Wealden Iron

Second Series
No.2 1982

Bulletin of the
Wealden Iron
Research Group

Including Index to
Bulletins 13-17

WEALDEN IRON RESEARCH GROUP

BULLETIN NO.2, SECOND SERIES

1982

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THE CHRONICLE AWARD

In 1981 the Wealden Iron Research Group were the winners in the competition for the BBC Chronicle Award. It is appropriate that at this stage of the history of the Group this event should be recorded in the Bulletin by publishing the statement of aims and achievements which accompanied the entry to the competition.

WIRG was founded in 1968 "to promote further research into the history of the Wealden iron industry, with the ultimate aim of publishing a survey and history of the industry in book form." There are now about 100 members, some 20 of whom are active field workers. An AGM with field visit and an annual winter lecture were instituted, open to the public. The Group is now a registered Charity. A bi-annual Bulletin was published and important reports appear in national or county archaeological journals, with summaries in the Bulletin. Recently we have changed to an annual publication and a newsletter; these are issued free to members and are on sale to the public.

The industry

The Wealden iron industry is sharply divided into two phases, in which the techniques of iron production were quite different. The first phase is known as the bloomery period, in which wrought iron was directly produced in bloomery furnaces; this phase continued from the Iron Age until nearly the end of the 15th century. There is no certain evidence of water-powered bloomeries in the Weald. Bloomery remains are recognizable as concentrations of charcoal and furnace debris and a distinctive form of iron slag. All the excavated bloomery furnaces in the Weald have been small; greater production was obtained by increasing the number of furnaces in operation. Concentrations of bloomery debris may therefore be quite large or very small.

In the early post-medieval period, water-powered blast furnaces which could produce large quantities of iron suitable only for casting were introduced into the Weald. Wrought iron could be produced from this pig iron by refining in a water-powered forge. Remains of these furnaces and forges consist of earthworks, water systems, and distinctive slags.

Within each phase precise dating can only be achieved on the basis of excavation finds, or documentary evidence, or by using appropriate modern dating techniques.

The last three years

By 1978, valuable experience had been gained by members of the field group in recognising both types of ironworking sites. A standard questionnaire had been devised and was used to record relevant details.

The Group had assisted, and sometimes initiated, rescue excavations at major blast furnace sites under the direction of the Department of the Environment and the Sussex Field Unit, all of which have now been published. Experience of bloomery excavation had been gained under the direction of the then Chairman, an experienced amateur archaeologist. An approach to the Department of the Environment resulted in a policy decision to schedule selected ironworking sites as Ancient Monuments. A number have been scheduled following our recommendations.

Two major finds needed accommodation; a cannon which had been excavated at Pippingford Park, and a seventeenth century cannon boring bar, found by the field group at a site at Chiddingly. No laboratory could be found to to treat the bar, so WIRG members experienced in metallurgy had undertaken electrolytic treatment and rust prevention (Post-Medieval Archaeology 9 (1975), 38-41). The cannon had been treated by the Department of the Environment. Small finds relating to the boring process also needed conservation and accommodation. We hoped to extend our contacts with museums, with a view to preserving and exhibiting these major finds.

Much had been learned by 1978, but much remained to be done to complete our research for the book now accepted for publication by Leicester U.P., and to publish our accumulating knowledge in other ways that would interest the public. From 1978-1981, therefore, the following projects were undertaken:

1. Plotting and dating of bloomery furnaces

It became evident that the incidence of bloomery sites was much greater than anyone previously imagined, and that it would therefore be impossible to make a complete survey of the Weald in this respect. A close study of the intensity, siting and dating of bloomery sites was therefore completed in a given area of 182Km^2. All stream valleys and as much as possible of woodland and arable were walked and sites plotted on an Ordnance map. The problem of dating remained, as bloomery slags of all dates are similar in appearance. Experience of bloomery excavation had revealed pottery in the slag heaps; 15% of the heaps in the given area were therefore dated by trenching. The resultant pottery finds showed that 80% of those dated were Roman and 20% were medieval. We believe that this result shows the extent and importance of the industry during Roman times, and points to a degree of Roman settlement in the area which had not been previously realized. (Sussex Archaeological Collections 119 (1981), 57-64).

2. Excavation of a Roman bloomery site

A site was discovered on the former Ashdown Forest, now part of an Army Training area and therefore threatened by damage. Total excavation was completed. The site was found to contain three bloomery furnaces, with their accompanying reheating hearths, an anvil area, and clay and roasted ore dumps. Pottery of the Roman period was found, and much new information gained on furnace types and possible working methods. Professional reports were obtained on the pottery, archaeomagnetic dating and ore analysis (SAC 117 (1979) 47-56).

3. Excavation of a Saxon bloomery site (Rescue)

During 1980 a rescue excavation of major importance was successfully undertaken. Water pipeline trenching across Ashdown Forest, being watched by members, revealed a bloomery site of unusual type and with unusual pottery. In the few days available before the destruction of the site it was excavated by members and the co-operation of the Department of the Environment enabled archaeomagnetic and radio carbon samples to be taken. The results (supported by the pottery) gave the first archaeological evidence of (Middle) Saxon presence in the High Weald, and the remains of one of the rare Saxon bloomery furnaces in the country were fully recorded. A report is being prepared for publication.

4. Excavation of a medieval bloomery site

A site near East Grinstead, dated by associated pottery to the medieval period, is currently being excavated to learn more about the little-known furnaces of this period.

5. Metallurgical Experiments

Experiments were made, directed by one member, in using locally available materials to produce iron. Clay for Roman type shaft furnaces was dug and charcoal made on site, and iron ore (siderite) obtained from a local clay pit. Bellows and all necessary tools were made by the member directing the experiments, of which approximately 30 have now been carried out. Inconsistent results emphasise the sophisticated technology of the ancient smelting process, but some blooms of iron have been made and forged on tree trunk anvils to produce billets of Wealden iron (WIRG Bulletins 14 (1978), 9-10; 15 (1979), 11-15).

6. Documentary work and collation

For the post-medieval section of the book, intensive documentary research combined with the earlier field work has resulted in the completion of a gazetteer, with map, of all known Wealden sites. A list of all known bloomery sites has also been prepared.

In addition to the above work, members have undertaken a wide range of educational activities, as follows:-

1. Advice to individuals, schools and socieities, including the identification of slags and chance finds, choice of sites for visits, book lists and basic information.

2. Visits, courses, conferences and lectures. Members were responsible for the content, field visit and lectures of a course for teachers which was sponsored by East Sussex County Council (1979).

We helped to arrange and provided speakers and an itinerary for the Annual Conference of the Historical Metallurgy Society (1979).

Many talks, lectures and field visits have been undertaken, and exhibitions arranged at the request of local socieities and other groups, including the Association for Cultural Exchange, and the Cambridge Institute of Art and Technology.

3. Museums. We have permanent exhibitions of our material at Haxted Mill, near Edenbridge, Kent, and in the Museum of Local History, Anne of Cleves House, Lewes. At Haxted Mill, members have made and stocked the display case with diagrams, photographs and samples, and one member has devised an ingenious automatic system for showing an informative tape/slide sequence. At Lewes, the curator has arranged a new display, with a life-size reconstruction of the method of cannon-boring, using the WIRG boring bar and parts of a water wheel and gun carriage also excavated from Wealden sites. The cannon excavated at Pippingford is displayed, and also a model of a gun pit based on that excavation. Members are preparing an informative booklet to go with this and other parts of the display.

4. Television and radio. Members helped with Professor Hoskins' programme "Kent, Landscape of War and Peace" (1975). More recently we took part in a series of recordings on the Wealden Iron industry for Radio Brighton and in 1980 facilities were provided for filming one of our bloomery experiments as part of the Merry Go Round series of children's programmes. A Radiovision filmstrip for schools has also included the Cowpark excavation as one aspect of its theme, "The Weald".

The active members of our Group are all amateur archaeologists, but it has always been our policy to ask for expert and professional advice or help when the time and organisation required for a task was beyond our capacities (as in the rescue excavation of a water-powered site) or when professional expertise was needed (as in the use of modern dating techniques). Since the work began the need for it has become even more apparent, and details of many sites have been recorded before destruction by public or private works. From a research point of view there is increasing interest in what has been described as "the oldest capitalistic industry".

FIELD NOTES compiled by C. F. TEBBUTT

Furnace Wood, Buxted (TQ 477267). A large heap of slag was found on the east side of the main riding through Mill and Furnace Woods.

Sharpsbridge, Fletching (TQ 444209). A scatter of slag, furnace lining and cyrena limestone was found on the ploughed field, where there were also areas of burnt soil. The site was reported by Mrs. Robin Kenward.

Wilderness Wood, Hadlow Down (TQ 536237). A bloomery site in this wood was reported in the last Bulletin. The owner, Mr. Chris Yarrow, has now discovered a further site with abundant slag.

Crump Corner, Little Horsted (TQ 475165). When the grass field was ploughed in 1976, in the south-west angle of the two roads, two areas of black soil appeared separated by a slight depression. Both areas had a heavy scatter of slag, roasted ore and furnace lining. The site nearest to the road angle had also a scatter of Romano-British pottery. It was reported by Mr. R. E. Wilson, Crump Cottage, Little Horsted.

Wadhurst (TQ 645313). A scatter of slag in the ploughed field on the north-east side of the main road has been reported by Elizabeth Gibb.

Brambletye Forge (TQ 41433497)

In Bulletin 16 (1979), 20-21, C. F. and M. Tebbutt described the water system serving Brambletye Mill, believed to have been built on the site of the 16th-century forge. This prompted Mr. P. Wood of East Grinstead to write to the authors referring to an auction map of the Brambletye Estate of 1831, taken from a lost map of East Grinstead parish by Chilcott, 1826. On this a small field of about 2 acres on the left bank of a tributary of the Medway

(see grid reference above) is named 'Forge Mill Meade'. The field is shown on the 6" Ordnance 1911 edition, but has since been incorporated into the larger field to the west (Fig.1).

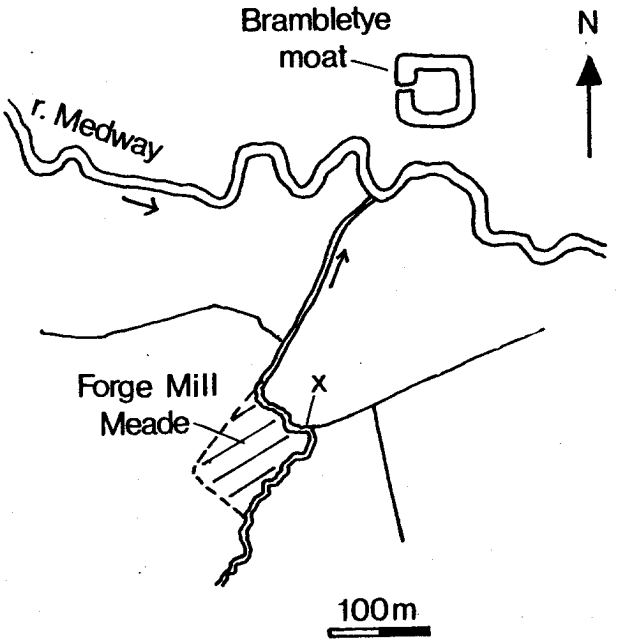


Fig.1 Sketch plan, Brambletye Forge

A visit to the site, now arable, by the writer and R. Adams, disclosed that it was a silt-filled hollow suitable as a pond, but with no sign of a bay. Within the area was a low mound of reddish brick-clamp debris with broken bricks of 55 mm thickness, indicating a date not later than 1650.

An examination of the stream bed in low water conditions proved more illuminating. Ten metres downstream from the first right-angle bend were one whole and several pieces of forge bottom in the stream, while at stream-bed level squared timbers protruded from both banks (Fig.1, X). That in the right-hand bank was partially cleaned in situ (Fig.2) and appears possibly to be part of the hammer framework.

We are especially grateful to Mr. Wood for the information given.

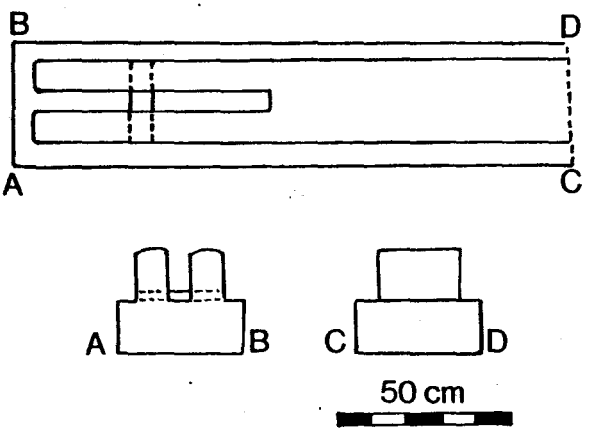


Fig.2 Brambletye Forge

Darwell Revisited

On 1 December 1981 Darwell reservoir was revisited with Dr. Woodcock, the County Archaeologist, to observe the possible effect on archaeological remains of the proposed raising of the water level. At TQ 709207 it was found that about 50 m of the extreme south end of the bay still survived above the present water level, and more if its course under water could be traced visually by shallow-water vegetation. A great quantity of glassy slag remained. All signs of the bay will disappear when the water level is raised.

At TQ 717205 a deep ravine-like gill has been blocked to form a causeway, with the stream culverted under it. This earth bank contained glassy slag and the culvert appeared to be original. It may be the bay mentioned by Manwaring-Baines (Bulletin 17 (1980), 11) and would seem to be a causeway for heavy traffic from the furnace.

Nearby Bushy Shaw (TQ 715205) was noted as having a close pattern of small round large opencast minepit

New Light on Pippingford Steel Forge

The site of the early 16th-century Pippingford Steel Forge has always been a matter of conjecture although it was evident that it must have been near, if not actually on, the site subsequently used for the late 17th century furnaces. The Parliamentary Survey of c.1655 names the Millbrook stream in that vicinity as Steel Forge River.

The recently published Catalogue of Manuscript Maps in the custody of the Sussex Archaeological Society (1981), under Ashdown Forest, page 7, lists maps of the area dated 1692-3 and 1738. On the former appears a small pond on the Millbrook stream labelled 'Still Forge Pond', with no attached buildings; on the latter in the same position is shown a larger pond labelled 'The Furnace Pond' with a furnace building depicted. Also on this later map a track labelled 'The road to the Old Furnace' is shown going in the direction of Colemans Hatch.

It is therefore now clear that the Steel Forge was on the site of the later furnaces, and was no doubt destroyed when they were built. The maps referred to have now been taken into the custody of East Sussex Record Office.

