NEWSLETTER No 39 Spring 2004

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THE WINTER MEETING

Reg Houghton is a distinguished member of WIRG, having not only found time to be our treasurer for many years but also to carry out a number of surveys of water-powered sites. These, as members will know, have appeared in the WIRG bulletin accompanied by their respective plans, drawn up by Reg. In addition to all this, Reg has perfected a way of drawing cut-away representations, which show the working and all the components of a water-powered iron site. The last and most complete axonometric reconstruction of a blast furnace site was the subject of Reg's talk to the winter meeting.

Because there are no remains above ground in the Weald, many sources of information were consulted, each contributing to the final result. Reg's talk took us through various aspects of an iron site and some of the sources he had used, pointing out their limitations. One such was a painting by Bles (c 1520), that appears to be of a primitive type of furnace, which made it difficult to be sure of details, such as whether there was a small penthouse. The Lenard Fireback (1636) shows a part-elevation of Brede furnace, together with its timber framing and tusk tenon joints; a valuable source. A print of Tintern Forge showed the controls to the sluice gate, as well as counter-balances to the bellows and scales hung beneath a buffer frame.

Documents consulted included the Panningridge building accounts (1542) and Sir James Hope's Diary, in which he describes a visit to Barden Furnace in 1646 - much useful information here. Excavation reports and plans of furnaces, particularly those of Chingley (1558), Maynards Gate (1562), Batsford (1572), Scarletts and Pippingford West provided more information and suggested alternative layouts of sites. Secondary sources included R S Schubert (History of the British Iron and Steel Industry) and our own Cleere & Crossley.

Having sifted through all this information, Reg translated it into a totally believable drawing. The general plan of his site was taken from Pippingford and the bellows area is similar to that at Barden, described by Hope. The frame around the furnace and its construction came from the Lenard fireback. (Reg noted that this feature was considered early but is shown on a very small drawing of Beech Furnace on an estate map of 1742. Internal furnace sizes of the forehearth, hearth, boshes, etc were taken from Schubert, Cleere & Crossley and Hope. The Chingley excavation plan contributed details of the furnace structure, which was shown to have had three skins - external, internal and infilling. However, the talk was not just about those features that went to make a good drawing but also pointed out differences and anomalies in the information gained from the various sources, particularly those concerning the layout of sites.

The equipment shown in the drawing was generally taken from paintings in VeerBrugn's "The Art of Gunfounding Bronze Cannons" (late 18th century). The forming of cannon moulds, etc. is virtually the same in

iron or bronze. There would have been a blacksmiths' forge, a carpenters' shop, and areas for clay preparation, model and mould making and moulding boxes.

Reg noted that the main difficulty of drawing was the problem of the 3D geometry; of structurally interlocking the furnace proper of hearth, bosh and shaft in its renewable lining with the permanent furnace structure and its casting and bellows tunnels. His comment, "It looks simple; but like everything that looks simple - IT AIN'T!)

As well as the furnace and its equipment, the drawing shows a particular moment of its operation: the furnace has been blown in; the last of the sows, pigs and firebacks are waiting to be carted away; the first cannon has been broken from its mould and new cannon moulds are in the making.

All those hours of research and calculation have resulted in a magnificent drawing. No amount of wordy description can convey its impact and its detail; it has to be seen and preferably full size. We hope this will be possible at a future meeting.

DMM

FORAY NOTES

October 2003

The forayers explored one stream to the south of Bungehurst Farm because it seemed likely that more bloomery sites might be found, bearing in mind that we have just found a new Roman site in the next valley to the north. In fact, the probable source of ore, on the hilltop is closer than the Roman site.

Some five charcoal platforms were discovered along the valley, but with the two blast furnaces and a forge close by, this was to be expected. Nevertheless, two platforms were smaller than usual and the surface a lighter colour but there is no simple way to date them.

Three possible bays were found at the lower end of the stream; one might have been a causeway but one was definite because the pond area can be seen to have been dug out.

Although a small amount of bloomery slag was found soon after entering the valley, it was only when returning across the boundary field that the site was found. The slag was spread out, probably due to ploughing, for about 75 x 75 feet and its original size was impossible to estimate. Another bloomery site was found further up the valley and on miniscule side stream, which may have been man-made. As far as we could see, the site was also very small.

The survey team, surveying what we suspect is Bungehurst blast furnace had borrowed a "total station" surveying system. In theory, this is a much faster surveying system, providing the batteries last out, which unfortunately they did not, even though they had been charged the previous evening. So good "old fashioned" tapes were resorted to, and although reliable, progress was slower and a return visit will be necessary.

BH

November 2003 foray

For the third foray of the 2003/04 season the weather continued the 2003 pattern; hot! We searched the next gill south from where the Roman bloomery site was found in September, knowing that any sites might be closer to the mine pits on Newick Lane, between TQ595240 and TQ594231, unfortunately, only two rather small sites were found.

The bottom of this gill starts in the Ashdown Sand at TQ59922425 and rises up to the Wadhurst clay at TQ59672405, ideal dry ground for furnace building. Initially, the probable remains of 3 small bays were seen, although one may have been a causeway, with the lowest bay having a charcoal plateau on the south side. The first pieces of slag were found near TQ59832417 (see below) but no source was found and it was thought that it might have slipped down from the field above; this was be investigated on the return journey.

