CHARCOAL IRONMASTERS OF CHESHIRE AND LANCASHIRE, 1600-1785

BY B. G. AWTY, B.A.

Read 5 December 1957

RECENT years have seen the discovery of a number of new sources for the history of the iron industry in the late seventeenth and early eighteenth centuries. In particular the Foley MSS. have cast light upon the iron industry of Cheshire, about which so little was known formerly. And fortunately the accounts in the Foley MSS. coincide almost exactly with the period during which the industry there was at its height. Working backwards and forwards from this fixed point it is now possible to outline the spread of the industry to the Cheshire plain, its growth and decline. In the earlier period considerable help is obtainable from the records of the exchequer court of the palatinate of Chester and also from chancery cases. For the eighteenth century the production lists of furnaces and forges are useful, whilst the books of William Latham, manager of the Duddon furnace, show something of the make-up of the company which ran the Cheshire ironworks and the outlying furnaces linked with them.[1] Alfred Fell has given a complete and generally accurate account of the industry in north Lancashire in *The Early Iron Industry of Furness and District*, but new material on the industry in south Lancashire is very welcome. Only in the date of the erection of Goatfield furnace (p. 412) is Fell's chronology seriously astray. Far from building remote charcoal furnaces in 1775, Kendall and Company were then anxious to dispose of them.

The equipment of the industry during this period was furnace, forge and slitting mill, which Lancashire was the last of the ancient centres of iron production to adopt. In the furnace the

[1] For the Foley MSS. see Johnson, B. L. C., "The Foley Partnerships", Economic History Review, 2nd Series, IV, p. 322, and "The Iron Industry of Cheshire and North Staffordshire", Trans. North Staffs. Field Club, LXXXVIII, p. 32. Lists of furnaces and forges are published in Hulme, E. W., "Statistical History of the Iron Trade, 1717-1750", Trans. Newcomen Soc., IX, p. 16. The other new source of information, though of less importance for this area, is the Spencer-Stanhope MSS., dealt with by Dr. A. Raistrick in "The South Yorkshire Iron Industry, 1698-1756", Trans. Newcomen Soc., XIX, p. 51, and in Raistrick, A., and Allen, E., "The South Yorkshire Ironmasters, 1690-1750", Econ. Hist. Rev., IX, p. 168. The books of William Latham are L.R.O., DDX 192.

ore was smelted into fully liquid iron and then cast into pig or sow iron. At the forge two processes were undergone. The pig iron was first of all decarburized in the finery and then "drawn out" under the hammer into bars at the chafery. The two parts of the forge might be under one roof, but occasionally fining and drawing out were done at places many miles apart. The iron might now be sold in the form of bars or it could be sent to the slitting mill where it was cut into rods of still smaller section. Fuel in the furnace and finery was always charcoal, but in the chafery and slitting mill, where the iron was worked at lower temperatures, iron smelted from coal-measure ironstones could safely be heated in a coal hearth, with a considerable saving in cost. Furnace, forge and slitting mill might all be on one site, but since charcoal was expensive and in short supply, chances were that they would be at some distance from one another. This tendency to diffusion increased as time went on, and was also encouraged by the distance which often separated the sources of ore and fuel from the intended market. The other factor influencing location was the need for water power to work the furnace bellows, forge hammers, and the rollers and cutters of the slitting mill.

The first known reference to ironfounding in this country occurred at Buxted in Sussex in 1492, and by 1500 there were at least three furnaces at work in that area. The industry probably entered the midlands about the middle of the sixteenth century, for by 1553 Lord Paget had established three iron mills on his newly-acquired Cannock estate, where cast iron was certainly being made in 1584. The earl of Shrewsbury, whose interests in the trade stretched from Herefordshire to Yorkshire, built a furnace at Shifnal and finery forges at Lizard in Shropshire in 1564. In the Sheffield area he had Kimberworth furnace and Attercliffe forge operating by 1589, whilst from 1590 Sir Francis Willoughby was in possession of a furnace and forge at Oakamoor, on the Shrewsbury estate in northern Staffordshire. The five iron mills, which Sir Thomas Lodge of Westham, in Essex, hoped to supply with ironstone from the Tunstall mines about 1563 may have been only bloomeries, or bloomery forges, but by 1590 Lancashire nailers appear to have been journeying to northern Staffordshire in search of the cold-short iron produced from coal-measure ironstones by the new method of smelting, for, in the words of William Stout, bloomery iron "would be no nails". It is unlikely that they would have travelled as far as Oakamoor or Cannock, but the Knutton furnace and forge, which John Smith of Newcastle-under-Lyme mentioned in his will of 1619, may well go back to

1590, and have been their goal. On the other hand it is impossible to say whether the forge at Market Drayton, leased by William Grosvenor (of Bellaport?) to George Leicester in November 1590, was other than a bloomery forge. The same applies to the earliest Cheshire forge on record, that at Tib Green.[2]

I. EARLY CHESHIRE IRONWORKS

Tib, or Tip Green forge is shown on Yates's map of Staffordshire (1775) as lying on the Cheshire side of Checkley Brook at the point where the stream forms the boundary between the two counties. It is the Betley parish register which records the baptism of *Alicea filia Radulphi Jolley, Tibgreene, hammerman* in 1619. By 1646 this was almost certainly a finery forge for it was then in lease to Walter Chetwind of Rugeley. The Royalist Composition Papers show that Chetwind was then in possession of Lord Paget's forge at Abbots Bromley, of his Cannock ironworks, and of several works on the western fringe of Staffordshire. These were Heighley furnace and Winnington forge in Staffordshire, Norton forge in Shropshire and a forge in the township of Wrinehill in Cheshire, which must almost certainly have been Tib Green. This forge would then have probably been fining pig iron from Heighley furnace, and perhaps later from Madeley furnace, which Chetwind secured in 1649.[3]

The particulars of the estates of Sir Thomas Delves, Sir Hugh Calveley, Thomas Cholmondeley and William Lawton in the Royalist Composition Papers contain no mention of the ironworks which later flourished at Doddington, Lea, Vale Royal and Church Lawton. In view of this it is reasonable to suppose that most of the Cheshire ironworks came into existence during the Commonwealth, when new ironworks were being built in large numbers. The Civil Wars had hit the old-established ironworks hard. Along with the nobility and

[2] For W. Stout see *Autobiography*, p. 80. For Sussex see Straker, E., *Wealden Iron*, p. 47; Cannock works: Pelham, R. A., "The Migration of the Iron Industry towards Birmingham during the Sixteenth Century", Trans. Birm. Arch. Soc., LXVI (1950), p. 142; Earl of Shrewsbury: Schubert, H. R., "Shrewsbury Letters", Journal, Iron and Steel Inst., April 1947; Oakamoor: Hist. MSS. Commission, *MSS. of Lord Middleton* (1911), p. 497; Lancashire nailers: L.R.O., *Report for 1957*; Sir Thomas Lodge: P.R.O., Chancery proceedings, Bundle 116, No. 35 (1563); Market Drayton forge: National Register of Archives, Crewe MSS.

George Leicester may well have been brother to Thomas Leicester of Poole, near Nantwich, who was Sir Thomas Lodge's son-in-law. Record Soc. of Lancs. and Ches., Vol. LVIII, p. 147.

[3] P.R.O., C 6. 116/45.

gentry who controlled the mines and woodlands, many of the ironmasters took the losing side. The Parliamentarian general Sir William Waller destroyed many of the Sussex ironworks, a disaster from which this former centre of the industry never recovered. Some of the Forest of Dean ironworks suffered the same fate, and in 1650 the rest were ordered to be destroyed, because they were consuming timber badly needed for the Navy.

In the 1650s, however, a considerable revival took place, though it occurred largely in new areas. One of the reasons was probably the desire of many landowners to raise money from their estates as rapidly as possible, the former Royalists in order to pay their fines, and the Parliamentarian merchants who had purchased forfeited estates because they feared a sudden reversal of political fortunes might prove their undoing. There could have been few quicker or easier ways of doing this than by selling the woods to the ironmasters. For instance, when Charles Lloyd bought the forfeited manor of Caerinion in Montgomeryshire in 1651 he built "an iron mill, and made great destruction of timber, having felled and sold away more timber than his whole purchase money amounts to". The following year he sold the manor and with it this Parc Mathrafal forge to William Fownes, a London merchant.[4] Other ironworks started at this time were Rockley and Bank furnaces in Yorkshire, and George Sitwell's furnace at Foxbrook in Derbyshire. By 1658 steps were in hand to build a furnace in Cheshire.

The first Cheshire ironmaster of whom we have record was John Turner of Stafford. In the 1650s he was running the Lizard forges under a twelve-year lease assigned to him by Rowland Revell. There is evidence that the rent of these forges was considered to be excessively high at the time, and it may well be that this was one of the considerations which induced Turner to turn his attention towards Cheshire, where rents were almost certain to be lower because ironworks were fewer. The site selected was a corn mill at Church Lawton, of which a twenty-one year lease at a rent of £44 a year was obtained from William Lawton in April 1658. Turner also intended to build a forge in Cheshire, apparently about seven or eight miles from Church Lawton, but having difficulty in raising capital he arranged to reassign the Lizard forges to Rowland Revell and Thomas Fletcher with effect from 25 May 1658. Meanwhile Turner set the building of the furnace in hand and bought £3,000 worth of timber for the furnace

[4] Raistrick, A., *Quakers in Science and Industry*, p. 108.

and forge. He also arranged to sell a hundred tons of pig iron to a Mr. Newbrook (possibly Joshua or another member of the Newbrook family of Stourbridge) at the rate of twenty tons a month commencing in August 1658, and entered into a bond of £50 to supply Higginson, farmer of the excise of iron in Cheshire, with all the bar iron he could make in 1658, 1659 and 1660. Unfortunately Revell and Fletcher failed to take over the Lizard forges until December. Shortage of money delayed completion of the furnace for two months, the woods had to be coaled during the wet season so that the ratio of iron produced to charcoal consumed was very low, the forge was not built and the woods bought for it had to be carted seven or eight miles before they could be used. Newbrook obtained no pig iron until the end of November and then refused to accept more than twelve tons, whilst there was no prospect of fulfilling the engagement with Higginson. The bond was in danger of being forfeit. Turner estimated his losses at over £300.

At some period Turner entered into partnership with John Crompton of Milwich in Staffordshire for the running of Lawton furnace. Together they arranged to raise £500 by mortgaging the furnace in February 1659 to John Crompton's nephew, Robert Crompton of Elstow, near Bedford. This loan was to be repaid at the rate of £100 a year for seven years, a pretext for a great deal of trouble. John Crompton invited Turner to a conference about cordwood in July 1661 at Congleton. Turner was arrested at the suit of Robert Crompton for an alleged default in payment of the instalment of the mortgage due on Lady day 1661, and on several other suits including two of John Crompton and one of George Parker, a supplier of wood, and William his son for £3,000. For three weeks Turner was held in Congleton gaol, whilst Robert Crompton seized the furnace and made arrangements for it to be carried on by his own men. But Turner was released, regained control of the furnace, suborned Robert Crompton's men and converted to his own use wood for which Crompton had paid £400 to William Vernon. Suit and counter-suit were brought in the exchequer court of Chester and finally in March 1668 Turner was ordered to be restored to partnership. Already, however, Robert Crompton had entered a bill in chancery stating that his nephew was now conspiring with Turner against him. But whether this were true or not, Turner and John Crompton were soon at each other's throats again. Even a settlement made between them when they were both in gaol in 1674 was not adhered to, and in January 1676, shortly before John

Crompton's death, the dispute broke out again. At this time Turner was living at White Friars in London, but nothing is said of what had become of the furnace.[5]

Following the old road from London via Warrington and Lancaster to the north, the first place of any importance after Church Lawton is Holmes Chapel, or Churchhulme as it used to be called. On the opposite side of the Dane, in Cranage, the road to Manchester and eastern Lancashire led off to the right, and at this important junction hostelries grew up where the traveller could dine or spend the night. With roads leading to both parts of Lancashire and another into Staffordshire, Holmes Chapel was a good centre for the distribution of bar iron. The area had not so far been penetrated by ironworks, and charcoal could probably be obtained from Rudheath and the Forest of Delamere. It was here that Cranage forge was established, possibly on the site of the water mill purchased in 1660 from Lord Kilmorey by John Leadbeater of the Hermitage. For the next hundred years Holmes Chapel remained a focal point in the iron trade of the north-west.

A chancery case concerning the purchase of wood from Thomas Cholmondeley of Holford in the 1660s, shows that Cranage forge was then being run by William Fletcher of Makeney, near Duffield in Derbyshire, in partnership with George Whyte. Fletcher was possibly related to Paul Fletcher of Walton near Chesterfield, one of the ironmasters mentioned in the Sitwell papers, whilst a George Whyte was later established at New Weir forge in Herefordshire.[6] It is possible that they also had a furnace in Cheshire because in 1664 haematite ore from Sir Thomas Preston's Stainton mine in Furness was sold to "Mr. Fletcher and his Partners" at Holmes Chapel.[7] Fletcher may have had Street furnace in Odd Rode, about which nothing is known apart from its conversion into a plating forge in 1701/2. On the other hand haematite ore might have been sufficiently in demand to withstand the cost of land carriage through the Peak District for smelting in Derbyshire. In that case Cranage forge would have to rely mainly on Lawton furnace for its supply of pig iron, as it did at a later date.

In 1665 Turner also bought seventy-one tons of ore from the Stainton mines, the price increasing during the year from 11/-

[5] The account of Lawton furnace is based upon P.R.O., E 134 (1659) Easter 4 and P.R.O., C 6. 41/16 and C 10. 493/53.

[6] Journal, Derbys. Arch. and Nat. Hist. Soc., X, p. 29 and Bradney, Sir J. A., *Monmouthshire*, II, p. 261.

[7] P.R.O., C 6. 182/18, and L.R.O., DDCa 1/106.

to 13/- a ton, put on board in Furness. This we may be sure was sent on to Lawton furnace, which must be regarded as the first furnace in the area to have smelted haematite ores. Unfortunately the only accounts for the Stainton mines to survive at this period are those for 1665 (Fletcher's accounts being in arrears) so that we do not know who first started the importation of haematite, or how long Turner remained an importer.

The Cheshire ironworks continued to import haematite ore from Cumberland and Furness for the next century, however, and some of it penetrated as far as Mearheath furnace in Staffordshire.[8] A writer of 1766, advocating the building of the Trent and Mersey Canal, wrote, "Several parts of the country in the neighbourhood of the canal yield great quantities of that sort of iron-ore, commonly called iron-stone, proper for making cold-short iron; and which, when mixed with the red-ore from Cumberland, makes the best kind of tough, or merchant iron. The iron-stone of this country is likewise so necessary for working the ore in the north, that even the great expence of land-carriage hath not prevented large quantities of it from being conveyed that way to the river Weaver, to be shipped for Cumberland; and the ore from the north has been brought into this country under the like inconveniences".[9] Since the ironmasters concerned in the Cheshire works consistently made use of Cumberland and Furness ores in this fashion, as is shown by both the Foley accounts for the period 1696-1712, and by the Weaver Navigation tonnage books for the period 1732-1750, we must conclude that the scorn poured by Dr. Plot on this practice of mixing the ironstones was not altogether justified. Plot wrote on page 159 of his *Natural History of Staffordshire* (1686), "Ore for coldshear iron they have at Cheslinhey, Redstreet and Apedale, the worst and leanest being that from Cheslinhey, the next from Redstreet being a red stone, and the best of the three from Apedale, being of a blewish colour, and call'd Boylom; yet these three are commonly mixt together, and sometimes with other stones to make them better or worse: the only uses that I could hear of for this sort of Iron, being to make small nailes not above two a penny, and sheering nailes for ships, having broad heads and short shanks, to keep the timber from being eaten by grubs".