Mayfield Forge (TQ 594281)

Visits by members to the area downstream of Mayfield Furnace in Spring 1981 and at the AGM in July 1981 established the position of the historically recorded Mayfield Forge, which had previously eluded both the Field Group and Cattell (SAC 117 (1979), 171). It was noted that a channel or leat, now dry, leads from the north end of the furnace bay to join the present stream about 150 m downstream. At this spot there is obvious artificial disturbance on the north bank, with another dry channel looping round to rejoin the stream further downstream. In the main stream itself, at this point and below, are forge cinder and forge bottoms. 50 m further on the public footpath that follows it, the stream reaches cultivated fields named appropriately Great and Little Forge Field.

Mayfield Boring Mill (TQ 593281)

During the winter 1980/81 cutting of coppice and clearance of undergrowth in the vicinity of Mayfield Furnace revealed features previously hidden by vegetation. This was particularly apparent in the area to the south of the stream, downstream from the furnace bay, where the O.S. map shows a bay across a small side stream flowing from the south-west, with a pen-pond upstream. In these favourable conditions the whole area was surveyed by Peter Leach.

Evidence for this having been a boring mill came from the ground towards the main stream, where the soil was heavily impregnated with charcoal and contained large quantities of broken cannon mould. Further evidence was provided by specimens of boring swarf found on a small levelled area downstream from the bay.

Mayfield Furnace revisited

A study, by Anne Dalton, of a probable seventeenth century map of Mayfield (Sussex Archaeological Society Map Catalogue p.38, 'Mayfield Place Farm') has revealed several new features relating to the water supply for the main furnace pond. The map shows that the present main road crossing the stream at TQ 59022825 was then a bay with a sluice.

On the south-east side of the present road, at TQ 59002815, a short bay with sluice is shown crossing a small tributary stream. Although this bay is now broken signs of it could be seen on the ground on both banks, and slightly downstream is a small house platform with a scatter of glassy slag. This may be the site of the cottage recorded by Straker (p.293).

Upstream, north-west of the road, recent coppice cutting has revealed a further, much higher, broken bay at TQ 58802806. With further pen ponds on the main stream, and the separate power supply for the boring mill, it seems evident that great anxiety must have been felt for maintaining a continuous water supply to the furnace.

FIELD GROUP FORAYS

Maresfield and Uckfield Bypass Route

The walking of the above route, some nine kilometres long, was undertaken on behalf of the East Sussex Archaeological Officer and occupied forays from 1981 to 1982. A scatter of bloomery slag was noted at the northern end at TQ 459249, just south of Cave Wood, where the route impinged

on the line of the London-Lewes Roman road. Otherwise little of Wealden Iron interest was found. Other results of archaeological interest will be reported to the Sussex Archaeological Society.

Tugmore Shaw, Hartfield (TQ 461137. 10 Oct.,1981)

To assist the WIRG survey team, members walked the woodland in close formation each carrying a bundle of bamboo canes with attached numbers. A cane was stuck into each mine pit encountered, enabling the survey to be made over a number of subsequent weekends. (For later publication in the Bulletin).

Thundersbarrow Hill. (TQ 230084. 14 Nov., 1981)

The chalk downland foray under the guidance of Mr. Roy Hartridge was an attempt to confirm, or otherwise, evidence of pre-historic iron smelting on the chalk, possibly using iron pyrites as ore. The large arable field selected and walked by members, by kind permission of Mr. Draycott, included a Roman site and the ploughed out part of the Iron Age hill fort. Iron pyrites lay scattered over part of the area, and both Iron Age and Roman pottery was found. However no sign of iron smelting could be discovered.

Oldlands Roman Bloomery (20 March, 1982)

See separate report.

WIRG Slag Collection

The slag collection representing some 100 sites, mainly water powered, has been accepted by Hastings Museum through the curator, Mr. Devenish.

REFERENCES IN RECENT PUBLICATIONS C. F. TEBBUTT

Calendar of Assize Records, Elizabeth 1. Sussex. Stationery Office 1975, no.1934. June 1600 East Grinstead Presentments.

Thomas May for carrying 30 loads coal for more than two miles along the highway from Waldron Down to Mayfield, and carrying 20 loads coal from Cotchford Bridge to Mayfield. Also for carrying 100 tons gravel from Mayfield towards Lewes.

John Harman of Tonbridge, Kent, for carrying by Andrew Edwards of Wadhurst 20 tons of sows from Snap Furnace (Scrag Oak) in Wadhurst to Beanhale Forge [Benhall] in Frant.

Wm. Father of Tonbridge, Kent, for carrying by Wm. Russell of Rotherfield and Thos. Harman of Pembury, Kent, 20 tons of sows from Riverhall Furnace in Wadhurst to a forge called Postern in Tonbridge.

Sussex Industrial History no.11 (1981)

This latest volume from the Sussex Industrial Archaeology Society contains an interesting article The Use of Clay at Ashburnham Brickworks by Jack Harmer. In brickmakers' terms the raw material for brick and tile making is in two distinct forms, clay and loam. Contrary to common belief, at Ashburnham at least, only loam is suitable for bricks and only clay for tiles. The Ashburnham brick loam had a high silica content, 75%, and shrank very little in burning; on the other hand the tile-making clay had little silica, less than 25%, and a high shrinkage rate. Clay was very sticky and difficult to handle.

An historical footnote to the above article has been added by W. R. and M. Beswick, based on research into the Ashburnham account books in E.S.R.O. They record many thousands of bricks and tiles supplied by Ashburnham Brickworks to the furnace in the seventeenth and eighteenth centuries.

The Beswicks write:-

' In March 1760 the brickworks supplied the furnace with 300 tiles, 1600 double bricks, 3700 common bricks and also 3700 bricks mixed with clay. The inference which may be drawn is that it had become apparent that a high silica brick was unsuitable for blast furnace use, particularly where limestone was added to the furnace as a flux, and therefore a brick with a higher alumina content, was needed. Hence the admixture of clay in bricks for the inner lining of the furnace.'

OLDLANDS ROMAN BLOOMERY — M. AND C. F. TEBBUTT

This was probably one of the most important of the large scale 'factory type' Roman iron smelting sites of the central Weald. The working area (TQ 475267) was almost completely destroyed, early last century, when the vast slag heaps were used as a source of road-making material. The site lay astride the stream separating Maresfield and Buxted parishes, the working area being in the former and the mining in the latter. On the north-west side of the stream, the working area side, the valley is relatively flat but with some hollows and undulations. On the south-east side, now known as Mill and Furnace Woods, the ground rises rapidly and the Wadhurst Clay is exposed.

The waste slag heaps that once lay on the north-west side were such a prominent landscape feature that the nearby gate into Ashdown Forest was known, in the sixteenth century, as 'Sinderhatche Gate'. It was not however until 1844 that the significance of the site became known, by which time it was

mostly destroyed. The Rev. Turner, Rector of Maresfield, noticed Roman pottery among heaps of bloomery slag used for repair of the main London road in his parish. He immediately enquired as to the origin of the slag, visited the site and questioned the workmen engaged in digging the slag heap. The circumstances of this find, together with the information which Rev. Turner received, were published by Lower in the Collections of the newly formed Sussex Archaeological Society (Vol.2, 171), most of the article being quoted by Straker (Wealden Iron, 395-7).

According to this account the slag heap had been very deep in places, and covered some six or seven acres. Under it were said to have been Roman domestic buildings and the heap contained large numbers of pottery sherds. It even had burials in it. Coins found dated from the first to third centuries A.D. The buildings presumably dated from an early phase of the iron workings.

In March 1982 the Field Group visited the site to see what could be learned from a field survey of the whole area divided by the stream.

Old Mill Cottage Farm (Fig.1)

This comprises most of the site on the north-west side of the stream and is all grass with the exception of the house garden, where plentiful bloomery slag and dark soil can be seen. The grass fields were surveyed by Brian Herbert, using a beat frequency type metal and slag detector. A summary of his report follows. Part of the area was complicated by its former use as a water mill with a bay and now dry pond (A) immediately north of Old Mill Cottage. The area of the dry pond gave a negative reaction to the slag detector, probably owing to the depth of silt. Slag occurs in the stream to the east and in the garden to the south and is therefore probably present under the pond silt.

Field B showed a scatter of slag over the whole of its area, but with a greater concentration to the north and north-west. Its south-west boundary is what appears to be a natural stream, to which it drops steeply down in typical gill fashion. From just north of the gate into field C a dense layer of slag can be seen on the left bank, and scattered pieces in the stream bed. Similar conditions extends to its junction with the main stream.

Field C shows obvious disturbance at its north-east end, the north part part next to the boundary stream being low and marshy. Near the centre of the field is a hollow where slag could be detected, and scattered slag occurred from this point south-east to the main stream at 50 m below the junction.

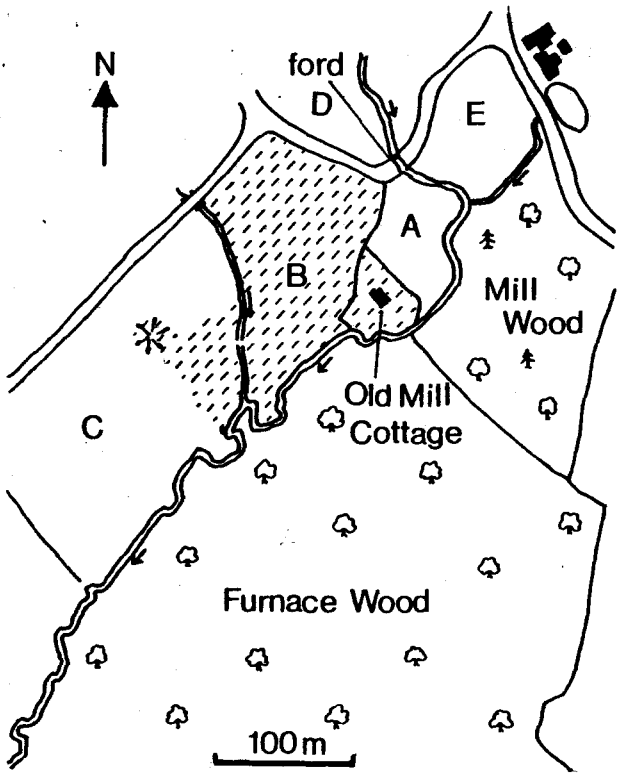


Fig. 1 Sketch Plan, Oldlands

Field D was not included among those where permission to survey had been obtained, but at its south-west end molehills revealed intensely black soil.

Field E. No slag was recorded on this field.

The area where slag was detected covers some five acres, or a total of six acres if the dry mill pond (A) were added (see hatched area on Fig.1). The probability that the main stream originally flowed along the west side of the mill pond, and that the pond utilised a minepit quarry, was considered to be possible but cannot be proved.

Mill and Furnace Woods (Fig. 1)

All along the wooded eastern side of the main stream the ground rises steeply. This was walked by Field Group members as far south as TQ 475263. In the main body of the wood, but particularly in the half nearer the stream, there had been sporadic mining in large opencast pits, with a group of small round pits at c.TQ 475264.

To account for the huge amount of Roman slag recorded on the north-west side of the stream, mining on a very large scale would have been necessary, and this did appear to have been done along the edge of the wood bordering the stream. Here large quarries at stream level had been dug deep into the hillside, as far downstream as TQ 474265. It seemed probable that the whole valley may have been widened, by an unknown distance, to the east.

Where ore occurs in rising ground in the Weald this type of mining is the easiest method, extraction and drainage problems being minimised. There can be little doubt that at Oldlands the favourable mining conditions determined the large 'factory' smelting site across the stream.

Slag from a probable bloomery furnace was found in the wood on the east side of the main road at c.TQ 477267.

The Group is grateful to the Forestry Commission for leave to enter their woods and to Mr. and Mrs. Knight of Old Mill Cottage both for their permission and their hospitality. The Archaeological Officer of East Sussex County Council kindly supplied maps of the area.

MINEPIT SURVEYS GILES SWIFT

1. EXCAVATION OF TWO MINEPITS IN MINEPIT WOOD, ROTHERFIELD

As part of research into the mining of iron ore in the Weald two minepits were excavated in July 1981 in Minepit Wood (TQ 521343).

The pits were excavated in order to:

1. survey and record the section of a minepit.
2. determine the feasibility of discovering the profile of minepits by systematic probing.

The two pits were chosen for their accessibility as the excavation was carried out by a mechanical digger. Both were probed before excavation using a 5 m probe.

Pit 1

A trench 0.9 m wide, 4.5 m long, 2.6 m deep was dug across the apparent width of the pit. The section revealed a small naturally silted pit 1 m deep. Probing had indicated, however, the bottom of the pit to be 2.9 m deep, which was deeper than could be excavated by the digger.

The section of the trench consisted entirely of stiff yellow clay similar to that subsequently found to be the fill of Pit 2.

The trench was then extended the following week by approximately 1.5 m at a depth of 1.2 m revealing the edge of the pit with the dark grey crumbly subsoil as was observed in Pit 2. Iron ore was seen to occur in the subsoil but none in the yellow clay.

The amount of collapse of the section that had occurred during the intervening week made it impossible for a profile to be drawn although the pit seemed to be of similar construction to Pit 2 with the same material used as backfill, but probably of rather larger size though the edge of the pit was not reached at the western end of the trench.

Pit 2

A trench 0.9 m wide, 5.5 m long, 2.75 m deep was dug across the pit. The section revealed a pit 3.5 m diameter at the top, 2.5 m deep tapering to a diameter of 0.75 m at the bottom. There was evidence of slight undercutting of the pit sides at a depth of 1.5 m.

Systematic probing of the pit prior to excavation had indicated a depth of 2.35 m with a profile closely matching that actually found.

Thin layers of ore were struck at depths of 1 m, 1.5 m, 2.4 m from the surface in undisturbed dark grey subsoil on either side of the pit.

The bulk of the fill of the pit consisted of a very stiff yellow clay with a naturally silted depression at the centre. Provisional results of carbon 14 dating of wood found in the fill of the pit at 2.3 m depth indicate that the pit is unlikely to have been dug before 1600 AD.

