



NEWSLETTER

No.37 Spring 2003

Editor: Dot Meades, Brackenside, Normansland, Fairwarp, Uckfield,
E Sussex. TN22 3BS. Tel: 01825 712367 Email: meades@freeuk.com

Page	<u>Contents</u>
1	Winter Meeting: <i>Talk by Christopher Whittick</i> The Gage family and its connections with the iron industry <i>DMM and JSH</i>
2	A Missing Fireback. <i>M J Leppard</i>
3	Cowden Furnace <i>a poem sent in by H Pearce</i>
4	Foray Reports: Stumbleholm, Bungehurst, Blackham, Coopers Farm <i>BH, PG and AC</i>
5	Two Sidelights on the Wealden Iron Industry <i>M J Leppard</i>
6	Recent Publications: <i>Iron For the Eagles. JH</i> Forthcoming events. Dinosaurs and the Wealden Iron Industry. <i>Dr B Worssam</i>
8	Access2Archives Relocation of a Grave slab in East Grinstead Church. <i>Brian Herbert</i> Experimental Smelting and the web site.
9	Further Observations on the 'Pestilence' firebacks. <i>Jeremy Hodgkinson</i>
10	News from Elsewhere: Lithgow Blast Furnace. <i>Julia Farmer</i> Notes on traditional bloomery furnaces in India (from Percy). <i>Dr T Smith</i>
12	Editor's note with copy date.

WINTER MEETING - 1st February 2003

The Winter meeting held at Nutley Memorial Hall was exceptionally well attended. Christopher Whittick, Senior Archivist at the East Sussex Record Office spoke on "The Gage Family and the Iron Industry."

He made the point that the Gage family were probably not directly engaged in the production of iron. Their relationship with the industry was through their status as Lords of the Manor of Maresfield, through their ownership of land and also, in the case of Sir Edward Gage by the execution of his duty as Sheriff of Sussex.

The ironworks which were situated on Gage property were Maresfield furnace and forge and Warren Furnace (known also as Hedgecourt and as Mill Wood) together with Woodcock Hammer.

A good marriage between John Gage and Phillipa Guildeford brought the Gage family from Gloucestershire to live at Firle. (It is conjectured that the stone which built Firle Place was probably taken from Lewes Priory at the time of the Dissolution.). Edward Gage, a staunch Roman Catholic, was very popular with Henry VIII and also with his daughter Mary Tudor.

When a tenant died, the new applicant had to apply to the Lord of the Manor, and Richard Lenard of Parrock Furnace had to do this at Maresfield. The Lord of the Manor owned the minerals beneath the land and there is interesting correspondence about a dispute between Edward Gage and Richard Sackville over the taking of iron ore from Gage land by Sackville men. Bearing in mind the fierce religious controversy of the times this controversy may have been exacerbated by the fact that Richard Sackville was a Protestant.

John Fawkener, a man who was closely associated with Edward Gage, was a Presenter of Protestants, some of whom fared much worse than being accused of stealing iron ore. In his capacity of Sheriff in the reign of Mary Tudor, Edward Gage had to attend executions, including that of Richard Woodman, ironmaster, one of the Lewes Martyrs. John Trew, the son of the founder at Robertsbridge had his ears cut off for being a radical religious activist. Wisely, thereafter, he took himself off to work in the iron industry in Wales.

The Maresfield connection

In 1545 the manor of Maresfield was granted by the crown to John Gage; William Levett, clerk, [*of gun-casting fame*] was one of three attorneys to deliver seisin; this grant includes reversion of a 30-year lease to James Gage of two fulling mills, granted in 1537.

It is interesting to speculate about the activities of John Fawkener and his son of the same name. In 1562-3, the name appears as the farmer and bailiff of Maresfield paying rent for the fulling mill, for wood sales and for the park. John Fawkener the younger was also bailiff and rent-collector of the Gage manor of Alciston. In 1567 John Fawkener the elder with John

French of Chiddingly, took a lease of a furnace in Hedgecourt; in 1570 he had 81 cords of wood on one of the copyholds and a John Fawkener was named as tenant in the 1574 list of ironworks. Although this appears to be a direct connection with the iron industry, it does not necessarily mean the he was working the furnace. Leases were often granted to trusted employees as rewards; they could then use them as they wished, often selling them on to a new owner. For this reason there is some doubt as to whether he was a direct officer of Gage ironworks.

In 1590, George Collyn of East Hoathly, yeoman, took a lease from Edward Gage of the forge and cottages, watermill and house at Maresfield. Anthony Goldsmith, who held the park at £50, the furnace and forge at £30 and the mill at £12 pa was called ironmaster in a new lease to William Crowe. In an interesting non-iron industry aside, it was noted that in 1608 20 tons of silver ore were sent from Scotland, via Newhaven, for experimental smelting at Maresfield. In spite of this, rent was owed at 25th March 1610.

Others who were associated with the Maresfield works were Thomas Catt of Maresfield, founder and John Bartholomew, forgerman, whose wills were proved in 1597. Bartholomew refers to his master George Kenyon [also associated with the Hogge ironworks].

From 1610-1619 William Crowe and David Middleton were associated in a financially unsuccessful attempt to work the Maresfield ironworks and Sackville Crowe was granted a patent for guns for the merchant service. A notable visit occurred in 1627 under Nicholas Stone's tenancy, when Donevide, a servant of Cardinal Richelieu, visited Maresfield to see the ironworks for making and boring guns.

The works continued to produce guns under various tenants. John Newnham paid £14 'for the forge rent' in 1669 and 1678-82, down to £12 by 1701-02; he was a major exporter of guns during the Dutch wars. However, the activities of Walter Norman, who bored the guns, caused some concern to the Quaker meeting at Lewes, whose records state, 'Walter Norman was with us this day at our monthly meeting and was desired by us to take it into his consideration the lawfulness of that employment he now useth in boring of guns, which things hath been a burden to some friends and an offence to the testimony of Friends in that behalf; we now leave the matter to the witness of God in his own conscience, which will direct him in this matter if he hearken to it to do that which shall bring with it peace and justification; so in hope to hear the next

meeting from him of some good resolutions in this business.' Alas, no more was heard, so presumably Walter Norman continued to bore guns.

