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Wealden Iron
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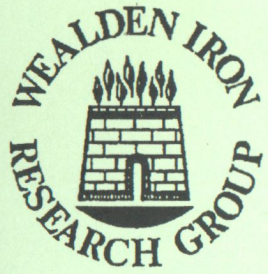

# WEALDEN IRON RESEARCH GROUP
# BULLETIN No. 25, SECOND SERIES
# 2005

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# FIELD NOTES

**compiled by J. S. HODGKINSON**

## A bloomery in Peasmarsh, East Sussex

Digging by badgers on the south side of a pasture field, close to the public footpath from School Lane, Peasmarsh, has brought thick (>100mm) pieces of tap slag to the surface. The badger set lies at the western end of the wooded part of Van's Gill (TQ 8850 2223), and slag can also be seen on the northern slopes of the gill. Probing indicated that the slag layer lies as much as 1m below the present surface of the field, and that it extends over an area of at least 500m$^2$.

We are grateful to Mr M. Feeny-Brow for drawing attention to, and showing the location of this site.

## Romano-British site at North Chailey, East Sussex

Preparatory work for the construction of a domestic garage off Downsview, North Chailey, revealed a series of pits and two lines of postholes. The pits contained Romano-British, East Sussex ware, together with varying quantities of iron slag. The site lies immediately to the north of a bloomery site (TQ 3936 2087) and a connection between the two sites seems likely. The remains suggest the possibility of a settlement on the ridge carrying the modern A272, perhaps linked to ironworking.

Our thanks to Chris Butler for notifying us of this site.

## Ashburnham forge, East Sussex

Recent building work on a brick-built, former cart house has revealed what may have been the site of the charcoal store for the forge. To lay a drain to prevent the ingress of surface water from the road along the former pond bay, which abuts it on the north side, a trench was dug all round the building, down to the base of the outside wall. Beneath the building, at about 3m from each end,

and for a distance of about 6.5m on both sides, the ground was heavily impregnated with charcoal pieces and fines. Although it was not possible to trace the extent of the blackened area to the north and south of the building, because of the narrowness of the trench, it is estimated that it represents the position of a shed measuring about 4m x 6.5m. Excavated from the trench on the side of the building adjoining the bay were a considerable number of forge bottoms.

The present building (TQ 6868 1603) may date from the final working period of the forge, which closed in about 1828. There is a barred window at its eastern end, and the excavation of the trench, which also resulted in the removal of material which had slumped against the wall next to the bay to a height of nearly 2m, revealed the base of a chimney at the same end. Local folk memory has it that the pay window for the forge workers was at the eastern end, although its closeness to the headrace of the forge makes this somewhat improbable.

## In search of Bournemill furnace, Kent

Bournemill furnace is first mentioned in a list of furnaces in Kent dated November 1588, where it is also called 'fforde mill fornace':

> *Sir Thoms ffane knight hath w$^{th}$ in the pish of Tunbridge a ffornace nere unto South Frythe called Bornemill fornace now in the occupacon of Edmund Willard, and Abraham Willard of Tunbridge gent in w$^{ch}$ fornace thear ar caste only sowes of yron and not any one peec of ordnance, as it is said…*[1]

Sir Thomas Fane is listed as having two unnamed furnaces in Tonbridge in the Declaration of Christopher Baker of 1574.[2] In another list, dated 15 February 1573[/4], Fane is named as owner of one furnace in the parish, again unnamed.[3] Given that Bournemill was in the occupation of Edmund and Abraham Willard in 1588, it may be significant that, in a further list, undated but probably of 1574, of occupiers of furnaces and forges, Davy Willard is listed as having two furnaces and two forges near Tonbridge.[4] While Willard was warned to appear before the Privy Council, Fane was not.[5]

Cleere and Crossley suggest that Bournemill furnace is synonymous with Vauxhall furnace, which was in operation by 1552.[6] However, Chalklin has asserted that Vauxhall and Bournemill were two separate furnaces.[7] The fact that Vauxhall was originally owned by the Duke of Northumberland, and that it was leased to George Harper and Thomas Culpeper, is not disputed; nor is the fact that the works were sub-let to David Willard. At the end of 1573 Culpeper surrendered the lease to the Crown, to whom the ownership had been transferred. Given that Chalklin is unable to account for the operating history of Vauxhall furnace after 1573, and that Bournemill furnace is not mentioned until 1574, the possibility of them being one and the same seems strong. Chalkin mentions a Star Chamber case of 1610, concerning Vauxhall, in which an Elizabeth Levet laid claim to the tenancy of the works. The site referred to in the case can be identified also as Bournemill in a conveyance of 1615 in which a 'messuage and farmhouse called Bornemill in Tunbridge, Kent, and 1 old furnace pond late in occupation of Mrs. Levit' are among the properties conveyed.[8] It is interesting to note that the property then bordered Southfrith, and lands belonging to, amongst others, Sir Francis Fane and Lord Clanricard.

Notwithstanding the debate as to whether Vauxhall and Bournemill are one and the same or separate sites, the Field Group has examined the site suggested by Chalklin as the possible location of Bournemill furnace (TQ 594443). Not, as he claimed, half a mile north of the site of Vauxhall furnace, but nearer to 200 metres away, the postulated site lies at a point where the furnace stream is crossed by a public footpath before being culverted beneath a railway embankment. The construction of the railway in the 1840s must have disturbed the ground considerably but no evidence was found which suggested ironworking on the site. Crossing to the other side of the railway and following the stream down to Bournemill Farm, a similar lack of evidence of ironworking was noted, although it was not possible to examine the site of the former mill.

Uphill to the east of Vauxhall, and to the south of Bournemill, the Group were able to walk through Minepit Wood (TQ 593435), where a small number of pits were seen.

## In search of Iping furnace, West Sussex

Iping furnace is not listed in the gazetteers of either *Wealden Iron* or *The Iron Industry of the Weald*. The first documentary reference is in the inquest, in February 1629[/30], into the death of Richard Heather, who had drowned, together with his horse, when the latter, frightened by the noise of the bellows and the water rushing over the water wheel, plunged into the furnace pond.[9] The furnace was described as 'newly built… [by]… Sir Peter Bettisworth [sic], kt.

Further evidence of a furnace in Iping, in West Sussex, can be found in a Chancery decree, dated 19 February 1634[/5], in which the principal litigants were the same Sir Peter Bettesworth, and Roger Pearson.[10] Bettesworth, the decree notes, possessed a furnace and a forge in Iping, to which Pearson was appointed clerk in 1630. While the terms of the complaint that Bettesworth made against Pearson are not particularly relevant in establishing the location of Iping furnace, the decree is useful in that it corroborates the existence of the furnace by making specific reference to the stock of iron ore at the furnace, and also confirms the existence of a forge by referring to the quantity of wrought iron that was expected to be made there. What is not clear is whether the furnace and the forge are on one site or two. There are references to the 'forge and furnace' which suggest a combined works, but also separate references to each, suggesting different sites. Pearson is described as clerk of 'all the ironworks in Iping'.

Of the forge, there is little doubt that this probably refers to the site known as Chithurst Hammer, the majority of which lay in Iping parish. However, no such certainty exists surrounding the location of Iping furnace.

To date, no furnaces have been identified in Iping, although the fragmentary nature of many of the former parish boundaries adds considerable confusion to such identification. Iping was a long, thin parish, which used to extend from Ingrams Green, south of the River Rother, where it abutted Didling parish, up to the boundary with Bramshott, in Hampshire. To the east lay the equally long and narrow parish of Stedham, while to the west it was bounded, in the main, by Chithurst and Trotton. While several

outliers of neighbouring parishes were to be found both inside and adjoining its boundaries, Iping does not seem to have any detached portions. However, to what extent the boundaries of the parish remained constant is not known.[11] What seems clear is that the furnace lay in Iping, as the inquest notes that the tragedy occurred on 'the road recently constructed in the lower part of the common called Iping Marsh in Iping' which crossed the bay of the furnace.

The extent of Iping Marsh varies slightly on maps of the nineteenth century but it is still identified on modern OS maps. However the name now applies to a much smaller area than formerly. The draft drawings for the first edition of the one-inch Ordnance Survey map, which were surveyed in 1808-9 at a scale of 1:31680, show it as a common covering most of the central part of the parish from Stubbs Farm north to Weston's Farm. A narrow neck of land, running south-west from Robins Farm beside Moorhouse Lane to New Bridge, was also included. It could be assumed that the 'lower part of the common called Iping Marsh' refers to that part which is generally lower lying. This could be taken to mean the area north and north-east of Robins Farm. However, a deposited plan for the enclosure of Iping Marsh, dated 1857, also includes Milland Marsh and part of Wardley Marsh.[12] It is possible that the 'lower part of … Iping Marsh' could be taken to mean these areas.

Fieldwork to find the location of Iping furnace is circumscribed by the need to find a site which lay on Iping Marsh (or perhaps Milland or Wardley Marshes where they lay in Iping parish), and which has evidence of a, possibly former, road across the top of the bay.

The Field Group began its search for Iping furnace by walking the Hammer Stream from Durrants Pond (SU 8407 2725) northwards to Milland Mill. The mill is first documented in the 15th century and the present building dates from 1821. The mill went out of use about 80 years ago, and has since been converted to a private house. No slag has been found in the grounds of the mill by its long-time owners. Its pond is still in water, with a leat that formerly took the overflow following the edge of the adjacent field to the south-east before turning through ninety degrees to rejoin the main stream. Above the mill are two more pond bays, both now dry. Both have been breached in the centres of their bays

and both have sluices at the western end of their bays, in one case stone, and the other brick. In neither case was any evidence of iron working found. Above them is the site of Milland furnace. For there to be two pen ponds above a small corn mill is slightly unusual, although other uses, such as fishing or wildfowling, should be considered. Returning to Durrants Pond, which is in water, and was formerly on Milland Marsh, it should be noted that the local road crosses its bay. The area below the bay was examined. The stream is culverted below the road at the west end, passing a stone-walled enclosure known locally as the sheepwash. The stream then runs the length of the narrow copse that lies parallel to the road before turning towards the south opposite the east end of the pond. This site lies less than a metre below the level of the road and is of insufficient depth to have accommodated the working area of an ironworks. Where the stream emerges from the copse a quantity of blast furnace slag, including some pieces the size of bread loaves, were found in the stream bed and sides, but not enough to suggest convincingly that this was an ironworking site, the slag probably being derived from slag used to surface the road.

Continuing down the stream, which is known as the Hammer Stream, occasional pieces of blast furnace slag were noted, but no concentrations. This remained the case along the length of the stream as far as Lyford Bridge (SU 8420 2633). At this bridge, which was formerly between the extremities of Iping and Milland Marshes, no evidence of ironworking was noted. A tributary stream which flows from the east into the Hammer Stream just above Lyford Bridge was explored. This stream flows from higher ground and takes the outflow from the ironworking site in Inholmes Copse, which lay in Stedham parish. No evidence of industrial activity was noted along this stream as far east as the former parish boundary which coincides with Lambourne Lane. However several minepits, exploiting resources in the Weald Clay, and centred on SU 850263, were noted in Lambourne Copse. In a subsequent search upstream from Lambourne Lane, as far as the site at Inholmes Copse, a pond bay was noted at SU 8535 2626, although its former use was not apparent.

The area below the bay of Slathurst Pond (SU 854 52715) has also been examined, as has the length of stream between there and Lambourne Lane, but no evidence of ironworking was found. The search for the location of Iping furnace remains unsatisfied. The enigmatic furnace site in Inholmes Copse, for which no documentary sources have been found, and for which no cartographic evidence is known before 1808-9, suggests itself as a candidate by default, but does not fulfil the conditions as set out in the coroner's inquest, namely that it should be in Iping parish, and have a road across its bay. It does, however, lie just beyond the northern edge of Stedham Marsh, which abuts Iping Marsh on its western side. It is possible that the ironworking site below its bay was once part of an outlier of Iping parish but, unless or until evidence of this comes to light, the jury must remain out.

## Two bloomery sites in Maresfield, East Sussex

A concentration of bloomery slag, covering an area of about 175m$^2$, has been found centred on TQ 4765 2496. The slag is on a slight bank about 100m east of the Weald Way public footpath. A small number of pieces suggestive of slag tapping were found.

A further concentration of bloomery slag, similar in appearance to that found at the site above, and covering an area of about 80m$^2$, has been found at TQ 4775 2499, between two converging streams.

## Bloomery slag in Mayfield, East Sussex

A small, but discrete, area of bloomery slag has been discovered at TQ 5860 2580, during fieldwalking along the stream from Cranesden Farm, off Piccadilly Lane, north-westwards towards Newick Lane. Pieces of tap slag lie in the stream bed over a distance of about 50m, but the actual source is not apparent, being buried probably beneath valley side deposits.

**Notes and References**

1. Staffordshire Record Office, D593/5/4/28/3.
2. Public Record Office, SP12/95/20 f48v.
3. op. loc., SP12/95/21 f51r.
4. op. loc., SP12/95/61 f131r.
5. op. loc., SP12/95/61 ff128-130.
6. H. Cleere & D. Crossley, *The Iron Industry of the Weald* (Cardiff 1995), 362.
7. C. W. Chalklin, 'Iron manufacture in Tonbridge parish, with special reference to Barden furnace c. 1552-1771', *Archaeologia Cantiana*, **124** (2004), 95-115.
8. East Sussex Record Office, DYK/557.
9. Hunnisett, R. F. (ed.). *Sussex Coroners' Inquests 1603-1688* (Kew: Public Record Office, 1998), 76.
10. Public Record Office, C78/416/6 Iping. I am grateful to Peter King for drawing this document to my attention.
11. The northern part of Iping parish has now become the parish of Milland, which also includes neighbouring parts of the former Stedham and Trotton parishes. The southern part of Iping has been combined with the southern part of Stedham to become the parish of Stedham with Iping.
12. West Sussex Record Office, QDD/6/W26.

## EARLY KENT IRONWORKING SITES

**NEIL ALDRIDGE**

The iron smelting sites at Ulcombe and Headcorn were located as a result of archaeological fieldwork undertaken between 1994 and 2001. It is worth noting that these sites were not particularly close to watercourses but were situated on ridges.

Ulcombe: Little Poplar Farm – TQ 8385 4668
Iron Age Bloomery site

The site of an Iron Age bloomery hearth and associated cremation cemetery in this part of Ulcombe parish was previously reported in *Wealden Iron*.[1] At a distance of some 600m SW of this bloomery

site another area of interest was noted in 1996 when at least three roughly circular patches of dark soil were seen after ploughing. These lay in a west-facing slope in the field known as Bank Field, 200m northeast of the two bloomeries seen briefly when a fishing lake was being excavated (TQ 8378 4649).[2]

The largest circular feature was relocated and a soil auger used to ascertain that a layer of charcoal and burnt clay existed below plough depth. A small test pit was opened with the aim of finding the nature and possible date of this material, as it was possible that it simply represented a recent bonfire.

It was found necessary to extend the trench to 3mx3m after it appeared that a bloomery hearth lay just below the ploughsoil. Owing to the limited extent of the excavation any interpretation can only draw on the available information. It is possible that further fieldwork could be undertaken at some future date as part of a larger excavation.

The main feature was a large oval bloomery hearth aligned north-west to south-east and measuring approximately 1.25m in diameter. This contained, to a depth of 0.4m, iron slag and some charcoal. Beneath this was an intact furnace bottom set into the clay subsoil. The wall of the hearth was made up of a few small stones with an inner edge of burnt clay, vitrified grey in places and with iron slag adhering to it. As hearth 1 was being excavated and recorded it became clear that it was possible to identify a series of four other smaller bloomeries overlying the original feature. These hearths, 2, 3 and 4, were sited within the interior of hearth 1, with hearth 5 outlying in the south-west corner of the trench. All of the hearths could be confirmed as bloomeries as furnace bottoms remained *in situ* in their bases. The whole feature could be confirmed as being of late Iron Age date by pottery sherds stratified across its upper level. A posthole of uncertain date was located in the eastern end of the trench.

