From the *Transactions* of the
Bristol and Gloucestershire Archaeological Society

The Copper Works at Redbrook and at Bristol

by R. Jenkins
1942, Vol. 63, 145-167

THE COPPER WORKS AT REDBROOK AND AT BRISTOL

by RHYS JENKINS

THAT the smelting of copper was formerly carried on in Gloucestershire has been put on record by the county historians. Thus Rudder (1779) tells us, under 'Newland':—'There is an iron furnace in this parish, and two copper works at a place called Red-Brook, but they have their copper ore from Cornwall and other parts'.

The history of these works is of more than local interest; from the pioneer work done at Redbrook arose a great industry, that of copper smelting in the Swansea district.

INTRODUCTION

In the time of Queen Elizabeth the Society of the Mines Royal established in Cumberland copper works which remained in operation more or less continuously up to the time of the Civil War, in the course of which they were destroyed. Soon after the Restoration the copper mine at Ecton, Staffordshire, was worked and the ore was smelted in the vicinity. This project was given up after a few years, as it was found impossible to produce copper at a price that could compete with the imported metal. The position then, say about the year 1680, was that all the copper used in England came from abroad.

The difficulty was the cost of fuel; so far wood or charcoal had been the fuel used in the smelting of metals, and in England wood was expensive and difficult to come by. However, for many years inventors had been seeking to make use of other fuels, in particular of pit coal, and mainly in connexion with the smelting of iron and lead, and now about 1685 some degree of success had been

arrived at in smelting lead in a reverberatory furnace using pit coal as the fuel. This result was attained at a works near Bristol under the direction of Sir Clement Clerke of Launde Abbey, co. Leicester, with whom was his son Talbot, then quite a young man. However, it is easily understood that the final steps, perhaps the critical steps, towards the end in view, may have been made by one of their assistants. Behind Clerke was Lord Grandison, who held a patent for smelting lead with pit coal; he had advanced considerable sums of money, and getting no return, laid a complaint and alleged that Clerke had swindled him. Clerke was thrown out of the works that had been set up with Grandison's money, but very soon he had started again 'at the Cupilo near Bristol'. However Grandison took further action which, in 1686, put a stop to the smelting of lead by Clerke, at any rate until the expiration of Grandison's patent in 1692.

That Clerke had already been experimenting with copper smelting is very likely; now that he was forced to give up lead smelting he must have taken up the treatment of the other metal with vigour, for in 1688 he had copper for sale. A letter signed by Sir Clement and his partners authorizes an agent in London to sell rose copper at 10 pence a pound. In the following year Sir Clement instructs the agent to sell four hundredweight of copper at the same price; he thinks the price is too low to pay the charges of bringing the copper to London, but the money is wanted to pay the workmen.[1] Just before his death in 1693 Clerke received a patent entitling him to coin farthings from copper made in England. There is no evidence that he did so, but it is clear that a supply of English copper was available. We may take it then that Sir Clement Clerke and his son Talbot were the pioneers in the revival of the copper smelting. As to where they produced this copper we have no documentary

[1] Clerke Papers—a small collection in the possession of the writer.

evidence, but such evidence as we have goes to suggest that some of the first copper made for sale was smelted at Redbrook, Gloucestershire. Why this place was selected as the site of the works is an interesting question. It was conveniently placed for supplies of fuel, whether wood or pit coal, not so for ores from Cornwall. The voyage from the Cornish ports to Chepstow and then up the Wye to Redbrook was a long one, a good deal longer than that to the ports on the Glamorgan coast which were equally well placed for supplies of fuel. The explanation is that when the works were started it was expected that adequate supplies of ore could be derived from the Forest of Dean. It is likely then that the existence of a body of ore was known, but that in a few years this turned out to be merely a pocket. This view is confirmed by the remarks of some visitors from Sweden. Eric Odelstierna, writing in 1692, stated that recently a company had begun to work some mines in the Forest of Dean, and that a small quantity of copper had been smelted. Six years later Thomas Cletscher wrote that the Forest copper mines were quite exhausted.[2] It was when mining in the Forest was becoming unproductive that Cornwall was resorted to for the supply of ore. The revival of copper mining in Cornwall towards the end of the seventeenth century is ascribed to Sir Clement Clerke in association with John Coster.

The Port Books of Plymouth and Fowey (including Truro, St. Ives and Penzance) have been examined for the period 1680 to 1700. The first entry we meet in the year 1688 is of the shipment in October of 10 tons of copper ore to London for Talbot Clerke. Clearly this

[2] At this period a considerable part of the copper used in England came from Sweden, so the rise of the smelting industry here was a matter of great interest in that country; accordingly we find in Svenska Riksarkivet—the State Record Office, in Stockholm—a number of letters and reports on the subject which are of the greatest value. In this paper the letters or reports ascribed to Odelstierna, Cletscher, Swab and Kahlmeter are from that source.

was for experiment. For the year 1689 there is no entry. In 1690, 50 tons of ore were sent from St. Ives to Chepstow in two cargoes ; in 1691, 53 tons were sent to Chepstow, as well as 28 to Bristol. Then in 1692 work at Redbrook began in earnest, the ore brought over amounted to 502 tons, and five years later, in 1697, the quantity had nearly doubled, it was 986 tons.

As to the copper produced, it is quite safe to say that it was sent away by water, but the Port Books of Cardiff (which cover Chepstow) are defective and it is quite likely that the existing records do not reveal the full amount and perhaps not the earliest despatch. However in the second half of the year 1693 over 30 tons of copper are entered outwards from Chepstow ; in the year 1699 the amount is 66 tons and in 1701 62 tons. For the most part the copper was sent to Gloucester, but some went to Bristol.

