Wealden Iron

Second Series
No. 22 2002

Bulletin of the
Wealden Iron
Research Group

ISSN 0266-4402

WEALDEN IRON RESEARCH GROUP
Bulletin No. 22, Second Series
2002

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Published by the Wealden Iron Research Group in collaboration with the West Sussex County Council Planning Department

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Field Notes

compiled by J. S. Hodgkinson

A bloomery in Beckley, East Sussex

A bloomery has been discovered by members of the Hastings Area Archaeological Research Group in Waterfall Wood, Beckley (TQ 8639 2138). The site lies above the bank of a gill close to one of two eponymous waterfalls. The central part of Beckley and Waterfall Woods occupies a cap of Wadhurst Clay, which is sharply faulted on the east side, close to this site.

A bloomery in Brightling, East Sussex

A concentration of bloomery slag has been discovered at the edge of a field on Perryman's Farm, Brightling (TQ 6825 2245).

Two bloomeries in Burwash, East Sussex

A substantial area of bloomery slag, including much tap slag, has been found in Park Wood, Burwash (TQ 6897 2599). The slag extends for about 70 metres along the east side of a gill, and for about 25m back from the stream. Slag is also evident in an area of about 400m on the opposite bank. Trial trenching in October 2001 failed to locate any datable material in the slag heap. A cap of Wadhurst Clay lies across the ridge followed by the A265 Burwash-Etchingham road, and Park Wood is on its north side. A much-weathered exposure of ore was found in the bank of the same gill as the bloomery, about 150m to the north, close to the edge of the wood.

A further concentration of bloomery slag, again with pieces of tap slag, has been found at the head of a small gill (TQ 6922 2525), part of Borders Farm, Etchingham. This site lies to the south of the same road and would have been able to exploit ore from the same

clay outcrop.

We are most grateful to Mr Mike Tebbett, the farmer, for informing us of these sites, and for passing on information about the landscape history and archaeology of Park Wood.

A bloomery in Kirdford, West Sussex

Bloomery slag has been found in the suggestively named Firey Field (TQ 032297), close to the boundary with Loxwood parish. Pieces of cinder from within a furnace, together with small pieces of tap slag and some fragments of furnace lining have been found close to the eastern and southern edges of the field, about 80m and 120m, respectively, from the south-east corner. The pieces of slag had been considerably dispersed by ploughing and, owing to the field being under cultivation at the time of visit, it was not possible to ascertain if slag was distributed over the intervening area.

Just inside the shaw east of the field are two shallow, elongated depressions, which were water-filled when seen. It is possible that these were the source for ore, although they lay just over the boundary into Loxwood. Fragments of coarse medieval pottery were also found scattered with the slag near the eastern edge of the field.

We are most grateful to Mr Mark Knight for informing us of this site and of subsequently locating a hitherto un-noted reference to it.[1]

Four bloomeries in Hartfield, East Sussex

Peter Goodall

For the first foray of 2002 the Field Group returned to the area around Blackham where, when first visited in November and December 2000, three new bloomery sites were found and one investigated. Attention at that time was concentrated at Tollhurst Farm situated at the eastern end of a block of land lying just north of the East Grinstead to Tunbridge Wells Road. (A264), on a north-facing slope. The latest foray took place at the western end of the block, some 1250 metres from the previous sites, lying, strictly

speaking, within the parish of Cowden. The location chosen for the foray was a triangular shaped piece of land, its base, the southern end, being the A264 and its sides two heavily wooded streams lying in gullies, the western adjacent to the Hartfield Road (B2026), and the eastern forming a field boundary some 600 metres away. The triangle, having an area of about 100 acres, lay with its apex to the south of Hethe Place (TQ 4797 3972), the enclosed ground divided roughly between woodland (for the most part Cullinghurst Wood) and pasture (part of Hethe Place Farm). The main block of woodland, on average some 300 metres from north to south, was found to contain a considerable number of minepits of uncertain age and of varying depths and surface areas together with indications of trackways running generally north/south through the wood. It was noticeable that the southern limit of the pits formed a line roughly parallel to the road and about 150 metres from it, corresponding with the boundary of the Ashdown Sand in that area as determined by The Geological Survey,

Whilst no evidence of ore processing or smelting was found within the main body of woodland, traces of bloomery slag were discovered at its edge, at a point (TQ 4825 3950) on the stream system leading to the eastern-most gully. Some 70 metres north of this location along this gully (TQ 4815 3953) a number of large pieces of slag were found partially buried in the stream bank and lying partly below the water level at the time. The cluster included one piece 40cm x 47cm x 22cm thick. Nearby, on the opposite bank, a piece of slag, curved in plan and about 20cm long, thought to be part of a furnace bottom, was discovered and removed for further examination. Similar pieces, perhaps from a separate source, were found a further 50 metres along the stream at TQ 4800 3965. A search of the western gully revealed two deposits of slag again along the bed of the stream. The first was at TQ 4775 3960 (but with the possibility of it having been moved to that position by earth slip or land drainage works in the adjacent field) and the second was at TQ 4765 3935, at the confluence of the

main and a subsidiary stream to which point a man-made water course had, at some time been constructed.

A Romano-British ore-roasting pit in Beckley, East Sussex

Continuing excavations by members of the Hastings Area Archaeological Research Group, at Glossams Place in Beckley Woods, have revealed an ore-roasting pit associated with the substantial ironworking site identified beneath the remains of a medieval manor house. The pit, which survived to a depth of 20cm contained unroasted ore, slag and charcoal, as well as roasted ore.[2]

Notes and References

1. C.H. Bayley, *Ifold, Loxwood & Plaistow – forgotten border villages,* (Ifold and District Local History Society 1988), 93.
2. A. Woodcock, 'Excavations at Glesham (Glossams Place) in Beckley', *HAARG Journal*, New Series **12** (Winter 2001), 2-4, 6; D. Padgham, pers com.

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Two Possible Medieval Bloomery Sites in Alfold, Surrey

Judie English

Fieldwork at two high status medieval settlement sites in the Weald of Surrey has produced bloomery tap slag. At Great Wildwood Golf Course the slag was found close to a moated site and in a context insecurely dated to the late 12th or early 13th century. At Monktonhook the slag was found during fieldwalking on a site known to have been occupied from at least 1325 until the mid-20th century.

Great Wildwood Golf Course

Background

The development of a golf course at Great Wildwood Farm, Alfold resulted in extensive disturbance over 75ha in the immediate vicinity

of the moated site in Wildwood Copse (TQ 0505 3525). During the summer of 1990 ploughed land was fieldwalked whilst the course was being built. Four scatters of worked flint were found and have already been published (English, 1991) and medieval pottery was located in a field immediately adjacent and north west of the moat (English, unpublished). This report concerns a single context producing bloomery tap slag and associated pottery.

Geology and topography

The Wildwood estate lies in an area of Weald clay with a narrow band of alluvial deposits on either side of the small stream which forms the southern leg of the moat. The area is essentially flat and lies between 55 and 65m OD.

Documentary evidence

"La Wylwode" is first mentioned in a deed of 1294/5 (Giuseppi, 1903). In 1313 "le Wylwode" was held by John D'Abernon as part of Albury manor, held in turn of the Honour of Clare (Manning and Bray 1804-14) and in 1327 a survey of Albury manor includes "*XL acr boscis querci ni cujus pastura val p v s et non plus pro umbra arborum*" which probably refers to Wildwood.[1] The contrast recognised here seems to be between wood pasture and woodland where only sparse grazing, or possibly pannage, was available. Buildings are first mentioned in 1391 when Elizabeth Grey, lady of Stoke D'Abernon, granted the soil and wood of Wildwood except the moat, grange and manorial rights (Manning & Bray, 1804-14). The moated site in Wildwood Copse lay within a detached portion of Albury parish until rationalisation of the boundaries in the late nineteenth century and it seems likely that this represented the demesne of the sub-infeudated manor of Wildwood.

Fieldwork

During development of the golf course it became apparent that extensive earth movement was taking place. The topsoil of the entire area to a depth of at least 30cm was disturbed and much of it

moved around the area of the course – most of that area must now be considered to have had any archaeology present irretrievably damaged. All available ploughed land was fieldwalked.

In the field immediately to the north west of the moat a scatter of medieval pottery was found in an area of approximately 60m x 60m centred on TQ 0500 3539. This pottery has been dated to between the late twelfth and the fourteenth or fifteenth centuries (Phil Jones, pers comm).

In part of this area the soil was notably dark in colour and when an irrigation trench 40-50cm deep was dug across the field an opportunity to investigate the cause was provided. No signs of any structure were found but 1.7kg of bloomery tap slag and eight sherds of pottery, including two rims, were recovered from the base of the trench. Whilst this could not be considered a sealed context, an association between these finds seems likely. All eight sherds are of coarse shell-tempered S2 ware. The rim sherds of the two cooking pots are in styles that were current during the late twelfth and thirteenth centuries. The absence of any ware other than shelly S2 suggests the possibility that the sampled context had been of twelfth century date, but as only eight sherds are involved, it could as easily have been deposited in the thirteenth century (Phil Jones, pers comm).

Monktonhook

Background

Monktonhook Farm was deserted in the middle of the twentieth century but was reputed to have been the location of a grange of Waverley Abbey. Ploughing during the mid-1990s encroached closer to the site of the last house than had been normal and the opportunity was taken to fieldwalk the area in an attempt to locate the medieval occupation site.

Geology and topography

Monktonhook was situated on Weald Clay at 65m OD close to the watershed between the rivers Wey and Arun which marks the county boundary between Surrey and Sussex.

Documentary evidence

The earliest surviving reference to Monktonhook dates to 1325 (Gover *et al,* 1934) and this holding may be that claimed by the Abbot of Waverley in 1346 (Malden, 1911). At the dissolution of the Abbey the property is listed amongst those granted to William Fitz William. The site is located close to the junction of two paths, one running east/west along the county boundary and the other running southwards from Guildford, through Alfold into Sussex. Prior to the creation in 1809 of a turnpike road through Alfold Crossways (Budgen, 1991/2) however, these represented the major route between Guildford and Horsham.

Fieldwork

Fieldwalking produced large amounts of pottery and building material dating to between the fourteenth and twentieth centuries. In one location (TQ 0503 3356) a concentration of bloomery tap slag was found together with fourteenth century Coarse Border Ware pottery. These were surface finds and the association may be artefactual.

Discussion

Neither structural nor documentary evidence of ironworking has been found at either of these sites but the presence of bloomery tap slag, in one case in close association with twelfth or thirteenth century pottery, suggests that their economy may have included the production of iron. Both sites represent detached outliers of extra-Wealden parent holdings, in one case ecclesiastical and the other secular; a position seen elsewhere in Surrey in the licensing by the steward of Banstead manor in 1372 for ore digging at the Wealden

outlier of Horley (Cleere & Crossley, 1985).

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Budgen, C. (1991/2). 'The Bramley and Rudgwick Turnpike Trust', *Surrey Archaeological Collections,* 81, 97-102.

Cleere, H. & Crossley, D. (1985). *The Iron Industry of the Weald.* Leicester University Press.

English, J. (1991). 'Flintworking sites at Great Wildwood, Alfold', *SyAS Bull,* 255.

