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Frizington Fraud: William Wood's patent iron process

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At one level, this article is about a failed metallurgical process, in which William Wood and his sons tried to make iron in reverberatory (or air) furnaces, mainly at Frizington near Whitehaven. At another, it is about apparent corruption at the highest governmental levels, including Sir Robert Walpole. It is also about speculation in company shares in a completely unregulated stock exchange. In this period there were comparatively few joint stock companies, and some of them were being used for purposes remote from those for which they were founded. Many of the events that need to be recounted to provide the background for the story told here concern high finance in London and ironmaking in Shropshire. However, the core of this article concerns an unsuccessful ironmaking project at Frizington some miles inland from Whitehaven. If the hopes of William Wood and the other projectors had been fully realised they would have revolutionised the iron trade. As it turned out their process did not make good iron and their efforts to finance it became fraudulent. Nevertheless, William Wood's sons John and Charles went on to develop potting and stamping which was important at the start of the Industrial Revolution.

THE early part of the Bubble year of 1720 saw (according to Anderson's list) over 180 companies floated,[1] but the Bubble Act called a halt to this at midsummer, by forbidding new joint-stock companies (unless incorporated by Act of Parliament or royal charter). Soon after that, the value of many over-priced stocks began to fall.[2] This article concerns events about a decade later, at times entering the murky world of stockjobbing and bill discounting, sometimes coming close to plain fraud. Because patents of invention had been used in the past as the basis for stock floatations, George I had also directed that the number of participants in patents should be limited to five.[3] Much of the evidence presented here comes from Privy Council papers – from the consideration of two petitions for charters to avoid these restrictions.[4] Aspects of the subject have been described before by M. W. Flinn (who only used material in Walpole's papers) and J. M. Treadwell (who also used the Privy Council papers).[5] However, further light is thrown on the subject by a re-examination of the latter, and additional detail is provided by the estate correspondence between James Lowther (while in London) and his land agent John Spedding at Whitehaven.[6] Lowther was the principal landowner around Whitehaven. Much of his income came from mining coal,[7] but the correspondence also contains much detail on local events. The article will consider the background of the participants. Then it will look at the project, separating events in London from those near Whitehaven. After that the story returns to London to describe attempts to incorporate a company and associated trials of the process at Chelsea. The final section will consider the aftermath of this, including Kingsmill Eyre's attempt to use a process involving scrap iron. Finally the conclusion will look briefly forward to subsequent events.

Background

Ancient companies

The company most involved here was the amalgamation of Society of Mines Royal and the Company of Mineral and Battery Works. Both were incorporated in the 1560s. The Society of Mines Royal once had a significant mining and smelting business, based on monopoly rights over Mines Royal in many counties, including mining and smelting copper near Keswick but its business had shrunk away.[8] The Mineral and Battery Works had similar rights in other counties (but mostly ones where there were few metal mines). It also had wireworks in the Wye valley, but they were leased out. However, foreign competition in making wire had meant that by the 1680s the company was no longer able to obtain a substantial rent from the Tintern and Whitebrook wireworks.[9] The two companies (now little more than dining clubs) had informally amalgamated in the late 1660s, but each continued to maintain its own minutes. The monopoly mining rights of each company were effectively cancelled by the Mines Royal Act 1693, leaving them as moribund chartered companies without any business. The Society of Mines Royal stopped meeting in 1695, and only met again in 1709 to formalise the amalgamation. The Company of Mineral and Battery Works continued to meet sporadically, but it was without its own records from 1703 to 1709.

The minute book of the Mineral and Battery Works records frequent meetings in 1709 and 1710, but to little avail. By purchase, or by excluding absentees, most of the shares came into then hands of Moses Stringer, its deputy governor since 1703. He was 'Her Majesty's chymist and mineralist', and he had a laboratory and foundry at Blackfriars (London), the venue for some of the meetings. The company's rights were granted to Stringer at various royalties, including for processes in which the company had never been interested hitherto. The meetings of 1709 and 1710 involved proposals to recover (or enforce) the companies' ancient rights. Raising a joint stock for this purpose was proposed, but came to nothing. Indeed, the whole of the company's proceedings in this period seem almost detached from reality. After this burst of activity, the company sank back into only having an annual meeting, and even these ceased after 1713, probably due to Stringer's death in 1714. He had published *Opera Mineralia Explicata* (1713), which is largely about the company.[10]

Nothing further is known of the company until 1718, when an insurance syndicate purchased the charters (or rather all 124 shares in the amalgamated companies) for about £2900. Onslow's Insurance (also known by other names) had raised a subscription of over £1,000,000 (10 per cent paid up) as a joint stock and needed to operate through a company, but company charters were difficult to obtain. This made the two old charters potentially valuable assets. Four syndicates (including Onslow's) sought incorporation in January 1720. The Attorney General considered that 'insurance under colour of the charters aforesaid and in the name of the supposed corporations are illegal and unwarrantable [as] wholly foreign to the design of those incorporations'. However, in March he recommended incorporation for Onslow's and Chetwynd's (or Ram's) syndicates. The speculative floatations of the period were also under investigation by a Commons Committee. Robert Walpole proposed the solution that these two groups should each receive a charter, upon agreeing to pay £300,000

towards the king's Civil List debts, and the two syndicates became respectively the Royal Exchange Assurance and the London Assurance. This was provided for in the Bubble Act of 1720, which also prohibited the creation of unincorporated joint stock companies and existing chartered companies from operating beyond their powers, on pain of the penalties of *Praemunire* (perpetual imprisonment with deprivation of all property).[11] This made the old charters again redundant. In fact they were doubly redundant, for the original mining rights had been leased in 1718 for 10,000 years to Philip Peck, a merchant.[12] Nevertheless, the amalgamated company re-emerged, as will appear.

William Wood's iron businesses

William Wood of Wolverhampton was born in 1671 and in 1690 married Mary Molyneux of Willenhall, daughter of Richard Molyneux, one of a family of prominent ironmongers. William followed his father-in-law's trade, but little is known of his activities. Over the next 24 years, his career was unremarkable. He was variously described as a 'chapman', an ironmonger, or an iron factor, and lived, (latterly at least), in a large house near the centre of Wolverhampton, known as the Deanery.[13] He evidently rose to be an opulent merchant,[14] probably manufacturing locks, hinges, and other ironware in and around Wolverhampton and selling this in Bristol and London.[15] In 1715, he made two major changes in his commercial life. Firstly, he became Receiver-General of Land Tax for Shropshire, a post with a modest remuneration, but providing a very substantial cash balance that could be profitably invested until it had to be paid into the Exchequer. Secondly, he formed a partnership with John Hayes, of Wolverhampton; Thomas Harvey, of Tern Mill, Shropshire, Thomas Maynard, ironmonger of Queenhithe, London; Robert Marsland, hardwareman of Cornhill, London; and Robert Sparke, ironmonger and brazier. The last three may be the London tradesmen with whom he (and perhaps Harvey) dealt.[16]

Harvey was a Quaker, then living at Stourbridge, but with family links to Evesham (both in Worcestershire). With Quaker partners, he had established Tern Mill, close to the mansion of Tern Hall (now Attingham Park), a few miles east of Shrewsbury to work with copper smelting works at Coalbrookdale. Tern Mill was then primarily a brass manufacturing works, but also with the ability to work iron. However, it seems that their copper mine at Harmer Hill (in Myddle, Shropshire) was exhausted; certainly, most of the partners withdrew in 1714. Wood and the others then came in with replacement capital (totalling £6000), and an intention to expand the business.[17] This business apparently did well. They built further forges at Sutton by Shrewsbury and probably Eaton on Tern (Salop.), and with Charles Lloyd of Dolobran (Monts.), a blast furnace at Bersham (Denbs.).[18] In February 1720, Wood wanted to expand the stock (i.e. capital) further and issued a prospectus for a company with capital of £100,000 (in 1000 shares). Shortly after Onslow's Insurance had opened a subscription for their new maritime insurance (using Mines Royal Company as their vehicle), a subscription was sought for a company calling itself, "The Grand Lessees of the Mines Royal and Mineral and Battery Works Company". A paper called *The Present State of Mr Wood's Partnership* starts by referring to their having a lease of mining rights in many counties. This suggests that the Grand Lessees were identical both to Mr Wood's Partnership, and to the new £100,000 company described above.

