

The old wireworks and ironworks of the Angidy Valley at Tintern, Gwent

by H W Paar and D G Tucker

Introduction

Tintern, a village on the tidal part of the River Wye, in Monmouthshire (now the new county of Gwent), is famous for the ruins of its abbey, but the casual visitor does not know that Tintern was for nearly three and a half centuries an important industrial centre. Here, Britain's first water-powered wire-drawing works were set up in 1566, and by the mid-eighteenth century there was a large complex of iron and wire works spreading from the banks of the River Wye up the valley of the small Angidy river for nearly two miles, entirely water-powered, and in 1821 using 20 waterwheels. There were eventually twelve dams (or dammed ponds), and some extensive leats. The iron and wire works finally closed in 1901. Now there are very few remains except for the ponds which add to the charm and beauty of this steep-sided, well-wooded little valley.

The financial and managerial history of the Tintern works has been told before, (1,2,3,4,5,6) but the published accounts do not say much about the events of the 18th and 19th centuries, or about the geography of the works, and this paper particularly attempts to deal with these matters. The Angidy valley also sheltered several corn water-mills, reference to which is confined to the caption to Fig. 1, except in cases where mills were incorporated into the iron industry.

The general layout of the Angidy river system and of the ponds, leats and mills is shown in Fig. 1, the caption to which lists the thirteen mill sites (there were many more than 13 individual mill buildings) in terms of their 19th-century designations.

The early history of wire- and iron-making at Tintern

In centuries past, one of the largest, and probably the most important, of uses for wire was in the making of "cards" for the preparation of wool for spinning; others were for bird-cages, knitting needles, curtain rings, small chains, etc. In the mid-sixteenth century the British hand-drawn product was inferior to that of the Continent. It was, however, official Government policy to make Britain less dependent on imports. Thus William Humfrey, Assay Master of the Royal Mint in London, was able to get support for the establishment of a wire-making industry at Tintern using water power, in 1566. It was at first intended to make brass and brass wire at Tintern, and Humfrey went to Saxony to obtain the services of an expert, Christopher Schutz, who came to Tintern in 1566. However, only a small amount of brass was made, and he started to draw iron wire instead. At first this was not very successful, as much experimenting was necessary and it proved difficult to get suitable iron as exceptional ductility and tenacity were required. An iron known as Osmond iron was really necessary. Further foreign experts had to be obtained and all this caused about two and a half years of delay.

Eventually iron wire drawing proved lucrative, and much wire was sold.

In 1568 the works were taken over by the Company or

Society of the Mineral and Battery Works, who held the lease until 1631.

It was said that by 1597 there were 5000 workers employed in different parts of the country making goods from Tintern wire. Such was the demand for wire that the Company built a second wireworks in 1606-7 at Whitebrook, a few miles to the north of Tintern. (7,8)

For a long time the Company had a legally-enforced complete monopoly of wire-making in Britain, although several attempts were made to break it. (1)

Iron-making at Tintern

We do not know when the furnace and forges at Tintern were first built. In the early days of the wireworks the Osmond iron was made at Monkswood, where for a time the forge belonged to the wireworks. The raw iron used was made by the bloomery process. When blast-furnace iron came to be used as the raw material is not clear. There were charcoal blast furnaces around Pontypool in the last two or three decades of the sixteenth century, but it is unlikely that their product was used for making Osmond iron.

It has been suggested that there were two different furnace sites (1,2) but we have been unable to find any positive evidence for more than one.

The early furnace was a large and efficient one, producing in 1672-3 no less than 1142 tons of pig iron in 62 working weeks, and in 1675-6, 1034 tons in 61 weeks, using a mixed charge of cinders and myne (ie ore) in the ratio of two to one (9). In the accounts (10) for the year 4 August 1694 to 31 July 1695, the amount of pig iron "made this Blast" was 943 tons, and it appears that about 2000 loads of charcoal were used for this, with 1374 dozen bushels of "Iron Oar". Stocks of ore were held at "Brockwear, Redbrook and Abby Back", and stocks of cinders at "Monmouth, Abby Back, Brockwear" and at the furnaces.

There were two (and almost certainly three) forges by 1690, for account books (11) refer to the Upper and Lower Forges and to Bont Seyson (sic) Forge. Indeed, the forge at Pont-y-Saeson must have been built by 1675, for it is shown in John Ogilby's map of that date (12). The accounts previously quoted (10) give some details of production at the Upper and Lower Forges. For example, in the year ending July 1695, the Upper Forge produced over 61 tons of Osmond iron, nearly all for the wireworks, and the Lower Forge produced over 81 tons of merchant and bar iron. That the Upper and Pont Saison Forges were separate is reasonably certain, as sites are known, from later records, for three forges.

Lessees and operators at Tintern

The land on which the Tintern works were built belonged to the Earls of Worcester, who later became the Dukes of Beaufort, throughout the existence of the works. The operators of the works were lessees except during the period up to 1631 when the Company of Mineral and Battery Works were the lessees and then the operators were sub-

lessees ("farmers") of the Company. For the sixteenth and seventeenth centuries, Rees gives details of the operators, and from his involved account Section A of Appendix 1 has been prepared. The present authors have found only one discordant piece of evidence, which is noted.

When it comes to the eighteenth and nineteenth centuries, however, there is no clear comprehensive account of the matter, and Section B of Appendix 1 has been put together from a large number of sources. Several contradictions are included, which cannot at present be resolved.

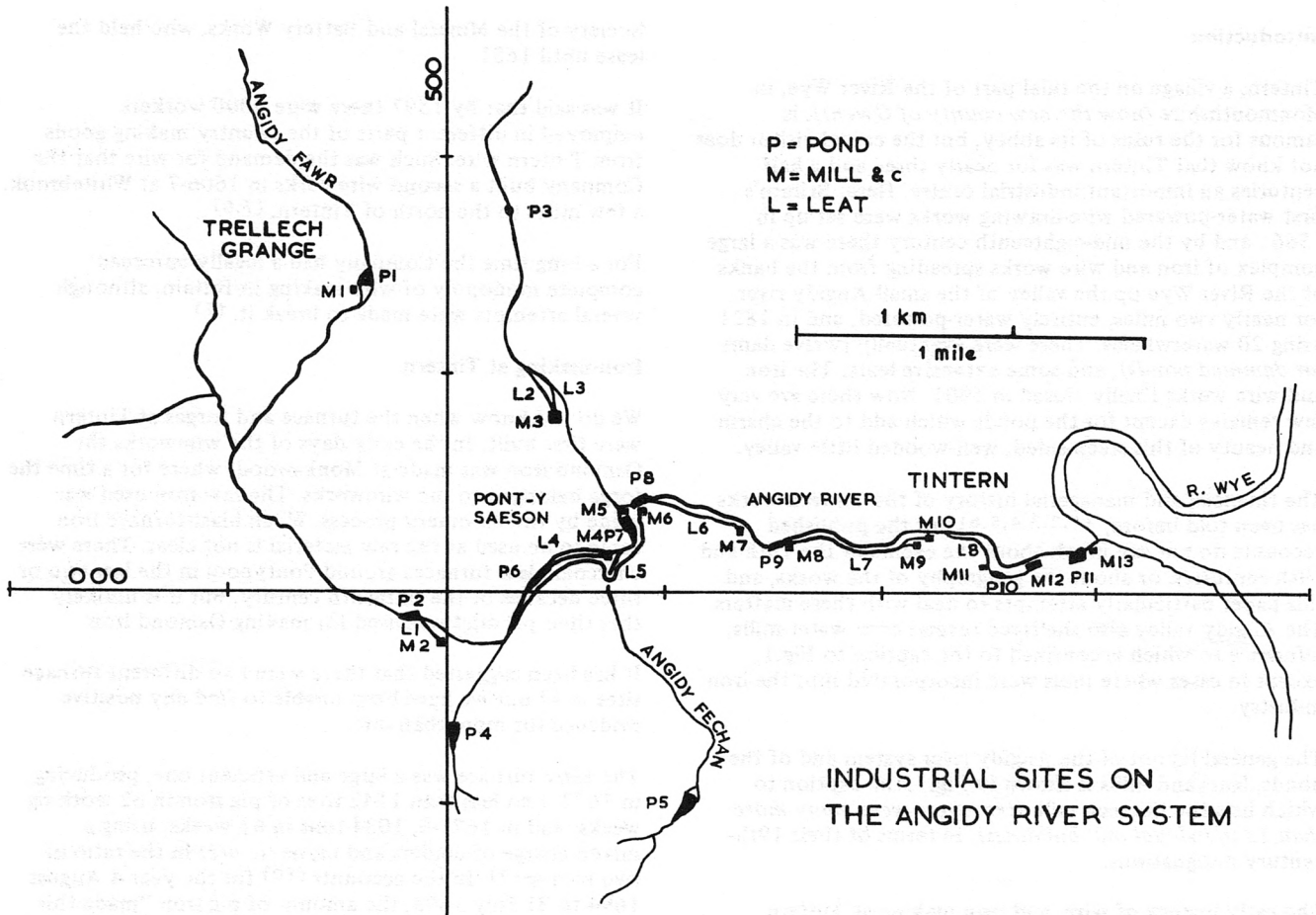


Fig 1

Map of the industrial sites on the Angidy river system at Tintern. P = pond, M = mill, works, etc., L = leat