The smelting of lead had been carried on in this country for ages and natives were available who were fully conversant with the process. For the smelting of copper, as in Cumberland and at Ecton, the aid of foreign workmen had been relied upon. If we are right in considering that the ores first smelted at Redbrook were mined in that district, we may go farther and say that they were the carbonates and oxides, comparatively easy to treat, and that the work was done by Englishmen. Dealing with the sulphide ores of Cornwall was another matter, the smelting process was very complicated and called for men of experience. So in 1708 we find in Nathan Rogers's *Memoirs of Monmouthshire* the statement that :—

' The famous Copper-Work that turns so much to the advantage of the Nation, and Benefit of the Undertakers, is also about 2 miles from hence [Tintern] on the River Wye, manag'd by Swedes and other Foreigners '.

In the Calendar of State Papers Domestic under the date 1695, February 23, we find the entry of a pass to Thomas Shults, Jacob Ziegler, John Coster and others to

go to Harwich or Gravesend for Holland. It is likely that we have here an indication that the foreign experts were already in this country. We can imagine that they had been engaged on the Cornish ores, that some hitch in the procedure had occurred, hence a visit to some works on the continent for further observation and perhaps advice, or it may have been that the foreigners were merely going home for a holiday. In either case the English manager, John Coster, would avail himself of the opportunity of inspecting some of the works abroad. Eight years later, in 1703, the name of John Coster again appears as a grantee of a pass. Of course it must be understood the identification of this John Coster with John Coster the copper smelter is an assumption.

It should be mentioned that the parish registers of Newland and of Monmouth do not show any noticeably foreign names in the period in which we are concerned. Redbrook is in the parish of Newland, and Monmouth between two and three miles away is the nearest town. So far the historical material dealt with has been concerned with Redbrook broadly, but there were two distinct smelting works, one at Upper Redbrook and the other at Lower Redbrook. The site of the latter, or part of it, is now occupied by the Redbrook Tinplate Works. Before proceeding to consider these separate undertakings it must be explained that the success attained by Sir Clement Clerke in 1688 was followed within a few years by a burst of activity in the production of copper in this country. In 1697 we find it stated that there were five joint-stock companies concerned in it. Probably some of these were mining companies and did no smelting, on the other hand some smelting was done by private companies.

A petition to Parliament in 1698 sets forth that the English Copper Smelters have now ' fully attained to the art of making copper in as great perfection as what has been heretofore imported from Sweden, and in such

quantities as more than supply the home consumption, having been obliged to export a great deal to Holland for want of sale here '.[3] This petition was signed by William Cowper and Robert Lancashire on behalf of the concerns at Upper Redbrook and Lower Redbrook respectively, and by others acting for the works at Bristol, at Alderley Edge, co. Cheshire, and at Corbeck, co. Cumberland. Operations in Cheshire and Cumberland ceased within a few years.

Coming to the year 1725, in addition to the two Redbrook works, we have two at Bristol, two at Neath, one at Swansea, one at Hayle in Cornwall, one at Warrington and one on the Thames at Cuckold's Point, Rotherhithe. Redbrook however, is still considered the most important copper-smelting place in England.[4]

The Upper Redbrook Works and the Costers

As will be seen later there are indications of a works at Lower Redbrook in 1692, whereas we have no distinct mention of Upper Redbrook earlier than the petition of 1698 just referred to, but although records fail us there can be no doubt that Upper Redbrook was the parent establishment and that John Coster, a Forest of Dean man, was identified with it from the beginning. Upper Redbrook was the better placed for supplies of ore and coal from the Forest and had more ample water power. One is forced to think that the works at Lower Redbrook was set up after the supply from the Forest became insufficient or failed and the smelters had to turn to waterborne ore. A site beside the river Wye then became preferable to one a mile away and uphill.

What little we do know of Upper Redbrook is bound up with John Coster, and, to a less extent, with his son Thomas, and may be set forth in an account of that family.

[3] House of Lords MSS III, N.S. 244.
[4] Kahlmeter's report (Swedish records).

Redbrook is in the parish of Newland and in Newland church is a large mural tablet with a long inscription in Latin, commemorating John Coster (1647–1718), Mary his wife, and their sons John and Robert.[5] In the floor of the church there are a number of slabs over the remains of members of the family. Among them is that of the copper smelter with the inscription ' John Coster died 13 Oct. 1718, aged 71 ', and beside it is a slab with the inscription ' John Coster, died Oct. 23rd 1678, aged 63 '. It is quite safe to say that the John Coster who died in 1678 was the father of the copper smelter, and the name is sufficiently rare in Gloucestershire to allow us to say also that he is identical with the John Coster whose daughter and wife were buried at Lydney, the one in 1666 and the other in 1688, and with the John Coster who in the years 1657–60 bought pig iron from the Forest of Dean blast furnaces, to the amount of 168 tons, as well as with the Mr Coster who in 1676 was in trouble about a deal in timber with the Crown ; he had bought 40 tons for the use of the ironworks and it was alleged that he had taken 18 tons more.[6] These purchases of pig iron and of wood indicate that the John Coster was the owner or else the manager of a forge ; whether he was a Gloucestershire man has not been determined, the writer has found no earlier mention of him than in connexion with the purchase of pig iron in 1657. The name suggests a foreign, possibly a Low Country origin, and he may have come to this country in connexion with some project for the smelting of copper.[7] On the other hand we find at Kempsford in 1543 Walter Costert, in 1571 William Custard, and in 1583 Robert Coster, and our man may have been of that family.