Giuseppi, M. S. (1903). 'Deeds, etc., in the Society's Library'. *SyAC*, **18**, 222.

Gover, J. E. B., Mawer, A. & Stenton, F. M. (1934). *The Place-names of Surrey.* English Place-name Society.

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Malden, H. E. (1911). *A History of the County of Surrey.* The Victoria History of the Counties of England.

Notes and References

1. Surrey Record Office, Woking, G 1322/4/56

Iron Plat, Queenstock Hammer Pond and a 15th-Century Ironworking Site at Buxted

Pam Combes & Christopher Whittick

Three tantalisingly early references to ironworks in Buxted have been discovered, the first two by Brian Awty and the third by Judith Brent, in the course of the last twelve months. The purpose of this article is to locate the furnace or furnaces mentioned in two grants of land by the manor of South Malling in 1509, and to establish whether either of the two Buxted hammer ponds rated for the new cut at Newhaven in 1537 can be identified with the same site.

The documentary research upon which our conclusions have been based, although far from exhaustive, has involved a minute investigation of the records of land-ownership, and only a summary can be presented here. The three texts are:

1. Court for the manor of South Malling, 12 July 1509

> To this court comes Robert Mauncer the younger and takes from the lord's hands three crofts of old assart containing by estimation five acres <of land>[1] and a half in the ward of [*blank*] with its appurtenances in Buxted, lying by the furnace in the aforesaid parish, the which lands lay for the making of iron in the days of Lord John Morton, cardinal and archbishop of Canterbury [*died 1500*]

2. Court for the manor of South Malling, 17 December 1509

> To this court comes Thomas Hudson and takes from the lord's hands [certain lands *deleted*] a piece of waste land of new assart lying at the furnace <containing by estimation four acres of

land> now lying in the lord's hands, formerly Wodye's, and lately called [Jenyns and Je *deleted*] Jenensy and Jenynsy Medue [which came into the lord's hands after the wasting of the pond (*post vastationem stangni*) there *deleted*], <lying with its appurtenances in Buxted>, to whom the lord by his steward granted [it], to hold to him, his heirs and assigns at the will of the lords according to the custom of the manor by the rent and service thereof due and accustomed. And he gives to the lord for a fine to enrol such an estate [*blank*] and does fealty and has seisin by the rod

Draft court book of the manor of South Malling: Public Record Office, SC2/206/34, f121, 128V (microfilm at ESRO XA 77)

3. Inquest before commissioners of sewers at Uckfield, 25 May 1537

Buxted: all such lands hereafter following lieth in the level of the sewers and is once in the year surrounded by fresh water and payable to the common scot of the sewers:

includes:

William Olyffe hath in the hammer pond at Quenstoke	6 acres
Thomas Hudson in the same pond	3 acres
Thomas at Well in the hammer pond at Oborne [Howbourne]	3 acres
John Page hath in the same pond	½ acre

East Sussex Record Office GLY 84

A tributary of the river Ouse running southwards towards Buxted Mill and referred to by Straker as the Uckfield River formed, with one exception, the boundary between New House Farm on its west bank and Totease Farm on its east in 1840. That exception is a small field called Iron Plat which, although on the East side of the stream, formed part of New House Farm.[2] Straker identified Iron Plat as an ironworking site; further fieldwork was undertaken there in 1990-91.[3]

Totease Farm, east of the stream, was purchased by the Buxted Park Estate in 1859 and the map attached to the conveyance forms Figure 1.[4] Of immediate significance among the field-names of the

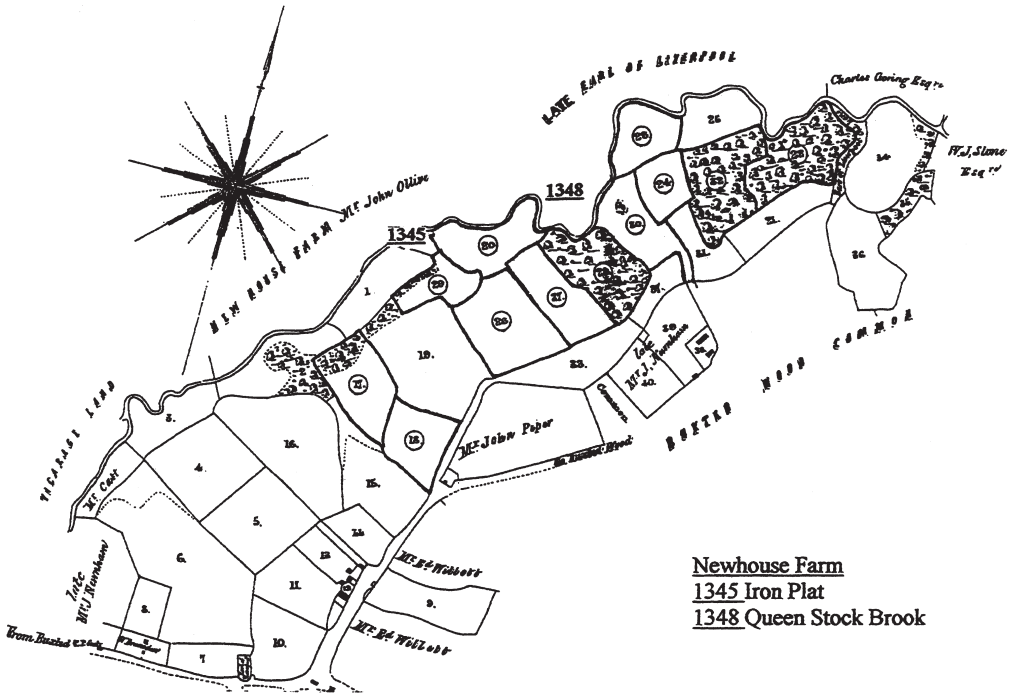

Figure 1: Totease Farm in 1859

Map from the conveyance of 1859 (ESRO SAS/FB 693); four-figure numbers added for relevant fields of Newhouse Farm (see key) from the Buxted tithe map of 1840 (ESRO TD/E 135)

REFERENCE

No	Names of Fields	Quantity A	R	P
	— BRUNSDENS —			
1	Upper Reeves Bottom	3	1	31
2.	Middle Dº	4	2	29
3	Lower Dº	2	3	8
4	Brook Field	5	2	24
5.	High Dº	5	1	31
6	Hollow Dº	12	0	16
7	Little Meadow	1	3	3
8	Malthouse Hop Garden	1	2	12
	Total	37	1	34
	— PINGARDEN. —			
9	Kiln Field	2	2	32
10	Forcast Meadow	3	3	26
11	Barn Dº	3	1	17
12	Site and Lane	1	1	6
13	House Hop Garden	1	0	9
14	Lodge Field	2	0	29
15	Spring Meadow	5	0	16
	Carrd Forrd	19	2	15

No	Names of Fields	Quantity A	R	P
	Brot forward	19	2	15
16	Cow Field	8	0	13
17	Lower Percys	4	0	18
18	Upper Dº	3	3	18
19	Banky Field	8	0	8
20	Pond Bottom	3	3	33
21	Long Field	2	3	32
22	Part of the Great Wood	6	0	32
	Total	56	3	11
	— ROSELEGE —			
23	Bridge Bottom	3	0	11
24	Queen Stock Meador	2	1	24
25	Huggetts Brook	3	1	7
	Total	8	3	8
	Brunsdens	37	1	34
	Pingarden	56	3	11
	Total Freehold	103	0	13

No	Names of Fields	Quantity A	R	P
	Copyhold.			
26	Jenny's Mead	5	3	37
27	Dº Dº Hop Garden	3	2	13
28	Mine Pit Wood	4	3	37
29	Bingate Meadow	2	1	33
30	Rough Pasture with Lane	3	2	20
31	Rocky Field	2	0	32
32	Part of Great Wood	4	3	8
33	Common Plot	4	0	32
34	Carrs Field	5	2	33
35	Dº Shaw	1	0	16
36	Dº Plot	4	1	35
37	The Wood Slip	1	3	10
	— NEWHAMS. —			
38	Two Cottages in 3 Tenements	0	2	33
39	House Meadow	3	0	28
40	Common Field	2	2	0
		6	1	21
	Total Copyhold	51	1	12
	Total Freeholds	103	0	13
	A.	154	1	26

154-acre estate are plots 26 and 27 (tithe numbers 77 and 79), Jenny's Mead and Jenny's Mead Hopgarden. Although their combined area of over nine acres forms a poor match with the four acres of the grant to Thomas Hudson in 1509, Pond Bottom, the neighbouring field to the West (plot 20, tithe 72), at almost four acres provides a virtually perfect fit. Both its name, Pond Bottom, and its location between the stream and Jenny's Mead, satisfy the description contained in the grant, and provide a topographical context for its presence in the lord's hands after the destruction of the hammer pond had returned it to dry land. It is, furthermore, immediately upstream from Iron Plat. To confirm the location, in about 1570 a later Thomas Hudson also held nine acres 'lying to the great water of the furnace on the East'. In 1840 the manor of Framfield associated the land with plots 27 (Jenny's Mead Hopgarden) and 28 (Mine Pit Wood).[5]

Further examination of the map of 1859 reveals the name Queenstock applied to a 2¼-acre meadow upstream from Jenny's Mead (plot 24); the tithe map of 1840 also uses *Queen Stock Wood* (tithe 88) for the 1859 map's Great Wood (plots 22 and 32), and the name is also present, in the form *Queen Stock Brook* (tithe 1348), on the New House land on the west side of the stream.[6]

It is therefore possible, on the evidence of the Buxted tithe map and a conveyance of 1859, to associate the grant to Thomas Hudson in 1509 with the area described as Queenstock Hammer Pond in 1537.

In the middle years of the sixteenth century the lordship of South Malling, which had belonged to the archbishops of Canterbury since before the conquest, was acquired by the Crown and split into the three manors of Ringmer (covering Ringmer, Cliffe and South Malling), Framfield (Framfield, Buxted and parts of Withyham) and Mayfield (Mayfield and Wadhurst). To learn more about the site it is necessary to examine two surveys of the manor of Framfield made in about 1570 and in 1617, and a rental of 1810 which purports to relate contemporary descriptions to those in the earlier surveys, an attempt

followed by the schedule to the conveyance of 1859.[7]

The survey of 1617 reveals that the boundaries of both New House and Totease Farms had substantially formed by that date. New House was owned by William Olive (John Olive still held it in 1859) and Totease by George Burgess.[8] What was later to become the southernmost portions of both farms was in 1617 part of the demesne of Thomas Baker's manor of Totease, itself held as a tenement of the manor of Framfield.[9]

The descent of New House Farm has not been followed in detail, but it seems clear that it was owned by the Olive family from before 1537 until after 1859.[10] The survey of 1617 demonstrates that George Burgess's title to Totease Farm was a relatively recent acquisition. In 1604 he had been admitted to nine acres called Newlands (except half an acre with a house built on it) on the surrender of his mother Alice Burgess; this can be identified with land owned in about 1570 by Thomas Hudson, described as lying East of 'the great water of the furnace'.[11] In 1608 Burgess purchased the larger element of the estate from Elizabeth Wells of Buxted, widow, in a transaction which combined freehold and copyhold land. In 1617 the freehold consisted of a messuage and two pieces of land called Pursers and Hammercroft (7½ acres) and another piece called The Hills (½ acre); the copyhold included a bingate by the messuage of Thomas Hudson, deceased, and a four-acre piece of middle assart at the Furnace, lately called Jenens Eye and Jenens Eye Mead, formerly Woody.[12] Reference to the map of 1859 allows us to identify Pursers and Hammercroft with Upper and Lower Percys (plots 17 and 18, tithe 73 and 74), and the bingate with Bingate Meadow (plot 29, tithe 71).