From 1717 to 1738 there are references to the forge but no longer to the furnace. After 1761 things seem to have gone from bad to worse, with tenants often only occupying the works for from one to three years. The last Tenancy 1781-1801 was to Thomas Willis. Finally, comes the sad entry: 'the forge down, the materials sold and the pond let to Mr Newnham for £10; the house and waste ground let with Park Farm; his will, as forgerman of Maresfield, was proved in 1811.

Woodcock Hammer and Warren Furnace

The other sites on Gage property, Woodcock Hammer and Warren Furnace were situated on the demesne land of the manor of Hedgecourt. In 1562-63 no ironworks were mentioned but farmer John Thaw repaired buildings and a water mill. This may be connected with a 1567 grant by Edward Gage of a 21 year lease of ironworks called Mill Wood. John Faulkner was also involved in Hedgecourt and Mill Wood. Again, he may have been the recipient of a beneficial lease, or have been acting on Gage's behalf.

Sales of wood and of ore, as well as rentals, indicate that the furnace continued in operation until about 1602 in the hands of the Thorpe family, after which rent for the furnace pond was only for fishing rights. The Thorpes had been overstepping their rights as lessees of the demesne of Hedgecourt by taking wood from parts they had not leased

However, Woodcock Hammer continued in use: in 1629 Richard Thorpe leased it from John Gage. Thorpe's son, also Richard, left with clearing his father's debts, sold his interest in the estate to Simon Everenden of Lewes in 1651. He was granted a new lease the following year and sub-let to John Newnham, associated with the Gage's Maresfield properties, and Jeremy Johnson, both of whom supplied the government with shot. Later tenants were Thomas Stanford and Samuel Baker, who in the 1740s paid £30 rent for Woodcock Hammer.

By this time, Edward Evelyn was leasing the land round the forge, which led to his purchase of the freehold of Hedgecourt from the Gages. In a map of his newly acquired estate drawn in 1748, the Hammer is shown but not the furnace, although the Myllwood had become the Warren, allowing for the renaming of the furnace when it was revived in the 1750s.

A MISSING FIREBACK

The following item is the happy result of Helen Pearce's article about the firebacks in Dorchester museum (Newsletter 36, Autumn 2002). It is contained in a letter from regular contributor Mr M J Leppard who had news of a fireback in a PS to a letter of local reminiscences sent to him for publication in the East Grinstead Society Bulletin in August 1972 by a former resident of East Grinstead.

"He was Captain RJR Dendy, RN (ret'd) born here Nov.1900 and descended from the Blakers who obtained possession of Lewes Priory before the railway was constructed. He claims that his father donated the Priory to the Sussex Archaeological Society [*Mr Leppard says he can find no confirmation of this*]. 'On surrendering Lewes Priory my father gave me an old Sussex Fire Iron back, depicting the Battle of Hastings. This was originally in the Priory Hall. My brother resident in Henley now has it. About 3 feet long and 2 feet high, it weighs something like 2 hundredweight or more being ¾ " thick or more.'

Mr Leppard continues "I did not publish this PS because it has nothing to do with E.G. and have never tried to take it further. I suppose all one could hope to do now is find a Dendy in the telephone directory covering Henley, or write to the local paper there. (I feel a bit dubious about the Battle of Hastings.)"

Mr Leppard also refers to p.12 of Newsletter 36 and suggests that a *ly'ury* is not a place to sleep but a livery.

COWDEN FURNACE - A poem

Helen Pearce, who is working on a theme 'Wealden Iron in Literature' writes:

"The following lines are from a long poem about Cowden furnace which appeared in a little book of verse, "In a Forgotten Corner", by George Bailey of Chiddingstone, in 1854. Bailey describes himself as not having the advantage of even a moderate education, but obviously loved his village and environs which feature in the poems, including Scarletts Mill. He was lucky enough to secure the patronage of the Rector at Cowden and other locals to produce the original booklet. It was republished by his great-great-great grandson Kevin Laing in 1987, together with a short foreword and old photographs of Cowden and Scarletts. I make no comment on the literary merit, spelling or historical errors, but thought it might hold curiosity value for some members."

Lines upon the Ruins of an Old Furnace, formerly standing in the parish of Cowden, where now stands a Corn Mill, known as the Furnace Mill. June 1846

Come ye, who love 'mongst deeds of note to range,
View time's rude hand, and mark her every change,
Which thinking men delight to ponder o'er
And view old ruins built in days of yore.
Or should such ruins all be cleared away,
And buildings raised by men of modern day,
On the same spot where once was seen to rise
Their lofty structures towering to the skies;
E'en then the spot delight and love inspires,
Revives the passions, kindles new desires,
And chases care and sorrow from the mind,
Oh! sweet reflection thou wert ever kind.
How sweet to live in their enlighten'd age,
Bless'd by the rays of history's golden page;
Here we may read and gaze with awe profound
On many a spire long level'd with the ground;
But still more sweet the tale appears to me,
When told of changes wrought in memory,
To catch the words, as from the lips they flow,
Of one, whose silver locks are white as snow;
And still more dear when near our native home,
Not miles away where one might chance to roam,
But near our birth-place where, in childish years,
A gentle mother kissed away our tears.
'Tis thus with me, and near the lowly cot
That gave me birth, and cast my changeful lot,
Stood a proud furnace, where, in days of yore,
In liquid streams had flowed the iron ore.
There roared the bellows with a sick'ning howl,
And the fierce element knew no control;
And pond'rous hammers, with a thrilling clang,
Loud burst with fury on the anvil - bang.
There liquid streams to mighty cannon cast,
Proudly to range the seas' tempestuous blast,
And face the foe with might thund'ring roar,
And lay him prostrate where he'll rise no more,
With guns and balls of every size and form,
To roar and whistle in the battle's storm:
The cruel spear, the agonizing dart,
To o'ertake the victim, pierce his innest heart.
Thus at this mart all warlike tools were made
In great abundance, not a petty trade;
And ore in plenty near the place was found,
And woody fuel did plenteously abound.
But peace, sweet peace! with her delightful sway,
Beams o'er our land and opes a happier day;
And thrilling wars no longer stun the ear,