- M1 Trellech Grange Mill with pond P1 (*building used as house, ancient mill site*)
- M2 Panta Mill with pond P2 (*demolished, probably early 19th century*)
- M3 Unknown mill (*derelict, two leats at different levels*)
- P3 Farm pond
- P4 Fedw Pool (*fish pond/storage pond*)
- P5 Fair oak Pond (*fish pond/storage pond*)
- P6 Probably a fairly modern pond associated with extraction of water from river for augmenting public water supply

- M4 Pontsaison Mill
- M5 Pontsaison Forge with "Forge Pond" P7
- M6 New Tongs Mill (*Upper Wireworks*) built about 1803
- M7 Blast Furnace with "Furnace Pond" P8
- M8 Tilting Mill
- M9 Chapel Wire Mill (*formerly Oil Mill*)
- M10 Middle Wire Mill
- P9 Pond for M8, M9, M10
- M11 Hammer House; Little Block Mill
- M12 Lower Wireworks with Pond P10
- M13 Abbey (*or Lower*) Forge and Corn Mill with "Forge Pond" P11

Corn-mills embodied in the industrial complex

There were undoubtedly mills on the Angidy river system in medieval times, and when the wireworks had been established over half-a-century, we find references to grist-mills within the workworks:- (13)

"In 1625 Lord Herbert, son of the Earl further pressed for the release of the ripping-house at Tintern in order to set up a grist-mill there, a request that was granted.

"In 1629 the position was complicated by the action of a tenant of the Earl, Gwenllian Welsh, whose mill, built when the works were idle, had become incorporated into the Tintern lease without any stipulation as to its legal position, and Welsh, after receiving a lease on the site from the Earl, imposed a rent of £7 on the use of the water-course, which she threatened to close."

It is not clear whether one, or two separate mills are involved here.

In 1742, Richard White's lease of the wireworks included a "Mill called Abby Orchard". It is a source of much confusion that there is an area and hamlet in the Angidy Valley about half-way between the Wye and Pont-y-Saeson which is called Abbey. This mill would almost certainly be at this place, and could just possibly be the same as "Abby'es mill" which was leased to Thomas and William Jordan in 1707 with the description "that ancient water Grist Mill commonly called Abby'es mill and now lately converted into an Oyle mill and other sorts of mills"(15). This mill was at the site marked M9 in Fig.1. It had evidently been converted for grinding linseed to extract the oil, and was still an oil mill in 1763 (16), belonging to "Mr Jorden", but became a wire-drawing mill before 1813, when it is included in a lease of the whole Tintern works to Robert Thompson as "Wire Mill formerly an Oil Mill" at a rent of £14 pa (17). In 1763 there was a reference (18) to "Pontsaison Mill" at the site marked M4 in Fig.1. John Aram's maps clearly show the leats marked L7 and L4 in Fig.1, leading to the Oil Mill and Pontsaison Mill respectively. These mills were located quite explicitly in his maps, at points which now have the OS grid references SO 521 003 and 508 001 (5) respectively. Pontsaison Mill was again referred to in a lease of 1813 (19).

In 1821 we find the Abbey Corn Mill close to the Lower or Abbey Forge at grid ref. SO 529 002 approximately (20). Its equipment is included in the schedules reproduced in Appendix 2, from which we see it had three pairs of stones.

THE DEVELOPMENT OF THE ANGIDY VALLEY SITES IN THE EIGHTEENTH AND NINETEENTH CENTURIES

There must have been some continuing development of the works along the Angidy river between the Wye and Pont-y-Saeson during the early part of the eighteenth century, but little definite information seems to be available until 1763.

In 1707 there is an interesting reference (21) to "a place called ye wirepool" which was higher up the valley than the oil mill. This was presumably one of the ponds in which wire was placed for the process known as "watering".

In 1739 we have an inventory of stock (22) at the "Abby Wyre Works & Pontsaison Forge". This unfortunately does not include a list of equipment, but the materials

in stock were valued at £1514, and very little of this was finished wire awaiting sale; it was mostly the raw materials for wire making, suggesting a healthy business. Nevertheless, shortly afterwards Thomas Price, who had been running the works for a short while as executor of the lessee Francis Price who died in 1739, petitioned the Duke of Beaufort to take over the works (23).

The first definite information regarding the location and extent of the works sites appears in the very fine volume of maps (24) produced in the survey of the Duke of Beaufort's estates by John Aram in 1763. These maps, mostly on the scale of 1 inch to 4 chains (or 1 : 3168), give considerable detail. Referring to our Fig.1, we find the following shown as in existence in 1763:-

"Pontsaison Mill" (M4) with a leat (L4) about 300 yards long, but no pond (ie P6 not in existence). The Angidy Fechan (or Killkerks Brook as it is marked) is at least partially diverted westwards to augment the flow in the leat.

"The Forge Pound" (P7) with "The Forge" (M5)

"The Furnace Pound" (P8) with a leat (L6) to "The Furnace" (M7).

"The Pound belonging to the Wire Works" (P9) with "The Water Course to the Oyl Mill" (L7) and "The Oyl Mill" (M9), together with a short branch leat which fed "The Upper Wire Works" (M10), "The Hammer Houses" and "The Block House" (M11).

"The Lower Wire Works" (M12) with a leat (L8) but no pond (ie P10 not in existence).

"The Forge Pound" (P11) and "The Forge" (M13).

It will be clear from what follows that the Tintern industrial complex in the Angidy valley was, by the mid-eighteenth century, already well developed and, in terms of sites occupied, not very far from its ultimate development.

Later the sites were mapped in great detail, on the scale of 25 inches to 1 mile, in successive indentures of lease; that of 1821 (25) not only includes a fine map, but also gives a schedule of all the equipment in all the works and mills. This is so important in assessing the nature and size of the works that it is reproduced in full as Appendix 2:

Figs. 2, 3, 4 and 5 show the layout of the different parts of the Angidy complex approximately as given in the map. Everything shown in Fig.1 is now present except the pond P10.

Appendix 2 will tell its own story to the industrial archaeologist. We may note here that the Oil Mill of 1763 is now the Chapel Wire Mill, the tongs mill has been changed from "Upper" to "Middle", and the Abbey Corn Mill is part of the wireworks organization. The New Tongs Mill or Upper Wireworks (M6) with its long leat had been built about 1803 (26). The "Tilting Mill" (M8) just below the dam of pond P9 was evidently also built between 1763 and 1821. A count of the waterwheels in the schedule gives a total of 20 for the works and mills between Pont-y-Saeson and the Wye. The "river" (only a small stream) was evidently fairly fully utilized.

The equipment schedules of Appendix 2 show that the

wiredrawing plant comprised 12 pairs of tongs and 23 blocks. When Robert Thompson leased the works in 1799, there had been only 10 pairs of tongs and 10 blocks, (56) so he evidently expanded the wiredrawing capacity very considerably.