The location of these plots demonstrates that Thomas Hudson acquired the four acres of former furnace pond in 1509 because it was next to his house, the 'bingate' or yard of which lay immediately to the South, plot 29 on the map of 1859. He still occupied the land in 1537, when three acres of it was subject to water-scot; William Olive,

the other occupier of land in Queenstock Hammer Pond in 1537, was the owner of New House Farm on the west bank of the stream. The term Queenstock, later to apply to a bridge some 750 metres to the north carrying Fowly Lane across the stream, seems from the field-names unequivocally to apply to the land a little above Iron Plat and Hudson's house; the original Queenstock Bridge, first mentioned in 1509,[13] is likely to have traversed the stream immediately west of Bridge Bottom (plot 23) within plot 30 ('Rough Pasture with Lane'), where a footpath still crosses at TQ 501244.[14]

What of the land granted to Robert Manser in 1509? Possibly it lay on the west side of the stream opposite the land granted to Hudson, was subsequently absorbed in New House Farm and is to be identified with the land in Queenstock Hammer Pond held in 1537 by William Olive. It is unlikely to be associated with Howbourne, where a hammer pond was certainly in existence in 1537. Howbourne was a sub-manor of South Malling owned by the Atwell family, and the archbishop had no need to site an ironworking operation on land with such independent tenure. Furthermore, the wording of the grants of 1509 assumes that only one furnace was then to be found in the parish of Buxted. The only hint in the 1617 survey is provided by abuttals to part of Goldsmith Hudson's holding, which lay on the 'main river' adjoining land of William Henslowe, described as 'late Monser'. Henslow's holding has not been precisely located, but at least parts of it abutted a road from Queenstock Bridge.[15]

There, until the matter can be clarified by fieldwork and further documentary research, the question must rest. It seems certain that the ironworking site hitherto referred to as Iron Plat should now be called Queenstock Furnace. The discovery of evidence for a forge at the same location, coupled with the terms *Queenstock Hammer pond* in 1537 and the field-name *Hammer Croft*, perhaps suggest a double operation. The proximity of the manor of Totease, the property of the Baker family of ironmasters, to the site is worthy of further investigation; the presence of William Levett's Buxted Rectory and

the Hogge House within half a mile of Queenstock must at least call into question the traditional attribution to Oldlands of the origin of cannon-founding in England.

Notes and References

1. Material in angle brackets added to the text in a contemporary hand.
2. E(ast) S(ussex) R(ecord) O(ffice) TD 135 (Buxted tithe map).
3. Ernest Straker *Wealden Iron* (1931) 390; H Cleere and D Crossley *The iron Industry of the Weald* (second edition, 1995) 339, 387; D M Meades and R G Houghton in WIRG*, Wealden Iron,* 2nd series **12** (1992) 23-6.
4. ESRO SAS/FB 693.
5. ESRO AMS 5843 f34v, ADA126 f54; see also ADA 139 p23 for a detailed rental of the same land in 1810.
6. ESRO TD 135.
7. ESRO AMS 5843, ADA 137, 139, SAS/FB 693.
8. ESRO ADA 137 pp 41, 315 (George Burgess), 360 (William Olive).
9. The Totease demesne consisted of 130 acres in 1617 (ESRO ADA 137 p391) and 1650, when it included Furnace Meadow (ESRO SAS/PN 33). Robert Olive [of New House Farm] bought 32 acres of the Totease demesne in 1650 (ESRO SAS/PN 34) but that on the eastern side of the stream descended with the manor and formed the core of Totease Farm (ESRO SAS/FB 687-698). For the descent of Totease, including its tenure by the Baker family of Withyham, Battle and Mayfield, ironmasters, *see* ESRO KIR 2/1, AMS 5843 f34v, W/A 3 186 (will of John Baker of Duckings in Withyham, 1555), Sussex Record Society 20 (1915) 442, ESRO AMS 3171, AMS 5673/2.
10. ESRO GLY 84, SAS/FB 693.
11. ESRO AMS 5843 f34v.
12. ESRO ADA 137 41; William and Robert Woody had been briefly involved in the ownership of Totease during the 16th century: see the documents cited in note 8 *above.*
13. PRO SC2/206/34, f113.
14. ESRO QAB 3/1 (Queenstock Bridge one of three bridges repaired by the borough of Greenhurst within the hundred of Loxfield, 1717). The survey of 1617 contains many references to Queenstock Bridge, none of which can be plotted with certainty.
15. ESRO ADA 137 p345 (Goldsmith Hudson), 348-50 (William Henslowe).

Re-Dating an Early Document

Christopher Whittick

Among the archive of the Maryon-Wilson family of Searles in Fletching at the East Sussex Record Office is an undated book of instructions, partly executed, for a survey of the woodlands on the manor of Framfield (ESRO SRL 13/1).[1] The document makes several mentions of ironworks, and provides an important means of dating the early operations in the Framfield area.

The original record office list compiled in the early 1970s dated the document to about 1560, but recent re-listing of the Searles archive in the course of the PRO's *Access to Archives* project[2] has provided a definite date between October 1570 and November 1571 for SRL 13/1.

The document consists of a paper book of instructions, possibly written by Thomas Sackville, Lord Buckhurst (1536-1608) to his servant Richard Leech of Sheffield Park in Fletching,[3] to survey the woods on Buckhurst's manor of Framfield in order to establish whether the tenants were abusing their customary rights to take timber. A copy of the detailed list is printed as an appendix to this note.

The first seven pages of the document list almost 200 tenants of Framfield manor, and although there are no surviving manorial records from that period, parish records can be used to narrow down the date of compilation with certainty to between the death of Bernard Isted of Hastings All Saints in October 1570 and the death of John Bassock of Uckfield in November 1571.[4]

The crucial passage, on page 25 of the document, deserves to be printed in full; the spelling and capitalisation of the original has been modernised.

> To enquire also how many iron mills have been and are maintained with the tenants' woods. Also to how many iron works the whole woods do so lie as all the said woods may be brought within three miles, or else, if all will not be brought to any, then to how many iron works every several wood doth lie, namely not going above three miles from the said woods.

The answer by Richard Leech's information:

> First there are three iron forges that have had wood and have wood most years out of the common woods and those are these, viz: Pounsley Furnace, Howbourne (*Huborne*) Forge and Huggetts Furnace.
>
> There is no iron work that all the whole woods may be brought to it within three miles nor yet within four miles.
>
> But there are within three miles of some one of the woods these many works, viz: Pounsley Wood and Eching Wood of Ralph Hogge's furnace and his two hammers, Mr Pope's furnace, Little Buxted Hammer, Howbourne (*Huborn*) Hammer, Huggetts Furnace and Pounsley Furnace.
>
> And there is more within three miles of Langherst Wood and Barnet Wood John French's hammer and Waldron Furnace.

[*in margin*]

> what more you can learn touching these things write them after this [*nothing written*]

The location of Hogge's three operations is still in doubt, but of the woods which must be within three miles of them, Poundsley Wood is at TQ 529219 and Eching Wood at 506222. For the sake of completeness, Langherst Oak (presumably representing the wood) is at TQ 516205 and Barnet Wood at 515185.

Whatever the location of the ten operations mentioned by the document lay, its re-dating by a decade needs to be addressed in any further discussion of those ironworks or citation of SRL 13/1.

Appendix

ESRO SRL 13/1

page

1-7 instructions to assess 'as you ride up and down the woods' whether tenants have adequate fuel, whether they have an excess and whether they sell it; book prepared with tenants's names, divided by the parishes of Framfield, Buxted and Uckfield

many answers

8-12 *blank*

13 which tenants have sold timber received for custom-wood?

no answer

14-16 *blank*

17 search out witnesses of the tenants' practice of under-estimating loads of customary fuel to deceive the queen

no answer

18-20 survey and value the woods, and to establish whether they are spoiled for want of enclosure, and which of the tenants are brokers and buyers up of custom-wood

no answer

21-22 *blank*

23 find evidence concerning noctural fires in coal-pits on Couchman's ground in Buxted and damage done to the hay

of Couchman, Sir Alexander Culpeper's man

no answer

24 *blank*

24 the number of iron furnaces and forges within three and four miles of the woods, with the replies of Richard Leech, naming seven furnaces and seven forges; 'what more you can learn touching these things write them after these'

no further answer

Richard Leech was described as Lord Buckhurst's servant in 1571 (SRL 1/2/2 above) *and the instructions may be in Buckhurst's hand and the replies in that of Leech.*

Notes and References

1. The archive's group-reference, SRL, is erroneously given as *FRL* on page x of *The Iron Industry of the Weald* (2nd edition, 1995) and as *Searle* in the body of the book.
2. For which *see* http://www.a2a.pro.gov.uk/
3. For a reference to Leech as Buckhurst's servant in 1571 *see* ESRO SRL 1/2/2.
4. East Sussex Record Office, PAR 361/1/1/1, PAR 496/1/1/1

More Additions to the Catalogue of Early Wealden Iron Graveslabs[1]

J. S. Hodgkinson

Foots Cray, Kent TQ 4771

1. 1665 Martin Manning and Barbara Manning churchyard, 1 metre south of chancel; 65-68cm wide x 181cm long x 3cm thick. Loose, formerly on brick plinth.

HERE LYETH INTERRED THE BODIE
OF MARTIN MANING YEOMAN WHO
DEPARTED THIS LIFE ON THE
10 [?] DAY OF OCTOBER 1656
AGED 63 YEARS

AS ALSO BARBARA THE WIFE OF
MARTIN MANNING WHO DEPARTED
THIS LIFE ON THE 5 DAY OF
APRIL 1665 AGED 67 YEARS

IN SPEM RESURRECTIONIS

Incised 3 cm letters in straight, well-spaced lines. Each line starts c.5 cm from the left edge of the plate but continues almost to opposite edge. Above the inscription is a pair of incised, crossed bones, each bone c.28 cm long. The slab lies face down adjacent to its former plinth and had to be turned over to read the inscription. Although most of the lettering is just decipherable, an earlier, published notice of this slab has been used to confirm the inscription.[2]

East Peckham, Kent TQ 6652

1. St. Michael's church, now deconsecrated, lies out of the village, to the north, close to the border with West Peckham parish. The church is only open infrequently.

n.d. ?William Bansor
nave. Wrought iron, stepped cross, set in a stone slab, with a brass plate inscription. The stone slab measures c.65 cm x c.117 cm.