On the right bank of the stream, a miniscule (but dry) side-stream had cut through an 8-ft bank into the main stream. It is on the left bank of this side stream that the first bloomery site was found at TQ59722409. It was very small, with slag visible only at stream level, unless it is all buried under the bank.

It would be quite an interesting site to dig, as the slag is unusual, being rather "rounded", although too little slag was visible to make a reasonable assessment. This side-stream is unusually straight and might be man-made, but why? It merges into the main stream at right angles; this is unusual, although it may be spring-fed in winter. On emerging from the gill @ TQ59672405, where a fault line crosses the stream, a short length of hollow-way was seen.

On returning along the fields to the north of the gill, some blast furnace slag was noted @ TQ59712416. The bloomery slag noted in the gill (see above), was found to have come from an area of slag in the field @ TQ59792420, just where there is a distinct "square" of field jutting into the gill. It was difficult to say how much slag was underground in the 25 x 25 metres area.

The slag seems in an unusual situation; why is it only in this "square" of grassland? Could it be the remains of a cesspit from Bungehurst Farm? Probably too far away! It is unlikely to be a barn foundation as it is not on level ground. It does not seem to be part of a trackway. The metal detector did not find a specific area of dense slag.

BH

December 13th 2003

This foray continued work previously carried out in the area during forays in 2002/03, At that time, a number of bloomery sites were identified approximately one mile to the north west of our field study area. This new area was to the north of the A264 between the Sussex Oak public house and Blackham.

Seven forayers parked at Stone Cottage, TQ 4935 3933 and searched for evidence of ironworking. Starting behind the cottage we followed the watercourse upstream, exploring all possible features.

The woodland has the appearance of having been worked but we concluded that the platforms / undulations were the result of the Wadhurst clay slumping downhill. The only notable finds were pieces of "shelly" limestone and a possible piece of iron ore.

At Pitfields Farm we located a number of pits, some now showing as depressions in the field, others as ponds – their origin remains uncertain.

Returning to the woodland, we sat in the continuing rain to enjoy our packed lunches and reflecting on our sanity! We continued to search a second stream without success.

Roger Houghton

January 2004

The WIRG fieldwalking records for Moat Mill Forge, Mayfield @ TQ59062492, are very meagre, and need to be brought up to date; this was the purpose of the foray. (The same applies to Old Mill Furnace a little way to the south-west, which we hope to visit next season.)

The pond area has been much changed to prevent a repeat of the disastrous flooding of the house in recent years. As suggested by the site name, a corn mill was later built here in the 19th century, presumably to utilise the water power provided by the forge bay. Although forge bottoms were found in the garden and also detected in the bay close to the mill wheel, it is not yet possible to decide if the mill was built on exactly the same area as the forge. The tail race follows a long route to the R. Rother because of its wide flood plain, although the spillway takes the shortest route to the Rother; this would not cause a problem when the water backs up. Many forge bottoms and some blast furnace slag were found around the area, even as far away as the long gone outbuilding associated with Moat Mill Farm. There are signs of a (low) bay on the west side of the old pond area, and possibly signs of the route of the river prior to the forge. Inevitably, a further visit will be needed to sort-out some of the ideas that have come to mind since returning home.

We are indebted to the owners of Moat Mill for allowing us into their house to inspect the remaining mill machinery, although it is stationary nowadays, and allowing us to photograph their fireback that is still in use.

It is hoped to visit the ESxRO to inspect the AD1840 tithe map of the area, and so glean more information concerning the site, Presumably it will show the corn mill that was built about 1820.

A 2.5in/mile map has been scanned into a computer and a redrawn and enlarged copy made of the relevant features. This will allow updated information to be added, as required. It can be used as the archive copy and perhaps published in the Bulletin. It was whilst copying the map that a valley was noticed to the south east of the forge. Although no stream is shown, there is a pit to the side, and it will be visited on another foray.

Forge Farm at TQ59032430 was visited but showed no evidence of another forge site as neither bay nor forge bottoms could be found. A pit was seen near Forge Farm at TQ59042425 and also one to the north-east at TQ59452452. As all the above pits are towards the top of the Wadhurst Clay, it is not known whether they were mine pits.

BH

February morning

Netherfield Furnace

This foray revisited the remains of the blast furnace site at Netherfield, first visited in March 2003, which appears to be that of Netherfield Furnace. The purpose of the foray was to measure and record on a site report the various features noted last year, and to explore further up the valleys for any signs of other ironworking sites.

The main bay was measured to be 80m in length, with a height upstream of 2m and downstream of 2.3m. There is a breach (now used by a footpath) 29m from the western end. A long depression – possibly a watercourse – can be traced downstream from near this breach for some 100m. This feature is bounded to the east by a bank up to 1m high, now topped with ancient coppice trees; in the root of one of these is embedded a large piece of furnace debris, which could not be excavated. The stream now flows through a second breach towards the eastern end of the bay.

The area immediately below the bay was explored to try to identify the working area. There are large slag deposits either side of this area, extending some way downstream. Probing across this area indicated a narrow channel free of slag running downstream, away from the bay, possibly originally a watercourse. A piece of iron was found in the stream bank, along with fragments of tile.

The area around the bay was explored unsuccessfully in the hope of finding a site for a charcoal store.