[5] The lettering on this tablet was reblacked in 1933 by Sir Charles Brickdale who was good enough to send the writer a full copy of the inscription ; it runs to forty-four lines (*see* p. 153).

[6] Calendar of Treasury Books, 1, 244.

[7] The name is common in Sweden—information from Dr Carl Sahlin.

In other parts of England the name Coster was not at all uncommon. In the sixteenth century there were at the University of Oxford half a dozen men of that name, and of these three had the Christian name of John.

To return to the mural tablet ; this monument was set up in 1737 by the eldest son Thomas Coster (1684–1739) and in the inscription he refers to his father as gifted with a rich and liberal natural ability, well versed in natural philosophy, a very learned mathematician and the restorer of the art of copper in Britain. It is this claim that John Coster was the restorer of the art of copper in Britain—(Æreariæ inter Britannos Restaurator Artis)—that most particularly concerns us. Thomas Coster was at this time an important man, perhaps the most important, in the copper trade and in position to know the facts, and one gathers that he was a level-headed man, not liable to be carried too far by filial affection and respect. But the material that has come down to us, while it leaves no doubt that John Coster took a leading part, is not sufficient to justify the claim without qualification. Still it is, to some extent, confirmed by the account of Kahlmeter, a Swedish mine official, who visited Cornwall towards the end of 1724 and wrote that Sir Clement Clerke began to smelt the ores of that county more than thirty years ago, and that Coster was in his employ and brought the process to perfection. Of the early life and training of John Coster nothing is known. We first meet with his name in 1685, when he had attained the age of 38 years. A Chancery action, concerning an agreement for the smelting of lead, was brought by Lord Grandison and Henry Howard against Sir Clement Clerke and his son Talbot, and in the papers relating to it John Coster is referred to as ' their chief agent and workman and a sharer therein '. The Clerkes were carrying on lead smelting at the ' Cupilo near Bristol ', the site of which had been leased in 1678 to ' Arthur Coster of the City of London, gent.', who was no doubt acting as

INSCRIPTION ON MURAL TABLET TO LEFT OF SOUTH DOOR OF NEWLAND CHURCH, GLOS.

Juxta hoc Marmor Requiescunt
Cineres Johannis Coster
Qui bono et liberali Ingenio Indutus
In Philosophia Naturali admodum versatus
In Mathematicis bene Eruditus
Ærariæ inter Britannos Restaurator Artis
Non sibi sed Vixit Suis
In hac Arte Egregius multos
Imparibus nitentes Viribus
Invenit Invidos
Sibi autem neminem reliquit parem
Omnibus Dilectus, Eheu ! flebilis Omnibus
Immaturi Morte correptus Occubuit
13° Die Octobris Ætat : suæ 71
Annoq : Domini 1718
A Latere obdormuit Maria Uxor
Quæ annum agens sexagesimum nonum
E Vita hac caduca, immortali fruitura
Migravit 26 Junij 1734
Sex peperit illa Liberos
Tres nempe filios, totidemque natas
Quorum quattuor sub hoc marmore teguntur
Johannes natu Secundus decessit Cælebs
27 Jun : 1731 Ætat : 43
Qui felici natus indole
Artioq : metallicæ & Machinariæ peritus
Inter Cornubienses inclaruit
Robertus minimus natu ob : improles
31 Martij 1736 Ætat 39
Uxorem duxit Gratianam sororem unicam
Gulielmi Pendarves de Pendarves
In Agro Cornubiensi Militis
E Filiabus Eugeniae Sola Superstes
(alteræ enim Infantulæ sunt Denatæ)
Nupta est Georgio Stoughton
De Warwick Armigero

Thomas Filius natu Maximus Unicusq Superstes
Parliamenti Britannici Senator
A Civitate Bristoliensi Delegatus
Ut Suæ in Parentes charissimos pietatis
In Fratres dilectissimos Amoris
Extaret Monumentum
Honorarium hoc marmor Erigi Curavit
1737

attorney for Talbot Clerke, then under age. In 1684 a new lease was granted to Talbot Clerke of ' all those new erected buildings . . . called by the name of the Cupilo '. Arthur Coster was the brother of John and the appearance of his name in this matter suggests that John may have been associated with the Clerkes and with lead smelting, at any rate as early as 1678.

The result of Grandison's action was that in 1686 the Clerkes had to give up the smelting of lead. Two years later, in 1688, he and his partners in London (Coster was not one of them) had on sale English-made copper, no doubt a small amount. Where this copper was made we do not know ; it may have been in London, but with John Coster at their elbows it is quite likely to have been at Redbrook. Coster was a Forest of Dean man who would know of the occurrence of copper in that region. We have distinct evidence of smelting at Redbrook a few years later.

Coster seems to have been a man of some education and to have been a quite unassuming person. We do not find him pushing himself to the front and his name occurs but rarely. Thus in the Port Books showing the shipment of ore from Truro and St. Ives to Chepstow in the years 1690–1697, while the names of the Company of Copper Miners and of Joseph Herne the Governor thereof occur very frequently as the owners or Consignees of the cargoes, that of Coster is not mentioned. We do, however, find the names of Thomas Treluddra and Edward Crofts. They were no doubt agents, acting, at any rate in part, for Coster.

It may be due to this characteristic that we get the impression that Upper Redbrook was a less important establishment than Lower Redbrook. Figures we have for the year 1725 suggest the contrary, Upper Redbrook then had in all 26 furnaces as against 16 at Lower Redbrook. At Upper Redbrook too there was ore-crushing apparatus, no doubt put up to treat the Forest of Dean

ores. John Coster in his will mentions ' the Upper Stampers ', so it would seem that there was more than one stamping mill.

