

The Iron Bridge

**A short history of the
first iron bridge in the world**



The Iron Bridge

Front Cover:
Engraving of the Iron Bridge, 1782
by William Ellis (1747-1810)
based on a painting by
Michael 'Angelo' Rooker (1743-1801).

The Background

The Coalbrookdale Iron Bridge, the first structure of its kind in the world, is Britain's best known industrial monument. It has always been a spectacle, a curiosity, a visible proof of the skill and daring of the eighteenth century Shropshire ironmasters. Visitors who flock to the bridge today follow in the steps of the thousands who came to Coalbrookdale to watch its construction. This publication answers as completely as the current state of research allows, the questions which most visitors ask about the bridge and its history.

When the Iron Bridge was first contemplated, the Severn Gorge had been a busy industrial area for nearly two centuries. The large scale exploitation of coal for export along the Severn had been the foundation of its prosperity in the sixteenth and seventeenth centuries. In the 1750s began the rapid expansion of the East Shropshire iron trade which, by the late eighteenth century, made the district the most important iron producing area in Great Britain. The pace of industrial activity was such that many heavy cargoes had to be ferried over the river. Limestone from Benthall Edge and iron ore from Ladywood went to the furnaces at Coalbrookdale. Pig iron from Horsehay went to the ironworks at Willey. Firebricks from Broseley went to several ironworks north of the Severn. Many people too, had to cross the river to their work, their religious meetings or their recreations. The nearest bridges were at Buildwas and Bridgnorth, and the lack of a bridge in the Gorge itself must have been a severe handicap to both industrial and social activity. There were several passenger ferries in the Gorge, but anyone who has seen the Severn in flood will realise how uncomfortable and, indeed, how dangerous they would have been at certain times of the year.



It is not surprising therefore that, from the 1750s at least, there was talk of a bridge in the vicinity of Coalbrookdale.

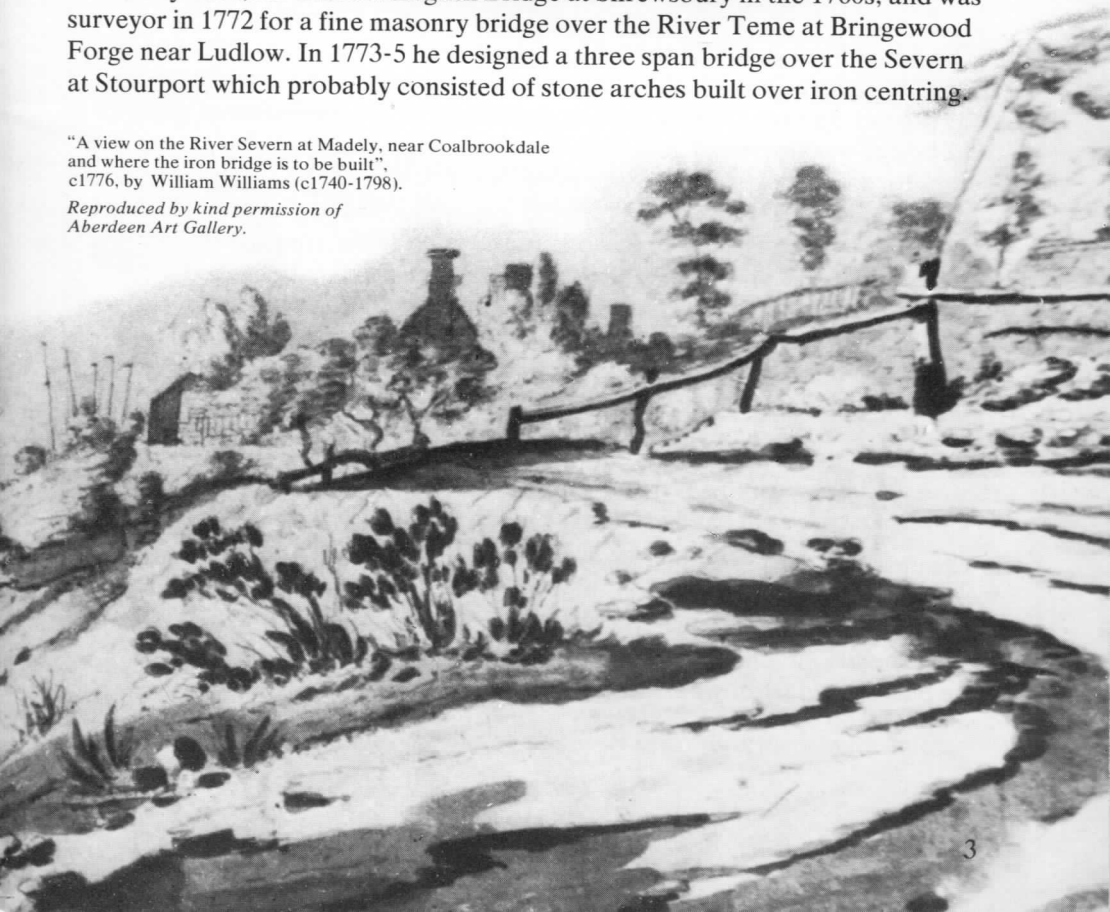
The barge traffic on the Severn was so intense that a bridge of a single span was almost essential, and the steep sides of the Gorge made impossible a multi-span structure with gradually rising approaches such as John Gwynne built in stone at Atcham in 1769-71, or Thomas Telford in timber at Cressage in 1799-1801. Bridging the Severn at Coalbrookdale was therefore something which taxed to the limit the technology of the day. To build a bridge in iron was not simply a matter of whim, fancy or ostentation, but the application of a new technology to the solution of a particularly difficult problem.