After lunch one group explored the valleys downstream from the site, in Arches Wood. The second group revisited the other features upstream and walked up the valley towards Ivyland Farm. After finding a few odd pieces of bloomery slag, a significant slag layer was found in the stream bottom at TQ71581779. The surrounding woodland was searched to try to identify an associated working area, but this was unsuccessful.

Ann Callow

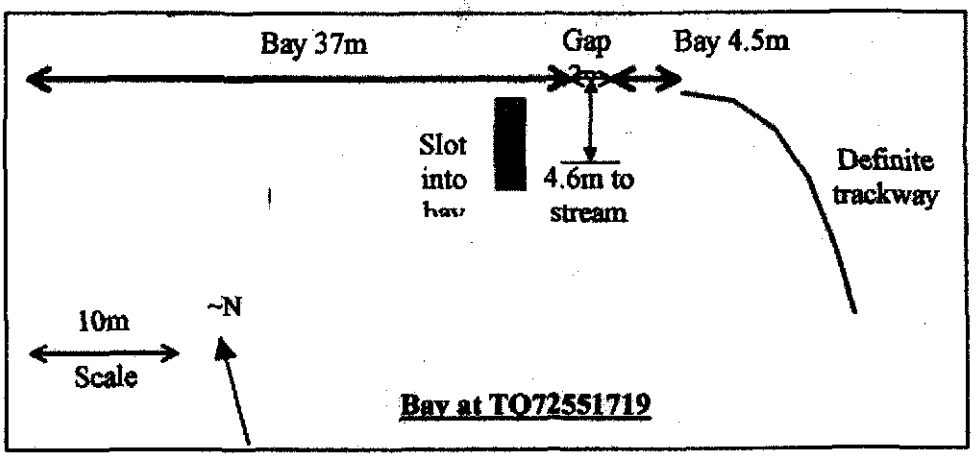
Further comments and conjectures

1. On the previous foray, a pit was noted in the field at about TQ722171.
2. If the coach road over the stream was originally the bay of another pen pond, then the south part of the Netherfield Furnace site would have been under water and become silted-up. This would account for the soft ground, which is easily probed for a depth of about 400mm. It would also account for the spillway being silted up and the fact that no tail race could be found.
3. The pit on the east side and down stream from the bay seems to have a solid base at about 400mm.
4. The site was unusual in that there was a slope across it; low to the west and high to the east, probably due to the depth of slag. Assuming that the slag has not been moved, there is no place for the furnace to have stood because the ground is too high.
5. There seems to be no loading ramp and no feature suggesting a charcoal store (black soil) was noted. This leaves the west side as the only place to put the furnace; but where is the loading ramp?
6. The bay might have been used for another pen pond for Beech Furnace.
7. The water from the first stream followed would have been stored in the possible bay formed by the coach road (2). *BH*

February afternoon - Beech Furnace

The foray started at TQ72251695 in Ashes Wood, where a small stream flowed down approximately from the north. Although the first part of the foray is on Ashdown Sand, an east-west fault changes the geology to Wadhurst Clay, but at an unknown height up from the bottom. Nothing was seen apart from a few charcoal plateaux and many springs near the stream. At about TQ726177, the terrain was too rough to continue and we walked up and over to the east and down into the next valley. Although no mine pits were seen, this may be because we did not approach a proper Ashdown Sand-Wadhurst Clay junction.

Walking down this stream, nothing was seen until we bumped into a rather steep bay. This was measured (see page 5)



Several pieces of 'solid' green blast furnace slag were found high up within the bay but nothing at stream level. The "working area" of the site would have been very small and not suitable for a furnace.
The "slot" in the bay might have been made by water running through a penstock and eroding the bay.
The trackway, initially wide enough for a cart, was very interesting because it aimed directly at the bay and then stopped. The other direction seemed to go towards Beech Furnace. Initially, it was thought that the "trackway" might be a head leat taking water to Beech Furnace. This was not so, as at one point it went uphill. The track seemed to peter out after about 100m and was not followed beyond this point; this should be noted on the Beech Furnace notes and NOT for Netherfield Furnace site.
A little to the south of the bay, a "long" open cast quarry was noted at TQ72481710; this seems to be on the line of the east-west fault line. The entrance to the quarry is cut into the steep bank on the west side of the trackway and continues for some 100m, where a short north-south cut has been made (effectively making a "T" shape). Only a small outcrop of sandstone could be seen near the top of the "T" although there is a possibility that iron ore was dug out. ***BH***

EXCAVATION NEWS

Little Furnace Wood, Mayfield - resumption of bloomery site excavation

Excavation will take place on the Saturday and Sunday of two successive weekends (17th/18th and 24th/25th April 2004). However, it is intended that excavation will continue, perhaps twice a year for as long as necessary, to explore the site and to record as many features as possible, such as working areas, other hearths and locations of possible buildings. Work will start on site at 10am and the same arrangements for access and parking will apply as last season. For further details contact Jeremy Hodgkinson (see Contact List p 10)

NEWS FROM ELSEWHERE

Traditional Japanese ironmaking of the 6th Century

(Abridged from a paper by Kazuhiro Nagata, Tokyo Inst of Technology, by Tim Smith. Original paper (hard copy) on application to tjsmith@waitrose.com).

