WEALDEN IRON RESEARCH GROUP

NEWSLETTER

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Letter from the Chairman

Dear Fellow Members,

Two years ago I put forward the suggestion that we ought to celebrate the 500th anniversary of the establishment of the blast furnace at Newbridge; the first such documented site in Britain. Various ideas were suggested by members and discussed by the Committee, some more grandiose than others, and some we would have liked to have done but which would have been impracticable for a small group.

What we have settled on, modestly, is the erection of a plaque so that visitors to the site may be better informed as to its importance. And make no mistake, important it was, and although there may have been any number of locations that would have been suitable for the setting up of a new type of ironworks, it was Newbridge that was chosen. And if Newbridge was the first, then those who set it up would have done so with that knowledge. What they were not to know was that it started a revolution in iron making in this country every bit as important in its time as the developments at Coalbrookdale more than 200 years later. So I hope many of you will join us when the plaque is 'unveiled' later this year.

Newbridge, of course, featured in the programme of this year's AGM, which was the best attended for years, and the group that gathered in the sunshine, and included many visitors, enjoyed one of the pleasantest summer meetings I can remember. The dispersed nature of the Group's membership means that some have to travel long distances to attend meetings, but how good it is when so many make it.

I write this every year, but it is worth repeating; I, and the other Officers and members of the Committee greatly value your correspondence on the aspects of the study of Wealden iron in which you are interested or involved, so please keep us informed.

My best wishes for the new year

Jeremy Hodgkinson

ERIC STEWART WOOD 1912 - 1996

WIRG lost a distinguished friend in Eric Wood, who died last May. He had belonged to the group from the beginning, having attended the meeting in Brighton in 1968 at which its formation was proposed and, although distance and other interests had kept him from taking an active interest in recent years, he unfailingly continued to send his apologies for his absence at Annual General Meetings. A writer on archaeology, he made an important contribution to the archaeology of the Weald in his work on the glass industry, and always recognised the close link between it and its cousin, the iron industry, with their common landscape and need for wood fuel. He was an amateur in the same mould as Fred Tebbutt and James Money, whose loss will not be replaced. JSH

LETTERS FROM MEMBERS

Did Wealden Furnaces belch flame? Continuing the correspondence started in the Spring 1996 Newsletter, we have a letter from someone with a great deal of practical experience. **Charles Blick** writes as follows, "Of course you are correct. I have worked on a hand charged blast furnace (Moss Bay, Washington in 1935) and it is a whopping big yellow flame. When CO first turns to CO2 it is blue - then it's yellow. There might have been some hydro-carbons burning off to contribute to the yellowing - but the yellow flame can be seen "for miles around" - not the blue one."

A warning to smelters (the human variety) Charles also mentions that he was once caught by insidious CO on the leeward side of a furnace at Appleby in 1937, when a colleague woke him just in time. I recall that Brian Herbert, also, was overcome by fumes during one of Roger Adams' smelts some years ago; fortunately

other WIRG members were there to help him away from the furnace site. DMM

A Fireback reputedly cast at East Grinstead

Mr M J Leppard writes "A photograph of an iron fireback in Haslemere Museum is reproduced in Sussex Notes & Queries, vol 2 (1928-29) facing p242. A note on p242 says the donor stated it was reputed to have been cast at East Grinstead and appeals for information from readers. It is dated 1582, bears two sets of initials, discussed below, and sports five heraldic roses and crowns.

The attribution of a similar rose and crown to East Grinstead as its coat of arms since at least c1716 led me to discuss the fireback in an article, "Our" Rose and Crown?" in a recent issue of the Bulletin of the East Grinstead Society [1] which also dealt with the town's "Rose & Crown" public house (so named since 1841; "The Rose" from 1781) and a livery button showing a rose and crown between the letters D and M found during alterations at 28 High Street, East Grinstead, in 1939 and now in the Town Museum.

I concluded that no link between the fireback and the town could be upheld; "reputed" was not a strong enough term, the rose and crown was a badge of our Tudor monarchs, the collector John Every believed makers of firebacks "were in the habit of putting in anything that came to hand" [2], and the initials could not be related to any known local ironfounders or families.

More positively, I suggested that I A, the initials arranged vertically on the right, could be John Ashburnham of Panningridge furnace, Dallington, c1572-84 [3], and T M I, the initials vertically arranged on the left with a gap between the M and the I could be the clients, a husband (T) and wife (M) with a surname beginning with I or J.

After writing the article I recollected having once seen a fireback dated 1571 with a rose and crown motif in Horsham Museum but on enquiring I was told by the Curator, Mr Jeremy Knight, that it is not there now and must have been on temporary loan when I saw it.

My article drew no response from readers and a copy sent to Haslemere Museum was not acknowledged but perhaps WIRG members can confirm or improve on my suggestions. Perhaps, too, someone will one day compile a catalogue of firebacks which will make it easier to identify their provenance and so give a fuller picture of the work of the Wealden furnaces.

[1] Bulletin 55 (Autumn 1994), p5, including illustration of button and references to sources

[2] Sussex Notes & Queries vol 3 (1930-31) p256

[3] Cleere, H & Crossley, D. The Iron Industry of the Weald (1985) pp150,349

(Copies of the East Grinstead Society Bulletin referred to may be obtained from me, M J Leppard, 20 St George's Court, East Grinstead, RH19 1QP, for five first class stamps)

WINTER MEETING

MAYFIELD 30th March 1996

It was good to see so many of our long-standing members at this delayed meeting, together with some new ones and a few local people.