It was only through careful excavation that it was possible to unravel the complex series of interlaced bloomeries. My thanks are extended to the landowners, the Coomber family, for their continued interest and to Terry Standen who rendered much-needed practical help.

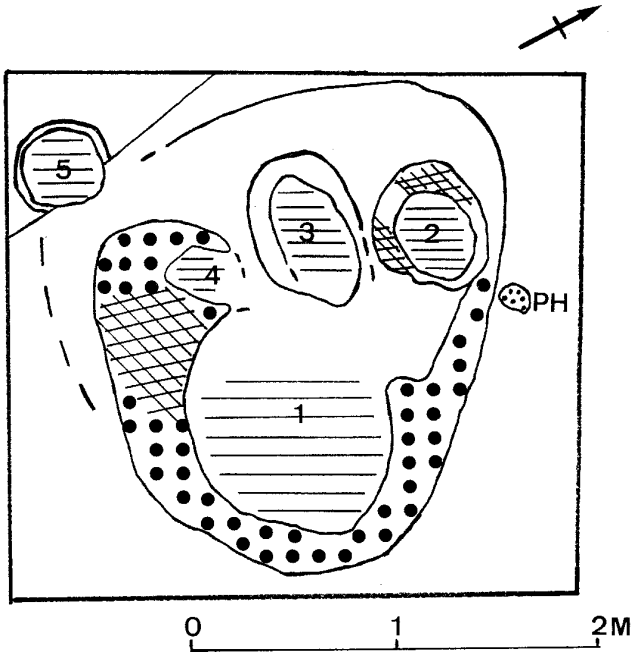


Fig 1. Ulcombe, Kent; TQ 8385 4668 Five Iron Age Bloomeries

Ulcombe: Little Poplar Farm – TQ 8410 4718
Romano-British ironworking and settlement site

This site, which subsequently produced evidence, through selective excavation, for three timber buildings dating from the late first century through to the mid third century AD, initially suggested that iron working had been taking place in its vicinity. Fieldwalking of the arable farmland showed that a varying density of iron slag was present across a tract of country 1km from north to south and some 500m in width from west to east. This area lies between a minor watercourse on the west and the Ulcombe-Headcorn road to the east. Although there was a significant amount of bloomery slag present, only one possible Roman ore-roasting hearth was located at TQ 8420 4705. This had *in situ* Roman pottery to provide a possible contemporary metalworking link with the nearby settlement. The hearth base had just survived earlier ploughing activity and was 1.5m in diameter with traces of ironstone and charcoal within its fill.

The largest rectangular Roman building which was traced by complete excavation measured 9m by 4m. A number of iron objects were found within it; on the floor level these included several iron blades, iron nails, a socketed iron spear head and part

of an iron door latch. The Roman site appears to be sited south-west of and close to the line of the Sutton Valence-Westhawk Roman road, which probably lies slightly further to the south than the postulated course.[3]

Headcorn: Little New House Farm – TQ 8313 4317
Romano-British ironworking and settlement site[4]

The site plan shows the relationship of the iron slag spread (hatching across site) to the excavated features of a settlement dating from the late Iron Age and through the Roman period of the first to late second century AD.

A spread of bloomery slag extends across a westerly facing hill slope below the main occupation area, which is sited just below the crest of the hill. Test trenches provided evidence for a Roman settlement enclosed by a ditch which appeared to date to the Iron Age. A complete pottery vessel was found in the base of it. A second century AD military belt plate was found (see Fig 3) in a small gully. A quantity of pottery and other artefacts, including two lead steelyard weights, quernstone fragments, tiles, coins and iron nails were found on the site. A small cremation cemetery contained two burials, one with a *fibula* of late first century date. There was no trace of a Roman building in the trenches that were excavated over the centre of the main pottery spread. A probable Iron Age roundhouse drip gully was found and partially excavated, lying below the later Roman site. Although no definite evidence of smelting hearths was found, it appears likely that the slag relates to this settlement. The site stands on a low hill to the south of Headcorn and the floodplain of the River Beult.

Rolvenden – TQ 856308

This site has been re-examined as there appears to be conflicting information over its exact location. The reference to a site at TQ 855303 is taken from Straker.[5] However, the site as seen today lies close to a farm track and gateway with no obvious sign of slag, and does not appear to be the same as that noted by the Ordnance Survey Archaeological fieldwork department around 1962.[6]

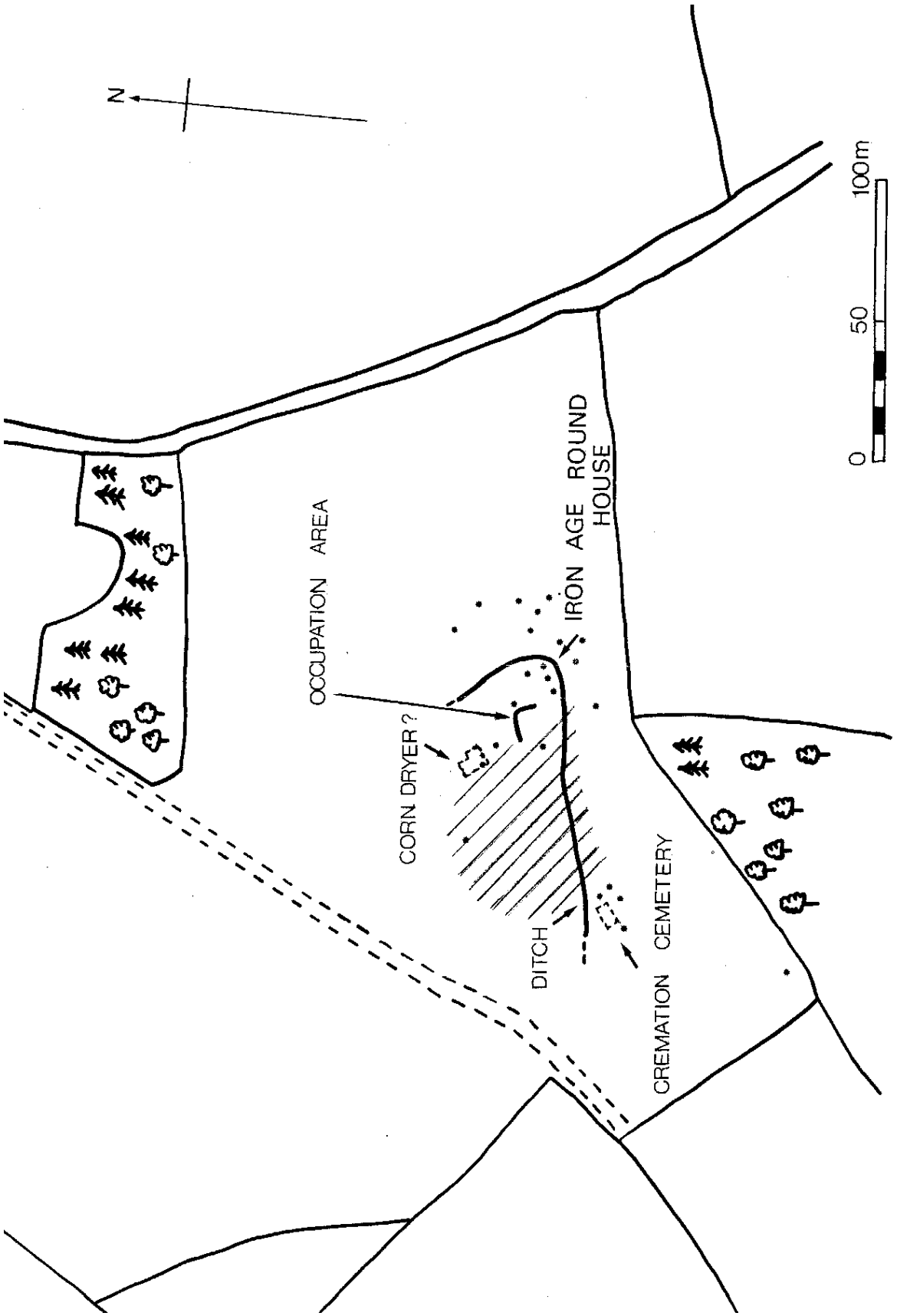


Fig 2. Headcorn, Kent; TQ 8313 4317 Iron Age/Roman-British Settlement; Slag spread indicated by cross hatching

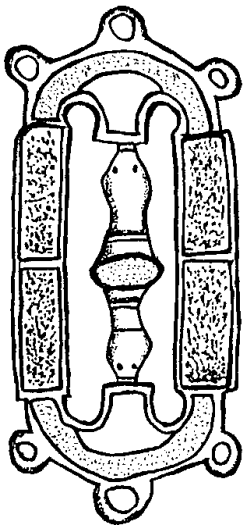

Fig 3. Headcorn, Kent; TQ 8313 4317
Roman Military Belt Plate (reconstructed)
2nd-3rd century AD

In 1962 the Ordnance Survey stated that, 'a bloomery existed at Rolvenden Layne at Lat. 51° 20' 40" N., Long. 0° 38' 50" E. The field "Cinderbank", now pasture, has beds of ancient amorphous type cinder beneath the turf.' They also noted that, the 'southern boundary…abutting an old water-course, now a drain, contains much bloomery slag, and a dark patch at TQ 8555…also contains slag and ironstone.'

Following on from this information, the writer made a brief inspection of the area in November 2003, a few weeks after it was ploughed and after heavy rain, the land then being down to arable. It was seen that an area located at TQ 856308 was an area of iron slag some 70m in diameter, which straddled a field boundary. This appears to be slag waste with the greatest concentration on the northern side of the hedge. On the southern side two pottery sherds of East-Sussex-type ware were found amongst the slag debris along with pieces of clay furnace lining. There appeared to be no sign of the watercourse as was described in 1962; it may have filled in or piped.

A search failed to produce any further concentrations of iron slag in the general area. Thanks are due to Mr T. Lewis, of Morghew Estate Farms, Tenterden.

Sandhurst: Rochester-Bodiam Roman road – TQ 785267

A section of the iron slag surfaced road was recorded where it is exposed in a stream bank on the parish boundary of Sandhurst and

Bodiam. This feature was first noticed by the active fieldwork group of the Battle and District Historical Society in 1960,[7] and a section drawing was later published in *Archaeologia Cantiana*.[8] The very heavy rains of the winter of 2000-2001 caused considerable erosion of the bank which exposed a longer and more complex section than was seen in the 1960s. The newly exposed face was cleaned and recorded in June 2001. The total length of this new section was 10.5m, some 9.55m consisting of an iron slag layer representing the road. all of the features were buried under a deep layer of hill wash, which appears to have moved down the general line of the road.

The following features were noted in the section east of the bridge carrying the Sandhurst-Bodiam road:

1. A 'new' section of iron slag road extended out from the bridge for 1.8m. This has been cut by the modern bridge and must have continued westwards for an unknown distance. It was 28cm thick tapering to 10cm where it was cut by a recent cable trench.
2. The slag, 8cm thick, was again visible at 2.5m from the bridge. This is the limit of the section published in *Arch. Cant.* in 1964.
3. The western edge of ditch 1 was 1.4m wide, 30cm deep. Although overlain by the road this may have been one of the original road ditches.
4. At 7.3m east of the bridge the iron slag was 36cm in depth, indicating the centre of a cambered road.
5. Ditch 2, similar to Ditch 1, was 1.6m at the top and 25cm in depth.
6. The slag metalling ended 10m east of the bridge with a further Ditch 3 beneath its edge.

A metal detector survey of the fields to the south and east of this point revealed an extensive spread of slag, m ore than can simply have derived from the road surface. This may be indicative of a Roman industrial site which might be associated with a nearby Roman harbour tentatively suggested by Margary.[9]

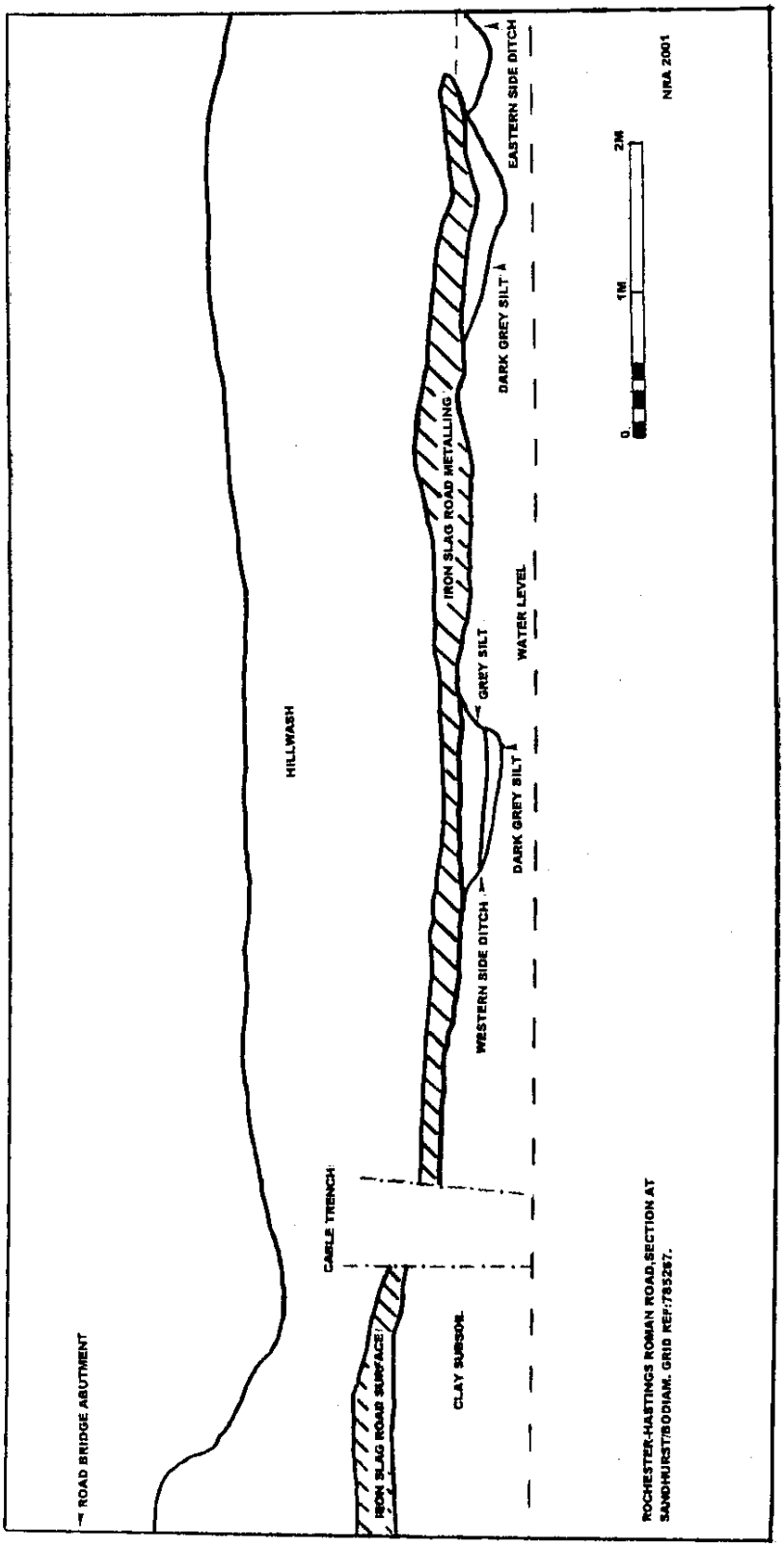


Fig 4. Sandhurst, Kent; TQ 785267 Section of slag-metalled Rochester-Hastings Roman Road