Another unfavourable comment on the growth of the iron industry in Cheshire, quoted by Hall in his *History of Nantwich*,

[8] Johnson, B. L. C., "The Iron Industry", p. 43.
[9] Lowndes, T., *History of Navigations* (1779), p. 63.

was made by Roger Wilbraham in 1682. He bemoaned the change over from charcoal to coal in the salt trade "for since then we find by sad experience that the salt that is made with coale is nothing so good; the Trade much slacker; the Woods which were preserved to serve the Salt works are now cut down and destroyed to make worse Iron than we had then from beyond the seas". Whilst tough iron made from the haematite ores of Furness and the Forest of Dean was soft and malleable, the coldshort or coldshear iron manufactured from the local ironstones was of a hard, brittle quality. There was, however, a good market for it since it was highly suitable for making nails. As late as 1780 the nail trade was thought to consume half the iron produced in Great Britain and some Russian iron as well. Since the proportion of iron absorbed by the casting trade must have been much less in the previous century, one would imagine that the proportion of iron used by the nailers would be greater than it was later. This would explain how most of the coldshort iron produced was used.

Inside the iron industry itself coldshort iron had another use in the casting of forge hammers and anvils. Though a coldshort hammer or anvil did not last many weeks it did have the steely quality necessary for the heavy work it had to carry out, and hammers and anvils of good quality were transported for many miles. Sir Thomas Delves's Doddington furnace was one at which hammers and anvils were cast. In December 1667 Sir Thomas's agent, Thomas Wright, agreed to supply thirty-five tons of the "best Coltshire Iron pig mettall" at £4. 14s. per ton long weight and five tons of hammers and anvils and other cast metal at £7. 5s. per ton to Cranage forge. Thomas Wright was agent to Sir Thomas Delves for several years both before and after this transaction, but there is no other indication of how long the furnace had been in blast. To all appearance it was out of blast during the period covered by the Foley MSS., for it is not mentioned until 1710/11, and then only as Doddington Works, which seems to have included Lea forge.

But the purchaser of the pig iron and anvils for Cranage forge was not William Fletcher, for he and Whyte had already assigned the forge to William Keeling of Bemersley in Staffordshire, who took his brother Francis Keeling into partnership. William Keeling went bankrupt in 1668 and it was left to his brother to pay for the iron bought from Sir Thomas Delves. Francis Keeling made these payments through the manager of the forge, William Rowley, who was probably his nephew, son

of George Rowley of Ridgway in Staffordshire. Unfortunately Francis Keeling, then of Kinderton, died in 1672, and no more payments were made. Sir Thomas Delves brought a case against Rowley in 1678 for payment of the money outstanding. It is not stated whether Rowley was still at Cranage forge, but a marriage license granted on 30 April 1681 to William Rowley of Kinderton suggests that he was.[10]

On the estate of John Crewe on the Wheelock, a little north of Warmingham, was situated another forge of this period. It is of particular interest because the tenant in 1677 was the Staffordshire ironmaster, Richard Foley of Longton, son of Richard Foley of Stourbridge (d. 1657). He had held the forge for several years and owed £300 to John Crewe on account of rent and other charges, which would probably include wood.[11] The full extent of Richard Foley's interests in ironworks is not known. He was working Mearheath furnace probably in conjunction with the forges and slitting mills at Consall and Oakamoor, for all these works were certainly in the hands of John Foley of London in the next decade. Richard Foley of Longton died in 1678 and his eldest and only surviving son, also named Richard died in 1681, leaving his estates to John Foley, the youngest of his father's half-brothers. John Foley died in November 1684 and the estates now passed to Henry Glover of Stourbridge, husband of Priscilla Foley. Before Glover died in November 1689, John Wheeler of Wollaston Hall is shown as manager of the ironworks in the accounts which survive in the possession of Major Foley of Stoke Edith. These accounts cover the one season 1688/9 and show that by that date the two forges and slitting mills mentioned above were still working in conjunction with Mearheath furnace. There is, however, no mention in the accounts of any connection with Warmingham forge, so that it was probably disposed of during this period when the estate changed hands so frequently. It is probable that Foley had some nearer source of pig iron for Warmingham than Mearheath furnace. Both Street and Vale Royal furnaces may have been in blast at this period. Indeed, Richard Foley is one of the few people who might have had the resources to build Vale Royal before the 1690s. Either this Richard Foley or his father, Richard Foley of Stourbridge, had already had interests on the Cheshire border, because the tenants of Madeley furnace before Walter Chetwind secured it in 1649 had been William Yonge and Richard Foley. The extension of the Foley family's interest

[10] Rowley v. Wright and Delves occurs in P.R.O., Chester 16/89.
[11] Crewe v. Foley occurs in P.R.O., Chester 16/87.

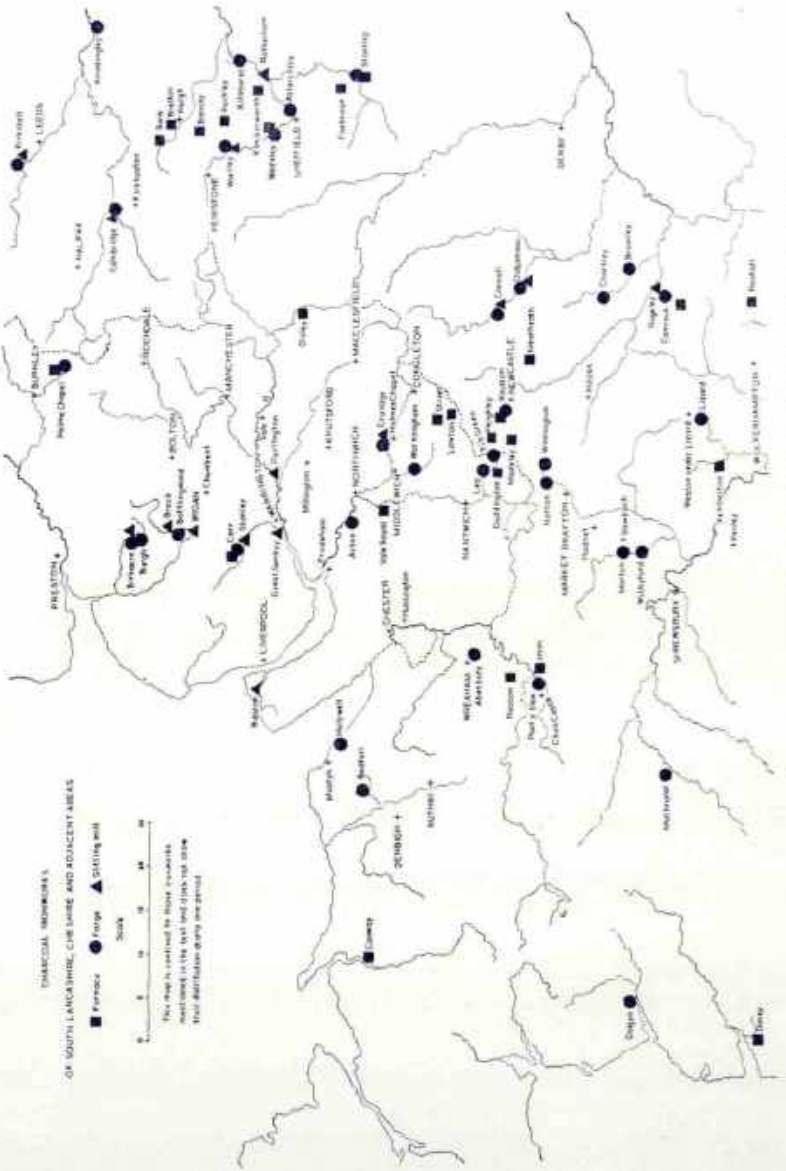


Fig. 26. CHARCOAL IRONWORKS OF SOUTH LANCASHIRE AND CHESHIRE

into Cheshire may well go back to about 1650, for in 1651 Thomas Foley of London was employing Richard Pearson of Wrexham to sell brass, iron ordnance, shot, grenades and mortars.[12]

The only other ironworks known to have been in existence in Cheshire at this date was Lea forge, lower down Checkley Brook than either Tib Green forge or Doddington furnace. In 1674 the nuncupative will of Hugh Hampton of Lea forge was proved at Chester. One of the witnesses to the inventory was Walter Pensell, whose name suggests a connection with the Chetwind family, for Walter Chetwind's clerk in 1643 was Richard Pencell.[13] Walter Pensell of Lea forge was probably the man, "one Pensell", by whom Thomas Wright received an instalment of money from William Rowley of Cranage forge in December 1670. It is not clear from the context whether he was acting on behalf of Rowley, Sir Thomas Delves, or quite independently.

II. SUPPLYING THE LANCASHIRE AND CHESHIRE NAILERS

Though men from the south-east had been largely responsible for establishing the Cheshire ironworks presumably with the intention of supplying midland needs, there is no doubt that a considerable proportion of the iron was being used locally, and, at least from Cranage forge, it must have been finding its way through Warrington into Lancashire. In Cheshire, probates are recorded of wills of a Nantwich locksmith in 1633, and of nailers at Church Lawton in 1663 and at Macclesfield in 1667. Other nailers were William Vale of Smallwood (1618), James Clowes of Odd Rode (1669) and Thomas Seavell of Tushingham (1678). At Nantwich the family of Verden was established as ironmongers from before 1640. From about 1620 two Warrington ironmongers, William Brock and William Russell, were supplying iron to Lancashire nailers, and when Russell died in 1637 he had goods worth £11 in Congleton. John Bulling, another Warrington ironmonger who died in 1669, probably had trade connections in another direction, because he left considerable bequests to the twelve

[12] For ownership of Consall forge and Mearheath furnace 1683-1689 see Beech v. Locker in P.R.O., Chester 16/100. For John Wheeler see Johnson, B. L. C., "Iron Industry", p. 34. For Richard Foley at Madeley furnace see P.R.O., C 6. 116/45. Richard Pearson's connection with Thomas Foley was pointed out to the author by G. Dykes. For Foley family see P.C.C. wills of Richard Foley 1657, Richard Foley 1682 and John Foley 1684.

[13] Pennington, D. H., and Roots, I. A. *Committee at Stafford*, 1643-1645, p. 24.

children of a Shropshire forgemaster, John Browne of Sowbach.[14]

The other area from which Lancashire was acquiring its iron was Yorkshire, the ironmaster concerned being Sir John Savile, later Baron Savile of Pontefract, whose forge was the former monastic one at Kirkstall. After the Civil War, however, a group of Shropshire merchants acquired interests in many of the Yorkshire ironworks. They were John Spencer (*c.* 1599-1658), William Fownes of Kenley (d. *c.* 1647) and Gilbert Fownes, his brother, who was father of the younger William Fownes who bought the Parc Mathrafal forge in 1651. The ironworks they first acquired appear to have been Colnbridge forge, near Huddersfield, and Barnby furnace, near Barnsley. The management of these two works was in the hands of two cousins, Thomas Dickin and William Cotton respectively, who probably came from Hodnet in Shropshire.[15] The records of the Wigan court of king's pleas show them to have been interested in supplying iron to the Wigan area from about 1650 onwards. John Spencer and Gilbert "Foanes" brought a plea of debt against John Jackson, a Wigan joiner, in 1650/1, and Thomas Dickin, presumably acting as their agent, brought similar cases against Edward Marsh of Ince, William Harvey and Matthew Markland of Wigan, all blacksmiths, in 1652/3, and against William Hatton, formerly a Chorley nailer, in 1653/4.[16]

This partnership grew during the 1650s to include Wortley and Kirkstall forges and Bank furnace, all in Yorkshire. William Cotton, who had married Eleanor, daughter of the elder William Fownes, became chief clerk or agent for the whole combination, and on the death of his mother-in-law, Elizabeth Fownes, in 1657, inherited a fifth share in the partnership. This he disposed of in 1660, and soon after he entered into partnership with Thomas Dickin to run Colnbridge forge on their own account. Cotton still remained chief clerk for Spencer and Company. It was probably to replace Colnbridge, and to take advantage of coal from the coalfield of southern Lancashire, that Spencer and Partners built a slitting mill in Lancashire itself. The clerk of this mill was Richard Brock of Wigan

[14] Probate records referred to are: Thomas Beelin of Nantwich (1633), William Bagnall of Church Lawton (1663), James Braddock of Macclesfield (1667), John Verden of Congleton (1640), William Russell of Warrington (1637) and John Bulling of Warrington (1669). Vale and Clowes are referred to in C.R.O., Calendar of Baker-Wilbraham MSS., p. 15. Thomas Seavell was a deponent in P.R.O., Chester 15/88, Tushingham v. Roe.

[15] Information of W. E. C. Cotton, F.S.G.

[16] L.R.O., DDKe (Wigan).

(1622-1684), who was probably the son of the Warrington ironmonger, William Brock. The site of the mill is not stated, but as the Wigan parish register shows Richard Brock to have been resident in Market Street during the 1660s, it cannot have been far from Wigan. Probably the mill was the one in Haigh, later called Brock mill, for the marriage settlement of Roger Bradshaigh shows that both a forge and slitting mill had been erected in Haigh by 1673.

In 1662 the stock at the mill was £409, but by 1666 this had increased to £2,277, approximately a quarter of the stock of the whole partnership. This suggests that an enormous amount of business was being done in Lancashire, or that by 1666 the forge had been erected. The list of debts contracted for the partnership in Lancashire by Thomas Winstanley and Richard Brock seems largely to consist of names from the Wigan and Leigh areas, but the only customer whose location is given was John Chaddock of Dublin, who owed £12.

The Lancashire slitting mill was a short-lived enterprise, but indications are that this had nothing to do with the running of the mill itself. William Cotton had been interested in the Denbighshire ironworks from at least 1663, and it was probably about 1667 that he withdrew from the chief clerkship in the Yorkshire ironworks, and became partner with Richard Myddleton of Chirk Castle in that family's ironworks.[17] This was a severe loss, but the dissensions that soon broke out between the partners made matters worse. Edward Spencer of Huntington, son of John Spencer, had inherited three-fifths of the shares in the stock, but he sold one-fifth to his brother-in-law Russell Alsopp. Gilbert Fownes's share descended to his son William and William Cotton sold his share to John Bancks. About 1672 Alsopp, Fownes and Bancks became dissatisfied with the way in which Edward Spencer was running the works. They deprived him of control and installed their own managers. From the start, however, they seem to have been intent on realizing whatever money they could by disposing of all the stock and then of the leases. Very naturally the Lancashire works was one of the first to go, payments from Richard Brock to the partnership ceasing in 1673, when the slitting mill was occupied by William Brock.[18] By 1676 they appear to have succeeded in disposing of everything, and as Lionel Copley, who was running the duke of Norfolk's ironworks in the

[17] *Chirk Castle Accounts*, 30 May 1663, and Davies, A. Stanley, "The charcoal iron industry of Powys Land", Montgomery. Coll., XLVI, pt. 1 (1939), p. 42.

[18] The account of the Lancashire slitting mill is based upon documents in P.R.O., Chester 16/89 and 15/89, and Chetham Soc., N.S., CIX, pp. 61-2.

Sheffield area, died about the same time, the Yorkshire ironworks all came into new hands. Among the men who came into prominence at this time, two in particular concern us, for they soon acquired interests in the Cheshire ironworks.