We are much indebted to Hugh Sawyer for the following account of Jamie Kaminiski's talk. We apologise for the acoustic problem experienced by those of us who were sitting a little away from the speaker and hope this account will fill in any major gaps.

"The Roman Industry around the High Weald"

Below the High Weald, which was well-known as the home of Wealden Iron, lay the less familiar, but no less important Low Weald. Thus, Jamie Kaminski introduced his audience to an area which he was actively researching as part of his doctorate.

Sites found on the periphery around the High Weald had been considered anomalies, rather than part of a coherent system. These had tended also to be eclipsed by other research, for example: Oldlands, Chitcombe, Beauport Park (1840 - 1899); Straker sites discovered in the East and West (1920's); and more recent discoveries at Broadfield and Runham Farm (1968 - 1985).

Currently, a dozen sites had been located. Four had been found in the West - and eight by Maidstone (eg Lenham, Staplehurst, Harrietsham), a possible link with the High Weald, suggesting continuity of industrial activity. Excavations at Runham Farm had revealed evidence of carbonised bread wheat and animal bone, suggestive of a villa/farmhouse-style of occupation and possibly indicating a pre-Roman industrial and agricultural activity. Furthermore, charcoal samples were found to be of older, damp-loving species such as low oak, high hazel, alder and willows. Interestingly, maple and hawthorn were also well-represented, indicative of open ground, following clearance of woodland for agricultural purposes. Slag had been detected in substantial but scattered volume. It was felt that there had been a high local industry, destined for use at a villa with surplus iron being traded.

At Bramble Farm (Wye), a smelting hearth and coins of the 1st to early 3rd century had been discovered, together with ceramics of semi-industrial proportions. It was also noted that one of Margary's routes 130 ran nearby. Other sites nearby were of equal importance:

Eastwell Park - pre-Roman, possibly exploiting traffic between the High Weald and Canterbury; Coldharbour Farm - evidence found in 1961 of a 7th century cremation group; Ramden Place - a most important site where a Faustina coin was discovered in the late 19th century. Three ponds indicated ore-pits

By contrast, in the West of the region, there were fewer and scattered sites, apparently with limited activity, perhaps because of the limited fieldwork. However, Roman activity had been detected at Farleigh Heath where an inscription had been found; the names of Jupiter and Vulcan suggested a link - albeit tenuous - to the High Weald.

Alfoldean was an extensive site showing occupation debris, iron slag and a smelting furnace - all characteristic of Roman activity at a possible posting-station. However, Alfoldean was considered a 'backwater'; the environment was less beneficial for agriculture, but nevertheless supported an active market in iron.

In summary, Jamie Kaminski believed that there was considerable potential for finding further sites. The relative paucity of sites discovered so far could be partly attributed to the heavy clay in the region, which tended to conceal sites, particularly from aerial photography.

REVIEWS

Allan Williams and Anthony de Reuck, **The Royal armoury at Greenwich 1515-1649: A History of its Technology.** The Trustees of the Royal Armoury, Monograph 4, 1995. (140pp Card Covers 12.95 + 1 p&p in UK; 3.50 p&p overseas)

Mrs Dalton kindly drew attention to the following review which appeared in Current Archaeology No.149, September 1996 in "John Musty's Science Diary". We thank the editors of CA and Mr Musty for permission to reprint it here.

"The quality of armour reached its zenith by the 15th/16th centuries when plate armour, sometimes highly decorated, had become unversal. One of the best known workshops for its production was the Royal Armoury at Greenwich Palace which was set up by King Henry VIII in 1515 to make fine armour for himself and his Court. It was finally closed by Oliver Cromwell in 1649. Much of the Greenwich armour has survived and some was on display at the Tower of London, but now has been transferred to Leeds in keeping with the new decentralisation policy.

Not only has the armour survived but so have written records of its production. Thus an opportunity has been provided to study the technology of this armour and to view this in its historical context. The result is a very well written and illustrated account under the authorship of Alan Williams (metallurgist) and Anthony de Reuck (historian), a happy combination.

Prevous to the setting up of the Greenwich workshop it was necessary to go abroad to obtain fine armour - from Northern Italy (especially Milan) and Southern Germany. Thus when Henry VIII set up his workship he initially staffed it with armourers from Milan and Brussels, but the main body of workshop staff were the so-called Almain armourers, subjects of the German Emperor (both German and Flemish), recruited in 1515. It is this group of Almain armourers who are central to the study reported in the Monograph.

We learn some surprising things. For example, all the iron and steel was imported and there is no record of the use of English iron at Greenwich. Evidently, according to the authors, the results from the measurement of hardness and examination of microstructure demonstrated that between c.1545-c.1567 there was an extended period of experimentation to increase hardness, and to master the technique of quenching the steel plates without warping. Thus in metallurgical terms the Royal Armoury seems at first (for a period of 50 years) unable to harden its steel properly.

The armour did not come cheap. For example, a set of plain armour would have cost £5,000 in to-day's money, and a princely parade armour would have been £50,000. It seems that the peak of manufacture of the Greenwich armour covered the period 1567-1608 under the masterships of John Kelte and Jacob Halder, although the hardness was still less than could have been achieved but this may have been deliberate.