The beginnings of the project

In 1773 Thomas Farnolls Pritchard, a Shrewsbury architect, wrote to John Wilkinson the ironmaster, suggesting the building of an iron bridge in the Severn Gorge. Pritchard was born in 1723 the son of a Shrewsbury joiner, and by the 1770s had been responsible for a variety of important buildings in Shropshire and neighbouring counties. He had many connections with the leading ironmasters. In 1756 he designed the memorial to John Wilkinson's first wife in Wrexham parish church, and later carried out work on Wilkinson's house in Broseley. He appears to have done restoration work for the third Abraham Darby at Hay Farm, Madeley, and ordered fireplaces to his own designs to be cast by the Coalbrookdale Company for Shipton Hall in Corvedale. He also installed fireplaces for the Harries family at Benthall Hall. He had considerable experience in the design of bridges. He submitted plans, not ultimately used, for the new English Bridge at Shrewsbury in the 1760s, and was surveyor in 1772 for a fine masonry bridge over the River Teme at Bringewood Forge near Ludlow. In 1773-5 he designed a three span bridge over the Severn at Stourport which probably consisted of stone arches built over iron centring.

"A view on the River Severn at Madely, near Coalbrookdale and where the iron bridge is to be built", c1776, by William Williams (c1740-1798).

Reproduced by kind permission of Aberdeen Art Gallery.

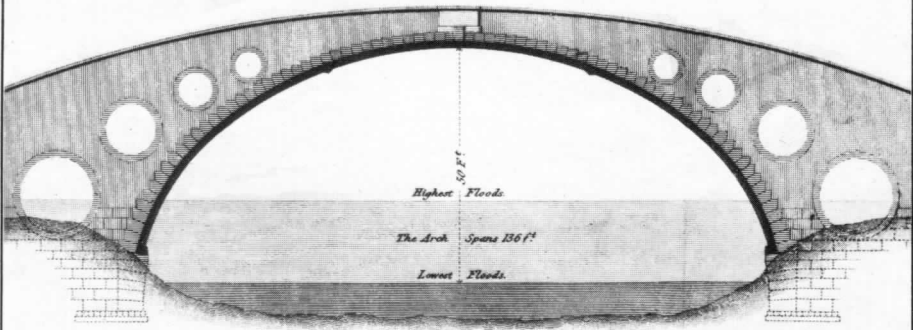


John Wilkinson was by the 1770s one of the most prominent ironmasters in England, with works in Denbighshire and Staffordshire as well as at Willey in Shropshire. He loved innovation, and it was entirely within his character to be associated with a project like the Iron Bridge. It seems likely that it was he who took the first steps towards making Pritchard's proposition a reality. In February 1774 the West Midlands newspapers reported that the people of Broseley and Madeley were proposing to petition Parliament for leave to build an iron bridge of one arch over the Severn near Coalbrookdale. Notices that a petition was being prepared were issued in the summer of 1775, and in September of that year a group of people interested in the project met at a public house in Broseley. The site of the bridge was determined, the southern end just in the parish of Benthall, the northern end by the house of Thomas Crumpton in Madeley Wood. Abraham Darby III of Coalbrookdale was appointed treasurer to the project. Preparations were made for securing an Act of Parliament. The subscribers included many of the leaders of local industry besides John Wilkinson and Abraham Darby III, among them Edward Blakeway, Wilkinson's partner at Willey and later one of the founders of the Coalport china works. Edward Harries, Lord of the Manor of Benthall, John Thursfield, of Benthall Hall, a surgeon and mine owner, and John and Charles Guest members of an old Broseley mining family who subsequently founded the great Dowlais ironworks in South Wales. Thomas Farnolls Pritchard, also a subscriber, was commissioned at the meeting to prepare a design for the bridge. His first drawings produced in October 1775, were for an iron bridge of four ribs with a span of 120ft. Abraham Darby III agreed to erect the bridge, and estimated the total costs of the structure including the purchase of the ironwork at £3,200.