Conclusions

The shape of Pit 1 and Pit 2 is similar to that of the minepits excavated at Benzells Wood, Herstmonceux[1] and Petley Wood, Battle[2] with no evidence of bell-shaped pits as suggested by Topley[3] and Straker[4]. Following this excavation five pits were seen in section in the quarry face at Sharpthorne Brickworks (TQ 375328), all of which were of similar size and shape to those excavated. Perhaps in future this type of pit

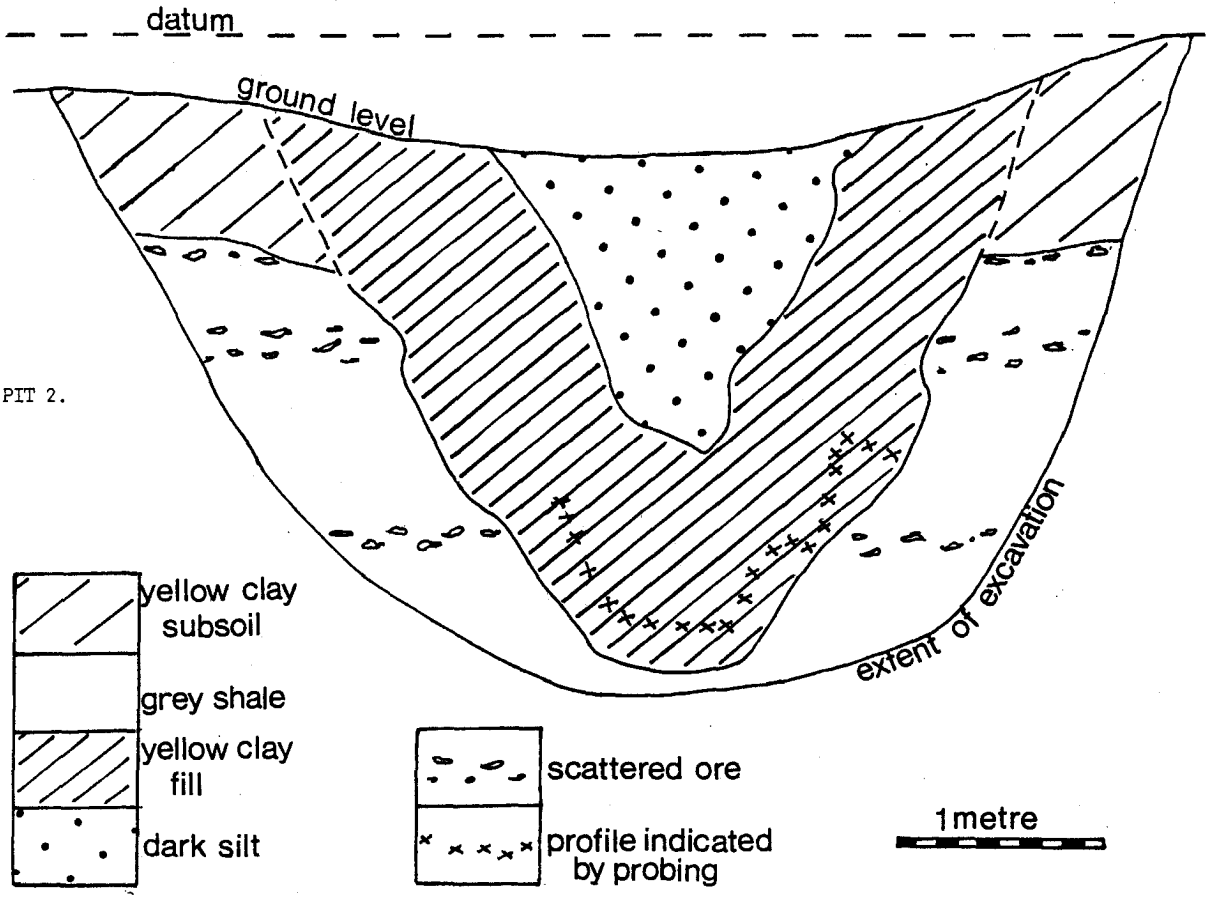

datum
ground level
extent of excavation
yellow clay subsoil
grey shale
yellow clay fill
dark silt
scattered ore
profile indicated by probing
1 metre

FIG 1. PIT 2.

should be referred to as a minepit rather than a bellpit as there seems to be no evidence of bell-shaped construction.

The amount of undercutting observed in Pit 2, approximately 0.25 m, was very limited and any attempt to undercut to any greater extent would have been quite dangerous. In view of this no hand work was carried out in the trenches and within 24 hours substantial collapse had taken place.

Probing of minepits would appear to have some potential as a means of determining depth and profile, although further excavation would be necessary to check accuracy at other sites.

The pits appear to have been backfilled very soon after excavation leaving a depression at the centre in which a small pond formed and gradually silted up.

The yellow clay fill of the pits would seem to consist, almost exclusively, of the yellow clay that occurs naturally below the top soil and extends for approximately 1 m, below which depth dark grey shale occurs. Almost no trace of this latter shale was found in the fill. This, together with the quite large volume, 1.4 cu. m, of the central naturally filled pit, and meagre amounts of ore obtained in the natural subsoil either side of the pit, all indicate that all of the grey shaly subsoil was removed, probably for marling purposes, together with any iron ore that was encountered.

The ore was a shelly calcareous ironstone composed of the closely packed shells of the bivalve Neomiodon in a crystalline, probably sideritic, matrix. The sample from the middle layer had an alongate lenticular form with one surface flat. This is probably the upper surface and the form suggests that the shells accumulated in a groove or micro-channel eroded in the underlying sediment.[5]

The apparent extraction of clay for marling must have made the economics of minepit digging rather healthier especially when so little ore was recovered as a result, as in Pit 2. The extent to which these pits were dual purpose in nature would need to be tested by further excavation. The depth of the pits, approximately 3 m, would be limited by the miners' ability to throw the spoil clear without having to resort to lifting devices erected over the pit and perhaps inflow of ground water as digging proceeded below the water table.

Acknowledgements:

I should like to thank Lord Gibson for permission to excavate, S. J. Lusted for his help and the hire of his digger at reduced rates, Mrs. M. Tebbutt for drawing the section, C. F. Tebbutt for all his advice and encouragement and members of WIRG Field Group who helped at the site. I also thank the Sussex Archaeological Society Archaeological Committee for a grant towards the cost of the excavation.

Notes

1. WIRG Bulletin 14 (1978), 6-8.
2. Proceedings of Battle and District Historical Society 1951-52 and 1952-3, 27-29.
3. W. Topley, Geology of the Weald (1875), 334.
4. E. Straker, Wealden Iron (1931), 101-108.
5. B. C. Worssam, personal communication.

2. SURVEY OF MINEPITS IN TUGMORE SHAW, HARTFIELD TQ 458373

These pits, 250 in total, occupying an area of approximately two hectares were surveyed and recorded by members of the WIRG Field Group during autumn and winter 1981. No system was apparent in the layout of the pits. The quite large area of undug ground between the pits may indicate that mining was taking place in woodland which needed to be preserved.

Whilst carrying out the survey a track 2.5-3 m wide surfaced with blast furnace slag was located in the wood. As its course was fairly straight and no pits encroached onto the track it would seem to be contemporary with or earlier than the digging of the pits. The track was traced east as far as Butcherfield Lane TQ 46013650 and south towards St. Ives Farm for a distance of approximately 700 m following the line of a footpath.

Lying along the NW and NE sides of Tugmore Shaw were two large open cast quarries. The quarry to the NW probably predated the small pits as several were dug into the working face of the large quarry.

Thanks are due to S. F. Frederick Esq., for permission to survey in Tugmore Shaw and walk over his land.

3. POSSIBLE MINES FOR THE ROMAN BLOOMERY AT CANSIRON

Following the survey of minepits in Tugmore Shaw and considering the proximity of the Roman industrial site at Cansiron it seemed possible that the large quarries at Tugmore might be the source of iron ore for the Roman bloomeries.

The most profitable source of ore occurs at the junction of Wadhurst clay and Ashdown sand and reference to Geological map sheet 303 revealed two sites probably suitable for mining: Tugmore Shaw 1.3 km to the SE and the area around Puckstye Farm 1.25 km E.

Field walking on the ploughed land to the NW of Tugmore Shaw revealed an area of bloomery slag, possibly put down to make a hard standing in what was the entrance to the large open cast quarry lying on the NW edge of Tugmore Shaw, and within 250 m of Butcherfield Lane which C. F. Tebbutt has suggested forms part of a track surfaced with bloomery slag running from the Roman ironworking site (TQ 44753830) to join the London-Lewes Way at Butchers Cross (TQ 46703700).[1]

The pit lying to the NE end of Tugmore Shaw could not be investigated as it forms part of a private garden. However, the Roman track must have passed immediately in front of its entrance.

Of the four large pits in the area of Puckstye Farm two can be eliminated from the Roman scene as they have been dug right through the line of the London-Lewes Road at TQ 46303860 and TQ 46353840. The large pit at TQ 46553860 lies on an outcrop of Cuckfield stone, a calcareous grit formerly much quarried for road-stone.[2] The remaining pit at Puckstye Farm TQ 46103840 extends over about 1.5 ha, and at the quarry face is approximately 10-12 m deep, having been dug right into the side of the hill.

C. F. Tebbutt has suggested the presence of a track running from the Roman site at Cansiron through Little Cansiron Farm TQ 454384 and field walking the ploughed land between the Roman site and Puckstye revealed a scatter of bloomery slag all along the 60 m contour level.[1]

Actually on the line of the track at TQ 45603830 the tiled floor of a Roman building, dimensions approxiamtely 6 x 10 m were found.

Of the two mining sites Puckstye would appear to be more favourable as it was slightly closer with a dead level run between mine and smelting site.

Thanks are due to E. L. Udell Esq., Farm Manager, for permission to walk over Cansiron Farm.

NOTES

1. C. F. Tebbutt, 'A Roman Bloomery at Great Cansiron, Nr. Holtye, Sussex', Sussex Archaeological Collections 110 (1972), 10-13.
2. C. R. Bristow & R. A. Bazley, Geology of the Country around Royal Tunbridge Wells (1972), 116.

SOURCES FOR THE HISTORY OF THE WEALDEN IRON INDUSTRY IN THE PUBLIC RECORD OFFICE, PART 3.

SYBIL M. JACK

Ironworks as Crown Property

If the iron mills stood on the king's own lands, one would expect to find some record of them in one or other of the royal courts. This is also true where mills stood on lands which subsequently came into royal hands and where the records of those lands, or evidence, therefore came to the king. Records relating to property which at some point had been in Crown hands as royal property may be found in the Special Collections. These include rentals and surveys, ministers accounts, court rolls, and even extents, put together from the records of a number of different exchequer departments with a blithe disregard for their archival origins, and the administrative practices which produced them. They include, for example, court rolls for John Gresham's manor of Mayfield from 1546 to the end of Edward VI's reign, but these, alas, only contain formal records of land transfers and no reference to iron mills.[1]

For the fifteenth and early sixteenth century they are nothing if incomplete. The reasons for this are worth noting. While the sheriffs continued to account for the small amount of royal land that from time immemorial had been, and still remained part of the farm of the county, most of the royal lands that were of any significance were either part of one of the great fiefs which had become attached to the Crown, of which the Duchy of Lancaster is the prime example, or were accounted for in the king's chamber. These accounts were not therefore part of the ordinary process of the Exchequer but were deposited from time to time for safekeeping with one of the keepers of records. They were, therefore, eminently losable.

One might expect this group to contain the records which came from the monasteries when they were dissolved in Henry VIII's reign. On the whole, however, they do not. This is not only because not all monastic records were duly deposited with the Crown, but also because when the Crown disposed of property the new owner was entitled also to the evidences which went with it. In this way deeds and other evidence such as court rolls legitimately passed out of Crown possession. The administrative re-organisation of the 1530s did, however, result in the appearance of much more continuous records relating to royal lands. It is therefore possible to establish the nature of the monastic property when it first came into crown hands from the first surviving royal accounts, which are in general much fuller, and occasionally much more accurate than the Valor Ecclesiasticus of 1535. Where the property was granted away so quickly that there was no time for it to come within the onus of the receiver for the county the details of the property can usually be recovered from the appropriate membrance of the Particulars for Grants (E318). If there were iron mills on monastic property at the time of the dissolution one could confidently expect to find them. Unfortunately the relevant accounts yield an apparent blank. Whatever monastic manufacture of iron there may have been before the Black Death, this had apparently ceased before the dissolution and these accounts yield no clues as to the earlier whereabouts of bloomeries.[2]

The monasteries, it would seem, did not favour the iron industry. It is difficult to be quite so certain about the Crown, because it is not easy to establish a complete list of royal landholdings before 1536 (and particularly difficult to establish what queens held). Not only was there no single point at which the land revenue was brought together, but the nature of royal rights is not always clear. That an area was royal forest did not necessarily imply that all land within it was owned by the monarch, only that the area came under the forest law and the highly restrictive jurisdiction of the separate forest courts. Much of the land of Ashdown Forest was parcel of the Duchy of Lancaster, but the Crown also had other rights which were accounted for separately[3] and which make no mention of iron mills. When the extent of the forest which includes an account of Newbridge mills was taken in the forest courts[4] it was taken because the Earl of Wiltshire, Anne Boleyn's brother, had been attainted and his property therefore forfeited to the king. The extent distinguishes quite clearly between the earl's and the king's rights. It gives a detailed

description of the two forges or fineries which Wiltshire has leased to 'one Nyssell' for seven years yet to come, but only mentions briefly a 'new' furnace pertaining thereto, which was on the king's commons called Stomlett (outside the forest bounds) and the Stilford, which was in decay.[5]

Royal land at this time was invariably leased, but the lessee did not have the right to do what he or she pleased with the property. The erection of an iron mill, mining for coal or ore, or any other new activity would, to be legal, have needed specific royal permission, and there is no evidence that it was commonly granted. When at the beginning of Edward VI's reign the Court of General Surveyors was united with the Court of Augmentations one has for the first time a single account for all royal lands not forming part of the Duchy of Lancaster or other appenage. The only exceptions were the dower lands of Catherine Parr and Anne of Cleves, which were added on their deaths. The only iron mills revealed are those on the lands of the Duke of Norfolk - the works at Sheffield and Worth. Even then, the survival of the detailed accounts which Giuseppi printed in Archaeologia in 1912 is due to an unlikely combination of events. Edward Seymour, Lord Seymour of Sudeley, who had obtained a lease of the works from the Court of Augmentations was himself attainted before the accountant had yielded his account to him, and this subsidiary account had therefore to be heard directly by the Court of Augmentations. After the dissolution of that court it came with other such accounts to the King's Remembrancers' office. Once the mills had been leased again the detailed account would be rendered to the lessee whose only responsibility was to pay the rent agreed.