III. COTTON AND HEYFORD

William Cotton of Haigh, near Barnsley, was the eldest son of the former chief clerk of the Yorkshire Works. He inherited his father's shares in Colnbridge forge and in the Denbighshire ironworks. Together with Thomas Dickin he took over Kirkstall forge and Barnby furnace from Russell Alsopp and Partners. His principal partner in Cheshire was Dennis Heyford. Heyford became partner with William Simpson of Babworth in Nottinghamshire in the Wortley forges from 1676 and in the duke of Norfolk's works—Chapeltown furnace, Attercliffe and Wadsley forges, and Rotherham slitting mill—in 1678. They also acquired Rockley furnace, which had formerly been in Lionel Copley's hands.[19] Outside Yorkshire Cotton, Heyford and Simpson were partners in what was called the "Company of the North", which may have included the steel mill (probably Blackhall Mills) on the river Derwent in County Durham, which Heyford bought about 1687.[20]

At present it is not possible to say when exactly Cotton and Heyford made their appearance in Cheshire. Accounts filed with the will of Nicholas Withington, an Atherton nailer who died early in 1680, show that he then owed £264. 16s. to Heyford. It is probable that this was for iron supplied from Cranage rather than from Wortley forge. Cotton probably came to Cheshire later than Heyford for in a deposition dated 1680 (P.R.O., Chester 15/88) he stated that he was a partner in the Yorkshire and Denbighshire ironworks only. By 1687, however, both he and Heyford were engaged in an action brought by John Crewe's widow, and her new husband, Edward Turner, against John Crewe Offley, the heir to the Crewe estates, John Acton the steward, and others, concerning the administration of the goods of the deceased. Apparently Cotton and Heyford had been receiving cordwood from the Crewe estates, but this part of the case was unfortunately not proceeded with, and we do not learn whether Warmingham forge was in Cotton's hands.[21] The two works which they are known to

[19] Wortley forge was leased to Simpson in 1676, Andrews, C. R., *The Story of Wortley Ironworks*, 2nd., p. 33. See also Hunter, J., *South Yorkshire*, II, p. 190.
[20] Information of G. G. Hopkinson, and P.R.O., C 11. 1744/7.
[21] P.R.O., E 134 (1687/8), Hilary 19.

have acquired are Cranage forge and Lawton furnace. It was probably much about the same time that Lord Paget leased to them Abbots Bromley forge in Staffordshire,[22] and from this time onwards Bromley forge was one of the chief recipients of Lawton pig iron. In association with this forge William Cotton and Partners are known to have worked Cannock forge and Rugeley slitting mill, which also belonged to Lord Paget. In the period 1692-1712 the Foley MSS. show that Lawton pig iron was sent to Bromley forge which was a finery, from there the "blooms" were sent to Cannock where they were drawn out into bars with coal fuel, and finally the bar iron was sent to be slit at Rugeley. The market for this rod iron was almost entirely in Birmingham and the towns of the south Staffordshire coalfield. It is of course possible that this pattern of trade for Lawton pig iron antedates the arrival of Cotton in Cheshire and south Staffordshire, but there is no evidence that the ironworks at both ends were in the same hands until the 1680s.

In Cheshire Cotton's main concern was Lawton furnace, whilst Heyford's was Cranage forge, in which he apparently had the sole interest. In 1689 Heyford consolidated his position in Cheshire by marrying the heiress to the Millington estate, Gwyn Millington, and thus became cousin of Francis Cartwright,[23] a wealthy Manchester merchant who was a buyer of rod iron from Rotherham and Colnbridge slitting mills. By 1693 Heyford was selling steel in Lancashire.[24]

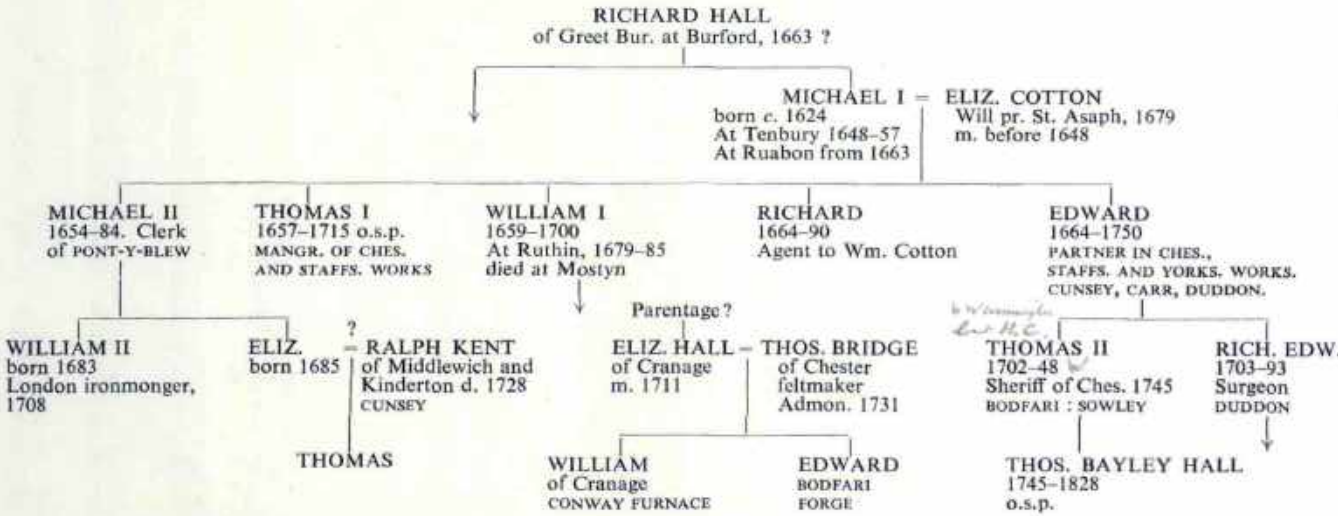
Management of the Cheshire ironworks was probably in the hands of William Cotton's cousin Thomas Hall, who was cited as a defendant in the Crewe estates case, along with Cotton and Heyford. Cotton's aunt Elizabeth had married Michael Hall of Greet in Shropshire, probably in the 1640s, and from the pedigree quoted in Ormerod's *History of Cheshire* it is possible to follow the movement of the family northwards. Until 1657 the Halls were living in Tenbury in Worcestershire. In 1659 their third son was born at Weston-under-Lizard, probably at the home of his grandfather, Thomas Cotton. In 1663 they were at Ruabon, presumably at the instance of the elder William Cotton, and there the eldest son, Michael, later acted as clerk at Pont-y-blew forge. In 1685 the sixth son, Edward, a former scholar of Brasenose College, was delivering iron for the use of Sir Thomas Myddleton. The fifth son, Richard, was

[22] William Salt Library, Aqualate D 1735/T/AB 135 a-c.

[23] "Marriage Licences granted in the diocese of Chester", Record Soc. of Lancs. and Cheshire, LXXIII, p. 167, and L.R.O., Will of Francis Cartwright, gentleman, 1709.

[24] Information of G. G. Hopkinson.

THE HALL, KENT AND BRIDGE RELATIONSHIP



1. The baptism of Michael, son of Michael and Elizabeth Hall at Burford 30 November 1654, proves that *Creet* and *Trambury* in Ormerod's pedigree were really *Greet* and *Tenbury*.
2. No Michael is mentioned in the will of Richard Hall of Greet [P.C.C. 1613], so that the parentage of Michael I shown above is more likely to be correct, though the pre-Civil War register of Greet no longer exists to prove it.
3. The burial at Burford in 1600 of *Gyles Maryan, hammerman*, shows the possibility of Hall connections with the iron trade before Michael I's marriage.
4. It is not certain that the Elizabeth Hall of Hermitage who married Ralph Kent at Churchulme in 1708 was the daughter of Michael II.

also one of William Cotton's agents, and had been supplying iron to Ralph Thrup of Chester prior to 1689.[25]

By 1693/4 Thomas Hall was clearly in charge of the Cheshire Works because the sow iron received in that year by Bromley forge was "bought of Mr. Thomas Hall",[26] whilst payments received by the second Thomas Dickin on account of the Cheshire ironworks from January 1694 were made by Hall.[27]

In 1696 the Cheshire Works included Vale Royal and Lawton furnaces, and the forges at Warmingham and Cranage. A new lease of Warmingham forge had been granted to Thomas Hall in January 1694 by Ann Crewe Offley,[28] but it may well have been held by Cotton and Partners since the 1680s, when, as we have seen, the Foleys probably relinquished it. Vale Royal was the only contemporary English furnace to be situated as far as fifteen miles from its nearest possible source of ironstone—the north Staffordshire coalfield. This suggests that the site was selected primarily to obtain easier access to the haematites of Cumberland and Furness, which otherwise had to be carried from Frodsham to Lawton furnace for smelting. The effects of land and water transport on costs or ore are shown by the fact that haematite was inventoried at 30/- a ton at Vale Royal, whilst its price put on board at Whitehaven or Piel was 16/- in 1696/7. Usually about a quarter of the ore charged into this furnace was Staffordshire ironstone inventoried at 15/- a ton, so that carriage across the Cheshire plain approximately doubled its cost. Whilst Lawton furnace was one of the cheapest of contemporary furnaces to run, Vale Royal was the only one at which more was laid out in payments for iron ore than for charcoal. Clearly the organisation and capital needed to make this venture succeed, especially the credit to secure a steady flow of 600 or 700 tons of iron ore each year from the north, was not at the disposal of John Turner. It might have been possible for Chetwind, Foley or William Cotton. Cotton's marriage in 1677 to Barbara Curwen of Sellapark is evidence of his interest in Cumberland before he became involved in the Cheshire Works. The Vale Royal furnace expenses for 1696/7 show the necessity of "Masons work building the Race from the

[25] *Chirk Castle Accounts*, II, p. 151*n*, and 25 April 1685. P.R.O., Chester 16/99. Cotton and Heyford v. Knowles. In this case they state that they "are and for many years last past have been Joynt dealers and Partners in severall Ironworks in this County Pallatine and elsewhere."

[26] Foley MSS. All references to ironworks accounts of the Cheshire and Staffordshire Works during the period 1689-1712 are from this source, unless otherwise stated.

[27] P.R.O., C 9. 372/11.

[28] N.R.A., Report on the Crewe MSS., Box 44, No. 13.

foundation to the false bottoms". This need not imply, however, that the furnace was new because that year it "blew out for want of water" and production was limited to 155 tons, so that the supply of water for the bellows-wheel would have required overhaul. Nevertheless, it was only in 1697/8 that Thomas Hall began to supply tough metal to Chartley and Consall forges in large quantities. The small amounts which had been received at Cannock forge in 1692/3 from Cotton and Partners are attributable to the smelting of Cumberland ore at Lawton furnace for part of the blast.

In 1699 the partnership built, or obtained the lease of, a new forge at Bodfari in Flintshire on the land of Sir Robert Cotton of Combermere, the hammers and anvils coming from Lawton furnace. Tough pig iron only was refined at Bodfari forge mainly from Vale Royal furnace, though 38 tons of Cumberland metal were supplied in 1700/1 by Richard Patrickson, presumably from Cleator furnace, and in 1703/4 37 tons of Forest pigs were received from Obadiah Lane. Bodfari forge produced only best merchant bar, some of which was sold locally, but much was shipped to Chester, Warrington and Liverpool from the warehouse at Mostyn.[29]

The increased capital needed to stock Bodfari forge and Vale Royal furnace would account for the contraction of William Cotton's partnerships elsewhere. In 1690 his partnership in the Denbighshire ironworks appears to have come to an end, for in that year his name dropped out of the Pont-y-blew forge rental.[30] In 1692/3 William Cotton and Partners sold Bromley and Cannock forges and Rugeley slitting mill, though they continued to supply them with pig iron from Lawton furnace. These works were then brought together with Mearheath furnace, Consall forge and slitting mill, Oakamoor forge and slitting mill and Chartley forge, in what was henceforth called the Staffordshire Works. It appears that capital was only to be obtained with difficulty, because it was necessary to raise "moneys took upon bond to stock the Staffordshire Works", paying interest at 5%. Of the total stock of £11,994, Philip Foley of Prestwood subscribed £3,050.

No document so far discovered gives the stock or shares in the Cheshire Works at this time, but the capital was probably not far short of the £21,426 invested in 1700. In the summer

[29] See Johnson, B. L. C., "The Iron Industry", pp. 36-40 for Vale Royal furnace, 46-7 for Bodfari forge and 52-3 for the midland market for Lawton pig iron. See also the same author's M.A. thesis (Birmingham University) "The Charcoal Iron Trade in the Midlands", Appendix 13, for a detailed analysis of smelting costs at all the furnaces for which there are accounts in the Foley MSS.

[30] *Chirk Castle Accounts*, II, p. 236*n*.

of 1699 a huge consignment of nails went from Cheshire to London, where its sale realised £991 6s. 2d. net profit. Out of this the younger Thomas Dickin, who had taken over the partnership with William Cotton on his father's death in 1692, received a quarter share. On the other hand Dickin's share in the Cheshire Works would seem to have been equal to Cotton's, because half of what Cotton received from Thomas Hall on account of the Cheshire Stock was due to Dickin. The payments made to Cotton and Dickin for the years 1692-6 were £3,162, so that the total proceeds would have been £6,324, or an average of nearly £1,600 a year.[31] This probably represented a return of about 10% on the stock, which would have been regarded as normal at this date. Whether the other half of the stock belonged entirely to Heyford, or was shared by him and Thomas Hall it is not possible to say.

IV. OTHER FURNACES IN LANCASHIRE AND CHESHIRE

In addition to Vale Royal and Lawton, two other Cheshire furnaces, Street and Disley, appear to have been in blast during the 1690s. All that is known of Street furnace in Odd Rode is the comment in the Warmingham forge accounts for 1700/1, that "Street furnace being only two miles from Lawton . . . and the woods in the country growing scarce, the intent of Thomas Halls taking this furnace was for the service of Lawton furnace". It was first intended to establish a wire works at Street, but eventually the furnace was converted into a plating forge, manufacturing salt pans, frying pans and saw irons from 1704/5 onwards. Disley furnace was situated on land of the Jodrell family, on the boundary of Yeardsley Whaley. It is first noticed in the 1690s when small quantities of "Jodrell pig" were being received at the south Yorkshire forges, but in 1702 some of its produce found its way as far as Carburton forge in Nottinghamshire.[32] An estimate of the estate for 1737 shows it to have been worth a rent of £50 and then in the hands of Samuel Bagshaw, whilst in 1770 the tenant was Joseph Lowe. There is nothing in the Bagshaw of Ford MSS. to suggest that Colonel Bagshaw was its tenant in 1737.[33] On the other hand one member of that family, William Bagshaw of Chowbent, surgeon, lived in the heart of the Lancashire nail-making area and was brother-in-law to a Manchester whitesmith named William Pierpoint. Pierpoint's other brother-

[31] P.R.O., C 9. 372/11.
[32] Information of G. G. Hopkinson.
[33] John Rylands Library, Jodrell Suppl. 59 and 74, and Bagshaw MSS.

in-law was named Lowe, and he himself was in partnership with a Manchester firm, James Broadbent and Company, who were importers of Yorkshire iron from Spencer and Fell.[34]

There was at this time a forge in Manchester, Collyhurst forge, mentioned in the Blackley parish register from 1731 onwards. Whether this was a finery forge and therefore concerned in the production of iron, or only a large smithy is not clear. Apart from John Wellwood, one of the forgemen who died and left a will in 1768, none of the shareholders are known, so that it is not possible to say what its industrial associations are. By 1788, according to Lewis's Directory, it was owned by James Bateman, the Manchester ironfounder.