The Act of Parliament for the bridge was obtained in February 1776, but for the next eighteen months the subscribers were racked with indecision about the project. In May 1776 the minute recording Darby's commitment to build the bridge was rescinded, and advertisements were issued seeking people with plans for a single-arched bridge in stone, brick or timber. No such plans were forthcoming, and in July 1776 Pritchard was authorised to prepare a model of an iron bridge. A schism had developed among the subscribers, Abraham Darby III and his supporters Pritchard, Wilkinson and a miller called Leonard Jennings, seem to have been determined to build a bridge in iron, and they held the majority of the shares. But a majority among the shareholders clearly preferred a less unorthodox structure. Throughout the winter of 1776 there was a deadlock, not resolved until October 1777, when on the advice of counsel, there was a completely new assignment of the shares, which at last settled the legal and financial framework of the project. Work actually began the following month.

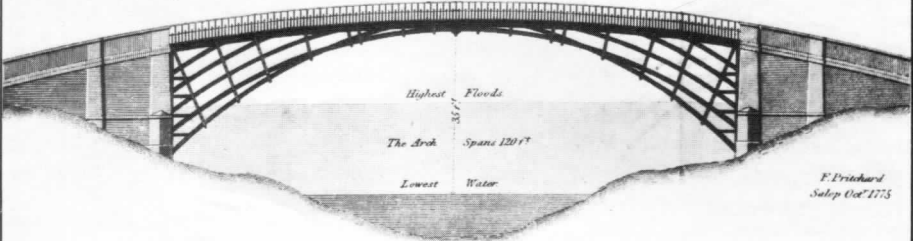
The design of the bridge had been altered between the time of the first proposals, which envisaged a structure with a span of 120ft, and July 1777 when a bridge with a 90ft span was contemplated. It is likely that the span was subsequently increased to 100ft 6in to accommodate the towing path, and that the plan agreed by July 1777 was essentially that of the bridge which was actually built.

Design of a Bridge constructed on a Cast Iron Centre



F. Pritchard
Salop 1774

Design for a Cast Iron Bridge between Madley & Bromley



F. Pritchard
Salop Oct 1775

J. White del.

0 10 20 30 40 50 60 70 80 90 100

Pritchard's first designs for an iron bridge 1774-5. From "On Cementitious Architecture as applicable to the Construction of Bridges" by John White, 1832. Ironbridge Gorge Museum Trust.

The role of Thomas Farnolls Pritchard

The part played in the project by the Shrewsbury architect

Thomas Farnolls Pritchard has long been a matter of some confusion. The first design for the bridge was certainly his. He was one of the original subscribers, and remained so until his death in October 1777, by

which time the final design of the bridge was settled. In

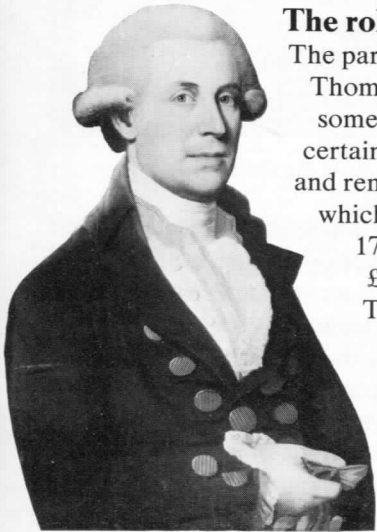
1779 the bridge proprietors paid to Samuel Pritchard £39 19s 0d "for his late Bror. T. F. Pritchard's Bill".

There is no evidence that Pritchard ever withdrew from the project, and it seems likely that he contributed substantially to the design of the bridge as it was finally built. He was an

architect, not an iron-founder however, and the bridge doubtless owes as much to the technical abilities of Abraham Darby III and

his foundrymen as to him. Like most major

bridges, it was not the product of an isolated genius working alone on his drawing board, but of the discussions of a team of specialists each contributing their own particular skills.