No more the cannon's thund'ring voice we hear
 But mark the change, where this proud furnace stood,
 And tools were made for shedding human blood;
 Now dies her commerce with war's sick'ning sound,
 And soon her walls were level'd with the ground.
 The waters too, that turned the ponderous wheel,
 To bore the cannon - sharp the pointed steel,
 Have change their course; to other use applied,
 No more with blood their crystal stream is dy'd.
 But now their errand is to turn he mill,
 That stands erected by the flowing rill;
 Where once with proud ambition stood
 The mighty mass that mock'd the swelling flood;
 And buildings now are raised upon the spoil,
 In tasteful order joined to modern style;
 All that remains of the once famous bust
 Is heaps of dross and loads of worthless dust.
 'Tis thus with time, the rolling years move on,
 What once was famous, now is past and gone;
 The glory changed, the splendour passed away,
 Like fading eve when passed the summer's day

This poem reads almost as a first-hand account of iron-working operations and I wondered whether this could be so in view of the date of writing - 1846. Cleere & Crossley state (p 325) that a map of 1748 shows "furnace at N end and 'boring house' at S with 'workhouse' between." William Bowen, a gun founder is referred to in the Fuller correspondence between 1747 and 1764 was apparently using Cowden upper furnace at this time. We do not have a definite date when Cowden furnace was finally 'blown out'.

On balance, it seems likely that the account is taken from local memories as is hinted at in the poem but probably only those of the previous generation.

Interestingly, it mentions "spears and darts and all war-like tools" being made "in great abundance", as well as the expected guns. I do not know of another such reference.

DMM

FORAY REPORTS

Stumbleholm Bloomery The field group returned once again to Stumbleholm Bloomery site in Ifield, Sussex, TQ23023706; Straker p458. A previous foray found roasted ore in a trial trench but no pottery. In this latest dig, signs of an ore-roasting hearth were partially uncovered, but time prevented it being fully investigated, and once again, no pottery was forthcoming. Despite the area being polluted with forge slag from Ifield Forge, it is felt that that this is a bloomery furnace site because of all the roasted ore that has been found and also the

Roman-type tap slag around the site and in the stream. We hope to return to the site during the next foray season.

BH

Bungehurst Blast Furnace

Our 15th foray to the new search area, north of Heathfield and close to the Mayfield border, has caused some problems. It was mentioned in a previous Newsletter that we would be trying to confirm the position of Old Mill Furnace and Bungehurst Furnace in the near future because their grid references in C & C do not seem to be correct. The foray started at "The Woodlands", whose owners kindly allowed us to park in their garden and who told us that they had a blast furnace on their stream. Being experts(!) we dismissed this as not being Bungehurst Furnace because all the grid references WIRG possesses are further to the north. The owners took us down to the stream and there was a blast furnace site; but whether or not it is Bungehurst Furnace remains to be seen. There are other possible contenders, the result to be decided on a further foray - or two!

It is surprising how many items of interest we find on our forays, not necessarily related to the iron industry. On this foray, we came across some seams of coal just a few mm thick and the cast of a dinosaur footprint (reported upon elsewhere in this Newsletter) and a solid bed of Ashdown Sand inclined at 22° making the bed of a stream for at least 200 ft. Apart from these interesting asides, there were dry pond bays at TQ60143360 and TQ60082300 and an iron ore seam at TQ60172356.

BH

Blackham. January 2003

During the course of 2002 the Field Group visited the Blackham area on two occasions completing the coverage of the land, commenced the year before, lying between the village of Blackham, to the east and the Hartfield /Cowden Road (B 2026) to the west. The southern limit of the area was taken as the East Grinstead / Tunbridge Wells Road (A 264) and the northern, the line of the old toll road running along the top of the high ground above Kent Water.

During the visit in January 2002 evidence was found in the form of furnace bottoms and considerable quantities of slag, suggesting the existence of at least five separate bloomery sites in the area surveyed. All were in or alongside one of the two major watercourses to be found within the confines of Hethe Place Farm (47973972) and lying over a discrete area of the Ashdown Formation.

Prior to the latest foray, the gully running north from Hethe Place Wood roughly along Grid line 48, was re-examined with the aid of a metal-detector and in it a site (one of those originally identified) around map reference 48033965 was chosen for further examination. It lay at the top of the western side of the stream just below the level of the ground forming the adjacent pasture, the valley at this point being some 15 metres in width, with a depth to the bed of the stream, of about 6 metres.

On the day of the foray, six trial pits were dug through about 150mm of loam to the underlying sand and although examples of the various types of slag normally associated with early iron making in the Weald were recovered, no datable material was found. However, on the opposite side of the stream and revealed by the random digging of a shallow hole, the top of a clay structure was found lying some 300mm below ground level. The object, about 600mm in diameter contained, in a depression in its uppermost surface, what appeared to be a segment of furnace bottom together with items of roasted ore and slag. As time would not allow for the complete excavation of the site, its position was noted, the finds were replaced and the hole back-filled for it to be investigated at a later date.