The 'Tatara' is a Japanese traditional process capable pf producing both molten pig iron and also steel bloom from iron ore and charcoal in a box type furnace measuring approximately 1.2m high, 1m wide and 3m long. The 'Tatara' technology was introduced to Japan from Korea in the latter half of the 6th century as a bloomery furnace, and its adoption to also make molten pig iron came about in the beginning of 8th century, and was commonly in use in the 18 century - the so called 'Industrialised Tatara'.

Most of the product was molten pig iron in the Edo period (1603-1867) and even in the Meiji period (1868-1912), half was molten pig iron and half was a steel bloom known as *'Kera'*. It was in the Meiji period that cheap pig iron and steel imports from Europe resulted in a decline in commercial production using the 'Tatara' and eventually brought it to an end in 1922.

However, in 1977, the *Japan Institute of Art - Japanese Sword* reconstructed a 'Tatara' furnace in Yokota city - the so-called 'Nittoho Tatara'. The furnace is operated three times each winter and produces mainly *'Kera'* (bloom).

The operational characteristic of the 'Tatara' is it operates at a temperature some 200°C below that of the blast

The operational characteristic of the 'Tatara' is it operates at a temperature some 200°C below that of the blast furnace, and also ore passes through the furnace much faster, taking only 20 to 40 minutes. In addition, if molten iron is produced, its silicon content remains low. However, unlike the blast furnace which uses limestone as a flux, the molten slag produced is fluxed by iron oxide making the process inefficient in iron recovery.

Construction of 'Nittoho Tatara'

The furnace is of box type made of clay, 1.2m in height, about 3m in length and 1m wide. It has 20 tuyeres in each side close to the bottom of the furnace. The lower third of the furnace tapers inwards steeply. The furnace is built on a deep foundation of charcoal 2.73m deep, 3.64m long and 4.85m wide. Either side of this are two tunnels, and beneath the charcoal bed a clay layer prevents water from rising up from below. Below this clay layer is a layer of more charcoal, beneath which are coarse stones and sand and a drain. (Fig 1)

The charcoal bed and tunnels act as insulators to conserve heat in the furnace and also to absorb water expelled from the furnace. The foundation and furnace are constructed in a building called a 'Takadono'.

Before constructing the furnace on the foundation, wood is first burned on the bed of charcoal and compacted using long wooden poles. The bed is fully compacted in this way to preventing the large and heavy *'Kera'* (bloom) to be produced from sinking. This work is called *'Shitabai'*. The bottom and centre walls of the furnace, so called *'Moto-gama'* and *'Nak-a-gama'*, respectively, are made from clay and dried by burning wood over night. The next morning, the upper wall, *'Uwa-gama'*, is made of clay.

Bamboo pipes,*'Kiro-kan'*, join the tuyeres, *'Hodo'*, to two wind boxes, *'Tuburi'*, one on each side of the furnace. Four piston type blowers are connected to the wind boxes and cold air can then be blown into the furnace through the 20 tuyeres. Today, the blowers are driven by an electric motor, but in the Meiji period a water wheel was used, and in the Edo period, two or four people *'Banko'*, provided the blast.

Operation of 'Nittoho Tatara'

After an hour from firing the charcoal filled furnace, baskets of charcoal and iron ore are charged to the furnace every 30 minutes. Smelting requires some 60 hours and is divided into three stages; the first stage *'Komori'* takes about 20 hours, the second, *'Noborf'*, 16 hours, and the third, *'Kudari'*, about 28 hours. Prior to World War II, there had been four stages, with *'Komori-tugi'* as a second stage following *'Komori'*. The Komori and 'Komori- tugi' stages are very important for producing a molten slag, *'Noro'*, and molten pig iron. In the early stages, easily reduced iron ore, *'Komori-kogane'*, was used, while in the subsequent *'Nobori'* and *'Kudari'* stages, coarse iron ore, *'Masa'*, was charged. A mixture of fine iron ore, *'Akome'*, and coarser *'Masa'* was used mostly to make pig iron. Today, in the *'Nittoho Tatara'*, only *'Masa'* is used so as to produce a steel bloom.

The iron ore used in the first *'Komori'* stage has more moisture in it than that employed in the later *'Nobori'* and *'Kudari'* stages. Mr Yoshizo Abe, who led the revival project, developed this technique because he could not obtain the more easily reducible *'Komori-kogane'* iron ore (moisture will produce hydrogen and assist reduction).

The total iron content of the ores selected increases from a typical 58% at the first stage, to 60% at the final. Significantly, this was achieved with an increase in the quantity of ferrous (FeO component) present (rising from 11% to 21%) and a reduction in the ferric (Fe_2O_3) component from 70% to 62%. The ratio Fe_2O_3/FeO charged is dropped from 6 to about 3 as the smelt proceeds. Typical SiO_2 content of the ore was around 6%, Al_2O_3, 4.5% and CaO 0.4%.

The furnace operator *'Murage'* can understand the condition of the smelt from the colour of the flame, the colour and shape seen through the tuyeres, the colour of the molten slag and the sound of the furnace. The best colour of the flame is bright yellow, so called *'Yamabuki-bose'* or *'Kiwada- bose'*. The best condition seen through the tuyeres looks like a full moon. The best molten slag is fluid and looks yellow-red, so called *'Kani-noro'*. The best sound from furnace is to hear the blast in even cycles as well as the noise *'Ji-Ji-Ji-'* from the bottom of the furnace - the so called *'Shijiru'* sound.