The cross is formed of six lengths of wrought iron bar, all c.2-3 cm wide, making up the three steps, the main vertical, the horizontal, and the top vertical section. All have been cemented into a cut depression in the stone base. It has been suggested that the iron cross replaced an earlier, brass cross, which may have been removed during the Reformation. William Bansor, thought to be a cleric, is noted in the area before 1420; the use of the cross supports the suggestion that he may have been in holy orders.[3]

Notes and References

1. WIRG, *Wealden Iron*, 2nd series **8** (1988), 16-46; 2nd series **9** (1989), 9; 2nd series **14** (1994), 28-9.
2. V. J. B. Torr, 'Notes on an iron grave slab and the church fittings of Foots Cray', *Archaeologia Cantiana*, **43** (1931), 215-9.
3. P. Lawrence, pers. com.

❖

The Penkherst Family of Ironmasters

Anne Dalton

During recent work on the NADFAS[1] Record of the Furnishings of St. Dunstan's Church, Mayfield, East Sussex, it became possible to examine and record a floor-slab to members of the Penkherst/ Penkhurst family of ironmasters of Coushopley Furnace in the same parish.[2] The last time that this slab was studied was by William Courthope in the 1840s, when he had had, so he wrote, to consult Sir William Burrell's notes in the British Museum in order to complete the transcription.[3]

The slab, in the floor of the Chancel of St. Dunstan's under the north Choir Stalls, of polished black slate (with a crack in

it), measures 204cm long by 98cm wide, only 28cm. of its width normally being visible. The inscription, written in very abbreviated Latin, is incised in two sizes of capitals and at the head of the slab is incised the coat of arms of the Penkhersts, without colour or hatching. [Blazon: Argent, a fess ermine between six mullets, Sable.[4]]

The inscription, composed by Stephen Penkherst, the Younger, who was then aged 17, is dedicated to his grandfather, Stephen the Elder, who died in February 1645-46, and also to his father John, who died in 1631 when the younger Stephen was two years old. There is also reference to Stephen the Younger's great-grandfather, William, and to his great-great-grandfather, John, thus five generations of the family are named on the slab. The inscription (with the expanded Latin in brackets to clarify the translation[5]) reads:

inscription	*translation*
STEPHANO PENKHERST	TO STEPHEN PENKHERST
WILL.[ELMI I F.[ILIO]	THE SON OF WILLIAM
IOH.[ANNIS] N.[EPOTI]	THE GRANDSON OF JOHN
IOHANNI PENKHERST	TO JOHN PENKHERST
STEPH.[ANI] F.[ILIO] WILL.[ELMI] N.[EPOTI]	THE SON OF STEPHEN THE GRANDSON OF WILLIAM
P.[OSUIT]	PLACED
STEPHANVS PENKHERST	STEPHEN PENKHERST
IOH.[ANNIS] F.[ILIUS] STEPH.[ANI] N.[EPOS]	THE SON OF JOHN THE GRANDSON OF STEPHEN
DE BUCKSTED ARMIG.[ER]	OF BUXTED ESQUIRE
A.[NNO]D.[OMINI]	IN THE YEAR OF OUR LORD
MDCXLVI.	1646.

During the 16th and 17th centuries the Penkhersts referred to on this slab owned much land in Mayfield and the surrounding area, including Trodgers in Mayfield which was left by John (d.1513)[6] to his son, William. John stated in his will that he wished to be buried in St. Dunstan's as did Stephen the Elder,[7] specifying the High Chancel. Stephen left 20s. to the Minister at his funeral and £6 to the poor of Mayfield as well as other sums to the poor of Wadhurst, Waldron, Heathfield, Lamberhurst, Barcombe, Lindfield, and Smarden in Kent.

Stephen the Elder was linked by marriage to other ironmasters of the eastern Weald. His sister, Elizabeth, was married to William Fowle, son of Nicholas Fowle of Riverhall in Wadhurst and of his wife Eleanor Isted of Mayfield, while his son, John, was the husband of Nicholas Fowles' niece, Anne Fowle, who, after her husband's death in 1631, married Robert Baker. After Stephen's death his grand-daughter, Elizabeth, married William Dyke II of Frant.[8]

Stephen the Younger bought Buxted Park in 1651,[9] marrying the heiress Elizabeth Marsham in 1652 but by February 1656[10] he was in prison for debts amounting to £12,493. In June 1656 there was an agreement to sell Stephen's lands in order to obtain his release from prison and settle his debts.[11] He died in 1657 aged 28, leaving two sons, John and Ferdinando, both of whom died unmarried; John, of the Inner Temple, was dead by 1681 and Ferdinando died in 1708, bringing an end to the Penkhersts of Mayfield, Wadhurst and Buxted.[12]

The Wealden DFAS Church Recorders are most grateful to Christopher Whittick for helping them to record this 350 year-old slab in the Chancel of St. Dunstan's, Mayfield, a visible reminder of Wealden ironmasters of the 16th and 17th centuries.

Notes and References

1. National Association of Decorative and Fine Arts Societies
2. East Sussex Record Office (hereafter ESRO), PAR 422/10/2/1; H. Cleere & D. Crossley, *The Iron Industry of the Weald*, 2nd ed. (1995), 169, 324.
3. Christopher Whittick of ESRO, personal letter 1999, using College of Arms, Courthope MS24 (ESRO XA38/2 microfilm) with reference to Sir William Burrell's notes in the British Museum.
4. J. F. Huxford, *Arms of Sussex Families* (1982), 396.
5. C. Whittick, ESRO, personal letter 1999.
6. ESRO, DYK 1002.
7. ESRO, DYK 844 and Dyke (Hutton) Mss; Introduction.
8. ESRO Dyke (Hutton) Mss; Penkhurst Pedigree; J. J. Goring, 'Wealden ironmasters in the age of Elizabeth', in E. W. Ives et al (eds.), *Wealth and Power in Tudor England* (1978), 204-27, esp. 224.
9. ESRO AMS 6362, (illustrated in J. M. Farrant (ed.) *Sussex Depicted*, Sussex

Record Soc. 85 (2001), 184, 186.
10. ESRO DYK 825.
11. ESRO DYK 827.
12. ESRO DYK 1003 and Penkhurst Pedigree.

Bar Iron Production in the Weald in the Early 18th Century

P. W. King

John Fuller wrote to Sir John Lade in 1735:[1]

> '... There has not been any barr made in Sussex for this fourty year last past but for our own consumption that anything has been gotten by, which is the reason wee have so few forges.'

The iron industry of the Weald from the 1690s, unlike the rest of the British iron industry, was heavily focused on ordnance production, where demand fluctuated according to the cycle of war and peace. Accordingly in wartime, peak demand exceeded the capacity of the Weald. As a result, contracts were occasionally placed with furnaces outside the Weald. Furthermore, new furnaces were constructed within the Weald, namely Heathfield, Gloucester and Pippingford Furnaces. Thus ordnance suppliers in the 1690s also include Philip Fincher, who delivered about 105 tons of shot and 300 tons of grenado shells from 1695 to 1697, while agent in London for the nail trade of John Fell & Co. of Sheffield, the principal firm of ironmasters there. This shot does not appear in the accounts of John Fell & Co., suggesting that it came from their associated 'Company in the North', who owned Allensford Furnace, inland of Newcastle.[2] In the same letter John Fuller complained of competition from 'air

works in town, which are supplyed with old cast guns from all parts of the world'. Nevertheless, the influence of such ironfoundries was not wholly negative, for William Bowen, who owned Barden and Cowden Furnaces in the mid 18th century was one of those with a foundry in town, in his case at Marigold Steps, Southwark.[3] From the late 1720s he, and then Philip Troughton of Sowley, found a further market for iron cast direct from the furnace in the form of ballast bars for the Navy. However the majority of the suppliers were the owners of blast furnaces outside the Weald.[4]

J. S. Hodgkinson has recently written about the dozen Wealden forges that survived into the late 18th century.[5] It is the object of this article to examine them in the earlier part of that century. I have written elsewhere of one of the final attempts to produce bar iron for regional (as opposed to local) markets.[6] But how much bar iron was made in the Weald for those local markets? There is in practice a minimum level of production below which a forge cannot operate effectively. This was probably about 40 tons per year, though cases of 30 tons or even less being made can be found. In such a forge it is likely that there was a single forgeman, who was performing the functions both of finer and of hammerman, as the minimum output for a forge elsewhere (with one finery and one chafery) seems to have been 80-120 tons per year. If less was produced, that man would not have been fully employed at the forge and would have had to have a second, probably less remunerative employment. It was no doubt for this sort of reason that Philip Sone decided he no longer needed a finer in 1751, when he had contracts for cannon.[7]

Parts of eastern Sussex are unusual in that there survive land tax assessments fairly continuously throughout most of the 18th century, rather than there merely being a series between 1780 and 1832, when a duplicate had to be lodged with the Clerk of the Peace, as in many counties.[8] This provides a means of determining who was occupying each forge, and this information may be combined with sales records for pig iron (and gunheads) from the Fuller archive and with rentals

to provide an unusually good picture of what forges were operating. Land tax assessments are not always the most straightforward source to use as often there is no description of the property assessed, merely personal names and amounts payable, but the valuation on which the assessment was based never changed. Only the rate of tax varied and that but rarely. The order of the names usually remained the same from one assessment to the next. Thus it is relatively easy to trace the descent of a hereditament (once it is identified) just by following the sum payable from assessment to assessment. For forges (and furnaces) there were usually two separate assessments, one on the land and buildings and another on the stock there, for despite the name 'land tax' there was an assessment on stocks of goods. The assessment on stock also rarely changed until the works was closed and the stock ceased to exist. On the other hand, sometimes the tax on the land was paid by the landlord or was combined with other property, so that there is nothing in the assessment to indicate who was in occupation of a furnace or forge.

This source can provide significant new information. For example, it indicates that Burwash Forge remained open rather longer than has hitherto been supposed: from 1789 to 1803 it appears to have been used by John Fuller and Samuel Standen in partnership. In 1804 only 'widow Standen' is named; then from 1806 to 1810 Thomas Standen was the occupant; only then did it close. However in general the land tax records reinforce and add detail to what was already known. What is currently known about forges in the first half of the 18th century is summarised in the appendix. Inevitably the quality of information varies very considerably according to what survives. In some cases there is still little detail, but in others a great deal. Where an assessment is on land rather than stock it is sometimes not clear whether the occupant was using the forge or merely having to pay the tax because he was farming fields that had been let with the forge. This applies to the long tenure of John Snepp at Bugsell Forge in Salehurst, a forge that does not appear in

the lists of *c.*1716 or 1735.[9] The very existence of that forge earlier in the century seems only to be shown by the land tax records, since it does not appear in the standard lists. However, the forge must have been in use in the 1690s, since it was the subject of an assessment. Nevertheless, it is conceivable that the lists have confused Iridge with Eridge, whose use can only be demonstrated from other sources to have continued to 1711, and might therefore have closed in the years between 1711 and 1716.