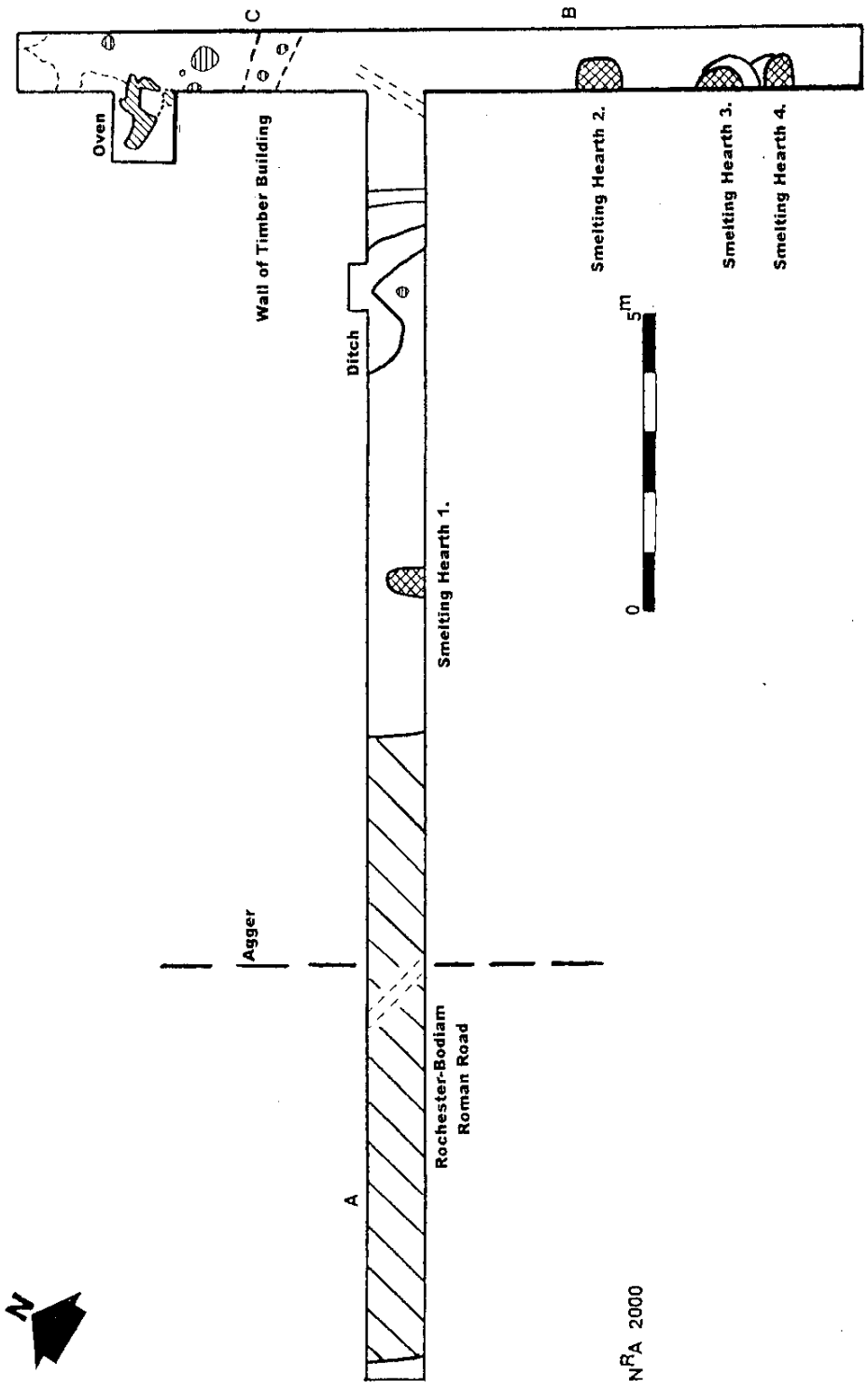


Fig 5. Cranbrook, Kent, Little Farningham; TQ 8010 3528 Romano-British ironworking site. Plan of August 2000 Excavations

Cranbrook: Little Farningham – TQ 8010 3528
Roman road and associated site

The fieldwork of 2000, carried out under the auspices of the Kent Archaeological Society, was briefly outlined in *Wealden Iron*[10] and in *Archaeologia Cantiana*.[11]

A site plan is included here to show the relationship of the Roman road (Rochester-Bodiam) with a series of bloomery hearths and a timber building with a domestic clay oven located when the line of the road was sectioned by machine during fieldwork undertaken by the Kent Archaeological Society. The new site lies some 90m west of the work undertaken in the late 1950s. As a result of the fieldwork of 1999-2000, it would appear probable that other features, including buildings, lie between the two sites.

Further research has now provided an identification for two objects recovered during the fieldwork of 2000. The first was a bronze nail, 50mm in length, found at TQ 8010 3528, which is similar to Roman ships' nails found at Richborough,[12] and the second is part of a bronze Roman door lock pin which came from TQ 8010 3630.[13] The nail may be further evidence for the involvement of the Classis Britannica at this site.

**Notes and References**

1. *Wealden Iron*, 2nd ser., **21** (2001), 9-11.
2. ibid, 9.
3. Margary, I. D., *Roman Ways in the Weald* (1965), 232-4.
4. *Wealden Iron, op. cit*., 11.
5. Cleere, H. and Crossley, D., *The Iron Industry of the Weald*, (2nd ed. 1995), 293, referring to Straker, E., *Wealden Iron* (1931), 323.
6. Ashford Reference Library, Ordnance Survey Archaeological Record Card; Rolvenden, Kent, TQ 8555.
7. Lemmon, C. H. and Darrell Hill, J., 'The Roman Road at Bodiam', *Trans. Battle and District Historical Soc.* (1959-60), 32-4.
8. Miles, A., 'The Rochester-Hastings Roman Road', *Archaeologia Cantiana*, **79** (1964), 207-8.
9. Margary, I. D., *op. cit*., 223, 225.
10. *Wealden Iron, op. cit*., 11.

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11. Aldridge, N., 'Little Farningham Farm, Cranbrook, Revisited', *Archaeologia Cantiana*, **121** (2001), 135-56.
12. Lyne, M., 'Roman ships' fittings from Richborough', *Journal of Roman Military Equipment Studies*, **7** (1996), 147-9, fig 1,1.
13. Mills, N., *Celtic and Roman Artefacts* (2000), 80.

## BUNGEHURST FURNACE, HEATHFIELD - SITE SURVEY

**R. G. HOUGHTON & J. S. HODGKINSON**

There is considerable confusion in published sources as to the location of what is known as Bungehurst furnace. Straker, using latitude and longitude, located it at about TQ 6013 2359, while in Cleere and Crossley it is recorded at TQ 600239.[1] While the navigational reference given by Straker appears to be incorrect, his description matches the site which is the subject of this survey. The description given by Cleere and Crossley, which was drawn from notes made following a visit by the Field Group in October 1973, appears to be of another site, all evidence of which seems to have been removed or covered over, for when the site was revisited in December 2002 nothing of it could be found. It would seem that there had been two blast furnace sites on the stream that joins the Rother at Scotsford Bridge.

The site of Bungehurst furnace lies near the northern edge of Newick Wood, at TQ 5992 2357, on a north-flowing tributary of the River Rother. Its layout is typical of many of the smaller blast furnace sites in the central Weald. The bay (**A**), which measures about 48m in length, is about 2.5m high on the downsteam side and 3m on the upstream side. The pond is not in water. A gap (**B**) has been formed in the middle of the bay and this probably represents the position of the sluice which fed the waterwheel of the furnace, as adjacent to this gap, on the downstream side, there is a mound of brick and slag debris (**C**) which was, in all probability, the site of the furnace stack.

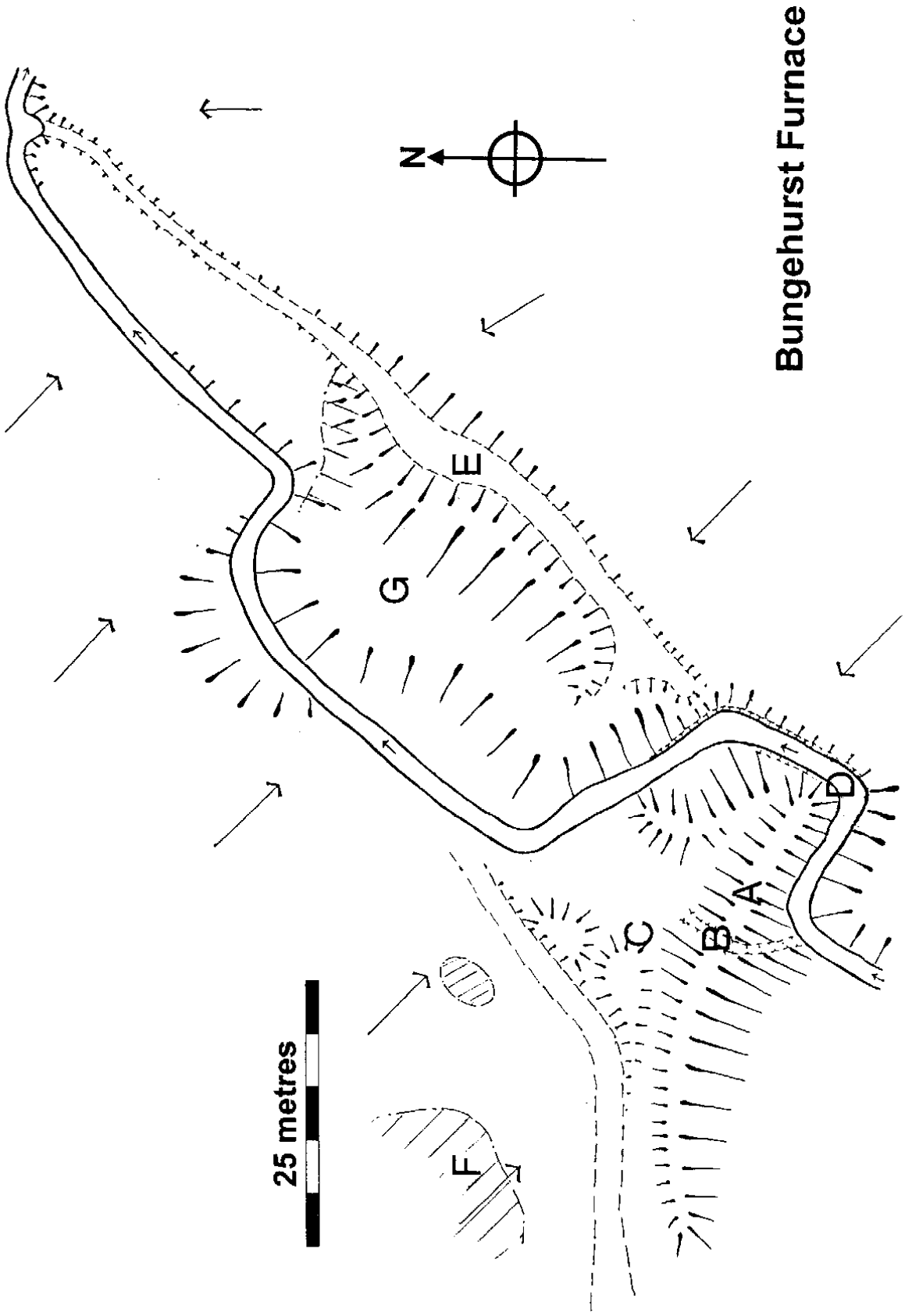



Fig 1. Bungehurst Furnace - plan

The present course of the stream from the south flows towards the gap, but it veers south-eastwards along the bay before breaking through at the extreme eastern end (**D**). The stream then traverses the site and continues to flow along what was probably the original tail race. The stream has broken through the bay where the former spillway may have been sited. Projected away from it along the length of the site, there is an embanked, man-made channel (**E**) to remove overflowing water from the working area. This rejoins the stream about 75m to the north east. This channel has been blocked at the south-west end.

The mound of debris that probably constitutes the remains of the furnace lies at the end of a raised bank which may have formed the charging bank. Near to the end of this bank and uphill from it, is a dense area of charcoal fines and pieces (**F**). The position of this area probably represents the location of the charcoal store.

Although there is blast furnace slag in most parts of the site, the principal heap is located beside the embanked spillway channel, and this has extended sufficiently to cause the course of the present stream to bend round the heap (**G**).

**Notes and References**

1. Latitude/longitude converted to OSGB36. Straker, E., *Wealden Iron* (London 1931), 287. Cleere, H. and Crossley, D., *The Iron Industry of the Weald* (Cardiff 1995), 320, 384.

## WARBLETON PRIORY FURNACE TQ 6440 1743
## Supplementary site information[1]

**J. GALLOWAY**

**Summary**

Straker[2] describes the bay as ‘inaccessible due to dense undergrowth’. Access was probably difficult to other parts of the site. Now the woodland has grown up to suppress the undergrowth

so that access is feasible to all areas. Better visibility has uncovered problems in Straker's description.

The furnace area and its water system and access roads were inspected to find the features described in Straker. Everything was found apart from the roof tiles. Additional items were found in the stream just below the bay, and at the ford where the access road crosses the stream. The conclusion was reached that there may be errors in Straker regarding the access roads and pen ponds, and alternative interpretations of the evidence are proposed.

**Access**

On the West side of the valley, an old track runs southeast/northwest from the Rushlake Green to Bodle Street Green ridge road down past Pilley Farm, where it widens, to the stream. Access to the furnace would probably have been through Pilley Farm, as the old track above it is too deep and narrow. After fording the stream, the track turns north, and the old track reappears running up the valley just west of north heading for the east end of the bay. Another track, probably made when the furnace was built, forks off slightly right parallel to the old track, going to the top of the storage area.

It is possible that the flat area along the east side of the stream was used to take the products of the furnace down to the ford.

At the ford, and just east of the stream, a smooth rust-coloured object, of 18cm by 9 cm cross section, and which I could not identify, projects 60cm from the bank.

**Bay**

The bay runs east/west and is breached by the stream. Length 65m, of which 25m is to the west of the stream. Height c.7m to the stream.

**Spillway**

At the east end of bay, the spillway runs south protecting the loading area and then turns west. Sandstone blocks and a bear on the outside of the corner were intended to prevent erosion. The spillway appears to have been made from part of the old track which continues up the valley above the bay.

The ‘hollow way leading to site’ (Straker) is the old track south of the right angle turn to the west of the spillway. As the turning spillway blocks it, the old track would not have been used to reach the storage area.

