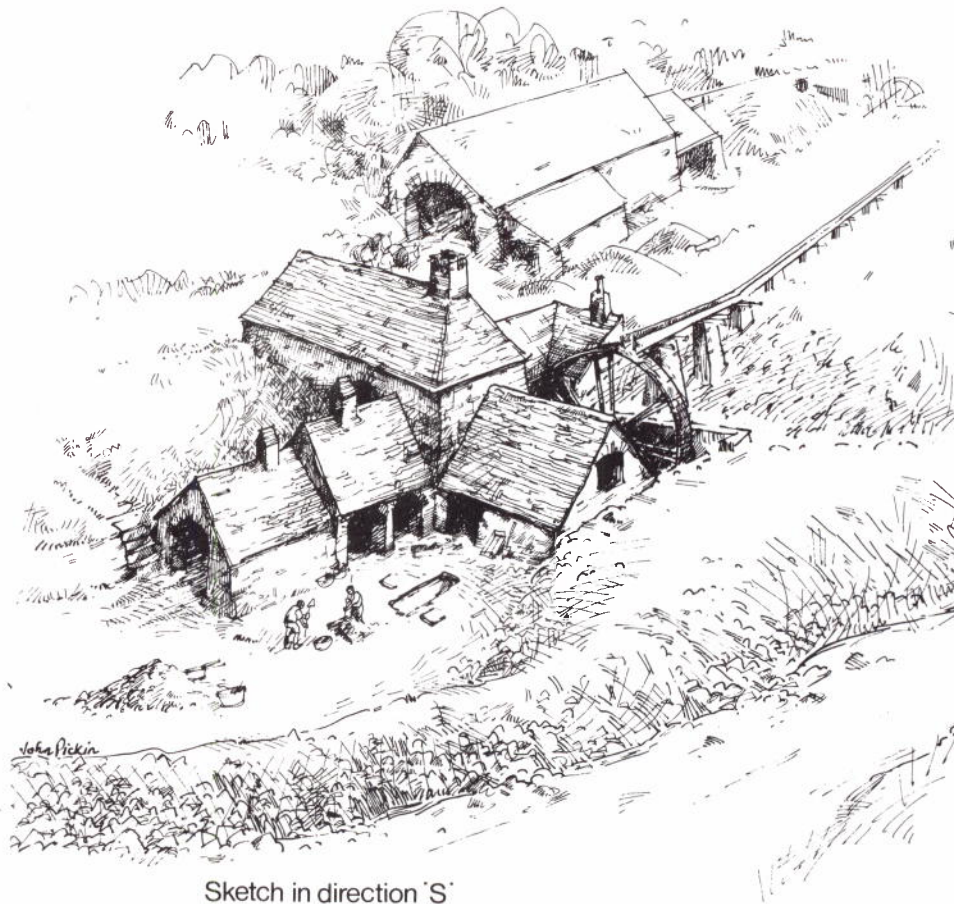
Phase 3 (Post 1826)

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 bloomy slag scatters within the Angidy Valley.

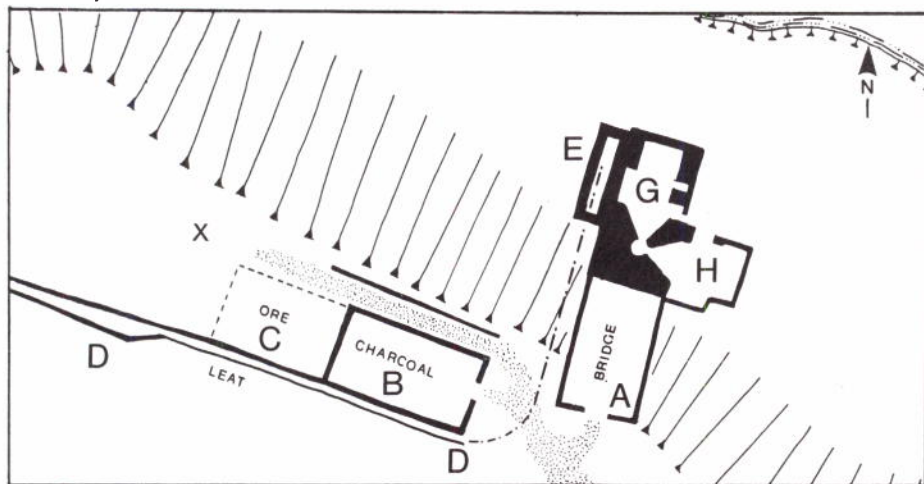
Work is now in progress on the consolidation of the various structures and it is hoped to open the site for June 1981. Two interpretation panels, produced jointly by the Council and Newport College of Art, are to be erected on site, and a trail is planned for the valley which will link the furnace with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