Peter Goodall

Coopers Farm, Stonegate

Coopers Farm lies south of the ridge between Stonegate and Wadhurst; its western boundary, with Bardown Farm, follows a stream running southwards from the ridge in a wooded ghyll towards the Rother. An ancient trackway, now a footpath, runs down the ghyll, west of the stream, with a collapsed brick bridge giving access to fields across the stream. Slag had been noticed in the stream at this point (TQ65952850) and the purpose of the foray was to make a small excavation in the hope of finding dating material.

Trial trenches were dug where indicated by the metal detector. One area, close to the track, contained small pieces of slag; this was thought to be road metalling. A further area in the wood above the east bank of the stream yielded a small triangular piece of pottery, shaped like the rim of a flower pot, amongst the slag. This has been identified as being probably from a jug dated between c1250 and 1350. Further bloomery slag was found in the banks of a side stream close to this point. Another interesting find in the stream was a quantity of quadrant-shaped bricks, stamped with 'DRAIN'; such bricks were exempt from the 19th century Brick Tax.

Ann Callow

TWO SIDELIGHTS ON THE WEALDEN IRON INDUSTRY

Two articles that I contributed to the East Grinstead Society's Bulletin 77 (Autumn 2002) include incidental information relating to the Wealden iron industry.

Discussing the place-names Whalesbeech and Whalesbergh, both taken by Straker (pp.239f.) to refer to the mound of cinder surviving at TQ 395345, I have shown that Whalesbergh was actually located at TQ 417346, now in the grounds of Kidbrooke Park, Forest Row (Michael Hall School). I have also cited Professor R.A. Coates's interpretation of beech in Whalesbeech as the tree-name.

In a documentary history of 1-2 Judges Terrace in East Grinstead High Street I have concluded that Jeremy Johnson, who lived there from at least 1674 until his death in 1707, is the Jeremy Johnson of Charlwood who rented Woodcock Forge at Felbridge from 1664 to 1701 (Wealden Iron, second series, no.22 (2002), p.34). Money from ironworking evidently enabled him to live in the nearest town and acquire the status of 'gent.'

Copies of the Bulletin, in which these points are fully argued and referenced, may be obtained from me for five first-class stamps: M.J. Leppard, 20 St George's Court, East Grinstead, RH19 IQP.

M J Leppard

RECENT PUBLICATIONS

David Sim & Isabel Ridge, *Iron for the Eagles: The Iron Industry of Roman Britain* (Tempus, Stroud, 2002); 159 pp., illus., bibliog., gloss., index.

For the student of Wealden iron, the title of this book is promising; suggesting that here will be an overview of the industry in the province from which one can learn about the activities of Romano-British iron makers in the Weald in a context with other regional concentrations of iron making. Regrettably that promise is not fulfilled. Instead, what the authors present is, for the most part, a survey of Roman smithing, and the majority of the text has little to do specifically with iron making in Roman Britain at all.

That the contents of this book should be read with caution is presaged in the opening chapter - an overview of the Roman iron industry - in which an estimate of the output of the iron industry in Britain is based on the requirements of the population of the province rather than

on any calculation of actual production. This estimate is drawn from an unpublished MA dissertation, as is a thoroughly unsatisfactory distribution map of iron ore working in Britain, in a chapter on mining and prospecting, in which excavated examples of ore roasting pits are given equal status with, so called, mines and ore sources. The failure to recognise the inadequacy of this and other references does not inspire confidence in the authors.

Returning to mining and prospecting, it is very clear that the authors, in making few, if any, specific references to examples from Britain, have relied on general surveys, and uncritically assumed that practices recorded in the Roman world in general, applied to the industry in Britain. It is significant that the only chapter in which specific references are consistently made to evidence from Britain is in that on the subject of charcoal; the significance being that the chapter was contributed by Jaime Kaminski, although it has to be said that the evidence is largely from Wealden examples.

In the chapter on smelting, examples are drawn from Britain but there is little to suggest that the authors have cast their net widely to include many recently discovered sites, the exception being those at Laxton in Northamptonshire. Many of the sources quoted date from the 1970s. The rest of the book is devoted to smithing and artefact production, with very few references to examples of specific practices noted in Britain and, as some of the illustrations suggest, is a reflection of one of the authors' interests as a practising blacksmith.

This is a thoroughly disappointing book, given its title. Nowhere do the authors survey the evidence for iron production in Roman Britain; there is no map showing the distribution of the industry, and very little in the text to indicate what is known from archaeological fieldwork throughout the country. Even the bibliography is woefully short of references to British examples. Finally, there are the illustrations, of which there many and which are, on the whole, relevant to the text. The inadequacy of the maps I have already mentioned; the colour plates of artefacts are useful, but there seem to be too many pictures of re-enactmentists dressed as Roman soldiers.

JSH

FORTHCOMING EVENTS

Weekly Course: The Iron Industry of the Weald. Tutor Jeremy Hodgkinson; 10 weeks; Oakmeads Adult Education Centre, Marle Place, Leylands Road, Burgess Hill; starts Wednesday 24th September 2003; 7.30-9.30pm; details from 01444 236355 .

Historical Metallurgy Society Annual General Meeting 2003 will be held on **Saturday 10th May at the Royal Armouries, Leeds.** The associated Spring meeting will address research frameworks in archaeometallurgy. There will also be an opportunity to visit behind the scenes in the conservation and scientific sections at the Royal Armouries.

Roman Archaeology Conference 2003 (and TRAC) University of Leicester 3rd to 6th April 2003. Includes a session on Roman landscapes and Mining. See web site <http://www.le.ac.uk/ar/rac>

HMS Annual Conference 2003 (12-14 September) will be held on Exmoor. The focus of the conference will be on metal production landscapes and field visits will include non-ferrous mining and smelting from the Late Iron Age to the 19th century. In particular, it is hoped that participants will be shown newly emerging evidence for a significant Roman iron production industry in the area.