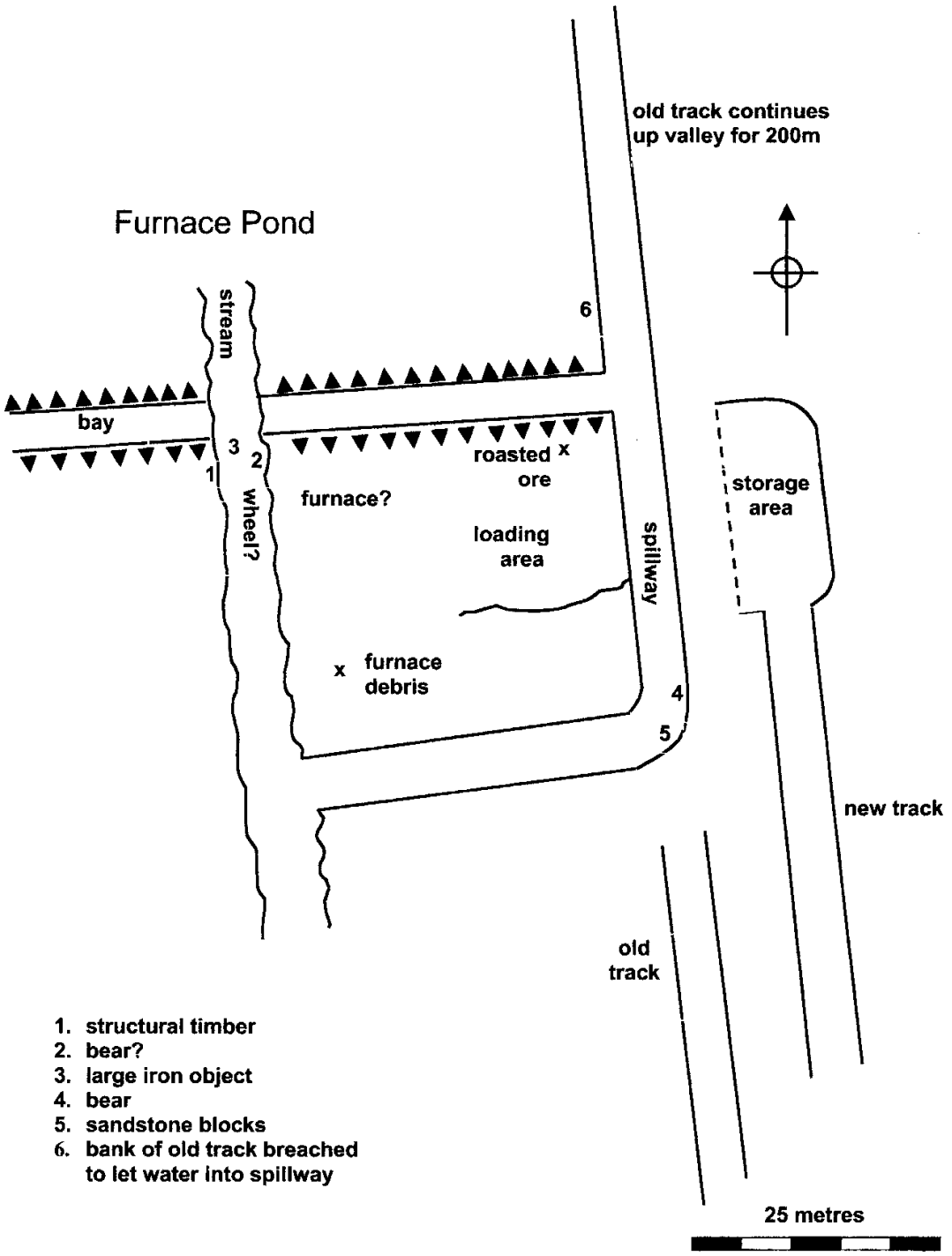



Fig 1. Warbleton Priory Furnace – plan

## Working Areas

In the west bank of the stream 4m below the bay, a 2m long timber of 18cm flat section was found. This could have formed part of the structure supporting the water wheel. In the east bank 2m below the dam there is what might be part of a bear. In the stream 1.5m below the dam there is a large object of high iron content which I could not identify.

To the east of the stream, and about 15m south of the bay, small piles of furnace debris were found. In the loading area, just below the dam and west of the spillway, there was a pile of roasted ore.

East of the spillway, opposite the loading area on the west side, is a levelled storage area of about 10m x 22m. Scratching the ground with a boot revealed blackish earth, presumably containing charcoal dust.

## Pen Ponds

Pen pond bays are located 260m and 325m NNW from the furnace pond bay, as on the OS map.

The lower bay is breached by the stream, and there is a spillway at its eastern end. It is 45m long from stream to spillway, and 5m high above the stream. West of the stream is pasture where ploughing has destroyed it.

The higher bay is of similar layout, 28m from stream to spillway and 4m high. On the west side there is an unploughed 2m section next to the stream. Further west it has been ploughed, but there is a hump in the pasture where it would have been.

### Notes and References

1. Cleere, H. & Crossley, D, The Iron Industry of the Weald (2nd ed. Cardiff, 1995), 363-4.
2. Straker, E., *Wealden Iron* (1931), 359.

# CHARCOAL PRODUCTION IN WOODLAND AROUND THE BLAST FURNACE AT DARWELL IN EAST SUSSEX

**JONATHAN PRUS**

77 charcoal-burning platforms have been identified in the woodland surrounding Darwell furnace near Brightling in East Sussex (Cleere and Crossley, 1995. p.328). For location see Figure 1. Although there is no direct evidence linking these platforms to the furnace, the later energy-hungry industries in the area (lime-burning and brick-making) are more likely to have used wood as a fuel, and later, coal (Beswick, 2001). There is only one place (TQ 6932 2072) within the woodland investigated with any bloomery slag, so it is unlikely that charcoal burning on this scale was associated with bloomeries. One platform (at TQ 7074 2021) is cut by what appear to be mine pits, placing those pits at a date after that platform was last used.

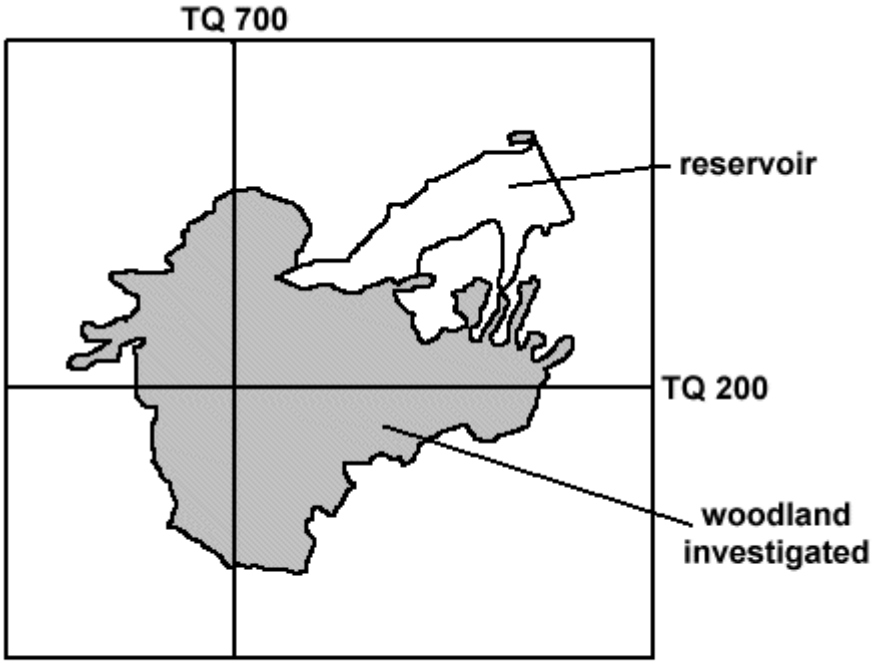



**Fig. 1 Area of woodland investigated relative to Darwell Reservoir**

That this woodland supplied the fuel for the Darwell furnace is evidenced by a letter from a Mr. Hayley to the historian Sir W. Burrell, April 29th. 1777, quoted by Straker (1931) as follows:

"Darvell (*sic*) wood is said to be 800 or 1000 acres. In later (*sic*) times it has supplied with fuel a Furnace for casting iron, established on its skirts, which was occupied by the owner and its tenants till the last peace with France and Spain."

It is a reasonable inference that charcoal made at the sites identified below was used at Darwell furnace. This does not mean that the charcoal produced was not sometimes used elsewhere. Similarly, it does not rule out the possibility that charcoal burnt in other woods was delivered to the Darwell furnace. However, the evidence presented below suggests that the charcoal burning sites in this woodland could have satisfied the peak demands of the furnace.

None of the woodland studied has been lost to other uses since 1878, and some of the open land on the 1878 Ordnance Survey map is now wooded. Rackham (1986) argues persuasively that most of the ancient woodland that we have lost has been lost since 1945, and that land used as woodland has been in that use for surprisingly long periods of time. It is reasonable to suppose that the 320 hectares we see today could have been available to provide fuel for the Darwell furnace. It does not follow that all the charcoal burning sites have been identified. Disturbance by modern forestry, peculiarities of the terrain and dense vegetation probably conceal more platforms.

Charcoal platforms stand out in the Wealden landscape because they are nearly perfectly flat. They seem incongruously level on steep slopes. Flatness, however, is not the criterion. Where wood has been coaled for any length of time a layer of blackened soil containing charcoal builds up. Cuts through seven Darwell platforms reveal black layers up to 400 mm. thick. Without exception, the Darwell platforms get a strong response from a metal detector. This does not seem to be due to any burnt ore, or to metal objects, although flecks of reddened earth do occur.

John Evelyn (In *Sylva*, 1664 ) insists that the burning clamp must be circular. This is supported by the photographic evidence provided by Armstrong (1978), and by the accounts of surviving wood colliers that she reports. A striking observation at Darwell is

that the areas on which the clamps once stood are mostly not circles. Typically they are ellipses with a long axis of about 8m. and a short axis of about 6m. In 13 of the 77 sites found the working area seems to be almost exactly twice as big, suggesting two clamps next to each other. There may be a sub-population of smaller circles with diameter about 5 m., but the smaller size could well represent the encroachment of trees at the platform edges.

**The distribution of the charcoal burning sites**

With one exception, the platforms identified are within a few metres of either running or standing water. A further round flat platform is located at TQ 7099 2022, identical with those near water, but showing no sign of blackening and getting no response from a metal detector. In fact, most of the sites listed below are strung along the banks of little streams like beads on a necklace. Water was evidently important in the charcoal burning process and Armstrong (1978), lists barrels as part of the collier's equipment. Jonathan Roberts of the Weald and Downland Museum has done a number of experimental burns. He offers the opinion that water was used to stop a burn both by reducing the temperature of the charcoal and (expanding on boiling) by driving off any oxygen remaining in the clamp. Although the platforms are close to water, in many cases that water is not present in summer. (See Figure 2 for the location of the streams on which most of the platforms were located.) This must mean that burning was a seasonal activity, probably confined to winter and spring.

There are lengths of stream bank in the woodland on which there are no platforms to be seen. These include areas that are flat, areas covered in brambles, areas which have been flooded, and some which have been replanted with conifers in the style of the Forestry Commission. In addition there are some areas with no platforms but with soil that is discoloured grey-to-black where some burning has certainly taken place (but may have been burning other than for charcoal). Roughly 30% of the stream sides are bereft of identifiable platforms. A possible estimate of the total number of Darwell charcoal burning sites is, thus, 110. The mean distance of each site to its nearest neighbour is 78 metres. If the

platforms were regularly spaced within the woodland their mean separation would be about 204 metres, so they are clustered, and the reason for clustering is almost certainly the availability of water.

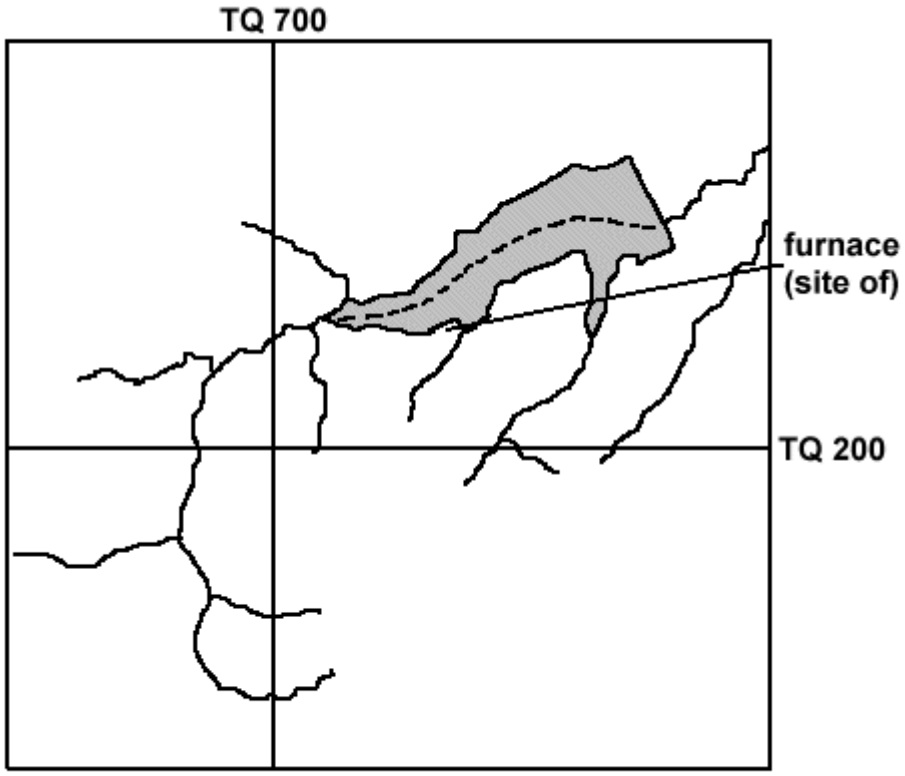



Fig. 2 Relevant Streams

## Moving the product

There are numerous deep tracks worn into the slopes above the furnace. Typically, these have a crescent or even semi-circular cross-section and contain no evidence of having been rutted by any two-wheeled vehicle, In particular, one set forming a lacework of interwoven paths, connect the furnace site to an area with deep mine pits. These pits cut into the Purbeck beds. The track ways continue south-east in the general direction of Netherfield (and/or Battle?) but miss the lime kilns marked on the Ordnance Survey map of 1878 by several hundred metres. It may be deduced that these paths are connected with the iron works, but not with the lime works. There are also rutted tracks around the furnace and elsewhere, but these may or may not be ancient.

The majority of the charcoal platforms are not close to the hollow track ways, or to rutted track ways. In particular those platforms that are perched on the banks of the streams are not on any path. A plausible conclusion is that the fuel was moved by pack animal or on human shoulders to a convenient path, or perhaps to the furnace itself. It seems unlikely that wheeled vehicles could have serviced many of the charcoal platforms.

## Moving the raw material

An advantage of locating a clamp on the bank of a stream is that the raw material travels downhill. Newly cut wood is five to seven times as heavy as the charcoal it produces (Edlin (1947), Armstrong *op. cit.*), so the effort saved would be considerable. Since the platforms are not on paths, it seems unlikely that wood was carted to them.

The distribution of streams and other water in this woodland is such that almost all of it is within 400 metres of a charcoal burning site. It is possible that the wood was manhandled into place. It is also possible that animals dragged it. A find of one ox-shoe is suggestive, but this was in a hollow track way, and might have been connected with the movement of limestone and ore in, or castings out, of the furnace area.

## The Coppicing cycle

The woodland around the furnace has probably been managed ever since agriculture began. Recent bulldozing, for example, exposed a flint blade, suggesting prehistoric use. After a prolonged period of neglect and/or modern forestry interventions, coppice management was reinstated a few years ago.

Although it would be futile to make guesses about mediaeval and pre-mediaeval management, the trees themselves can tell us much about the early modern period. There are large stools of chestnut, ash and hornbeam whose size is consistent with an age of at least three hundred years. Approximate minimum age can be estimated by calculating the average annual growth of a stem and comparing it with the girth of the stool at ground level. This method is not as precise as aging a single-bole specimen by

counting its rings, but the simple ring counting option is not available with coppiced wood. There is also a great deal of hazel coppice, but there is no obvious method of estimating its age. Stools of alder, field maple and three species of willow also occur. Oak has also been coppiced, but it does not usually form stools like other species and coppicing it may be a fairly recent practice.

A large part of the woodland is coppice with standards. Under this regime all small specimens are cut, leaving larger specimens at intervals of perhaps 30 to 40 metres. This has the effect of both providing shelter and encouraging the coppice stools to grow straight and tall. In some parts of the woodland, standards are absent, but this tells us little because they may have been removed for timber during World War II when the coppice wood was last felled in large amounts.

Most of the extant standards are oaks. There is no sign of any timber-oak much more than about 100 years old, and in particular there are none that have been shredded. Shredding is a practice described (and figured) by Rackham (1989). It involves harvesting wood from a tree by removing its branches and then leaving the whole bole to regenerate. This method of obtaining wood was used in the locality: striking examples can be seen from the road at the edge of the Ashburnham estate nearby. The resulting trees taper much more markedly than a timber tree left to grow naturally. Similarly there are very few pollard trees, and these few seem to be in boundary hedges.