About 1700 the first blast furnace was built in Lancashire at Holme Chapel between Todmorden and Burnley. It is first referred to as "Mr. Wilmott's furnace", and from 1702/3 onwards for a few years small quantities of pig iron were received from it by Colnbridge and Kirkstall forges.[35] Robert Wilmott had married Mary, one of the five daughters of the elder Thomas Dickin. These five daughters became co-heiresses to the partnerships of their brother when he died without issue in 1701. Dickin's share in Colnbridge forge eventually went to Sarah and her husband, Matthew Woodhead, clerk of Wortley forges, and the share in Kirkstall forge went to Mary and Robert Wilmott. The identification of Robert Wilmott presents an interesting problem, because the name is a stranger to the Kirkstall region. It seems probable that he was the second son of James Wilmot of Hartlebury in Worcestershire. James Wilmot was closely associated with the iron trade of the lower Stour. Shortly before 1687 he set up Wildon forge, and it was probably he who converted the family's fulling mills at Mitton into forges.[36] His two sons, James and Robert were joint executors of their father's will (1695-6), after which Robert disappeared from Worcestershire. His mother's will, proved in 1709, however, shows that he was still alive at that date.[37]

Holme Chapel furnace had an unfortunate history. In 1713 three more Yorkshire ironmasters joined Wilmott in running it. They were John Silvester of Burthwaite Hall, Nicholas Burley of Wooley and John Spencer of Cannon Hall, all from the Barnsley area. An experienced Yorkshire founder, Charles Clay of Flockton, was put in charge, and it was intended to

[34] L.R.O., Wills of James Broadbent (1754) and William Pierpoint (1768), and information of G. G. Hopkinson.
[35] Cartwright Hall, Bradford, Spencer-Stanhope MSS.
[36] Johnson, B. L. C., "The Charcoal Iron Trade in the Midlands, 1690-1720", (unpublished thesis for M.A. degree, Birmingham University) pp. 98-9.
[37] Worcester City Library, Willis Bund MSS., p. 190.

build a forge and a slitting mill in the same area.[38] Local ironstone had been purchased: wood might be had from both the Townley and Whittaker estates which had already been among the suppliers of Colnbridge forge. Dr. Raistrick in *The South Yorkshire Iron Industry* puts the average output of the furnace at about 300 tons of pig iron and the bar iron output of the forge at 150 tons. Since a slitting mill was included, the intention may have been to secure a nearer vantage point than Colnbridge for supplying the Lancashire market. In 1714/15 Clay sent 22 tons of pig iron to Colnbridge, but this, the largest amount ever received from the furnace was also the last. An account dated 1727 between Spencer and Fell mentions 28 tons of pig iron sent from the Lancashire furnace by "Mr. Heyford", but this went by a different route, for it was lost in the Ribble. This account also refers to £533 lost by the Lancashire furnace in each of two blasts.[39] In 1742, when an attempt was made to settle the accounts of the Kirkstall and Colnbridge forge partnerships, William Spencer of Cannon Hall maintained that Kirkstall forge must be charged with a proportion of the loss by Holme Chapel furnace, because " 'twas a partner Wilmott in Kirkstall that was the Occasion of that Partnership".[40]

Meanwhile, the two Cheshire forges on Checkley Brook had been brought into the larger partnerships. In 1685 Tib Green forge was being run for Sir Philip Egerton of Oulton by Richard Skinner, when a dispute arose concerning iron supplied to a Nantwich ironmonger, Richard Hilditch.[41] The possibility that Richard Skinner was the forgemaster who received pig iron from Blakeney furnace and who sent bar iron to be slit at Wolverley on the Stour, is confirmed by Yarranton's statement that Forest of Dean iron was sent as far north as the Cheshire forges for fining before being supplied to the ironmongers of the midlands.[42] It is surprising that Skinner should also have purchased charcoal from Blakeney, but the charcoal supply for the ironworks on Checkley Brook must have been even more precarious than for Street and Lawton furnaces. Heighley furnace had probably come down before 1680,[43] but before that there had been two forges and two furnaces on a five mile stretch of stream, whilst Madeley furnace was only about a

[38] Sheffield City Libraries, Spencer-Stanhope MSS., Section 35.
[39] Information of G. G. Hopkinson.
[40] Cartwright Hall, Spencer-Stanhope MSS. [41] P.R.O., Chester 16/95.
[42] Johnson, B. L. C., "The Charcoal Iron Trade", pp. 141 and 161*n* and Yarranton, A., *England's Improvement by Land and Sea* (1677-81), p. 57.
[43] Parrott, E., "Account of the parish of Audley", Staffs. Record Soc. (1944), p. 35.

mile from Tib Green and Heighley. After Richard Skinner's death, which occurred in 1700, Sir Philip's successor, John Egerton, must have considered it not worth his while to carry on the forge, for he leased it to the Staffordshire Works at a rent of £40.

References in the Foley MSS. appear to link Lea forge with Thomas Corfield at this time. In 1698/1700 Cranage slitting mill received 20 tons of Corfield's coldshort mill bar, and in 1703/4 Corfield bought 6 tons of tough pig iron from Vale Royal furnace. Corfield would presumably be of the family which held many of the Shropshire forges in the late seventeenth century. The hammerman of Lea forge, however, was William Skinner, brother of the man who was managing Tib Green.[44] There are no forge accounts for Lea in the Foley MSS., but the 1709/10 accounts of Vale Royal furnace mention charcoal stocks there. In the following year the Cheshire furnaces sent their first big consignment of pig iron, 150 tons, to Lea forge. In the same year a payment of £1,339 was made on account of Doddington Works, and Stourbridge clay was purchased for Doddington. This suggests that Doddington furnace had also been acquired, and that it was being rebuilt in order to work in conjunction with Lea forge. The clerk of Doddington Works was William Wright, who may have been related to Sir Thomas Delves's former agent, Thomas Wright.

V. ADMINISTRATIVE CHANGES IN THE CHESHIRE WORKS

In the Cheshire partnership it is possible that some reorganisation took place in 1696. Payments by Thomas Hall to William Cotton and Thomas Dickin are recorded only up to 1696, whilst the Foley family's series of accounts for the Cheshire Works begins in 1696/7. A further change was brought about in July 1698, when Cotton and Hall bought Cranage forge from Heyford. It was probably about this time that Heyford acquired an interest in the Derbyshire ironworks, for by 1700 he was living at Staveley Hall. Until 1700 Cranage forge was run by Cotton and Hall in partnership, but then Cotton withdrew from the Cheshire Works altogether and a new partnership was formed.

The largest subscriber was Thomas Hall's youngest brother, Edward Hall of Cranage, who contributed £10,251. Then came a younger brother of William Cotton, Daniel Cotton of Churchhulme, with £8,848, and lastly William Vernon, probably the eldest son of Edward Vernon of Twemlow, with £2,327.

[44] C.R.O., Wills of William (1698) and Richard Skinner (1700).

The management of the Cheshire Works from 1696 appears to have been: Thomas Hall for Cranage forge and Lawton furnace, Daniel Cotton for Vale Royal furnace, and Edward Hall for Warmingham forge, and also for Street plating forge from 1701. The smelting of phosphoric Staffordshire ores at Lawton furnace, and of haematite ores at Vale Royal, enabled the Cheshire ironmasters to command supplies of both coldshort and tough pig in nearly equal quantities. The unusual feature of furnace practice in Cheshire was the intermixture of small quantities of haematite in coldshort pig and of phosphoric ore in tough pig, and on occasion the production of "mixed pig". In other areas it was the practice for this blending of different qualities of iron to take place in the finery, but blending occurred at the furnance wherever the Cheshire ironmasters held sway. Even as late as 1780 the practice was still carried on at Duddon furnace, where the phosphoric ore needed was brought from Harrington in the Cumberland coalfield.[45]

Cranage possessed the only slitting mill of the Cheshire Works and much of the Lawton pig received there must have been slit. But comparison of the output of rod iron with receipts of coldshort pig proves that some Cranage rod iron must have been manufactured from tough pig or from metal blended in the forge. Through the Warrington warehouse of Mr. Banks the rod iron reached customers in Chowbent, Shakerley, Winstanley, Sutton and Liverpool. Most of the remainder went to customers in northern Staffordshire, but smaller quantities were sold in Middlewich, Congleton, at the Chester warehouse of Charles Griffith, and as far away as Wrexham.

There is no doubt that the bulk of the iron produced by the Cheshire forges was tough merchant bar. Most of the pig iron produced at Lawton furnace was despatched to forges in the midlands; some of it travelled overland to Uffington on the Severn and then downstream to the forges on the Stour. Even Cranage forge received appreciably less coldshort pig than tough after 1698, whilst Warmingham received very little, and Bodfari none at all. Merchant bar found buyers in most of the main Cheshire towns. The inland towns were supplied largely from Warmingham and Cranage forges, but from 1700 onwards Bodfari became the chief source of supply for Chester itself. All three forges supplied large quantities of bar iron to Warrington, which was easily the largest consumer of all types of iron produced by the Cheshire forges. In Warrington the

[45] L.R.O., DDX 192/4.

chief customers were Enoch Tomlinson, Thomas Boult and Hugh Croxton, whilst at Chester Nathaniel Bradburn, Randle Bingley, Robert Bulkeley and John Clubb bought most of the iron. Other large purchasers were George Maudslay of Liverpool (from Bodfari), John Eddows and Thomas Talbot of Nantwich, Thomas Hall of Sandbach and Richard Taylor of Newcastle under Lyme (from Warmingham), Thomas Pool of Knutsford and Roger Eddows of Macclesfield (from Cranage).

Unusual in contemporary ironworks was the salt pan plating which went on at Warmingham and after 1704/5 at Street forge. Though established presumably to meet local conditions, the pan trade reached markets far outside Cheshire. Manchester, Liverpool, Bristol, Uttoxeter and London are among the places mentioned, whilst saw irons were bought in large quantities by John Podmore of Broadwaters, Kidderminster. The sale of the large quantity of nails in London already alluded to suggests that the Cheshire ironmasters were regularly engaged as factors in the nail trade, but evidence confirming this is not apparent in the Foley accounts. Another side-line of the Cheshire Works was the casting of pots at Vale Royal furnace. The potter was Edward Legas, and the pots were sold locally in Cheshire and Denbighshire. The presence of James Legas, a potter, in the Forest of Dean, and of John Legas, a partner in Gloucester furnace, in Kent, is another illustration of the close contact between ironworkers of different regions in the eighteenth century.

About 1706 a rearrangement took place in the management of the Cheshire Works. Edward Hall took over Vale Royal furnace and Bodfari forge. He was replaced at Warmingham and Street forges by William Vernon, and Daniel Cotton moved from Vale Royal to replace Thomas Hall at Lawton furnace and Cranage forge. It is probable that this rearrangement was made in connection with the partnership changes which then occurred, the full significance of which is only apparent in light of events elsewhere.

In Yorkshire the death of Thomas Dickin was followed after a short interval by that of the younger William Cotton in May 1703. Cotton left several children, all of them under age, and it fell to his widow Anna and his brother Daniel to act as their guardians. John Spencer of Cannon Hall, who has already been mentioned in connection with Holme Chapel furnace, seized his chance to re-establish the dominance of his family. He was related to the John and Edward Spencer who had been the leading figures in the Yorkshire ironworks in the previous century. His father, another John Spencer (1629-1681), had

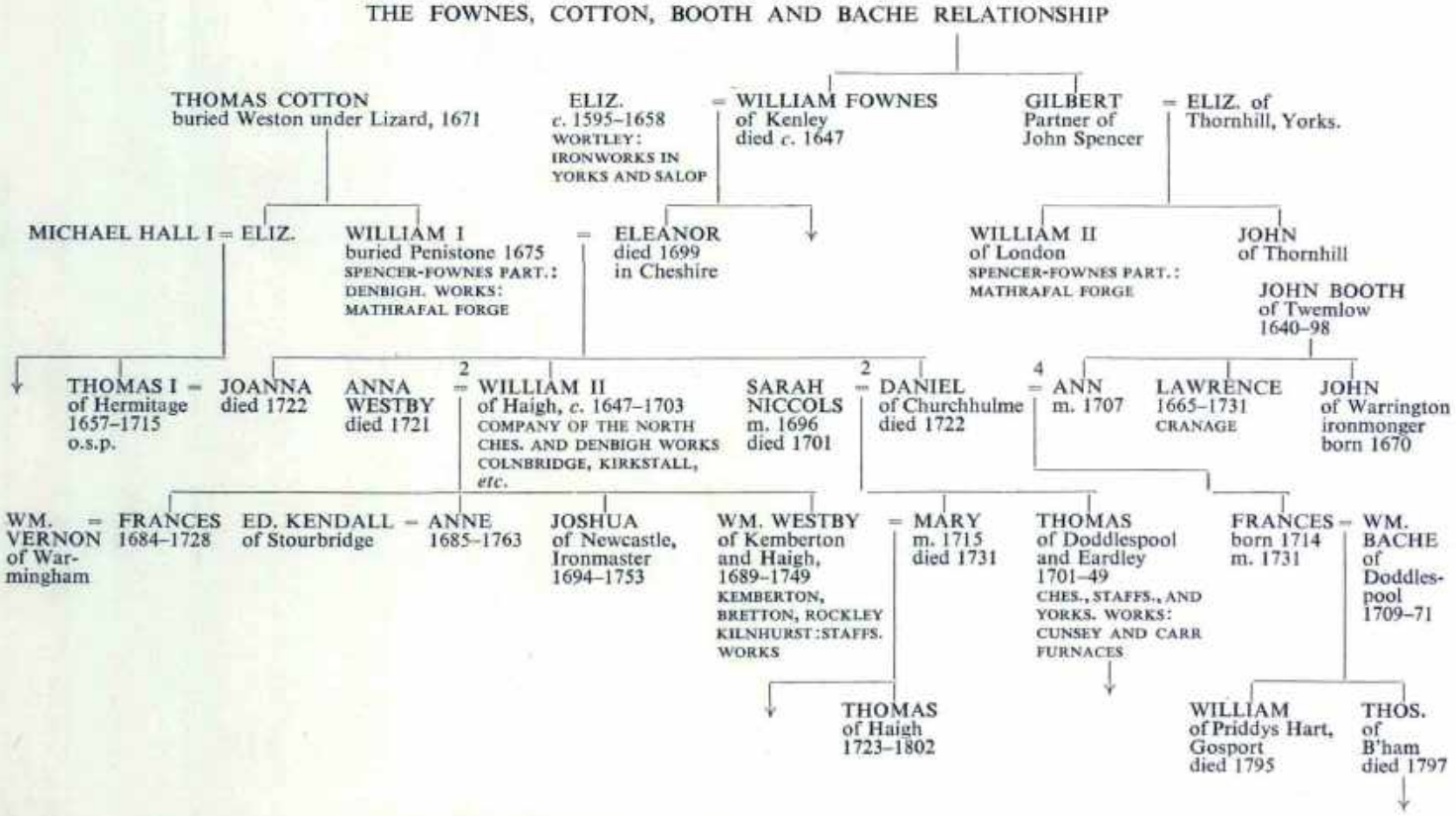
come from Wales in 1650 in order to act as clerk at Barnby furnace, and had begun to retrieve the fortunes of the family by purchasing a third share in Kirkstall forge and Barnby furnace from the elder Thomas Dickin and the younger William Cotton in 1676. John Spencer the son became partner with the second Thomas Dickin in a new lease of Wortley forges in 1696, and after Dickin's death seized Wortley forges and secured an additional interest in Kirkstall forge. Finally, with William Cotton out of the way, he gained a foothold in Colnbridge forge by inducing Matthew Woodhead to sell him half the share which Dickin had formerly had.[46] William Cotton's eldest son, William Westby Cotton, appears to have left Yorkshire. Between 1715 and 1717 he was certainly living at Kemberton in Shropshire,[47] where the family presumably had an interest in Kemberton furnace, later handed on to Edward Kendall of Stourbridge. From this time onwards the Spencer family remained the dominant figures in the charcoal iron industry of Yorkshire, despite all the efforts of Daniel and Anna Cotton.

The events which followed may be construed as a deliberate campaign by the Cotton family to bolster up their position in Cheshire and to secure friends in the Midlands. The first step was the amalgamation of the Cheshire and Staffordshire Works which took place in 1707. The partners in Cheshire were Philip Foley of Prestwood; John Wheeler of Wollaston Hall, the managing director of both the Staffordshire Works and the Forest of Dean Partnership; Obadiah Lane, the general manager of the Staffordshire Works; his son Nathaniel Lane; Edward Hall and Daniel Cotton. Each had a share of £2,250 in the total stock of £13,500. In the Staffordshire Works the shares were sevenths. Nathaniel Lane had no share, but Obadiah Lane had two. The seventh share was held by Thomas Hall. As the Staffordshire Works had only one furnace and had always relied on Cheshire pig iron to make up the deficiency, this development was logical and the new combination was all but self-sufficient.