The Crown obtained a number of iron mills in this way but it seems in every case that the mills were erected when the ownership of the property was in the hands of a subject. The woods and forests around Tonbridge - Northfrith, Southfrith and others - had been traditionally part of the queen's jointure but in Edward VI's reign they were one of the prizes obtained by the Duke of Northumberland, and it was under his auspices that permission for the erection of iron works was obtained. The St Leonard's Forest iron works were similarly erected in Mary's reign when the property was in the hands of the Norfolks. The nominal lessee whose name appears in the royal accounts was not necessarily the person who held effective legal rights over the property. Usually the lease was assigned or sub-let.

The fact that the property was in Crown hands does, however, tend to mean that further information can be found in the Exchequer - usually on the memoranda rolls. Thus in Hilary term 1555 in a list or commissions concerned with the preservation of timber there is a commission to Circioco(?) Petit, Hugo Cartwright, Thomas Royden and George Clerk esquire to enquire about Northfrith wood, Southfrith, Postern and Cage. They are to survey them, "the lidges park and pales, the iron mills and what wood master Darcy has cut for the iron mills and what hurt and waste the same do and to see how the woods already cut are closed and fenced for their continuance."[6] The government, in short, is endeavouring to ensure that the conditions of the leases are being observed. The outcome of this enquiry cannot be established and it presumably had little lasting effect. The woods at the time must have had an adequate supply of timber, for the queen was selling woods in Southfrith at this time either by warrant from the Lord Treasurer or by commission under the Exchequer seal, issued on 20 April 1554.[7] By 1570, however, the court was suffering considerable alarm over the situation in Southfrith. The well-known commission issued by the barons resulted in the extremely alarmist depositions which have been extensively quoted in the Victoria County History, and by Straker.[8] The lessees of the ironworks were in danger of considerable damages for non-fulfilment of covenants, and it is not surprising that as the lease drew to its end a suit was initiated in the Exchequer in 1586 which casts a flood of light on the tenurial complexity with which the site was surrounded. The petition came from Elizabeth's cousin, Lord Hunsdon, to whom Elizabeth had granted the property in fee tail with reversion to herself. Hunsdon relates how in January 1552 the Earl of Northumberland granted Sir George Harper and Thomas Culpeper a forty-year lease of the manors of Tonbridge and Hadlow, Tonbridge Castle and the parks of Northfrith Cage and Postern so that the lessees could take the trees and woods growing upon the premises and employ them upon the ironworks already erected, and to be erected, upon the premises. Northumberland's lands then came to the Crown by attainder and when Elizabeth came to the throne she granted them to Hunsdon. Culpeper died and Harper, the sole tenant by right of survivorship assured the lease to Alexander Culpeper, knight, son and heir of Thomas, Richard Lewkener of the Middle Temple and David Willard of Tonbridge, yeoman. The covenant to the lease included a requirement for coppicing, and for repairs to the property including the castle. Hunsdon claimed that the tenants had committed both

spoil and waste. They had uncovered the castle and taken the lead, timber and walls and sold them; they had not coppiced the woods, they had destroyed the pales and built houses, mills and other buildings. To add insult to injury David Willard, who had obtained a lease of the parsonage of Tonbridge and Hadlow, was now obliging the tenants to pay tithes in kind.

Richard Lewkener, however, disputed the tenurial descent. He claimed that on 1 August 1575 Alexander Culpeper had assigned the term to Richard Lewkener of Northfrith and David Willard. Richard Lewkener of Northfrith, then in debt, had assigned his share to Richard Lewkener of the Middle Temple who had undertaken to pay them and the two had held until 1581 or 1582 when they devised it to Thomas Spicer of Lincolns Inn, Sir George Carey and others. Therefore any waste since that date was their business - and Lewkener claimed that in any case Carey, Hunsdon's son, had long had Hunsdon's right in the property assigned to him. As for the castle, that had been in ruins since shortly after the death of the Duke of Buckingham and the lead had been stripped by Cardinal Wolsey.

David Willard's reply agrees that he had held the lease only for the years Lewkener indicated but that he had worked the furnace before that, cutting down woods by warrant from George Harper and Sir Alexander Culpeper, which he thought good. He admitted that he had cut a great deal of wood but only what was fit for building and repairs.[9]

The Crown also recovered control of land on which furnaces were built when Norfolk was attainted for his indiscretion over Mary, Queen of Scots. The Extent made of his property shows amongst other things the manor of Highly with the forest of Worth and iron mills in the forest valued at £5 per annum.[10] The Crown also gained a short-term hold on a number of mills when it extended the lands of Crown debtors. Where these were held for a number of years at a fixed rent to pay off the debt the Crown leased the property. Occasionally it had to intervene to protect its interest - even against its own servants, the over-zealous Commissioners for Sewers. Thus in 1590 John Ashburnham, who had been in difficulties for some time, suffered the final indignity of having his lands seized by the Queen. She took the manor of Ashburnham, including the lower forge, but then discovered that the Commission for Sewers was threatening to pull it down, evidently on the grounds both that it was an impediment to drainage and also that it came under the act which forbade the building of new ironworks except on old bays unless they were built on freehold lands which could supply all the necessary

woods from the owners' own property outside the normal prohibited areas. The barons ruled that the hammer had been built more than eighteen years and ordered the Commission for Sewers to desist.[11]

Another ironmaster whose financial difficulties led to works falling into Crown hands was Francis Fortescue. His own estates lay in Essex and Cambridgeshire but on his marriage to Dorothy Ford he moved to her estates in Rogate where he and his brother-in-law Henry Knevitt inherited not only the property but also a long standing feud with the Mervyn family over the ownership of part of the property. The Mervyns claimed that it had been part of the Abbey of Durford's lands sold in Henry VIII's reign to Edmund Mervyn but that Edmund Ford had succeeded in a lawsuit by trickery. In Mary's reign Elizabeth Mervynwas suitor in the Star Chamber against Edmund Ford for forcible ouster from the land, unsuccessfully it appears from the later suits.[12] Ford and his friends were not slow to retaliate in the same court[13] and the Ford family had the ear of the government. All this, however, was expensive, as the Mervyns were prepared to renew their legal offensive. Mervyn had evidently leased the property from Ford when the original struggle had been lost, but just before 1584 Henry Mervyn had started a new suit in Chancery alleging that the land was 'concealed', that is land which had belonged to a monastery and which had not come to the Crown hands as it should at the Dissolution. The suit may have been partly inspired by Fortescue's decision at about that time to build a furnace on the property, at Harting Combe. Fortescue responded with a suit in the Exchequer in which the history of the case was related, and retained possession.[14] In 1587, however, Fortescue was named by the Commissioners for the Rape of Chichester to be High Collector of the Subsidy, and this was to prove his family's disaster. He died before accounting, leaving considerable debts to the Crown. Anyone who had to undertake a post of that kind had also to enter into recognisances for its due performance and to bind others with him. Then his debts to the Crown took precedence over any others and any money owing to him was passed to the Crown for collection. His guarantors had included his brother-in-law Henry Knevitt whose estates in Harting were also extended.[15] The Crown issued a Commission to extent Fortescue's property but problems then began to arise. As a result the barons ordered depositions to be taken. The Crown claimed the value at which the ironworks had been rented to Henry Glydd and Michael Martin, £400 for a twelve-year lease of furnace, forge and 5000 cordes of wood annually. This lease, however, had been

had been cancelled and a new lease of furnace and forge separately entered into on 17 April 1589 instead, whereby for the two sites, and another erected in in Rogate, the partnership paid 4d for the first three years and £30 for the residue of the term. Edmund Fortescue argued in response to a bill put in by the Attorney General that his father did not have more than a life interest in the land on which the mills stood. This was true enough for most of the property since it was his wife's. Edmund also argued that the mills were not erected when he was appointed Collector, but only afterwards 'in consideration of great sums of money did, ... erect and set up the said furnace, ponds and waterbay and also upon the said parcel of ground called Haben erect the forge and hammer.'[16] The Barons' inquisition revealed, however, that while Edmund's claim may have been true for the furnace, the hammer had been built on the site of an old corn mill, the fee simple of which Francis had bought of 'one Peter of Arundel'. Edmund's plea about the date of erection also seems to have been at best a very nice one, for the agreement which Fortescue entered into with his neighbours over the construction of a leat, without which he did not have enough water-power to operate the hammer, was apparently dated 1588 and the forge was said to have been built the year before.[17]

At all events the Queen kept the hammer for an indefinite period and someone kept a close eye on Glydd and Martin. In separating the lease in this fashion they had perhaps preserved more for the Fortescue family than they might otherwise have done but they risked running foul of the stringent requirements of the act which restricted the conditions upon which new iron mills could be erected. Two years later, the partnership, now enlarged to include Richard Michelborne, were in trouble for cutting sound timber for making iron in the iron mill or furnace. One of the deponents makes it plain that there are only two works in Rogate, the furnace in Harting Combe and the hammer in a place called Haben. The evidence given also makes it clear that they had maintained their supply of charcoal by woods 'bought and supplied of others'. This alone without the evidence that they were converting to coal wood that 'might have made cleve wood' was enough to get them into trouble.[18]

In 1595 Elizabeth devised the hammer mill in Rogate to William Beech, gentleman, for as long as it remained in the Crown's hands for £20 a year. He, three years later, assigned it to Sir Edward Caryll. After ten years, however, Caryll was in difficulties with the owners of the adjoining land

through which the watercourse ran. The owners of the land - Edmund Ford, gentleman and William Westbrook - had a reasonable case. They retorted that the original agreement entered into in 1588 had granted Fortescue the right to dig a trench of 110 perches long and ten feet wide and four feet deep, but for twelve years' use only, after which it was to be filled in. They stated the rent as £12 a year, whereas Edmund Fortescue had originally mentioned £33, so it is possible that this was not the whole length of the leat. Caryll had paid the money for three years after the expiry of the original agreement, but had then witheld it for three years which gave them, they felt, every right to regain their property.[19] Caryll was also in difficulties over his wood supply.[20]

The Crown had a direct interest in a large number of woods in the Wealden area, and this also helps to cast light on ironworks there. There does seem to have been a conscious policy on the Crown's part to retain woods and forests that came into its hands. The use the Crown then made of them may not always have been sensible but it did supply a measure of control over waste. The Crown's behaviour is hardly surprising. The ships being built were not yet on the size of those of the eighteenth century, when a ship of the line was to require 2,600 tons of timber for hull structures alone, and 700 large oaks, from perhaps sixty acres of mature woodland. Nevertheless, the demands of the navy were still considerable. The availability of oak of 80 to 120 years growth, with a bole of 10-feet circumference, as well as elm and beech of full growth was giving cause for concern. The oversight of royal woods was in the hands of a surveyor, a post for two to three generations in the hands of the Taverner family. It was the job of Taverner or his sworn deputy to determine what trees should be cut and to mark them for the cutters. This applied even where a warrant fom so many trees or so many cords had been granted. Taverner was assiduous in bringing cases relating to supposed waste. Many of these involved men who were known to have been involved in the iron industry. Thus in 1576 there was a case over the woods in Shelleys Park, Bewbush, which had been let to Mrs. Dane, and another in 1594. In 1576 there were said to be 1407 oaks, 595 beeches, and 25 ash in Shelleys Park - but four hundred trees had been sold by warrant in the past two years. In 1594 the case concerned topping and lopping of five hundred trees which, it was alleged, had killed many. The evidence given was that few had died - but some said that 170 timber trees had been used for firewood. The agent in all this was John Middleton, gentleman - the ironmaster.[21] It is interesting to note that tops

and lops of the five hundred trees amounted to no more than six hundred cords of wood. John Middleton was again the object of prosecution in another case. He had cut trees in Bewbush and Shelley where Sir Thomas Shirley had a twenty-one year lease for £200, 4000 cords, from 1582. Middleton's defence was that he was acting as Arthur Middleton's executor, that George Hall, Taverner's deputy had appointed him to mark and that the rent per cord was greater than had ever been given. Another ironmaster in constant strife with Taverner was John Eversfeld.[22] In 1592 Taverner brought a case against him because although he had a lease for £40 a year of 1200 cords of wood from Sedgwick and Colstaple, Marlpost and the manor of Tarring he had for eight years been in breach of the covenant that it should be done only by direction of the surveyor.[23] Other victims of Taverner include Henry Shelley (for 500 trees worth 10s each in Warminghurst) and Thomas Bagley (for 200 oaks in Saleham).[24]

Taverner was not the only person to bring cases which related to woods on Crown lands. The tenants of manors belonging to the Crown were equally willing to do so, and many of the cases also relate specifically to the demands of ironworks. In the St. Leonard's forest area the tenants of the manor of Marlepost, for instance, resisting demands for wood, claimed that their copyhold was 'Canterbury hold' which exempted them from paying heriots and gave them all the wood growing on their copyhold to their own use.[25] A similar case concerns the common woods in Slinfold.[26] Braver than these were the tenants of Loxfield who early in the 1570s complained of the behaviour of Thomas Sackville, Lord Buckhurst. Now Buckhurst was a powerful figure. His father, Richard, had been Chancellor of the Exchequer and had been able to use his position to obtain an extra-ordinary commission from the Crown to oblige Sir Edward Gage to sell him ore and also to bring pressure in other disputes. The Queen had leased woods to Buckhurst but had sought to protect the tenants by a covenant that Buckhurst should not build any ironworks. This, the tenants protested, was no assurance that the woods would not be destroyed by iron mills 'for that there be twenty iron mills within five miles of the said woods, whereof fourteen are within two miles of the said premisses'.[27]

NOTES

1. PRO SC2/206/13.
2. See the Calendar of Ministers' Accounts on PRO shelves.
3. PRO SC6/1028 various numbers. The Duchy of Lanc. Survey DL42/112 ff. 153-64, 165-73 concerns the manor of Duddleswell and contains no mention of mills.

4. PRO E32/197
5. Cf. WIRG 11 (1977), 10.
6. PRO E368/336 Hilary 1 & 2 Ph.& M Commissions Rot. 3.
7. PRO E315/460.
8. E. Straker, Wealden Iron (1931), 219-222.
9. PRO E112/20/33.
10. PRO E178/2274.
11. PRO E123/14, p.270.
12. PRO STAC/Ph & M/bdle 1/27.
13. E.g. STAC/ Ph & M/8/26.
14. PRO E112/45/5.
15. PRO E178/2306.
16. PRO E112/45/69.
17. PRO E178/3119.
18. PRO E178/2305.
19. PRO E112/127/169.
20. PRO E112/127/174.
21. PRO E178/2281.
22. PRO E112/45/121.
23. PRO E112/45/93.
24. PRO E112/45/133, 137.
25. PRO E112/45/73.
26. PRO E112/45/82.
27. PRO E112/45/12.