Oaks do, contrary to popular lore, grow fast and compete well. There is no reason to suppose that oak was not plentiful in the underwood coppiced for charcoal burning. A fifteen-year oak, competing with closely packed saplings on Tonbridge sand can easily achieve a girth of 250 mm. This is a good size for charcoal burning and is similar to that of much of the charcoal sample discussed below.

Another species that does not usually form stools is birch. Birch occurs throughout the woodland and seems to invade newly coppiced areas of other species quite vigorously. Today it occurs with a similar frequency to the ash, oak, hornbeam and hazel. It is not clear whether it would be so common if it the trees around it were protected from grazing.

Given the present species composition and the age of many coppice stools, it is a reasonable guess that the charcoal burners of the early modern period used a mix of species, of which the main were ash, oak, hornbeam and hazel and birch.

78 pieces of charcoal collected from seven of the platforms found were measured. The pieces of charcoal were added to the sample if they had a curved edge that represented the outside of a piece of wood. The majority of these pieces are no larger than the end of an adult's forefinger, but come from timber with a wide range of thicknesses. It is likely that these pieces represent the small fragments discarded because they were too small to be of use. This could lead to sampling bias towards pieces from small-diameter wood, but the statistical test described below suggests otherwise. In aggregate, the sample composition is consistent with a random sample drawn from a harvest of 12 to 15-year-old coppice. (See Appendix below.)

This estimate of the length of the coppicing cycle also provides some additional evidence for dating the charcoal burning sites. Using a wealth of documentary evidence, Rackham (1986, 1989) demonstrates that mediaeval coppicing practice was different to that of the early modern period. He reports mediaeval cycles as short as five to seven years. Modern cycles (excluding short-cycle bio-mass crops) run from 12 to 20 years. Because iron smelting in the post-medieval period required charcoal that was robust enough to support the weight of iron ore in the furnace, the usual growing period for coppice for smelting charcoal was a minimum of 15 years (J. Hodgkinson, pers. comm.). The presence of wood from longer cycles makes it more likely that the Darwell charcoal burning sites were used in the post-mediaeval period. (However, it does not preclude the possibility that some of the platforms themselves are mediaeval in origin.)

There are marked differences between charcoal burning sites in the maximum size of the wood represented. This could result from leaving different coppices for different lengths of time. This would be consistent with the extreme fluctuations in the demand for cast iron products (and, hence, underwood for charcoal) during the seventeenth and eighteenth centuries.

## The possible charcoal yield of the area and the platforms discovered

If the estimate of 110 charcoal burning sites in woodland on an approximate 12 to 15-year harvesting cycle is correct, then perhaps 7 or 8 would have been in operation at any one time.

To determine whether or not it is plausible to suggest that the woodland around Darwell furnace could have been its main source of charcoal, we have to answer two questions. First, could seven or eight charcoal burning sites have produced sufficient charcoal to service the furnace? Second, could 320-odd hectares of woodland have produced enough wood to meet the demands of those wood-colliers?

According to Agate (2002) ash, hazel and oak should yield approximately 2.5 tonnes per hectare per year under a 15-year regime. It seems likely, therefore, that an area in excess of 320 hectares should yield something in the order of 800 tonnes per year. Armstrong (1978) suggests a conversion rate of between five and seven to one of wood to charcoal. This provides us with a conservative estimate of output of about 114 tonnes per year.

Straker (1931) suggests that the furnace output was up to 150 tons per year, but this figure is the maximum output, and the industry could be stopped in its tracks by an untimely outbreak of peace. Cleere and Crossley *op. cit.* tabulate possible charcoal consumption in terms of loads of charcoal per ton of pig produced. "Load" is a measure of what a cart can carry rather than a specific mass or volume. Young (1812), tells us that "two cord of wood makes one load of coal" and that "At present *(i.e. in 1812)* to make 13 ton of pig iron, takes 50 load of charcoal". Applying a 7:1 conversion ratio, and using the value one cord = one ton, this means that making one ton of pig iron uses approximately one ton of charcoal. Young is otherwise a meticulous observer and recorder and his 50:13 ratio is in the middle of the range of values given by Cleere & Crossley.

Whilst the woodland might not have sustained an annual charcoal production of 150 tonnes, it could almost certainly have sustained the average demand of a fluctuating production system with peak demand of 150 tonnes.

Could the 7 or 8 charcoal burning sites have produced 150 tonnes of charcoal in one particular year? The variables involved are the cubic capacity of each clamp, the density at which it is packed, the time between successive burns and the duration of the burning season.

Working back from the 7:1 conversion ratio, the mass of wood required would be 1050 tonnes. Armstrong (*op. cit.*), and Edlin (*op. cit.*), give estimates of twenty five hundred weight and one ton per cord of wood respectively. It is agreed that a cord of wood occupies 128 cubic feet. Converting to modern units, one tonne of cord wood would occupy approximately 3.5 $m^3$. Thus the volume of stacked wood charked to produce 150 tonnes might be about 3800 $m^3$.

Armstrong (*op. cit.*), gives a variety of answers to the question of how long it takes to chark a clamp. One estimate for a large clamp is six days. Suppose, then, that seven sites burned for 26 weeks of the year with seven days between the start of each burn on a site, the required average volume of stacked wood in a clamp would be about 21 $m^3$. Is this plausible?

The photographs in Armstrong (*op. cit.)* show a series of clamps whose shape is approximately hemispherical. Most seem to be considerably more than the height of a man. A hemisphere whose volume is 21 $m^3$ has a diameter of approximately 4.5 m. and thus a height of 2.25 m. (7 ft. and 5 inches). Adding a coat of earth, maybe 0.5 m thick, the result could well be a clamp 5.5 m. across. This would fit very well with the observed sizes of the charcoal burning platforms.

At each stage of the calculation above the conservative estimate was chosen: the density of a cord, the conversion ratio and the burning season were chosen at the limit that maximised the stacked volume. Similarly, the longest estimate for the burn was chosen. If any of these figures had been less conservatively set, the required clamp volume would have been lower.

**Questions arising.**

The absence of documentary evidence means that there must remain some doubt about a link between the sites identified and the furnace itself. However, the fit between the possible output of

the known charcoal burning sites and the charcoal requirement of the furnace is quite remarkable. It is asserted that that transporting charcoal any distance led to a loss of quality (Cleere and Crossley *op. cit.*). Is there other evidence that woods adjacent to furnaces provided the fuel?

If a *minimum* coppicing cycle of fifteen years was required to produce charcoal of the right sizes, then there is clearly a limited period over which a maximum iron output of 150 tons per annum could have been sustained. Applying the estimates used above, and assuming that no part of the wood had less than four years growth, the charcoal would have run out in year eleven. The sufficiency of the woodland immediately adjacent would have depended, in part, on the number of consecutive years in which full production was maintained. Clarification of this issue would probably require the accounts of the Darwell operators.

Since wood was denominated in cords it is probable that each clamp contained an integer number of cords. 21 $m^3$ is almost 6 cords. Unfortunately, although there is some oral tradition relating to charcoal burning, there is no way of connecting a tradition relating (say) to the early twentieth century to the early modern period. It would be interesting to find any documentary evidence for the number of cords favoured as an optimum by local wood colliers.

The size of the operation too, is interesting. If there truly were about seven sites working on a seven-day cycle, the fit with the working week is close enough to pose a question for historical research. Is there evidence that wood-colliers worked as a team running what would have been a nearly continuous production process?

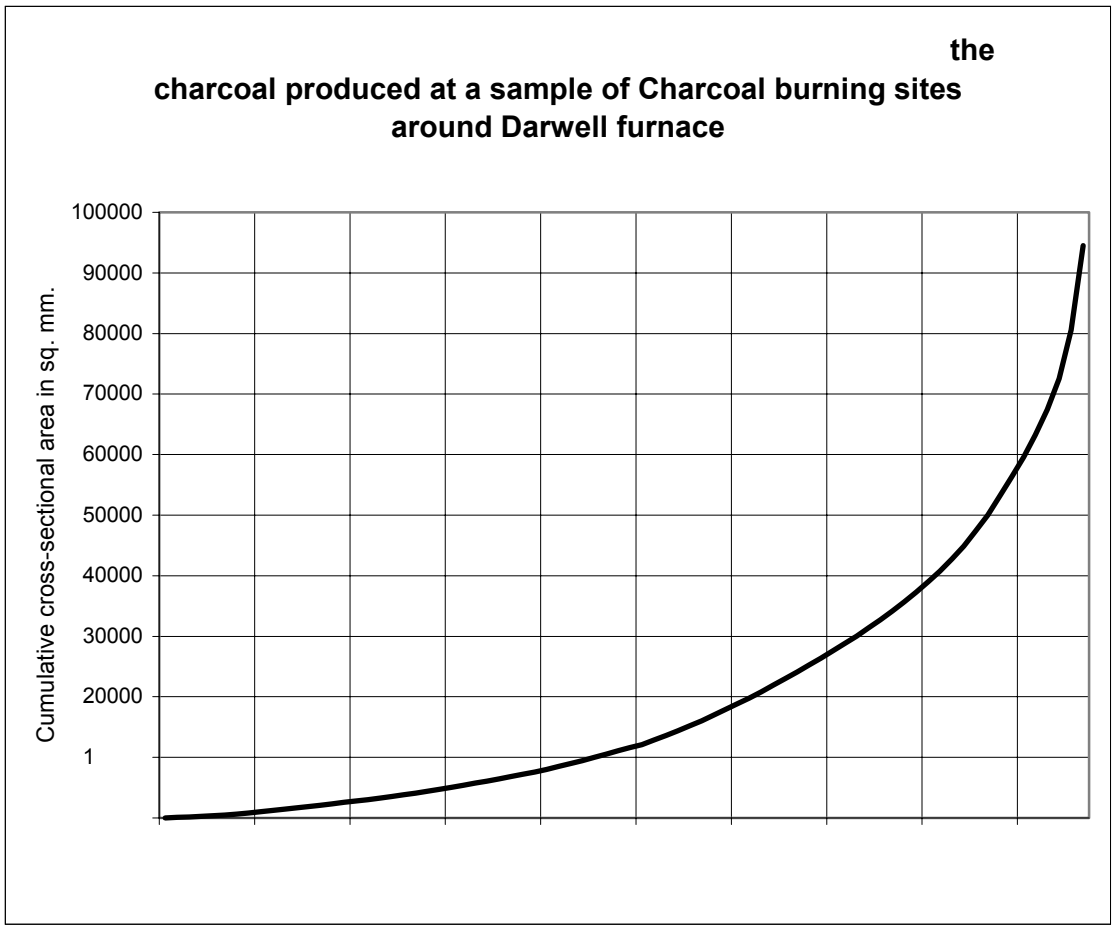
The relationship of the charcoal burning sites to seasonal water is compelling evidence that, like many blast furnace operations, this industry was winter-and-spring seasonal. (The stream that fed the Darwell furnace is, itself, a mere dribble in summer.) What, then, did the wood colliers do the rest of the year?

*I am grateful for the initial comments of Mrs. D. Meades and the detailed criticisms and suggestions of Mr. J. Hodgkinson.*

## Appendix 1: analysis of charcoal sample.

Most of the pieces in the charcoal sample were fragments with only a part of the arc of the outer surface remaining. Only a few pieces of about 10 mm. or less retained the complete round of the natural wood. In order to find the original thickness of the fragments were filed flat in a plane perpendicular to the run of the grain, and traced round the curved edges onto paper.

Since coppice wood is approximately circular in section, the diameter was found from the relationship between the length of the chord and the distance between the chord and the arc. Similarly, the cross-sectional areas were found from these diameters, again using the approximation to a circle.




It was assumed that the charcoal recovered was representative of the diameters of the wood included in the clamp. The specimens were ranked by diameter. The amount of charcoal contributed by wood of each diameter is proportional to the area of its cross section. The cross-sectional areas of the whole sample were summed, adding each ranked specimen to a running total.

This produced a cumulative distribution for the contribution of wood of different diameters, displayed graphically below.

To examine further the possibility that there is serious sampling bias, a logarithmic transformation of the cross-sectional area data was made. The log-plot of this data is linear for values where the inferred diameter of the charcoal is greater than 16 mm. The shape of the tail of this distribution suggests very strongly that charcoal less than 16 mm. thick significantly *under*-represented in the sample. This may just mean that pieces from thicker stems were added to the sample preferentially, but it probably means that twigs were usually put aside for some other purpose.

With such a small sample it is most unusual to obtain data from plant material that are as regular as those displayed above. There may be a mechanism underpinning this regularity. It could be suggested that this mechanism is the inclusion of whole plants in the burning clamp: trees start with one thick stem and end with (predictably) thinner stems.

Although the median thickness is 26 mm., charcoal of up to this thickness provides only 11% of the total bulk. 70% of the bulk appears to be provided by charcoal more than 40 mm. thick and 55% is provided by charcoal more than 50 mm. thick. The maximum diameter represented in the sample was 133 mm.

There is a necessary correction to make to these measurements: wood shrinks when it is coaled. Charcoal making experiments suggest that lateral and longitudinal shrinkage are each approximately 20%. The maximum thickness of the wood contributing to the sample may, therefore, have been 160 mm. Measurements of recently coppiced ash stubs at Darwell show a maximum 15 year ring width of 135 mm. at the base, with a mean of 108 mm.

The mean 10-year ring width in the same sample was 80 mm. This supports the inference of a 12-15 year cycle at Darwell but does not rule out the possibility of longer cycles.

## Appendix 2: location of charcoal burning sites

The location of the charcoal burning sites was determined using gps equipment accurate to about 2 metres in optimum conditions.

Many of the sites are heavily treed which makes the GPS less accurate. The sites are as follows:

TQ

| | | | |
|---|---|---|---|
| 7025 2077 | 7031 2014 | 7129 2014 | 7013 2100 |
| 6964 1981 | 7030 2014 | 7115 1998 | 7023 2097 |
| 6958 1994 | 7035 2032 | 7109 1992 | 7025 2095 |
| 6945 2031 | 7028 2046 | 7131 2010 | 6940 2064 |
| 6950 1974 | 7031 2026 | 7132 2005 | 6933 2072 |
| 6975 2042 | 7020 2028 | 7124 2005 | 7020 2051 |
| 7035 2090 | 7029 2034 | 7122 2008 | 7027 2032 |
| 7056 2048 | 6994 2001 | 7183 2012 | 7027 2022 |
| 7056 2053 | 7094 2044 | 7178 2006 | 7027 2015 |
| 7039 2043 | 7071 1991 | 7171 1999 | 7030 2022 |
| 6963 2001 | 7076 2005 | 7120 1999 | 7067 1998 |
| 7041 2096 | 7074 2021 | 7186 2010 | 7063 1989 |
| 7027 2100 | 7078 2027 | 7176 2002 | 7071 2027 |
| 7022 2106 | 7076 2033 | 7183 2007 | 7123 2016 |
| 7010 2102 | 7084 2041 | 7108 2026 | 7112 2031 |
| 6991 2107 | 7067 2019 | 7057 2032 | 7131 2028 |
| 6988 2105 | 7068 2005 | 7093 2026 | 7140 2030 |
| 6937 2102 | 7067 2002 | 7087 2032 | 7131 2041 |
| 7002 2100 | 7068 2000 | 7041 2114 | 7129 2020 |
| 7140 2028 | | | |

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## JOHN BROWNE, GUNFOUNDER TO THE STUARTS

**RUTH BROWN**

John Browne, the son of Thomas Browne, Queen Elizabeth's gunfounder, claimed in his will to have been born at Chiddingstone in Kent, where his father, Thomas Browne, owned the Red House from 1593 to 1597 and had been living in the parish at an earlier date. We know little of his education except that he wrote in 1621 'at the request of the ordnance officers, and the East India Company, I was put to the trade, that I might continue if my father failed' (*CSPD, James I, vol 5*, 639).