The construction of the bridge

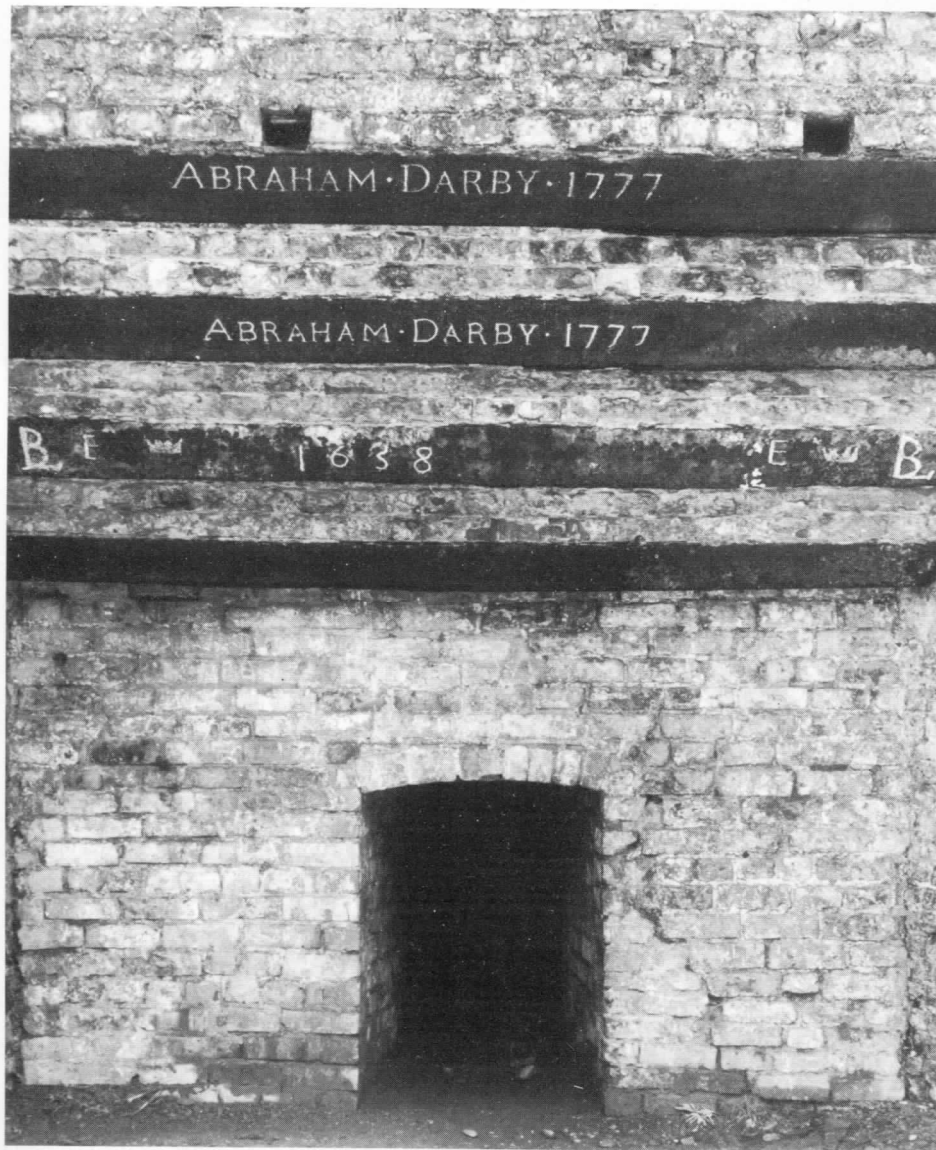
Once the design was finalised the building of the bridge was undertaken by Abraham Darby III. He arranged for the payment of the workmen, and the procuring of building materials and tools. It was so much his personal responsibility that the accounts for the project were kept in the ledger in which he recorded his own petty household expenses.

Work began on the bridge in November 1777 although only a few men were employed there during the winter which followed. Throughout most of the summer and autumn of 1778 probably between 20 and 30 were employed, with twice as many during some short periods. The principal task was the building of the abutments, and their completion was probably marked by an ale-drinking at the end of October. The pace of activity slackened during the winter, but by the spring of 1779 preparations were being made for the erection of the ironwork. Remarks made by John Wesley following a visit to the area on 26 March suggest that the ribs were by that time laid out on the bank awaiting erection. Ropes and timber for scaffolding were purchased. In April as many as 40 men were working on the site, probably erecting the scaffolding. A Severn trow was hired from a local owner, Thomas Sutton, during June, and on 1 and 2 July the first pair of ribs were lowered into place. The completion of the main structure then went ahead quickly. The spending of nine guineas on ale on 23 October probably celebrated its completion, and in November the scaffolding was taken down. Throughout the period when the bridge was being erected, the barge traffic on the Severn continued normally.