Society for Post-Medieval weekend visit to Blaenavon World Heritage Site 5th-7th September 2003. will be housed at Hill House, Abergavenny. It was a focus for early post-medieval industrial activity, including iron ore extraction from the 1670s, ironworking from the 1780s and steelmaking (including the Basic process 1878) and coal mining until the 20th c. Contact Martin Locock, Glam. Gwent Archaeological Trust, Heathfield House, Heathfield, Swansea SAI 6EL. Tel 01792 655208.

DINOSAURS AND THE WEALDEN IRON INDUSTRY

Is there really any connection between dinosaurs and the Wealden iron industry? Well, perhaps not much, except that dinosaurs were part of the ecosystem of what is now the Weald in Lower Cretaceous times, some of them browsing on the vegetation that flourished in the warm swampland that then existed, and others preying on the herbivores. While the vegetation itself, in its decay, gave the acid swamp waters that in turn brought iron minerals into solution, eventually to be precipitated in the sediments as the iron ore layers forming the basis of the industry.

There is also the circumstance that WIRG forays can reveal much in the way of natural history, in addition to the evidence for bloomeries or blast furnaces provided by occurrences of slag. Thus in December 2002, on a foray to an area north-east of Heathfield, a small slab of sandstone in the bed of a stream claimed attention. The site is at Grid Reference TQ 5995 2560, about 750m SSE of Bungehurst Farm, at a spot just to the north of where the stream has broken through the former bay of

a blast furnace, thought to be Bungehurst Furnace as described by Straker, though at the time of writing this is not entirely certain. In the banks of the stream are some exposures of Ashdown Formation white to yellowish clayey silts, with some thin beds of fine yellow sandstone, fragments of which litter the stream bed. The slab in question measures 21 x 13 cm and is up to 4 cm thick. It tapers towards its edges along its length but is broken off along parallel joints on either side; it may originally have been of a round disc- or lens-shape. What is clearly the original top surface is smooth and slightly undulating, but the under surface has a projecting central ridge and two others (one of them not very well defined) diverging from it at angles of about 30°, as illustrated in Fig. 1.

This is unlikely to be other than a dinosaur footprint cast. An alternative slight possibility, that the ridges are the casts of cavities caused by burrowing crustaceans, as found in some Weald Clay sandstones, can be discounted, if only because these crustaceans existed in brackish waters, and the Ashdown Formation is freshwater throughout. As it happens, an account of dinosaur footprints in Ashdown Formation sandstones at Fairlight, near Hastings, has fairly recently been published, by A. S. Parkes in the Proceedings of the Geologists' Association vol. 104 (1993). Fig. 2, from that paper, shows sketches of footprints, so it looks as if the print here described was made by a theropod, a carnivorous dinosaur, rather than by an iguanodont. (The term iguanodont means a member of the group Iguanodonta, which may or may not be *Iguanodon* itself. A modern analogy might be that lions, tigers and pumas all belong to the Felidae, so if their footprints are indistinguishable they could be called felid footprints. Nature programmes on TV get round this by calling them Big Cats.)

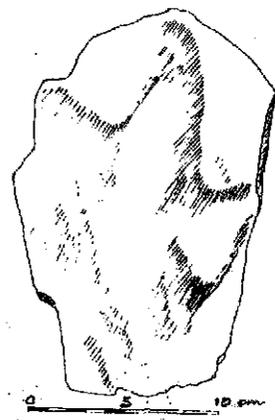


Fig.1 A drawing to scale of the underside of the sandstone slab

Most of the footprint casts described by Adrian Parkes were on the underside of a very thick (1.5m) bed of sandstone, seen in the cliffs or as large blocks that had tumbled to beach level, so the prints could only be measured and photographed *in situ*. Some occurred in short trackways. His theropod prints ranged from 23 to 42 cm in length x 20 to 35 cm in width, and in depth from 2.5 to 5 cm. The Heathfield print has a length of about 18 cm and width of 12 cm, and a depth of 2 cm, so is on the small side. There is even a formula for estimating the height at the hip of a dinosaur from its footprint length; thus a theropod with a footprint length of 18 cm would have been about 80 cm high at its hip.

Parkes inferred that the Wealden substrate had a soft deformable surface layer which was viscous enough not to have run back into footprints and disturbed their shape before they were infilled and overlain by a subsequent deposit of fine sand. From further reading in the literature one gathers that most dinosaurs, like birds, were digitigrade, with the digits spread out on the ground, so that the 'sole' of the foot did not make contact with the ground; that it is not possible to refer prints to particular species; and that theropod footprints are much rarer than those attributed to iguanodonts, possibly because theropods themselves (which included *Tyrannosaurus*) were rarer, being at the top of the food chain - Parkes listed three theropod as against seventeen iguanodont prints from Fairlight.

Sightings of dinosaur footprints are not very common in the Weald, other than at Fairlight. The first discovery of *Iguanodon* remains (teeth and bones) was by Gideon Mantell, a Lewes doctor, in 1822 at Cuckfield. At Maidstone in 1834 an *Iguanodon* skeleton was found in a Kentish Ragstone (Lower Greensand) quarry; together with Mantell's specimens this is now in the Natural

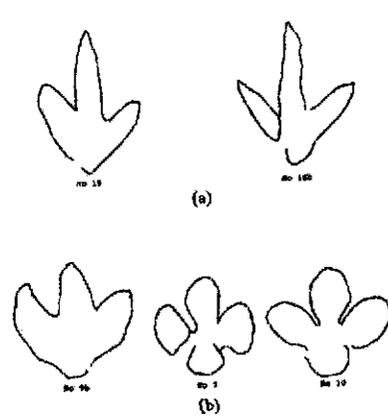


Fig 2 An illustration from Parkes (1993) labelled by him: 'Sketches of footprints from Lee Ness (a) theropod; (b) iguanodont footprints.'