In August 1615, he was granted the office of Gunstone Maker for life (*CSPD James I, vol 2*, 301). From this period he appears to have been actively involved in running the iron business which his father had built up. The following year he married Martha Tylden at Brenchley church; his father had taken over Brenchley/Horsmonden furnace by 1604 (Cleere and Crossley 1995, 337). The earliest reference and payment in the Ordnance Debenture books is dated 7 June 1617 for 6 culverins, 13 demi-culverins and 10 sakers for a debenture 'unto John Browne Deputie unto Thomas Browne his Maties Founder of Iron Ordnance and Shott' (WO 49/46, 70r). John alone was paid for 3 culverins and 3 demi-culverins for Ireland proofed at Milhall on a debenture dated 2 Dec 1619, by which time he was now described as 'his Maties Founder of Iron Ordnance and Shott' (WO 49/48, 139r). After this John is increasingly named while his father is mentioned less and less; for example John was paid for a batch of round shot from minion up to demi-culverin in 10 Jan 1620, amounting to over £400 (WO 49/49, 3r).

*Cannon Export, legal and illegal, 1610s to 1620s*

In the late 1610s Thomas and John were heavily involved in the export of cannon. Thomas had formed a working relationship with Elias Trip, the leading Dutch arms trader. At this period the Dutch not only needed guns for their own state navies and merchant shipping, but also traded in them across the globe. This connection led the Brownes into various disputes with the government who were increasing trying to control the export of iron guns. The Brownes were far more dependent on their trade with the Dutch who purchased guns in the 100s than the few guns bought by the English government. Problems surfaced in February 1617 when King James granted a licence to Sir Noel Caron to export 200 iron guns for supplying forts in the Netherlands, declaring that this would be the last licence allowed for some time (*APC vol 35,* 138). The following year both the Venetian government and the Dutch state navies were refused permission to export iron guns, until England had produced enough for its own needs (*APC, vol 36*, 69)

In January 1619 the Privy Council ordered the Customs officers in Kent to investigate 130 cast-iron sakers, demi-culverins and culverins at Brenchley, awaiting shipment to the Netherlands. They were told to prevent the removal of these guns and all other cannon, except those intended for the East India Company or with a special licence (*APC vol 36*, 353). Within days John Browne, described as 'master of the furnace at Brenchley', found himself being interviewed by government officials, when he claimed he had '200 men at work, and more than half of the ordnance manufactured by him has been bought and exported by the Dutch under licence; knows nothing of what is done at the four ordnance furnaces in Sussex.' (*CSPD James I, vol 3*, 12).

John Brown put his case to council thus: 'The causes why I sold ordnance to Lord Caron and his deputy are, that at that time having no employment either for his Majesty or the EICo, I supposed I might lawfully make my market where I could find it, especially to such as were never known to have shipped any ordnance, but had sufficient warrant for it. Four years ago, my father and myself had special warrants to make for Mr Elias Tripp, commissary for the States, 200 great pieces, and less pieces in

proportion, but more being then cast than was needed, they yet remained at Millhall, in Kent. Lord Caron's merchant, hoping to obtain another license from his Majesty, bought more pieces of me, who never thought but that I might freely sell to such a one as his lordship. The said ordnance was sold and delivered almost a year before the orders for bringing the same to Tower Hill. If I had not sold that ordnance to Lord Caron, I had not been able to keep my men at work' (*CSPD James I, vol 5*, 629).

A year later in December 1619 the government were again ordering officials in Kent to seize and transport to Tower Hill at owner's expense 'the great ordnance of iron ordnance lying at Milhall to be transported by stealth beyond the seas'. They were also told to take a perfect inventory for cross-checking which included 'iron ordnance provided for strangers, and also of other iron ordnance now lying on the wharfs of Robert Palmer, and of Mr Browne, at Milhall, Kent' (*APC vol 37*, 93; *CSPD James I, Vol 3*, 104). However by January 1620 the customs officers at Rochester were reminded to transport the guns to Tower Hill immediately (*APC vol 37*, 112).

Late in 1620 yet another scandal broke. The retiring Spanish ambassador attempted to ship iron ordnance out of Lewes on a forged licence. Although the Brownes were not directly involved - Stephen Aynscombe at one of the Sussex furnaces was the culprit - this was the final straw for the government. The repercussions of this smuggling attempt would ring down the years, still causing problems when Charles II regained his throne in 1660, when Thomas, John senior and John junior had long been dead.

*The Brownes versus Sackville Crowe*

A commission was set up under Sir Robert Mansell to investigate the manufacture and export of iron ordnance. He 'found one Browne had the sole making of it for the King'. It was decided to allow only two furnaces to operate and grant a second patent to Sackville Crowe to cast cannon for merchants (*CSPD James I, vol 5*, 629). Crowe, a minor official, was a friend of James I's young favourite George Villiers and was connected with the Sackvilles at Maresfield. The notes for drawing up the patent 'for the sole making of iron ordnance for the shipping of the Kingdoms, except

for his Majesty's service', included the condition of his 'setting unemployed bow makers to work, keeping the market on Tower Hill supplied and not raising the price above £13 per ton' (*CSPD James I, vol 3*, 202).

The Brownes could not allow such a flagrant attack on their livelihood to pass unopposed and Thomas and John began a campaign to have the act annulled, since they would not be able to survive on the normal government orders. John Browne wrote in stinging terms to Solicitor General Heath:

'The matter between your kinsman and me stands thus: my father has for the last thirty years cast ordnance for the late Queen and the King, and for years maintained the trade alone… If I may still cast for merchants, if the King wants 200 pieces, I will cast them in 200 days.

Mr Crow has got a patent for sole-making of ordnance for merchants; this would confine me to the King's service, which only takes 10 days a year.' He goes on darkly:' You know how this patent was obtained, and the commissioners advised there should be two furnaces for King and merchants, intending me to have one'. Browne threatened 'You know what Parliament ordered... If anyone thinks he can perform service without me, let him try. If I have to cease working, and then should be ordered sudden service, it would take a long time, for I must cut and coal the wood, draw the mine and work it into ordnance, if it be but for 20 pieces'. Then Browne offered his olive branch: 'If Mr Crow will join me friendly, there will be work for both. There will be a good quantity of shot needed yearly, but now the town is full' (*CSPD James I, vol 5,* 639). In addition the Brownes petitioned the council, parliament, ordnance office and anyone else they could think of, pointing out the difficulties of their situation:

'About 2 years past the King appointed commissioners to examine the complaints of unlawful transportation of iron ordnance, and to settle a cause of the prevention of the like in the future. To effect this the Commissioners thought fit that but two furnaces should be allowed of which theirs should be one, as by a certificate will appear. Contrary to this order of the commissioners a gentleman named Sackville Crow had since procured a patent for the sole supply of the subject, thereby restricting the petitioners to His Majesty's service. They have not had

employment for one month in a year for these many years in casting iron ordnance for his Majesty's particular service, besides it is impossible for them or anyone else to cast such pieces, viz. culverins and demi-culverins, without casting many smaller pieces first, which are fitted for the use of the subject: so if they should be restrained as intended by the new patent the service both of his majesty and the subject will receive great prejudice. This will appear by the certificate of the Officers of the Ordnance and by order of the Commons House. Seeing that the petitioners have never offended His Majesty nor the state by any unlawful transportation, and are now enforced to become suitors to the Parliament, for that their former petition exhibited to the King is now in the hands of Mr Crow; pray that for the upholding of their furnace and mine which supplies the best ordnance in the kingdom, they may cast ordnance as heretofore for the use of the subject as well as the King' (*CSPD Charles I*, Vol 23, 181).

At this period there were four gunfounding furnaces in Sussex and a fifth in Wales. Within a few years the furnace in Wales closed down and the other ironworks in the Weald began to wither away, leaving only those controlled by Browne and Sackville. There were other far-reaching results. Since the Dutch merchants could no longer rely on their English suppliers, they had to find other ways to obtain iron guns and began actively to encourage the industrial development of Sweden, whose iron industry would eventually rival and even surpass that of the Weald. Far from encouraging an industry which had been developed in England and in which she was a leader, the government were keen to control and even suppress it.

Following the death of James I, Charles I renewed the grant to Sackville Crow in August 1626 'for the sole manufacture of iron ordnance for the merchants, during life, and also to make for 21 years all iron ordnance by the King or Council ordered to be transported' (*CSPD Charles I, vol 1*, 573). John Browne (possibly now on his own; it is unknown when Thomas died) began a much more serious campaign to end this, suggesting that the two ironmasters co-operate to supply the market 'For me to undertake the making of 250 tons of ordnance and half the shot yearly for merchants and Mr Crow the residue of the ordnance with half the shot required by merchants. Or the converse, … an equal division

of both ordnance and shot -decided annually. To which purpose it would be desirable that a time and place of meeting between us should be fixed that once a year we may examine what the kingdom will require' (*CSPD Charles I, Vol 23*, 181).

Crowe offered 'If Mr Browne will be so content I will join with him in all, stock his furnace, allow him a third of the profit, he allowing £10 percent for the third of the stock employed. The pieces Browne has already made to be delivered in by him at Tower Hill at reasonable prices; I to deliver in the like at the same place' (*CSPD Charles I, Vol 23,* 182). It seems that the two founders were able to co-operate for a time.

*Ordnance Office*

In view of the threat to the Brownes' merchant trade, the sales to the Ordnance office now took on special importance. After a gap of several years, Browne began to supply the Ordnance Office again from 1624, firstly with two batches of shot in July and September 1624 weighing almost 7 tons (WO 49/54, 9r-10r). This was followed by an order for 6 cast-iron minions for the pinnace *Primrose* (WO 49/54, 10r).

However the real challenge began in 1625 when the Ordnance needed to buy a large number of iron guns quickly to arm the 50 Newcastle ships hired as transports for the Cadiz expedition. The international situation was deteriorating, and Britain was being drawn into the conflict of the Thirty Years War. The Ordnance ordered 300 demi-culverins and 200 sakers; the first 33 demi-culverins of 8½ feet and 40 sakers of 9 feet, with shot, were delivered by 19 February (WO 49/54, 24r; 26r). Proofs were held at Millhall, Maidstone and, unusually, at the Tower of London, suggesting the Ordnance may have been already at the Tower Hill market. They had to be dragged to a nearby hill for proof, then carried back to Tower Wharf; one saker broke in proof and the remaining guns were delivered on 26 May and I June (WO 49/54, 24r; 27r; 44r; 52r; 56r).

The estimate for the 500 guns and shot came to £15,740, which the Ordnance clerks noted was to be paid from a third subsidy (WO 49/55, 43v). To meet this very unusual demand - iron guns were normally purchased in very small numbers -

special arrangements for payment were arranged: £1,000 was to be paid to John in advance from the funds for furnishing the ships (*CSPD Charles I, vol 1*, 172). Throughout December 1625 John Browne remained in London, petitioning for speedy payment and for extra guns to be accepted (*CSPD Charles I, vol 1*, 172; 182). On 22 December the Officers of the Ordnance wrote to secretary Coke to explain that: 'John Browne, the founder of iron ordnance, not finding any present satisfaction, and having spent five weeks in attending in hope to receive money, they had not been able to persuade him to further patience. He had departed into the country with the determination to employ himself in such works for the subject as would yield him ready money' (*CSPD Charles I, vol 1*, 184). Browne was angry not only over the delay in payment but also the Ordnance's refusal to accept the last guns, which he pointed out were hard for him to dispose of because they were 'too big for the merchant service'. (*CSPD Charles I, vol 23*, 720). Browne had had to lay out money in 'coales and other materials at excessive rates, wherein hee ingaged divers of his friends for securitye', then had had to sell the extra guns at a loss' (*APC, vol 41*, 412-3)

The descent into war with France and Spain meant that the English coastal defences needed strengthening, and new guns were ordered for a number of fortifications: on 12 October 1625 Browne delivered 1 culverin, 5 demi-culverins, 5 sakers and 3 minions for Sandown, Walmer and Deal castles, as well as 2 culverins for Dover Castle (WO 49/54, 131r; 131v). Despite payment problems, John continued to supply the Ordnance Office: 18 culverins, 15 demi-culverins and 3 sakers were sent to strengthen the East-Anglian defences at Harwich, Landguard point and Mersea, costing over £1000, and for Dover Castle, 10 demi-culverins, 16 sakers, and 2 culverins were cast in 1626 costing almost £550 (WO 49/56, 26r; 29v; 65r). Browne was also paid for 'ingraving his highness Arms very large and faire' on these guns (WO 49/56, 95r). Now other communities asked the government for help in defending themselves. Carew, Master of the Ordnance, wrote to the Council in April 1626 in response to requests from Yarmouth and Lyme Regis that there were no guns available for them but 'the King's founder has pieces to supply the petitioners' wants if they will buy them; or, if the king thinks fit to supply the

necessities of these towns out of pieces which the founder has ready cast for the King's castles, a privy seal must be passed and present money procured for payment, which with the carriages, will amount to about £1,109'. Guns were chosen for Lyme Regis, although Carew warned of the precedent this set (*CSPD Charles I, vol 1*, 303; 318). In December 1626 guns were delivered for the defence of Scilly: 7 demi-culverins, 2 culverins and 4 sakers (WO 49/56, 190r; 192r). Some of the demi-culverins were of the new refined metal discussed below. In August 1627, 2 cast-iron sakers were purchased for the Isle of Wight (WO 49/58, 214). In November 1627 he produced 2 culverins and 2 demi-culverins of refined metal for Pendennis Castle in Cornwall (WO 49/58, 265). Guns were still needed for ships: 20 sakers were proofed at Tower Hill for the captured French *St Claude,* costing £328 8s *(*WO 49/55, 122r; 123r). A further 18 minions were proofed in May 1626 for 6 merchant ships, hired to 'waft the fleet of fishermen towards the Northwards' (WO 49/56, 76r).

Demand for shot rose dramatically in the same period. Browne supplied not only round shot from large culverin down to small falcon but more complex types of ammunition, such as cross-barred shot; double cross-barred shot; langrell shot, coupled flat shot, base and burr as well as shells for mortars and grenadoes (e.g. WO 49/56, 91v; 111v; 130r; WO 49/58, 10v; 72v, 96-96v).

In January 1627 Browne seems to have persuaded the Office to pay for 29 cast-iron demi-culverins and 10 sakers which were part of the 1625 delivery (WO 49/58, 10r). Other guns were bought for the hired merchant ships through 1627: 30 sakers, 28 minions, and 8 falcons, (WO 49/58, 48r; 83v; 169v;197r; 198r). However this was not enough to meet the current emergency and in November 1627 the Ordnance Officers requested permission to buy guns direct from the stores for the merchant shipping (*CSPD Charles I, vol 2*, 452). The purchases continued in the summer of 1628 for the hired ships: 37 sakers, 3 minions for ships which were proofed at Milhall (WO 49/ 59, 109r; 110v; 100Ar). At the same time Browne was still pressing for payment; this time it was agreed at £2000 (*APC vol 43*, 494).

*Drakes and special metal; Browne and the East India Company*

As early as 1619 the East India Company had complained about the weight of the ordnance for their ships 'which is only for the gunfounders' profit'; they decided to future to purchase pieces 'of lesser weight' (*CSP-EI*, vol 3, 326). The following March they noted with disapproval the increase in the price of ordnance (*ibid 3*65). In response to such concerns, which were echoed by the officers of the Navy and Ordnance, Browne began experimenting with both the form and the metal for cast-iron cannon. All over Europe during the 1620s gunfounders and gunners were trying to devise means of making lighter guns; in Sweden Gustav Adolphus promoted leather guns and in Holland guns made of a combination of wrought iron and bronze were tried. In the 16th century a type of chambered light gun was invented in Spain which was copied in the Netherlands in the 1610s and called a drake. Maurice of Orange sent these new cannon as a gift to young Prince Charles who had a special drake cast for him soon after. So it may not have been entirely John Browne's own invention when he informed the authorities he had devised new light guns made from a special iron.