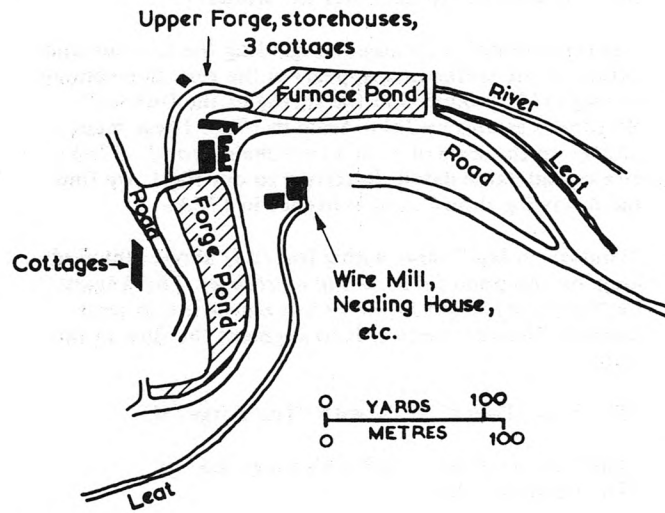


Fig 2 Map of works at Pont-y-Saeson, 1821

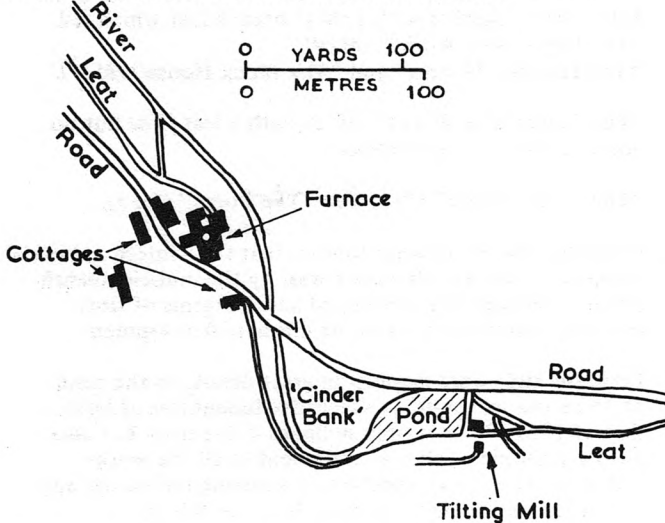


Fig 3 Map of works at Furnace and Pond P9, 1821

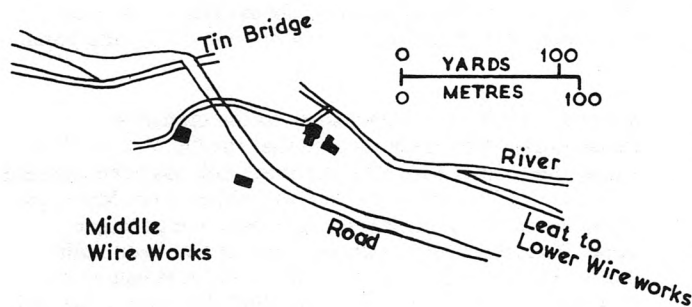


Fig 4 Map of works at the "middle" site (M9 and M10), 1821

Unfortunately the 1821 map (and also its successors in the leases of 1866 (27) and 1878 (28)) does not show the

actual names or purposes of the individual buildings.

Little is known of the state of business in the middle half of the nineteenth century, but it is likely that it was not always good. In 1838 the Messrs Brown were trying to dispose of the lease of their works, and their advertisement(29) largely confirms the list of mills given in Appendix 2, and also shows that the wireworks complex included no fewer than 3 dwelling houses, 39 cottages, 3 farms, and miscellaneous gardens, etc. It mentions the "wet Dock and Wharfs" and then states:-

"A large sum has been expended by the present tenants in enlarging and improving these works, and every preparation has been made to put down a steam engine; but owing to the declining health of the senior partner, and the other partner being obliged to attend to their business in Yorkshire . . ."

It appears that the works were running down. It is fairly certain that no steam engine was ever installed. It also seems from later documents that the Browns were unsuccessful in disposing of their lease. Nevertheless, the wireworks were reported as being "in prosperous operation" in 1863.(5)

The maps of 1866 and 1878 show how the works changed during the middle half of the century. From the 1866 map we learn that the small pond P10 had been inserted in the leat to the Lower Wire Works since 1821, and that the furnace was definitely disused, being marked only as "Site of Old Furnace". By 1878 the Upper Wire Works (M6) had gone out of use, being marked "Site of Wire Mill, etc"; this mill had thus existed for less than 75 years.

Although the wireworks were in decline in the 1870's, the Duke of Beaufort insisted on the Wye Valley Railway building a branch across the river to the Lower Wireworks (M12), in order to secure the advantage of improved transport for the works. The branch was opened with the main line in 1876.(30)

However, there was a general slump in the British wire trade at that time (31) and the wireworks did not recover; so it was decided to embark on the manufacture of tinsplate at the Lower Wireworks site. A new group of people leased the works in 1878 and started trading as J R Griffiths and Company (32) (or as the Abbey Tintern Wire and Tinsplate Company) in February 1880, despatching their first waterborne cargo of tinsplate on 14 April 1880:-

"The Abbey Tintern Wire and Tin-plate Company sent off their first cargo (70 tons) of tin down the Wye by the steamer ALBERT of Chepstow on Wednesday, Mr Josiah Richards and others interested in the manufacture being present. The company sent off several trucks of tin to Liverpool and Birkenhead last week."(33)

The plant had two rolling mills and "The Cold Rolls were worked by water power."(32)

It is probable that some wire-making continued for a time; Grey-Davies (34) says so, and the trade of "wiredrawer" continued to occur in the parish registers until 1888.(35) Brooke suggests that Griffiths and Co ceased trading in May 1895, when the works were taken over by the Abbey Tintern Tinsplate Company. It is certain that the works were faring badly at this time, for on 1 June 1895 it was reported that (36)

"the Tintern Tin Works, which have been going most

irregularly for some time past, closed up last Saturday, with no hope of an immediate restart. This is a serious blow for the neighbourhood, as the men, unless something is forthcoming soon, will have to remove, and the loss of about £100 a week in circulation must of necessity affect others beside the workpeople. On Wednesday the agents of the Duke of Beaufort placed Mr Coomber, bailiff of Chepstow, in possession for arrear of rent and unless an arrangement is come to a sale of all the loose plant and stock will be held on Monday."

Presumably some arrangement was made which prolonged activity for a while. However, the business had finally failed by 1900, and as it could not be sold as a going concern, it was put up for auction in small lots on 10 January 1901 "under instruction from the debenture holders." (37) Including not only the tinplate rolls and other plant but also the locomotive and trucks of the branch railway, it sold for about £1500.

The tinplate works site was used for industrial purposes for many years, first as a stone sawmill, later adapted to timber.

A local tradition for which no documentary evidence has so far been found has been told us by elderly local inhabitants and is worth recording as a tailpiece to this part of the paper. It is that some part of the first Atlantic telegraph cable was made in Tintern in 1857(38), and that the barge RINGDOVE was used for transporting it.

THE INDUSTRIAL ARCHAEOLOGY OF THE ANGIDY COMPLEX

Having outlined the history of the industrial activities that occupied the Angidy valley for so many centuries, it now remains to describe their present-day remnants and, where possible, to deduce something of the former arrangements. It is convenient to treat the subject geographically, working down the stream.

Pont-y-Saeson iron works

Forge Pond (P7) is still in good condition as far as the dam is concerned, but is rather silted up. There are few remains of the Upper Forge itself, once a considerable establishment as shown by the 1821 map (Fig.2) but now represented only by the few remains shown in the plan of Fig.7. It is probable that the water-wheel shown in Appendix 2 was immediately below the dam, in the large rectangular block shown in the 1821 map (indeed, *Aram* shows two wheels there in 1763), and that the fineries, with their chimneys, were in the comb-shaped block to the east.