These are just a few of the interesting facts from this well written account of a comparatively less well known area of scholarship".

Many thanks to John Musty for this excellent review. It is particularly interesting that only imported steel is recorded as having been used, since there were two Wealden Steel Forges, one erected very early at Hartfield, just upstream from Newbridge and the other at Warbleton, both with dates which fit into the period mentioned. If, as has been assumed, these forges were initially experimenting to find a reliable method of steel production, and if the Armouries brought over German and Flemish armourers, it seems surprising that steel makers were not also encouraged to bring their expertise

to the Weald. Or were they, and we just don't yet have the evidence. DMM

P.W.King, '**Ashburnham furnace in the early 18th century,**' Sussex Archaeological Collections, 133 (1995), 255-62.

Peter King's article draws attention to a short, but important episode in the later history of Wealden iron making. It was B.L.C.Johnson, in two papers in the early 1950s, who first hinted at the existence of trade between Ashburnham furnace and the west Midland ironworks. He did not elaborate though, and it has taken more than forty years for the facts to be revealed. Contrary to the inference drawn from correspondence between William Ashburnham and two ironmasters, John Hanbury and Ambrose Crowley, the Sussex furnace, together with Westfield forge, was leased, in 1709, not to them but to William Rae, of Monmouth. Rae, who is confirmed as the 'Mr Ray one of Mr Hussey's partners' who supplied the list of ironworks found in John Fuller's letter book, was a partner in the Forest Ironworks built up by the Foley family. Their use of the Sussex works as part of their integrated ironworking partnership in the Forest of Dean and Stour valley, was one of a small number of instances of co-operation between ironworks in and beyond the Weald. It was not, however, the Foleys' first involvement in the Weald, for Thomas Foley had been an active executor of John Browne's will in the1650s.

Accounts held at Hereford Record Office detail the sale of a variety of castings and forgings in the early years of the seven year lease. The market destinations of these products, the partnership's forges in Worcestershire, Shropshire and Monmouthshire, demonstrate the advantages which involvement in such a wide-ranging partnership could bring. In addition, iron was sent to Derbyshire and Nottinghamshire, to London, and to Ambrose Crowley's works on Tyneside. The lease expired in 1716, coinciding with a period when there was an embargo on imported Swedish iron, and it is unfortunate that the records have not survived to show to what extent the works were able to continue to take advantage of the network of markets that the Forest partnership had opened up. From this period the works seem to have been taken on by Rae's local manager, Thomas Hussey; William Rae having become heavily indebted over the purchase of some woodland, and eventually being sacked as managing partner. Hussey is a figure who demands greater attention, for his partnerships, firstly with Rae, and later with John Legas, himself a former Forest Ironworks manager, laid the foundations of the latter's partnership with William Harrison during the War of the Austrian Succession.

A number of questions arise from this article, and are not answered. What were the motives behind the Forest Partnership's purchase of the leases of Ashburnham and Westfield? In the 1650s, Thomas Foley's interest was encouraged by the prosperity of the Wealden ordnance trade during the first Dutch War. Ordnance was not involved in the 1709 leases. Swedish iron already had a strong foothold in markets in eastern England. There was a lengthy sea journey from Pevensey or Rye to Bewdley on the River Severn. Was there some significance in the nature of the iron products which the Sussex works produced? Hammers and anvils for forges figure prominently, as do blooms. Anvils needed to be made of grey cast iron; an iron which Wealden gun founders were adept at making. Was the quality of these products seen as particularly good? Ambrose Crowley considered Sussex and Kent bar iron to be of 'tough' quality, comparable to Swedish iron. If that was the case, why was it not in greater demand? Finally, it is known that the Stour valley forges blended different qualities of iron, but why were blooms, unfinished products of the forge, exported, in addition to pigs?

JSH

NEWS FROM ELSEWHERE

Dr Tim Smith is editor of Steel Times which includes a regular feature on the history of production and use of iron and steel, and personalities involved, each month. Tim is very good for us; it is easy to be so immersed in what went on in our own area that we forget how widespread iron technology was. Tim reminds us that the Weald was only one ironsmelting area amongst many, with this review of some very exciting iron archaeology which has been taking place in Sweden.

Eco Museum Bergslagen

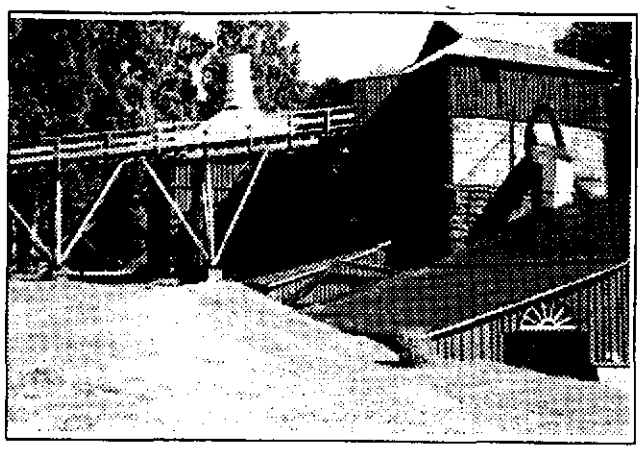
Located some 60 miles North West of Stockholm lies the region of Bergslagen in Central Sweden. Here, over 400 blast furnaces once worked smelting iron from locally mined ore.