The East India Company seem to have been the first to be informed when in July 1621 the court discussed a 'Project of Mr Browne an ironfounder to make ordnance of iron that shall be as light as if of brass and of as good effect.' After a brief discussion the court noted it had 'no liking to make trail of his skill therein' (B7, 11r); Browne himself was probably describing these when he boasted to the solicitor General during the Sackville Crowe crisis that he had 'produced lately two such pieces as I challenge others to do the like' (*CSPD James I, vol 5*, 639). At this time bronze cannon were still preferred by the navy and it was to break into this market that Browne developed his special guns.

Nothing further is heard about the project until November 1625 when the government asked the Navy and Ordnance officers to look into the problem of heavy iron ordnance; they were further asked to examine 'whether the iron ordinance which is now cast in Sussex be as good and pure for the mettel and as light for the weight as it was about 40 years since or what is the difference now in each kynde and the true reason that hath caused the same, for

the better discoverie whereof you are likewise hereby authorized to call before you such founders, workmen and other persons as you shall think fittest to give light and informative herein and after diligent enquiry and examination by you taken, as aforesaid, wee further think fit and require that you make certificate in writing to this Board of what you fynd touching the said abuse togeither with your opinions what cause were fittest to betaken for reformation of the same' (*APC vol 40*, 239-40).

In a suspiciously quick time a week later, on 6 December 1625, the Commissioners of the Navy reported back: that concerning 'the weight of iron ordnance, we have conferred with John Browne, the King's founder, who hopes and partly assures us (that he is able) to cast the same to be serviceable, and to endure the King's proof, and yet be as light as brass ordnance. For a time he will go down and cast two culverins, two demi-culverins and two sakers, as soon as he possibly may' (*CSPD Charles I, vol 23*, 74). Interestingly this is at exactly the same time that Browne was in London, trying to extract his £1000 down-payment for his 300 guns.

The officers discussed the implications of the new invention, particularly the advantages of lighter iron guns for the ships and the cheapness of substituting iron for the more expensive bronze (*CSPD Charles I, vol 1*, 172). However the Ordnance were clearly sceptical of the claims as relayed by Carew:

'Wee have bin informed that John Browne, His Majesty's founder of iron ordnance, hath cast sixe pieces of ordonnance for His Majesty's service which he pretends to be of lesse waight then pieces of the same height and length at the least a third part and yet to be as serviceable everyway as the former were, whereby His Majesty shalbe be advantaged many wayes if these peeces prove as serviciable as those which were a third part heavier; to the end that the True use and performance hereof may appeare, wee have thought good to pray and require your Lordship to send the master gunner of England with a sufficient proportion of powder and shott to make such triall thereof as your Lordship with the advice of the officers of the Ordnance shall find fitt for His Majesty's service as whether they will hold and endure as often discharging as the other and all other things you shall think futt in matter of this nature' (*APC, vol 40*, 342-3).

By March 1626 Browne had cast the guns in question and John Reynolds, the master gunner of England, went to Milhall to proof them and report back. He stated Browne had 'fulfilled his contract, but by reason of the lightness of those pieces they would deliver their shot uncertainly.' Carew sent the report on to Secretary Coke, with the comment 'if more are to be made the earl wishes to make known an explanation given by John Browne the gunfounder' (*CSPD Charles I, vol, 1*, 279).

If the Ordnance were sceptical, the navy was more enthusiastic, rewarding Browne with £200 in April 1626, stating that having 'been directed to see what could be done toward reforming the abuse of the overweight of iron ordnance, they had consulted divers gunfounders, but found John Browne alone willing to assist them. He had succeeded in casting 6 pieces which had endured the King's double proof, and yet were lighter than brass ordnance (*CSPD Charles I, vol 1*, 320). In June the Ordnance made out a debenture for 6 light pieces of cast-iron ordnance: 2 culverins, 2 demi-culverins and 2 sakers 'in respect of the extraordinarie charge in refyning the mettell and of the Art and workmanship in casting and framing them of such extraordinary lightness and yet to endure the His Maties double proof' (WO 49/56, 90r). In November 1626 the East India Company discussed the possibility of using the new cannons: 'As another ship cannon be made ready in due time it was proposed to strengthen the ships with better ordnance, either brass or light iron, much lighter and yet as serviceable as the other, some whereof were to be seen at Tower Wharf, but deferred until the chief commander be known' (*CSP-EI, vol 4*, 266).

The guns had two new elements; one was the special fine iron, while the other was its design, which involved a smaller, tapered chamber so that the gun fired a smaller charge. What the gun lost in long-distance shooting, it gained in lightness as the cannon was both thinner in its wall and shorter than a conventional gun, so that there was a saving on materials, while the smaller charge meant that gunpowder also went further. Exactly what Browne's new refining techniques were is also unknown, although they appear to have involved turning since the payment for guns for Pendennis castle specifies he 'agreed…the rate (in respect of the choice and fynness of the mettell, the greate

wast and losse of mettell in casting these kinds of peeces' (WO 49/58, 16v).

There was then a delay before the ' light guns' began to appear through the Ordnance Office. One stumbling block was the price of the new guns by comparison with both the normal iron guns and even bronze guns. On 13 December the Ordnance issued a debenture for 3 demi-culverins at a special price (WO 49/56, 192r). From January 1627 a number of payments for drakes went through the Ordnance office; on the 10 January he was issued with a debenture for 36 cast-iron demi-culverin drakes, as the guns were now known, and on the 16th for 7 cast-iron demi-culverins and 1 culverin (WO 49/58,11, 16v).

A new opening appeared for which the drakes seemed ideally suited. In general the navy preferred to arm its ships with bronze rather than iron guns. However in February 1628 the earl of Buckingham, the High Admiral, ordered 10 of a new class of ship to be built, the *Lion's Whelps,* to protect shipping and communities from the Dunkirkers and Barbary pirates, who haunted the waters around Britain. For these ships, designed for speed, the new light guns were a boon, and complete sets of drakes were ordered for them. These were proved in May 1628 - 20 demi-cannon drakes, 40 culverins and 40 demi-culverins, as well as 6 bronze sakers (WO 49/ 59, 80r-81r). However, these guns were in their experimental stage and there were still a number of problems in their production: the debenture bore the note; 'For the overweight of xxvi demi-cannon drakes, 40 culverin drakes and 40 demi-culverin drakes of cast-iron made of very fine metal and extraordinary workmanship being more than the estimate' (WO 49/ 59, 192r). Later that year Sir Guildford Slingsby wrote to the lords of admiralty, suggesting the demi-cannons in the *Whelps* should be exchanged for sakers or minions as they were too heavy for the decks (*CSPD Charles I, vol 3*, 392.). Throughout their working life, the captains complained of how the *Whelps* had been gunned, suggesting changes. It seems the guns did not live up to their initial promise, as after 1628 no more cast-iron drakes were ordered for several years.

However if John Browne thought that the invention of his drakes of refined iron would bring him fame, fortune and the good respects of the authorities, he was in for a disappointment. While

the government initially liked the drakes - despite the high cost, they were thought they would turn out a cheaper option at a time when the bronze foundries were in decline - they decided to forbid any general sale or export, even when they were not acquiring any new guns of their own. As early as March 1629 the Venetian ambassador described to the Doge and Senate the artillery available for arming hired ships, stating that there were two sorts in England 'the one light, invented lately, which does not weigh one half of the usual artillery,' for which it was necessary either to have a licence from the king or give heavy security for their return *(SPV vol 21*, 571). By September the government were tightening up on their control

'Upon information this day given…that divers persons do go about to buy and provide for themselves a kind of Iron ordnance called Drakes, and that in case they should be permitted so to do at this present His Majesty's stores could not be so sufficiently furnished as is fitting and necessary And for as much as it is known by experience that none of His Majesty's subjects can have the likewise use of that kind of ordnance for their private occasions as His Majesty's hath for the public, and the defence of the realm, it was therefore ordered that none of the said Ordnance called drakes should be sold to any person whatsoever until His Majesty's stores be furnished with a complete proportion thereof And that Mr Browne Founder of His Majesty's ordnance shall (as soon as conveniently he may) cast such a quantity of the said Drakes for His Majesty's service as shall be appointed by the Lord Treasurer, the master of the ordnance and Mr Chancellor of the Exchequer or any two of them, which being done it shall afterwards be lawful for such of His Majesty's subjects as shall desire it to furnish themselves with so many of the said Drakes as may be spared whereof as well the Officers of the ordnance and the said Gunfounder as all others whom it may concern (*APC vol 45*, 135).

Browne protested in vain about this policy, because it appeared to come from the very top of government; Sir John Heydon reported to Nicholas 'the king in the writer's hearing said he would give order to restrain the sale of any iron drakes' (*CSPD Charles I, vol 4*, 72). Instead of becoming freer, the policy became stricter and in March 1630, the King wrote to the Ordnance:

‘Having resolved not to permit the transportation or sale of any of the iron ordnance called drakes to any person whatsoever, they are to call to them the founder, and take account of all the iron drakes he has ever made, and how the same have been disposed of, and charge him to forbear casting or selling any new drakes, except 24 granted to the Earl of Holland, for his plantation on the coast of America, by warrant of 24 Feb. 1630 (*CSPD Charles I, vol 4*, 212).

Later in November 1630, John Browne petitioned to Lord Vere, Master of the Ordnance:

‘His Majesty has restrained all sorts of iron ordnance called drakes to his own particular service. The use of them is much desired by the King’s subjects, and no inconvenience can thereby happen; but contrariwise they may prove a preservation to their lives and goods. The Master of Trinity House will be ready to give satisfaction therein.’ He included references from Trinity House and Lord Vere, the Master of the Ordnance (*CSPD Charles I, vol 4*, 389-90).

This seemed to have the desired effect and in December 1630 Charles wrote to Lord Vere:

‘Understanding that the use of Drakes is grown common in other countries, so that our merchants will be much disadvantaged if they are debarred of them, and for other reasons presented to the Council, and by them allowed and recommended to the King’s consideration, the king permits his founder of iron ordnance to cast and make sale of Drakes to the king’s subjects, the former warrant remaining in force only against aliens (*CSPD Charles I, vol 4*, 398-99).

*Burlamachi and Browne*

However while the government were preventing Browne selling his drakes, it was actively encouraging a quite different export drive. At the time of the struggle with Sackville Crowe, a third person became involved in the trade in iron guns. In1623 Philip Burlamachi, a Protestant merchant of Italian descent with Dutch connections, was considering ways to pay for the upkeep of princess Elizabeth, whose husband had had to flee from his electorate of Heidelberg in the Thirty Years War and was then

living at the court in The Hague. Dudley Carleton wrote to Sir Dudley Carleton in October 1623 with the news that 'Burlamachi's business of the ordnance is forward, and from it is to be raised money for the King and Queen of Bohemia.' He was granted a licence to export guns to Amsterdam (*CSPD James I, vol 4*, 103.) Unfortunately Dunkirk pirates captured his ship carrying 50 pieces of artillery in March 1624 and it took Burlamachi several months after identifying the captured guns to get justice (*SPV vol 18*, 334). A second attempt to export ordnance later in 1624 seems to have met with more success. It is not known who supplied Burlamachi with these guns, but he certainly agreed with Browne's view of the industry, that 'the export of it should not be considered an offence, as it is done by another nations, and reserve only deprives the English of the benefit of the manufacture. If others can offer more for the export than he, begs that they may have it, but thinks they are only dogs in the manger' (*CSPD James I, vol 4*, 296).

James I was pleased enough with this venture to sanction it again in 1625. Burlamachi was allowed to ship to Elias Tripp of Amsterdam '328 pieces of iron ordnance, made at his own charge, after each piece is marked with its weight and quality and duly entered in the books of the Master of the Ordnance and Custom house Officers, without any duty thereon (*CSPD James I, vol 4*, 463).

A few years later, Browne was certainly involved in Burlamachi's new scheme to finance Elizabeth's family. In June 1629, the Council ordered 'the officers of the Ordnance together with HM gunfounders' to make a list 'of the number of ordnance (as well drakes as others) as have been made within this Kingdom since the first year of His Majesty's reign. And how many of them have been sold or dispose of to His Majesty, how many of them to His Majesty's subjects, with the particular names of the persons to whom the same were so sold, as likewise by what warrant and upon what caution and security not to alien them. And what number of them have been sent beyond the Seas, into what parts and by what warrants. And lastly it is ordered that all such Bonds as aforesaid given by any of the said persons for the non aliening of the said ordnance be likewise forthwith delivered over into the hands of the Lord Treasurer. Hereof as well the said officers and

founders as all other persons to whom it doth appertain the said officers are required to take knowledge and to govern themselves accordingly' (*APC vol 45*, 51).

Using this information the government was now in a better position to put the next part of the plan into operation. It was decided to sell off 4000 tons of iron ordnance 'to the United Provinces with the proceeds whereof the States are to be assisted, the King's jewels redeemed and the Queen of Bohemia paid a debt due unto her. And it is likewise ordered that for expedition herein such ordnance as may be spared out of His Majesty's stores be forthwith delivered for this service wherein Philip Burlamachi merchant is appoint...' (*APC vol 45*, 93). On 20 July 1629 the Master of the Ordnance was ordered to deliver all spare ordnance to 'Philip Burlamachi, merchant, being His Majesty's Agent for that service' (*APC vol 45*, 94). However this was not the only source of guns; on the same day it was announced that a contract for 2 years had been made with John Browne to supply Burlamacchi with ordnance (*APC vol 45*, 93).

The Ordnance office found it difficult to decide what was surplus to requirements, and 10 days later received further orders, with details of 233 iron guns from culverins to minions which were to be delivered to Burlamachi and to call in government guns on loan to merchant ships to make up any shortfall (*APC vol 45*, 114).

The Venetian ambassador sent a report back to the Doge and Senate in August 1629:

'The merchant Burlamachi is about to depart for the Netherlands. He is going for the purpose of redeeming the jewels of the Crown, which are pledged at Amsterdam for the sum of 300,00 ducats. As the money is not ready he is to make a proposal to the states, and if they are willing to supply money for the major proportion, the king here will give them in exchange a corresponding number of pieces of ordnance. For the rest I gather that there is some idea of selling those of inferior value' (*SPV, vol 22*, 157). A month later he reported that Burlamachi was still in England but 'still speaks of leaving tomorrow.' He explained further that the 'whole intrigue consists in selling several pieces of ordnance to the India Companies to redeem the jewels, in order to pawn them again' (*SPV, vol 22*, 179).

Finally, after delays caused by contrary winds, Sir Henry Mervyn of the *Lyon* was able to write to the Admiralty that he had landed Philip Burlamachi and Sir Francis Nethersole, Elizabeth's steward, at Flushing on 15 Sept 16 (*CSPD Charles I, vol 4,* 62). The Venetian Ambassador in the Netherlands updated the Doge and Senate in December 1629 on Burlamachi's progress in Amsterdam, stating he had 'finally concluded the business he had…. He has given these merchants reasonable satisfaction by the sale of a quantity of guns and artillery, transported from England to Zeeland, with which the King will have an opportunity of making money and afterwards securing the jewels' (*SPV, vol 22*, 248). By January 1630 Burlamacchi was back in England, having dodged the Dunkirkers waiting for him in the Channel. The Venetian Ambassador in the Netherlands reported that Burlamacchi had had all the gold and silver melted and turned into coin and had paid off the greater part of the debts with the guns, although some jewels were still in hands of Amsterdam merchants (*SPV, vol 22*, 262).