The smelter checks the tuyeres using an iron rod, *'Hodo-tuki'*, and repairs them when necessary with wet clay using a bamboo spoon. The furnace can be recovered from poor operation by controlling the amount of iron ore charged, the strength of the blast and sometimes by adding dry iron ore, *'Hayadane'*. Dry iron ore rapidly falls past the front of the tuyere. Adding *'Hayadane'* was the idea of Mr Abe. Molten slag intermittently flows out from each of two holes, *'Yuji'*, opened in the lower part of the furnace on both sidewalls, *'Omote'* and *'Ura'*. The molten slag is rich in fayalite containing about 60 to 70% of this Ferro silicate ($2FeO.SiO_2$).

At the end of the final stage '*Kudari*', the lower wall of the furnace has been eroded by molten slag and becomes thin. Then, blowing is stopped and the furnace is broken open. About 2.5 tonnes of '*Kera*' (bloom) and/or '*Zuku*' (pig iron) are produced from about 10 tonnes of charcoal and 10 tonnes of ore. The '*Kera*' is drawn out from the hearth '*Takadono*' and cooled in air. After cooling, the bloom is broken into small lumps using a large chisel. The pieces are classified into grades: '*Tamahagane*', '*Mejiro*', '*Doushita*', '*Oroshigane*' and '*Zuku*' according to their quality, such as size, carbon content and impurities. The compositions of '*Zuku*' (pig iron) and '*Kera*' (bloom) are shown in Table 1. Silicon, manganese and titanium are little reduced.

Table 1 Composition of bloom and pig iron (%)

	C	Si	Mn	P	S	Ti
Bloom	1.32	0.04	trace	0.014	0.006	trace
Pig Iron	3.63	trace	trace	0.10	0.003	trace

The concept of the low temperature reduction of ore at high oxygen potential associated with the Tatara process has recently been adopted in a new rotary hearth process developed by Kobe Steel of Japan, as an alternative to making iron in the blast furnace, which emits less carbon dioxide. A laboratory scale Tatara furnace has thus been constructed for investigation.

Ironmaking in 'Experimental Tatara'

Sixteen smelts were conducted in an experimental small scale Tatara of internal dimensions, 230 x 345mm and 600mm high. Various smelting conditions were tried, a selection of which are summarised in Table 2.

Experiments were designed to produce either bloom or pig iron, the latter being achieved by setting the tuyeres in pairs;, each tuyere was 25mm diameter. Most trials were conducted with the tuyeres inclined downwards at 15°, but this was increased to 29° for two smelts – with no significant change in temperatures recorded, and to 0° in one smelt when pig iron was produced (but pig could also be produced at 15° tuyere declination).

In each case, over twice as much charcoal was charged as ore by weight, the ratio ore to carbon ranging from 0.37 to 0.53. Small quantities of silica (sand) were also added to aid slag formation (the ore naturally contained from 4.6 – 8.2% SiO_2).

Before charging the furnace it was preheated by burning charcoal and blowing air until the lower thermocouple reading reached about 1200°C. Iron ore and charcoal were then loaded in small amounts every 10 minutes. Molten slag was intermittently tapped from a hole opened in the bottom wall of the furnace. The molten fayalite slag (FeO-SiO_2) produced was saturated With FeO for the experimental 'Tatara' but with SiO_2 for the former commercial 'Tatara'.

Table 2 Operating results of experimental Tatara furnace

Charge (kg)			Product (kg)	Temperature °C		
Ore	Sand	Charc.		Bottom	Tuyere	Shaft
30.0	0.0	74.2	Bloom 5.0	1091	1349	1159
29.7	0.9	63.6	Bloom 7.7	1074	1330	1123
30.0	0.6	65.6	Bloom 8.0	-	1368*	1082
30.0	0.9	68.3	Pig 5.7	1134	1381**	1062
30.0	0.6	72.8	Pig 8.6	1212	1319	1086

Notes *Tuyere 29° downwards **Tuyere horizontal (all others at 15° down)
Temperatures measured in front of tuyere and at 20cm above