As already explained, the grand-sounding mining rights had been defunct since 1693, but Philip Peck (with his 10,000-year lease from the companies) had leased all ores (except calamine and alum) in many counties for 14 years, to Charles Tunnah and Thomas Waldick who assigned them in trust for Wood, Harvey, Marsland, and Joseph Read (a London merchant).[19]

Formal completion of the partnership deeds for Wood's new company only took place in August 1720 (after the Bubble Act), with Wood appointed as its general manager with very extensive powers of management. However, there was also a committee of management (effectively, a board of directors) in London. Harvey was reluctant to join in, but was eventually persuaded, selling to a new company his shares in the 1714 company and certain other assets for £17,100. Part of thus sum was still unpaid until 1729, but the litigation over this was settled by handing back the ironworks to Harvey. All this is described elsewhere, but £2000 paid into court in the course of that litigation comes into the present story.[20]

Wood's next project involved an agreement with the king in 1722 to produce halfpennies and farthings for Ireland. For this he paid £10,000 to the king's mistress, the Duchess of Kendal. This was a means of the king providing for the Duchess and for their daughters after his death. Other 'fees' no doubt also had to be paid to secure this. Since Wood (who had 500 of the 1000 shares) had almost certainly invested all his assets in the company, the money paid for the patent was probably the company's, not his own. The story of Wood's halfpennies is well known. It was the subject of a pamphlet campaign by Jonathan Swift and others, who considered that the Irish public were being imposed upon, because the coinage was too light. Indeed, they were imposed upon in terms of the metallic content, for it was effectively a debasement of the Irish coinage to pension off the king's mistress. Ultimately, the government had to compensate Wood with an annuity from the Irish Revenue.[21] Nevertheless, the subsequent behaviour of Wood and others suggests that Sir Robert Walpole, as the leading minister of the day, was left owing favours to Wood, or at least that he believed so. This explains the involvement of Kingsmill Eyre, a minion of Sir Robert. Walpole held the lucrative posts of Paymaster to the Forces and Treasurer of Chelsea Hospital. This had enabled him to appoint Eyre as Secretary to Chelsea Hospital in 1718 and Agent to the Four Companies of Invalids in 1720, posts that Eyre held until his death in 1743.[22] Eyre probably oversaw the building of Orford House for Walpole in the hospital grounds and the landscaping of Walpole's park at Houghton in Norfolk.[23] His involvement probably explains the choice of Chelsea for the final trial of Wood's process. Walpole's open support for Eyre's and Wood's ambitions raises the question of whether Walpole also had a secret financial interest in Wood's ironmaking project, the subject at the core of this article.

The Iron Project

Origins

Wood's involvement in Cumberland had begun earlier. Thomas Baylies of Stourbridge, formerly a partner of Abraham Darby in the Coalbrookdale ironworks in Shropshire

and then in Sutton Furnace near St Helens (Lancs. – now Merseyside),[24] visited John Spedding in September 1723. He was looking for a source of iron ore, probably to feed furnaces in Denbighshire, and apparently bought a quantity of ore that had long lain on a staith at Whitehaven. Spedding showed Baylies the country and he fixed on Frizington as the place to open a mine. He thought of setting up works (probably a blast furnace) on the River Keekle 'above Mr Benn's Mill' (unidentified). He was afraid that the Cooksons of Newcastle, who were building a furnace nearby at Little Clifton, would secure the mine ahead of him. He therefore went on to County Durham (presumably to Raby Castle) to negotiate a lease of mining rights in Frizington Parks from the Vane family,[25] who had inherited that property with the rest of the estates of the Fletchers of Hutton in the Forest.[26] The lease was to Wood's son Francis (though possibly for the use of the father) for 21 years at a rent of £20.[27] Francis, on visiting Whitehaven in September 1725, approved 'mightily' what Baylies had obtained.[28]

In summer 1726, Francis visited James Lowther boasting of a new process for making iron with pitcoal only.[29] Francis was apparently then managing an ironworks at Lee Hall in Bellingham in Northumberland (of which very little is known). There he developed the pitcoal-based ironmaking process with which this article is concerned.[30] In September, Francis also secured another iron ore mining lease, from Joseph Benn of Netherend, in respect of ground called Dobgill in Cleator. This probably belonged to the Crossfield tenement, near Jacktrees. The lease was replaced by one to his father in January 1729.[31] His father (who was then also trying to sell or borrow against his Irish annuity – his compensation for the coinage patent) visited Lowther in London the following winter. Lowther advised him to set up one furnace at Whitehaven to 'show the goodness of his iron'. The following summer, William Wood senior visited Lowther at Whitehaven and showed him a small piece of iron, before going on to works in Northumberland (evidently Bellingham).[32] Francis patented his process in 1727, and William Wood himself obtained a similar patent in his own name in September 1728.[33] Francis transferred a one-twentieth share of his patent to his brother John for £75, as an inducement for John to move from Wolverhampton 'to Lee Hall in Northumberland' to manage ironworks there. In January 1727 William Wood (the father) wanted control of all shares in the patent. John demanded £2000 for his share, for which the father gave a bond payable in six months. When this bond was six months overdue John sued, and John's brother-in-law William Buckland persuaded Kingsmill Eyre to provide a bond payable in twelve months. Eyre was trying to get out of paying this in 1730.[34] Eyre probably took counter-security from William Wood and others, but this was probably valueless, due to their want of assets.

In this period, some one offered to buy the rival patent of Thomas Tomkyns for £10,000.[35] Tomkyns' process, which made bar iron from pig iron in an air furnace (*i.e.* reverberatory furnace) without charcoal, was viable, though its yield was poor. However, Tomkyns was in debt to the government, having speculated with and lost public funds in his hands.[36] Tomkyns was apparently led into this by George Robinson,[37] a stockbroker, who was Tomkyns' supporter in his subsequent efforts to put his process into practice, until Robinson absconded abroad, with his credit exhausted despite fraudulently obtaining loans from the Charitable Corporation.[38] Tomkyns was arrested for debt in July 1728, and languished in prison until 1732.[39]

He blamed his arrest on his rivals, who certainly enjoyed sufficient political patronage to procure it: 'one of the directors (no stranger to a prison) proposed to get Tomkins' patent to be sunk, by informing the Treasury thereof and that the same might be extended (*i.e.* seized for debt) and Tomkins hurried to gaol which was accordingly done'. Tomkyns also (though wrongly) believed that William Wood's patent (granted a few months after his arrest) covered his own process.[40]

Financial affairs in London

William Wood's object in buying back his son's patent was to raise capital for his business. According to Lowther in February 1729, 'Old Wood is a subtil smooth talking man, and tells a plausible story to those who do not know him'.[41] He was in negotiations with 'Sir John Meres and Company'. Sir John was the governor of the Mines Royal and Mineral and Battery Works, which was the Company in question.[42] Sir John was a friend of James Lowther, and a wealthy man, deeply involved in company share speculation.[43] In 1732, he was 'apprehensive of Parliamentary censure for his practice of managing so many small bubbles for near 20 years last past'.[44] An agreement was reached in May 1728, by which William and Charles Wood would have 5,500 shares (£5 shares) in the Company's stock. The Woods contracted the sale to the Company of ore and coal from their mines and undertook to make this into 'the best tough malleable bar iron fit for all common uses' and to deliver that to the Company. The quantity was to be 1000 tons (if possible) in the first 15 months at £10 per ton; 2,000-3,000 tons in the next year, also at £10; at least 5,000 tons in the third year at £12, and at least 10,000 tons for the rest of 14 years. It was to be delivered at Whitehaven or Newcastle, and part at London if the Company so required. The Company would advance up to £15,000 to build the works. However, the Company would be entitled to retain money from the sale price apparently in respect of what was due from the Woods for calls on the shares.[45] The quantities of iron would have been very significant. British production in 1735 was about 13,500 tons with *c.*26,000 tons being imported.