This successful venture was to be immediately followed up; already on 10 December a warrant was issued stating that since 'it appeareth by Certificate under the hand of John Browne, His Majesty's gunfounder, that the markets are sufficiently furnished both for His Majesty's service and the use of the subject, the Lord Treasurer is therefore prayed and required to give effectual order for the shipping (at the Ports of London, Lewes, or Rochester) and sending over of 500 tons of iron ordnance to …Burlamachi towards the making up of the 4000 tons…and likewise 200 tons of shot under the hands of George Hooker and the said John Browne may well be spared and without which the said ordnance cannot be readily and conveniently sold (*APC vol 45*, 205). Shipments were sent in January 1630 and later (*CSPD Charles I, vol 4*, 165).

However it seems the venture began to unravel; Burlamachi seems to have tried to sell on his patent while Browne complained of the deadness of the market (*CSPD Charles I, vol 4*, 435-6; *vol 5,*195). In April 1631 Browne petitioned the government. His father's old trading partner, the Dutch merchant Elias Tripp, was now heavily involved in promoting the Swedish ventures of his brother-in-law, Louis de Geer so that John found it difficult to sell his guns at the current prices. He claimed that when the contracts

were originally drawn up, it had been estimated that the sums raised would pay the crown's debts 'besides profit to the Petitioner. But that now, by reason of the great esteem of the Swedish Ordnance and by the practises of one Tripp and his company to advance the sale thereof and to hinder the importation of English Ordnance, the price was fallen from 15 guilders to 8, so that the Petitioner was altogether unable to perform his said contract, wherein he humbly sought to be relieved by the favour of this Board, either in being freed from the said contract or in being permitted to transport 3500 tons of Ordnance to any foreign parts in amity with His Majesty which would be a means still to continue the manufacture of Ordnance in this Kingdom .' The government agreed to look into the matter and see what they could do (*APC vol 46*, 297-8).

However in November 1632 Browne complained to the Lords of Admiralty that he was forced to transport his guns in Dutch ships because the Navy gave him no convoy and that Burlamachi and Tripp were allowed to bring their ships up river as far as Upnor Castle, which privilege he was refused. He claimed his 'hoys are not allowed to come further than Gillingham, whereas Dutch hoys, which bring not 20s a time profit to his Majesty, go clear through the Navy up to Rochester town quay.' He asked to be allowed the same privilege. (*CSPD Charles I, vol 5*, 443). The matter was referred back to the Navy and Admiralty, who reported back in March 1633 that the 'Masters Attendant of the Navy do not remember any Dutch vessels brought up to Upnor Castle in the time of Burlamachi and Tripp; vessels may safely receive their lading in at Gillingham, which is not distant a mile from Upnor; Dutch vessels that go up to Rochester obtain leave and bring commodities for that city and country. Mr Browne was not prohibited by Capt Pett alone, but by the general consent of the writers, who conceived that it might prove prejudicial that strangers should have access to that river, having opportunity thereby to sound the same, and view the strength of the castle and barricade' (*CSPD Charles I, vol 5*, 443). A few years later there was gossip in court circles that Burlamacchi may have sold off some of the jewels as well as hints of Sir Sackville Crowe's involvement while Browne claimed that he had lost much money from the venture (*CSPD,Charles I, Vol 7*, 611).

*Workforce and transport*

John Browne ran a furnace on the borders of Brenchley and Horsmonden in Kent, which his father Thomas Browne had worked before him, as well as a second works at Barden. By the 1640s he was also working at Cowden, possibly because a third furnace was needed once the bronze foundry was established. He claimed to employ 200 men and clearly this created difficulties (*CSPD James I, Vol 3*, 12) The government wanted to establish a Provost marshal in 1617 in Sussex, because the ironworks on the borders of Kent and Sussex drew a multitude of rogues and beggars, implying that they looked upon the area as something akin to the lawless wild west rather than the site of a respectable concern (*CSPD James I, vol 2*, 460). When Sir James Hope visited Barden in 1646 he commented the chief founder and moulder were 'most part drunke' (*WIRG vol 4*, 18).

But there were other issues. By the 1620s, if England could see no advantage in encouraging its gunfounding industry, other countries could appreciate the benefits of producing their own cast-iron cannon. The quickest way to do this was to poach experienced workmen and get them to set up or improve foreign works. Such a case occurred in June 1627, when 'one Michel Donnevide, a Frenchman' was apprehended in Kent on suspicion of attempting 'by sinister means to debauch and entice some of the workmen employed in his Majesty's workes in casting of iron ordinance under John Browne, of Brenchley in the said county, his Majesty's gunfounder, and secretly convey them in the parts beyond the seas'. Donnevide was ordered to be taken in front of the Attorney General; the government were worried such happenings could 'turn to the great prejudices of his Majesty's service and the hurte of this realme, by carriing that arte into forrain countries where it is not yett knowne' (*APC vol 42*, 368). A further warning was sent to Browne, that 'we have been informed that there are diverse ill disposed persons, that go about to seduce and draw away your workmen that are imployed by you in that your place of his Majesty's gunfounder of iron ordnance and to convaye them over the seas, whereby his Majesty's service will be neglected, and other inconveniences come upon it; these

are therefore to will and command you to use all the dilligence and vigilance that you can, to observe and finde out any such person or persons that endeavour or goe about to debauch or draw away any of your said workmen from their worke, and if by such means any of them be esloined or gone from you, that you cause them to be apprehended and brought back and putt in safe custody until they putt in good security not to depart the kingdom, and likewise that you apprehend all such persons as have persuaded them to forsake their work, as aforesaid. And for the better enabling of you to perform this service, wee doe hereby will and command all mayors, JPs, constables, and all other his Majesty's officers, to be aiding and assisting unto you' (*APC vol 42*, 379). Sackville Crowe also came under suspicion that he had colluded with the Frenchmen.

However it was not merely foreign governments who were enticing Browne's servants; the Stuarts' own policies had a similar effect. James gave a patent to Nathaniel Edwards and James Galloway 'for casting iron ordnance in Scotland'. They complained that workmen they had hired were stopped on their journey and he and they were ordered to appear before Council (*CSPD James I, vol 3*, 474). John Browne had had them stopped, stating that the king himself had 'for the preservation of the sole making of iron ordnance and shot within this kingdom, prohibited the departure of all men versed in that mystery, as a thing of great consequence and not fit to be imported to any other nation, but one Nathaniel Edwards, by cover of a warrant from the King, has enticed away divers of petitioner's workmen to go beyond seas in discovery of the said mystery to other nations' (*CSPD Charles I, vol 23*, 429). As a *quid pro quo*, Browne was required to 'entertain and employ (the workmen) in such sort that they may have no just cause for want of employment here to seek work in any other place. And it is further ordered that the persons hereunder specified shall attend His Majesty's service here in like manner as the other under the aforesaid John Browne and if it so chance that he do not set them on work they may freely seek employment elsewhere. The list of workmen included under the titles of Founders and Fillers were Drew Taylor and his son, John Tylor, Richard Tyler, John Barten, William Jarret, Stephen Bugue, Charles Taylor and his son, Robert Lallam and his son, John

Daniel, Charles Hooke, Thomas Jarret, Christopher Jarret, William Wimble, William Bassage, Richard Gower, Edward Tully and his two men, Richard Rolfe, William Shoobridge and two sons, besides the one before named, John Durant, Thomas Wickinge, William Wattes, John Tully, Thomas Shoebridge (*APC vol 44*, 71-2)

We have already seen in the discussion of the Burlamacchi venture how Browne's guns were shipped from Gillingham for the Dutch markets, but other means were available for moving the guns. The government's dire need of artillery in the late 1620s meant that Browne could pull some strings; The Privy Council wrote to the Justices in Kent and Sussex in July 1628, stating they had been informed 'that the Highways that lead to and from His Majesty's iron mills are so foul that the Ordnance and shot made there cannot be carried from thence without great difficulty and danger of sinking the carriages and spoiling the horses; we do therefore hereby require and in His Majesty's name expressly charge you to take present and effective order, for repairing and amending of the said highways in such manner as they may be passable without danger but to His Majesty's loving subjects who have occasion to travel those ways and also for the passing of the Ordnance and shot from the aforesaid Mills (*APC vol 44*, 71). A year later the Privy Council had to write again, this time asking the JPs to assist in dropping cases against Browne and his servants, who had made difficulties over paying for the improvements to the roads as he was now 'willing to pay as much as any other Iron masters towards the mending of the said ways (*APC vol 46*, 88). Moreover, moving by water was not without difficulties; river rights were jealously guarded and boats 'laden with His Majesty's ordnance' going from Twyford to Maidstone' were stopped by one landowner who claimed it was his private stream (*APC vol 45*, 308-09).

*The early 1630s: Sweden bites deep - and other rivals*

John Browne later claimed that the Burlamachi affair forced him to look for markets in other parts of Europe. Unable to sell his guns in the Netherlands, he asked permission 'to transport 4 demi-culverins of cast-iron and 400 single demi-culverin shot to the

parts of Italy' in December 1631 (*CSPD Charles I, vol 5*, 195). After this was granted, Browne then needed a special favour from the Admiralty and requested to 'borrow' James Allen, gunner of the *Constant Reformation*, to send him to Marseilles and Genoa to prove some pieces of ordnance. He explained his buyers intended 'to prove them there with a far greater proof than is used here, and by that means would break most of the pieces sent to the writer's exceeding loss, and to the great disgrace of the English pieces, by which the manufacture would be much damnified.' Slyly he added, 'the Swedish merchant sends a gunner along with his pieces to prevent this danger' (*CSPD Charles I, vol 5*, 531.). In March 1633 the Admiralty agreed to Allen's absence for ten months (ibid, 554).

This short exchange brings attention to the rise of the Swedish iron industry, the only serious rival not only to Browne but also to the future founders in the Weald. Browne's former clients, the Dutch arms dealers of Amsterdam had not been content to wait for English policy on export of iron ordnance to change. Instead they had invested in the new iron industry in Sweden and began now to exploit their new resource. Within a very short time, Swedish guns were available on the continent and winning customers with their quality and cheapness. They were particularly welcome in countries which did not wish to be dependent on England, such as France and the Netherlands.

John Browne sought to bolster his position and petitioned the government in 1633: 'The making of iron ordnance was first found out in this kingdom, and foreign kingdoms used to be supplied at the will of this state, but within a few years Sweden has endeavoured by underselling to engross the markets beyond the seas, and there is fear that, as the musket-makers being near 80 families, were enforced, in king James's time, to transplant themselves and their manufactory to the Hollanders, the like will happen to the workmen in iron ordnance, whereupon, as in the first year of his reign, the king had to buy muskets from strangers, so on any sudden occasion he will have to do with iron ordnance. To prevent which the writer proposes to his Majesty to grant various patents of privilege to the makers of iron ordnance, and among them one for the sole making of cast-iron pots, kettles, backs, salt-pans and soap-pans' (*CSPD Charles I, vol 6*, 358-9).

However the cost of obtaining these monopolies was itself crippling. About 1634 Browne wrote that he was unable to fulfil his contract to export 6,000 tons of ordnance, and that the experience had left very much in debt, having paid £18,000 for the privilege. He blamed 'the Swedish merchants, who being desirous to supplant the English in their trade in iron ordnance have undersold the Petitioner by reason of the large privileges they have from the state of Sweden. Prays the King to take the transportation of ordnance and shot into his own hands, and to order the payment to Petitioner of moneys paid by him for ordnance not transported; also to give Petitioner such privileges as the alum farmers have, to enable Petitioner to continue his workmen in employment (*CSPD Charles I, vol 7,* 385). Shortly after, he was forced to write that 'Has engaged himself and his friends to the value of £26,000 and being unable to appease the violent demands of several men, prays a protection for three years for himself and for his sureties (*CSPD Charles I, vol 7*, 385).

However not all Browne's rivals were living in Sweden or in the merchant palaces of Amsterdam; he objected to the petition of Thomas Petyward who asked the Admiralty for permission to ship 16 guns from Sussex instead of London the 'ways being deep' (*CSPD Charles I, vol 6*, 218). Browne wrote to the Admiralty that this request to export guns from Lewes 'is altogether against the King's orders and articles, and against the contract made with the writer that none should make nor transport ordnance but only himself.' He further pointed out this was not an innocent request, that 'Thomas Petyward and Roger Petyward his brother have combined with William Relfe, an ironmaster, for making shot and are now encouraged by the writer's sufferance to impeach his sale and making of ordnance. Prays him to be a means that the Lords of the Admiralty may understand those things' (*CSPD Charles I, vol 6*, 227). Relfe was the ironmaster at Ashburnham furnace.

Meanwhile Sir Sackville Crow was still a minor thorn in Browne's flesh. He and Browne had earlier come to an agreement to share the gunfounding market, then Sir Sackville Crow had been persuaded to give up his patent and later wrote to King Charles, 'On King's command petitioner resigned two patents which he had improved, so that they would have been worth to petitioner £4,000 per annum. They were the best part of his

subsistence, and the only favour he receive at Court after 14 years service. Some satisfaction was allotted to him, which though it were not the third part of the value of those grants, yet it was acknowledged by petitioner with all thankfulness. Almost five years are past during which he has no ways importuned the King, but from day to day has attended the performance of his Majesty's intended grace to him, but that which his Majesty directed for his satisfaction has not been made good.' He claimed he was still owed thousands of pounds for his patents, which presumably was one of the reasons Browne was in financial troubles. Now Sir Sackville proposed to make iron guns in the Kings works in the Forest of Dean instead (*CSPD Charles I, vol 6*, 307).

Abbreviations

*APC - Acts of the Privy Council of England* (46 volumes). 1890-1964.
*CSPD Charles I - Calendar of State Papers, Domestic: Charles I* (23 volumes) 1853-189.
*CSPD James I - Calendar of State Papers, Domestic: James I* (5 volumes). 1857-1872
CSP-EI - Calendar of State Papers, Colonial Series: East Indies, China and Japan 1513-1634 *(5 volumes) 1862-1892*
*SPV – State Papers and Manuscripts relating to English Affairs, existing in the Archives and Collections of Venice, and in other Libraries of Northern Italy* (38 volumes) 1864-1947
WIRG - Wealden Iron Research Group Bulletin, 4 (1972)

*Manuscript Sources*
WO/49 - Ordnance Office Bill books, Public Record Office, Kew.
B - Court Minutes of the East India Company, British Library, London

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# MR LITTLETON; SUPPLIER OF ORDNANCE MATERIAL

**JEREMY GREENWOOD**

The outbreak of the Second Dutch War (1665-7) found the Board of Ordnance unprepared as ever. A desperate shortage of shot led them to inquire of George Browne - His Majesty's gunfounder - as to the extent of his manufacturing capacity. His reply includes a reference to 'Mr Littleton'.[1] Not being able to identify him from the standard works, a desktop investigation was initiated.

This revealed that a James Littleton had rented Woodcock furnace from the Gages although it was then (1665) in the hands of Jeremiah Johnson.[2] The only other references to a person of such a name relate to a London merchant.[3]. Were the merchant and ironfounder the same? Other examples of investment by London merchants in Wealden ironmaking abound, e.g. Westernes, Bakers. The final fact is provided by John Browne's will of 1651 which reveals Littleton was Browne's son in law.[4]

**Notes and References**

1. R. R. Brown, 'Notes on Wealden furnaces in the records of the Board of Ordnance, 1660-1700', *Wealden Iron*, 2nd ser., **13** (1993), 22.
2. East Sussex Record Office, Lewes, SAS/G33/69, G43/52.
3. Wiltshire Record Office, Salisbury, 212A/38/26/1; The National Archives, Kew, SP 82/12 f.46, 68, J.R. Woodhead, *The Rulers of London 1660-1689* (1966) *per* British History online.
4. Centre for Kentish Studies, Maidstone, TR1295/23.

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