From his will, made in 1716, it appears that John Coster owned 74 shares in the Upper Redbrook works ; probably he was the principal proprietor, but this we do not know as the total number of shares is not stated, nor is their value. He owned a ' Plate Mill ' at Redbrook, another plate mill called Bymill in the parish of Stanton Drew, co. Somerset, and a ' double Tuck mill ' at Swinford near Bristol ; land at Redbrook and across the Wye in Monmouthshire, and a number of houses, including five on College Green, Bristol, but his dwelling house was near the works and seems to have belonged thereto. The will mentions also shares in tin and copper mines in Cornwall ' and all my water engines, tin ore, iron, bell-mettle, cillenders and brasses and all other engine materials '.

We know that Coster had a good deal to do with mining in Cornwall, indeed he has been styled ' the father of copper-mining in Cornwall '. This is no doubt too eulogistic, but it is clear that in the revival of copper mining in that county he was associated with Sir Clement and Talbot Clerke, and his younger sons John and Robert lived there for a great part of their lives.

One of the great difficulties at the mines was the water, the devices for raising it were defective, so it is not surprising to find the Costers turning their attention to the subject. In 1714 a patent was granted to ' John Coster of Redbrooke in the county of Gloucester, gent. and John Coster, junior of Redruth in the county of Cornwall, gent'. for ' their new invented engine for drawing water out of deep mines '. The apparatus constructed under this patent are the ' water-engines ' mentioned in the will, and the ' iron, bell-mettle, cillenders and brasses ' are, as suggested, ' engine-material '.

John Coster had three sons, Thomas, John and Robert. John seems to have devoted himself to mining in Cornwall

and his name became well known in that county; he died in 1731, at the age of 43, and was buried at Newland. Of Robert little is known, he lived for some time in Cornwall and married Grace Pendarves, a lady of that county; he died at Bristol in 1736 at the age of 39. The most important of the brothers was Thomas, the copper smelter. He seems to have been in charge of the copper works of the Bristol Brass Company at Crew's Hole, Bristol, perhaps from the start (about 1712) and was no doubt a partner in the company. Upon the death of his father in 1718 he took control of the Upper Redbrook works also, of which later he seems to have been sole owner. In 1730 he leased the works at Neath that had been started by Sir Humphrey Mackworth in 1698. In addition to smelting he was concerned in copper mining in Cornwall.

Thomas Coster settled at Bristol and attained a prominent position in that city, of which he was one of the Members of Parliament from 1734 to his death in 1739. He died at his house in College Green and was buried in the Cathedral, wherein his death is recorded in a large mural monument with a long Latin inscription. He left a daughter only, who is described as 'an agreeable lady of fine accomplishments'; she is said to have inherited a fortune of 40,000*l* and married Robert Hoblyn, a Cornishman.

The last we hear of the Upper Redbrook works is in the year 1786 when it was included in a list of the establishments of the Bristol Brass Company. Probably it was then idle and had been so for some years.

The Lower Redbrook Works and the Company of Copper Miners in England

It has been stated above that towards the end of the seventeenth century there were five joint-stock companies concerned in the mining and smelting of copper. The best known of these companies was the Governor and

Company of Copper Miners in England, otherwise known as The English Copper Company. It was incorporated by charter in 1691 with Sir Joseph Herne, a wealthy London merchant, as first governor, and Francis Parry as deputy governor. This Francis Parry is no doubt identical with the man of the same name who was one of the partners in the Clerke company in 1688. Of the ten assistants the interesting name is the last in the list, Thomas Chambers. Such evidence as we have goes to show that he was the mainspring of the enterprise and that he had been concerned in copper smelting before the formation of the company, at any rate he stated in the House of Commons in 1715 that he and others ' had purchased at a very dear rate ' the interest of Sir Talbot Clerke and his friends in Clerke's patent of 1686, and were afterwards incorporated as The Governor and Company of Copper Miners in England. In the petition for the charter no mention is made of Clerke's invention, but as appears from papers connected with it, they held the inventions of John Duckett and Gabriel Wayne for ' furnaces, engines, and other inventions for the more speedy, easy and effectual melting down and refining of copper ore.'

It seems that a works had already been set up and smelting started, no doubt on a small scale, but sufficient to show Herne and his partners that there were good prospects of success on a large scale. At any rate in the year the Company was formed copper was being made, and they petitioned for and obtained extension of their powers to cover Ireland and New England. They petitioned also for power to make and vend copper coins. In the following year, 1692, the company presented to the King a copper gun : ' a Field Piece of English Copper '. Although there can be no doubt that Redbrook was the scene of their first operations we have no documentary evidence earlier than 1692. In that year Joseph Herne, the Governor of the Company, is named in the Port Books

as the consignee of some of the cargoes of ore sent from St. Ives to Chepstow.

In the same year, 1692, the company purchased certain property in Lower Redbrook. This we learn from a schedule attached to one of the deeds of The Redbrook Tinplate Company.[8] The name of the Company does not appear again in these deeds until 1748, but in the meantime, from 1703 to 1720, Thomas Chambers had been acquiring various properties and erecting works on his own account, adjacent to that of the Company. It is likely that the Company rented his works and carried it on as part of their own ; at any rate he was working in amity with the Company. The combined properties seem to have included three water mills.