The region is now an 'eco museum' - a museum without walls - where the visitor can wander freely around 52 sites ranging from bloomery furnaces dating from 500BC to 'modern' blast furnaces and 'puddling' forges which operated, in some cases into the 1960s.

Based on the occurrence of ample raw materials - rich magnetite and hematite iron ores; ample wood to make charcoal; and water power to drive the bellows and hammers - the region was a major centre of iron production for over 2000 years. From the 16 C, it became a major exporter of 'bar' iron to destinations well beyond the original markets of the Baltic. From 1740 to 1799, for example, total exports of iron from Sweden grew from around 4270 tonnes a year to 4790 with just

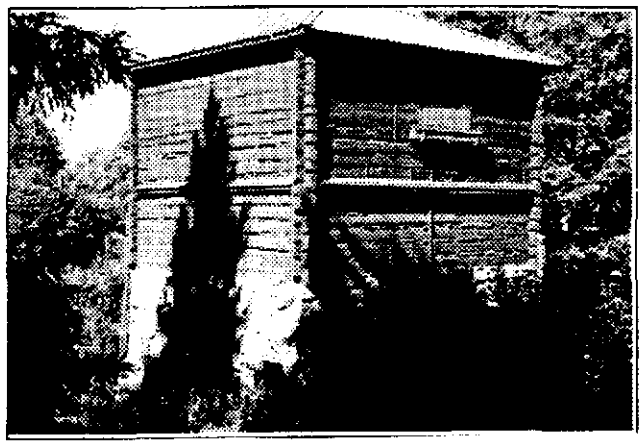
over half of shipments going to Britain where Swedish bar (refined) iron was much sought after for the cementation process because of its low phosphorous content. The other main markets were, Holland, Portugal and France, as well as the Baltic region(1).

Many of the most visible remains in the Eco Museum are timber clad blast furnaces typically dating from 16th C, some of which, with minor alterations, were operating into the first two decades of the 20th C. These furnaces were charcoal fired with water wheels to drive the bellows and the hammers of the nearby forges. One such example is so remarkable in its completeness that it has been declared a 'World Heritage Site' by UNESCO. The present furnace on this site, Engelsbergs Bruk, dates from 1779 and worked until 1919 (Fig 1). The original 8m high stack was extended to 12m in the 1870s, and an ore roasting kiln added (seen standing beyond the ramp in Fig 1), but the building otherwise remains little changed. Some improvements were made to the furnace operation with the addition of an air preheater, twin tuyeres in opposite walls (most furnaces had only one tuyere), and a water driven blast engine to replace the bellows. The bellows' water wheel was then apparently converted to drive an ore crusher. At its peak, the furnace produced 3000t a year.

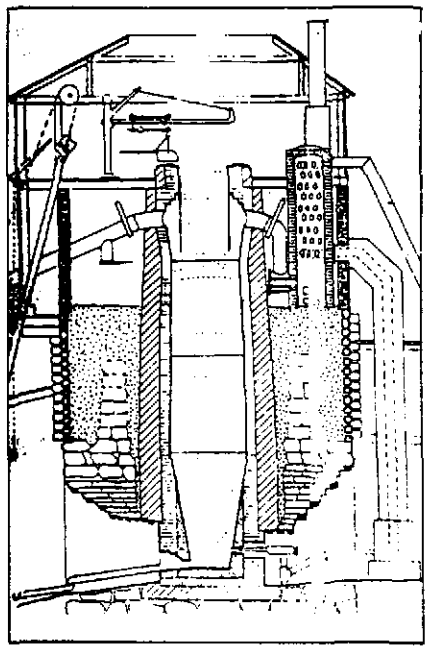


- Fig 1: Engelsberg Bruk blast furnace. The high building to the right houses the furnace which is charged via the ramp. A section of the roof was removed during furnace operation to allow the burning gases to escape. The ore roasting furnace beyond the ramp is a later addition and was fuelled with blast furnace gas.

To the purist who prefers a furnace unmodified, nearby Landsforsen offers an example of a timber clad - earth filled furnace built in the late 1700s which worked until the 1840s (Fig 2). The lower third of the wall is stone built and the remainder consists of interlocking logs (approx 350-450mm in diameter) with the gap between the furnace stack and the walls infilled with earth or sand. Fig 3 shows a cross section of a similar furnace, although of more modern design, being fitted with an air pre-heater.



- Fig 2: Landforsen blast furnace. A timber clad furnace showing charging door on right wall to which a ramp would have led. The tapping arch is in the wall beneath the ramp and the tuyere arch in the left wall. (The roof is of modern construction replacing an older structure).