Since the Company was acting within its powers, this was a potentially viable proposition and not prohibited by the Bubble Act,[46] or rather would have been viable if the Woods had been able to perform what they promised. During June, the Woods signed receipts for £28,500, and were advanced a further £4,500 on a bond dated 26 August, Kingsmill Eyre giving a receipt for this.[47] According to Charles Wood, the £28,500 was not paid in cash, but by a share issue at £18 per share, most of which was taken up by the directors. Sir John Meres took up 1000 shares, paying his subscription using shares in the Charitable Corporation, valued at £7.10s each, but when Charles sold them, he could only get £6 each, receiving only £14,000, not £18,000. Charles also received some of the Mines Royal shares, being told they 'were as good as money', but he could not sell them, finding them 'of little value'. Furthermore of the £4,500, Eyre only released £2,500. Charles said that was expected to return £20,000 to several of the directors as gratuities out of the £60,000 that was to be raised,[48] but this may have been the paid up capital of the new shares (issued to Charles nil-paid), rather than the corrupt payment that he implied.

For the advance of £15,000 to build works, the Woods assigned as security, the works at Frizington, and all their interest in works in Shropshire or elsewhere in England or at 'Canaby' in Scotland, in favour of Sir John Meres, Kingsmill Eyre, and three others. At the same time, for securing the £4500, Charles Wood and Kingsmill Eyre vested Charles' company shares in the trustees to be sold at £18 per share.[49] The unpaid £2,000 (of the £4,500) was probably the sum borrowed from Sir John Meres. This was paid into the Court of Chancery, as security for Harvey's claim, for unpaid purchase money from the 1720 sale shares in the 1714 Shropshire ironworks partnership.[50] Canonbie is just beyond the Scottish border on the Edinburgh road out of Carlisle. The forge there had existed since 1699, possibly originally being built to fine pig iron from the blast furnace at Cleator, but it had a chequered history after the failure of Richard Patrickson and his partners in 1702. In 1719, it was in the hands of Boock and Dod.[51] The latter may be the unnamed man who came to Whitehaven to set up a much needed 'nailery and some other iron manufactory' in October 1725, having been 'broken by an iron furnace he set up in the borders of Scotland'. Spedding obtained an affidavit in February 1730 from 'a nailer of Dod's, who was plagued with working some of Wood's iron and because Dodd may say he made it into nails'.[52] Dodd is mentioned in the Lowther letters as one of Wood's many stewards at Frizington.[53] He left there in March 1731, and apparently described practices there to some one (possibly John Spedding).[54]

The advances from the Mines Royal were used to set up works at Frizington Moor. William Wood said that he planned these about Michaelmas 1728.[55] Certainly, he obtained a 99-year lease from John Williamson of Frizington of all mines and minerals in the moor and the 'right to use any vacant ground in the common to set up any forges furnaces or other buildings for smelting melting refining and converting' these, for 'iron goods and iron manufactures', and for building workmen's cottages (see Fig. 1).[56] However, he was unable to start work on them until the following spring. The building was 375 feet long and 36 feet wide, with space for 22 furnaces and four forges, but at a cost of £10,000, only 11 furnaces and three forges were completed, as well as a large smiths' shop, workmen's houses and a stable for 20 horses. There were also engines for grinding coal and iron ore, shafts or pits on the moor for getting coals and an engine for drawing water from them.[57] Further detail of what actually happened at Frizington will be described below.

In early November, Lowther was importuned by his old acquaintance Sir John Meres 'to let him know the real truth of what was doing at Frizington'.[58] Wood had (in Lowther's view) lied about his relations with Lowther.[59] According to Thomas Baylies, Wood had sought to make a contract with him for 10,000 tons of coal per year, with the option of 40-50,000 more, but Lowther refused, wanting to see whether Wood's process would work. Wood clearly feared the risk that if he built his works without securing a coal supply, Lowther (as the greatest local coal owner) would have been able to name his own price, and thus reap Wood's profits. Wood (incorrectly) attributed to Lowther the intention to do just that. According to Lowther's own account, about Michaelmas 1728, Mr 'Steward' (an agent of Wood) proposed that Lowther should supply 20,000 tons of coal from 'a colliery called Whingill, which was nearest of Mr Wood's iron oar of any colliery [Lowther] had open'. Lowther asked what security

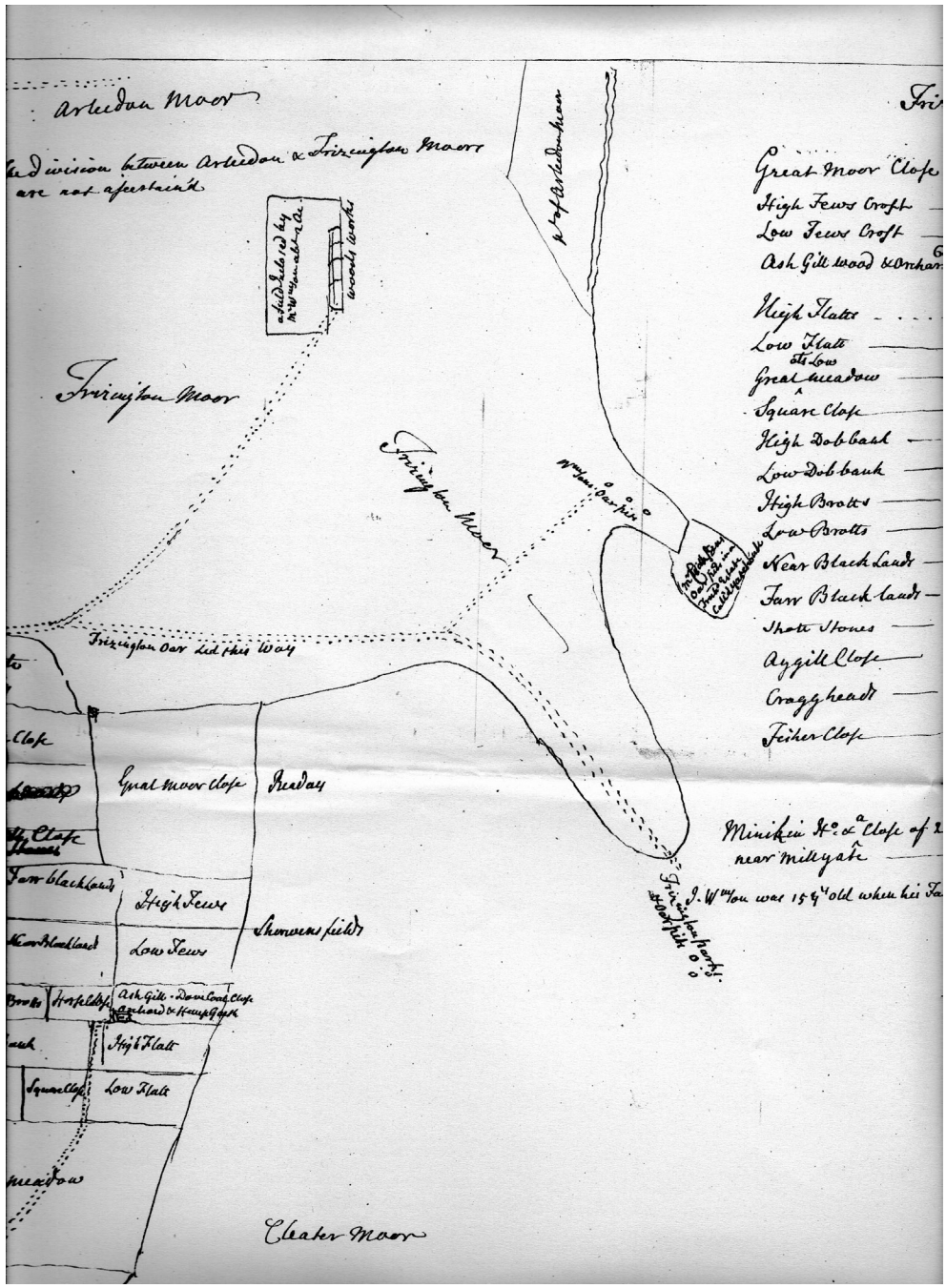

Fig. 1. An extract from sketch plan drawn when John Williamson was preparing to sell part of his estate in the late 1740s. This shows in the midst of Frizington Moor 'A field inclosed by M^{r} W^{m}son ab^{t} 2 ac' with 'Woods Works' along the edge of it. CRO, D/Lons, box 1686 (Frizington deeds), 'Account of Jn^{o} W^{m}sons estate at Frizington with a sketch'. By permission of the Lowther Estate Trust.