Nathan Rogers in 1708 stated that the concern was being carried on to the ' Benefit of the Undertakers '. There may be some doubt about this, particularly as a few years later, in 1716, the Company wished to get rid of the works and advertised offering to sell or let ' the lease for the Cupilo, or Copper Works at Lower Redbrook in Gloucestershire '. The lease was taken over by Thomas Chambers, junior, the nephew of the Thomas Chambers before mentioned, and no doubt he was acting as a nominee for his uncle.

Chambers carried on the works for a few years and the sole income of the Company seems to have been the £100 a year he paid as rent. Then we come to 1720, the year of the South Sea Bubble, when the public was rushing to invest money in any scheme whatever. The opportunity was taken to reconstruct the Company and bring in new capital. An agreement was entered into between 1, The Company, 2, Thomas Chambers, junior, and 3, John Essington, James Bradley and Case Billingsley. Chambers was to restore to the Company the copper works, on which it was stated considerable

[8] The writer has to thank the Directors of the Company for allowing him to examine the deeds at their office in Pontnewydd, Monmouthshire.

sums of money had been laid out, and Essington, Bradley and Billingsley were to bring in the copper mill at Wimbledon on which they had expended £9400; the lease had 31 years to run, the rent was £42 per annum.

At this time the Earl of Westmoreland was Governor of the Company. He persuaded the Prince of Wales (afterwards George II) to take up that post and no doubt a block of shares was given him in order to qualify for it, at any rate it is related that the Prince claimed to have made £40,000 on his own shares. However, when the Courts found that the Company had been acting illegally he speedily severed his connexion.

There was a good deal of speculation in the shares of the Company, one evidence of this is furnished by the fact that in the pack of cards known as the Bubble Playing Cards issued at this time, the nine of hearts bears the following lines

> The headlong fool that wants to be a swopper
> Of gold and silver corn for English copper
> May in Channge Alley, prove himself an ass,
> And give rich metal for adulterate brass.

The Prince of Wales was succeeded as Governor by Thomas Chambers, who kept up his interest in the copper works to the end of his life.

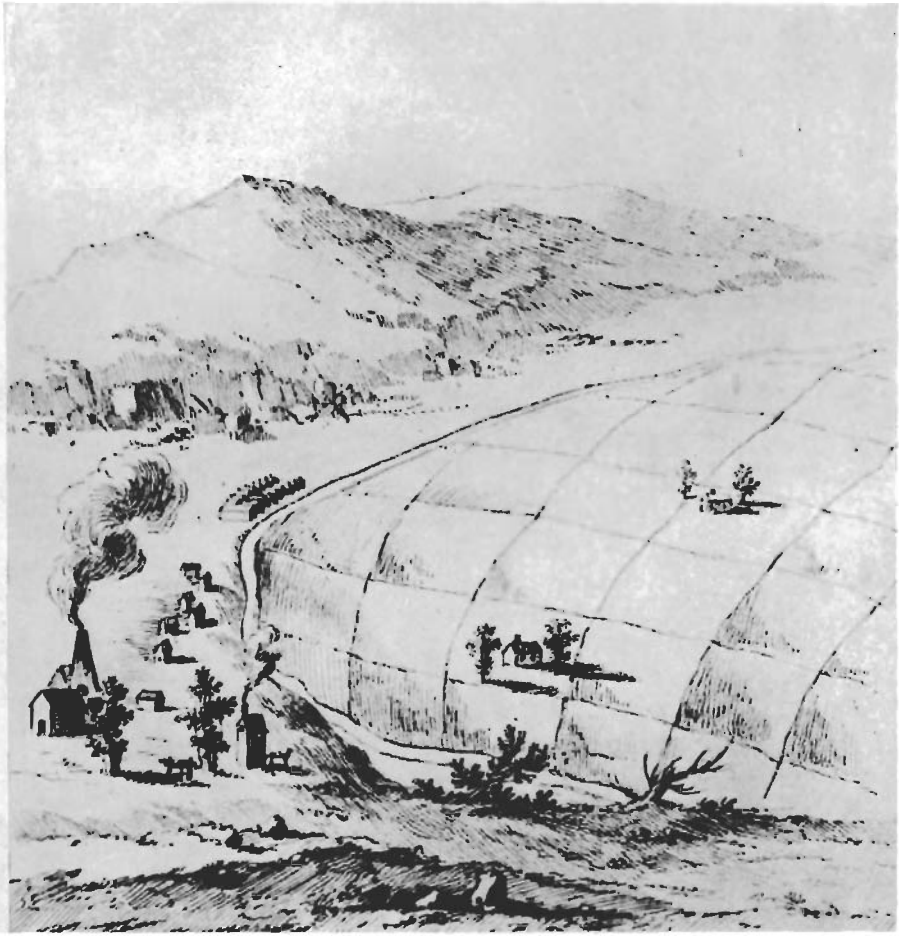
Chambers died in 1726 at Bristol where we may take it he had gone to meet other men in the copper trade. He left two daughters, one married to William Bate of Foston, co. Derby, and the other to Brownlow Cecil, Earl of Exeter. The Redbrook property is not specifically mentioned in his will, but it came to the daughters and their husbands who in 1748 sold it to the Company.

The Lower Redbrook property remained in the possession of the Company until 1790, when it was sold to David and William Tanner of Monmouth. The purchase price was £2750, of which sum £2200 was found by way of mortgage. The property conveyed is described in the deeds as :—

> all that freehold copper work consisting of furnaces forges foundrys mills utensils implements erections and works for calcining smelting refining hammering rolling and manufacturing copper ores and copper together with three large ponds or reservoirs for supplying the work . . . water grist mill or tucking mill near adjoining a water grist mill formerly of Warren Jane, then in the tenure of William Carter, but since converted into a copper work . . . also that messuage or tenement in Lower Redbrook late in the occupation of Thomas Chambers deceased, formerly a water corn or grist mill, but converted into a large copper work. . . .