Although the remains of the Upper Wireworks (or *New Tongs Mill*) are fragmentary, there are sufficient to enable some idea of the layout to be determined, as shown in the plan of Fig.8 which confirms the crude plan of 1821. The long leat (L5) which took water from high up the Angidy Fawr and crossed the Angidy Fechan by a stone structure that probably enabled water from the latter also to be taken, entered the wireworks at the eastern end and supplied a water-wheel which was probably of about 6m diameter and anything up to 2.5m wide. The wheel-pit is still quite distinct and adjoins the remains of the drawing-mill, a building about 12m x 7m which would probably have been of three stories, but now shows only small portions of the lower walls. To the west lie the remains of the annealing furnace; merely a small hearth and some pieces of wall remain. Possibly this furnace was of the tower type

as used for the annealing of brass wire at Kelston, near Bristol, and illustrated elsewhere (39). The whole site was a very awkward one, on a steep slope high above the road, so that very extensive retaining walls were needed. The road approach to the site is from the east, by a lane from the valley road.

The blast furnace site

Furnace Pond (P8) is in very good condition, although the dam has probably been rebuilt in comparatively recent times to carry an enlarged road. The leat ran from the southern end of the dam; now, thanks to the good work of the Forestry Commission, who have cleared the whole route of the leat and the whole furnace site, the leat can be followed for the whole of its length. It comes to an end about 45m from the furnace itself, in a somewhat widened terminal basin, as shown in Fig.9, and at an elevation of about 10m above the river level.

The plan shows the layout of the site as it exists. It is not easy to interpret it. The remains of the furnace itself are clear enough. There is only a fraction of the furnace structure left, as can be seen from the photographs, but it is clear that it was about 3m diameter internally at the widest point, and its height could not have exceeded 6m. It was a broader furnace than the 17th century furnace at Coed Ithel(40), a few miles to the North; this had a maximum diameter of 2.3m. However, the Tintern furnace was in use until about 1826, and if it really had operated on this site since the 17th century, it would have been rebuilt once or twice, and it may well have started like Coed Ithel. David Mushet(41) stated that at the end of the 18th century Tintern furnace could produce pig iron at the rate of about 1500 tons per year, and was helped to do this by the introduction of blowing cylinders in place of the older bellows, being, he believed, the first charcoal furnace thus equipped in this country. It will be noted from Appendix 2 that all blowing at Tintern was done by cylinders, the three forges, like the furnace, each having two cylinders. Mushet stated that the Tintern furnace went out of blast around 1826 and was later used for experiments with Wootz ore.(42)

The blast furnace was built where the slope of the land made it easy to load the furnace on its north-west side, and to tap it on the south-east side. The low-level area at the south-east corner of the plan must have been the casting floor. Adjacent to the furnace on the north-east is a large pit, stone-lined, which must have contained the water-wheel and blowing cylinders. In spite of limited excavation to the level of the river water, no tail race arch has been found, nor is there anywhere any sign of a tail race. The water from the leat must have been brought to the wheel by an elevated wooden launder. According to the 1821 maps, (see Fig.3) the leat did indeed connect with this pit; moreover, *Aram* showed the wheel here in 1763.

It is probable that the areas around the furnace were covered by a roof; not only does the 1821 map suggest this, but Appendix 2 refers to the Bridgehouse and Castinghouse. There were also several offices and sheds, and a Mine Kiln (ie an ore-roasting kiln). The positions of these could be determined only by a very large-scale excavation.

A curious feature of the 1821 map is the 'Cinder Bank' between the road and the river to the south of the furnace site. The river does not now flow on the course indicated, nor did it when the 25 in.O.S maps were surveyed in 1879, but instead takes a course very close to the road. There is plenty of slag and cinder both in the river bed and between it and the other little stream indicated.

The middle works

If we define the middle works as those from Pond P9 down to Mill M10, then we have a group of works of which practically nothing remains except the pond and leat. The pond is in good condition (*the angling interests account for the present good state of so many of the ponds*). The leat, like all the others, is a wide one and can be followed throughout its length. It terminates abruptly on the hillside above where the middle wireworks were, at an elevation of about 12m above the Angidy. There appear to be two places where wooden launders might have taken the water down to a mill, and this is consistent with Aram's maps, which show two separate branches of the leat, as indicated in Fig.1. Below the first place there is an obviously artificially-constructed flat area about 6m above the river, and we may suppose that this was the site of the original corn-mill which became the oil-mill and finally the Chapel Wire mill; this would agree with the markings on Aram's map. The site is now used as a garden and there is no sign whatever of former buildings.



A Remains of blast furnace at Tintern, showing interior; white ruler is 1 ft in length.



B General view over blast furnace site, showing interior of furnace on left and wheel pit and blowing house in right foreground.

Aram's map appears to show the rest of the works, as existing at the middle site in 1763, located beside the river. There are some retaining walls here, obviously very old, which could have been the back walls of some of the buildings; there are also some a little further along, near

where the leat commences that fed the Lower Wireworks. Since we have to account for the Middle Forge (*see Appendix 2*) as well as the Middle Tongs Mill, it is tempting to consider these areas as likely to have been at least associated with the works, but there is no evidence for this, and they were certainly not industrial sites on Aram's map of 1763. He shows the works as being where a pair of houses (*dated 1904*) now stands. There is a special feature connected with the easternmost house of this pair which lends support to this having been a works site. A public footpath descends from the upper road through the garden and right alongside the eastern wall of the house, and is in consequence rather embarrassing to use. But if this was the path into the forge and wiremill, what more natural place would one expect?

Another special feature which suggests the location of another works building is that a bungalow has been built on a platform spanning the Angidy river just where Aram shows part of the works. One must suppose that the platform was the original foundation of the works, merely utilised by the more modern building because it was already there. Smart ⁽³⁸⁾ refers to this site and says there used to be a nail factory here.

Since the Chapel Wire Mill, the Middle Tongs Mill and the Middle Forge each had two water wheels, we have to account for six in all, and there is now no sign of where they could have been or how the water was got to them.

One other mill has to be accounted for in the middle group – the Tilting Mill (*M8*). The maps indicate the site of this as being immediately below the dam of Pond P9. From the schedules, it does not appear to have been a very large mill, and it is therefore just possible that some stonework in the present river bed could have been its foundations.

The lower wireworks

The leat supplying water power to the lower works left the Angidy at a small weir, the remains of which can still be seen, by means of a sluice-gate which still remains but has been blocked up. Parts of this leat are in very good condition, with the stone sides intact, but other parts have been filled in. This leat carried water for the turbine at what became the sawmill until the 1930s.

At the big bend shown at M11 in Fig.1 there were shown on Aram's map the Hammer Houses. In the schedules of 1821 no units of this description were included, nor were the buildings at this point identified on the 1821 map. On the other hand, the 1866 map quite specifically labels these buildings as part of the Lower Wireworks, thus inferring that they were still in use. The only conclusion that we can thus draw is that these buildings were part of the rather large number of individual units included in the 1821 schedules from Gig Mill down to Lower Block Mill, and that they were most likely to be the Gig Mill ⁽⁴³⁾ and Little Block Mill. If this is correct, there were two water wheels at the mills M11. At this point the leat comes to an end now at a level about 3m above that of the pond P10, which we have already shown to have been a mid-19th century addition. Presumably, therefore, the mills (*M11*) used a head of 3m. Nothing remains on the site except the rear retaining wall.

What seems to have been generally called the Lower Wireworks, ie M12 on Fig.1, was evidently an assembly of seven separate buildings, three of which (*a scouring mill, a rolling mill, and a wiredrawing or block mill*) used water wheels. In 1763 Aram showed three separate leats or

launders to three water wheels, yet the 1821 map shows only two, these being the two eastermost of Aram's map.

How the water wheels were disposed is not known, but support for the small leat, which we have added in Fig.5 at the western end of the site comes from the fact that there remains to the present day a rectangular stone structure, suggestive of a wheel pit, at the north side of the road, in just the position indicated. Under the road at the eastern end of the present Forestry Commission buildings is a large arched opening, which may well be where the leats to the eastern end of the site crossed the road. Immediately to the east of this the large pipe, about 1 m diameter which fed the later turbine, comes down at a steep slope from what must have been the line of the main leat across the road. This pipe is entirely underground. The turbine pit itself, which we think was constructed when the works were going over to tinplate making in 1880, is also entirely underground, about 6 m long by 3.5m wide and deep. At the end of the main pipe a

Y-junction was fitted, with one branch blanked off obviously intended for a second turbine if business later necessitated it. The turbine fitted on the other branch is still in place, complete with governor of the "King's Patent" type. There is no maker's name detectable on the turbine which, as can be seen from the photograph, is a cylindrical type about 1.2m diameter. The pit wheel and shafting which coupled it to the machinery is still in good condition.