The material derived from the land tax assessments confirms the significance of the business of Legas and Hussey. This originated in Thomas Hussey's management of Ashburnham Furnace for the (Foley) Forest (of Dean) partnership. It is probable that firm withdrew from the Weald in 1717 on the reconstruction of their partnership following the death of Philip Foley, but that William Rea, their managing partner, retained an interest, by forming a new partnership with Hussey, the local manager. The same year Hussey took over the Pelham family's works, Waldron Furnace and Brightling and Bivelham Forges. In 1725 Rea, Hussey and Mr. Gott were partners in Beckley Furnace and Westfield Forge. However, Rea is likely to have sold his share about 1727 towards satisfying his substantial liabilities to his Forest partners. Sussex is not mentioned in the litigation about them, save in passing. It was presumably after that when Hussey and John Legas took leases of Gloucester Furnace and Chingley and Hawksden Forges.[10] Their partnership may be seen as the origin of Legas's successful collaboration with William Harrison and his successors as gunfounders in the wars of the mid-18th century.[11]

The remainder of the forge proprietors were mainly small-scale operators, having one or at most two forges, often without a furnace. Typically their annual purchases from the Fuller family's Heathfield Furnace was in the region of 20 to 30 tons, but varied considerably. In some years they only bought 10 tons or even nothing at all, but rather more in others. This probably indicates that there was at least

one other furnace supplying pig iron to these forges. Henry Weller of Eridge, Henry Jarman of Etchingham, Jeremy Johnson and then Thomas Standford at Woodcock, and Henry Gale at Tinsley only had a single forge, but John Busbridge's name appears both in association with Etchingham and Bugsell Forges.

Among the forge owners Ambrose Galloway stands out as buying significantly more pig iron than any of the other forge owners, perhaps double the norm and may indicate that both Ardingly and Maresfield Forges was operating. Similarly the works listed in c.1716 as 'Mr Dibbles' have exactly double the production of the other two forges listed as in Surrey, which probably confirms he had both Abinger and Thursley Forges. Galloway was a Lewes ironmonger, while James Goodyear, a later successor of Dibble at Abinger and Thursley, was a Guildford ironmonger. At this period an ironmonger in a country town was probably buying much of his stock from a manufacturer in the Birmingham region or from a wholesale ironmonger in London. However he might also be having some goods made on the spot by smiths, whom he employed. Thus Rowland Pytt of Gloucester and later his son-in-law William Coles manufactured iron goods at Gloucester in the mid- to late-18th century, and the late-18th century Bath ironmongers, Harris and Paris and then George Stothert, employed smiths, braziers, tin-men and plane-makers.[12] The principal areas for manufacturing iron were around Newcastle, Sheffield and Birmingham, all of which had coal readily available as fuel. Coal was, of course, much cheaper than charcoal. Coal brought by water would have been available at both Lewes and Guildford, brought by coastal shipping to Lewes and up the River Wey to Guildford. This would have made these towns relatively cheap places to manufacture ironware. No doubt production at Newcastle or Birmingham would have been even cheaper, but only someone on the spot would be able to meet the exact specification laid down by a customer placing a special order.

In conclusion therefore, it seems that the bar iron industry in

the Weald was able to survive for much of the 18th century, but it primarily met local demand, or as John Fuller put it, made iron 'for our own consumption'.[13] However there were no slitting mills south of the North Downs to cut bars of iron into rods suitable for making nails. It is therefore improbable that nails were made in the Weald in this period. Similarly, no other blade mills, scythe mills, or cutlers' wheels are known, except at Sturt Hammer in Haslemere in the early-18th century.[14]

Such mills (with a waterwheel turning a grindstone) were needed in order to sharpen edge tools. Accordingly, these (like nails) must have been made elsewhere and have reached Sussex and Kent as finished products. Nevertheless, the survival of a modest number of small forges in the Weald clearly demonstrates that some manufacture was taking place locally, probably both by village blacksmiths and by smiths employed by ironmongers in towns. Conversely, this manufacture was evidently on a sufficient scale to support modest bar iron production in the Weald up to the Industrial Revolution.

Appendix

The information in this list is intended to supplement that in H. Cleere & D. Crossley, *Iron industry of the Weald* (2nd edn., Merton Priory Press, 1995). The lists referred to are printed in P. W. King, 'Early Statistics for the iron industry: a vindication' *Hist. Metall.* 30 (1) (1996), 23-46. The other sources used as pig iron sales in the Fuller accounts (ESRO, SAS/RF, various) and Land Tax assessments (ESRO, ELT and LT).

Abinger see Thursley below

Ardingly remains obscure. It belonged to Ambrose Galloway in 1695-6, but is missing from the list of c.1716 and sales to Ambrose Galloway from Heathfield and Waldron may refer to Maresfield Forge rather than Ardingly.

Barden appears in a list of 1735 and seems likely to have operated as

long as the furnace there, that is until the 1760s, but it is missing from the c.1716 list in which the furnace there does appear. It is possible it belonged to Mr Ball of Tonbridge Wells, who bought Heathfield pig iron from 1724 to 1728.

Bivelham: no new evidence but compare Glaziers (below).

Little Buxted Hammer was purchased by John Newnham from John Fermor and may have been used by him earlier as Fermor had been under age. The copyhold of the forge descended in the Newnham family until at least 1765, but it is not clear how long it was used. Pounsley Furnace, which also belonged to John Newnham, apparently made nothing in 1716 and may, like Coushopley and Pippingford, have at the end of the War of Spanish Succession been a victim of the dearth of orders from the Board of Ordnance.

Chingley is known to have been in the possession of John Legas in 1726, but is excluded from that of 1735, implying closure.

Glaziers (or Brightling) belonged to Sir John Pelham in 1702 and 1792, then Sir Thomas Pelham (subsequently Lord Pelham and Duke of Newcastle) until 1716, followed by Henry Pelham (his brother) until 1725. However the stock stands in the name of Mr Hussey from 1719 to 1734 and then 'late' Mr Hussey until 1756. Similar information is not available for Bivelham Forge or Waldron Furnace, but there is every reason to suppose their descent was the same.

Eridge seems to have been occupied by Henry Weller of Frant, who was a buyer of Ashburnham, Heathfield and Waldron bar iron, but not necessarily later than 1711.

Etchingham was occupied by Henry Jarman from 1702 (or earlier) to 1718. The following year's assessment was against 'Mr Snepp or Mr Busbridge'. After this Mr Busbridge appears until 1737. The latter date is surprising because the forge was let to Sir Thomas Webster in 1732 and the final sale of pig iron from Heathfield was

settled with iron delivered to Ambrose Galloway in 1732.[15] Later land tax references are merely to the forge land, thus suggesting the forge closed in the late 1730s.

Hawksden's history appears from rentals and pig iron sales. Thomas Sands leased the forge in 1665 and was evidently succeeded by John Sands, who bought pig iron from Waldron and Heathfield up to 1724. Thomas Hussey and John Legas then took a lease in 1727. Rentals name John Legas as tenant until 1750 and Richard Tapsell until 1767.[16] The land tax assessments tell a similar story, but 'occupiers' replace Richard Tapsell in 1765.

Bugsell Forge in Salehurst was occupied by John Busbridge 1702-06, by Henry Gorham 1707-09, by John Gorham 1713-15, and by Mr Busbridge and Mr Gorham 1716-21. After this the assessment is against Mr Busbridge or tenant until 1724, then against Will Busbridge from 1724 to 1749 and against John Snepp from then until 1799. No stock was ever assessed. Mr Busbridge also appears at Etchingham and bought pig iron until 1732 only. The closure date remains an open question and may have been about 1721 or in the 1730s.

Maresfield, according to Gage rentals, was occupied by John Newnham between at least 1668 and 1701, by Ambrose Galloway of Lewes, and by Richard Tidy in 1743-44. Galloway bought Heathfield pig iron from 1710 to 1738, but Masters and Tide of Brighthelmstone bought some in 1737.[17] Land tax gives Mr Tidy as occupant in 1750.

Pophole remains obscure.

Robertsbridge Furnace and Forge were always occupied together. Thomas Westerne the London ironmonger and gunfounder was their occupant in 1692, but like Ashburnham Furnace they were void in the 1700s. Thomas Snepp was tenant from 1713 to 1727, followed by Thomas Webster until 1737 and then 'occupiers' until 1755.

Thursley Hammer had James Goodyear, the Guildford ironmonger, who was also tenant of Abinger Hammer as its occupant in 1780 and 1781. The following year there was a Mr Lowe whose assessment was expressed in 1785 to be for ponds, suggesting closure not later than 1781. The joint tenure of Abinger and Thursley may also have occurred earlier, as Mr Dibble's name occurs in connection with both.[18] Significantly his works are stated to have made 80 tons in the list of about 1716, as opposed to 40 tons made by the other two Surrey forges.

Tinsley Forge belonged to Henry Gale, who bought pig iron from Heathfield until 1737, though only intermittently after 1731. This suggests it closed not long after it appeared (twice) in the national list of forges of 1737.

Westfield Forge belonged to Mr Denham in 1702, to Peter Gott from 1706-11 and to 'occupiers' until 1751, after which Mr Tapsell is named.

Woodcock Forge was rented by Jeremy Johnson between 1664 and 1701, by Thomas Standford in 1738 and by Samuel Baker in 1743-44.[19] Of these Thomas Standford had pig iron from Heathfield from 1730 to 1734.

Notes and References

1. David Crossley & Richard Saville, *The Fuller letters 1728-1755: guns, slaves and finance* (Sussex Rec. Soc. 76, 1991), No. 182.
2. Public Record Office [hereafter PRO], WO 47/18, 25, 73, 393; *cf*. Sheffield Archives, SIR/14, 124; SIR/15, 71, 194; and corresponding journal entries in SIR/2; SIR/16, 53.
3. Southwark Local Studies Library, deed 8287, cited in J. S. Hodgkinson, 'The decline of the ordnance trade in the Weald', *Sussex Arch Coll*, **134** (1996), 165-66 (notes).
4. P. W. King, 'Iron ballast for the Georgian navy and its producers' *The Mariner's Mirror* **81**(1) (1995), 17-18.
5. J. S. Hodgkinson, 'Forges in the late eighteenth century Weald' WIRG, *Wealden Iron,* 2nd series **17** (1997), 13-23.
6. P. W. King, 'Ashburnham Furnace in the early 18th century' *Sussex Arch.*

Coll., **133** (1995), 255-62.

7. A. Fell. *The Early Industrial History of Furness and District* (Ulverston 1908; republished Cass, London 1968), 288-90.
8. East Sussex RO [hereafter ESRO], Early land tax.
9. For these lists see E. W. Hulme, 'The statistical history of the iron trade' *Trans. Newcomen Soc.,* **9** (1928-9), 12-33; P. W. King, 'Early Statistics for the iron industry: a vindication' *Hist. Metall* 3**0**, 1 (1996), 23-46.
10. P. W. King, 'Ashburnham', 259-60; PRO, E 112/957/94; E 112/957/107-111; Herefs. RO, E12/VI/DGd, *passim*. I am grateful to Mr A. T. Foley for permission to examine his family archives.
11. J. S. Hodgkinson, 'Decline', 155-67, esp. 163-4.
12. Amina Chatwin, 'Some Gloucestershire ironmasters' *Hist. Metall.* **31**, 1 (1997), 23 (which mis-states certain family relationships); Somerset RO, Graffin Prankard's accounts, DD/DN/433-8, *passim*; H. Torrens, 'The early years of Stothert & Pitt' *Bristol Ind Arch Soc Jnl.,* **9** (1976), 24.
13. See note 1.
14. H. Cleere & D. Crossley, *The Iron Industry of the Weald* (2nd ed., Merton Priory Press, 1995), 391-2.
15. Fuller a/c; C. Whittick, 'Wealden iron in California: a recent foray at the Huntingdon Library, San Marino, California' WIRG, *Wealden Iron,* 2nd series **12** (1992), 29-62 1992, 34 & 41; Herts. RO, 46860-1.
16. ESRO, Glynde 1229-34 2809-14 2935-7 2925-30.
17. ESRO, SAS/G/13/49-53; *ibid.*/11/27-30.
18. M. S. Guiseppi, 'Rake in Witley ... ironworks in Witley and Thursley Heaths' *Surrey Arch. Coll.* **18** (1903), 52; Christchurch Coll. (Oxford), Evelyn unsorted, notice of distraint.
19. ESRO, SAS/G/43/52-70, 42/110-6, 43/148, 11/27-30.