History Museum. The Maidstone Museum holds a number of large Iguanodont footprint casts, some of them from Fairlight and of the size of soup plates. The Museum curator, Dr Ed Jarzembowski, having seen the specimen here described, was pleased to be offered it as an addition to the Museum collections.

Bernard Worssam

Access2Archives

A2A is being developed by the Public Record Office, the British Library and the Historical Manuscripts Commission. Its website (<http://www.pro.gov.uk/archives/A2A>) contains a searchable database of archives in County Record Offices and other repositories, at catalogue level. The archive can be searched by personal names or by place. Data is being entered under a number of headings, representing specific projects—not all are yet complete.

The base has its limitations, in that the data is mostly created by using information contained in pre-existing paper catalogues, so that if the name being searched does not appear in the catalogue it will not appear on the data base. Spellings, as researchers will be aware, can also vary.

However, the data base is a valuable timesaver for searching those archives that are in it so far and a quick way of identifying material in locations where it could never have been predicted. As the work progresses, it will become ever more valuable.

With acknowledgements to HMS News No 52 Winter 2002
DMM

RELOCATION OF A CAST IRON GRAVE SLAB IN EAST GRINSTEAD CHURCH

One of the cast iron grave slabs in East Grinstead church has been relocated to a more prominent position, where previously it had been only partly visible. Although there are two earlier, undated graveslabs in the Weald (Burwash, on or after 1537 and Rotherfield before 1547), the East Grinstead one is inscribed 1570. At one time it had been used as a scullery doorstep in an earlier East Grinstead vicarage but fortunately up side down, so preserving the raised lettering. This rare opportunity to measure and inspect the under-side of a grave slab was therefore taken.

There was nothing of interest on the underside, which would have been the top-surface at the time of casting.

However, the thickness measurements, noted below, indicate that the open sand mould was not exactly horizontal because the edge thickness varied, however, the diagonal dimensions are nearly equal, indicating a very accurate rectangle.

The most interesting observation was the remains of the “runner”; showing that during casting, the molten iron had run down a sand furrow from the furnace, before dropping just ¼ inch onto the surface of the mould, this is to be seen on the left hand side of the grave slab (when on the casting bed); see diagram below:

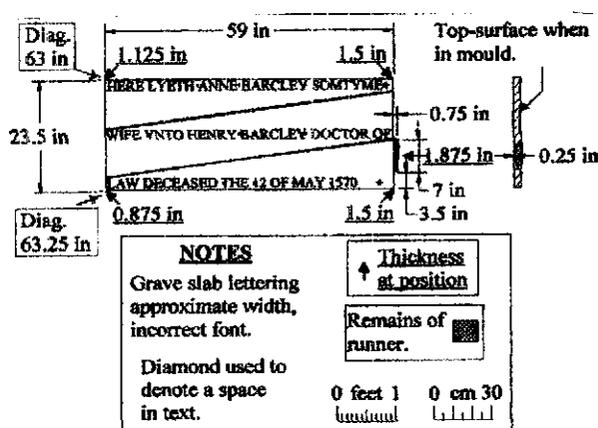


Diagram of East Grinstead grave slab

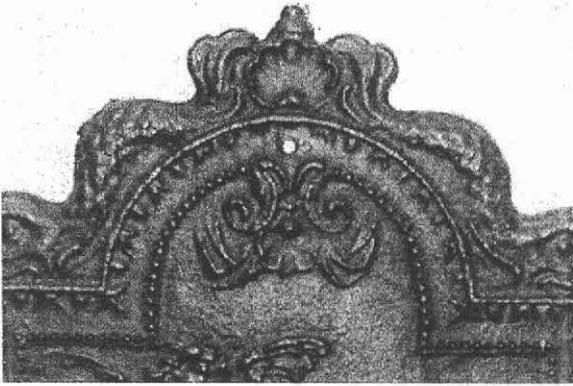
The lines of letters on the grave slab have been produced very accurately, as if three separate lines of text were carved and then impressed into the moulding sand, whilst a square-edged board impressed into the casting sand produced the diagonal lines. The font used in the diagram above is not an exact copy, however, each line is correct. Concave-sided diamonds were used between words, instead of spaces; while these have been retained they are not drawn exactly to scale.

Brian Herbert

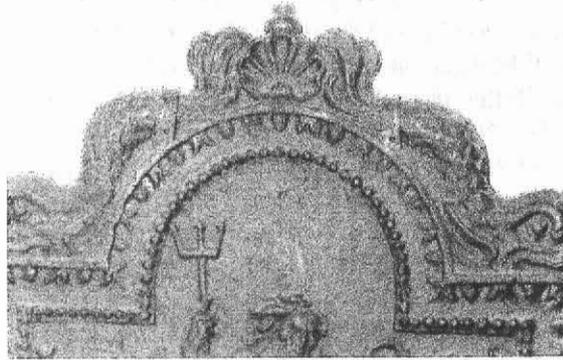
EXPERIMENTAL IRON SMELTING

No news this time but preparations for future smelting are in hand.

A full account of work to date written by Dr Tim Smith, will shortly appear on our web site:
www.wealdeniron.org.uk



Dorchester 'original' Pestilence border



Hastings Poseidon border



Lewes - Pestilence detail



Dorchester 'copy' Pestilence detail

Further observations on the 'Pestilence' firebacks

The reporting of two examples of a fireback seen in Dorchester Museum has prompted me to take a closer look at this particular design, and to draw attention to some other examples. The two, described as 'original' and 'copy' in last autumn's Newsletter, as well as having differing borders, also have pictorial scenes, identified as from the Second Book of Samuel, which are slightly different. A closer examination of the photographs taken (and I am grateful to Dot and Tony Meades for sending me digital images) shows that the juxtaposition of the elements in each picture is not the same.