Wood would give and Steward answered 'there was no occasion for security for if Mr Wood pays you what he takes you will be no sufferer and if he does not take one ton what hurt will it be to you'. Lowther said 'he would be to blame to make such bargains'. That was the end of the matter, but Lowther remembered it, 'because he soon had occasion to relate it on account of false reports which were immediately put about of that discourse'.[60] The agent was evidently Samuel Stuart, who later stated that he was at Whitehaven from 10 October; his job included making payments for the works.[61]

Sir John Meres provided Lowther with 82 shares in the Mines Royal, enough to qualify as a director, and Lowther was elected First Deputy Governor on 5 December, Sir Fisher Tench, his sons and others of Wood's friends being turned out of office.[62] The basis of Lowther's shareholding was a secret between him and one other (presumably Meres),[63] but he later used the word 'buy' for the transaction. He did this 'for the sake of clearing up the truth and as a means to sett matters in a true light. [He] soon found that accounts given to Sir John and the company misrepresented the state of affairs at Frizington and Mr Wood was very sparing in sending accounts to Sir John and the Company'. What the company had was merely extracts from letters. Lowther had 'different accounts both of the coal and iron viz. that they had little coal and the iron they made was very bad and that only very small quantities of iron were made'.[64] Soon after both the new directors and the old were resolved to advance no more money to Wood, and not to make their second payment to him.[65] The second payment on the shares, which would have financed this, was postponed, because the company were 'not yet well satisfied with Wood's performance'. This was delayed periodically and had still not been called by 27 May when Wood expected his third payment; the calls were probably never made.[66] However, the Woods already had received money raised from the initial share sale, providing the funds to undertake their building work. That work proceeded over the following year, as will be described below.

Events near Whitehaven

According to Lowther, Wood came to Whitehaven, soon after Michaelmas 1728 when Stuart had failed to make a coal contract. From then until mid-October, his agents 'began to amuse the country with prodigious things [Wood] would do in making iron, what vast buildings he could erect, the vast sums of money he would expend; how he would enrich the country and employ a great part of the ships about Whitehaven'.[67] This was the context of Sir John Meres seeking Lowther's advice and getting him 'chosen into the direction of the Company' (as just described). Despite money having been raised, Wood's credit remained poor. He was arrested for debt in November, but bailed out by Mr Coates, who had a glass works at Whitehaven.[68] Spedding wrote that this was just as they did in Northumberland 'where they sharpt Mr Wallace of several(?) hundreds of pounds'.[69] Wood opened a mine in Frizington Moor to work a seam of coal there.[70] During December, Wood was evidently boasting of the thickness of the coal seam they had found, but Spedding heard that it was six foot thick (not ten foot), but 'they acknowledge themselves that not above two foot was clear coal and of that only eight inches that is choice good'.[71] Later that month, Spedding reported that Wood had made 'some few bars of iron of about three foot long. It was taken out of the furnace where it lies like a great cinder and is carried with smiths tongs to the

hammer, and as it cools it is heated over and over again in the smiths hearth till at last it is beaten into a bar', but whether it was tough or brittle was a secret.[72] The great hammer weighed four hundredweight, and was operated by horses, but 'the dross of iron flys so prodigiously about the room that horses will be killed by it', according to Lowther's 'leaders' (i.e. carriers) who saw it.[73] The use of horse-powered forges was exceptional, as forges were normally operated by a waterwheel;[74] indeed, Wood evidently considered using water power, as he sent his millwright to Canonbie at the end of December 1728.[75]

Some breakthrough occurred on 17 January. Immediately after that, the works were opened to visitors. Spedding did not go himself, because he thought he would not be allowed to see as much as he wanted. However, everyone told him that the iron 'looks well and had the appearance of being good', but several doubted that he was 'so perfect in the secret of making iron as to put it beyond doubt'. Nevertheless, they were not sure whether further ingredients were added. They noted that they 'artfully contrive to get people out of the room' where the second furnace was and locked the door. The workmen were 'making a sort of raree show of it and crying out to the spectators, "Observe, gentlemen, the mettle is taken out of the furnace! Make way for the loop!" '. (A loop – French *loup* – is a mass of iron awaiting forging).[76] Finally, iron was only made when people came to see it done and then only a few bars. 'The whole that is made scarce exceeds' a hundredweight, and they were using ore from Langaran, three miles away. Wood, his son and daughters were expected to leave as soon as they had 'erected another machine to work a hammer of about' four hundredweight.[77] They left for London in mid-February, leaving behind a third son Richard. By that time, both 'Mr Bayly' [Baylies] and Mr Stuart were expressing doubts about the profitability of the process.[78] In March a ship, which had delivered iron pigs to Bristol from Little Clifton Furnace and was to have returned with a lading for Wood, came back from there empty, 'he having no further credit'.[79] Ash timber and Stourbridge clay (fireclay) had been carried up to Frizington at the end of April, and by 1 June, a 'great hammer engine' was completed.[80] With Lowther's return to Whitehaven in June, his correspondence with Spedding ceased until October, and with them Spedding's regular account of events at Frizington.[81]

The Mines Royal Company were told of the January success, by a letter that reached them during a directors' meeting on 23 January, but Lowther also told them what he heard.[82] Wood (on his return to London) talked of sending two hundredweight of iron up to London by carrier, but Wood declined 'showing how good his iron was'. At the end of April, Lowther sold his shares back to Sir John without profit or loss, thus disqualifying himself from being a Deputy Governor. New directors were elected unanimously on 8 May, 'every man of Sir John's appointing'. Lowther thought he was obliged to act as he did, as many affirmed that he had laid out great sums of money in buying shares. On his arrival at Whitehaven in June, he sought the best information from merchants, and they fully confirmed his view. He 'was thus fully convinced that Wood was keeping a number of people together and seeming to be carry on the works to amuse folks in London in order to make his shares rise'.[83] So far as the company were concerned, Wood failed in that aim. He had no credit left and a judgment had also been entered against Kingsmill Eyre. Charles Wood was also a defendant in Chancery

proceedings for failing to complete a lease from Mrs Thomas of her 'great house and warehouse in Basinghall Street', London. This had been intended as an office for the company and a storehouse for iron.[84]

Lowther subsequently discovered worse. According to a joint affidavit by Lowther, John and Carlyle Spedding (Lowther's agents), and James Gorton (a Quaker and chief steward of Wood's mines from about Christmas 1728) made in September 1730, they met James Crowley at Lowther's house a few days before. Wood had in July 1729 employed James Crowley (brother of Sir Ambrose, the great ironmonger) as a clerk. Gorton had often talked with Crowley, 'whom he found most dissatisfied with the management'. He told John Spedding, and both Speddings met with him and Crowley. Next day they all met with Lowther at Lowther's house, after which the others made an affidavit as to what Crowley had said: much of their iron was being sent from Frizington to 'Eskdale to be run with charcoal, and when it came back he observed it did alter the colour a little so as to be less black than it used to be, but did not alter its ill qualities'. He objected to the cost of sending iron to and from Eskdale, to which they (not clear who) answered, "What is charges to Mr Wood?" Then, Crowley said "Why then, you may make it better by putting in bits and scraps of other iron, nails, stumps, etc." If that was not done, the iron came back from Eskdale the same as before.[85] This seems to refer to a bloomery forge owned by Mr Russell at Forge Houses near Eskdale Green (SD147993), over 15 miles from Frizington and operating until at least 1740.[86]