The completion of the bridge took longer than expected. There may well have been difficulties in constructing the roadway across the top and certainly the making of adequate road connections posed many problems. About 20 men were employed throughout 1780, until the bridge was opened on New Year's Day 1781. A few minor tasks remained, and the last workmen were paid off on 13 January 1781. The total cost of erection, excluding that of the materials from which the bridge was made, amounted to £2,737 4s 4d compared with a mere £550 allowed for the purpose in the estimate prepared in October 1775. The cost of the ironwork is at present unknown.

Where were the parts for the bridge made?

It is not now possible to establish beyond any doubt where the ironwork for the bridge was cast. By tradition the ribs were made at the upper furnace at the Coalbrookdale ironworks about a mile and a quarter away. Each of the main ribs weighs 5 tons 15cwts, and it would have been a formidable task indeed to move such ribs with the transport facilities available in 1779. These considerations have led a number of people to suggest that the ribs were not made at Coalbrookdale, but either from an air (or re-melting) furnace adjacent to the bridge site, or at the nearby Madeley Wood furnaces which were purchased by Abraham Darby III in 1776. While these suggestions have some merits on the grounds of practicality, the mass of historical evidence tends to confirm the tradition that the ribs were made at Coalbrookdale. Just after the final decision to build in iron, one of the Darby family wrote "I suppose it will all be cast in the Dale for Cousin Abram will have the whole direction".

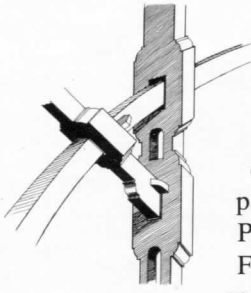


The Old Furnace. Coalbrookdale. *Ironbridge Gorge Museum Trust.*

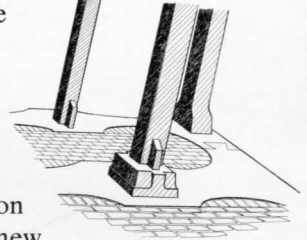
Several near-contemporary accounts of the bridge state without equivocation that it was cast at Coalbrookdale.

More relevant still, the archaeological evidence at the Coalbrookdale furnace (the beams indicating a substantial rebuilding in 1777) suggests that some particularly important project was then being contemplated. By that time it no longer made economic sense to enlarge the blast furnaces at Coalbrookdale where transport costs were much higher than at the other works owned by the partnership at Horsehay and Ketley, unless there was some especially good reason to do so. The amount of iron in the bridge is equivalent to the output of a contemporary blast furnace for three or four months, so that some rebuilding would have been essential if the established trade of the works was to be maintained.

Features of the iron bridge



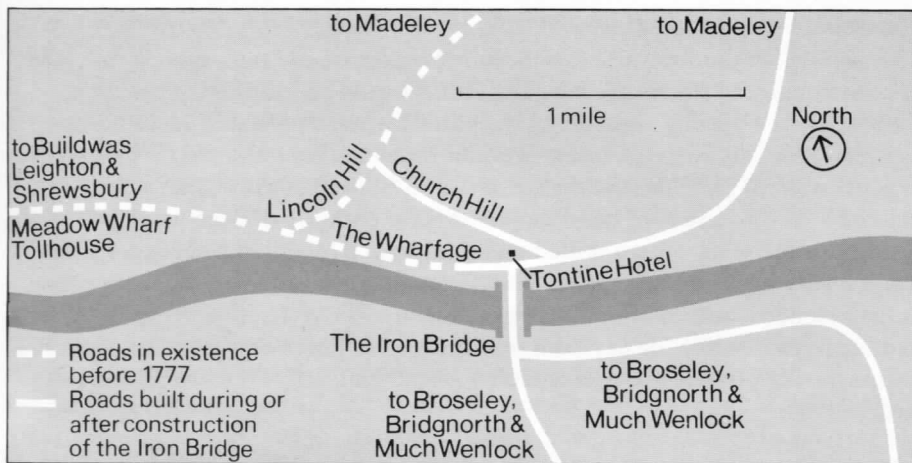
The bridge eventually built is markedly less adventurous in its use of iron than that which Pritchard proposed in 1775. It derives much from contemporary practices with other materials. The shape and general proportions of the bridge closely resemble a number of contemporary single-span masonry bridges, and it has a particularly close resemblance to Thomas Farnolls Pritchard's stone bridge across the Teme at Bringewood Forge built in 1772. The detailed construction, the way in which the parts fit together, resembles carpentry practice. The base plates are held together by dovetail joints. The uprights are secured to the five main ribs by wedges. Radials are held to the main ribs by shouldered joints. The weight of iron in the bridge is 378 tons 10cwt, substantially more than for any subsequent iron bridge of the same dimensions. Unfamiliarity with a new technology doubtless prompted the builders to err on the side of caution and to prefer strength to economy in the use of materials.