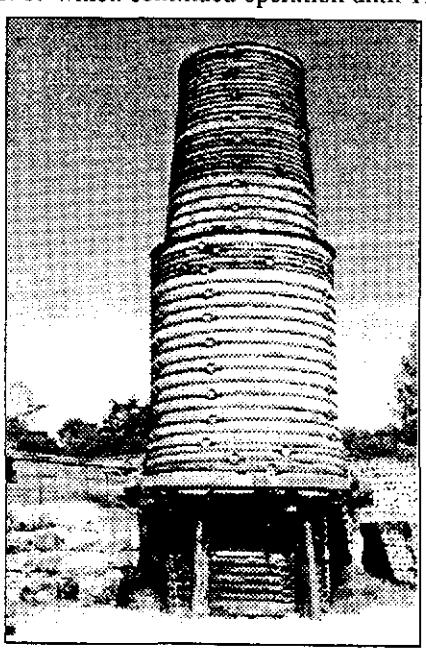
- Fig 3: Cross section of a typical timber-clad blast furnace with air preheater.

The pig iron produced in such furnaces was refined by oxidising the carbon contained in it from a typical 4%C to less than 1.2%. In the earlier days, this was carried out in a single operation in the so called 'German' forge. A pig of iron weighing 60-110kg was heated in a bed of charcoal while air from a tuyere was played upon it. The pig began to melt, but as the carbon was removed, the melting point of the iron increased producing a 'pastey' mass of iron which was repeatedly worked by the Smith until supposably homogenous. The 'loop' so formed was

then consolidated under a water driven helve hammer. The process typically took 6 hours. Later development of the technique lead to a second heating and refinement of the iron, followed by hammering, to increase homogeneity, but the price for this improved quality was the use of more fuel, greater iron loss and lower productivity, so this was reserved only for special irons. The 'walloon' process, probably introduced from Holland, took the two stage process further by using two hearths, the 'finery' and the 'chafery'. A much larger 'sow' was fed into the hearth through a hole in the side of the finery and pieces weighing some 25kg periodically broken off by playing a strong blast of air onto the end of the sow. The 'loop' so obtained was transferred to the hammer, then back to the finery for reheating before being carried hot to the chafery where it was further oxidised but, this time, under a gentler air blast. Following this, it was again forged under the hammer. At a typical productivity of 0.75t/man/week(2), the Walloon forge was more productive than the German forge (0.66t/man/week) but required more fuel and yielded less, but higher quality, iron.

The forges surviving today in the Eco Museum are 'modern' Lancashire puddling hearths, the process was first devised in 1823 by Henry Cort, and became widely adopted throughout Europe during the second half of the 19 C.

In contrast to the timber clad blast furnaces, 'modern' free standing furnaces are also present in the region. Hgfors bruk is an excellent example of an ironworks built in 1915 which continued operation until 1953.

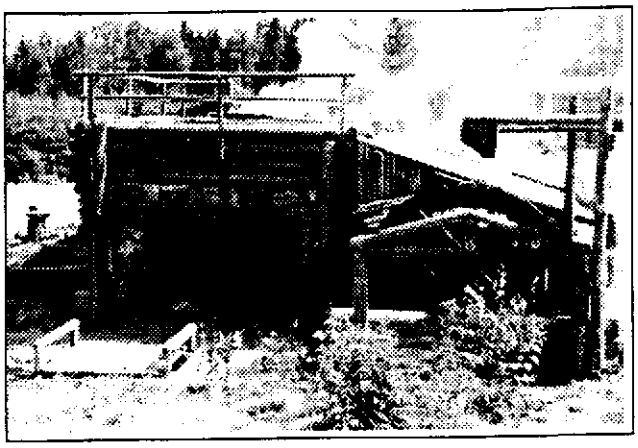


- Fig 4: One of two charcoal fired blast furnaces at Hgfors bruk which worked until 1953.

Two blast furnaces remain, charcoal fired like their timber clad predecessors, and water powered, but by a turbine driving a blast pump. Unusually, the charcoal sheds have survived on this site. The timber built shed is 150m long with plank walls spaced apart so as to allow good ventilation. As with most traditional timber buildings in Sweden, the timber is preserved with a red 'creosote' producing a very pleasing sight.

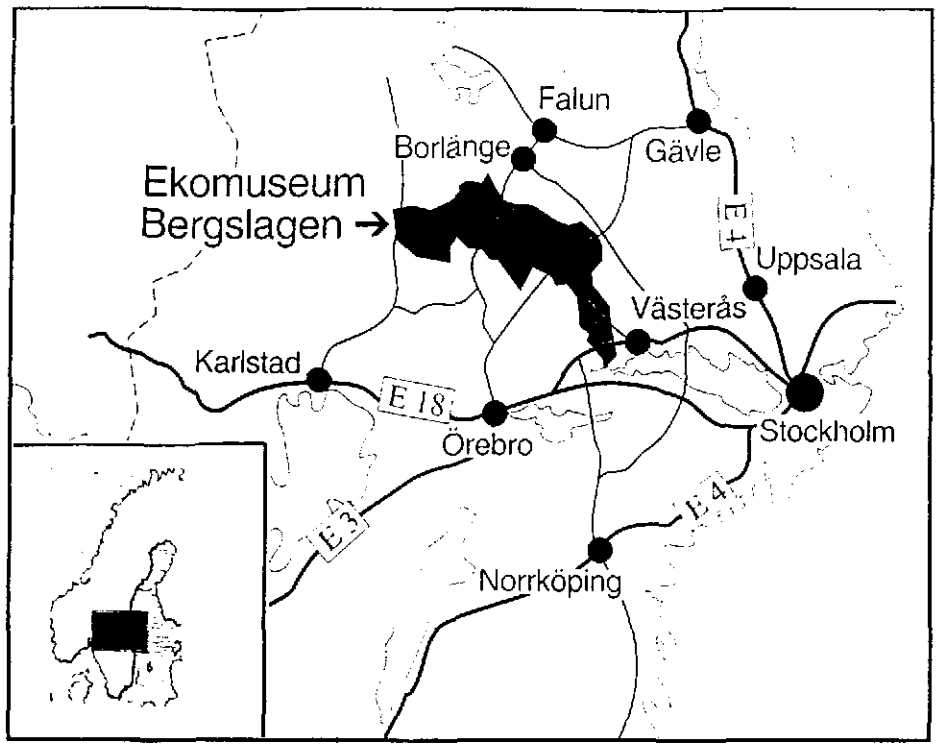
A word on charcoal, even in the 16 C this was a valuable commodity, and much was required. The store houses in which it was kept dwarfed the surrounding buildings, even the smelting house. Most ironworks had tenant farmers who were obliged to supply charcoal at a fixed price, well below that of 'free' charcoal burners. Indeed, the suffix 'bruk' attached to many of the locations indicates a self contained estate with charcoal and agricultural activity being part of the ironmaking enterprise.