As time went on the hand of the Cheshire partners increased in strength. Obadiah Lane died in April 1708. John Wheeler also died and Thomas Hall replaced him as managing director of the Staffordshire Works, Wheeler's place in the Forest of Dean being taken by William Rea of Monmouth. By about 1710 the shares in the Staffordshire Works were held by Philip Foley, John Wheeler's executors and the three Cheshire

[46] P.R.O., C 9. 466/2; Spencer-Stanhope MSS.
[47] Harleian Soc., XXXVII, p. 122.

THE FOWNES, COTTON, BOOTH AND BACHE RELATIONSHIP



partners, giving the latter a dominating position in the Staffordshire Works. As there was no benefit of survivorship in most ironworks partnerships, (the shares of a deceased partner descended to his heirs and did not accrue to the surviving partners), the Lane interest must have been bought out. This accounts for Thomas Hall's paying "£1,200 out of the Bodfari Stock to carry on the works in Staffordshire," in 1710/11. The Bodfari forge account for 1711/12 is blank and it is possible that it was left temporarily in other hands for want of capital. Tib Green forge, too, was sold in 1709 to Thomas Hart, who had previously been clerk at Bodfari forge.

It is evident, however, that these partnership agreements do not tell the whole story. Partners sometimes made private arrangements to raise their money, so that outsiders appear from time to time having interests in individual forges or furnaces. For instance, in 1701 Obadiah Lane entered into a joint partnership with Edward Hall whereby each advanced £400 for the running of Warmingham and Street forges. In 1707 the south Yorkshire ironmaster, Simpson, invested £51 in the Cheshire Works. In his will of 12 September 1722 Lawrence Booth of Twemlow speaks of having purchased for about £500 from Edward Wheeler, a share in Cranage forge.[48] One would similarly imagine that Thomas Hall made some contribution to the Cheshire stock in 1700 and that William Vernon did so in 1707, but this is not apparent in the agreements.

A further strengthening of the position of the Cheshire partners was brought about by a series of marriage alliances. In 1707 Daniel Cotton married Ann Booth, sister of the Lawrence Booth mentioned in the preceding paragraph. The following year Elizabeth Hall of the Hermitage married Ralph Kent of Middlewich, later of Kinderton, and William Cotton's eldest daughter married William Vernon of Warmingham forge. In 1711 Elizabeth Hall of Cranage married Thomas Bridge, a Chester feltmaker, and in 1712, Anne, another of Cotton's daughters, married Edward Kendall of Stourbridge. Finally, in 1715 came the marriage of William Westby Cotton of Kemberton with Mary Cotton of Churchhulme, so that the heir to the Cotton interests in Yorkshire was now son-in-law, as well as nephew to Daniel Cotton.[49] All

[48] For Lane's interest in Warmingham and Street forges see Johnson, B. L. C., "The Foley Partnerships", p. 329. For Lawrence Booth see Earwaker, J. P., *History of Sandbach*, p. 225. The information concerning Simpson was sent to the author by G. G. Hopkinson.

[49] For the marriages of Frances and Anne Cotton see Harleian Society, XXXVII, p. 122. For the remainder see Chester Marriage Bonds, Record Society of Lancs. and Cheshire, LXXXV, XCVII, CI.

these marriages were probably accompanied by such formal marriage settlements safeguarding the interests of the children as that revealed in the will of William Vernon in 1733, and all of them, especially that between Anne Cotton and Edward Kendall, were of importance to the iron trade.

Edward Kendall was born in 1684, the fourth son, but ultimately the heir, of Jonathan Kendall of Austrey in Warwickshire. By 1702 he was an agent under John Wheeler in the Stour Valley—Forest of Dean Partnership. In 1710 he and William Rea became joint managers of the Staffordshire Works. He is generally called Edward Kendall of Stourbridge, and from 1724, when he acquired the lease of the Cradley ironworks, previously held by the Wheeler family,[50] that was where his chief interest lay. Other ironworks in which he had an interest were Kemberton furnace, from which he supplied ten tons of pig iron to John Kelsall of Dolobran forge in 1729, and probably Rushall furnace, from which he supplied pig iron to Edward Knight's Stour forges from 1725 to 1728.[51]

The practical expression of these new alliances is seen clearly in the building of the furnace at Cunsey in Furness. It is evident that because of its distance from supplies of iron ore, Vale Royal furnace was very much at the mercy of its suppliers. It was probably on account of this drawback that in 1709 the Cheshire ironmasters started mining on their own account at Matson's Crossgates mine. They may already have had the possible building of a Lancashire furnace in mind. Certainly wind of this intention got abroad, so that the Backbarrow ironmasters were able to bring their furnace into blast first. The two concerns evidently started off in fierce rivalry. A letter from Abraham Darby to William Rawlinson written shortly after a visit to his fellow Quakers told how he spent some time with Hall on his way home "pumping his mind in relation to the desput that is betwixt you." Differences were ironed out, for the two companies were soon taking joint leases of Furness forges and iron mines, some of the forges being taken, it would appear, merely to keep competitors out, for they were closed down.[52]

The lease of Cunsey forge and mill was obtained in November 1711. In 1716/17 119 tons of Edward Hall's Lancashire pigs arrived at Wildon forge, and 71 tons at the Bewdley storehouse

[50] Information of the Borough Librarian of Dudley.

[51] John Kelsall's diary, 17.12.1728. Extracts published by A. Stanley Davies, *op. cit.* Also Knight MSS.

[52] Fell, *op. cit.*, pp. 38, 39, 61, 72 for mines; pp. 198, 199, 203 for Hacket, Burblethwaite and Stony Hazel forges. From L.R.O., DDAr it appears that Stony Hazel forge was held jointly by the two companies from 1726 to 1755.

on the Severn.[53] In 1715 Thomas Hall had died, and the partners in Cunsey furnace in 1718 were Edward Hall of Cranage, Daniel Cotton of Churchhulme, Edward Kendall of Stourbridge, Ralph Kent of Kinderton and William Rea of Monmouth.[54]

Both the inclusion of Rea in the partnership and the deliveries of pig iron up the Severn show that Cunsey furnace did not serve exactly the same function as Vale Royal. Yet, as Raistrick shows in his *Dynasty of Ironfounders*, Vale Royal was rapidly abandoned, and was taken over in 1716 by Abraham Darby of Coalbrookdale and his partners, John Chamberlain and Thomas Baylies. Charles Cholmondeley, the proprietor, was to furnish the charcoal; Darby and partners to provide the ironstone and work the furnace. The pig iron was to be divided each Monday, Cholmondeley having one half and Darby and partners the other. A new partnership agreement was made in 1720, but how long Vale Royal continued under these old-fashioned arrangements is not clear. If the Acton forge included in the second list of forges was on the same site as the later Acton forge on the Weaver near Acton bridge, it is possible that it was built in order to work in conjunction with Vale Royal. As the forge is recorded as being out of action at the time of the list this would indicate that Vale Royal too had closed down. No entries in the Weaver Navigation tonnage books seem to be connected with the furnace or forge, so it may be that neither was worked after 1733.

Though Vale Royal left the Cheshire Works the policy was still one of expansion. As we have seen, Doddington Works were being brought into action about the time that Cunsey furnace was being built. Possibly the threat of increased supplies of coldshort iron from Cheshire prompted the entry in the Colnbridge forge accounts for 1710/11 of "Expences to New Castle to Sell Iron and Save Lancashire markett £2. –. –." But Lord Paget's Cannock furnace is described in 1732 as "late used by Edward Hall, Warine Falkner, Thomas Cotton and Edward Kendall", so that it too must have been in blast some time after the 1717 list of furnaces. In 1732, however, it was apparently derelict for only the furnace site was conveyed by the new lease of the Cannock ironworks and Bromley forge. To make matters worse for Colnbridge forge, it is probable that Madeley furnace was brought into production again at this

[53] Johnson, B. L. C., "The Charcoal Iron Trade", p. 9.

[54] Fell, *op. cit.*, pp. 209 and 265. Fell contradicts himself regarding Daniel and Thomas Cotton. As Thomas was not baptized until 1701 it is likely that the lease and share both belonged to Daniel Cotton until his death in 1722.

time. In 1716 Daniel Cotton and William Vernon entered into a twenty-one year agreement with John Crewe for a supply of all his suitable oaks in Barthomley, Warmingham, Gawsworth, Sandbach, North Rode, Boseley, Madeley, Muccleston and Muxton. They were also to get Chalky and Boylam mine in Leycett, and sufficient limestone from Madeley to work the furnace, should they wish to repair and rebuild it.[55] As Madeley is shown as being in production in the lists of Staffordshire furnaces in 1717 and 1735,[56] both of which dates fall within the period of the agreement, the furnace must have been rebuilt. And as the getting of ironstone in the parish of Madeley is limited to Cotton and Vernon, it is reasonable to suppose that it was they who rebuilt it. The bringing of Madeley and Doddington furnaces into action accounts for the movement of Daniel Cotton's son, Thomas, to this area. He lived at Doddlespool House, which belonged to Thomas Coape, a clerk in the ironworks, until about 1730, when he moved to Eardley End, nearer to Lawton furnace. His place at Doddlespool was taken by William Bache, a Birmingham ironmaster, who married Thomas Cotton's half sister in 1731. The William Wright of Doddlespool, who married Edward Kendall's sister, Mary, was presumably the clerk of Doddington Works.

In 1716 an attempt was made to regain some control over Colnbridge forge. Anna Cotton notified John Spencer that she had assigned her share to her son William Westby Cotton and to her sons-in-law, William Vernon and Edward Kendall. But control would appear to have remained firmly in Spencer's hands, because in January 1718 they complained to him that they had not received the accounts for the year ending May 1717, nor the £600 "heretofore payd as advance of Stock".[57]

Between 1717 and 1720 Westby Cotton returned home to live at Haigh, and it was about this time that the neighbouring furnace was built at Bretton. Edward Hall of Cranage, Thomas Cotton of Doddlespool and Samuel Shore of Kilnhurst agreed to run this furnace with him as equal partners for twenty-one years from Michaelmas 1720. Also included in the agreement were Kilnhurst forge and other Yorkshire ironworks, Rockley furnace probably being among them, for Westby Cotton obtained a sixteen-year lease of it in 1726.[58] It seems that in his turn Cotton had a share with his cousin in the Staffordshire Works.[59]

[55] William Salt Library, Aqualate D 1734/T/AB 135 a-c, and P 61 B9.
[56] For 1735 list see Shaw, Stebbing, *Staffordshire*, I, facing p. 1.
[57] Cartwright Hall, Spencer-Stanhope MSS.
[58] Sheffield City Libraries, Spencer-Stanhope MSS. Surtees Soc. LXV, p. 262.
[59] J.H.C., XXIII, p. 112.

VI. RENEWED ACTIVITY IN SOUTH LANCASHIRE

In 1720 Edward Hall attacked Colnbridge forge where the effect would most be felt, in the Lancashire nailing area. The rod iron delivered at Rochdale by Colnbridge forge had recently climbed to £20 10s. per ton, a high price for coldshort rod, so that the prospect of selling more iron in Lancashire was inviting. On 25 March Edward Hall secured from Sir William Gerard of Garswood a thirty-year lease of Carr Mill in Ashton in Makerfield.[60] For the low rent of £32 the lease envisaged the building of one or more furnaces and forges, the rebuilding of the dam head and the possible creation of three or four new mill pools. No provision was made in the lease for the mining of ironstone, but iron mining is known to have been carried on in the neighbouring township of Parr on the Tyrer estate during the 1740s. Considerable quantities of Staffordshire ironstone were shipped down the Weaver by Thomas Cotton and Company during the 1730s and '40s and it is likely that a considerable proportion of this was destined for Carr furnace, particularly as shipments ceased in August 1751 on expiry of the lease. Charcoal was being obtained from Hulton Park in the years 1741 and 1742. William Hulton had sold all the trees on his estates in Lancashire and in Brianstown, Ireland, to four men, one of them a tanner, in April 1739 for £10,000, but two of these men found themselves unable to fulfil their part of the bargain and withdrew in April 1740 after some of the wood had already been cut. Maurice Hall of Cranage agreed to take the wood from Hulton Park the same month. Of particular interest is a letter from Edward Hall dated 22 March 1742 in which he says that he requires all the wood to be coaled that summer because he "can take none next year, our Furnace will not be in blast then". Unless this is mere bluff to obtain the charcoal quickly, it means that Edward Hall was able to plan his campaigns two seasons ahead, in theory at least.[61] It is unlikely that there was ever more than one furnace at Carr Mill. Only one furnace is spoken of in the next lease in 1759, and charcoal supplies would hardly have permitted the erection of more than one furnace on each site. The chief product of Carr furnace is likely to have been coldshort pig for the nail trade, but a certain amount of tough pig may have been made, as it was listed, together with Duddon and Cunsey pig iron, at the Stour forges in 1746-1751 and 1754.[62] It would, of

[60] L.R.O., QDD Roll 4th Geo. I.
[61] L.R.O., DDHu 19/38-9 and 53/47-8.
[62] Knight MSS.

course, be in no worse a position than Vale Royal for receiving Cumberland and Furness ore. Probably some of the iron was used by the numerous Prescot iron pot founders of this period.

The price of Colnbridge rod iron at Rochdale fell to £20 a ton, but managed to remain at this price until the depression of 1737-8, when the price fell to £18 10s., and by 1745 down to £16 10s. But the full extent of the loss suffered by Colnbridge forge in the 1720s cannot be accounted for by the fall in price alone, since this would never have caused more than a £60 or £70 decrease in receipts. In fact all the Yorkshire forges had a period of difficulty around 1720, but in the case of Colnbridge "the period of difficulty lasts for much longer than the general accounts of the industry as a whole would suggest".[63] In the twenty-five years before 1720 profits had averaged over £300, but the only years between 1720 and 1749 in which this figure was exceeded were 1733/4 and 1734/5. For the years 1721-6 the net profit of the forge was only £131. Nevertheless, the amount of iron sold in Lancashire from Colnbridge actually increased after 1720, and after the depression of 1737-8 Colnbridge rod was being delivered in Chowbent itself. It is probable too that an understanding was soon reached between the two concerns, because a new distribution agreement for the Yorkshire ironworks made in 1728 included Bretton furnace and Kilnhurst forge.[64] In 1740 Spencer and Cotton co-operated in drafting the bill for the Saltersbrook turnpike.[65]

In connection with the lease of Carr Mill it is of interest that both parties to it were Roman Catholics. Edward Hall had his estates registered as a Roman Catholic in 1723, but most other members of the Hall family were of the established church. Edward Hall's son Thomas (1702-1748) was actually sheriff of Cheshire during the '45. Silver communion patens were presented to Bodfari church in 1699 by Thomas Hall, and to Lawton church by "William Hall, Iron Master". Thomas Hall also presented double-tiered brass candelabra to Holmes Chapel in 1708 and endowed schools there. Bells were given to Lawton church in 1713 by "The Present Ironmasters of Lawton Furnace", and to Holmes Chapel in 1709 by Daniel Cotton. Both Cotton's father and eldest brother had been prominent Non-conformists and friends of Oliver Heywood, and the Non-conformist minister Thomas Cotton was another of Daniel's brothers. But this did not prevent Cotton

[63] Raistrick, A. and Allen E., "The South Yorkshire Ironmasters", p. 175.
[64] Raistrick, A., "The South Yorkshire Iron Industry", p. 70.
[65] Information of G. G. Hopkinson.

from making the gift mentioned above, having his children baptized in the Church of England, and presenting William Dugard to the rectory of Warmingham in 1714. It would be interesting to know what prompted Thomas Cotton of Doddlespool to become a benefactor of Woodhead chapel in 1728, since the other gifts mentioned were all connected with centres of the iron trade.[66]

Edward Hall was not the only Roman Catholic ironmaster in south Lancashire at this time. In 1715 John Chadwick of Sale, yeoman, took a lease of Park Hall in Charnock Richard. The inclusion by endorsement of Park Hall water mill in the lease suggests that he may already have had the building of a forge in view. But he did not stay long at Park Hall for it was leased again in 1722, and by 1724 Chadwick was acting as steward to Roger Dicconson of Wrightington. Now he certainly came into contact with the ironmasters because the Dicconson estates included an iron mine in Furness. Chadwick's first forge was probably at Birkacre in Chorley, which he acquired after the death of Sir Alexander Rigby in 1727. It is first mentioned in the marriage settlement of Chadwick's eldest son, Thomas, in 1744, and in 1747 deliveries of hoop iron were being made to William Houlcroft of Liverpool from the slitting mill built alongside the forge. Thomas Chadwick was probably responsible for the building of Burgh forge, a little higher up the Yarrow than Birkacre forge, on the adjoining estate which belonged to his father-in-law Matthew Cragg. Chadwick had an adventurous time during the '45, serving as a lieutenant in the Manchester Regiment and being captured at Carlisle. His youngest brother was the Rev. John Chadwick, vicar-general for the Roman Catholic church in Lancashire.[67]

The figure of 120 tons of bar iron given as the annual production of Burgh forge in the third list of forges, probably includes the output of Birkacre forge. In 1774 each forge had a finery as well as chafery: there were two lift hammers and

[66] For Edward Hall see Lancs. and Ches. Record Society, XCIV, p. 29. For Thomas Hall see Ormerod, G., *op. cit.*, III, p. 130. Bodfari, candelabra and peals of bells see Lancs. and Ches. Antiq. Soc., XXXII, p. 192; LV, p. 50; LVIII, pp. 234, 236. Schools and William Dugard see Ormerod, G., *op. cit.*, III, pp. 129*n*, 234. For William Hall see Earwaker, J. P., *op. cit.*, p. 214*n*. For Woodhead chapel see Earwaker, J. P., *East Cheshire*, II, p. 137. For nonconformity of the Cotton family see Turner, J. Horsfall, *The Rev. Oliver Heywood, B.A.* 1630-1702; *his Autobiography*, etc.