The version with the larger border (the 'copy') shows the head of King David looking down while, in the other version, he is looking up. Also in the 'copy' the sword carried by the angel is pointing directly at the-



Rowfant
Pestilence
fireback

head of the king, while in the 'original' it is pointing below his chin. The sacrificial pyre has larger flames in the 'original' version, and the position of what appears to be a small building next to the king is higher in the 'copy' than in the other. I have come across two other versions of the 'original' (that is the one with the head facing up), in Anne of Cleves Museum, Lewes, and at Rowfant House, Worth. A different fireback, in Hastings Museum, which shows Poseidon in his chariot, has the same border as the 'original' of the two firebacks from Dorchester, while a fireback with the same Poseidon design, also at Rowfant House, has a different border. Other firebacks with similar borders and proportions to all of the ones mentioned can be found at Hastings, Lewes and elsewhere.

It seems clear that the borders are interchangeable, which prompts me to suggest that furnaces may have kept a small stock of borders, and that there was some standardisation of the size and shape of the central designs to which these borders could be attached (although it has to be said that such is not the case with any of the three surviving wooden patterns). A common feature of all the versions discussed here is the dolphin motif on the top of the fireback and the use of the scallop shell in the design. The slight variation in the design observed at Dorchester Museum is paralleled by several different versions of the famous Lenard fireback from Brede, which exist in, among other places, the collections of the Lewes, Brighton and Victoria & Albert Museums, discussion of which will have to be left to another time.

I cannot leave the subject of these firebacks without offering a suggestion as to a date. The best clue lies in the armour which King David is wearing and which bears similarities to armour shown in portraits of figures in the mid-17th century. It would very interesting were it possible to discover a source for the illustrations on these firebacks. Did the inspiration for the designs come from books or paintings, and if so, where? It has often been written that these biblical and classical designs have a Dutch or German origin, so perhaps it is in those places that the search ought to begin.

Jeremy Hodgkinson

NEWS FROM ELSEWHERE

Lithgow Blast Furnace, Australia

While travelling in the Blue Mountains recently, I was arrested by a notice which read "Lithgow Blast Furnace", now a "Historic Site". Amongst the relics is a very impressive "Slag Monument" made up of huge pieces of slag approx. five metres high.

The town of Lithgow lies 144 km north west of Sydney and was the most important industrial centre in NSW in

the early part of the last century. Both coal and iron were found in the area in the 1870s and the iron and steel works developed in conjunction with the famous Zig-zag Railway. Begun in 1866 to form a link between Sydney and the fertile area beyond the Mountains, it climbs the sandstone escarpment zig zag fashion, with the help of tunnels and magnificent viaducts. In its day it was considered to be the greatest engineering feat in Australia. It is now a tourist attraction.

In 1907 a second furnace was opened, to meet increasing demand. However, Sandford was unable to meet the debts which this incurred and the works were sold to G and C Hoskins. Having secured the promise of a government bounty on Australian produced steel, they moved their business up from Sydney and output greatly increased to meet the needs of the Trans-Australian Railway.

In the first year of production, the Steel Works treated 51,000 tons of ore and employed 632 people....By 1926 the Steel furnaces had turned out of 178,000 tons of ore, resulting in 105,000 tons of pig iron." (Lithgow Public School 1947). However, the difficulties of obtaining enough coking coal and good quality ore coupled with a sharp increase in rail freight charges, eventually rendered the works uneconomical and they closed down in 1928. Four years later the furnaces were moved to Port Kembla, where access to transport by sea allowed the company to compete successfully with other iron and steel works in NSW.

Julia Farmer

Notes on traditional bloomery furnaces in India

The following notes are prepared from observations of the operations of traditional bloomery furnaces of the 19th Century in India, reported by Percy in his book *'Metallurgy - Iron & Steel'* (p254-279) published in 1864. The accounts are generally contemporary with this date and were recorded by Government officials with some knowledge of the European iron & steel industry.

Three types of bloomery are recorded. The smallest type were built of tempered clay and were free standing, ranging in height from 2 - 4ft' (600-1200 mm) with a circular cross section. They were operated with foot bellows made from a goat's skin, the top being attached to a springy branch to return the bellows to the open position. In some instances, a hopper extension was built on the top of the furnace enabling a single man to rake in the charge bit by bit

while still operating the bellows. They were located on the west coast and operated by migrant workers.



A reconstructed bloomery furnace used in a demonstration in 1963. Note the hopper extension at its top and the foot bellows with return branch

(Picture courtesy of Dr. Henry Cleere)

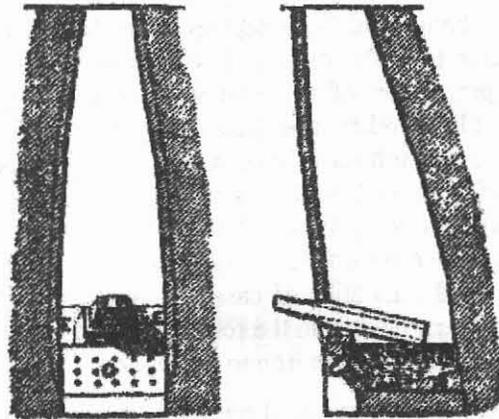
Five to six lbs (2-2.5kg) of iron were made at a charge in the smaller furnaces but up to 30 lb (13.6kg) could be made in the larger ones.

Type 2 furnaces were found in Central and NW India with the greatest concentration at Tendukera. These consisted of a bank of clay in which a cylindrical cavity 15-18" (35-45mm) diameter and 2' 6" (75mm) deep was cut. A row of three or more such furnaces was sometimes cut into a single bank. The bloom produced weighed up to 20lb (9kg) each 16 hour day. Foot bellows were used to supply the air, sometimes located in a pit.