Factors of Production in Mid-18th Century Wealden Iron Smelting[1]

J. S. Hodgkinson

Studies of the factors which controlled production at ironworks in the Weald have largely focused on data from a small number of sets of accounts. In the sixteenth century, the Sidney and Hogge accounts have provided the opportunity for detailed case studies, while the Fuller papers in the eighteenth century offer a wealth of detail.[2] Other source material, notably the Pelham accounts and the papers relating to the Harrison-Legas partnership, remains to be fully exploited. In addition to these major sources, however, and although much incidental detail can be derived from legal documents and letters, it is the archives of the Board of Ordnance to which we should turn for much more than accounts of the purchase of guns.

By the third quarter of the eighteenth century, a period which encompassed the Seven Years' War, the iron industry in the Weald was very much a product of its past. Virtually every factor upon which production depended followed practices established two hundred years earlier. Economic conditions may have changed, most especially in the predominance of gun founding, and most of the risk was being taken beyond the borders of the Weald; only in transport, and in the scale of the small number of furnaces erected in the last decade of the previous century, can any significant local development be discerned.

The Location of Ironworks

The location of the furnaces and forges in the mid-eighteenth century Weald was, in every instance, the result of a lengthy historical development. Even the works which came into operation during the period did so on sites which had previously been occupied for the

same purpose; Warren Furnace had been in blast in the late-sixteenth century, and Howbourne Forge had been at work until the 1650s at least.[3] When there had been a spate of furnace construction at the close of the seventeenth century, two of the three known new works had been constructed on existing ironworking sites.[4] The rationale behind this conservatism is obvious for, although the re-occupation of such sites would have necessitated the probable reconstruction of the furnace, or the complete reassembly of the forge machinery, the cost of either would have been insignificant compared with the expense involved in laying out a water management system consisting of bays, ponds and sluices not only for the storage of water but also for the passage of water over the waterwheels and, in the case of gun founding furnaces, for boring mills as well; costs that would have undoubtedly included considerable legal fees in settling with other landowners or occupiers whose rights to the water would be affected. Some doubt has been expressed as to whether Gravetye Furnace, at West Hoathly, was a completely new works in 1761, or whether it was a case of an earlier site reoccupied.[5] In the light of such financial commitment as suggested above, together with the apparent inexperience of the ironmaster, William Clutton, and the location, which cannot be said to have had the easiest access to Woolwich, it seems highly improbable that it was a virgin site.

The 1750s and 60s were a period when, in other parts of the country, furnaces and forges were being established in new locations. However, many of the Wealden gills were already occupied by ironworking sites of earlier periods, over 180 furnaces and forges having been established in the region since the end of the fifteenth century. The fact that both Edward Raby and probably William Clutton had to restore long-abandoned sites suggests that there were no working furnaces readily available, or that if there were, their leaseholders were not prepared to let them go. So it should not necessarily be seen as an indication that the Wealden iron industry lacked industrial vitality when, with those exceptions mentioned above, all the sites of the period had been established and working for most of the preceding century, and many, such as the works at Robertsbridge, Burwash and Ashburnham, had a

long history of continuous production.

The determining factors in the survival of Wealden ironworks into the 1750s seem often to have been coincidental: owing as much to family inheritance as to the advantages of location, and the maintenance of waterways and buildings that continued use bestowed on a number of sites. The Gott family, for instance, personally involved in the iron trade in the late-seventeenth and early part of the eighteenth centuries, continued to own the freehold of several ironworks; and the Ashburnhams, while generally landlords rather than being directly concerned, retained interest in their estate's works, taking back control of them at the end of the eighteenth century. Given that the establishment of a furnace depended largely on a suitable flow of water, with reliable sources of ore and charcoal within a radius of little more than five miles, and that by the 1750s, only 25 ironworks, at most, were at work in the Weald, the location of several of the works concerned left much to be desired in relation to the transport options available to them, and to the markets for which their products were destined. Even Heathfield Furnace, probably the first on its site, and built as late as 1693, was poorly situated, requiring expensive overland transport, either to the Medway or to Newhaven. Because of the state of the roads, carriage of guns was virtually abandoned in the winter months because of both the practical difficulties and the consequent expense.

With the principal market for Wealden iron dictated by the ordnance trade, access to the Medway, or to one of the Channel ports, either directly or via the Ouse, Brede or Eastern Rother, caused the principal concentration of furnaces to be in the easternmost part of Sussex. Northpark, far to the west, may either have sent its products via the Wey at Godalming or along the Western Rother/ Arun to Littlehampton. Robertsbridge and Beckley were the most advantageously situated of the furnaces, with access to navigable water throughout the year, although in wartime there were hazards in this advantage, as shall be seen below. Perhaps the most surprising locations for works re-established during the war period were of the

Warren and Gravetye furnaces; both remote from navigable waterways and from the sea, their location on the northern edge of the High Weald putting them within reach of Woolwich by an overland route which apparently remained passable during the winter.

The location of forges was less dependent on their markets than that of the furnaces which provided them with cast iron. A forge was often let with its associated furnace, as in the case of Woodcock and Warren, Pophole and Northpark, or the Robertsbridge works. In the case of Westfield Forge, its ownership by the Gott family, together with the furnaces at Horsmonden, Lamberhurst and Beckley, had ensured its continued association with those works when let to Harrison and Legas in the 1740s. Other forges, such as Maresfield and Abinger, served local markets which were sufficient to sustain them in work even though they had long ceased to be associated with particular furnaces. Bivelham and Glazier's Forges had a long association with Waldron Furnace when they were worked by the Pelham family, which continued under Harrison and Legas, who also operated Hawksden Forge, for which iron was being purchased from Waldron in the early years of the eighteenth century.[6]

A particular advantage in taking over ironworks in working order was the likelihood of specialist staff being available in the district, who were familiar with the furnace and the sources of raw materials. Where the Weald was able to retain its primacy over other regions in the ordnance trade was in the skill of its workforce. Within the close tolerances of gun founding, considerable losses in rejected guns could be avoided by employing a competent moulder or founder. An ironmaster, such as John Churchill, who purchased the lease of a working furnace and forge, could expect to be able to employ the skilled personnel already working at the site, although the enquiries he made prior to taking the lease of Robertsbridge did not mention the labour force. For the few who resurrected a defunct furnace or forge, there was the problem of finding suitable skilled men, and the risk of financial disaster if they did not. The skilled workers had to be enticed from other works or

from among the small number of founders, moulders and hammermen who had become unemployed by the closure of works elsewhere. The problems John Fuller had in 1751 with poorly cast guns being repaired with lead, serve to emphasize the need for a skilled workforce.[7]

The nearness to London and the prospect of being able to buy the lease of an ironworks in operation or, failing that, one which required restoration, rather than having to bear the expense of establishing works on a virgin site, must have acted as a considerable inducement for an ironmaster wishing to enter the ordnance trade, as must have been the reservoir of skill which the region had to offer.

Transport

Transport was a major element in the cost of Wealden iron and, as has been seen above, it was an important factor in the location of ironworks. Both land and water transport were liable to cause problems where a heavy commodity such as iron was concerned.

Overland transport was expensive but, when conditions were right, relatively quick. It was expensive because the weight of the iron prevented more than a limited amount being carried on any one wagon and therefore the number of wagons and the number of journeys involved were necessarily great. Robert Knight was carrying guns to Woolwich from Warren Furnace every three days in 1762, and in the Ashburnham campaign of 1760-1, at least 71 turnpike charges were incurred by the carriers taking guns to Maidstone.[8] Wartime placed pressure on gun founders to send guns to Woolwich overland because of the danger to coastal shipping from French privateers. Presumably to balance the cost against the danger, Crowley & Co. were sending half their output overland, and half by sea from Hastings. Ironworks probably had at least one wagon team to carry out the various transport tasks necessary through the year, but other teams were hired from neighbouring farms, such as Stephen Goodsall's team at Udiam Farm which carried guns from Robertsbridge Furnace to Maidstone, or along the short distance to Udiam Bridge where they were off-loaded

on to barges bound for Rye.[9] The state of the roads was a further disincentive to overland transport though clearly this varied from area to area. John Fuller's oft-quoted comment, about his nine pounders tearing up the roads to universal annoyance, has been used to illustrate the poor condition of Wealden roads.[10] However the volume of traffic from the Sussex furnaces which converged on the navigable River Medway by road, let alone from other destinations, suggests that road transport, while remaining expensive, was not always as difficult as it has been portrayed.

The growth of the turnpike system in south-east England contributed to the improvement in the state of roads although the ironworks were seen as a major cause of their decay and ironmasters had a statutory obligation to contribute cinder for road repair, or pay a duty. In the 1740s, Harrison & Legas had been paying an average of £200 a month in excise duty.[11] In 1767, the year the Act imposing the duty was repealed, the use of the road for the carriage of goods to and from the forges at Thursley and Pophole was put forward as an argument for the alteration of the position of the tollgate on the Guildford-Godalming Turnpike, in Surrey.[12] Forge goods from both works avoided payment of tolls by transferring to barges on the Wey, whose rates were presumably less, instead of passing through the tollgates. Harrison & Co. encountered a different problem when attempting to move guns from Lamberhurst in 1756. Their use of a six-wheeled 'machine' to carry one gun conflicted with the terms of the local turnpike Act, insofar as it had narrow wheels but required more than the permitted four horses. Compromises involving broad-wheeled wagons, which presumably incurred a higher charge, or the Board of Ordnance interceding on the Harrisons' behalf, did not apparently resolve the matter although the Board Minutes do not record the outcome.[13]

The state of the Wealden roads exercised its greatest effect in the winter months. Carriage of both iron and raw materials cost more at the very time when furnaces and forges were at their busiest. In a letter to the Board in 1762, Rose Fuller stated the impossibility of

delivering guns to Woolwich before June of the next year because of the condition of the highways.[14] Winter carriage was surcharged by 100% at Ashburnham whereas Fuller seemed to pay only 50% over the summer rate. Wartime did not appear to have an effect on carriage costs for, at Ashburnham at least, there was no alteration in the rate between 1757 and 1770. Where the state of the roads had an effect on ironmasters, such as the Fullers, who were loath to spend the extra to move their products in winter, was in the delay in delivery which resulted. The payment system of the Board of Ordnance was such that gun founders were only granted a debenture on completion of warrants, which depended on the delivery of guns before the expiry date set by the Board. When peace was declared in 1763, the price of ordnance dropped and many gun founders found that late arrivals were paid for at deflated, post-war prices.