There is a constant tendency for certain of the strata in the Severn Gorge to slip towards the river. It was not long before movements of this sort began to damage the bridge. In December 1784 cracks were found in the arch on the Benthall side of the river. In 1791 repairs to the ironwork on the same side were carried out, and in the following year repairs to the south abutment were put in progress. In 1802-04 the massive stone-faced embankment which led up to the south abutment was removed and replaced by two small wooden arches which themselves were replaced by the present iron land arches in 1821. The ironwork was protected in 1788 with varnish supplied by Lord Dundonald's British Tar Company which had kilns attached to the nearby Calcutts and Benthall ironworks.

The effects of the Iron Bridge on the local road system

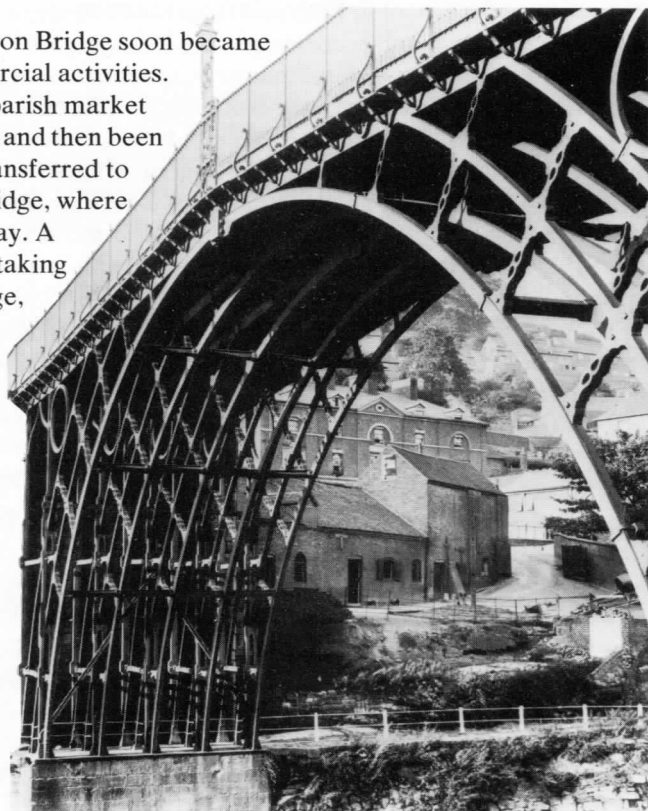
The only road to approach the bridge which existed before construction began was that known as the Wharfage, a quay lined with houses on the north bank of the river upstream from the Bridge. At Dale End this joined the turnpike road from Madeley to Buildwas which descended the side of the Gorge by the steep and narrow road now called Lincoln Hill. The Wharfage was linked with the north end of the bridge by a short stretch of new road, now called Tontine Hill. The bridge proprietors were responsible for the construction of two other new roads. One led from the south end of the bridge up the valley of the Benthall Brook to join the Broseley — Much Wenlock turnpike, and is still known as Bridge Road. It was frequently obstructed by raw materials awaiting use of the various potteries and ironworks along its route. On the north side the proprietors built the new road now called Church Hill, which turns awkwardly out of the open space at the end of the bridge, and climbs the side of the Gorge to join the old line of the Madeley turnpike at the top of Lincoln Hill. In 1806-10 the road along the Wharfage was formally turnpiked, and the turnpike trustees built the present main road to carry traffic from the bridge direct to



Madeley. On the south side, the road which runs parallel to the river in the downstream direction, and then climbs towards the Foresters' Arms at Broseley, was built by the Wenlock turnpike trustees in 1828.

While the bridge was being built a direct road link to Shrewsbury was established by turnpiking the route from Tern Bridge on the present A5, through Leighton, where there was a toll-gate, to Buildwas at the end of the Madeley turnpike. In order to get some income from traffic using this route to the Iron Bridge, the Madeley trustees in 1780 erected a toll-gate near the Meadow Wharf where a toll cottage still stands.

The north end of the Iron Bridge soon became a focal point of commercial activities. The ancient Madeley parish market which had once lapsed, and then been revived in 1763, was transferred to the north end of the bridge, where it is still held each Friday. A small town developed, taking its name from the bridge, and of the variety of professional and commercial concerns noted there by a visitor in 1836, the post office, printing works, principal inns, drapers, grocers, ironmongers, branch bank and doctors may still be seen.