THE SUSSEX WEEKLY ADVERTISER - SOME EXTRACTS

J. S. HODGKINSON

A further collection of items, relating to the Wealden Iron Industry, noted during a continuing search through copies of the Sussex Weekly Advertiser, or Lewes Journal, at Brighton Reference Library.

I would like to record my thanks to Mrs. D. Hatswell for her help in transcription.

Monday February 6th. 1759

To be Sold by Auction

At two o'clock in the afternoon on Thursday the eighth day of March next, at the house of John Bartlet at Woods Corner, in the Parish of Dallington, in the County of Sussex.

The Reversion of a Copyhold Estate, holden of the Manor of Burwash, consisting of a messuage or tenement, Barn, and several pieces or parcels of land thereto belonging, containing by Estimation 34 acres, more or less, lying and being in the Parish of Burwash in the County of Sussex, and now in the occupation of Mr. Cruttenden of Burwash, aforesaid, Expectant on the death of Elizabeth Carley, the wife of William Carley, who is upwards of 65 years of age.

N.B. There is good Mine and Marl on the premises, and the conditions of the sale will be left at the place of sale by Nine o'Clock in the morning of that day, and the premises to be viewed at any time before the Day of Sale, by applying to Mr. Thomas Grover of Ninfield in the said County, Farmer.

Monday May 7th. 1759

Last Monday in the Afternoon, died Mrs. Tapsell, wife of Mr. Richard Tapsell, Gunfounder, at Wadhurst, universally lamented by all her Acquaintance, and particularly the Poor to whom she was a great benefactress.

Monday March 9th. 1761

Last Friday se'nnight[1] as a man at Barden Furnace near Tunbridge Town, was asleep, the Fire catched hold of his Cloaths and burnt him in such a manner, that he died in about twelve hours, notwithstanding several came to his Assistance.

Monday October 19th. 1761

Last Friday, one Podman, a Labourer, at Gravetye in the Parish of West Hoathly in this County, was suffocated by the noxious vapours that arose from the Mine and Coal on first lighting the Fire. It is thought he went to lie down to sleep.

Monday June 7th. 1762

To be Sold by Auction in separate Lots.

On Wednesday the 1st. Day of September next between the hours of Two and Four in the afternoon at the sign of the Royal Oak, in Mayfield, in the County of Sussex, by the Assignees under a commission of Bankrupt lately issued against George Baker, of Saint Austle in the County of Cornwall, Grocer.

Two small Freehold Farms or Tenements.

The one called PRIORS, situate near Heathfield Down in the Parish of Heathfield in the County of Sussex ..... (etc.) The other, called COPHALL, situate in Lamberhurst in the said County of Sussex, in the Occupation of David Pearson, consists of a House and four pieces of land, Arable, Meadow, Pasture and Wood, containing about 18 acres, of which the House and six acres of plain Land is let to the said Pearson from Year to Year, at £5 per annum; the remaining 12 acres is woodland, and reserved in the landlord's hands, and is now of 11 Year's Growth or upwards, nearly fellable. There is a Bed of Loam in the Premises, which supplies Lamberhurst Furnace with that Material, the Benefit of which is reserved to the Landlord. There is also a Stone Quarry on the Premises.

For further particulars, enquire of Mr. Richard Dungate, Attorney, at Mayfield aforesaid.

Monday June 21st. 1762

To be Sold

By Joseph Molineux, Ironmonger in Lewes[2]

SCYTHES much better and cheaper than any sold elsewhere,
BAR IRON of all sorts,
A Quantity of Herefordshire CYDER, old in Bottles, strong and racy,
Rich PERRY,
VINEGAR from decay'd cyder, not inferior to what's called wine,
Also distill'd VINEGAR.

Monday November 15th. 1762

The Creditors who have proved their Debts under a Commission of Bankrupt awarded against William Clutton of Horsted Keynes in the County of Sussex, Ironmaster, Merchant, Dealer and Chapman (co-partner with James Norden) are desired to meet the Assignees of the said Bankrupt's Estate, on the 23rd. of November Instant, at the Hour of Two in the Afternoon, at the Star Inn in Lewes, in order to assent to, or dissent from the said Assignees working up the said Bankrupt's Stock in Hand at Gravetye Furnace, and at Buxted and Maresfield Forges; and also to assent to, or dissent from the said Assignees commencing or defending one or more Suit or Suits at Law, or in Equity, touching the said Bankrupt's Effects and their compounding, submitting to Arbitration, or otherwise agreeing any matters of Disputes relating thereto; and on other special Affairs.

All persons indebted to the said Bankrupt's Estate, are required to pay their respective Debts, without delay to the Assignees viz Samuel Durrant Esq., of Lewes; the Rev. Mr. Ralph Clutton of Horsted Keynes, and Mr. Robert Chatfield, of Cuckfield, or to one of them.

By order of the Assignees
HENRY BURTENSHAW
Clerk to the Commission[3]

Monday April 25th. 1763

IRON

Continues to be sold by the Assignees of Mr. William Clutton, at Buxted and Maresfield Forges,and at Lewes Bridge, for 19s. per Ton, Ready Money, and at 21s. per Ton, with Six Months Credit.

Monday December 5th. 1763

We hear a Barge, laden with Guns from Rothersbridge in this County, was sunk at or near Rye, but the men with great Difficulty saved their lives.

Monday September 10th. 1764

Last Friday se'nnight, a Stack of coals, at Cowden Furnace, belonging to Mr. Bowen, of Barden, took Fire and burnt till the Tuesday following, notwithstanding engines were employed all the time.

Monday December 3rd. 1764

To be SOLD

A Messuage, Barn, Oasthouse and other Buildings, Gardens, Orchards, and several pices of Land, Arable, Meadow, Pasture and Woodland, containing seventy Acres, situate, lying and being in Burwash in the County of Sussex, with Iron Mine in the Ground, and a good Quantity of young Timber.

For Particulars enquire of John Freebody, of Burwash.

Monday December 31st. 1764

To be sold to the Best BIDDER

Under the Commission of Bankrupt awarded and issued against William Clutton, late of Horsted Keynes in the County of Sussex, Ironmaster, Merchant, Dealer and Chapman, Partner with James Norden. At the Star Inn, in Lewes, on Friday the 25th. day of January next, between the hours of Three and Five in the Afternoon.

The Beneficial Interest of the Assignees in the capital Messuage called GRAVETYE, with the Farm and Lands thereunto belonging, containing by estimation 200 Acres, lying in the parish of West Hoathleigh in the County of Sussex, and held by Lease for a Term of Years, whereof 18 Years were unexpired at Lady Day last, under the yearly Rent of £66 8s. together with a Furnace, and all other conveniences for casting Cannon, and carrying on other extensive Iron Works, erected by the Lessees at a very great Expence on the Premises; the situation is in the midst of Ore and Fuel, and the Distance from London 25 miles.

For further Particulars enquire of James Lambe on the Premises, of Mr. Henry Burtenshaw in Lewes, or Mr. John Elliott, No.15, Kings Bench Walk, Inner Temple, London.

N.B. The Lease contains a Clause of Renewal thereof for a further Term of 21 years at the present Rent, and without any Fine if the Lessees shall be disposed to renew the same.

Monday November 26th. 1770

To be Sold by Auction at the White Hart Inn, Lewes,
the latter end of December next.

The Manor of BIVELHAM in the Parishes of Mayfield and Wadhurst, in this County, together with the demesnes thereof, situate in the Parish of Mayfield aforesaid and consisting of 180 acres 1 rood 35 perches of Arable, Meadow and Pasture land in the tenure of David Collins and Joseph Newington, as Tenants at Will.

An Iron FORGE called BIVELHAM FORGE (with the fixed working utensils thereof) in working condition, and 453 acres of exceedingly good woodlands, with a considerable quantity of underwood thereon, now fit for market, as also a large quantity of very fine timber.

The Date of Sale to be notified in this paper.

Further particulars, enquire of Mr. Baley, Lewes.

Monday January 13th. 1777

IRON FOUNDRY to be let
and entered upon at Lady Day next.

All that hammer known as POPHOLE HAMMER together with the Furnace[4] near adjoining the said hammer with all the buildings, ponds, water wheels, waterworks, cottages and appurtenances to the said Hammer and Furnace belonging or appertaining. The premises are situate on the borders of Surrey in the parshes of Linchmere and Farnhurst in the County of Sussex, within a mile of the turnpike road leading from Haslemere to London, and there is plenty of exceeding good mine to be had very reasonable.

Further particulars may be had of Mr. Sandham, Attorney at Law, Midhurst in Sussex, or at Mr. Fogg's, No. 5 Bond Street, London.

NOTES

1. Seven night - a week.
2. MIRG Bulletin No.1 Second Series 1981, p.16.

3. William Clutton's bankruptcy may well have been a convenient means of ridding himself of some financially embarrassing circumstances for, while it took his assignees until 1765, at the earliest, to dispose of his business assets, he had received a Certificate of Conformity, a sort of discharge, from the courts less than a year after being declared bankrupt in August 1762. (Public Record Office; Court of Bankruptcy; Docket Books B.416 p.238. Certificates of Conformity B.63, p.91).

   From the Carrier's Accounts of Robert Knight, it would seem that Eade and Wilton, who had widespread victualling interests, including gunpowder manufacture, and who were running Gravetye Furnace from almost immediately Clutton went bankrupt, perhaps as mortgagors or creditors, gave up the business after only three months and were replaced by the assignees themselves. (WIRG Bulletin 14 1978, pp.16-19).

4. Straker (pp.449-50) considers the existence of a furnace at Pophole to have been only in the early history of the site, but the evidence of this notice of lease points to the reappearance of a furnace in the later period, and needs investigating in the field.

INCOME AND PRODUCTION AT HEATHFIELD IRONWORKS, 1693-1788*

RICHARD SAVILLE

I

THE OPERATION OF THE FULLER IRONWORKS

This analysis covers several aspects of the operation of Heathfield blast furnace and gun-boring plant from 1693 to 1788.[1] It is based on papers in the Fuller family collection, lately held by the Sussex Archaeological Society and the East Sussex Record Office and now housed together in the record office in Pelham House, Lewes. Several of the papers have only recently been

* The author wishes to acknowledge the financial support of the Ivan Margary Research Fund and the Social Science Research Council for awards in aid of research on Sussex ironworking and estate development.

discovered and are discussed here for the first time. The family records have been supplemented by the details of payments for iron ordnance and shot purchased by the Board of Ordnance, the records of which are kept in the Public Record Office at Kew and Chancery Lane, London.(2)

The ironworks were located on a tributary of the River Cuckmere (TQ 599181) below Heathfield Park. The modern history of the furnace dates from the summer of 1693 when Major John Fuller (1652-1722) leased lands for the construction of the new works.(3) The occasion for this was the post-1688 increase in purchases of armaments by the Ordnance Board, and casting cannon and shot was to remain the basis of family involvement in the ironworking trade for the ensuing seven decades. The site was discussed by Straker in Wealden Iron, though no excavation has ever been undertaken.(4)

Several important writings by John Fuller and his son John (1680-1745) have survived, and they include discussions of the operation of charcoal blast furnaces, the Wealden iron ore strata, the technical problems of casting iron, the problems of foreign competition in the bar-iron market, and the post-1700 rise of bar-iron and cannon manufacture in the London area using reverberatory ('air') furnaces.(5) In addition to the ironworks the extensive Fuller correspondence and accounts covered their estates in Jamaica and Sussex, as well as agriculture in general, sugar, investment in London companies and social life and politics. The archives considered here comprise the financial and production accounts of the ironworks together with relevant estate and agricultural accounts, and in addition, government papers.

The form and content of the accounts present problems which restrict their coverage of certain crucial matters, in particular the level of profits and the efficiency of the furnace. For many years only the briefest of summaries are obtainable, and in most surviving papers there are no figures for stock of mine (ore) or charcoal at the beginning and end of each blast. Even if stock figures were available we would have to note the complication that Heathfield made several products in widely differing percentages one year to another, and that the amount of charcoal consumed per ton for cannon was generally greater than for pig iron. The only clear statements on the technical side relate to the capacity of the furnace.

Much of the information is derived from accounts whose primary purpose was to check the flow of services and inputs from the landed estate and the tenantry, noting a series of deductions from rentals, and recording 'payments' for charcoal and wood credited to the estate. We cannot be certain that these payments were similar to Wealden market prices: for several years in the 1750s the landed estate was 'paid' for the coppice wood supplied for coaling the furnace, though in at least one year (1755) this was charged at less than the local market price. Moreover, we cannot be sure that such payments were made prior to the 1750s.(6)

Unfortunately, there are years for which no family records have been found, from 1693 to 1704, from 1711 to 1716 and again for the early 1740s. It is clear from surviving papers that major omissions occur in the several sets of the Fullers' accounts, and that over the years these records varied in their format. Less ambiguous were the records kept by the Board of Ordnance in the Treasurer's Ledgers (WO 48) and the Bill Books (WO 51); the latter set, the Bill Books, detailed the payments for cannon and shot, and frequently the calibre of the cannon, size of shot, number of guns and the tonnage involved. This information, which may be further checked in the Exchequer (E 351) and Audit (AO 1) accounts, allows a minimum to be worked out for the Heathfield output; these papers are therefore particularly useful for years when family papers are sparse. The Board did not list cannon which failed proof, nor the year the cannon were cast, though the dates of the warrants ordering the cannon were given.