Lowther had several bars of Wood's iron, which they showed to Crowley. They had several broken, and he observed the difference. Most looked 'all black on the inside, like gunpowder, and were very easily broke.' Others had 'bright pieces of iron intermixed and the other parts black'. Crowley told of how, after Charles Wood had gone to London, he had sent a letter 'advising [the agents] to be very careful that it should not be known that there was other pieces of iron put in the furnaces to mix with them'. Crowley said that '96 lb. of pulverised ore with coal and lime in proportion was the charge of one furnace, and if it draw well will make 14 lb. iron; that it would require three winchester bushels of coal to make the furnace ready for one charge, besides what was used in heating the loops; that he computed 26 tons of coal would make one ton of iron'. The 'bottoms of the furnaces stood two days and then had to be remade'. Though he had deposed that the iron was made in four furnaces, yet nine had to be kept in full heat to have four always at work. He thus concluded that 'Mr Wood has yet to learn how to make iron.' 'Lowther took minutes and Crowley read them over and said over and over again that he would abide by everything he had said and would attest it on oath, and he signed' Lowther's paper. However, afterwards he refused to make an affidavit, as it would 'hinder getting in money owed to Mr Wood'.[87] Possibly, it was more about getting money that Wood owed Crowley. Henry Frame (master workman) and Baylies confirmed the deficiency of the process to Lowther a couple of years later. Frame stated that 'he himself put 5 *cwt*. of scrap in one parcel of bars he made for them; that two loops in three fail and break in the hammering; that their black iron cost them £25 a ton; that it is fit for nothing but short bars; and if broke won't well'd [weld] together; and they can't make a bit of workable iron without scraps'.[88]

Various other estimates were given of the potential output of the works, and of the size of the bars. Thomas Brett (agent of William Wood), Crowley (as clerk of the ironworks) and Frame had deposed that nearly seven tons of iron had been made in four air furnaces in two weeks in February 1730.[89] Charles Wood, talking of the three months from November 1728, claimed that 50 tons of iron had been made and 10 tons could be made per month.[90] However, under 15 tons of iron was dispatched to London in October 1729, which was apparently as much as they could get together.[91] Indeed if the same shipment is meant it was only 10.02 tons made up of 1,426 bars.[92] This works out at an average of 142 bars to the ton, or a little over 15.3 *lb* each bar. By contrast, Graffin Prankard of Bristol, who imported iron from Sweden wanted 'narrow flat' iron to be 62 or 64 bars to the ton, and for 'voyage iron' (for sale in Africa) 92 to the ton.[93]

In the latter part of 1729, relationships deteriorated at the works. In November, Spedding reported that Hayley (who had just departed southward) had countenanced Richard Wood against Ivey and Shepley. Ten days later, Ivey was in Whitehaven and expected 'to go no more to the works till Richard Wood is gone'. A few days later Mr Swainson (a Whitehaven attorney), who went to serve some process (in litigation), reported that he had found 60 workmen fighting, some for Richard Wood and others for Ivey or Shepley, 'every one crying out they wanted three weeks pay and till they had their money would obey neither of their masters'. Charles Wood arrived on 24 November, but whatever money he brought was soon spent. On 24 December, he sent the men off without pay until Twelfth Night. On 9 January, he paid the colliers off 'all but one week's wages', but the other workmen only got some small subsistence money. On 18 January, Dunstan (an alehouse keeper) was arrested at the suit of a Cockermouth maltster, but was rescued from the bailiffs, allegedly on Charles Wood's orders. A week later, the alehouse keeper and six or seven firemen involved in beating the bailiffs absconded. On 11 February Spedding received a writ for Charles' arrest, but found he had left for London a few days before. In mid-April 1730, William Stephenson, a Whitehaven merchant who had negotiated bills of exchange for the works and was owed money (probably from bills that were returned unpaid), had returned from London, saying he would pay Wood's people £10 per ton for all iron delivered to him, and had authority to draw on a banker in London for payment. By 24 April only Dodd, Brett, Crawley [Crowley], Frame and one or two others remained at Frizington.[94] Sir John Meres had a judgment against Wood, Eyre, and Buckland (Wood's son-in-law) and hoped the works would be assigned to him in 10 days,[95] a vain hope. In early May, 'they were beginning to hale and pull things to pieces at Frizington', and Dod and Brett were selling off timber.[96] By June 1730, Wood and Eyre were hiding from their creditors: they 'keep so close in the verge they are not visible there'. (The verge was the area around the king's court where arrest for debt was not normally allowed). Lowther's letter continued, 'They had a bad stroke yesterday by the breaking of Jenkins the banker, and the whole town lays his ruin to these projectors, who had drawn him in for great sums, which as soon as it was known occasioned a general run upon him. Tis said W[oo]d had drawn on him for 8 or 10,000 pounds'. Lowther later heard the sum was above £30,000.[97] The bank concerned was 'John Jenkins and James Jenkins, both of Lombard Street, London, Goldsmiths and Bankers and Partners', who were declared bankrupt about then.[98]

Shortly after these events, William Wood died.[99] He had made a will in June 1729, desiring that his son Charles and son-in-law William Buckland might be indemnified for bills drawn on Kingsmill Eyre. He gave his wife the lease of the Deanery house at Wolverhampton and his furniture, and then divided the residue into 100 shares. Charles and William Buckland were to receive a legacy of £15,000 each out of 25 shares and the rest were to be divided among his wife and children (including them), but John Wood was cut off with a shilling.[100] This was probably for demanding £2000 from his father for surrendering that share in Francis' patent. John no doubt eventually got his £2000 (though earning his father's ire for doing so), but it is unlikely that his siblings received even that much, as the estate comprised little but William Wood's interest in his patent and ironworks, and a mass of debts.[101]

The million-pound 'Company of Ironmasters'

Having spent the money raised from the Mines Royal and unable to get more, William Wood, with his sons William junior, Francis, and Charles, and Kingsmill Eyre petitioned the king for a charter of incorporation at the end of 1729. They wanted it to have a capital of £1,000,000 and for the restriction to only having five participants in the patent to be removed.[102] As mentioned above, George I had made a general direction in 1720, to prevent the abuse of patents by dividing them into many shares.[103] Thomas Hayley, who was Sir John Meres' nephew and the treasurer of the Mines Royal company (evidently sent to Frizington), told Spedding 'of Mr Wood being a very understanding man and has many and great friends that won't let him want money and hints that his great sufferings about the Irish halfpence, by screening some great folks, obliges them to feed him with money'.[104] It thus seems Wood expected no difficulty over his petition. However, the great folks were less in control than Wood imagined.