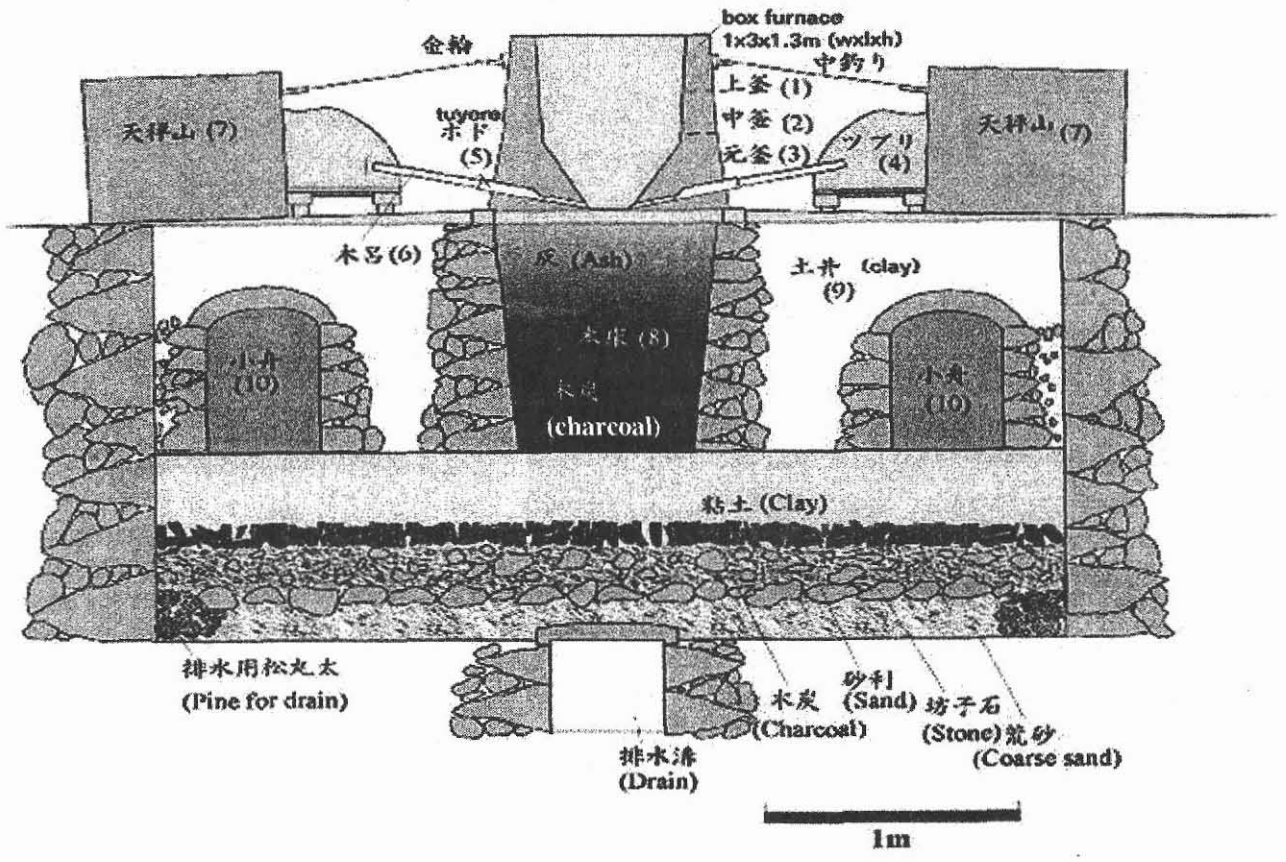
Notes: ***Tuyere 29° downwards **Tuyere horizontal (all others at 15° down) Temperatures measured in front of tuyere and at 20cm above***

The molten fayalite slag (FeO-SiO_2) produced was saturated with FeO for the experimental 'Tatara' but with SiO_2 for the former commercial 'Tatara'.

It took the ore about 40 minutes to pass through the furnace, and most of the ore formed sinter and was then fully reduced above the tuyeres. Reduced iron particles absorbed carbon from the charcoal above the tuyeres and, if sufficient was absorbed (the melting point is lowered with increased carbon content), produced molten pig iron of typical C content 3.63%, which dripped to the bottom of the furnace. Where bloom was produced, this had a composition typical of high carbon steel (1.32%C).

There is no description of attempts to forge the bloom. Diagram below. other page.

Tim Smith



WIRG BLOOMERY FURNACE EXPERIMENTS

A reminder that Carlton TV may be transmitting their recording of our smelting experiments in the spring, (exact date so far unknown) probably under the title of Carlton Country.

There have been no experiments during the last few months but it is hoped to resume later this Spring.

BH

LETTERS

A member from Seaford writes as follows :

Recently I came across a mention of Old Land Farm, Maresfield which, because of its early date, may be of interest to some members of our Group. The details are as follows:-

"Industrial Biography, Iron workers and toolmakers" by Samuel Smiles, published by John Murray 1863. page 17

"In a bed of scoriae several acres in extent the Rev Mr Turner found the remains of Roman pottery so numerous that scarcely a barrow load of cinders was removed that did not contain fragments, together with coins of the reign of Nero, Vespasian and Dioclesian."

Dennis Cliff

Foot note: "Source. M A Lower, contribution to Literature, historical, antiquarian, and Metrical. London 1854 pp 88-9"

Editor: This is indeed one of the most important Roman sites in this area of the Weald; both for its extent and the length of time that it was in operation. There is a comprehensive account, largely taken from Lower, in Straker, E. *Wealden Iron p 397*. The site lies only a few hundred metres from where I live: the fields are now under grass but cinder can easily be found. The soil of the garden at adjacent Mill Cottage is satisfactorily black with charcoal and full of small pieces of slag.

There are extensive diggings across the lane from Mill Cottage, which may have provided ore for this site and possibly also for the much later Oldlands Blast Furnace.

Altogether a very Wealden Iron rich little neck of the woods. Thank you for reminding us about it Mr Cliff.

DMM

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THE POWER OF THE WIRG WEB

The finding of the whereabouts of landowners is quite often a problem when organizing forays. Fortunately for WIRG, John Mew of Braylsham Castle, Heathfield, seems to know everybody in the study area; even so, things can still go wrong.

After organizing the January foray with the land owner and arranging to park the cars at the start of his drive and announcing our arrival on the day, it was assumed that all would be well.

Unfortunately, it came as a shock to the farm manager, to see all our cars in the drive. After considering 'phoning for the police he fortunately noticed our WIRG fingerposts at the drive entrance and decided first to search the web, where he found us at www.wealdeniron.org.uk. This produced the desired effect, as he remembered that we had been in the area on several other occasions.