More often it was coastal transport which gave rise to excuses for late delivery. Carriage by water was considerably cheaper than overland though somewhat slower. Stephen Fuller asked successfully for up to six shillings and six pence per ton more for guns sent overland to Maidstone, rather than out of Newhaven, because the Board were in urgent need of them.[15] Judging from the time taken to carry guns overland from the Warren to Woolwich, the round trip from Ashburnham or Heathfield to Maidstone cannot have been more than three days, and from Lamberhurst Furnace or Horsmonden boring house, half that time. The promotion of the Upper Medway navigation owed much to those in the Weald who had heavy materials, such as timber or iron, to move. In 1760, 30% of cargoes on the upper Medway were guns. Bowen, Tapsell and Fuller, the only three clients who used the navigation, had 1208 tons of ordnance freighted in that year. By 1770, only 11.8 tons were carried.[16] Carriage to the Medway, whether to Maidstone itself, or to Branbridges on the Medway Navigation, had the advantage during wartime of greater security for there was less chance of a Maidstone hoy, from Millhall or Newhithe, being captured in the Thames estuary than of a vessel travelling round the Forelands from Rye, Hastings or even Newhaven. For this reason, the ordnance

storeships either travelled in convoy or awaited escort by a passing naval vessel. The Board requested a convoy for a ship carrying guns for Harrisons' from Newhaven in 1756 but refused a similar request from Churchill the next year, denying their earlier action.[17] Further requests from Harrisons' the same year, and the next, were acceded to. Movements for the Board of Ordnance were exempt from the Act prohibiting coastal traffic in warlike materials.[18] It is likely that Churchills', having requested the Board to intercede with the Customs to allow them leave to export, were refused because the guns they were exporting were not for the King's service. Iron founders outside the Weald experienced greater problems with enemy threats to the coastal traffic. William Ford, at the Lorn Furnace in Argyllshire, and John Sunderland, at Low Wood in Furness, both shot founders, had considerable distances to send their products, and delays were frequent. The lack of a convoy had prevented shot cast for Edward Raby, by a sub-contractor in the Bristol area, from reaching Woolwich by the end of 1759.[19] Sometimes the fault lay with the suppliers. In the same year, a naval vessel sent to escort ships laden with guns from Rye for Harrisons', had to depart without them because they were not ready to leave.[20]

Bad weather was a further restraint. The convoy carrying Raby's shot was also delayed by contrary winds. Because of delays 'of convoy and wind', Thomas Pryce's shipment of round shot from Neath took from November to February to reach Woolwich in 1761-2.[21] The warrants had expired, and the shipment was prevented from landing until the Board's permission had been sought. Pryce had to bear the cost of keeping the crew at sea in the meantime. A similar fate befell guns shipped for Harrisons', Churchills' and Robert Morgan, from Rye in 1763.[22] The delay consequent on contrary winds and then ice in the Thames led to the cancellation of the uncompleted part of their warrants because of the Board's reduced requirements, peace having been declared since the orders were placed.

In wartime in particular, impressment threatened to deprive ships,

transporting guns or shot, of their crews. The Board were rarely sympathetic unless their needs suited them to be so. Vessels were also in short supply from time to time during the war period, either because of impressment or because of increased coastal traffic. Eade and Wilton's letter of January 1761, whereby they were unable to deliver guns 'for want of shipping,' typifies the problem.[23] The time limits imposed on warrants by the Board, resulted in financial loss even when out of the founder's control, and the prevailing attitude of the Board, whereby they were generally unsympathetic to most of the founders' excuses, may well have deterred many appeals for mitigation.

Raw Materials

An important determining factor in the location of ironworks was the supply of charcoal which, because of its friability, could not be transported intact from much further than a five-mile radius of its destination. This imposed a limit on the area which could be exploited by an ironworks, but it also protected the ironmaster from the competition of major charcoal users further away. The onset of a war in which demands for charcoal, particularly for gunpowder, might be stretched to an unprecedented extent could place pressure on existing consumers in a vulnerable area like the south east.

The cost of wood was a major element in the economics of iron manufacture. At Ashburnham, wood supply consumed 30% of the expenditure of campaigns between 1756 and 1770. In assessing the consumption of wood for a blast in the Weald in this period, the evidence varies according to location. At Robertsbridge, the only figures given are those supplied in letters to prospective lessees, in which the estimate was between 1000 and 2000 loads of charcoal per campaign to achieve between seven and eleven tons of iron a week at the furnace, with a further seventeen hundredweight of bar iron at the forge. At Ashburnham the expenditure accounts are more detailed and a quantity for each campaign can be calculated. Wood was purchased in a variety of ways, and the prices reflecting that diversity require some

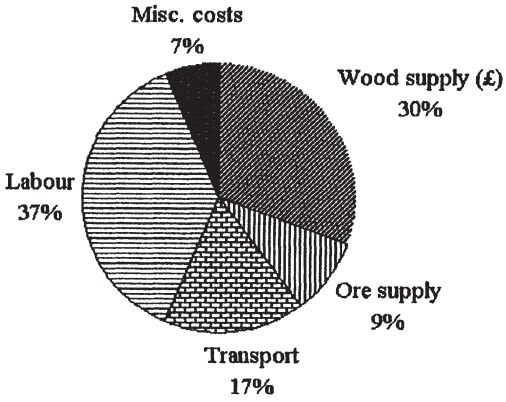

Fig 1: Ashburnham Furnace: Expenditure 1756-70
Source: ESRO ASH 1815

analysis for comparisons to be made. At Ashburnham there seemed to be little variation between costs during and after the war period. Wood was sold by the cord, cut or uncut, the variation lying in the quality of the wood: top wood, sprays, runts, coppice wood, spill wood. Over this was the cost of cutting, cording, teaming, and the many individual costs incurred by the colliers: cleaving, stacking, coaling, filling sacks. Prices at Robertsbridge and Ashburnham compare closely, those at the former not changing between 1747 and 1768. On top of these costs were those of carriage, 'trespass' over neighbouring land, and the occasional establishment of lodges to house the colliers. Carriage was the determining factor as in it lay the greatest variation: distance.

Undoubtedly the landlord-tenant relationship was important in determining to what extent ironmasters had to compete for wood with other potential purchasers. It was common practice for some rights to be established in the leases for works. Churchill's lease of Robertsbridge Furnace in 1754, which virtually reiterated the terms by which the Jukes brothers had it seven years earlier, obliged the landlord to sell all sixteen-year underwood grown within fourteen miles to the lessee for seven shillings a cord uncut. If none was to be available the landlord was to give adequate notice for the lessee to make alternative

arrangements.[24]

Prices fixed in the lease were protected from inflation. Ironmasters who had to negotiate with landowners for supplies of wood for charcoal were necessarily more conscious of the value of the commodity. From an ironmaster's point of view, the ability to sell off wood which was surplus to his needs was an important bonus. Churchill was able to sell wood, which was too small for coaling, as hop poles. Likewise, Samuel Baker, subsequently tenant at Hawksden, recognised the financial advantage of paying by the acre, and would have had a purchaser for the spray wood if he had been able to buy in that way, rather than paying for just the cordwood, with the timber of other sizes sold elsewhere.[25] Thus the interests of local wood reeves, wishing to market woodland to the best advantage for their landlords, inevitably conflicted with those of ironmasters, hoping to bargain for rights over a sufficient acreage of woodland to guarantee supply, and to allow for some additional income.

Although hinted at, there is no evidence that any attempt was made to import coke into the region, but the use of coal as a fuel has been suggested on two sites.[26] Straker refers to its alleged use by Churchill at Robertsbridge, and quantities of it were taken to Warren and Gravetye Furnaces.[27] The operation of an air furnace, or the drying of cannon moulds, remain as likely explanations.

Expenditure on iron ore was affected by the cost of carriage in the same way as expenditure on wood was, and again the payments made were broken down into a number of separate elements; the rent for the land, the labour of digging or 'drawing' the mine, and the carriage to the furnace. Prices varied with the distance carried and with the quality. The three grades, fine mine or 'veins,' coarse 'greys,' and 'pitty' (or marlpit) were priced at rates which, like the price of wood, did not materially alter throughout the war period and after. Fuller was paying the same price, 1s.6d. a load in the ground, twenty years earlier.[28] Unlike wood, which was a renewable resource, iron ore supplies could not be renewed, so it is a testament to the richness of

the Wealden beds that Ashburnham and Robertsbridge, both working since the mid-sixteenth century, could still draw upon sources which were close at hand. For instance, Foxearth Wood, from which ore was brought to Ashburnham in 1762-3, lay less than a kilometre away from the furnace.[29] The apparent abundance of ore within a short distance may have been the reason for the continued importance of some sites. Certainly, it was not always the case. William Clutton was having ore carried to Gravetye from Boyles Farm, south of East Grinstead, at least five kilometres distant.[30] Similarly, in 1767 the anonymous enquiry about ore to Clutton, by then steward of Broadhurst Manor, Horsted Keynes, which probably also relates to Gravetye Furnace, would have entailed a journey of six or seven kilometres.[31]

Local land sales throughout the period advertised the presence of beds of ore, and ironmasters who could not benefit from advantageous terms in their lease had to treat with local landowners for the necessary rights, though it is not clear to what extent formal agreements were entered into.

Technology

Tomlinson has said that the Wealden ironmasters were unable to adapt to new technology, which was geared to coke and to large-scale operation.[32] To some extent this must be open to question as within it lies the assumption that Wealden ironmasters were a different type from their contemporaries elsewhere in the Midlands, Wales or Scotland. In many cases the individuals and partnerships who operated ironworks in the Weald originated in the very areas where the innovation was taking place. It was the gun founding industry, and the specific regional advantages that the Weald offered in that business, which attracted them. However, it also can be said that the inflexible specialization of the Weald was a major contributor to its demise as a potent industrial area. What was absent from the Wealden iron industry were the developing manufacturing processes which were bringing prosperity to the other iron producing areas of the country; coke smelting, crucible

steel, slitting and rolling mills. Because of specialisation in casting, and ordnance in particular, none of these processes was necessary in the Weald, but when they began to influence the ordnance trade itself, the fate of the Weald as an iron-producing region of significance was effectively sealed.

Where technological advances could affect production of the Weald's specialism, they were utilised. The reverberatory, or air, furnace, wherein pig and scrap iron, and flawed castings, could be remelted and cast without the decarburization of the forging process, was developed during the seventeenth century, particularly in the use of non-ferrous metals. Its advantages lay in that it did not require a forced blast, thus obviating the need for streams, bays and ponds, nor did it require a nearby ore source, with the attendant problem of the disposal of large quantities of slag. It has not been appreciated how many of these air furnaces there probably were in the Weald. John Churchill's correspondence with Sir Whistler Webster discloses that the Jukes brothers had converted the second finery hearth at Robertsbridge Forge into one.[33] The executors of William Harrison installed one at Hamsell Furnace in the late 1740s, which was apparently still in use as late as 1758,[34] and Edward Raby undoubtedly had an air furnace, very probably at Warren Furnace, to melt bronze when he widened his production to this metal in about 1769.[35] William Bowen cast bronze mortars from metal which he received from the Board of Ordnance, and there is evidence that he did this at one of his Wealden furnaces.[36] Linked with their use of surplus iron from Ashburnham, Crowley & Co. would have probably had an air furnace either at Greenwich, or on Tyneside. John Fuller had to decline the Board's offer of part payment in old metal because he had no air furnace, declaring that he 'must lie at the Mercy of those that have, to give what Price they please'.[37] Some shot founders, such as Richard Gilpin and Stephen Remnant, both based in London, worked exclusively with air furnaces. The requirement of the Board of Ordnance that the iron guns they purchased should be cast from ore prevented the expansion of a London-based gun-casting trade using air furnaces.