The petition was initially referred, as was usual, to the Attorney General and Solicitor General on 31 December 1729.[105] This led to detailed evidence being given and to an investigation, particularly as Thomas Tomkyns put in a counter-petition that he, Sir Thomas Mackworth, Sir Archibald Grant, Samuel Palmer, George Robinson, and William Goostrey should have a charter for his process instead.[106] The law officers' report was adverse to both sets of petitioners, concluding that neither undertaking was on a scale to require a trading corporation.[107] Evidence given by Wood and his associates suggested that with a capital of £200,000 or £250,000, they could make enough bar iron to replace imports,[108] then averaging almost 20,000 tons per year.[109] If the Woods' hopes that their new process would undercut (and so replace) the entire charcoal iron industry had been realised, this capital would perhaps still have been excessive, but not grossly so. Another estimate exists that he would need £500,000 to make 20,000 tons per year.[110] Throughout all this, starting in April, Lowther orchestrated a pamphlet and newspaper campaign against Wood and his proposed charter. In this, he was assisted by Robinson and Goostrey,[111] who apparently hoped that Tomkyns would get a charter. They presumably hoped to profit from stockjobbing in shares in Tomkyns' proposed company; stockjobbing was something, in which Robinson (at least) was certainly deeply engaged, funding his dealings with fraudulent loans from the Charitable Corporation.[112]

The Privy Council considered the law officers' report in July 1730 and referred the matter to a committee. This met periodically over the summer, and in September, it asked for a list of people to be incorporated, and as to the 'terms upon which they are willing to engage in it so as to prevent any ill-use being made of the charter', if granted.[113] This led to a rumour that a charter was to be granted. However, the king decided to have the matter finally resolved, and told the Privy Council that he wanted an experiment made at his own expense.[114] The king (*i.e.* the government) provided £500, with which the proprietors built 'proper workhouses with furnaces, forges, etc.' near the turnpike in the High Road from Westminster to Chelsea.[115] The two furnaces were built in December 1730;[116] engines were demolished at Frizington and shipped with ore to London. The engines were erected and experiments began in early March. John Hanbury of Pontypool, a prominent ironmaster and another Member of Parliament, considered that this ore used had been 'picked' (i.e. carefully selected).[117] In March 1730/1, a trial of the process was formally ordered before inspectors, including the Earl of Hay, James Lowther, and John Hanbury, but there was no quorum on 8 April. More inspectors were appointed, but Sir Robert Walpole had to lobby hard to secure the attendance of a quorum.[118] Lowther had feared that no indifferent inspectors would be appointed, but several City figures (such as Mr [Samuel] Holden, the past Governor of the Bank of England) assured Lowther the he and the other company directors appointed (being half the number) 'would not be tools of Sir Robert to lay down the odium of cheating folks'.[119] The trial took place on 12 May, just after Parliament was prorogued. 'Lord Islay and some few were disappointed with the half bloom [the stage after the loop] flying to pieces at the fourth heating and hammering, but most of the inspectors were pleased, being fully satisfied before of the cheat and hoping to rid themselves of further trouble and difficulties about report making'.[120] Lowther wrote a few days later about the forging out of the blooms. They used a hammer with an 8-inch stroke and took 14 heats to produce a bar, John Hanbury told Lowther that the hammers at other forges had a 20- or 22-inch stroke and took only three heats.[121]

The Inspectors reported in October, and their report was referred to five of the Privy Council clerks.[122] All the time, the business of the charter was pushed forward by Sir Robert Walpole. Lowther had mentioned this in his letters in March 1729/30 and again in May, while the matter was before the law officers.[123] The king's decision in autumn 1730, to have the Chelsea trial,[124] is likely to have been encouraged by Walpole. By then, the whole council except Walpole and two or three others were against this charter; indeed all company charters.[125] Ten days later, the Lord Chancellor told Lowther that all the Council were against the charter except Walpole and Lord Chief Justice Eyre (of the Court of Common Pleas), who was Kingsmill's elder brother.[126] The Chelsea works had been pulled down in December and some of the 'iron geer' was sent off by sea (presumably to Whitehaven). Sir John Meres heard that Eyre had got £500 more and sent John and Charles Wood and six others to Frizington. They talked of doing nothing until the next summer, but some people thought they would make another push for a charter. Later Lowther wrote that 'Wood's men going off to Whitehaven was nothing but poor fellows going home again'.[127]

A further trial before the Privy Council clerks had taken place on 8 November. Their report (which is the fullest description of the process) will be described in the next section.[128] The projectors asked in February 1731/2 for a trial of their iron by two master smiths, Robert Gadd of Browns Garden and Nathan Heald of Chelsea Road near the turnpike. This was apparently the second trial held in Browns Garden. The Privy Council clerks attended it with the Master Smiths at Deptford and Woolwich (J. Dalton and John Bowles), John Montigny of Hyde Park Corner, Edward Gabb of Piccadilly, Samuel Barnet of Red Lyon Street (all smiths) and William Bowen of Southwark founder.[129] The adverse report of these smiths evidently ended any hope of a charter. Nevertheless, that had already become politically impossible due to the failure of the Charitable Corporation, of which Robinson (Tomkyns' supporter) was an absconding officer.

Wood's process

According to a pamphlet (probably his) Wood's process consisted of:

> 1st Mr Wood calcines all his iron ore and pulverizeth it.
>
> 2ndly He pulveriseth his pit coal and mixeth twice the quantity of it with the ore and its proper flux.
>
> 3rdly The iron thus mixt with pitcoal lieth in the furnace and every particle of ore having twice as much coal or fire attending it, the flame penetrates the whole body of the ore in the furnace and equally all parts at once (which could not be done with large or unequal pieces or lumps of ore or coal). But the proper flux occasioneth the due separation of the cinder from the metal. The cinder (dross or slag) is very thin and brisk and is by a taphole drawn off from the metal as often as the occasion requires, and when the metal is thoroughly purged, it is like heated wax rolled up into one lump, and being a little more heated is brought to the forge hammer and drawn into a bar of iron.[130]

Thomas Harvey, who visited the works for about ten days in September 1729, had the process demonstrated to him. The ore was calcined and pulverised; the coal was also pulverised and these were mixed together, with a 'proper flux'. 1½cwt. of this was charged to a furnace. When 'in a working condition, the cinder flowed out very plentifully', which Harvey let out at a 'taphole as the occasion required'. After 1½ hours, it was brought out and worked into a bar. He 'observed this to be free of cracks and worked as kind under the hammer as ever [he] saw iron made with charcoal'.[131] Other accounts of the process agree: Charles Greenwood of St Martin in the Fields saw a bar 11 feet long and weighing 22lb made. Daniel Ivie of the same parish visited in June, and referred to air furnaces and to lime.[132]

The best account of the process comes from the report to the Privy Council of a trial (before its clerks), carried out in two furnaces at Chelsea in November 1731, after William Wood's death. The charge consisted of:

Seven measures of calcined ore	22.5 lb. each	157.5 lb.
'Slacked' (slaked) lime		4.0 lb.
Five measures of coal 'coaked' or cinders ground very fine	7 lb. each	35.0 lb.
		196.5 lb.

Three successive charges were observed. The ingredients were 'well mixed together with water' and put into the furnace (the lesser the first time, the large one on the others). For the first charge, the report mentions stirring after 70 and 104 minutes

from charging, but is silent on this for the subsequent ones. The metal was taken out after 1¾-2 hours. On the second and third occasions the metal spent a further half hour in the lesser furnace and beaten with a wooden mallet to form a loop and returned to a furnace for ¾-1 hour. It was then beaten with the forge hammer into a square bar called a 'half bloom'. This required a further seven or eight heats to draw it into a bar. The details of the timings and results are set out in Table 1. The inspectors noted that they had no account of the amount of coal for the initial heating of the furnace or of coal expended in the smith's forge.[133] Coal there was usually 10 to 12 shillings per ton (presumably in London). The yield in the last at the foot of the Table 1, calculated by this author, seems a very low one, when pure Fe_2O_3, presumably the main component of calcined ore, contains 70 per cent iron. Wood had himself claimed that 1½ cwt. of ore would make a good sound bar of 42 lb. weight,[134] a yield of 25 per cent, about what they managed in the first trial.

Table 1. The demonstration at Chelsea

	First	Second	Third
Time in large furnace (mins)		122	106
Time in lesser furnace (mins)	104	30	30
Time in furnace after use of mallet (mins)	44.5	32	47
Coal consumed in heating (baskets with 43.5 lb.)	8	8	8
Heats during drawing out	7	8	7
Weight of bar (lb.)	41	33	29
Yield (calculated by the author)	26.0%	20.9%	18.4%

Source: as Note 133.