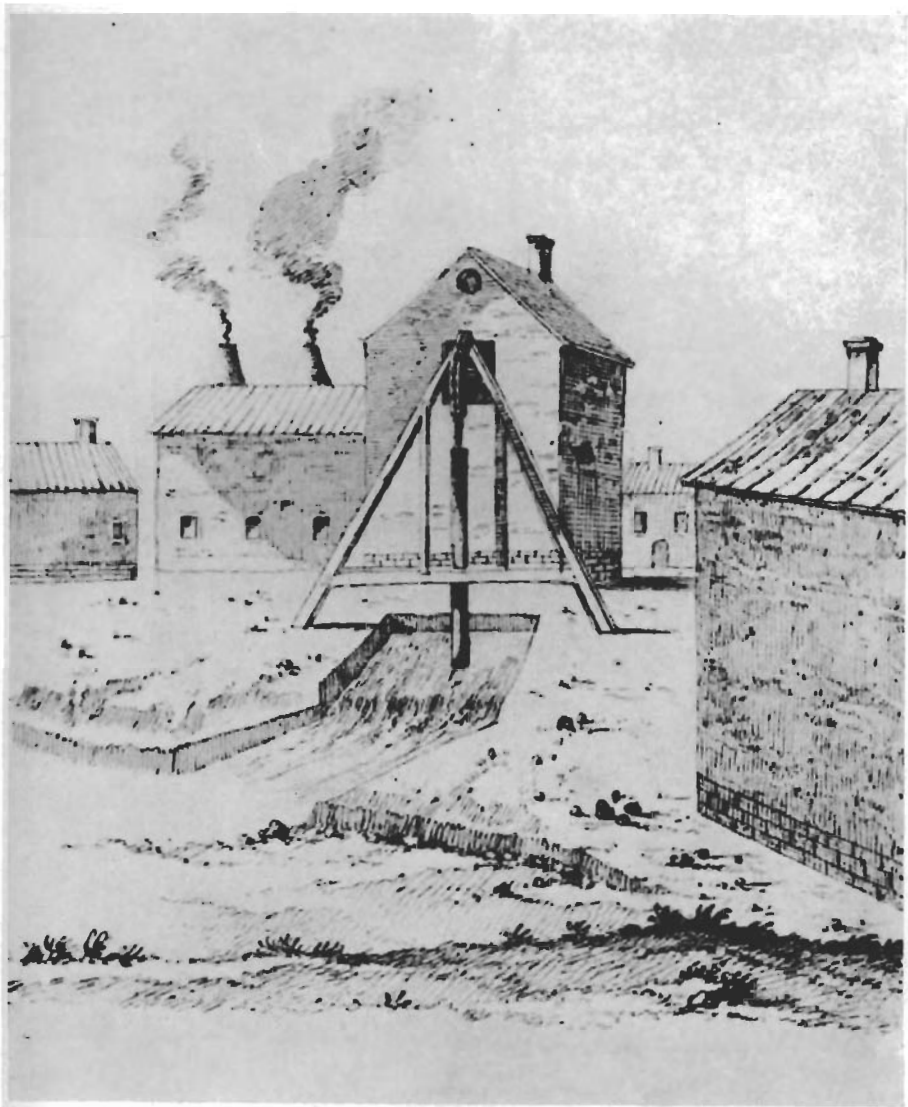
The Tanners converted the copper works into an iron forge and tinplate works, and finding the water power insufficient, they put down a steam engine. (Later on, in 1824, an additional supply of water was brought in from the stream passing through Upper Redbrook). The new owners however had launched out too boldly, they became involved in financial difficulties and in 1798 were declared bankrupt. The works was then taken on from the mortgagees by John James. The present owners, The Redbrook Tinplate Company, acquired the property in the year 1883.

The property sold in 1790 included, in addition to the works, two dwelling houses, no doubt built for the accommodation of the managers. One of these may be the house built of slag blocks with the date 1771 over the doorway which is still to be seen between the tinplate works and the river Wye. At the time of the sale one of these houses was occupied by John Taylor and the other by John Wright. According to Martin Phillips (*The Copper Industry in the Port Talbot District*, 1935), John Wright went in 1790 to Taibach in Glamorgan to take the place of manager of the Company's works there, vacant by the death of Thomas Tyler, another Redbrook man, who had held the post since the works was started. Wright was manager of the Taibach works until his



The Crew's Hole Copper Works, Bristol, in 1754 (*see* p. 164).

Sketch by R. R. Angerstein (*Resa genom England*—Archives of Jernkontoret at Stockholm)



Part of the Warmley Works in 1754 (*see* p. 165).

Sketch by R. R. Angerstein (*Resa genom England*—Archives of Jernkontoret at Stockholm)

The mills at Warmley were driven by a water-wheel, the tail-water of which was returned to the supply pond by a pump worked by a beam engine (a Newcomen engine). The sketch shows the engine house, the arch at the outer end of the beam, with its chain, and the pump. This is an early example of the application of the Steam Engine to driving machinery.

death in 1799. The ' John Wright of Lower Redbrooke in the county of Gloucester, refiner of copper ', who in 1756 obtained a patent for his ' method of raising steam for working fire engines ' may have been the same man.