We have mentioned that a tramway or branch from the Wye Valley Railway came to this site. Nothing remains to indicate the position of its terminal, but the small embankment beside the Angidy River on which it approached the site can still be seen.

Apart from the features we have mentioned, there seems to be nothing else on this site which can be positively identified with the old wire or tinplate works.

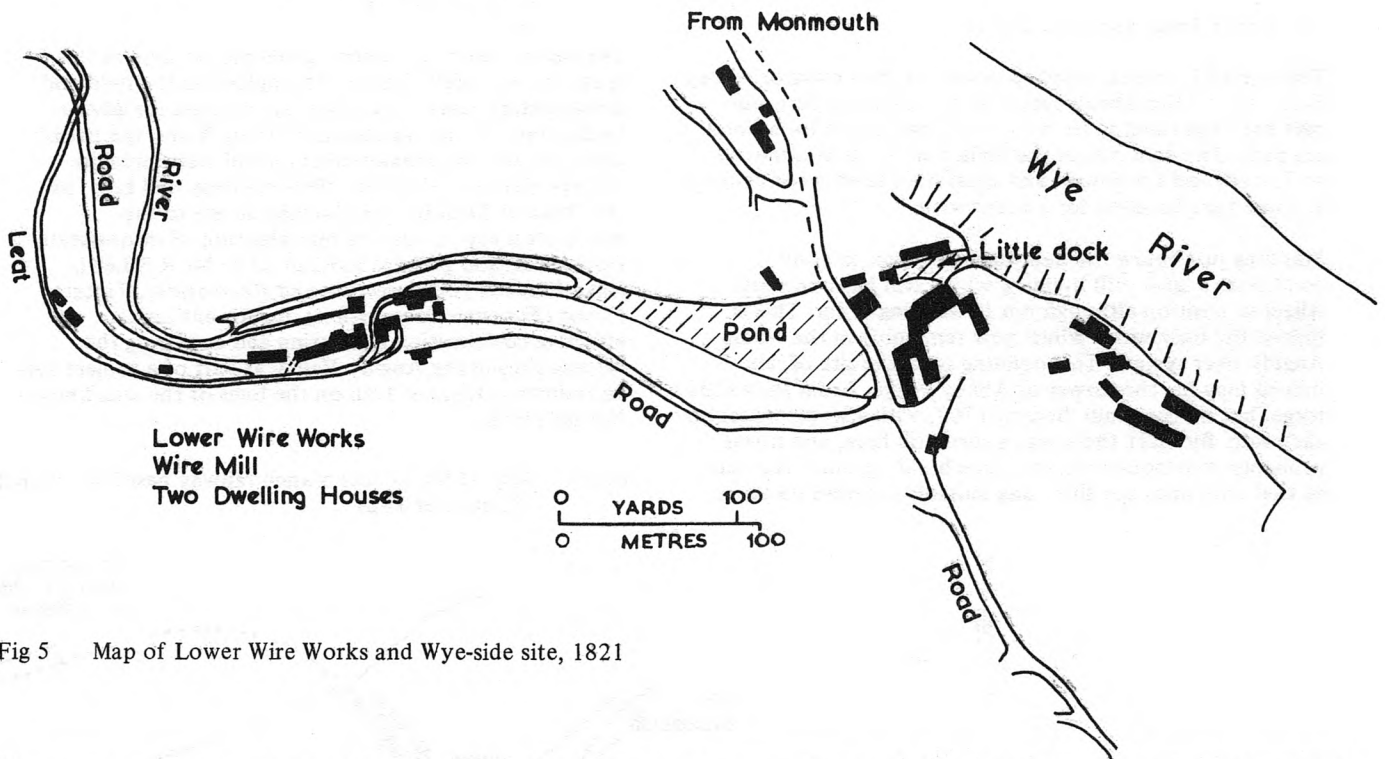
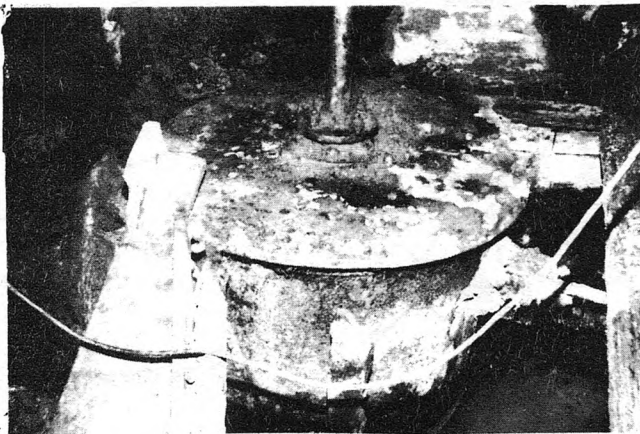


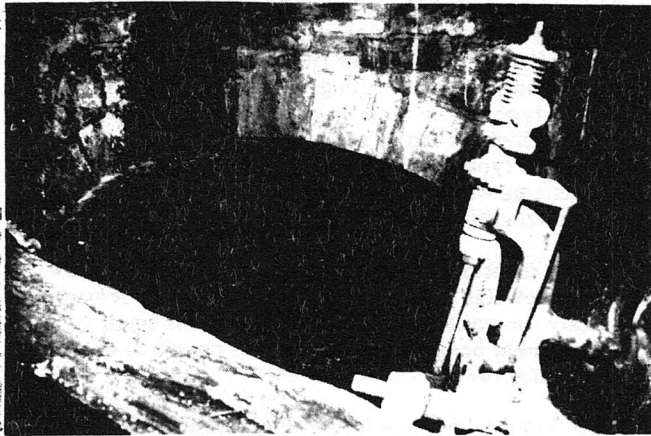
Fig 5 Map of Lower Wire Works and Wye-side site, 1821



C Turbine, probably dating from 1880, in turbine pit at Lower Wireworks site at Tintern. Diameter of turbine casing approximately 4 ft.



D Y-junction in turbine feed pipe at Lower Wireworks site; right-hand branch feeds turbine, left-hand branch blanked off.



E Tail-race arch in turbine pit at Lower Wireworks site, showing displaced governor of turbine.

The Lower Forge and corn mill site

The pond P11 which supplied power to the Lower or Abbey Forge and to the Abbey corn mill still exists in part, but part has been filled in to make additional space for a hotel car-park. The dam carries the main road from Monmouth to Tintern and Chepstow, and must have been reconstructed at some time to allow for a wider road.

Standing just below the dam there remains, in good condition, a large mill building which still has one water wheel in position although not in working order. This is indeed the only water wheel now remaining in the whole Angidy river system. This building is on the site of, and indeed may be, the Lower or Abbey Forge. Aram shows the forge, but no corn mill, here in 1763, with a water wheel on each side. By 1821 there was a corn mill here, and it was probably incorporated in the same building, since the map of that date does not show any suitable separate building.

In that case, there were four water wheels here by that time.