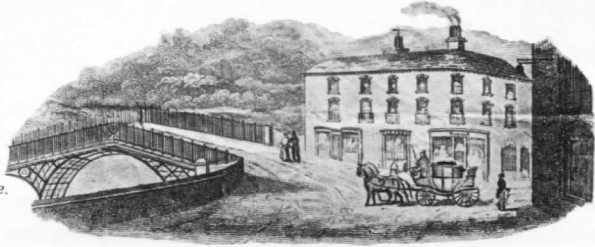
The Iron Bridge in the late nineteenth century. View from upstream. *Ironbridge Gorge Museum Trust.*

Models of the bridge

The minutes of the subscribers mention several models, and certainly the form of construction of the bridge suggests that it would be essential to rehearse thoroughly the putting together of the parts. It seems probable that a model was made for this purpose, and this could well have been the model which was in possession of Sir Edward Smythe of Acton Burnell in May 1782, when he paid £2 12s 0d to a firm of heraldic painters for painting it. Such a sum represents the work of two skilled men for about a fortnight and suggests that it was a very large model indeed. The fine mahogany model of the bridge now in the Science Museum, London, was made in 1785 by Thomas Gregory, who had been responsible for payment of wages to workmen employed on the bridge during 1780. It was presented by Abraham Darby III to the Society of Arts in 1787.

From the billhead
of Edward Edwards,
Linen and Woollen Draper,
Ironbridge, 1841.

*Labouchere Collection,
Salop County Record Office.*



Stage Coaches and Inns

In October 1781 a regular stage coach service, 'The Diligence' began to cross the Iron Bridge en route from Shrewsbury to London via Broseley, Bridgnorth, Alcester, Stratford and Oxford. In the early nineteenth century several other services from Liverpool to Bath and from Shrewsbury to London used the bridge. One stage coach proprietor in the 1790s gave as one of the advantages of his service the route across "that striking specimen of Art and so much admired object of travellers", the Iron Bridge. The efforts made by the bridge proprietors and the Leighton and Wenlock turnpike trusts to attract Shrewsbury-Bridgnorth traffic to the Iron Bridge route are reflected by the distances to Shrewsbury shown on mileposts between the Iron Bridge and Bridgnorth. Local innkeepers also attempted to attract travellers to use the Iron Bridge. The landlord of the Swan described it in an advertisement as "that incomparable piece of architecture" while in 1786 an advertisement for the Tontine Hotel, in which many of the proprietors held shares, declared that it was situated "close to the Cast Iron Bridge, so universally admired, in the centre of a most Romantic country".

The Iron Bridge as a spectacle

Long before the Iron Bridge was opened to traffic it was realised that it was a spectacle which would attract visitors. A relative of the Darby family staying at Coalbrookdale in 1776 forecast that it would be "one of the great curiosities this Nation or any other can boast of". Views of the bridge by a 'capital artist' were being advertised as early as June 1780. In January 1781 the bridge proprietors paid £29 to Michael Angelo Rooker, scene painter at the Haymarket Theatre, to travel to Shropshire to make a drawing of the bridge, engravings of which were on sale the following May. Numerous other pictures of the bridge were painted and drawn by the many prominent and not-so-prominent artists who visited the Gorge in the late eighteenth century and the first decade of the nineteenth.

In the earliest views of local industry, like the William Williams drawings of Coalbrookdale of 1777, people tend to be looking away from rather than towards the industrial monuments. In almost every eighteenth century view of the Iron Bridge puny and insignificant human beings are to be seen admiring it. The bridge was more than just an important development in civil engineering. It was part of a sublime Romantic spectacle which helped to change the way in which artists, and ultimately other people, looked upon the achievements of industry.

Later iron bridges

In spite of the visual impact of the Iron Bridge it was over a decade before more bridges were built of iron. Two were erected on the continent in 1791; one, cast by the Coalbrookdale Company, over a canal in the Netherlands, the other, a wrought-iron replica of the Coalbrookdale bridge at about a quarter of the scale, at Worlitz near Magdeburg in Prussia. A similar replica had been erected at Raincy near Paris a little earlier. In 1794 the Coalbrookdale Company cast a bridge which was erected somewhere on the extensive estates of the Marquis of Stafford, and in 1795 a bridge over the Teme at Stanford to the design of John Nash collapsed shortly after it was erected. The first iron bridge to rival in fame that at Coalbrookdale was the one built over the Wear at Sunderland under the direction of Rowland Burdon which was completed in 1796. After 1795 iron bridges came into fashion probably because people were favourably impressed by the survival of the Coalbrookdale bridge during the great flood of February of that year which severely damaged every other bridge over the Severn.