The fact that Wright was living at Redbrook in 1790, when the Company severed its connexion with that place, seems to indicate that operations were still being carried on there, no doubt on a small scale. Long before this the Company had been feeling the disadvantage of the inland position of the Redbrook works. There were competing concerns at Bristol and a number of works had sprung up in the Swansea district, from whence there was a considerable trade in coal to Cornwall, and where it was possible to secure sites for works within easy reach of coal mines and of the quays at which the ore was taken off the ships.

In 1742 the Company took on lease from Sir Herbert Mackworth the Melyncrythan works at Neath which had been worked by Thomas Coster from 1733 to his death in 1739. The Company's lease was for twenty-one years, but they do not seem to have carried on the works for more than seven years, that is not later than 1749, and we do not hear of them again in South Wales for about twenty years, when they began building the Taibach works at Port Talbot where smelting was started in 1774. At Taibach the Company carried on until 1838 when the works was sold to the Vivians, a Swansea smelting firm.

In 1841 the English Copper Company was absorbed by a new company formed by Cornish men, ' The Miners' Smelting Company '. This company already held, among other properties, the Cwmavon Works, near Port Talbot. The object was to get in fresh capital; the combined companies took the name of The Governor and Company of Copper Miners in England, that and the possession of the Charter of 1691 were of considerable value for so doing. The Cornish Company had bought up the bulk of the shares of The English Copper Company and now

the Governor and six of the Assistants of this company retired and were replaced by nominees of the Cornish Company. The shares in the old company were now valued at £13 each, and there were 7600 of them. New shares to the number of 2400 were to be issued at £13 per share. According to the printed prospectus the capital was to be a million pounds in 10,000 shares of £100.

The reformed company concentrated its affairs at Cwmavon which became a very extensive undertaking, embracing not only copper smelting works and rolling mills, but collieries, brick works, iron works and tinplate works. With this undertaking the name of The Governor and Company of Copper Miners in England remained associated until the year 1877, when the existence of the Company terminated after a life of 186 years.

Copper Smelting at Bristol

The earliest reference we have as to copper at Bristol is of the shipment in August 1691 of a cargo of 28 tons of copper ore from St. Ives in Cornwall. The shipment is in the name of ' George Clarke ' and he was no doubt the younger brother of Talbot Clerke and the son of Sir Clement Clerke, the pioneers in the smelting of copper with pit coal.

In 1684 Sir John Smyth of Long Ashton had leased to Talbot Clerke ' all those new erected buildings situated at the lower end of the slade called Stocklie Slade and adjoyneth to the river side there, called by the name of the Cupelo '.[9] These buildings (on the Somerset side of the Avon near the Clifton suspension bridge) had been put up for the smelting of lead. In 1686 operations had stopped by the intervention of Lord Grandison, who owned another lead smelting works in Bristol and had a

[9] Ashton Court documents quoted in ' An Account of Leigh Woods ', by Lewis J. U. Way, in *Transactions, B.G.A.S.*, 1913, xxxvi, 75–6.

patent for smelting lead with pit coal. Grandison's monopoly terminated in 1692 and Clerke's place was then taken over by a new company, ' The Governor and Company for smelting down lead with pit coal and sea coal '.

In the interval between 1686 and 1692, when the works was not used for smelting lead, it is probable that attempts were made to use the furnaces for copper, and that the copper ore imported in 1691 was intended to be smelted there. Whether merchantable copper was produced we do not know.

The real start of the industry in Bristol was made a few years later by Elton and Wayne. Sir Abraham Elton was a prosperous Bristol merchant and Gabriel Wayne had been in the service of the Governor and Company of Copper Miners in England at Lower Redbrook. They erected their works at Conham, on the bank of the river Avon, two miles or so above Bristol bridge. Smelting was commenced in 1696, in which year, from 8 May to 26 December there was sent from St. Ives and Truro to Bristol 165 tons of copper ore. In 1697 from 23 May to 25 November 153 tons were shipped. Of these shipments nearly one-half are in the name of Abraham Elton, the remainder are in the names of Croft and of Sanders, who seem to have been agents or brokers. For the most part the cargoes ranged from 20 to 40 tons ; there was one as high as 40 tons and one as low as 17 tons.

In 1698 a Swedish visitor, And. Swab, inspected the works, he found it to consist of three melting houses each with three furnaces. At about the same date Elton was soliciting the Lords of the Treasury for a contract to coin at the mint at Bristol a quantity of copper which he had on hand, into farthings and halfpence. In this he was not successful, but very soon a new field was opened to him in the supply of copper for the manufacture of brass. The Bristol Brass Company started the production of brass in 1702, and there can be no doubt that the copper

used was obtained from the local smelters.[10] The brass business expanded rapidly, calling for more and more copper and possibly Elton and Wayne were reluctant to embark upon too large an extension of their works, or it may be that the brass people felt that they were entitled to a share in the profit of copper-smelting; at any rate The Bristol Brass Company built a works at Crew's Hole, about half a mile from the Conham works. The date of this has not been determined, but it was before 1712, for in that year it was stated in the House of Commons that there were two copper works at Bristol.

The copper smelting business of the Bristol Brass Company was controlled by John Coster and his son Thomas. Tradition associates the names of both Gabriel Wayne and John Coster with that of Sir Clement Clerke, the pioneer in the revival of copper smelting in England towards the end of the seventeenth century, and as for Coster, there is documentary evidence that he was working with Clerke as early as 1685. John Coster was the principal partner in the Upper Redbrook Copper Works, and very possibly he supplied some of the copper that the brass company had been using. Of his three sons, the eldest, Thomas, was brought up to copper smelting and distinguished himself as a capable energetic man, so when the father died in 1718, at the age of 71, Thomas, then 34 years old, was fully competent to take his place, indeed it is likely that at Bristol he had been the responsible man from the start.

