Appendix 5

Other difficulties with the forge output data

The greatest difficulty in compiling a database of finery forges is that of excluding other kinds of forges, particularly plating forges. These were consumers of bar iron rather than producers of it. This actually provides a good means of distinguishing them, since they (or their owners) do not appear in furnace accounts as significant buyers of pig iron. They were relatively uncommon until the late 17th century, so that the dearth of surviving accounts from earlier periods causes no great hindrance in identifying them. Their owners do however sometimes appear in the accounts of Hales and Aston Furnaces, as buyers of modest quantities of hammers, anvils, and other cast iron goods. An alternative means of identifying plating forges is from the business of their owner. If a forge belonged to a person known to be making for example frying pans, saws, or musket barrels, it is likely that it was a plating forge, rather than a finery forge. For the avoidance of doubt, ironworks, which have been excluded from appendix 12 (as not being finery forges), which were not blast furnaces, have listed in appendices 16 and 17. Forges that appear in the latter are considered for various reasons not to have been finery forges, or at least not in the periods mentioned there. This covers many works of kinds discussed in the latter part of chapter 3.

In the course of examination of the database used for the forge computations for internal consistency, a number of minor problems were encountered. These were dealt with as indicated below:

(1) Some forges had a zero output in the 1736 list without there being good evidence of when their temporary closure began and ended: for these it has been assumed the closure was from 1733 to 1739, with the result that they are assumed to have been in full production in 1732 and 1740: this is a questionable assumption, but any alternative one would be just as arbitrary. This applies to Cwmdwyfran, Llandyfan, and Whitland (Carms.) and Cannock, Congreve, and Winnington (Staffs.).

(2) The 200 tons attributed by the 1715 list under Lancashire to 'bloomeries' has been apportioned between Backbarrow, Coniston, and Cunsey, but this leaves nothing for bloomery forges that may have still been operating at that date, including Stony Hazel, Aintree, Caton, and Barnacre. Since the computation is concerned with finery forges, this difficulty has not been addressed at this stage. These however appear in the bloomery computation.

(3) The 1794 list, whose primary content seems to date from 1790, omits Cardiff Forge (closed 1793) and Pentyrch Forge (puddling from 1792) and lists no plant at Prescott (closed 1794?), Bridgnorth (closed 1801?), or Titchfield (also called Funtley - closed temporarily in 1790), Prescott being marked 'stands'.[1] This aspect of the data thus probably dates from 1794. These are therefore treated as omissions and their output is estimated as the average of the rest. This raises the worrying difficulty that there may be other omissions as a result of closures or conversions to puddling in this period.

(4) A small number of forges, such as Sparkbridge in 1715, are omitted from one or other of the lists or appear with a zero output (or a blank), when they were probably in use in the year, for which the estimate was made (for example Tortworth in 1716). Where there is some acceptable output figure from another date the normal interpolation methods have been applied.

(5) In a few cases there is no acceptable output figure at all for an 18th century forge. This applies to Cardiff in 1790 and Tarrioch in 1736. They have been assigned an output figure by means described under those forges in appendix 3, but these estimates are inevitably rather rough. Fortunately the cases where this difficulty arises are very few and any error is consequently likely to be slight.

(6) In most cases the difference between one output figure and the next is modest, but occasionally it is much greater. Such large changes in output probably indicate the construction of an additional finery. The examination of the lists described in appendix 4 suggests this occurred at Powick Forge, where the most likely date for the increase is in the 1770s, when it was acquired by Sampson Lloyd & Son of Birmingham.[2] Elsewhere a second complete forge may have been built, as at Machen in 1658.[3] When such a forge opened or closed, the change in the output of the whole works would have been sudden rather than gradual. To ensure that the computation takes account of this, additional estimated production figures have been added for these forges for dates shortly before and after the change, so as to produce the desired step up in output that must have occurred.

(7) There was a second forge at Cleobury (S. Shrops.) in the Elizabethan period, but any estimate of its output figure for this would be wholly subjective. Accordingly this has been treated as a separate forge and provided with no output figure at all. This means that the national average is attributed to it, according to the estimation methods used.

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[1]. Cardiff: N.L.W., Bute box 48; Pentyrch: Chappell 1941, 27 39. Prescott probably closed on the bankruptcy of Samuel and John Hallen: Shrops. R.O., 1396/1; Bridgnorth: Shrops. R.O., BB/E/1/6/8, f.15; BB/E/7/2/4; BB/E/7/1/3: 1801 was the end of William Reynolds tenure, but it is possible it had by then already been reconverted to a corn mill; Funtley was closed in 1790 when the estates of Cort and Jellicoe were extended for a crown debt, but the mill was subsequently back in use in the hands of Samuel Jellicoe, perhaps a fact not known to the 1794 compilers: Mott 1983, 60-63; land tax assessments for Titchfield (Sarisbury).

[2]. HH a/c.

[3]. The date of the second forge at Machen is indicated by a licence to divert water: N.L.W., Tredegar mss. & docs. 653. Accordingly the additional estimates have been place shortly before and after that date. Since each forge had two fineries the estimated output before the second forge was built is estimated at half its earliest known output subsequently.

(8) A few forges appearing in the 1718 list seem to have been opened (or in the case of Swindon reopened) some years later. This confirms a suggestion made in my discussion of the lists that there was an element of anachronism in attributing the list to 1718.[4] There is no clear evidence of the dates of opening of Powick and Caton Forges apart from the lists save that they existed in 1725 and (perhaps) in 1734 respectively, nor of Swindon having reverted to a finery forge before 1734, but Llanfrede and Pipton Forges were built in 1723 and 1722 respectively, both certainly after 1721. The same difficulties might have arisen for many of the new forges of the embargo period, including Abenbury, and Sutton, where the evidence of their date is no better than for Powick, and the list has been relied upon for their opening date.

(9) For the King's ironworks in the Forest of Dean, the number of fineries is known from an inventory of 1635, but not their actual output. However their output may be estimated on the basis of the wood they consumed. From 1612 to 1620 there was an allowance of 12000 cords per year, and from 1621 to 1633 10000. The then farmers (i.e. tenants) exceeded this with the result that they were severely fined at the Forest Eyre of 1634: it was alleged they had used 178200 cords in about 12 years, almost 15000 cords per year.[5] The allowance of 12000 cords is enough for production of about 700 tons per year. However Lydbrook Forge made 140 tons in 1625 in three fineries, and Whitecroft 145 tons also in 3 fineries between 1656 and 1660. This suggests 700 tons may be a slight overestimate, since the five forges operating in the 1630s had 13 fineries between them. Of these two forges with six fineries were built in 1628 and the remainder about 1612. Thus 300 tons of a reduced estimate of 650 tons may therefore be apportioned to the two newer forges, leaving 350 tons for the older ones. Before 1628 the production of these older forges is not enough to have used up the wood available and perhaps as much as 750 tons of pig iron was being made for sale, in addition to the 450 tons or so needed by the forges.[6] As has been shown in chapter 4, there is evidence of pig iron being supplied from the Forest in the 1610s and 1620s.

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[4]. King 1996d, 31 34.

[5]. They were fined for all 178,200 cords on the basis that none of them had been properly delivered, but the fine was subsequently reduced in respect of those that had been paid for.

[6]. Estimated on the basis that 2½ cords are needed to make a load of charcoal, 3 loads of charcoal to make a ton of pig iron, 26 *cwt.* pig iron and 3 loads of charcoal per ton of bar iron: figures from Hammersley 1973, 604-5.