Authorised Ordnance Board payments for cannon and shot are indicated on the graph down to 1765, the last year of recorded payments to the Fullers by the Board. These payments are listed for the year in which they were ordered. However, payments usually referred to production one or two years previously; in the 1720s the Board tightened up on payments and waited until the completion of a contract, a practice the Fullers complained of on several occasions.(7)

FIG.1 notes a definite, but <u>minimum</u> quantity for iron output for the years for which we have only the Ordnance Board figures. It has already been noted by earlier writers that the Wealden iron industry derived much of its activities in the eighteenth century, and in particular the peaks of output, from Government demand. There is a sound basis for this judgement; the Seven Years War for example led to the re-opening of at least four Wealden Furnaces.(8) It is clear from the Fuller correspondence and agri-

Table 1: Production at Heathfield 1723-1739

	foundays/days	Guns and iron goods		Pig		Total tons	Output	
		tons (T.C.Q.L.)	%	tons	%		per founday (tons)	per day (tons)
1723-1724	33.3 (201)	66.17.2.0	27.2	172.11.0.0	70.3	245.18.2.0	7.3	1.22
1724-1725	29.5 (179)	6.18.3.18	2.5	273.18.1.0	97.5	280.17.0.18	9.4	1.57
1725-1726	25.5 (155)	74.5.0.5	31.8	159.0.3.0	68.2	233.5.3.5	9.0	1.5
1726-1727	31.4 (190)	4.18.2.10	1.7	284.14.2.0	98.3	289.13.0.11	9.2	1.52
1727-1728	35.0 (210)	154.11.1.0	48.7	162.19.2.0	51,3	317.10.3.0	9.1	1.51
1728-1729	20.0 (120) (incomplete)	0.6.0.13	1.0	186.0.3.0	99.0	186.7.3.16	9.3	1.55
1729-1730	35.4 (214)	101.6.0.2	32.1	213.9.3.15	67.6	314.15.3.17	8.8	1.47
1730-1731	32.0 (192)	179.1.3.19	62.4	107.13.0.0	37.6	286.14.3.19	8.9	1.49
1731-1732	30.2 (182)	219.4.1.0	89.0	27.6.1.0	10.9	246.4.1.0	8.1	1.35
1732-1733	25.0 (150)	153.2.3.0	72.2	58.10.3.0	27.8	211.13.2.0	8.5	1.41
1733-1734	21.3 (129)	3.6.0.0	1.7	168.19.0.0	98.3	172.5.0.0	7.9	1.34
1734-1735	20.3 (123)	4.19.0.0	3.0	161.11.0.0	97.6	166.10.0.0	8.1	1.35
1735-1736	21.4 (130)	138.7.2.2	89.0	17.0.0.0	11.0	155.7.2.2	7.2	1.2
1736-1737	25.2 (152)	84.5.3.0	46.2	97.13.0.0	53.9	181.18.3.0	7.2	1.2
1737-1738	34.5 (209)	149.2.2.0	55.8	117.3.4.0	43.8	267.2.2.0	7.7	1.28
1738-1739	23.4 (142)	111.0.3.5	61.7	69.3.5.0	38.3	180.4.3.21	7.6	1.27

Source: RF 15/26; 15/67; 15/29; 15/30.

cultural records that the Government contracts, which in their case ended in 1763, not only substantially increased family income, but also stimulated activity on the Weald in general, by raising income for suppliers of raw materials and services and helping the tenantry to pay their rents. The long runs of depressed grain prices in the first half of the eighteenth century were less bleak for those tenants and landlords who had connections with the iron trade, and this view has been confirmed in detail for the Fuller estates.

For the years where there are no family records, and only the accounts of the Ordnance Board, a number of reasonable inferences may be made to expand the Ordnance totals. We now know that the blast furnace techniques in use in Sussex and described in detail by John Fuller (d. 1722) required a slow working up of several weeks during which time pig iron was run[9]; this was a purely technical matter. Where direct evidence of campaigns survives in the family records this production of pig usually lasted a minimum of several weeks. In only two of the blasts from 1708 to 1711 and 1720 to 1739, a total of 21 campaigns, was the production of pig below 50 tons (1731-1732 and 1735-1736) and in fifteen blasts it was over 100 tons, and often considerably more than this figure (see Table 1). The pig was supplied to several Sussex forges and numerous blacksmiths, including the Burwash forge which was owned outright by the family from 1700.[10] The art of casting cannon required higher temperatures than for pig, and was achieved several weeks after the start of a campaign, thereby helping to avoid air bubbles forming in the metal. Each cannon had a 'head' of perhaps 10-15% by weight of the cannon into which impurities and air bubbles rose during casting and which on cooling was sawn off and sold at less than the price of pig iron. The furnace always cast a small tonnage of items such as hammers, anvils and plates for forges, but the products varied and included garden and sugar rollers, iron bars and railings, and occasionally firebacks and skillets. The Ordnance Board, therefore, took only part of the tonnage each year. The level of income from sales for years where no production figures exist is therefore problematic, and, inter alia also depended on the number of guns sold to merchants.

There are frequent references in the Fuller correspondence to sales of cannon for merchant shipping, both directly from Heathfield and via a succession of agents who managed London wharves adjoining the Thames. The Fullers used both civilian agents and Ordnance officers when arranging sales, even though the market was supplementary to purchases by the Board.[11]

This merchant market had definite advantages: the cannon required were generally of the smaller calibres, and their production helped extend the period when the furnace was heating up before casting the larger guns.[12] The Fullers made the point that the longer they waited before casting the larger calibres the more successful they tended to be. In any case merchant cannon were not proofed to the exacting standards of Government service, and as late as the 1750s civilian cannon were sold with holes in the inner bore filled up with lead, a procedure that the Board absolutely forbade for their cannon.

The market was intensely competitive. By the 1700s the number of iron-works in the London area using reverberatory furnaces and capable of casting cannon and shot was increasing. Though the evidence is incomplete, several of these furnaces made a variety of metal wares, and their sales to merchants appear to have involved a 'package' of iron goods including ordnance. John Fuller (d.1745) complained about this competition and about the quality of their guns.

Competition and a lower quality product drove the price down, from 1706 to 1726 the most common price for six pounder cannon cast at Heathfield and purchased by the Board was £16 a ton; this compared with £11 to £12 a ton for merchant guns.

There are few statements which would allow us to establish the scale of civilian sales though this market may have taken the bulk of output in several years of peace and it is probable that merchants took most of the guns cast in the 1703-1706 and 1708-1711 campaigns. In the latter three campaigns (1708-1711) Heathfield cast over 350 tons of guns, and of this total only 68 tons 3 cwt were purchased by the Board. A further 94 tons 10 cwt of round shot were bought in March 1711, but as these were not mentioned in the Fuller account, they might have been cast before 1708, or else included in the figure for pig-iron. There is little indication of purchasers: RF 15/1 f.10-11 does list a total of 636 cwt of small calibre guns sold to various persons including three (ships?) captains named from 1707 to November 12th 1712. Details of the other cannon sales, a minimum of 250 tons, have not been recovered.

II

THE FULLER ACCOUNTS

1703-1711

The accounts for 1703 to 1706 and for 1708 to 1711 are the earliest extant papers for the furnace campaigns. The former list certain expenses,

though probably only the 'running' costs, and there are no figures for output, stock and total costs. The evidence is collected on Table 2a.

Table 2a: Length of Blast 1703-1706

		type of output
1703-1704	29 foundays, wanting 2 days = 172 days	?
1704-1705	30 " , and 3 days = 183 "	shot and guns
1705-1706	26 " , and 4 days = 160 "	shot moulds

Source: RF 15/22.

The later set, for 1708-1711 (Table 2b) are more informative than for 1703-1706, and allow an assessment of charcoal consumption over the three years.[13] Moreover, we are on firm ground with the calculation of output per founday (a measure equal to six days) for 1708-1709; 7.039 tons for 32 foundays with an output of 66.22% guns and 33.77% pig iron. This does enable comparisons to be made for similar product mixes at later dates though such comparisons should strictly be made with comparable outputs and length of blasts. The small capacity of the furnace relative to other areas in England and Wales is striking, though Heathfield may have been somewhat larger than the furnace at Waldron, owned by the Pelhams.[14]

Table 2b: Output 1708-11

length of blast	year	tons	pig	other	loads of coal	loads of mine
192 days	1708-1709	149.19.1.16	76.15.3.0	2 anvils +?	1028	880
	1709-1710	111.7.3.8	53.6.1.6	?	1475-1028	1286-880
	1710-1711	88.16.1.8	164.7.0.0	?	2329-1475	2559-1286
		350.3.3.0	294.9.0.6		2329	2559

Source: RF 15/1

1720-1739

The surviving papers for 1720 to 1739 are included with non-ironworking accounts, and may conveniently be described as interim accounts compiled from just such brief notes as RF 15/1. They list summary statements for the furnace output and lend support to the contemporary view that the Wealden iron industry entered a phase of decline after the French wars formally ended in 1714. The

views expressed by John Fuller (d.1745) in the family letter book complement the evidence of output in these papers which show that until 1739 demand remained low with little Government involvement.

There were delays in four years of the 1720s in selling a proportion of the pig iron produced and in the 1730s output of pig more than halved: from 207 tons (on average) per year 1723-30 to only 91.7 tons per year from 1730 to 1739. Table 3 lists the destination of pig iron and gunheads from 1721 to 1734. Part of this decrease in pig iron was accounted for by the increase in the tonnage of guns and iron goods cast between the two decades; on average 58 tons in the seven years to 1730, and 116 tons for the nine years thereafter. This was insufficient to compensate in terms of tonnage for the decrease in pig iron (Table 1) though net income from the furnace probably rose in the 1730s as a result of the profit on selling guns. Moreover, if pig iron demand had been buoyant Heathfield could easily have run a greatly increased tonnage.(15) Table 1 indicates the tonnage of cannon made at Heathfield 1723-1739, a total of 1451 tons 13 cwt, though in the years 1722 to 1740 the Board purchased only 994 tons 12 cwt. This comparison is not exact, and makes no allowance for refused guns; though it does give an order of magnitude of around 30% for cannon made at Heathfield in the sixteen campaigns ending in 1739 which were sold in the merchant market.

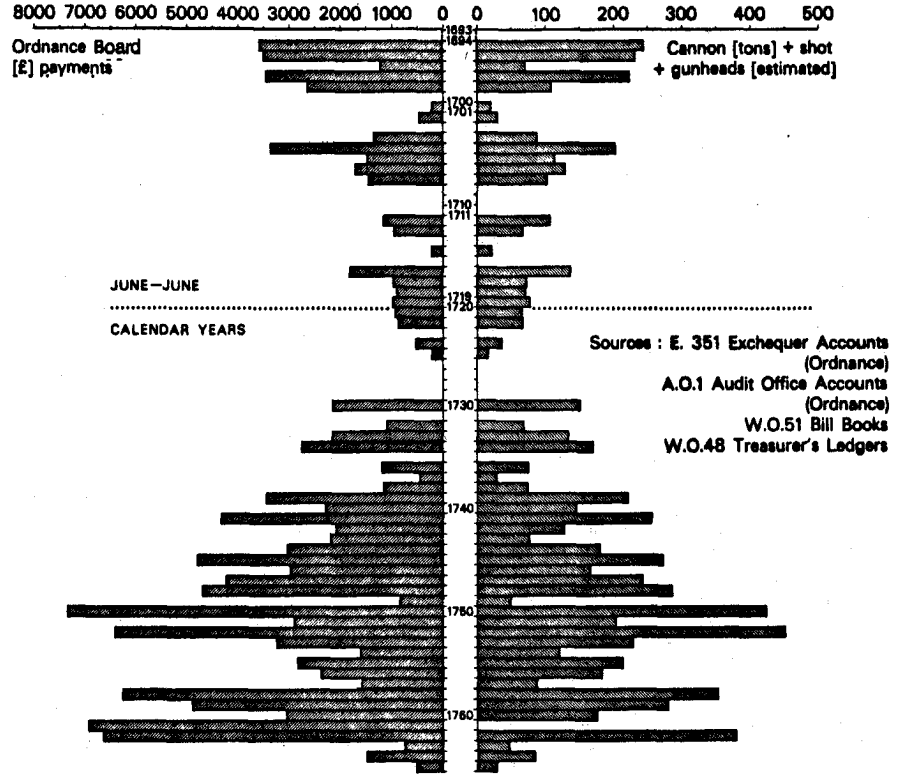
Table 3: Destination of output; pig, gunheads, broken and failed guns 1722-1734

Year	Destination		Tonnage		
1721-1722	Ambrose	Galloway	27.1.0		
	John	Busbridge	29.19.3		
		Mellor	39.1.2		
	Burwash		37.10.1		
		Hammers	0.10.2		
		Anvils	0.10.2		
		Plates & Anvils	1.1.3		
	Unsold pig		49.10.0	Total	185.12.1
1722-1723	Ambrose	Galloway	50.0.3		
	Henry	Gale	20.0.0		
		Mellor	15.13.0		
	Lawrence	Foster	15.0. 0		
	John	Busbridge	25.3.3		
	Burwash		22.14.3		
	John	Sands	7.12.0		
		Furnace	8.10.0		
		Pots & Kettles	1.0.0		
	Unsold pig		40.10.0	Total	206.4.0
1723-1724	Lawrence	Foster	20.6.2		
		Ball	46.7.0		
	Ambrose	Galloway	55.14.0		
	Henry	Gale	31.14.3		
	John	Busbridge	27.1.0		
	John	Sands	7.8.2		
	Burwash		28.17.3		
		Guns & gun heads	59.2.0	[51.12.0 guns]	
		Boxes	7.0.0		
		Small goods	3.4.1	Total	286.16.3.18

Year	Destination	Tonnage	
1724-1725	Ambrose Galloway	60.8.2	
	Ball	61.0.0	
	John Sands	13.19.3	
	Henry Gale	21.15.3	
	John Busbridge	34.4.2	
	Burwash	20.19.3	
	anvil/hammers	2.2.0	
	unsold pig	66.6.3.18	Total 280.17.0.18
1725-1726	Ambrose Galloway	71.4.1	
	Ball	60.1.0	
	John Sands	23.12.0	
	John Busbridge	23.4.2	
	Henry Gale	27.15.3	
	Burwash	28.13.3	
	sugar rollers	10.14.3	
	garden roll	9.1	
	kiln mouths	11.9.3	
	guns	51.0.3	
	pots & kettles	10.0	Total 308.16.1.19
1726-1727	John Busbridge	42.5.0	
	Ball	50.13.3	
	Ambrose Galloway	73.10.1	
	Henry Gale	21.7.0	
	Burwash	25.15.0	
	garden rolls	1.3.1	
	unsold pig	74.18.3	Total 289.13.0
1727-1728	John Busbridge	31.0.3	
	Ambrose Galloway	46.10.0	
	Henry Gale	20.0.1	
	?Ball	38.8.1	
	Burwash	16.2.1	
	gunheads	5.0.0	Total 156.17.2

Year	Destination		Tonnage		
1728-1729	Ambrose	Galloway	43.12.0		
	Burwash		21.17.2		
		Bowen	15.11.3		
	John	Busbridge	30.9.3		
	Henry	Gale	31.19.3	Total	143.10.3
1729-1730		Harrison	18.6.1 (guns)		
	John	Busbridge	17.3.3		
		Bowen	15.16.3		
	Burwash		20.6.3.		
	Henry	Gale	20.0.2	Total	91.14.0
1730-1731	John	Busbridge	23.13.3		
		Harrison	112.3.3		
		Bowen	20.2.3		
	Ambrose	Galloway	20.0.0		
	pots & other goods		1.19.2	Total	177.19.3.16
1731-1732	John	Busbridge	10.4.3		
	Burwash		16.6.0		
	Ambrose	Galloway	26.4.3 (gunheads)	Total	52.15.2
1732-1733	Galloway/Standen		20.9.3		
	Ambrose	Galloway	26.19.0		
	Henry	Gale	15.17.1		
		Harrison	28.17.2 (refused guns)	Total	92.3.2.13
1733-1734		Standen	1.6.3		
	Ambrose	Galloway	99.12.1		
	Burwash		19.1.1	Total	120.0.1.3

Source: RF 15/26; 15/27.