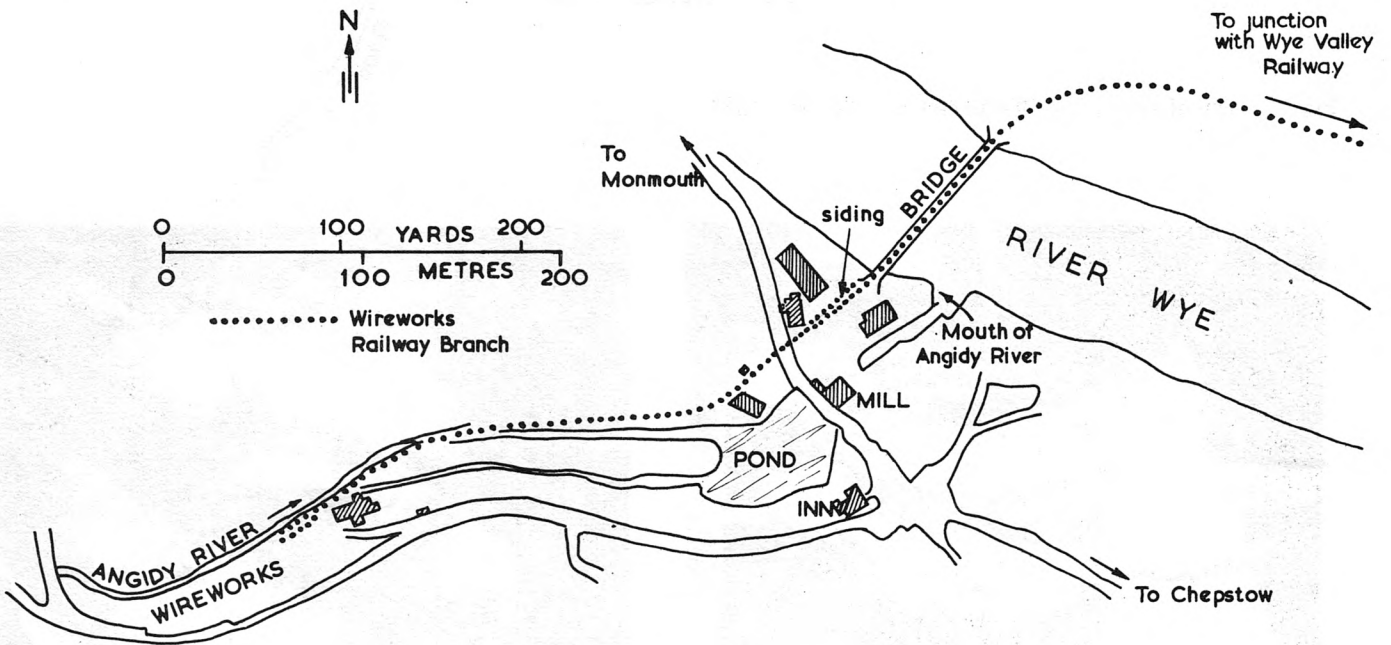
Aram shows other miscellaneous buildings associated with the works, and so does the 1st edition 25 inch O.S map of 1881; and of course, there were several wharfs which have now disappeared, together with the little harbour which at some probably later time, was fitted with tidal gates. This little floating harbour still exists, although its gates have gone, and in fact it forms the mouth of the Angidy. Its walls are sound, but it is understood that it is threatened by development.

Although the forge building remains, there is no sign of its former use for refining and shaping iron – it has had too many subsequent uses as wood turnery, wood sawmill, etc.

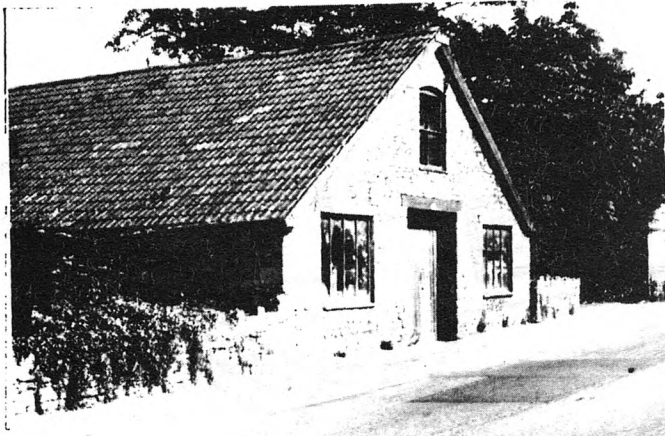
ACKNOWLEDGEMENTS

Thanks are due to a number of people for help in this study: to Mrs Mary Tucker who helped in the field and documentary work; to Dr Norman Mutton for advice; to the staff of the National Library of Wales, the British Museum, and the Monmouthshire and Herefordshire County Record Offices for their courtesy and help; to the Duke of Beaufort for allowing access to the Badminton Papers and the reproduction of information from them; and perhaps most of all to Mr R S Lewis, Head Forester (*Conservation and Recreation*), Tintern Forest (*Forestry Commission*), for his enthusiastic and effective co-operation in clearing and exploring the various sites in the Angidy Valley as part of a project for an Industrial History Trail on the lines of the well-known Nature Trails.

Fig 6 Map of Wireworks branch railway based on 25 inch O.S map of 1921



TINTERN WIREWORKS RAILWAY
(TOTAL LENGTH 1200 YDS.)



F Abbey (Lower) Forge/Corn-mill building at Tintern, west face.



G Abbey (Lower) Forge/Corn-mill building at Tintern, east face. →

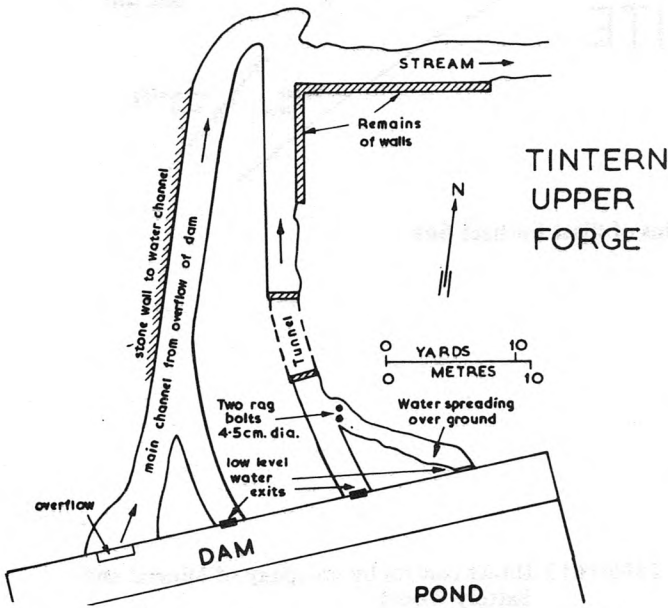
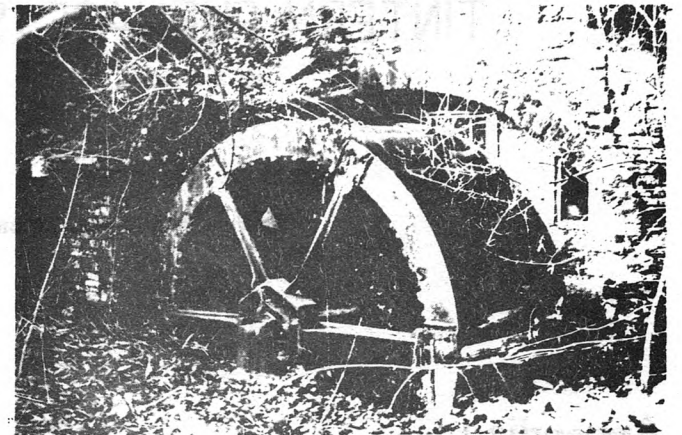
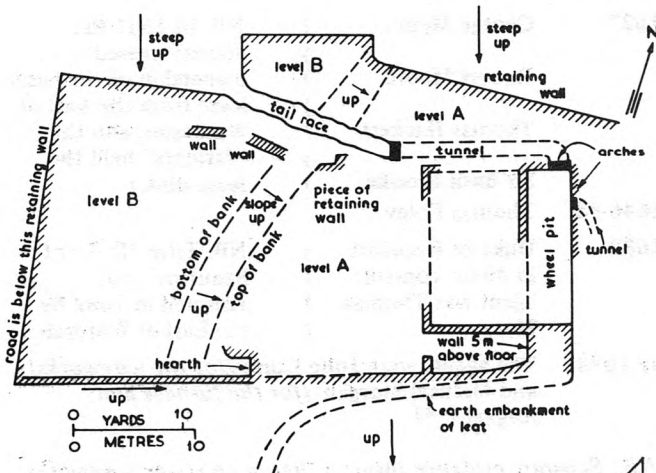


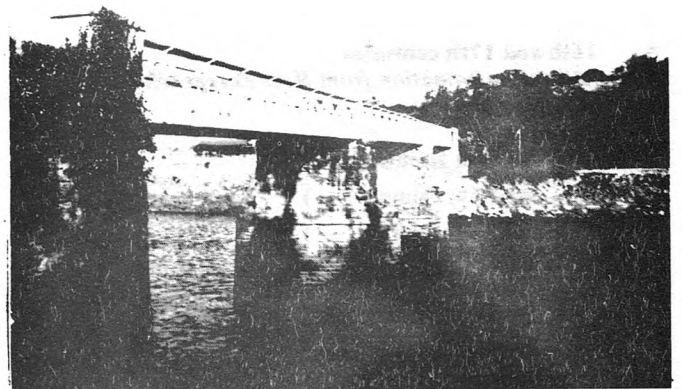
Fig 7 Plan of present remains of Pont-y-Saeson or Upper Forge



H The last remaining water-wheel at Tintern – at the Abbey (Lower) Forge/Corn-mill building.