At Coalbrookdale

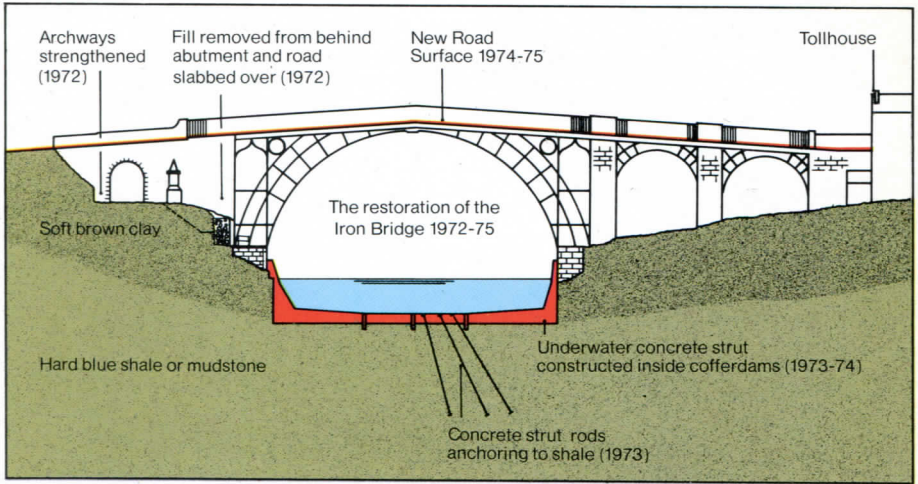
"the noble arch . . . exulting as it were in the strength of its connected massy ribs, reared its lofty head triumphantly above the mighty torrent, and would have given an undaunted and generous reception to double the quantity: neither huge logs of timber nor parts of houses which came with such mighty force made any impression on it — it firmly stood and dauntless braved the storm".

During the next decade the Coalbrookdale ironworks secured orders for numerous other iron bridges, including those at Cound, Bridgwater and Bristol Docks, and one exported to Jamaica. At the same time Thomas Telford began to employ iron for bridges on County roads in Shropshire, of which one notable example at Aston Cantlop still survives. (SJ 517063).

The Twentieth Century

The Coalbrookdale iron bridge has lasted much longer than any of its immediate successors. Indeed with the exception of the Cound bridge of 1797 it is probably the only eighteenth century iron bridge which remains intact. Nevertheless it has not been able to cope with the increasing density of traffic during the last seventy years. In 1909 pressure on it was relieved with the opening of the reinforced concrete 'Free Bridge', about half a mile downstream. Traffic passing over the Iron Bridge still had to pay tolls so that much of it was doubtless diverted. In 1931 the bridge was closed to vehicular traffic, though it remained open for pedestrians who had to pay a penny toll at the toll house on the south side. In 1950 the trustees handed it over to the administration of the

Shropshire County Council, upon which it was freed from toll. It had long been realised that substantial repairs were needed, which posed many engineering problems. These were finally resolved in 1971-2 when money for the repair work was raised by the Ironbridge Gorge Museum Trust.



The restoration of the Iron Bridge 1972-75.

The work of reconstruction eventually commenced in 1972, when a framework of concrete and steel was erected inside the north abutment, which had previously been filled with ashes and slag. In 1973 and 1974 an inverted concrete arch was constructed in the bed of the river to keep the abutments apart. The following year the road surface on the bridge was replaced, and the tollhouse was opened by the Ironbridge Gorge Museum Trust as an information centre, with a display illustrating the history of the bridge. Here can be seen a portrait of Thomas Farnolls Pritchard, a part of one of the wooden patterns used to make the moulds in which the iron ribs were cast, and a selection of early prints of the bridge.

TABLE of TOLLS.

For every time they pass over this BRIDGE.

For every Coach, Landau, Hearse, Chaise, Chair, or such like	8 d
Carriages drawn by Six Horses, Mares, Geldings, or Mules	2.0
Ditto by Four Ditto	1.0
Ditto by Two Ditto	1.0
Ditto by One Ditto	0.6
For every Horse, Mule, Ass, pair of Oxen, Drawing or Harness'd to draw any Wagon, Cart, or such like carriage, for each Horse	0.3
For a Horse, Mule, or Ass, laden or unladen, and not drawing	0.4
For a Horse, Mule, or Ass carrying double	0.2
For an Ox, Cow, or neat cattle	0.1
For a Calf, Pig, Sheep, or lamb	0.04
For every Horse, Mule, Ass, or carriage going on the roads and not over the Bridge, half the said tolls.	
For every Foot passenger, going over the Bridge	0.04

N.B. This Bridge being private property, every Officer or Soldier, whether on duty or not, is liable to pay toll for passing over, as well as every baggage waggon, mail coach, or the Royal Family.

Table of tolls displayed on the Iron Bridge Tollhouse.
David Knight.