One of the most remarkable sites in the whole museum is Nya Lapphyttan (New Lapphyttan) where a full sized working blast furnace typical of the 14 C has been reconstructed (Fig 5). With bellows driven by water wheel, the furnace construction predates the surviving furnaces of 17-18th C which are enclosed in buildings. The first trial smelt was made last August, with partial success. Ore was reduced to iron but the heat was insufficient for melting so the furnace could not be tapped. We still have much to learn from our forefathers! The project, which includes a reconstructed single hearth forge and village, is largely financed by the local authority and local businesses.



- Fig 5: New Lapphyttan, a reconstruction of a 14 C blast furnace. The tapping arch is seen on the front wall and the tuyere arch and bellows are behind the water wheel. Note the deflector on the water launder to turn the wheel clockwise to avoid splashes into the tapping arch

Construction is based on archaeological evidence from nearby Lapphyttan which also revealed a blast furnace of the late 12th C, showing that the technology was in use in Europe some 200 years earlier than previously known.



Visiting the Eco Museum

I cannot do justice to all the sites in Bergslagen in this short article. Not all places are about the iron industry. The world's oldest surviving oil refinery _ built in 1859 _ can be visited on 'Oil Island' _ a wise location following the destruction by fire of the previous refinery. Hydroelectric power stations have been preserved; there is a railway museum and the 60 mile Strmsholm Canal _ built in 1772-95 _ can be followed (or canoed). _ Only about 6 miles of canal were actually dug, the rest being lakes and rivers. Ludvika Mining Museum _ set up in the 1920s _ is believed to be the first attempt to preserve industrial heritage on its original site. Here, one can still see working the stnggng _ a method of transmitting power from a water wheel over several kilometres by means of heavy timbers, suspended from poles, which reciprocated with the rotation of the wheel. Elsewhere, open cast and underground mines from which iron ore, copper ore and silver were extracted, can be toured, as well as the remains of a copper smelting complex. Old buildings abound from timbered residences to constructions made of slag cast as blocks from the furnaces.

Although all sites can be seen externally, the best time to visit is from mid June to mid August when guided tours are conducted inside the buildings. Generally, there are three tours a day, starting at 11 or 12 o'clock, so be prepared to relax by the lake sides or walk through the forests in the mornings.

Accommodation can be booked through the tourist offices listed below. Most hotels offer large discounts (50%) during the summer; alternatively, self catering chalets are plentiful. If you dislike crowds, Bergslagen is the place to go, it is unusual to share a site with more than half a dozen people.

Useful Numbers

Ekomuseum Bergslagen, Kykogatan 2, 777 30, Smedjebacken, Sweden. Tel +46 240 66 30 82 Fax 46 240 748 60. (An excellent 72 page guide in English is available free).

Tourist Offices :

Fagersta Tel
46 223 131 00 Fax 445 55

Ludvika Tel
46 240 860 50 Fax 803 54

Smedjebacken
46 240 66 01 45 Fax 744 89

Norberg
46 223 29130 Fax 207 78

Surahammar
46 220 390 83 Fax 390 75

REFERENCES

1 Swedish Iron in the 17 and 18 Centuries Export Industry before the Industrialisation by Karl-Gustaf Hildebrand (p26) Pub Jernkontorets.

2 ibid (p62).

Editor's note: Tim also included diagrams of charcoal making taken from archaeological evidence gained from Dunshammer (300-800AD). These show that a pit was dug in a slope, filled with dry wood, covered and fired.

Wealden Guns from Corfu

A visit, while on holiday, to the Old Fort in Kerkyra (Corfu Town), revealed a number of pieces of iron ordnance lying about haphazardly. These included two pieces manufactured by Wilkinson and Co., of Willey furnace, Shropshire, one of which was cast for Harrison and Co. Another was a 1799 piece cast by the Carron Co. of Falkirk. But of greatest interest were two pieces made by Harrisons at Brede furnace, Sussex, identified by the letter B on one trunnion. One was buried breech down and used as an entrance pillar (as many of the guns appeared to have previously been), but the other was lying on its side, and a rough estimate of its calibre suggested that it was a 32 pounder. Both guns were in good condition and bore the cipher of George III, which shows they were cast between 1761 and 1763 (Harrisons cast no guns for the Board of Ordnance in 1760, the year of King George's accession, and none at Brede, for the Board, after 1763 at the latest). After many centuries under Venetian rule, followed by a few under the French, the island was a British protectorate from 1815 until 1864. It may, therefore, be a testament to the quality of these guns that they were still considered reliable enough to be used, if only perhaps as shore based artillery, more than fifty years after they were made.