In 1720 a third works was erected, by a man named Hobbs. He failed to make it a success and was succeeded by a company which did no better. In 1725 it was stated that the works had been at a standstill for over a year; the owners had thought of repairing one or two furnaces

[10] Throughout this paper, for convenience, this Company is referred to as The Bristol Brass Company, but in the course of its long life it bore a number of different titles. The history of this concern has never been worked up; it would certainly be found interesting.

in order to work up the slags and ore left about the place, but nothing had been done.[11] Like the Conham and Crew's Hole Works this was on the bank of the Avon, a situation favourable for the transport by water of the ore ; Hobbs however went to the Somerset side opposite the Hot Wells.[12]

Twenty years later William Champion was setting up his works at Warmley, five miles to the east of Bristol. The position was not a favourable one for the supply of copper ore, for it involved some miles of cartage from the landing place, but Champion's main object was the production of spelter and brass and the place was well situated for the supply of zinc ore—calamine—from the Mendip Hills, and for coal. At any rate he decided to smelt his own copper and to do so in the one establishment. In 1754 he had fifteen copper furnaces at work and probably this was still the case in 1768 when he had to give up the place owing to financial difficulties. A year or two later the works was taken over by the Bristol Brass Company, but the smelting of copper was not resumed.

Going back some years, in 1725, the Swede, Kahlmeter, came to Bristol and inspected the Conham and Crew's Hole works. He found at Conham 30 furnaces and at Crew's Hole 24. The capacity of both was said to be 200 tons a year, but in consequence of the falling off of

[11] Kahlmeter's report. This works seems to have been converted into a lead works, and to have been rebuilt before 1756, in which year it is described as the ' Bristol (newly-erected) Lead Smelting Works '. Later it became a cotton mill.

[12] By the end of the seventeenth century a number of factories had been erected along the banks of the river. The situation was favourable for getting in and taking away material, but it also afforded a too easy means of disposing of ashes and waste products. So in 1700 we find that the Corporation of Bristol obtained an Act of Parliament to prohibit the throwing of rubbish in the river, or its deposit on the banks. The preamble to this Act mentions ' Smelting places for Lead and Copper ', as well as Glass houses, as among those who ' doe from their Fuell Materialls and otherwise produce great Quantities of Ashes, Cinders and other Filth and Rubbish which for the Ease and Saving of Expence . . . are very often thrown into the River '.

the ore supplies from Cornwall, Crew's Hole was not making more than about 150 tons and Conham not more than 100 tons, all of which went to the brass works.

The main source of the ore was Cornwall, the Bristol Brass Company owned mines there, and it appears that about 1725 the two Bristol Companies and the two Redbrook companies were combined for the purchase of ores. Some ore was got from North Molton in Devonshire, some from Ireland (Elton and Wayne owned a mine at Ballymurtagh, co. Wicklow), and some came from North America, from the Schuyler mine in New Jersey. This mine was opened about the year 1715 and up to 1731 1386 tons of ore had been sent to Bristol. It is stated that the Bristol Brass Company spent much money in trying for copper ore in the American colonies, as well as in the western and northern parts of England, but without success.

When Sir Abraham Elton died in 1728, he left a sum of money to be divided among the workmen at Conham. It would seem that the firm of Elton and Wayne carried on with Sir Abraham II as the leading partner ; he died in 1742 apparently insolvent and probably it was about this time that the Conham works was taken over by the Bristol Brass Company. By the year 1754 it had been rebuilt, for it is then referred to as ' The New Copper Works ' and has 17 furnaces ; at Crew's Hole the number of furnaces had increased to 49, so that in the two works the Brass Company had 66 furnaces.[13]

In 1698 the wages of the furnace men were 12 shillings a week, and of the deputies 8 shillings. In 1725 the pay had fallen to 6 shillings a week, but the men got this all the year round, whether there was enough ore to keep all the furnaces at work or not. By the year 1754 there had been a change for the better, melters were now getting

[13] Angerstein, *Resa genom England*. Archives of Jernkontoret, at Stockholm.

10 shillings a week and some of the men as much as 15 and 18 shillings.

Conham and Crew's Hole were the only copper smelting works of any importance set up in or near Bristol. At an early date it became manifest that the ports of the South Wales coast in the neighbourhood of Swansea were better placed for smelting, so in 1730 we find Thomas Coster taking a lease of an existing works at Neath; this he held until his death in 1739. Then a few years later, the Bristol firm Joseph Percival and Copper Company, founded in 1742, erected a works at Swansea. The firm (it became John Freeman and Copper Company upon the death of Percival in 1764) carried on this works for about a hundred years. Here smelting only was done, the copper cakes and ingots were sent to Bristol for conversion into sheets, etc., in battery and rolling mills at Woollard, Publow, Pensford and Swinford. At Swinford, it is said, John Freeman and Copper Company were rolling copper sheathing up to 1860.

Some 60 years after Thomas Coster had taken a smelting works in South Wales, Harfords and the Bristol Brass Company acquired a works at Swansea. This they carried on until about 1820. It is not known whether they were still smelting at Conham and Crew's Hole. Towards the middle of the nineteenth century Christopher Pope and Company were in possession of works at Crew's Hole and Soundwell near Mangotsfield; they are stated to have been manufacturers of copper, spelter and brass, but whether they were actually carrying on the smelting of copper at Crew's Hole the writer is not aware, nor can he state the date at which copper smelting ceased in the Bristol district.