BH

RECENT PUBLICATIONS

Brian Awty & Christopher Whittick, 'The lordship of Canterbury, iron founding at Buxted, and the continental antecedents of cannon-founding in the Weald', *Sussex Archaeological Collections*, 140 (2002), 71-81.

Members' attention has already been drawn to the discovery of documents which support the existence of an iron furnace on land belonging to the Archbishop of Canterbury, in Buxted, as early as 1490 (*Wealden Iron*, 2nd ser., **22**, 2002). In this paper the background to the establishment of the ironworks known to Straker and WIRG as Iron Plat, but apparently once called Queenstock, is described and speculated upon.

In brief, there was a reference to a payment in December 1490 'for lernefounders at Buxtede', in the accounts of the master surveyor of the archbishop's manor of South Malling in Sussex. Following this there were grants, in 1509, of parcels of land adjoining a furnace in Buxted, some of which can be identified with the Iron Plat site. Implied in the details of the latter was that the furnace was no longer in operation, but that it had been in the time of Cardinal Archbishop Morton, who died in 1500. The presence in the manor of South Malling in 1511-12 of John Symard alias Pownsley and of Lambert Ponsley suggests a link with Pauncelett Symart, the former tenant of Newbridge furnace, and the works are identified as those referred to in 1524 as one of the iron mills belonging to Roger Machyn of Rotherfield, who also held the steel forge at Pippingford. The 'hammer pond at Quenstoke' was mentioned again in 1537.

A connection with the gunfounder, William Levett, is established through the site's location in Greenhurst borough, under which the foreign workers whom Levett employed were listed – dismissing the claims of Oldlands furnace, which was not in the same borough, to have been the site of the first cannon founding in the 1540s. Levett's career is re-examined, suggesting that he did not lose his position for doctrinal reasons as both clergyman and gunfounder, as has previously been supposed.

The development of iron cannon casting in the Duchy of Cleves and Jülich, in northwest Germany in the 1539-40 is described, and in particular the use of casting pits of barrel-like construction, similar to those excavated in the Weald. Also, attention is drawn to the use of comparable terms for certain sizes of guns, such as *falconet*, suggesting a similarity in style and design of guns produced there and in the Weald. Similar activity at Breteuil in Normandy in the same period, and the

political confluence of the two areas in alliance against Emperor Charles V, is suggested as being significant. Tentatively linking this with the site at Queenstock is Nicholas Wotton, who was sent by Thomas Cromwell to secure the marriage of Anne of Cleves to Henry VIII. After the repudiation of Anne, Wotton eventually returned to England, becoming dean of Canterbury. Because of his Kent connections (his family had, for a generation, been resident at Boughton Malherbe, and he held the livings at Sutton Valance and Ivychurch), it is rather sweepingly asserted that Wotton was 'well acquainted with Kent and the Weald'. A further overseas commission by which Wotton was sent to the Netherlands with Sir Thomas Seymour, and later as ambassador in Paris provides opportunities to suggest he was taking an interest in ordnance, and allows speculation that his post at Canterbury had allowed Wotton to become acquainted with Levett and his gun-founding activities at Buxted.

The break-up of the lordship of South Malling which began in the late 1540s, did not affect Queenstock initially, and it seems likely that it was the furnace in Buxted at which Levett employed aliens in 1500-1, although not in the following year. And that it was in use again in the 1570s under the control of Ralph Hogge.

Despite the questionable role of Nicholas Wotton, this is an important chapter in the history of iron making in the Weald. The links with the developments in northwest Germany need to be more firmly established, but they suggest a probable evolution of gun founding techniques which resulted in the ordnance trade in the Weald.

Brian G. Awty, 'The breakthrough of the 1540s in the casting of iron ordnance', *Ordnance Journal*, 15 (2003), 19-27.

Central to this paper is the description of gun founding activities in the Duchy of Cleves and Jülich, referred to in the paper above. However, given the nature of the journal, the author covers the subject to greater depth and furnishes the technological and political background of developments in iron founding which point to Westphalia and the adjacent county of Waldeck as being the areas from where skills and techniques in iron founding spread. The debatable role of Nicholas Wotton still gets a look-in but the emphasis is geared more particularly to the conditions in which crucial advances were made, and which were to spread quite rapidly to the Weald. Reading both papers will provide both the local and European dimensions.

J. S. H.

Sarah Barter Bailey, 'Early attempts to control the export of cast-iron guns and the market on tower Hill', *Ordnance Journal*, 15 (2003) 53-69.

With the Weald being almost the sole production region for ordnance in the 16th and early 17th centuries, a survey of the means by which attempts were made to control the export of guns is important for our understanding of the market forces which influenced the operation of furnaces, and the viability of ironworks as commercial enterprises. From early on, the Crown attempted to control the production and export of iron ordnance. The lists of 1574 were the first stage in this, and there followed a succession of measures to force founders, merchants and ship owners to account for their trade in guns, and place restrictions to protect the realm from threat. This paper charts the various pieces of legislation which were enacted and the degrees to which they were successful. They demand careful reading, for many of their clauses place particular responsibilities on founders as well as merchants, and help us to understand why, for example, certain founders worked together, why particular transport routes were employed, or why some furnaces may have ceased ordnance production altogether.