TINTERN UPPER WIREWORKS ←



I Tramway bridge over River Wye at Tintern.

Fig 8 Plan of present remains of Upper Wireworks or New Tongs Mill

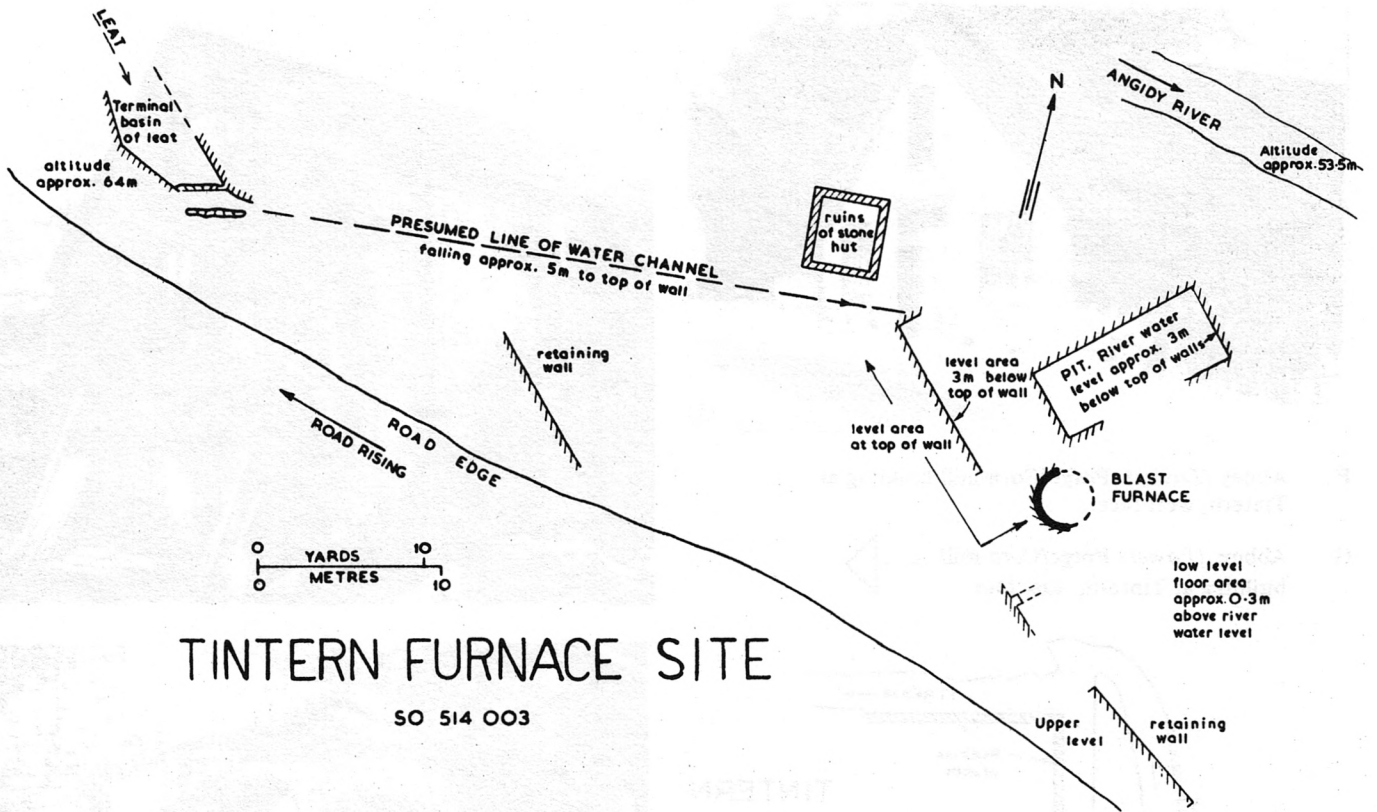


Fig 9 Plan of present remains of Blast Furnace Site

Appendix 1

LESSEES OF TINTERN WIRE AND IRON WORKS

A. 16th and 17th centuries

(All this information from Rees except where otherwise shown)

1566	William Humfrey				
1570-77	Andrew Palmer)			
	John Wheeler)			
	Richard Hanbury	)	as "farmers"		
	Sir Richard Martin	)	Hanbury was the		
	Alderman Gamage	)	chief manager		
	Francis Eaton)			
	John Eccleston)			
1577-80	Martin and Hanbury				
1580-89	Martin				
1589-91	Martin and Hanbury -				
1591-95	John Challenor. George and John Catchmay				
	were also involved during this period.				
1595-1613	Direct control by company of Mineral and Battery Works				
1613-26	Mr Hackett				
1626-27	Mr Webb				
1627-	George Mynne	)		NB. In 1631 the	
	Robert Moore	)		Society ceased'	
	Thomas Hackett	)		ownership of the basic	
	Sir Basil Brooke	)		lease from the Earl of	
	Thomas Foley	)		Worcester, and the	
1646-88	Thomas Foley	)		"farmers" held the	
1688	Duke of Beaufort	)		lease direct	
	in direct control;)			
	agent was Thomas	)		NB. Title "Duke of	
	Morgan	)		Beaufort" was	
		)		assumed in 1682 by	
		)		the Earl of Worcester	
by 1698	The agents were John Curre (for the wireworks) and Michael Morgan (for the furnace and forges) (44)				

(NB. Separate evidence suggests that in 1651 the wireworks were leased to John Gunning and Thomas Foley, and the furnace and lower forge to William Herbert (45).

B. 18th and 19th centuries

- 1704 Thomas Dix leased wireworks and upper forge⁽⁴⁶⁾. Still there 1718 ⁽⁴⁷⁾.
- 1706 George White junior leased furnace and lower forge ⁽⁴⁸⁾.
- 1707-8 John Hanbury of Pontypool held furnace ⁽⁴⁹⁾.
- 1739 Francis Price, to whom Abbey wireworks and Pont-y-Saeson forge had been leased, died⁽⁵⁰⁾.
- 1742 Richard White leased furnace, forge, etc⁽⁵¹⁾. Still in occupation 1754⁽⁵²⁾.
- 1747 Rowland Pytt and Thomas Farmer leased wireworks⁽⁵³⁾. Ironworks leased by Hanbury of Pontypool, then George White, then Edward Jordan ⁽⁵³⁾.
(NB. Schubert says “. . . in the early eighteenth century the wireworks were in the hands of the Foley’s.” There is, however, no evidence to support this statement, which must be presumed to be erroneous).
- 1763 Rowland Pitt in occupation of wireworks and upper forge⁽⁵⁴⁾. Mr Jorden in occupation of remaining ironworks ⁽⁵⁴⁾.
- 1775 David Tanner leased the complete Tintern complex ⁽⁵⁵⁾.
(NB. Rees states that Tanner took the lease in 1755, but this cannot be correct).
- 1799 Robert Thompson leased the complete complex⁽⁵⁵⁾ which had been advertised for sale in 1798⁽⁵⁶⁾. Still in occupation 1813⁽⁵⁷⁾.
- 1821 William Mathews leased the complete complex⁽⁵⁸⁾.
(NB. Rees states that in 1822 Messrs Briggs and Rowbotham were in occupation, followed by Brown and Co.).
- 1828 Lease assigned (by Mathews) to Copley Brown and Jeremiah Sharp Brown⁽⁵⁹⁾.
- in 1848 the Wireworks in occupation of J. Brown, the Abbey Works in occupation of H. Hughes, the Middle Works in occupation of Wm. Crawshay⁽⁶⁰⁾.
(NB. Rees states that in 1850 the works were occupied by John Hughes, but this must be a slip, as a directory shows Henry Hughes as “wire manufacturer” in that year. ⁽⁶¹⁾
- 1866 Murrell and Stothert leased the whole complex⁽⁶²⁾. The works had been in the occupation of Henry Hughes, but were “now unoccupied”.
- 1878 Josiah Richards, John Rowland Griffiths and David Williams leased the whole complex.⁽⁶³⁾ They traded as the Abbey Tintern Wire and Tinsplate Co, and/or as J.R. Griffiths and Co, from 1880 to 1895.
- 1895? Tinsplate works operated by the Abbey Tintern Tinsplate Co.
- 1901 Ironworking ceased for good.