John Pickin



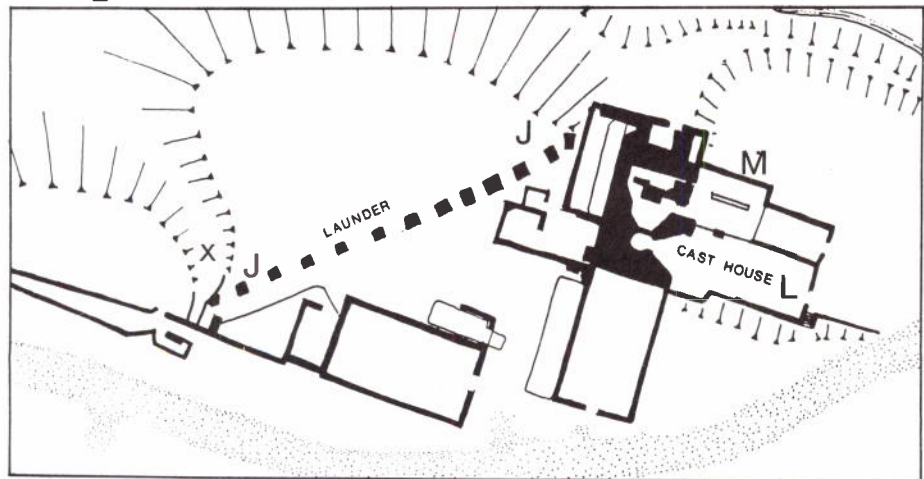
Sketch in direction 'S'

PHASE 1



ABBAY TINTERN FURNACE

PHASE 2



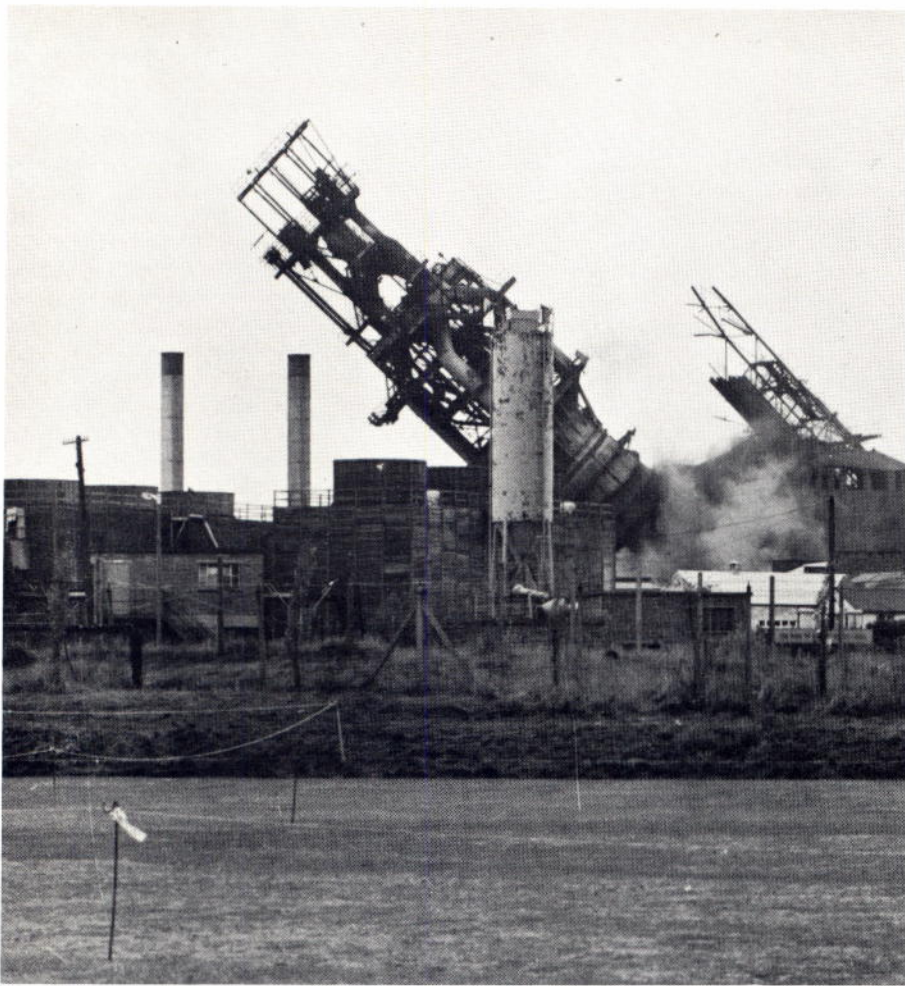
The Last of the Last Black Country Furnace. On 5th October 1980 a Wolverhampton Express and Star photographer took the historic picture shown above, and an era in iron-smelting history came to an end.

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.