Also of interest were two large, iron mortars (13 inch at a guess - the muzzles were resting on the pavement), which bore an indecipherable motif, but which were both dated MDCLXXXIV (1684) and carried the letters TW. It is likely that these were part of a consignment cast by Thomas Western, who cast at both Ashburnham and Brede, for the Duke of Bergamo. JSH

SMELTING REPORT

Brian Herbert reports that weather and animal damage to the experimental bloomery has necessitated a further rebuilding of the furnace, with a mixture of clay and sand rammed between formers. He has also further refined the blowing mechanism. A "trial run" to make sure everything worked produced some slag.

Charcoal has been purchased and the clay workings at Sharpthorne Brickworks were revisited to collect ore. Brian writes as follows :

"Our original visit to the Sharpthorne Brickworks had shown that there were three seams of iron ore at the quarry face. When we went there three months later to collect the ore, the face had been cut back to allow the clay to weather (for brick making), leaving only the top stratum accessible. Even here, it was noticed that the ore was intermittent. On standing back to survey the face, the reason for the missing ore could be seen: this top seam of ore had been won in former times by the digging of pits. Where each pit had been cut through, the in-fill had fallen down as a scree of weathered clay, with each pit showing-up as a scallope out of the vertical face.

It was noted that the pits did not bell-out at the bottom, in fact, a pillar was left between each of the pits, complete with the seam of ore; this showed up as a protrusion at each side of the pit, towards the bottom.

Much of the ore was very difficult to win because of the unstable over-burden. Also, the ore was tabular rather than nodular, and between 6 and 9inches thick. Thus we had to under-cut, remove the over-burden and then chisel at the back to snap a piece off, swiftly side-stepping as it slid down. With the ore duly dug out, it was very carefully transported to the bloomery site by car and van.

The ore was duly broken down to 1 to 2inch lumps by hammering it on a slab of scrap iron, after which roasting commenced.

Brian Herbert.

FORAYS

The 1994/96 forays proved to be very successful, after a disappointingly slow start. As mentioned previously, a new bloomery furnace site was found north of the Heathfield Transmitter, at TQ58022315. This site was revisted: it lies along a high bank beside a stream and is about 50 yards long. It seems to follow the layout of a typical, large Roman iron working site, but we hope to dig a trial dating trench in November. Some 80 yards the south, another new site was found at TQ57522257; again on high ground beside a stream. It covers an approximate area of 25 by 50 yards, having a gentle slope to the stream, although the undulating nature of the surface suggests that some slag has been removed from the site. Again, a dating trench may be dug in November.

Another find, predicted after consulting the geological map, was a very large mine pit near Herrings Farm, at TQ 576233. BKH

Field Group

Forays still to come during this winter's season are as follows: 14th December 1996 - Forest Row, fieldwalking the Laverty area - we hope to precede this by the ceremony to unveil a plaque commemorating the 500th anniversary of Newbridge; 11th January 1997 - Wilderness Wood, Hadlow Down, trenching two bloomeries; 8th February 1997 - fieldwalking in the Heathfield study area; 8th March 1997 - Burgh Wood forge, Etchingham - preliminary examination prior to measured survey of the site; 12th April 1997 - Peasmarsh - exploration of an area where bloomery slag has been noted.

Foray Group secretary is Hugh Sawyer, 14 Springhead Way, Crowborough, East Sussex, TN6 1LR 01892 652679 - please contact Hugh if you wish to join the foray group.

WIRG EXHIBITION

When the East Grinstead Library held a "local history" week in October, it seemed a good opportunity to exhibit our bloomery furnace experiment. At the recent jubilee exhibition at my work, (to show hobbies and handicrafts) a display was made up to show the two pairs of bellows, a corrugated cardboard bloomery furnace and a recently made gasometer to supply a constant flow of air to the furnace. Little extra work seemed to be necessary apart from some explanatory posters explaining Wealden Iron and the Group, and a "recipe for making wrought-iron". This latter, it turned out, needed well over two pages of one-line instructions, and should make a good starting point when we try to make iron again in October.

B.K.Herbert

MODERN TECHNOLOGY - A SNAG ABOUT SLAG!

An additional hazard has been encountered with "WORD 7", the word processing program from Microsoft. It is now possible to disallow certain words from being typed if they are considered to be out of fashion or "incorrect". Unfortunately, one of these words is "slag": fortunately however, it is possible to disable this feature of the word processor. What would WIRG do if we could not use this most useful of words?

B.K. Herbert

THE SUMMER MEETING - NUTLEY, JULY 1996

Dr Colin Brent, is the author of a number of publications on the rural economy of Sussex and Kent and more latterly on Georgian Lewis. He presented the 1996 Summer Lecture to a gathering of some 60 members of the Wealden Iron Research Group in July. As always, his talk was expertly delivered, humorous and informative with well drawn conclusions - he has our grateful thanks for this contribution to a very enjoyable meeting.