A technological development which had been under way in other regions for more than a century was in the size of furnaces. The capacity and output of Wealden blast furnaces was, in most cases, a legacy of the past, and affected the ability of the region's gun founders to expand their production to meet the demands of wartime. Estimating output from furnace hearth size relies on archaeological evidence for which there is little in this period. The remains of Northpark Furnace were surveyed and, although the hearth had not survived, the overall ground plan of the furnace measured 5.5 metres square, which is comparable to the plans of Batsford or Chingley Furnaces, both of which had been abandoned by the third decade of the seventeenth century; Northpark was put up for sale as a working furnace as late as 1777.[38] No excavation work has been carried out at any other Wealden furnaces from the Seven Years' War period, so the only estimate as to size can be made from the available output figures. Churchill's initial proposal to the Board was for 200 tons of ordnance in 1757 which, over an assumed average campaign of thirty-three weeks, is not unreasonable compared with the output level of seven to eleven tons a week quoted by the estate three years earlier.[39] Churchill doubled his proposed output for 1759, and it is presumed that he was able to make this offer by running Darwell Furnace as well as Robertsbridge.[40] In 1757 William Bowen offered to cast 300 tons of ordnance at his furnaces, presumably Cowden and Barden, which is a low figure suggesting small hearth capacity.[41] Heathfield was one of three furnaces erected during the 1690s, and it might reasonably be supposed that they were of similar size. Furthermore, it is known that the other two, Lamberhurst and Pippingford, were both larger than the norm for the Weald, as suggested by archaeological evidence; the former being 28 feet (8.5m) high and probably of comparable dimensions around the base, the latter being known to be 8m square at the base. The size of the hearth at Lamberhurst was reported to have been 16.275 cu.ft. (0.46m3) equating to a maximum capacity of 3.2 tons of cast iron.[42]

Cleere and Crossley have shown that production at Waldron and Lamberhurst averaged at about 1.4 tons a day in the 1740s, and that

Heathfield was achieving slightly more a decade earlier.[43] The warrants issued to Harrison, Bagshaw and Tapsell at the end of 1756 were for almost 1500 tons of ordnance which, at an average output per furnace of 250 tons, would have required the combined production of five furnaces.[44] Stephen Fuller was unable to guarantee to supply more than 270 tons for the Board in 1759, although he said he would try to deliver 300 tons. More than any other, Fuller's furnace seems to have been devoted to the production of ordnance at this time, so these figures may be a better guide.[45] Output figures are available for Ashburnham but they are distorted in that the weight of iron often relates only to ordnance and does not consistently include other castings. Nevertheless figures of 341 tons for 1759-60 and 307 tons for 1760-1, the latter in a campaign apparently lasting only 35 weeks, suggest a capacity substantially similar to the furnaces mentioned above.[46]

If Wealden furnace capacity was modest in this period, the ordnance production of furnaces outside the Weald was very similar. Robert Morgan, at Carmarthen, offered the Board of Ordnance 100 tons a year in 1758 and 1759, which appears very low in comparison with Wealden furnaces, but which cannot represent Morgan's maximum output as he was expecting to cast 650 tons in 1760.[47] Some Wealden gun founders, notably the Crowleys and, later, Edward Raby, as well as other non-Wealden gun founders, such as the Sones, of Sowley in Hampshire, Robert Morgan, and John Wilkinson, of Willey in Shropshire, combined production for the Board of Ordnance with orders for the East India Company, so orders for the Board cannot be taken as an accurate guide to furnace output.

Other technological innovations which began to appear elsewhere in the iron industry included alternative methods of blowing air into the furnaces. The traditional Wealden method, two pairs of leather and oak bellows, allowed little room for improvement. The Ashburnham and Heathfield accounts contain regular payments for hides and oil for their maintenance, without which furnace efficiency would be impaired and water supplies exhausted sooner. There is no reference to the

introduction of alternative blowing methods, such as the cylinders that Smeaton made for the Carron Company. Although the Fullers had an engine made to raise water in the 1730s, it does not seem to have been a success, and no other evidence exists of attempts to provide more reliable means of maintaining the water supply to furnaces and forges. The unusually dry years of the mid-1740s had passed, although Edward Raby reported to the Board that dry weather had prevented him from boring his guns to complete his 1759 warrants, and in 1757 Stephen Fuller's clerk, William Gregson, came to an agreement with the miller upstream of Heathfield to allow his water to be used, for a daily charge, to avoid his workers having to tread the water wheel in the absence of water.[48]

Forges played a role of diminishing significance in the Wealden iron industry during the 1750-70 period. Largely left to work up the surplus iron from gun foundries, their purpose had been reduced to serving the needs of local blacksmiths through the wholesale of bar iron, or, in a few cases, such as Maresfield, Howbourne and Abinger, to supplying ironmongery establishments in Lewes and Guildford respectively. The use of the forge at Ashburnham was subsumed to the more immediately pressing demands of the gun trade, by being converted to a boring mill.[49] The Fullers had built a second boring house at Heathfield Furnace in 1742, and there were two at Robertsbridge Forge.[50] A second boring mill was constructed at Ashburnham in 1766, possibly with an eye to future demand for ordnance, although the casting of mill cases and garden rollers required boring as well.[51] The innovation which perhaps had the most profound effect on the Wealden gun founding industry, Wilkinson's boring machine, did not appear until the 1770s, by which time smelting activity in the Weald had also virtually shrunk to merely local importance.

The relative unimportance of forges may have led to their neglect. In the 1765 correspondence about Hawksden Forge, the state of the works, the structure, machinery and waterways, was described as in need of repair, some urgently. It may be that the neglect was, in part,

due to the difficulties which had beset Richard Tapsell, the former tenant, prior to his bankruptcy. It also seems likely that tenants of forges had to take pains to ensure that, when they entered into a lease, a full set of tackle was included. Churchill made it clear that he expected Robertsbridge Forge to be in a good state of repair when he took it over.[52]

Labour

The permanent labour force of the iron industry in the mid-eighteenth century Weald was small. At Ashburnham, the accounts record payments to a clerk, founder, borer, moulder and labourer, in addition to a wide range of other individuals employed for specific purposes at piece rates. At Robertsbridge Furnace, earlier in the century, there are references to subordinates for the founder and filler, implying that the master founder's wage at Ashburnham might have been intended for further division to pay his assistants; average weekly amounts confirm this.[53] On that basis, with as many as fourteen furnaces at work at any time between 1750 and 1770, the total permanent personnel at work in them would have been nearly 150. However, gun founding was a particularly labour-intensive branch of iron making. John Fuller's comment in 1749, that he had '50 pairs of hands with nothing to do' for want of contracts, puts this in perspective.[54] The manufacture of gun moulds, each of which would have taken several days, and which would have been consumed at the rate of two or more a day for smaller calibres, would have occupied a considerable number of man hours. A figure of 700 workers based at the gun foundries across the region must, therefore, be realistic, and should be regarded as a minimum figure. It is impossible to count accurately the total number of persons engaged in supplying the raw materials to the furnace, for there is no way of knowing how many others were paid for out of the individual expenditure items. For the 1758/9 campaign at Ashburnham Furnace, about sixty people can be identified as being paid for one or more jobs, whether it was regular work such as coppicing, coaling, or transporting iron, or for periodic tasks such as repairing a boring bar,

making baskets or currying hides. Therefore, assuming that half as many again can be added to the sixty already counted, the number of non-permanent personnel may have been as many as ninety at a typical furnace; a total in the region of 2000 permanent and casual workers for some fourteen furnaces.

In addition there were the forges in the region, which again numbered about twelve at any one time, with a permanent staff of three at each. Forges required no ore, their output was considerably less than the furnaces (Robertsbridge had an average output of 40 tons a year) and their products were generally distributed in a smaller area. The casual labour force of a forge would therefore have been considerably less than a furnace; perhaps a quarter of the number. For an average of twelve forges, we can expect that nearly 400 permanent and casual workers may have been employed, making a grand total approaching 2500 for the whole industry in the Weald. In the period 1756-70, labour charges at Ashburnham, excluding any part of the cost of transport, consumed 37% of the total expenditure. A comparison between the labour costs at the beginning and the end of the period is less easy to make, as rates are not always given. Where they are, however, no change can be discerned over fourteen years.[55] There is evidence that ironmasters made some provision for the accommodation of their workforce, particularly in areas where there may have been insufficient housing in the surrounding agricultural community. A map of the lands of Sir Kenrick Clayton in 1761 shows a number of small closes with cottages, adjacent to the Warren Furnace, let to Mr Masters, one of the partnership operating the works.[56] At Northpark Furnace, memories of a 'shanty town' survive locally.[57]

In an industry where the number of skilled personnel was so small, it is inevitable that individuals became widely known, and that there was a distinct market for such artisans. The Diamond family, who in successive generations were moulders at Ashburnham, and of whom John Fuller thought highly, were called upon for advice at other furnaces than their own. William Bowen, the ironmaster at Barden

and Cowden furnaces, appears to have had a practical training in iron founding, for in 1744 John Fuller described him as 'the best Molder among us'.[58] Bowen may have worked for Samuel Remnant early in his career. John Butler, however, experienced some difficulty attracting specialist workers to his furnace near Fernhurst, outside the main area of Wealden gun foundries.

His response was to employ workmen from the north, though it is not known from where, until local men had acquired the necessary skills.[59]

With the gun founding industry spreading outside the region, the specialized skills of the Wealden workers were in demand elsewhere. Following the death of George Tyler, his founder, Robert Morgan had considerable difficulty attracting a replacement in 1759. A suitable candidate from the Weald could not be engaged. Desperation nearly drove him to employ "Drunken Bets," whose poor workmanship had caused such a disastrous proof for Abel Walter at Sowley, that the latter had given up trying to cast guns for the Board.[60] Coincidentally perhaps, the moulder at Ashburnham in the 1760s was a John Betts. The Carron Company employed moulders from Sussex, but in inadequate numbers for the output they were contemplating, and the use of unskilled labour led to a lower standard than the company were aiming for.[61]

Notes and References

1. The text of this article has been adapted from, J. S. Hodgkinson, 'The Iron Industry of the Weald in the period of the Seven Years' War 1750-1770' (unpublished MA diss., CNAA/University of Brighton 1993); research for the original dissertation was assisted by a grant from the Tebbutt Research Fund.
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Compiled by J. S. Hodgkinson

Compiler's Note

Wealden locations are listed by parish; other locations are listed by ancient county. Names of shipping vessels and publications are in italics.

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