ORDNANCE PAYMENTS FOR CANNON AND SHOT MADE AT HEATHFIELD 1693 — 1765

: with associated tonnage of guns and gunheads.

The accounts for 1723 to 1739 yield a certain amount of information on the length of the blast and the output per founday, and this is summarised in Table 1. The first year (1723-1724) was prior to a rebuilding of the furnace, though there was no such construction for the subsequent fifteen campaigns. The increase in output per founday after 1724 is notable, compared with 1723-1724 and 1708-1711, and,as we might expect,the highest figures were achieved in 1724-1725 and 1728-1729 when output was concentrated on pig iron. The figures are broken down in Table 4 under the five sections which compare similar product mixes. On the whole these figures confirm that the longer the blast the greater the output per founday. There were disparities, however, notably the campaign of 1728-1729 when only 186 tons of pig (99% of output) were cast, yet when there was a slightly higher founday output than in 1726-1727. In the latter 289 tons of pig (98.27% of output) were made, a rate significantly higher than in the two campaigns of 1733-1735, which each produced similar tonnages to 1728-1729. We might consider several explanations. It is possible that an older furnace had to be more carefully worked up. There is little literary evidence on this and John Fuller (d. 1722) does not mention it in his account of the working up of a blast furnace,[16] though if this was the case it might explain the fall in the two campaigns in 1733-1735. Technical problems with a specific blast, or with the combination of ores and charcoal were possible, though infrequent, for the art of furnace control and charging was highly developed by this time.

The fall in the output per founday in the mid-1730s might also be caused by a slowdown in working by the main furnace operators; their aim may have been to lengthen a blast by the reduction of output per day. This was a time of some strain in the relations between family and workmen, and at one point Fuller had threatened to arrest the founder.[17] As the Fuller correspondence testifies only too clearly, the 1730s were the most depressed years in the eighteenth century for Wealden agriculture and many of the workmen came from farming.

It was indeed feasible to lengthen a blast, thereby increasing the income to labour, as payment was by the number of foundays worked and not on piece rates per ton produced. There were several ways in which this could be done, including lowering the level of charcoal and ore in the furnace, using less ore in the charge, building a smaller hearth or raising the height at which the furnace was tapped. Such variations would have required the co-operation of several workmen, including the founder and the furnace fillers; the Fullers and their estate steward did not personally supervise the blast.

Table 4: Comparison of Production at Heathfield By Similar Product Mixes

		foundays/days	Guns and iron goods		Pig		Total tons	Output	
			tons (T.C.Q.L.)	%	tons	%		per founday (tons)	per day (tons)
(a)									
	1723-1724	33.3 (201)	66.17.2.0	27.2	172.11.0.0	70.3	245.18.2.0	7.3	1.22
	1725-1726	25.5 (179)	74.5.0.5	31.8	159.0.3.0	68.2	233.5.3.5	9.0	1.5
	1729-1730	35.4 (214)	101.6.0.2	32.1	213.9.3.15	67.6	314.15.3.17	8.8	1.47
(b)									
	1724-1725	29.5 (179)	6.18.3.18	2.5	273.18.1.0	97.5	280.17.0.18	9.4	1.57
	1726-1727	31.4 (190)	4.18.2.10	1.7	284.14.2.0	98.3	289.13.0.11	9.2	1.52
	1728-1729	20.0 (120)	0.6.0.13	1.0	186.0.3.0	99.0	186.7.3.16	9.3	1.55
	1733-1734	21.3 (129)	3.6.0.0	1.7	168.19.0.0	98.3	172.5.0.0	7.9	1.34
	1734-1735	20.3 (123)	4.19.0.0	3.0	161.11.0.0	97.6	166.10.0.0	8.1	1.35
(c)									
	1731-1732	30.2 (182)	219.4.1.0	89.0	27.6.1.0	10.9	246.4.1.0	8.1	1.35
	1735-1736	21.4 (130)	138.7.2.2	89.0	17.0.0.0	11.0	155.7.2.2	7.2	1.2
(d)									
	1727-1728	35.0 (210)	154.11.1.0	48.7	162.19.2.0	51.3	317.10.3.0	9.1	1.51
	1736-1737	25.2 (152)	84.5.3.0	46.2	97.13.0.0	53.9	181.18.3.0	7.2	1.2
	1737-1738	34.5 (209)	149.2.2.0	55.8	117.3.4.0	43.8	267.2.2.0	7.7	1.28
(e)									
	1730-1731	32.0 (192)	179.1.3.19	62.4	107.13.0.0	37.6	286.14.3.19	8.9	1.49
	1738-1739	23.4 (142)	111.0.3.5	61.7	69.3.5.0	38.3	180.4.3.21	7.6	1.27

Source: see Table 5.

Whatever the case, the decrease in productivity in the mid-1730s is quite evident. The average number of days worked in the years 1721-2 to 1729-1730 (eight campaigns) was 178.25 for each blast; in the succeeding nine years the number fell to 156.55, with five when the number worked was 152 or below, and in 1733-1735 the furnace worked only 252 days for the two campaigns. If founday output in 1733-1734 and 1734-1735 had been as high as in 1728-1729 (the nearest comparable year) then the 172 and 166 tons respectively of the two later campaigns could have been made in 110.9 and 107 days instead of the 129 and 123 days it took in practice.

The Family Accounts after 1744

A series of account books for the years after 1744 have survived, several of which overlap. The first (15/31) covers the years from 1745 to 1758 and the type of information varies within the ledger. Table 5 details output and length of blast for the campaign from 1744 to 1749. There are

Table 5 Length of Campaigns and Output at Heathfield, 1744-1749

Year	Length of Blast	Output (tons)	
1744-1745	?	249.14.0.0	guns
1745-1746	24 weeks	230/269.0.0.0	guns + 25 tons refused guns
			25 tons gun heads
			5 tons misc. iron
1746-1747	28 weeks	272.8.2.0 OR	guns
		282.11.0.0	guns
1747-1748	24 weeks	206.4.2.0	guns
		4.14.0.0	misc. iron (?)
1748-1749	36 foundays	282.19.0.0	guns
		plus 25, 32-pounder guns	
		= c.340.0.0.0	

Source: RF 15/31

no figures for pig iron in any blast, and, in four of the five campaigns, none for refused guns, gunheads or miscellaneous iron. There are two accounts for the campaign of 1745-1746 (f.20, 23), listed in the familiar double entry form of credit and debit and these are combined in Table 6. There are no

indications of stock before and after the blast and no mention of other products; there is, therefore, no clear indication whether the 'balance of £2061 (or £2365) is a true profit. The additional detail on the second account (f.23) and the higher tonnage given for guns (269 tons versus 230 tons) might suggest that the former account (f.20) was an interim statement before all costs were charged. However, the figure for gunheads remained the same in both accounts, which raises the possibility that the additional 39 tons were from sales of guns rejected by the Ordnance Board in the previous year, and then sold to merchants. Rejection of guns by the Board could be for a variety of reasons, only one of which was the inability of a gun to withstand the gunpowder of the proofing test. Filling up holes in the gun was absolutely forbidden by the Board by the 1720s, though acceptable for sales on the private market.

If the account is at least an approximation to actual income from the campaign it would be a measure of the advantage derived from the sale of cannon to the Board, and help to explain why several Wealden ironworks were re-opened during the Seven Years War, only to close thereafter,[18] and also why the pig iron market was not exploited in the way it was elsewhere in the British Isles, both before and after the ending of cannon contracts.

The 15/31 account lists miscellaneous information for these years until 1754 (f.50), at which point the ore, charcoal and labour expenses are listed in detail down to 1758. The 'Furnace Account Book' (AMS 5622/5) records part of the services provided for the furnace from 1750 to 1760, and for several campaigns thereafter (Table 7). It lists the amount of ore and charcoal moved to Heathfield in each year, whence it came, and names the miners, charcoal burners and carriers involved. The account also cites the carriage of guns, by whom and where to. It should be stressed that this is not a production account, but was kept as a record of work done, and it does not list the payments made. Most of these payments were however listed in 15/31 from 1754 to 1758, though the match was not precise, and 15/31 includes payments for many services not recorded in AMS 5622/5. From 15/31 the Fullers had a picture of most of the expenses for any year. The volume also recorded some receipts for items sold in Sussex, and for one account (f.54) for cannon receipts from the Ordnance Office and money from Thomas and Stephen Fuller in London.

Table 6 Furnace Account 1745-6: this account shows two statements in RF 15/31 for the same campaign.

DEBIT	f.20	f.23	
	£ s d	£ s d	
Furnace labour	257 - 12 - 6	360 - 15 - 0	
Colliers	185 - 19 - 6	162 - 2 - 5	
Woods	1203 - 15 - 0	1203 - 15 - 0	
Oxleys (gunboring)	98 - 17 - 6		
Carriage of guns	306 - 8 - 0	348 - 6 - 0	
Ore Veins	310 - 8 - 0	385 - 9 - 0	
Coarse			
Other materials	82 - 0 - 0	139 - 0 - 6	
Furnace wear and tear	50 - 0 - 0	50 - 0 - 0	
Agency payments at 5%	218 - 10 - 0	255 - 10 - 0	
Interest on £2500 at 4%		100 - 0 - 0	
Carriage of coal		200 - 0 - 0	
TOTAL	£2713 - 0 - 6	£3225 - 17 - 11	
CREDIT			
by 230 tons of guns at Woolwich at £19 ton	4370 - 0 - 0	5111	(for 269 tons)
25 tons refused guns £10 ton	250 - 0 - 0	200	(for 20 tons)
25 tons gunheads £5 ton	125 - 0 - 0	250	
Hammers, anvils	20 - 0 - 0	20	
Plates for my house and andirons	10 - 0 - 0	10	
	£4775 - 0 - 0	£5591 - 0 - 0	

Source: RF 15/31

Table 7: Weight (by loads) of Ore and Charcoal Purchased for the Campaigns from 1750-1760, With the Tonnage of Guns Despatched from Heathfield

YEAR	Mine		(Loads)	Charcoal	guns sent from Heathfield (tons) T.C.Q.	Other
	Veins	Coarse	Total			
1750	1019	320	1339	1201	238.8.0	31.8.1.0 (gunheads)
1751	737	368	1105	1008	224.1.0	
1752	662	483	1145	980	146.19.2	
1753	377	350	727	1649	151.17.0	
1754	571	371	942	1674	215.13.0	27.1.2.0 (merchant guns)
1755	1169	298	1467	2064	295.13.3	
1756	1391	403	1794	2864	304.9.0	30.15.0 (pig & anvils)
1757	1908	910	2818	3558	291.6.3.4	63.10.1.0 (gunheads + 15.13.1.0 pig & anvils)
1758	585	289	874	95	295.2.1.26	
1759	1526	557	2083	2035	340.2.0.0	26.7.3.0 (other)
1760	1127	329	1456	1763	255.11.0.0	

Source: AMS 5622/5.

The Recently Discovered Accounts. The Fifth Ledger (1,4) and the Eighth Ledger (4,20).

At the end of each accounting period in 15/31 the total of expenses were transferred to the 'Fifth Ledger' with the page number of the ledger given in 15/31. This ledger has only recently been found, and bears the number '1,4' on the cover. This volume forms part of a larger collection and with the other accounts discussed below, particularly the eighth ledger, enables us to have a clear idea of the decline of production at Heathfield after the ending of the Ordnance Board contracts. The figures from 15/31 match up with 1,4, though additional expenses were added in 1,4 which were not listed in 15/31. The

equivalent of 15/31 (a detailed rundown of expenditure) has not survived for the years after 1758, nor have the "sixth' and 'seventh' ledgers which listed the totals from successors to 15/31. However, an 'eighth' ledger has survived, now recognised by the number 4,20 on the cover. This ledger also includes a brief summary of expenditure in sixteen campaigns from 1755 and ending in 1781, and the information is recorded on the Debit side of Table 8. This last ledger has the drawback of not recording all income, noted in the Credit column on Table 8. This final summary used information from the fifth ledger (1,4) the sixth and seventh ledgers (missing) and from the eighth ledger (4,20). Page numbers are given in 4,20 and the accounts may be traced back both in this volume and in 15/31.

Output at Heathfield to the Closure in 1788

Table 8 lists the information from 4,20 for the sixteen campaigns from 1755 to 1779 and the Debit side illustrates the fall in expenditure after 1763, and we should note the gaps between campaigns after the last large scale casting of cannon in 1763.

The ledger 4,20 augments information in the AMS 5622/5 accounts and the 15/31 account, and the three accounts together form the information in Table 9 of the furnace output for the years 1768 to 1788. It should be noted that the dates given in 4,20 refer to accounting periods, and do not always coincide with the date of the relevant campaign. From 1763 Heathfield cast few cannon, the exception being in 1777, and we should note the attempts by Rose Fuller in 1773 to seek new contracts after a temporary suspension of purchases from the Carron iron works by the Ordnance Board.

For the last quarter century of output Heathfield made pig iron, and a small tonnage of cast iron goods including rollers. As indicated on Table 10 the clearance of this output could be slow; of the 240 tons made in the campaign of 1780 some still remained to be sold in 1783. The possible outlets had dwindled from those available earlier in the century, with the bulk now going to the family forge at Burwash. After the last campaign ended on 1 April 1788 the forge continued to work intermittently, closing in 1803, converting under 20 tons of scrap and pig per year for wrought iron goods needed by the estate and local blacksmiths. Table 11 lists expenditure for these last campaigns after 1778.