[67] For the Chadwick family in general see Catholic Record Soc., XXIII, p. 77*n*. For Park Hall see L.R.O., DDA1 23 and 27. For stewardship to Dicconson see L.R.O., DX 396 etc. For Houlcroft see TRANSACTIONS, LXXIII, p. 228. For accounts of family's properties see L.R.O., QDD 22 Geo. III, and wills of John Chadwick (1755), Thomas Chadwick (1780) and John Chadwick (1779).

one tilt hammer, and air furnaces for batting and casting of hammers and anvils. There was plenty of wood in the neighbourhood with pit-coal available within half a mile. At this date there was apparently no slitting mill, so that the slitting must have been carried out at Wigan slitting mill. It is stated that one forge was never flooded and the other only for four hours at a time.[68]

Wigan slitting mill was built on the site of School Common mill. An agreement to purchase land for the enlargement of the sluices of the "Mill or Other Intended Works of the said Thomas Chadwick where the Corn Mill called the Common Mill in Wigan formerly stood" was made in 1755, very shortly after John Chadwick's death. In the 1770s this mill was being run by James Thompson, a Wigan ironmonger, on behalf of the Chadwick family, and during 1774 the amount of iron slit there was 54 tons.[69]

The Chadwick family also held Bottlingwood forge in Wigan from the Dicconson family on "a lease for lives". In 1725 John Chadwick had accounted to Roger Dicconson for 1s. 2d. "Spent at Wigan with a millwright when he was at Bottlingwood Mill to view it". How soon the mill became a forge it is not possible to say, for the Wrightington MSS. contain no lease for it, but it may well have been about 1755, when the slitting mill was started.

When drawing up his will in 1775 Thomas Chadwick described Bottlingwood forge as "now or late in the tenure of Thomas Morland and Forth Winter Esquires". Winter of Whitehall in Kendal was a Furness ironmaster who escaped the notice of Fell, whilst Morland is mentioned only in connection with James Spedding of Whitehaven, when as proprietors of the Seaton furnace they were mining at Crossgates. These iron mines had come to Morland as a result of his marriage with Anne, daughter and co-heiress of William Matson of Tytup Hall (d. 1764). Morland must have been a considerable figure in the iron trade of the day. His will was made at Lamberhurst in Kent, near the Gloucester furnace, in 1774, but when he died in 1784 he was living at Broughton in Furness.[69a] His marriage with Anne Matson also made him partner to Forth Winter. Winter, Matson, John Law and Thomas Ireland of Ulverston, and Edward Wilson of Kendal had been partners in Wellhouse forge in Bardsea from 1757. In 1760 they also built a forge on Oxenholme Common, near Ulverston. Morland

[68] *Adams' Courant*, 18 October 1774.
[69] L.R.O., DDKe (Wigan) and DDTs.
[69a] L.R.O., Will of Thomas Morland (1784).

succeeded Matson in 1764, John Law died in 1762 and his administrators sold both the forge and Law's share in the partnership to the others in 1768.[70] Beyond the fact that they appear to have been about to surrender their interest in Bottlingwood forge in 1775, nothing is known of the end of this partnership.

The Chadwick family had interests in many directions. Thomas Chadwick purchased a sixteenth share in the Newland Company before 1761 and became interested in the Lorn furnace in Scotland, so that both these furnaces may have supplied him with pig iron. Pig iron was also shipped for Chadwick from Liverpool to Preston,[71] and a bill drawn by the Backbarrow Company on Thomas Chadwick in 1754 suggests a fourth source.[72] Thomas Chadwick's eldest son, John, was also interested in the iron trade. In 1771 he and Edward Thomas of Dolgyn forge near Dolgelly unsuccessfully petitioned for a patent for their invention of the "art or mystery of working and making iron malleable from pig or sow metal, etc. by turf or peat instead of wood charcoal".[73] The Chadwicks held a twelfth share in the Toxteth Park copper works of Charles Roe and Company, and interests in the Llandudno copper mines and Flintshire lead mines, but probably their most successful enterprises were their collieries in Wigan, Burgh and Charnock Richard.

Thomas Chadwick died in 1777, and later the same year Birkacre forge was leased to Richard Arkwright, already having been converted into a spinning mill.[74] John Chadwick died without surviving issue in 1779, and without proving his father's will. Thomas's second son, Edward, proved the will in 1780, but he found that the burdens laid by this will and that of his elder brother on the estate were so heavy as to be incapable of fulfilment. In 1782 the Chadwick family placed the whole estate, except Burgh Hall and Burgh colliery, in the hands of trustees for the benefit of the creditors. The Ordnance Survey of 1845 shows that the slitting mill had then been replaced by Wigan forge. On the site of Bottlingwood forge was Sutton flour mill, and only Burgh forge, the Upper forge, appears to have preserved its identity.

A third important interest in the iron trade of southern Lancashire was held by the Quaker merchants of Warrington,

[70] L.R.O., UDU1 3/31.
[71] L.R.O., DDca 1/47. 27 tons were consigned in 1752.
[72] L.R.O., DDK 1647, 1 September 1754.
[73] Davies, A. Stanley, "Early iron industry of North Wales", Trans. Newcomen Society, XXV, p. 86.
[74] L.R.O., DDPr 62/1.

especially the Tomlinsons, Titleys and Fothergills. Enoch Tomlinson who died in 1724 bought bar iron from both Cranage and Attercliffe forges.[75] By 1727 Joseph Titley (1677-1731) was probably the chief Warrington dealer in iron. Robert Cowley, a Winstanley nailer, died in that year and the inventory of his effects was sent to his partner Robert Atherton, who was at Titley's shop in Warrington. Titley was born at Helsby. By 1687 both his parents were dead and he is next encountered as a Warrington grocer in 1700, when he married Esther Squire of Great Sankey. When he made his will in 1731 he was in possession of a slitting mill in Great Sankey, which together with its wheels, engines, planks, screws and the adjoining smithy he left to his eldest son Thomas (1702-1753). Also mentioned in the will are the timber, poplar and other wood which he had lately bought for the mill's use. The usual fuel for a slitting mill was coal, so that it looks as though Titley were slitting better quality metals, such as tough bar iron and steel, for a wide variety of metal users. That tough bar iron was being received from northern Lancashire is likely enough, for in 1732 Thomas Titley married Esther, daughter of Abraham Rawlinson of Caton forge. Joseph Titley had also had a shop in Atherton, the heart of the nail-making area. This he willed to his youngest son, Benjamin, the shop to be carried on by the executors until he came of age.

Thomas Titley probably still had Great Sankey slitting mill in 1737, when the churchwardens of Great Sankey presented that he had not paid the church ley. In 1748, however, he extended his interests by buying the remainder of the lease of Brock forge near Wigan for £400. Sir Roger Bradshaigh had leased the mill in 1716 to John Russell of Portway in Staffordshire. Portway was a mining area in Rowley Regis parish, not far from the Cradley ironworks. What Russell's interest in Brock forge was is not clear, as the lease does not survive. Whilst he was tenant, however, Edmund Lee, probably a Wrightington man, converted the mill "into a Working Smithy or Shop . . . and made convenient Wheels and other Engines for that purpose and at his own expence provided and was possessed of several Anvils Hammers Bellows and other Implements". In a lease and release of the Haigh estate dated 1739 it is described as a forge and slitting mill, and it is unlikely that the forge was ever a finery. This is confirmed by the low rent of 15s. at which it was let, though Sir Roger obtained a ten guinea fine when Lee took a new lease for three lives in his own name in 1738, and £45 when it was leased again in

[75] Foley MSS. and information of G. G. Hopkinson.

1761. Lee mortgaged the forge early in 1743 to the Rev. Samuel Bourn of Wigan, and later in that year it was further assigned to James Morris, a Hindley fustian weaver. For four years he and Lee ran the forge in partnership, but then a dispute arose. The arbitrators ruled that Morris should be allowed to sell the lease in order to make good what he had paid for the assignment and invested in the partnership. It was at this point that Titley bought the forge. He was probably chiefly interested in the slitting mill, but he does not seem to have made a very good bargain, for the lease expired in 1761 and the forge was probably back in Morris's hands some time before that.[76]

Thomas Titley himself did not enjoy these leases for long, because he died at Bath in 1753, leaving a seventeen-year old son, Abraham (1735-1772), heir to his mills.[77] Before 1760, however, the family had extended its interests by acquiring a third slitting mill, this time on the south bank of the Mersey at Partington. Abraham also built a paper mill at Partington shortly before his death, but as he left no children, the Partington mills were advertised for sale the same year.[78] The slitting mill is shown on Yates's map of Lancashire in 1786.

Possibly the Titley family also had an interest in the Stanley slitting mill, for in the early 'eighties one of the partners in it was Abraham Titley's executor, Alexander Chorley, another of the Quaker ironmongers of Warrington. The mill was on the Blackbrook, a few hundred yards below Carr furnace. One would imagine that mechanical slitting was carried out in the vicinity of Carr furnace from 1720 onwards, but there is no evidence that Stanley mill was in operation before the construction of the Sankey Navigation, 1755-7.

Meanwhile James Morris had taken a new lease of Brock forge in 1761, but he died in 1763. His son John emigrated to America in 1767, and the forge was then run by James's brother Henry, for a Wigan attorney, James Wigan. After Wigan's bankruptcy in 1775, Henry Morris ran the forge on his own account until Lord Balcarres took it over as part of his Haigh ironworks.

Another eighteenth-century slitting mill was situated at Bidston. It was a tide mill at the head of Wallasey Pool. In 1745 it was in the hands of John Penkett, and after his death in

[76] John Rylands Library, Haigh MSS., leases.

[77] I am indebted to the Librarian, Friends House, for permission to consult the Registers of the Lancashire and Cheshire Quarterly Meetings for entries concerning the Titley family.

[78] L.R.O., Wills of William Dillworth (1761) and Abraham Titley (1773). *Adams's Courant*, 15 September, 1772.

1758 his brother William had it. In 1777 it was taken over by Peter Rigby of Liverpool and John Cooke of Kilnhurst forge. Rigby was probably the son of a former Liverpool ironmonger, Edmund Rigby (d. 1758). Edmund Rigby had been interested in the nail trade from at least 1738, when he is found importing midland nails down the Weaver. But in 1780 the mill was again advertised for sale, and by 1781 Brice Grant, formerly foreman at Walter Wilson's Lymm forge was running it. An entry in the Bidston parish register shows that iron was still being slit there in 1797, and since the rent charge on the mills was not due to expire until 1803, it probably continued at least until then.

VII. DEPRESSION IN THE INDUSTRY

In Cheshire, Street forge was abandoned by the Cheshire ironmasters before 1733. It was in the hands of Robert Butler when he died that year,[79] and probably continued making much the same articles, for in 1750 John Paddy, one of the witnesses to Butler's will, was shipping saws down the Weaver. He may well have married one of Butler's four daughters and his family long remained in possession. James Paddy was the tenant in 1779, and Thomas held the forge until about 1790.[80]

Despite this contraction in the activities of the Cheshire Works, expansion continued elsewhere. Bodfari forge[81] appears again to have been operated by the Hall family, for Thomas Hall of Cranage was supplying iron for Ruthin church in 1720. In his will he mentions his interest in this forge, but says nothing of Sowley furnace in Hampshire, of which he would appear to have been the leading shareholder. The pig iron received at the Stour forges in 1734/5 and 1737/8 from Sowley was attributed to Hall, and since Thomas Hall of Cranage was co-lessee with Myles Troughton of Bewley in Hampshire[82] in a sixteen-year lease of the duke of Montagu's Lindal and Dalton mines, dating from 1729, there can be no doubt which Hall was referred to.

The last big enterprise of Edward Hall appears to have been the building of the small Duddon furnace in Cumberland

[79] C.R.O., Will of Robert Butler (1733).

[80] Chaloner, W. H., "The Cheshire Activities of Matthew Boulton and James Watt", Lancs. and Chesh. Antiq. Soc., LXI, p. 125. C.R.O., Baker-Wilbraham MSS.

[81] *Chirk Castle Accounts*, II, 29 July 1720. C.R.O., Will of Thomas Hall (1748).

[82] Fell, *op. cit.*, p. 34. It is interesting to note that William Ford of Newland ironworks supplied Sowley iron to the Stour forges between 1767 and 1772.