Tim Smith has sent us the following account of Dr Brent's lecture:

The Weald as a Forest Region in Early Modern Times

Dr Colin Brent, author of a number of publications on the rural economy of Sussex and Kent and, more latterly on Georgian Lewis, presented the 1996 Summer Lecture to a gathering of some 60 members of the Wealden Iron Research Group in July.

Dr Brent contrasted the rural economy of the South Downs with that of the Weald to explain how the more independently minded Wealden people were able to develop the enterprising economy needed to supply the skills and resources to develop the iron industry.

In 1500-1700, the fertile soils of the South Downs, existing in the river valleys, the dip slopes and the scarp bench to the coast, led to the development of a 'sheep-corn' economy with wheat and barley grown for external markets, not only in London, but also the West Country and across the Channel to Holland. Sheep were grazed on the Downs, not only for wool, but also to ensure the fertility of the arable land by regularly driving them from the Downs to the fields where they provided manure, a practice which later lead to the vast Down-land flocks being described as 'a moving dunghill'. With increasing markets to feed after the population recovered from the 'Black Death' plagues of 1340s. farms grew in size at the expense of the small peasant farmer who had no other activity to supplement his income, or common land to graze livestock, so that by 1500 most small farmers had been displaced producing a polarised society of landed gentry and landless labourers.

In the Weald, the situation was quite different. The wooded forests and the infertile soils of heavy clay or sand were not attractive to the landed gentry but instead produced a peasant farmer who relied on rearing cattle for dairy produce and meat to supply the growing market of London. A little wheat was grown and some

oats, but mainly for local consumption. Sandy land was fertilised by spreading 'Marl', (preferably a calcareous clay, but often clay not containing the limestone necessary to sweeten the soil). In many places these same pits provided a valuable source of ironstone.

This form of agriculture provided the small Wealden farmer with time to find additional means of earning an income. As well as assisting the depopulated Downland farms with harvesting - which conveniently came a couple of weeks earlier on the Downs than on the Weald - craft trades flourished based on leather, brickmaking, pottery, glass and, of course, iron. The Weald provided all the materials necessary, the heavily wooded areas were a source of charcoal, the clay pits yielded iron ore, and the existing trade with Holland, Belgium and Northern France provided technical expertise.

It was thus no coincidence that Britain's first recorded blast furnace was built at Newbridge on Ashdown Forest in present day East Sussex. First referred to in 1496, the furnace was built on Dutchy of Lancaster land at the expense of the Crown. Its main purpose was to supply ordnance and it is probable that the Weald was chosen rather than other lands held by the Duchy - such as in Yorkshire - since it was a shorter distance to transport cannon and gun carriages to London from this region. There was also an established iron industry using bloomery furnaces in the Weald - indeed the occurrence of bloomery slag at Newbridge indicates earlier activity on this site. Technical expertise to operate a blast furnace probably came from France since records show immigrants arriving from the Pays de Bray region, where the blast furnace was already in use, as early as 1491.

Adoption of the blast furnace was slow at first, only two furnaces were recorded in 1520, including Newbridge which was not working at that date. The war against the Scots of 1540 waged by Henry VII increased the demand for ordnance causing more blast furnaces to be built, for example in the Buxted area of Ashdown Forest, again a location where bloomery furnaces already existed. By 1548, the number of blast furnaces and fineries in the Weald totalled 53. The demand for iron further increased as the local population grew more prosperous - partly due to the rents on their holdings being fixed - and a market for domestic items grew.

Ore was dug, trees coppiced, charcoal burnt and all cartage was undertaken by the peasant farmers at times convenient to them when they were not needed to tend their farms. Much of the work was carried out in the winter when there was also sufficient water in the Hammer ponds to work the furnace bellows and forges.

By 1630, under the pressure of a growing population to feed and competition from iron made in the Forest of Dean and imported iron from Sweden, the Wealden iron industry started to decline.

The Civil War in 1640 provides an interesting example of the unique social structure of the Wealden population. The area which is now East Sussex was the only county in England where no battle was fought, the Parliamentarian cause being totally supported. The lack of a dominant overlord hierarchy left the Wealden people independent in mind and religion - some would say unruly and undisciplined. This was reinforced by the fishing towns of the coast which were like minded.

Newbridge was just the start of an industrial revolution which spread across England in the 16th century, eventually leaving the Weald behind in its wake as the advent of steam power removed the dependence on water power and the use of coal (as coke) for smelting removed the reliance on charcoal.Tim Smith

Further Reading:

'The Rural Economy of Eastern Sussex 1500-1700' by Colin Brent East Sussex Record Office 1978

DATES FOR YOUR DIARY

Day School: British Gunfounding in the 16th-18th Centuries: Hastings Museum, Saturday 1 March 1997, 09.30-16.30. Tutor: Jeremy Hodgkinson. Details from Centre for Continuing Education, Education Development Building, University of Sussex, Falmer, Brighton, BN1 9RG; 01273 678537.

Newsletter:

Many thanks to all who have contributed articles, reviews, news and letters to this edition of the newsletter. It is good to have such a lively response. Please keep sending in your contributions, on disk or typed or legibly handwritten. Items intended for the next newsletter should be with me by the end of February 1997, or earlier if possible.