Table 8: Output at Heathfield 1755-1789; the Evidence of the 8th Ledger

Campaign [Accounting Year]	GAIN	Ledger & Page No.	DEBIT	LOSS	CREDIT	
		5th Ledger				
1755	305 - 18 - 9	168	4257 - 2 - 9		4563 - 1 - 7	[all credit here]
1756		154	5349 - 3 - 5	2872 - 13 - 8	2476 - 9 - 8	[some credit in books in London]
1757		155	9594 - 15 - 8	4198 - 11 - 1	4368 - 1 - 9	" " " " " "
"		255	56 - 12 - 7		1084 - 15 - 4	
1758	1945 - 16 - 7	169	1627 - 2 - 8		70 - 2 - 10	[nothing in London]
"		226	1140 - 14 - 3		4643 - 10 - 8	" " "
1759		223	3958 - 13 - 4		94 - 11 - 11	
"		237	782 - 10 - 3	4243 - 16 - 10	402 - 14 - 10	[great part of credit in London]
1760		232	3828 - 17 - 11	3258 - 13 - 2	465 - 10 - 2	[part of credit in London]
"		224	1 - 3 - 2		105 - 17 - 9	
1761		253	789 - 8 - 1	563 - 4 - 8	240 - 11 - 6	[credit not all here]
"		233	15 - 9 - 1		1 - 1 - 0	
1762		258	2848 - 13 - 10	2542 - 6 - 0	33 - 18 - 0	[credit not all here]
"		207	225 - 18 - 8		498 - 8 - 6	
1763	298 - 8 - 9	194	478 - 4 - 1		0 - 5 - 0	[nothing in London]
"		158	1 - 18 - 4			
"		22	1503 - 10 - 10		1529 - 15 - 6	
"		272	73 - 14 - 0		825 - 15 - 6	

Table 8 (Contd.): Output at Heathfield 1755-1789; the Evidence of the 8th Ledger

Campaign [Accounting Year]	GAIN	Ledger & Page No.	DEBIT	LOSS	CREDIT	
		6th Ledger (now missing)				
1767		240	1352 - 2 - 1	94 - 3 - 10		[nothing in London]
"		302	847 - 9 - 4		2105 - 7 - 7	
1768	240 - 0 - 6	288	1787 - 17 - 8		123 - 14 - 6	[nothing in London]
"		286	84 - 8 - 4		1988 - 12 - 1	
1771		4	1289 - 8 - 2	309 - 17 - 1		[some credit not here]
		13	379 - 19 - 2		78 - 15 - 0	
		122	3 - 15 - 6		1284 - 10 - 9	
1773		173	81 - 4 - 5	1158 - 13 - 5	15 - 18 - 9	[some credit not here]
		144	2125 - 17 - 0		1143 - 5 - 2	
		181	113 - 17 - 2		3 - 1 - 2	
		7th Ledger (now missing)				
1775		197	1124 - 9 - 11	762 - 6 - 9	4 - 1 - 0	[some credit not here]
		51	213 - 5 - 10		571 - 8 - 0	
1778		8th Ledger				
1778		100	1523 - 11 - 10	1982 - 18 - 5	30 - 19 - 8	
		166	491 - 6 - 3		1 - 0 - 0	
1779		170	574 - 13 - 5	574 - 13 - 5		[no credit here]
				by balance	£20,019 - 1 - 6	
			£48,864 - 9 - 8		£48,864 - 9 - 8	

Source: 4,20 the Eighth Ledger; citing information in the 5th Ledger (1,4), 6th and 7th Ledgers (missing) and 8th Ledger (4,20).

Table 9: Output at Heathfield 1760-1788

Campaign dates	no. of days	foun-days	Output guns (tons)	pig (tons)	Total incl. misc. (tons)	Out-put per foun-day (tons)
[1768]				188.17.2.0	201.5.0.4	
29 Dec 1769 - 19 May 1770	143	23.8		253.11.0.0	262.2.1.2	10.0
18 Feb 1772 - 7 June 1772	111	18.5		186.10.0.0	197.12.1.13	10.7
4 March 1774 - 15 June 1774	104	17.3		146.10.0.0	155.5.0.5	8.0
3 Jan 1777 - 20 May 1777	137	22.8	53.0.0	95.19.0.9	148.19.0.9	6.5
26 Oct 1779 - 29 Apr 1780	187	31.2		240.0.0.0	243.17.2.16	7.8
[1783]				146.7.3.0	149.14.2.16	
24 Jan 1788 - 1 Apr 1788	69	11.5		119.18.0.0	123.13.2.4	10.7

Source: 8th ledger (4,20) AMS 5622/5.

Table 10:

Output 1779-1780 pig 240 tons
cast 4 tons - 0 cwt - 2 qr - 16 lbs

	Clearance of pig	(tons)
1779	carried to Burwash forge	22.0.0.0
1780	" " " "	134.10.0.0
1780	carried to Sailhurst forge	27.10.0.0
1781	carried to Burwash forge	31.10.0.0
1782	" " " "	17.10.0.0
1783	" " " "	1.0.0.0
	remaining at furnace	6.0.0.0
	Total	240.0.0.0

Table 11: **Expenditure at Heathfield 1778-1791** (five accounts)

Accounting Years		payments for each year: Taxes	payments for each year: Rents	Misc.	Carriage of mine	Wood Cutting	General labour	Wood	Coaling	Coal Carriage	Mine
1778 blast		1-10-00	70-00-00	75-18-10							
	f100	1-10-00	70-00-00		2-00-00	82-02-08	77-12-03	500-00-07	212-09-00	251-00-00	
		1-10-00									
		1-10-00									
	f166	1-10-00		12-18-00	62-17-05		149-09-11	262-08-06			
		1-10-00									
1779	f170		70-00-00	9-03-09	13-15-00		30-02-00	2-10-06	18-02-07	371-09-07	
			70-00-00								
1781	f220	1-10-00	70-00-00	70-04-07	108-17-10		138-10-05		225-10-06	92-17-10	
		1-10-00	70-00-00								
		1-10-00									
		1-10-00									
1784-87	f277		70-00-00	48-14-01			2-09-01		42-10-00	32-09-07	
			70-00-00								
			70-00-00								
1787-1791	f335		70-00-00	36-11-04			94-15-00	127-19-06	80-10-10	78-02-07	2-18-00
			70-00-00								
			70-00-00								
			70-00-00								

Source: 8th Ledger (4,20).

NB. Tax and rental payments are inserted as in the original, one payment for each year: other items have been added together for each of the five accounts. This account does not include all payments made for the furnace: some were included in estate accounts.

III

TECHNICAL CHANGE 1708-1788

It has been possible to detail output per founday and thus make comparisons over time for the output of the furnace for the years 1708-1709, 1723-1739 and 1769-1781. These are listed on Table 12. The course of change in the periods 1708-1709 and 1723-1739 were discussed above, and it only remains to comment on the later period. The pattern is by no means uniform, though in three campaigns, 1769-1770, 1772 and 1788 the output per founday was higher than in any previous recorded period and worthwhile comparisons may be drawn with 1724-25, 1726-27, 1728-29 and 1734-35 (all seven of these campaigns were predominantly making pig iron). This would suggest a larger furnace in the later period than in the earlier, or some marked change in the technique used in the campaign. The latter must not be ruled out for lack of evidence, for such changes took place at earlier periods and elsewhere in the charcoal iron industry on the Weald. Yet in two campaigns, when pig was the main product, the level of output per founday was unremarkable, and for the short run of 1777, when cannon were cast, output was well down.

It should be noted that outputs of this size for the period 1708-1788 were well below average output in the charcoal industry elsewhere, other than in the Weald, and this was true for the whole period discussed here. By the early eighteenth century Wealden pig was clearly uncompetitive in the London market. By the time of the withdrawal of the Ordnance cannon contracts coke-made pig output was rapidly outstripping charcoal iron sales. Only a tied local market such as that which existed at Burwash forge, or some monopolistic market such as the Ordnance could have kept the Heathfield plant in use and returning some profit, and its closure in 1788 was followed in 1790 by Fernhurst, Robertsbridge in 1793(?) and Ashburnham in 1811.[19] Burwash forge continued to 1803 and Ashburnham forge to 1829: their local markets and their position on family estates ensured their survival into a different age.

Table 12: **Comparison of Outputs per Founday, 1708-1788**

Campaign	days	fd.	guns	pig	Total (+ misc.)	Output (TONS)	
						founday	day
1708-1709	192	32	149.19.1.16	76.15.3.0	226.15.0.16	7.1	1.18
1723-1724	201	33.3	66.17.2.0	172.11.0.0	245.18.2.0	7.3	1.22
1724-1725	179	29.5	6.18.3.18	273.18.1.0	280.17.0.18	9.4	1.57
1725-1726	155	25.5	74.5.0.5	159.0.3.0	233.5.3.5	9.0	1.5
1726-1727	190	31.4	4.18.2.0	284.14.2.0	289.13.0.11	9.2	1.52
1727-1728	210	35.0	154.11.1.0	162.19.2.0	317.10.3.0	9.1	1.51
1728-1729	120	20.0	0.6.0.13	186.0.3.0	186.7.3.16	9.3	1.55
1729-1730	214	35.4	101.6.0.2	213.9.3.15	314.15.3.17	8.8	1.47
1730-1731	192	32.0	179.1.3.19	107.13.0.0	286.14.3.19	8.9	1.49
1731-1732	182	30.2	219.4.1.0	27.6.1.0	246.4.1.0	8.1	1.35
1732-1733	150	25.0	153.2.3.0	58.10.3.0	211.13.2.0	8.5	1.41
1733-1734	129	21.3	3.6.0.0	168.19.0.0	172.5.0.0	7.9	1.34
1734-1735	123	20.3	4.19.0.0	161.11.0.0	166.10.0.0	8.1	1.35
1735-1736	130	21.4	138.7.2.2	17.0.0.0	155.7.2.2	7.2	1.2
1736-1737	152	25.2	84.5.3.0	97.13.0.0	181.18.3.0	7.2	1.2
1737-1738	209	34.5	149.2.2.0	117.3.4.0	267.2.2.0	7.7	1.8
1738-1739	142	23.4	111.0.3.5	69.3.5.0	180.4.3.21	7.6	1.27
1769-1770	143	23.8	-	253.11.0.0	262.2.1.2	11.0	1.83
1772	111	18.5	-	186.10.0.0	197.12.1.13	10.7	1.78
1774	104	17.3	-	146.10.0.0	155.5.0.5	9.0	1.49
1777	137	22.8	53.0.0.0	95.19.0.9	148.19.0.9	6.5	1.09
1779-1780	187	31.2	-	240.0.0.0	243.17.2.16	7.8	1.30
1788	69	11.5	-	119.18.0.0	123.13.2.4	10.7	1.79

Sources: See Tables 3(b), 5, 12.

NOTES

(1) The first campaign commenced in 1693, the last finishing in 1788. The family also owned Burwash forge which continued to operate until 1803.

(2) Accounts: Ordnance Board and Exchequer/audit (Public Records Office).
WO 48 Treasurer's Ledgers
WO 51 Bill Books
E 351 Pipe Rolls, Exchequer
AO 1 Pipe Rolls, Audit Office (Duplicates of E 351)
Accounts: Fuller Estates and Ironworks (East Sussex Record Office).
RF 15/1 includes accounts for 1708-1711
RF 15/22 furnace and rents book; some details 1703-1706 and 1709-10.
RF 15/23 brief notes for the campaign of 1769-1770

(3) There may have been a previous ironworks on the site though this is doubtful, E. Straker, Wealden Iron (1931), 374. There were six members of the Fuller family involved in the management of the furnace during 96 years of operation. Apart from Major Fuller, there was his son John (1680-1745) and grandsons John (1705-1755), Stephen(1716-1799) in charge for a short period from 1755 to 1757 and Rose (1708-1777). John Fuller (1755-1834) son of another grandson, Henry, was owner for the last eleven years of operation. It is this last John Fuller who was buried in the pyramid in the churchyard at Brightling.

(4) Bull. Wealden Iron Res. Gp. 8(1975), 31-2; see also D. Butler, 'The Fullers and Carron' ibid 2 ser. 1 (1981), 24-31.

(5) Mention should be made of the material in the British Museum, Sloane and Newcastle collections. The Fullers were related to Sir Hans Sloane by marriage and kept up a regular correspondence with him on a variety of subjects, including Wealden Iron ore strata. For this see VCH Sussex II (pp. 241-249) and Bull. W.I.R.G. 16 (1979), 17-20. For the detailed operation of Wealden charcoal furnaces in the early part of the eighteenth century see Historical Metallurgy 14:2 (1980), 65-73.

RF 15/26 Rents and payments book 1719 to c.1741, lists the detailed clearance for each tenant of the nominal rents due to the estate, and from which 15/27 was made up. This lists the debit and credit account of each person (tenant etc.,) on each double page, and from which 15/28 was partly made up. This was a final accounts ledger.

RF 15/29 and 15/30 were similar to 1526/27 and provide information collected in 15/28.

RF 15/31 Furnace payments and income book 1745-1757.

AMS 5622/5 Furnace account book 1750 to 1758, 1768 to 1788.

1 4 The Fifth Ledger Book.

4 20 The Eighth Ledger Book.

plus other uncatalogued material to be transferred to the East Sussex Record Office from the care of the Sussex Archaeological Society.

Letters: Letter Books (ESRO).

RF 15/25 Letter Book 1729 to 1754.

AMS 6/1 Letter Book, early 1770s.

Miscellaneous correspondence (ESRO).

Letters for the later 1750s, unsorted.

Bundles of letters SAS nos., 16, 17 (index in ESRO and Barbican House, with typescript now in the SAS library).

Dickenson papers (Somerset Record Office, Taunton)

There is a rough guide to these papers in the Historical Manuscripts Commission Office, Chancery Lane, London.

(6) AMS 5622/5 Accounts.

(7) RF 15/25 1 Sept. 1739; 20 Feb. 1738; 1 Sept. 1741; 1 Jan. 1742/3; 18 Jan. 1742/3; 26 July 1743; 20 Sept. 1743. WO 51 Bill Books list delays between the issue of the warrants and payments, by the 1730s this was frequently above two years.

(8) C. S. Cattell, The Historical Geography of the Wealden Iron Industry (London M.A., 1973) 118-9.

(9) Historical Metallurgy 14:2 (1980) 65-73.

(10) See Table 3 for pig iron sales 1722-1734.

(11) RF 15/25 25 Nov. 1736; 4 Oct. 1740; 20 Nov. 1740; 23 April 1741.

(12) This claim was usually made when pressing for contracts awarded by the Board. RF 15/25, 30 Oct. 1736; 26 May 1739; 11 May 1745; 5 Aug. 1748; 23 Oct. 1749.

(13) 2329 loads of charcoal for 350-3-3-0 tons of cannon and 294-9-0-6 tons of pig.

(14) RF 15/25 f.9 to 9v., 'A list of all the Furnaces and Forges in England and Wales ...'; Pelham Papers, Newcastle Collection, British Museum.

(15) Output was certainly higher during the Seven Years' War; there were problems with water supply prior to 1745, though a larger output was entirely feasible.

(16) Historical Metallurgy 14:2 (1980),65-73.

(17) RF 15/25. 31 Jan. 1729/30.

(18) See fn. 8 above.

(19) E. Straker, Wealden Iron (1931), 67.

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