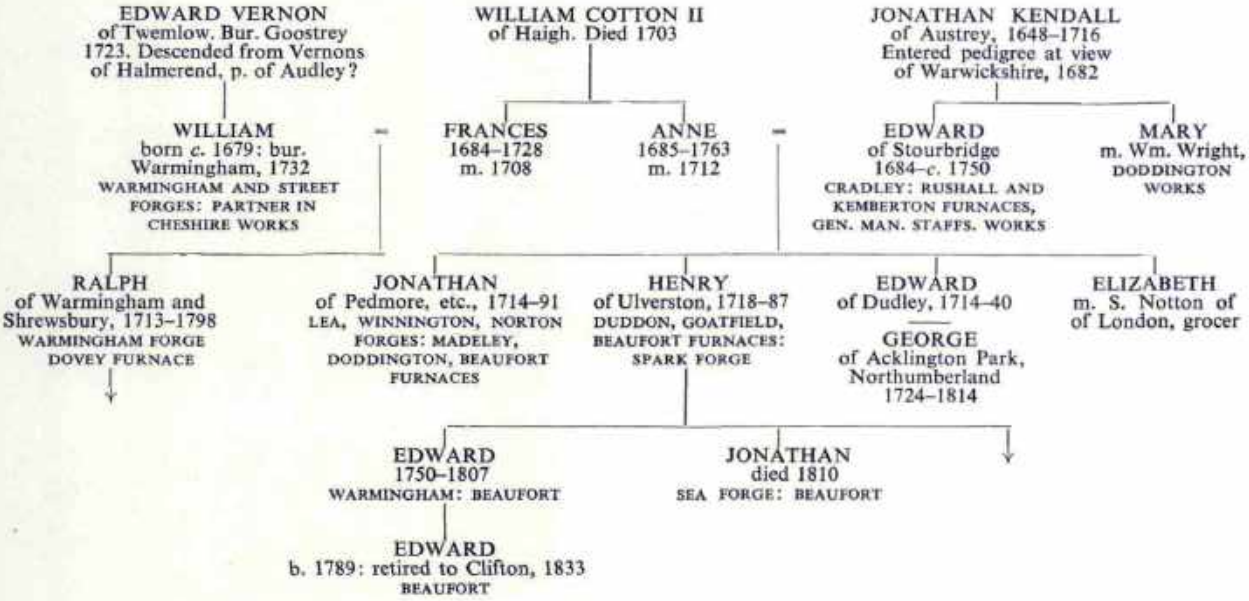
in 1736.[83] This was almost immediately followed by the great depression of 1737-8, which probably affected the Cheshire and Staffordshire Works seriously. The second list of forges is taken as applying to this period, and as being prepared in connection with the parliamentary inquiry into the state of the iron trade, which took place in 1737, a little before the worst of the depression would appear to have been felt. The list shows that in Cheshire production of bar iron had fallen from a possible 460 to 290 tons. Tib Green, Oakamoor, Chartley and Cannock forges are all shown as being out of action, whilst the production of Consall forge had fallen from 200 to 150 tons. Only Bromley forge remained in full production with 200 tons. Perhaps the position became even worse. In April 1738 Thomas Coape, the clerk at Lea forge, was taken on at Wortley forge by William Spencer, because Thomas Cotton of Eardley had no work for him.[84] In the list Lea forge was shown as producing 90 tons of bar iron.

On the Weaver Navigation the depression is marked by downward shipments of pig iron from July 1738 by Thomas Cotton. This was a most unusual occurrence, for though iron ore shipments normally flowed both ways, pig iron was invariably carried upstream. But the downward shipments continued until April 1740, amounting in all to 306 tons. It looks as though the Lancashire market for coldshort iron was less affected than the Midlands. In June 1738 Cotton stopped his downward shipments of ironstone, which may imply the blowing-out of Carr furnace. On the other hand Edward Hall shipped 117 tons of ironstone down to Frodsham between May and October 1739.

A feature of the 1740s is that Thomas Cotton made small downward shipments of tin plate. Probably this marks the building of the tinplate works shown on Yates's map of Staffordshire at Oakamoor, which may have been started to find an alternative outlet for iron in the depressed state of the trade. It is doubtful whether Cannock furnace was again brought into use after 1732, though it is shown on Yates's map. Similarly, though shown on Yates's map, it seems that Bromley, Chartley and Tib Green forges were out of production, at least around 1750, the date of the third list of forges. Oakamoor, however, is also omitted from this list though later leases for it do occur. Possibly the omission of Oakamoor is to be explained by its subordination to the manufacture of tin plate. In the 1750 list of forges, only Consall forge, with its production increased to 300 tons, and Cannock forge, with

[83] *Ibid.*, p. 215. [84] Information of G. G. Hopkinson.

THE VERNON—KENDALL RELATIONSHIP



180 tons, still remain out of the former forges of the Staffordshire Works. In Cheshire on the other hand, production of bar iron had actually increased from a possible 460 tons in the 1730s to 640 tons. This was entirely due to the expansion of Warmingham forge, at which Ralph Vernon (1713-1798) had succeeded his father William Vernon in 1732. Possibly the extension was made after the granting of a new lease of the forge to Ralph Vernon in 1739.[85] With an output of 300 tons a year, Warmingham forge was now one of the largest in the country.

VIII. KENDALLS OF AUSTREY

About 1750 far-reaching changes were caused in the Cheshire partnership by the death of all the leading partners within a few years of each other. Thomas Hall of Cranage died in June 1748, Thomas Cotton of Eardley in March 1749, his cousin William Westby Cotton in September 1749, and at last in September 1750, the long reign of Edward Hall of Cranage came to an end. Edward Kendall of Stourbridge, too, was certainly dead before 1751.[86]

The composition of the new company is not known. Kendall's eldest son, Jonathan, was certainly a leading partner, for the Duddon furnace was now run by Jonathan Kendall and Company. Samuel Hopkins, made sole executor of Thomas Cotton's will by a codicil executed only a day or two before his death, was another prominent partner, for he it was who gave authority to William Latham, Duddon furnace manager, to draw on the company's bankers, Thomas and Samuel Notton of Fleet Street.[87] Hopkins had been one of the witnesses to Edward Kendall's Cradley ironworks deed in 1724. In 1746 he was still at Cradley, but in the Nibthwaite furnace deed he is referred to as "of Cankwood forge". Executors of Edward Hall were his second son, Richard Edward Hall, the Manchester surgeon; his nephew, William Bridge, and William Latham of Duddon furnace. His heir was Thomas Bayley Hall, a boy of five, but his interest in Duddon furnace at least appears to have gone to his second son, and it does not seem that his grandson ever played a part in the iron trade.

From Thomas Cotton's will, now in the Birmingham probate registry, it is evident that he was very anxious that one of his sons should follow the trade of an ironmaster, for he bequeathed

[85] Crewe MSS. Box 31. 6/23.
[86] Barrow Pub. Lib., Nibthwaite furnace deed, Z 26, 1751.
[87] L.R.O., DDX 192/2, 11 August 1755.

his shares in the leases of the Staffordshire Works, but not the shares in the capital, to any son who should do so. In the event it seems that none of them did. He wished his executors to maintain his stock in the iron trade for ten years at least for the benefit of his children, but if they so desired they might dispose of the stock in the remoter works and retain only his stock in the Staffordshire Works. In the event the remoter works were driven on with if anything increasing energy. This was probably due to the influence of the Kendall family, who had interests in most of them. As time went on the part played by Samuel Hopkins in the Duddon furnace books appears to diminish, and it is possible that it was he, as Thomas Cotton's executor, who became chiefly concerned in the Staffordshire Works. Jonathan Kendall's brother Henry was established in Ulverston by 1750[88] and remained there until his death in 1787. Jonathan himself had moved north to Hilcot by 1762, when William Latham travelled there to see him.[89]

The reorganization in the works was no less comprehensive. The abrupt cessation in 1750 of the consignments of "Cotton's coldshort" and "Cheshire coldshort" pig to the Stour forges, where 1,262 tons had been received in the previous four years, probably marks the end of Lawton furnace. Cranage forge is thought to have ended about the same time. Cunsey furnace ended in 1750 and the lease of Carr furnace was not renewed. During 1755, however, two new furnaces, even more remote, were built. These were the Goatfield or Craleckin furnace in Argyll and the Dovey furnace in Cardiganshire.

The way for this development had already been paved by the erection of Conway furnace in Denbighshire. It is probable that Thomas Hall's interest in Bodfari forge had been taken over by his cousin Edward Bridge in 1748. Certainly Edward Bridge was living at Bodfari in 1752, and since Conway furnace, in which his brother William had the chief interest, was built about 1748, it is likely that both men moved into Wales about the same time.[90] The Kendalls probably had an interest in Conway furnace because shipments of pig iron received at the Stour forges were occasionally attributed to them instead of to William Bridge. On the Weaver Navigation, Bridge received shipments of ironstone in the autumns of 1749 (48 tons), 1751

[88] Haigh MSS., Sale of wood in Greenscoe, 4 January 1751.

[89] L.R.O., DDX 192/3, February, 1762. This was one of the periodic journeys made by William Latham "to meet the Company". Other visits were to Warrington (1755), Staffordshire (1756 and 1758), Cheshire (1756 and 1764), Middlewich (1760) and Holmes Chapel (1763).

[90] *Adams's Courant*, 5 December 1752. Sale of the Falcon Inn. Fisher, Roger, *Heart of Oak* (1763), pp. 49-50.

(72 tons) and 1753 (54 tons). From July 1757 to December 1758 he received 386 tons.

The Craleckin furnace was under construction in 1755, when William Latham was concerned in sending from Furness a tree for the water-wheel shaft, and three sows, presumably to be bedded in the walls.[91] Chief partners in Craleckin were the Kendalls and Latham himself.

Dovey furnace was also built in 1755, the partnership here being Ralph Vernon of Warmingham and the Kendalls. Dovey furnace was tiny, having an output of about 150 tons, and it is possible that Conway and Craleckin furnaces did not produce much more. There can be little doubt that charcoal supplies were the determining factor in the siting of all these furnaces. Charcoal was shipped on the Weaver during the 1750s, and the books of William Latham show that "Scotch Coals" were being received at Duddon furnace from March 1756. Duddon furnace itself never produced more than about ten tons of pig iron per week, and the long blasts of 1774/5 and 1779/80 produced only 385 and 421 tons in 43 and 52 weeks respectively.[92] This was a far cry from the immense yields of Mearheath, Lawton and even Vale Royal furnaces, and suggests that reduction in size, as well as increasing remoteness, was the answer of the ironmasters to the problems of charcoal shortage. A large part of the ore consumed by the new furnaces probably came from Furness, and though William Latham appears to have been relieved of responsibility for shipment of iron ore between 1751 and 1755, a period for which there are no accounts, he did pay £12 15s. to "Mr. Sunderland" in February 1757, for thirty tons of ore shipped for Argyll.

A list of the Cheshire Works in 1766 is given by the advocate of the Trent and Mersey canal. They were Doddington and Madeley furnaces, and Warmingham, Lea, Norton and Winnington forges. Between 1762 and 1779 Jonathan Kendall moved from Hilcot to Market Drayton, where he would be rather nearer these works. In the Staffordshire Works the increasing part played by the Hopkins family is indicated by Lord Paget's lease of Cannock forge and slitting mill to Thomas Hopkins in 1775.[93] It is unlikely though that the partnership was broken, because Thomas Hopkins was in partnership with the Kendalls in an iron and tin plate works at Aston.[94] As

[91] L.R.O., DDX 192/2.
[92] L.R.O., DDX 192/1, 2 and 4. The figures for ore quoted later in the paragraph also come from this source.
[93] William Salt Library, Anglesey MSS.
[94] John, A. H., *Industrial Development of South Wales*, p. 25.

Oakamoor tinplate works may well have been operated at the same time, it is likely that tough pig iron was increasingly in demand in Staffordshire, whilst the now growing popularity of coke-smelted iron in the nailing and casting trades would have lessened the demand for cold-short metal. This would explain why the Kendall family was now taking more interest in the smelting of haematite. Samuel Hopkins's move from Cradley to Cannock forge between 1746 and 1751 suggests that it was at this period that Cradley ironworks was given up. Mearheath is thought not to have remained in blast long after 1760, and by 1763 ironstone from its vicinity was probably travelling along the Derby to Newcastle turnpike in a westerly direction, which suggests that it was being smelted at Madeley or Doddington.[95] Though the Doddington pig received at the Stour forges between 1757 and 1762 was cold-short, the advocate of the Trent and Mersey canal implied that Doddington was mainly concerned in producing tough pig. He stated that 1,100 tons of haematite ore were required to keep this furnace in blast during the year, and that much of it was carried from Frodsham in carts across the Forest of Delamere.[96] This agrees with the Weaver Navigation books which show none of the 680 tons of ore which was shipped to Frodsham by William Latham in 1750/1. Heavy shipments of ore continued from Furness, but Latham's books do not show the amounts. In August 1761 difficulty over shipping caused him to go "to Conyshead bank to Seek for a vessell for Mr. Jonathan Kendalls Mine". A few days later he was "at Ulverstone with Ships Masters [on] Mr. Jonathan Kendalls account" and two more journeys to Ulverston on the same errand rapidly followed.

Increased demand for tough pig iron in Staffordshire would also explain why shipments of pig iron up the river Weaver to Winsford, which had been nil in 1759/60, should have soared in the following years to almost 500 tons, a figure which was maintained until 1775.[97] The change in the pattern of trade is also seen in Latham's Duddon furnace accounts. In 1750/1 the entire make of pig iron was shipped to Chepstow, and the first indication of any change occurs in July 1761 when Ralph Vernon made a payment of £201 on account of pig iron. Between 1773 and 1779, when the accounts are complete again, shipments of pig iron to Edward Kendall, who had then

[95] Moisley, "The Potteries Coalfield", (M.Sc. thesis, Leeds University) p. 46.
[96] Whitworth, R., *The advantages of Inland Navigation*, p. 44.
[97] Willan, T. S., "The Navigation of the River Weaver in the Eighteenth Century", Chetham Soc., 3rd Series, pp. 208-216.

replaced Ralph Vernon at Warmingham forge, amounted to 283 tons.

The efforts of the ironmasters to reach new supplies of charcoal had now reached fantastic proportions, the distances involved only being supportable so long as the demand for charcoal iron remained reasonably good. It was unfortunate that the period of greatest diffusion in the furnaces should have come precisely at the time when coke-smelted iron was being found more acceptable by the forgemasters. The advent of coke-iron in Lancashire is probably marked by the granting of a new lease of Carr furnace in 1759 to Samuel Johnson of Liverpool and Partners. These partners included George Perry and John Gosling, both described as "of Coalbrookdale, Ironmonger".[98] From this time onwards the erection of coke smelting furnaces went on steadily increasing.

The difficulties of the charcoal ironmasters in the face of cheaper coke smelting are seen in the bankruptcies and retirements from the trade which soon occurred. Ralph Vernon retired from the trade between 1765 and 1770, to spend the last years of his life at Shrewsbury. Both the Bridge brothers became bankrupt in 1773. By 1774 Bodfari forge was in new hands, and in July of that year both Conway and Dovey furnaces were offered for sale at Chester.[99] No purchaser came forward. Conway furnace was advertised for sale again in 1779,[100] but then appears to have been quietly abandoned. Around it wood was particularly scarce. In 1763 William Bridge, quoted by Fisher in *Heart of Oak*, had given it as his opinion that there was not a third of the quantity of wood in the counties of Caernarvon, Denbigh, Merioneth and Flint that there had been when the furnace was first built. No care was taken to propagate fresh growth in these counties and they would soon be bare of wood. On the other hand, in the counties of Montgomery and Cardigan there were some good examples of coppicing the woods. These statements are born out both by the advertisement, which states that large quantities of charcoal are available in the vicinity of Dovey furnace, but says nothing about fuel when referring to Conway, and also by the ultimate fate of the furnaces themselves. Though Conway came to an end, the Kendalls continued their interest in Dovey furnace for many years yet. The Craleckin furnace, too, was continued until 1813.

In 1779 the Kendalls took a lease of land in Brecknockshire

[98] L.R.O., DDGe/E 815.
[99] *Adams's Courant*, 11 and 25 May 1773, and 31 May and 7 June 1774.
[100] *Chester Chronicle*, 21 May 1779.

from the duke of Beaufort.[101] There they built a new furnace called Beaufort furnace, where they began coke smelting themselves. The remaining Cheshire ironworks were rapidly disposed of. The 1781 land-tax assessments for Doddington and Madeley show no sign of the furnaces or of the name *Kendall*, so it would appear that the two furnaces had already been disposed of, though Doddington is shown on Burdett's map of Cheshire (1777) and Madeley was leased again in 1790. The assessments for Warmingham and Lea show that these forges were held up to 1784 and 1783 respectively, after which *Paddy* appears at Warmingham and *Hopkins* at Lea. The name *Kendall* also occurs in Winnington land-tax assessments for 1781 and 1783, but not in the next to survive, 1788. Land-tax assessments for Norton are not available at this period.[102] Lea forge was the last survivor of the charcoal ironworks of Cheshire, not being dismantled until 1890, though this was long after any connection with the charcoal iron industry had ended.