Operating foot bellows during a reconstruction of traditional Indian bloomery smelting in 1963

(Picture courtesy of Dr Henry Cleere)



Front and side elevations of Type 3 furnace from Chandghur showing slag dam with perforations (left) and inclined tuyere (right)

The largest of the furnaces was designated 'Type 3' by Percy. This was also built of clay, three walls being formed by cutting a vertical slot into the side of a clay mound and the front formed by removable front wall of clay 5"-6" (13-15cm) thick. The height was 8'-10', (2.4-3m) width 6'-7' (1.8-2.1m) and the hearth 2'-3' (0.6-0.9m) above ground level. *[Percy comments the form is similar to the German Stückofen].*

The working bottom of the furnace was formed by a clay tile containing rows of holes not completely penetrating through. The tile was placed tilted at about 45° with its [lower end] on the back wall. *[ie the tile forms an inclined stopper for slag above which the tuyere rests - but in an alternative design the tile rests near the front of a hearthstone placed on the hearth bottom]*

. Cow dung [dried?] was introduced above the tile to a depth of 12" (30cm) and a pair of tuyeres inserted about 4"-5" (10-12cm) above the front edge of the tile. The tuyeres were 18" (45cm) long and projected almost to the rear wall of the furnace. The tuyere inclination could be adjusted by means of a clay wedge. The furnace was partly filled with charcoal, lit, and then filled to the top with more charcoal. The blast was applied from the front by a single man.

Ore and charcoal charged alternately for 12-16 hours. Slag was tapped at intervals by passing a bar through the incomplete perforations of the tile, beginning first with the lower holes and afterwards proceeding to the upper, the opened rows of holes were stopped with clay after each slag tap.

When the tuyeres were entirely burnt away, the iron having risen to their level, the smelt was ended. The bottom tile was then removed and the bloom withdrawn. It could weigh from 150-200lb (70-90kg) and was cut into four for working. The bloom usually consisted of a

mixture of malleable iron and natural steel, the relative amounts being said to be dependent on the nature of the ore rather than the process but if steel was desired a larger proportion of charcoal was used and a gentler blast applied. When iron [low C] instead of steel was required, the portion of bloom was brought to welding heat and hammered into bars, when it lost almost all appearance of steel. [*Presumably by decarburisation, possibly assisted by additions of hammer scale*]. Sometimes, small quantities of cast iron were present which had to be removed from the rest of the iron by the smelters who considered the iron to be 'injured'.

The slags contained round particles of iron which were recovered by crushing the slag, the iron particles then being used as shot.

Percy refers to the tools used being similar to European; tongs, hammers and anvils, and hence does not describe them.

Yields and Manpower

Four men were required to work a 4' high furnace (Type 1 & 2), producing three blooms in 12 hours.

The yield of bloom to ore (iron-sand ore) at Arnee (Madras) was recorded as 33%, [*From other work this yield is probably calculated on the iron content of the ore rather than the weight of ore used, but Percy does not make this clear*] and of bloom to bar iron 33% giving an overall yield to bar iron of 17%. Elsewhere, to produce 1lb of bloom, 6lb of charcoal were required and 4lb ore [*25% yield to ore weight*] and on forging to bar iron a 50% loss in weight occurred [*12.5% total yield ore to bar iron*]. At Vizagapatam (Madras) a 25% yield ore to bloom was also reported and a 57% yield on conversion to bar iron [*14% ore to bar yield*]. In Nagpore, Southern India, the forging yield was again 57% [*but no bloom to ore quantity is given*]. In Kumaon, the ore to bloom yield was 35% and the bloom to bar iron ratio 25%, giving an ore to bar ratio of only 8.8%. The total charcoal used for smelting and forge to bar was in the ratio 1: 8.16 Fe:C ie 12% Fe to 88% charcoal by weight. [*As well as yields, Percy goes into considerable detail as to the cost of each commodity and the selling price of the iron*].

Quality

Two qualities of iron were recognized, 'kachchá' and 'pakka', but these terms have different significance in each district. At Tendukera, kachchá consists of small blooms made in the Type 2 furnace, and is used for general-purpose applications. Pakka iron, made at Chandghur in Type 3 furnaces was considered superior. It forms as 'natural steel' which then loses its steely character on forging. The crude steel from the Type 3

furnace was used to make edge-tools. The kachchá quality of crude iron made at Chandghur was a rough mass of iron and slag which could not be used until reheated and forged to produce pakka iron.

The charcoal required to make pakka iron at Chandghur was in the ratio 1:1.10 [*presumably just for forging*] compared with 1:1.08 at Tendukera to make kachchá iron or pakka iron [*the latter presumably made from kachchá iron hence giving an overall charcoal requirement of 1:2.16*].

At Chandghur, part of the fuel used was wood. 5 tons of wood yielded 1 ton of charcoal.

Production costs were lower at Tendukera, partly attributed to the higher quality of ore, but also due to the better organization of the process over that at Chandghur. Tendukera was the largest ironmaking centre in India, but nevertheless produced only about 20 - 25 tons per week, and only for 8-9 months of the year, activities having to cease during the rainy season.

By TIM SAIL

Editor's note: Many thanks to all our contributors. As usual, their varied pieces make for interesting reading. Also thanks to those members who have so kindly expressed approval of the newsletter. It's good to know that we seem to be going in the right direction. Please keep the items coming.

It would be very helpful and save your editor a great deal of time and tribulation if those who send in their work by email would send it as an attachment. Both email and floppy disks should keep to the following acceptable formats:

JPEG for photographs; GIF for line/art/diagrams; Word or Rich Text Format for text.

I realize that not everyone works or wishes to work on a computer and I am happy to accept typed or neatly written items (though not too long please as I have to type them into a suitable programme).

Some time ago your Committee came to a decision that the newsletter should be available in March and November each year and the Bulletin in July ready for our AGM, so that members receive a publication every four months. To achieve this, I need enough time to read through contributions, edit, arrange and enter them suitably into the newsletter's layout. Copy should therefore reach me for publication in our next newsletter by

7th October 2003

Dot Meades