Wood had long resisted having his iron tried by his ostensible customer, the Mines Royal Company or any one else. Lowther had obtained some bars at Whitehaven, where the views of smiths from Whitehaven were mixed,[135] but some of them 'durst not buy any iron from the works belonging to Wood tho the iron were never so good or cheap being threatened by Mr Spedding agent to Mr Lowther that they would be turned out of their shops'.[136] Two bars from Frizington were tried in London on 20 May 1730 by order of Viscount Townsend (one of the Secretaries of State). This was tried in the presence of Thomas Ripley, comptroller of H. M. Works; by Thomas Smith, Master Smith of H. M. Works; William Winckles, Master Smith to Chelsea Hospital; John Cleave, Locksmith in Greenwich Hospital; Thomas Glover, master smith in Oxford Road; John Hill, master smith of Buckeridge Street; and Robert Gadd of Browns Garden. Gadd provided the premises for the trial. The smiths 'did declare themselves satisfied with the goodness thereof and that they thought it fit for any common purposes'.[137]

Some of the iron from the final Chelsea demonstration was sent for trial by smiths.[138] The Privy Council clerks as inspectors provided a report from the smiths, who stated:

> We are of the opinion that the bars we saw broke before us to be of unsound body having some part of earthy or coaly quality remaining in it. [They then listed a series of trials at making common iron goods (as Table 2).] Having seen the trial there doth appear to be greater labour and expense

> to work it than common redshort iron and that, when wrought into any shape it can be brought into, will not come up to any redshort iron in common and when cold of much weaker nature as appears by trying above spike that we desired might be tried in other shapes but they would not admit of it.[139]

Iron was classified as coldshort (liable to fracture when cold) or redshort (liable to break at red heat. Redshortnes is normally due to the presence of sulphur as an impurity, coldshortness to phosphorous. It makes the iron difficult for smiths to work; in an extreme case impossible, making the iron valueless. This accounts for the high number of heats recorded; also the lighter than usual stroke of the helve hammer and the breaking of bars during forging.[140]

TABLE 2. Operations by blacksmiths

Product	Heats for Wood's iron	Heats for 'common redshort iron'
Harrow tine	3	1
Harrow tine with a flap and nail hole	4	2
Bolt	11	5
Harrow tine	4	2
Hing[e] (not well done)	12	4
Hook for a hinge	4	3
Large spike	3	2
Square staple (whole bar)	8	4
Ditto (split bar)	6	3

The aftermath

The projectors

Even before the Law Officers had reported on the petition for a charter, the projectors were in serious financial trouble. It has already been mentioned that they were residing in the verge. Charles Wood and his brother-in-law William Buckland obtained diplomatic immunity by becoming 'servants in the house of the Resident of the Duke of Wolfenbottle' [*i.e.* Brunswick-Wolfenbuttel]. In October 1732, Mr Lyddall (a creditor) got Charles arrested, but he was then released. Lowther considered Lyddall imposed upon, as diplomats could not confer immunity on merchants.[141] William Wood junior (a founder a Southwark) and Francis (a brass wire miller and merchant of Ember Mills, Surrey) freed themselves of debt through bankruptcy in October 1732.[142] Charles did not follow this route until July 1733, but quickly obtained his certificate of conformity.[143] William Buckland did the same in August, but his Commissioners were required to meet again in 1736.[144]

Eyre continued living in the verge. Coates, who had a glass house (i.e. glass works) at Whitehaven, had cashed bills of exchange for William Wood, attracted by the large discount offered, but this left him liable for the full sum when Eyre (on whom the

bills were drawn) failed to pay them. In October 1731, he had Eyre outlawed, and petitioned the Board of Green Cloth (which managed the Royal Household) for leave to arrest Eyre in the verge. However, the Board (whose members all owed their valuable sinecures to Walpole) refused leave, leading to a public outcry against 'Sir Robert's unparalleled injustice in protecting KE'.[145] In April 1734, Lowther wrote to Spedding that he might tell Coates,

> Sir Rob[er]t is so set upon serving Mr E[y]re that he will do anything he can for him but part with his money. Sir Rob[er]t commends the project so hugely that no body that is intimate with him (as my Lord Lo[nsdale] is) will affront him so much as to reflect on a gang of projectors or Mr E[y]re that is the head of them whom Sir Rob[er]t crys up as a man of uncommon honesty; very likely, he puts on a level with his own, and that may be true.[146]

Earlier Lowther's advice to Coates had been to proceed in a public manner.[147] Coates had, in November 1732, tried writing to Lord Chief Justice Eyre about his brother, but got an evasive answer.[148] According to Lowther's advice over that winter, he was to come up to London; call a meeting of Eyre's creditors; prepare a statement of his case; publish it, giving a copy to each Member of Parliament; and seek redress from Parliament that way. However, the Commons would not receive petitions after late April. Coates came up to London in March 1733, but then dithered, rather than proceeding boldly as Lowther advised. This was due to getting conflicting advice from others.[149] Coates' wife thought he was throwing good money after bad, but his daughter disagreed.[150] By the time (in May) when he called a creditors' meeting, it was too late to petition Parliament; the creditors were divided, some being for petitioning the King and Council and others for bankruptcy. They were still divided in November. There had been a suggestion that the Board of Green Cloth would give leave for the arrest, but only by a particular court official, who had been bribed not to.[151] Eyre's outlawry was reversed in December 1734, and he entered an appearance in court (a mere formality),[152] but Coates (still unpaid) was again petitioning the Board in October 1736.[153]

Frizington

Little further was mentioned in the Lowther correspondence of the Frizington Works, but in August 1732, they were seeking Eyre's consent to sell things to pay Mr Williamson (the landlord).[154] A second sale took place shortly in October, leading to Lowther referring to 'gutting the works'.[155] In a letter whose draft is partly in shorthand (which this author has not completely deciphered) Spedding wrote:

> 'I called yesterday at Dikenook on Mr. Williamson and under pretence of buying some iron for the glasshouse and got a sight of all the works which look very dismally and ruinous, all the side buildings being entirely tumbled down and part of the _ of the workhouse _ main building also fallen; the furnaces are many of them and unfit for use; the bellows many of them rotten to pieces and the rest scarce fit to be _. The storehouse for their iron that was formerly kept lockt carefully and for the pretence of <having great> quantity lodged in them all empty save for about a tun <or> a little more of their sorry state. They _ of going _ and that they will _ the _ horse engines to shingle the iron that is taken out of the furnaces which is to _ to be carrid to forges so as by water to be drawn into bars. The workmen themselves owning themselves that the hammering of it with horses is the most ridiculous and expensive way that could possibly have been attempted that do not _ the tools belonging to the furnaces nor the Stourbridge and Windsor bricks but most of which things are gone and I cannot learn they that the whole they have _ amounts to any £70 so that Williamson must go to selling more _ hee'l fall v_ short if <they> give Tomkins … of making any bargains with them.[156]

1733, Charles Wood was in London boasting of making good iron at 'great works in Scotland', though the location was a secret.[157] The following February there were stories about Eyre making iron using scrap iron and wood charcoal. Sir John Meres considered it was to amuse his creditors 'till he can clear himself by a statute of bankrupt'.[158] (Bankruptcy was then only possible for traders).[159] A year later 'Wood's gang' (except the bellows maker) left Frizington. Sam Wood was going to London and Charles intended to follow the next month.[160]

Eyre's Patent

In January 1736, they were teasing Sir John Meres, presenting him with a cast iron medal with a rose and crown and the inscription 'Rosa Americana'. They claimed to have 20 tons and that it was pass as coin in the West Indies.[161] On 20 March 1736, Eyre obtained a patent for the version of Wood's process in which scrap iron was added. Unlike the earlier patents, a specification was enrolled:

> The ironstone or ore being calcined, and the coal charked, are pulverised and mixed together and put in an air furnace, with additional fluxes of lime and ashes of fern, which thins the slag, and causes a separation of the metall when it begins to come into the nature of iron. There is then added, according to the quality of the ironstone or ore melted, whether red short, or cold short, or the sort of iron to be produced, a certain quantity of old rusty iron, called scraps, or bushel iron, or nut iron, or hammer slough, whereby more metal is extracted out of the oar than it yields without that addition. It expedites the operation of the furnace, saves fuel, and meliorates the iron, bringing it to a greater degree of fineness and softness than usuall.[162]

A few days later, five tons of scrap iron was shipped for Eyre to Whitehaven. They proposed to use 5 cwt. of scrap to a ton, and to make 4000 tons per year.[163] Frank [Francis] Wood (who by then had a furnace near London) talked to Lowther of this in April, dismissing it, 'because the buying of scraps would raise the price too high'. Frank said that he could make very good pig iron with pitcoal at £3.10.0 per ton which would make good bar iron at 40s. He had 'a furnace near this town' [London], and invited Lowther to view it.[164] However, Eyre was serious, intending (according to Mr Stephenson of Whitehaven) to make halfblooms at Frizington and then them to forge near London.[165] How much happened over the summer is unclear, but in October, Charles Wood hoped that 20 tons of scrap iron could be spared from the Copperas House (probably at Whitehaven) and that a further 20 tons could be sent from London. Lowther was sending equipment for his steam engines by the same ship, *The Satisfaction of Cartmel*, but unless the master could get a full lading, he was not willing to go as far as Whitehaven. As the scrap was not forthcoming, the master only took Lowther's goods to Piel Foudry (near Barrow in Furness), where the goods were transhipped to Lowther's *Benjamin* to take them on to Whitehaven.[166] Eyre presumably had failed to pay for the scrap. However, some iron was made at Frizington in October 1736.[167]

Eyre's commercial career came to an end in May 1738, when Kingsmill Eyre 'heretofore of Chelsea now or late of the liberty of Westminster, dealer in iron and chapman' was declared bankrupt. The Commissioners in Bankruptcy met again in April 1739 'at the request of persons claiming large sums'.[168] He nevertheless retained his lucrative post as Secretary of Chelsea Hospital,[169] until his death in 1743.[170] The

rent for the Frizington Park mines due at July 1736 was apparently paid, presumably by Eyre when he was making iron that year, but not subsequently. The arrears were written off in the landlord's rentals in the year 1743/4. The Park iron ore mines were probably not worked again until 1761.[171] Williamson, the landlord of Frizington, demolished the works in December 1740 to recover what he could by selling the building materials. He evidently declared William Wood's 99-year lease forfeit. This action annoyed Coates, who 'showed his dislike of any but himself getting anything', 'when [he] himself is never like to get a farthing' of what he had lost.[172] Sir Richard Lane, who (with others) had 'got hold of Wood's concerns' told Lowther that they would sue Williamson for doing this.[173] Their proposal was to make iron from scrap.[174]

Williamson was himself in financial difficulties.[175] Lowther took over the mortgage on his estate in 1743 and (after making further advances) took over much of the estate in satisfaction of the mortgage in 1750.[176] Williamson relet the mines in Frizington Moor in 1747 to Benjamin Harvey of Sutton (by Shrewsbury), the son of Thomas Harvey, whose Tern Mill then belonged to Benjamin's brother-in-law Joshua Gee.[177] The mines soon became Gee's, being so described in sale particulars for Williamson's estate.[178] Gee left Shropshire in 1756 to manage his Frizington mines, after difficulties with Daniel Stephenson, his manager, and was still there in 1767.[179]

Frizington Moor was inclosed in about 1805, though the award was not made until 1820. The site of the works (NY 03451780) was still inclosed (see Figs. 2 and 3), but shown as belonging to the Vanes of Hutton-in-the-Forest (who also owned Frizington Park).[180] It lies west of the gill, a little distance to the west of Frizington Fire Station. The foundations of various buildings are evident as humps and bumps in the field, over an area at least as large as in the contemporary description. Several circular depressions may represent the sites of horse-mills. Considerable amounts of slag are present on the site, which would warrant further investigation.

Conclusion

If Wood's process had made good iron and cheaply, as he claimed, it is likely that he would have undercut the charcoal iron industry, and that the era in which bar iron was made entirely with mineral coal would have begun in the 1730s, not in *c.*1785 when it did. The process of his rival Tomkyns did work, but was inefficient, and so unable to survive in the difficult market conditions of the 1730s, when the market was glutted with Russian iron.[181] Surprisingly, the bankruptcy of most of the participants in Wood's project was not the end. Tomkyns and the Woods were involved in a project for making pig iron in 1738.[182] John and Charles Wood both re-emerged as ironmasters. By October 1740, John Wood was making 'six tons [of iron] week at Wednesbury in Staffordshire' and selling it at £18 per ton. This was from the 'pig iron, bushel or scrap iron, and skulls from furnaces', the material that one Payne intended to use in a trial for which he was seeking finance;[183] scull iron is actually a waste from foundries. John additionally acquired Little Aston Forge (not far from Wednesbury) in 1746.[184] Charles (with partners) opened coal and iron mines in Egremont in 1749 and established a forge at Low Mill, Egremont.[185] Both Charles and John thus became successful

FIG. 2. An extract from the Frizington Moor inclosure map, 1820, showing the site of Wood's works as an old inclosure within an allotment made to Sir Frederick Fletcher Vane, baronet. The moor was in fact divided in 1805 and 1806, but the award was not made until later. CAS, Quarter Sessions records, Q/RE/134.

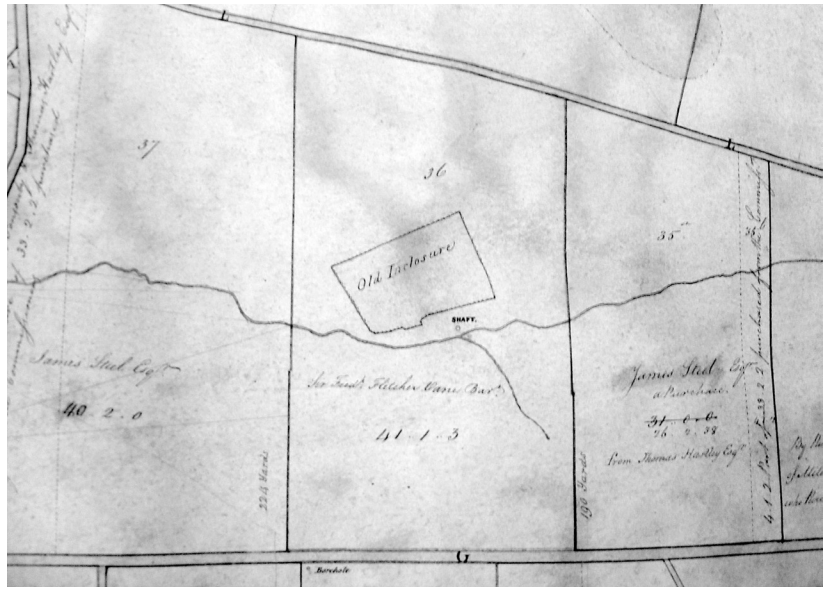

FIG. 3. A detail from the inclosure map reproduced in Fig. 2. The head of the shaft, presumably William Wood's coal mine, can be identified on the ground.

ironmasters, making iron from scrap and devising (and patenting) the 'potting and stamping' process, a precursor of puddling. However, that is another story.[186]

Lowther's efforts in opposing the incorporation of a company for Wood's project had another outcome. Lowther used his experience and the opportunity presented by the failure of the Charitable Corporation (defrauded by Tomkyns' friend Robinson and others) and the simultaneous near failure of the York Buildings Company. He joined others in controlling the loss-making activities of the South Sea Company, by having much of its stock converted to annuities. The chartering of Wood's company was clearly a proposal seriously considered by the government, but Wood's deceit and the fraudulent plundering of the other companies had the result that few further companies were created until the repeal of the Bubble Act nearly a century later. Again, that is another story.[187]

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187. I hope also to address this elsewhere.