The use of mineral fuel in furnaces meant that they could be larger, could have more powerful bellows, and could remain in blast for much longer. Coal and iron being obtainable on the same site, almost the only transport costs were in marketing the finished product. Coal was easily available in large quantities and so more than one furnace could be built on one site. At Beaufort Ironworks output increased steadily. The first furnace produced about 1,500 tons of pig iron a year, but with the addition of a second furnace and steam-powered blast, output rose to a peak of over 7,000 tons in the boom year of 1825.

In the face of figures such as these the furnaces of the last stages of the charcoal era must have seemed small and insignificant. Their names and the names of the men who worked them were soon forgotten. For example the great figures of the late seventeenth- and early eighteenth-century iron industry of Yorkshire—Spencer, Cotton, Heyford, Dickin—pass virtually unnoticed in the Victoria County History of Yorkshire. The name Kendall was equally forgotten in the Midlands, and no connection of the family with the iron trade is mentioned in H. B. Kendall's book *The Kendalls of Smithsby, Twycross and Austrey*, though Edward Kendall of Stourbridge, Jonathan Kendall of Hilcot and the two Edward Kendalls of Beaufort, were heads of the Austrey branch of the family, to which the author himself belonged.

[101] Lloyd, J., *Old South Wales Iron Works*, pp. 178-9.

[102] For information concerning the land-tax assessments I am grateful to the county archivists of Cheshire, Staffordshire and Shropshire.

The story told in this article is often incomplete, in some places only fragmentary, but there are certain features which additional details are unlikely to do more than amplify. One feature which is particularly well illustrated by the story of the Cheshire Works, is the value, in terms of stability, of industrial connections based upon family ties. The marriage alliances of the Cotton family with those of Hall, Vernon and Kendall, and of the Hall family with those of Kent and Bridge were all fruitful of future partnerships. Further cases of the kind between Turner and Crompton appear to have been avoided. This was of particular importance in an industry where vast distances separated the different works which went to make up the industrial unit. A good illustration is provided by the locations of the members of the Kendall family in the deed granting them the lease for their Beaufort furnace in 1779. Henry was at Ulverston, his brother Jonathan at Market Drayton, his son Edward at Warmingham, and his other son Jonathan at Seaforge in Gloucestershire. Not included in the deed were his other brother, George Kendall of Ackworth Park, Northumberland, and his brother-in-law Samuel Notton, the company's banker, who was also a London grocer.

On the other hand there may have been a tendency to co-operation amongst ironmasters as a whole during the eighteenth century. Spencer and Cotton, Hall and Rawlinson did not fight their differences to the last ditch, but allowed them to drop. Possibly the folly of the futile quarrels of the seventeenth century had been recognised as such. Possibly too, the addition of Russian to Swedish competition induced a more careful and rational attitude.

Great care was also taken by the well-established ironmasters to protect their interests by excluding interlopers. We have seen how the Cunsey and Backbarrow companies combined to exclude rivals from the Furness forges, a policy maintained successfully until 1735, when Richard Ford broke away from the Cunsey Company to set up the Nibthwaite works. Both the Madeley lease of 1716 and the Cannock lease of 1732 granted exclusive rights to the ironmasters concerned on the estates of the proprietors.

The opening up of the Furness area for smelting was significant for the trade as a whole in the large amounts of tough pig iron made available, particularly from 1735 onwards. By 1750 no less than eight furnaces had been built in the area, whilst the Halton, Conway, Dovey, Goatfield and Lorn furnaces were all in blast by 1756, all probably smelting Cumberland and Furness haematites. Fell was probably well wide

of the mark in thinking that "fully one-half, if not two-thirds of the charcoal iron produced in Great Britain during the eighteenth century was made by the ironmasters of Furness and district".[103] In terms of tough pig iron, however, the estimate is probably not unjustified. More and more as the century wore on, the surplus of Lancashire tough pig went to make up the deficiency of that material at the Stour forges. An even more significant stimulus to the export of Lancashire tough pig must have been the growth of the tinplate industry, from the 1740s onwards, particularly in the primary market, South Wales.

By common consent, Lancashire-Cheshire is the one area that did not participate in the general decline of the iron industry during the first half of the eighteenth century. Very much the reverse. The period before the slump of 1738, saw the erection of Cunsey, Backbarrow, Leighton, Carr and Nibthwaite furnaces, and the rebuilding of Doddington furnace, as against the loss of Holme Chapel and Vale Royal. After 1738 it is probable that no losses occurred until the blowing out of Cunsey, Carr and Lawton furnaces, all probably around 1750. Set against this, however, must be placed the building of Newland, Lowwood and Penny Bridge furnaces. When it is also considered that the Cheshire ironmasters were responsible for the erection of Bretton, Duddon and Conway furnaces and the rebuilding of Madeley and Cannock furnaces, outside the two counties, it is obvious that a considerable part of the decline in other parts of the country must have been compensated for here. Indeed, since Cannock, Bretton, Carr, Disley and Conway furnaces do not figure in any of the lists of eighteenth-century ironworks, one wonders whether too much has not been made of the evil days on which the industry had fallen.

The writer is greatly indebted to Mr. B. L. C. Johnson for the loan of his thesis "The Charcoal Iron Trade in the Midlands, 1690-1720", and his notes on the Foley and Knight MSS., to Mr. G. Dykes for all the references to documents in the William Salt Library, chancery cases and other material in the Public Record Office, to Captain G. G. Hopkinson for information from the Spencer-Stanhope and Fell MSS., to the earl of Crawford and Balcarres for permission to examine the Haigh MSS., to Dr. J. R. Harris for newspaper references, and to the city archivist of Chester, the librarians of Barrow-in-Furness, Dudley, Stourbridge, Wigan and Worcester and the district

[103] Fell, A., *op. cit.*, p. 312.

probate registrar of Birmingham for answering his queries. Also to Mr. W. Robertshaw, director of the Cartwright Hall, Miss M. Walton and Miss R. Meredith of Sheffield Central Library for their kindness on his visits there. He especially wishes to record his thanks to Major F. G. C. Rowe and Dr. F. Taylor for their help on his days spent at the Cheshire Record Office and John Rylands Library, to the staffs of Manchester Reference Library and the Public Record Office for their inexhaustible patience and to Mr. R. Sharpe France for his encouragement and advice.

The pedigrees are based largely on heralds' visitations (also used in identifying John Crompton, William Keeling and William Rowley), Hunter's pedigrees, Ormerod's *History of Cheshire*, Earwaker's *History of Sandbach*, the footnotes to *Chirk Castle Accounts*, and information communicated by Mr. W. E. C. Cotton.

APPENDIX I

CUSTOMERS OF THE LANCASHIRE SLITTING MILL, WITH ATTEMPTED IDENTIFICATIONS FROM THE LISTS OF WILLS PROVED AT CHESTER

This list was found among Chester 15/87 at the Public Record Office and is of accounts outstanding at the close of the slitting mill about 1673. See pp. 82-83.

	£	s.	d.	
Thomas Heyden	4	4	3	
Nicholas Withington	54	5	9	1679 Atherton, nailsmith
George Withington	13	17	0	1684 Westhoughton, nailsmith (See will of Nicholas Withington)
James Mattley	1	18	0	
Humphrey Winstanley	5	10	0	
Oliver Withington	10	17	0	
Thomas Fairclough	0	15	0	
Jeffrey Pilkington	4	7	0	
John Makins	28	19	0	
Roger Garstang	16	18	0	
Thomas Pilkington & [Blank] Doughty	1	19	0	1681 Whittle-le-Woods, shoemaker
Henry Holmes	16	0	0	
William Hilton	3	14	0	
[Blank] Beesleys Judgmt.	1	16	0	
Francis Brock about	2	8	0	1699 Haigh, carpenter
John Hartley about	24	0	0	
John Gregory	1	8	6	
Laurence Finch		9	3	1678 Standish, carpenter
John Chadock	1	17	0	
William Bell	2	0	0	
Gilbert Aldred	1	10	0	1667 Atherton, nailer
John Cash		12	9	
John Bushell	3	0	0	
Thomas Heyton		10	0	
Widow Burchley	4	0	0	
Widow Postlethwaite	15	0	0	
Thomas Dickin		9	1	Colnbridge forge
Thomas Hatton	1	10	0	
Oliver Fairclough	1	10	0	
William Wright	20	6	4	
Ralph Smith the elder	9	0	0	
James Meanley		2	1	1718 Tildesley, nailer?
Henry Dawson	5	10	0	1673 Atherton, nailer
Gilbert Smith	4	0	0	1666 Atherton, nailsmith
Thomas Collier and Nicholas Webster	2	0	0	1709 Anderton, nailer
Ralph Smith the younger	2	0	0	
John Chaddock of Dublin	12	0	0	
William Baitch	4	16	9	

SALES OF ROD IRON FROM COLNBRIDGE, 1710/11

Deliver'd at Colnbr(idge)	T.	c.	£.	s.	d.	Possible probates at Chester
Daniel Rigby	2	0	35	–	–	1722 Blackrod
George Withington	1	6	22	15	–	1729 Atherton, nailer
Retaile	1	6	23	9	6	
	4	12	81	4	6	
Deliver'd at Roachdale						
Thomas Rigby	10	10	194	5	–	1722 Pemberton
Thomas Collier	5	10	101	15	–	
Thomas Hirst	3	0	55	10	–	1728 Tildesley
John Collier	3	8	62	18	–	
Robert Heaton	2	10	46	5	–	
Robert Cowley & partner						1728 Winstanley
(Robert Atherton)	4	6	79	11	–	1745 Winstanley, nailer
John Winstanley	5	14	105	9	–	1721 Billinge, nailer
James Collier	3	0	55	10	–	1756 Atherton, nailer
Arthur Worthington	5	10	101	15	–	1714 Over Hulton, nailer
James Alred	1	10	27	15	–	1739 Atherton, nailer
Robert Marsh	3	4	59	4	–	1735 Atherton, nailer
Robert Abbott	3	6	61	1	–	Burnley?
Ralph Astley	12	0	222	–	–	Atherton?
William Manley	2	0	37	–	–	
Ellis Makant	2	0	37	–	–	1731 Atherton, nailer
George Withington	4	6	79	11	–	1729 Atherton, nailer
John Astley	4	10	83	5	–	Chowbent?
Simms (James?)						
and Kingsley	1	12	29	12	–	1724 Standish, nailer
William Smith	3	10	64	15	–	1725 Atherton, nailer
Sundry	1	2	20	7	–	
	82	8	1524	8	–	
Deliver'd at Manchester						
John Winstanley	1	12	30	–	–	1721 Billinge, nailer
Arthur Worthington	1	4	22	10	–	1714 Over Hulton, nailer
Daniel Rigby	–	8	7	10	–	1722 Blackrod
Mr. Hunter sold	9	14	184	6	–	1756 Manchester, gentleman
	12	18	244	6	–	

This list of sales is from the Colnbridge forge accounts in the Spencer-Stanhope MSS. at the Cartwright Hall, Bradford. Among later customers who can be identified are the following:

John Eaton of Sutton	1715/16
Jonathan Evans of Liverpool	1715/16
John Smarley of Liverpool	1715/16
Margaret Brewer of Rochdale	1720/1
Jane Rigby of Blackrod	1725/6
Humphrey Atherton of Atherton	1725/6
Nicholas Withington of Atherton	1730/1
Hugh Simms of Fishwick	1730/1
John Leach of Ashton in Makerfield	1745/6

APPENDIX II

ANNUAL OUTPUT IN TONS OF IRONWORKS IN LANCASHIRE, CHESHIRE AND FLINTSHIRE, 1717-1750

County	Furnaces	1717	Forges	1717	1737		1750
					have made	do make	
Lancashire	Mr. Hales and Partner (Cunsey)	500	Bloomeries	200	—	—	—
			Cunsey	—	120	100	120
			Backbarrow	—	200	100	260
	Backbarrow	500	Spark Bridge	—	120	100	120
			Coniston	—	80	40	80
	Leighton	300	Aynstry	—	60	0	—
			Cottoms	—	50	50	—
			Caton	—	—	—	50
			Burgh	—	—	—	120
Cheshire	Vale Royal	600	Warmingham	100	120	100	300
	Lawton	600	Cranage	140	200	100	200
	Doddington	500	Lea	100	140	90	140
			Tib Green	80	140	0	—
			Acton	—	100	0	—
Flintshire			Bodfari	150	200	130	200
			Holywell	100	120	0	—

These figures are based on the lists published by E. Wyndham Hulme in "Statistical History of the Iron Trade of England and Wales, 1717-1750," published in Transactions of the Newcomen Society, IX, p. 16.

The list of 1717, compiled by William Rea of Monmouth, managing director of the Forest of Dean Partnership, is the only one to include furnaces, and has appended to it a memorandum to the effect that Cranage forge would make 250 tons.

It has not been possible to locate Aynstry and Cottoms forges. Aintree would seem to be the likeliest original for Aynstry, but nothing in the Molyneux MSS. would appear to support this explanation. On the other hand the corn mill at Aintree was sub-let in 1717 to John Martindale for a rent of £25 (Record Society of Lancs. and Chesh., XCVIII, p. 13) and this John Martindale could be the Liverpool anchorsmith of that name. Cottoms forge may well stand for Mr. Cottom's forge, but the possibilities should not be overlooked that it is a corruption of Cotton's forge (*i.e.* Carr forge) or of Abraham Rawlinson's Caton forge.

ANNUAL TONNAGES OF PIG, BAR AND ROD IRON MADE BY THE CHESHIRE WORKS

	Furnaces		Forges				Slitting Mill
	Lawton	Vale Royal	Warmingham	Bodfari	Cranage	Tib Green	Cranage
1696/7	627	155	54	—	149	—	—
1697/8	700	331	50	—	128	—	—
1698/9	709	377	83	—	149	—	
1699/1700	650	—	—	—	148	—	144*
1700/1	850	805	87	113	151	—	74
1701/2	639	491	88	119	160	—	51
1702/3	—	—	—	—	—	99	—
1703/4	900	495	103	156	146	115	—
1704/5	—	—	—	—	—	134	—
1705/6	—	—	104	—	—	126	—
1706/7	794	640	99	125	129	92	39
1707/8	—	457	95	118	—	108	—
1708/9	—	—	101	—	—	41	—
1709/10	603	642	96	114	177	—	47
1710/11	571	647	—	—	148	—	76
1711/12	—	733	—	—	—	—	—

These figures are based on the MSS. of Major H. T. H. Foley, M.B.E., J.P., and were published by B. L. C. Johnson in an appendix to "The Foley Partnerships", Econ. Hist. Rev. (1952), 2nd Series, Vol. IV, pp. 338-340.

Tib Green forge has been included, though technically part of the Staffordshire Works in the period for which there are accounts.

A dash signifies absence of information.

*An 18-month period Michaelmas 1698 to Lady Day 1700.

	COLNBRIDGE SALES OF ROD IRON							
	1710/11	1715/16	1720/1	1725/6	1730/1	1735/6	1740/1	1745/6
	T. c.	T. c.	T. c.	T. c.	T. c.	T. c.	T. c.	T. c.
At Colnbridge	4 · 12	8 · —	9 · 6	12 · 7	16 · 9	24 · 11	26 · 5	29 · 18
At Rochdale	82 · 8	65 · 6	70 · 16	88 · 1	126 · 8	132 · 1	34 · 1	64 · 12
At Manchester	12 · 18	8 · 13	8 · —	—	—	—	—	—
At Chowbent	—	—	—	—	—	—	82 · 1	43 · 5
Total	99 · 18	81 · 19	88 · 2	100 · 8	143· 7	156 · 12	142 · 7	137 · 15

These figures are based on the Colnbridge forge and slitting mill accounts among the Spencer-Stanhope MSS. at the Cartwright Hall, Bradford. The amount of rod iron reaching Lancashire from this forge was greater than appears from this table because part of that sold at Colnbridge went to Lancashire, as is indicated by the frequent occurrence of *To Burnley* after the customer's names.