Appendix 2

SCHEDULE “containing a list of all the Machinery Fixtures and Implements in the Iron and Wire Works Corn Mills and other Buildings called the Abbey Works. . . .”

Dated 29 September 1821

At Pontsaison Forge

- 1 Water Wheel for working a Hammer, cast Iron sides Wood Soling and Ladles with a wood Shaft or Beam, cast Iron ring thereon weight 16^C 1^Q and wrought Iron bound.
- 1 Drome Beam containing about 70½ cubical feet
- 1 Water Post)
- 1 Large Lace or Stay)
- 2 small do.)
- 1 Prick post) all wood
- 1 Poppet)
- 1 Cross Key)
- 4 Hammer Arms)

Plummer blocks and sils		T	C	Q	lb
1	Crooked Leg) weight	0.	10.	1.	10
1	Straight Leg with) Cast Iron Boxes under him	0.	10.	1.	17
1	Wood repeat				

1	Wood Hammer Helve				
1	Hurst on d ^o . Cast Iron	0.	3.	0.	0
1	Hammer Do. Do.	0.	5.	1.	0
1	Anvill Do. double faced	0.	6.	0.	0
1	Anvill block d ^o . new	2.	10.	0.	0
1	Standard under the inner) Gudgeon of the Hammer) Beam, Cast Iron)	0.	4.	0.	0
2	Blowing Machines for Fineries with 30 In. Cylinders, Iron Rings and Cams compleat				
3	Finery Chimney Stacks with a Cast Iron to each weighing about 10 ^{cwt}				

New Tongs Mill

- 1 Annealing House and Oven, the casting in the annealing oven included with the oven.
- 1 Water Wheel with Cast Iron centre pieces without a fly.
- 11 pair of Tongs for drawing wire the machinery compleat to the end of the Tongs.

Blast Furnace

Upper Coal house on southside the Road and Mine Kiln adjoining Coal house on the North side with a slope or Shead at the Upper End.

— Stampers —

PAAR/TUCKER: ANGIDY VALLEY

- 1 Water Wheel and Shaft
- 2 Rings on D^o Cast Iron
- 12 Cams – D^o D^o
- 2 Gudgeons in D^o D^o
- 2 Cast Iron uprights for Stamper helves to work in about 12^{cwt}

An Office for the Furnace Stocktaker

A Charcoal Shed near the Office

Blast Furnace Stack Bridgehouse and Castinghouse the Furnace without a Hearth

Blast Furnace machinery consists of 1 water wheel:

2 Cylinders 1 regulator and blast pipes as far as the bag.

Middle Forge

1 Water Wheel for working the hammer, cast Iron sides wood soling and ladles, Wood Shaft or hammerbeam with Cast Iron ring (*weight 16^C 1^Q*) and bound with wrought iron hoops and 2 iron gudgeons

- 1 Drome Beam)
- 1 Water Post)
- 1 Large Lace or Stay)
- 2 Small do^s)
- 1 Prick Post) Wood
- 1 Poppet)
- 1 Cross Key)
- 4 Hammer Arms)

Plummer Blocks & Sils	)	T	C	Q	lb
1 Crooked Leg	)	0.	10.	1.	10
1 Straight Leg with boxes under them	) Cast Iron	0.	10.	1.	17
1 Wood repeat)				
1 Wood Hammer Helve)				
1 Hurst on hammer Helve Cast Iron	)	0.	3.	0.	0
1 Hammer D ^o	) D ^o	0.	5.	1.	0
1 Anvill	) D ^o	0.	9.	0.	0
1 Anvill Block	) D ^o	1.	10.	0.	0
1 Standard under the inner Gudgeon of the Hammer Beam Cast Iron	)	0.	4.	0.	00

- 1 Water Wheel for blowing Machine for the Finery with 2 cylinders 3ft 6ⁱⁿ diameter 2 Rings and 4 Cams in each Ring
- 1 Finery Stack and Cast Iron Lintel

Chapel Wire Mill formerly an Old Mill [should be Oil]

- 1 Water Wheel
- 1 Cog Wheel
- 1 Upright Shaft with nut working 6 Blocks compleat with Vices Springs, hand Staffs, Tongs, 6 Reels and pointing Anvills.

- 1 Water Wheel for Scouring Barrells working 6 Barrells Compleat with Lids (*Linings excepted being the Tenants*)

- 1 Drying Shed with four horses

Middle Tongs Mill

- 1 Water Wheel and Shaft with 2 Cast Iron Centre pieces Wood [... *illegible* ...] 2 Cast Iron Gudgeons working a pair of Tongs compleat to the end of the Tongs.

- 1 Water Wheel working 4 Barrells for scouring Wire complete [*except Linings.*].

An Oven for annealing Wire, with Cast Iron plates belonging thereto.

Tilting Mill

- 1 Water Wheel and Shaft Iron bound and 2 Cast Iron Gudgeons, Tilting Hammer, Helve Anvill and Anvill Block Compleat and 2 scouring Barrells attached to the same wheel.

Gig Mill

- 1 Water Wheel, Shaft, 1 cog Wheel, 1 nut & upright shaft working 3 Blocks in lower loft and 5 Blocks in the upper loft compleat as before

Little Block Mill

- 1 Water Wheel Cast Iron centre pieces 1 Shaft Cog Wheel and Spur with an upright spindle working 3 blocks compleat.

Lower Wire Works

- 1 Water Wheel working 4 scouring Barrells compleat as before.

New Ware House with a Carpenters Shop underneath

Old Smith Shop adjoining the New Warehouse

An Oven for annealing Wire with castings in the Oven.

Rolling Mill

- 1 Water Wheel
- 1 Cog Wheel
- 1 nut
- 1 Counter shaft with fly all cast and wrought iron and the cross Plank oak.

Cleaning House

Lower Block Mill

- 1 Water Wheel with Shaft
- 1 upright Shaft with a Spur wheel to work 6 blocks as before.

Abbey Forge

- 1 Water Wheel for working a Hammer, cast iron sides wood soling and ladles with wood shaft or beam, cast iron ring thereon weight 16^C 1^Q and wrought Iron band with Cast Iron Gudgeons.

- 1 Drome Beam) Wood

PAAR/TUCKER: ANGIDY VALLEY

1	Water Post)				
1	Large Lace or Stay)				
1	Poppet)				
1	Cross Key	)	Wood			
4	Hammer Arms)				
1	Prick Post)				
1	Lace to d ^o)				
	Plimmer Blocks and Sils	)	T	C	Q	lb
1	Crooked Leg	)	Cast	0	10	1
1	Strait Leg with boxes under them	)	Iron	0	10	1
1	Standard under the inner Gudgeon of the Hammer Beam, Cast Iron			0	4	0
1	Wood repeat					0
1	Wood Hammer Helve					
1	Hurst on d ^o . Cast Iron			0	3	0

1	Hammer d ^o	d ^o	0	5	1	0
1	Anvill d ^o	double faced	0	6	0	0
1	Anvill Block,	d ^o	1	10	0	0
2	Finery Chimney Stacks with 2 Cast Iron Lintels					
2	Water Wheels for blowing Machines with 2 cylinders to each of 30 Inches diameter each					

Coal house and Foundry Walls and Roof with the Pit for Moulding in.

Abbey Corn Mill

1	Water Wheel
1	Cog Wheel
1	nut on the Counter shaft
1	upright shaft and cog wheel working three nuts for 3 pair of stones
3	Wooden Flour Bins, Dressing Machines, Storehouse adjoining the Mill and the Machinery of the Corn Mill to the end of the Spindle.

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Erratum

We regret the error that appeared in the last issue of the JHMS (Vol.8, Part 2, 1974) in Dr Varoufakis' paper on

page 95, in the heading of which the date was given as AD. This should, of course, have been BC. This mistake was carried over into the contents list on the inside front cover.