As well as dealing with general regulations governing the sale of guns, individual stories come to light and the activities of familiar names such as the Johnson and Browne families are mentioned. Transcription of several of the regulations provides detail about ports, and sometimes about individual founders. An example is the Order in Council made in June 1619, which set out the market place and proving ground for guns for sale, and which placed limits on guns being cast in the Weald and on the role of the channel ports for overseas trade in guns.

Regulation of the markets brought to prominence Tower Hill as the principal buying and selling place for guns. Located next to the Tower of London, wherein were the Royal Armouries, it was to remain the main distribution point until the end of the 17th century.

JSH

DIARY

Forthcoming Evening Classes:

The Iron Industry of the Weald; 10 weekly sessions; Beacon Community College, Crowborough; Tuesdays at 7pm, commencing 28 September 2004; tutor, Jeremy Hodgkinson.

The Iron Industry of the Weald; 9 weekly sessions; East Grinstead Learning Centre, East Grinstead;

Wednesdays at 7pm, commencing 10 January 2005; tutor, Jeremy Hodgkinson. Details of both classes will be available from CCE, University of Sussex, Falmer, Brighton.

The Historical Metallurgy Society

is planning a visit to western Normandy and will be pleased to hear from any WIRG members who would like to join them. The proposed itinerary is as follows:

Monday 6th September 2004
Meet at Portsmouth Ferry Port by 22.00 (latest)
Check in for the 23.00 P&O sailing to Cherbourg

Tuesday 7th September
Breakfast on board before ferry docks in Cherbourg at 05.30 Drive south towards *Villedieu les Poeles* (c.60 miles) stopping for second breakfast en route.
In Villedieu visit a selection of:
• Fonderie de Cloches (bell foundry) http://www.comille-havard.com
• Atelier du Cuivre (production of wrought copper objects) http://www.artisansfrancais.com/atecuivr/index.htm
• Maison de l'Etain (pewter workshop)
• Musee du Poeslerie et Maison de la Dentelliere (museum of copper ware and lace-making)
• Musee du meuble normand (museum of Normandy furniture)
• Royaume de l'horloge (museum of regional clocks)
• Church with interesting modem stained glass windows.
Lunch at one of the many creperies or restaurants in the town
Late afternoon: drive to Falaise (c.60 miles) where we plan to stay for 3 nights

Wednesday 8th September
Drive south-west towards Domfront and visit some or all of:
• remains of blast furnace, foundry and forge at Varenne (1586-c.1850)
• museum of iron mining and other old crafts and trades at Dompierre
• other sites on the 'Circuit du fer' - including 19/20th century calcination ovens
After lunch, continue south to Jublains, near Mayenne.
• visit excavated Roman town, temple, fortress (with standing walls), theatre, Roman baths in the parish church crypt, and museum with displays of metal objects and metalworking finds
http://perso.wanadoo.fr/aetius/general/Jublains.htm
An alternative for the afternoon would be to go to St Remy (20 miles west of Falaise) to visit:
• Les Fosses d'Enfer, a geological resource centre for Normandy housed in the buildings of the old iron mines. Just above the village one can explore extensive remains of open-cast mines
http://www.etab.ac-caen.fr/map/servicesEduc/fossesEnfer.html
Return to Falaise (total mileage c. 130, or c.60 if Jublains is omitted)

Thursday 9th September
Drive south and east to:
• Champ de la Pierre (remains of blast furnace - 1572-1860)
• Forge d'Aube (well-preserved finery forge with four hearths and water-powered bellows and hammer - known from early 16th century and used into 19th century; then re-used to forge copper sheet in the 20th century)
http://membres.lycos.fr/forgeaube/aube.html
• Dampierre (remains of blast furnace-c.1670-1857)
St Remy could be substituted for Dampierre, if not visited the previous day
Return to Falaise (total mileage c. 100, or c. 160 if Dampierre is included)

Friday 10th September
Drive c.30 miles north to Ouistreham (arrive by 11.00) to get the 12.00 P&O fastcraft
Arrive back in Portsmouth 14.25

Estimate of costs (per head)

Ferry: Portsmouth - Cherbourg and Caen- Portsmouth	
Based on car + 4 passengers; 2x2-berth cabins on overnight crossing	80
Share of petrol/car insurance etc	15
3 nights in hotel (sharing twin/double room, including breakfast)	80
Entrance to attractions	10-15
3 lunches (if we picnic)	10
3 dinners (£10 - 30 per night, depending what you want to eat and drink)	30-90

Not included: travel insurance, meals on the boat, drinks.

If you are interested, please contact Justine Bayley@english-heritage.org.uk as soon as possible

FROM THE EDITOR

As usual, many thanks to all our contributors, without whom there would be no Newsletter. A reminder that small things, particularly any changes or developments that you might notice on your local sites are of interest. We try to keep our records up to date and so members' observations are valued and will be noted on our archive. Other things to look out for are cannon, mortars, cannon balls, etc. which may be seen on holiday - a photograph and/or description including any initials or writing on trunnions, etc. would be useful. Some of us keep an archive on particular artefacts such as firebacks, references to gunpowder, etc., for which contributions of information will be welcome.

You will have noticed that we now have a Contact List, where you can find our excellent web site as well as officers of the Group. Hoping to see you at the AGM - details about that to come.

DMM