



NEWSLETTER

No.32 Autumn 2000

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LETTER FROM THE CHAIRMAN

Dear Fellow Members,

One of this year's pleasures was a two-day school, which I organised for the University of Sussex. In it, it was possible to combine lecture and discussion sessions tracing the development of the Wealden iron industry, with visits to the Group's experimental bloomery site at Pippingford, where the participants were able to watch and assist in the stages of smelting and forging an iron bloom. Without the willing co-operation of the experimental bloomery team, it would have been impossible, so I am greatly indebted to them. It was a happy collaboration, for the hands-on activity at the bloomery gave substance to the drier, indoor dialogue.

Looking back over the last sixteen years, since I started giving lectures to local history and archaeo-

logical societies, it is the dialogue that usually takes place at the end of such lectures that is the most interesting part. For it is then that one gets to hear of the potential sites that people have in their back gardens, or learn a new slant on some aspect of the industry from the personal experiences or research of a member of the audience. What is constant is the wide popular interest that exists in our subject. I suspect that much of that interest, particularly in the Weald itself, derives from the close contact that many people have with reminders of the industry, whether it is because they live in a Furnace Lane or overlook a hammer pond, or merely because their local church or pub has an interesting grave slab or fireback. For these reasons I applaud the increasing recognition by some local authorities and strategic bodies that the iron industry is an essential aspect of the heritage of the region, and merits conscious efforts to acknowledge its key locations. A perceived conflict between the desire to raise public awareness of the past, and rural policies which seek to retain the quietude of many parts of the Weald, is overstated; part of the charm of the Wealden iron industry now is the apparent contradiction of present rural peace and past industrial energy. And WIRG's role in all this? - to be able to provide the planners and developers with the knowledge with which they can inform their decisions, and to go on refining that knowledge, and making it available to an ever wider audience.

Raising public awareness has resulted in this year being a busy one for WIRG's modest display, which has been on loan to several societies for millennium exhibitions. Not least of these was the recent Wood Fair, held annually at Bentley. Those directly involved in country life are often an excellent source of information about new sites.

The Committee is sorry to lose two members this year: Bill Whiting and Peter Goodall. Both have given of their time freely and contributed immeasurably. Their departure highlights a dearth of new recruits to the Committee, and it is a matter of concern. The job of the Committee is to manage

the Group, and it is not a requirement that one is an authority on the Wealden iron industry. So, please consider offering your services. We meet only four times a year.

My best wishes for the new year.

Jeremy Hodgkinson

PLEASE HELP

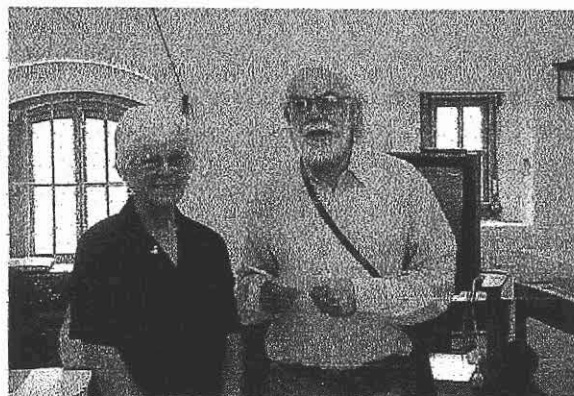
Perhaps even more urgent than the appeal for new committee members is our need for a new secretary. Shiela Broomfield has been our secretary for many years, and we much appreciate all that she has done. However, she now feels that other activities need to claim her time and unfortunately there are only 24 hours in a day. Shiela will retire at the next AGM. Please, if you can help at all, get in touch with Shiela (telephone 01732 838698, or on email: s.broomfield@pipex.com), who will be pleased to answer any questions you may have.

ANNUAL GENERAL MEETING

July 22nd 2000

Fort Nelson, Portsmouth

As usual, our AGM provided the opportunity for members who live or work far away from the Weald, to meet and exchange views. It was good to see such an excellent attendance, both from our own members and from the Ordnance Society. As usual, the business part of the meeting was quickly finished. Professor Alan Crocker from the Surrey Industrial History Group was presented with a cheque from the WIRG Tebbutt Research Fund to finance the conservation of the 19th century "Plan of Cobham Mills Belonging to Alexander Raby Esq." (see review of the Alexander Raby Conference Proceedings below)



Mrs Margaret Tebbutt presenting a cheque from the Tebbutt Research Fund to Professor Alan Crocker of the Surrey Industrial History Group

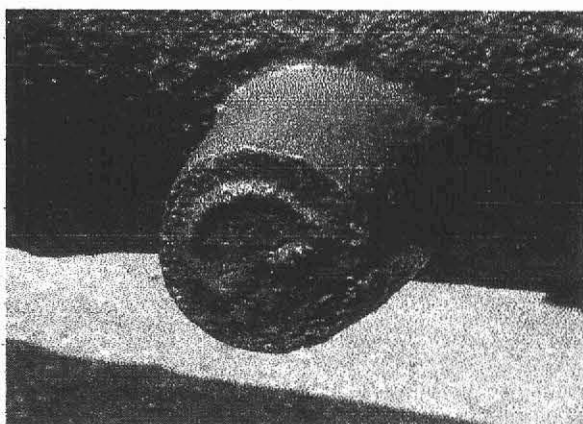
Pam Combes has kindly written the following report of the very interesting talks and activities at Fort Nelson that occupied the rest of the day.

Nick Hall the keeper of Fort Nelson kindly relinquished part of his holiday to come and tell us something of the history of the fort itself. In the wake of an invasion scare in the 1850's Fort Nelson was one of a group of forts built along the south coast to counter a perceived threat from the technically advanced French army. In Portsmouth the most significant risk was thought to be a possible land attack from the north, which would have enabled the enemy to bombard the fleet anchored in the harbour from the heights of Portsdown. Consequently the main defensive provision in all the forts on the hill faces north. The separation of the two lines of armament allowed the field of fire to extend in excess of 180° overlapping the front of neighbouring forts. In the event their effectiveness was never tried and the entire group of forts are remembered as 'Palmerston's follies'. Fort Nelson was used as a transit camp in 1914-18 and as an anti-aircraft ammunition depot in the 1939-45 war when the interior was filled with ammunition stores.

Following a less dangerous but potentially environmentally disastrous threat from property developers Hampshire County Council purchased the fort in the 1970's and restoration was begun. The Hampshire Museum Service eventually joined forces with the Royal Armouries to provide a sympathetic and remarkably appropriate use of the fort as a Museum of Ordnance with exhibits ranging from the 14th century Boxted (formerly Eridge) bombard to the 1980 supergun, destined for Iraq.

Ruth Brown then introduced the group to the distinctive characteristics and marks of early Wealden guns. The Scandinavian founders were employing a recognised system of marking by the late 17th century and although Thomas Western was marking his guns made for export in the 17th century it was not until the early

18th century that the English guns produced for the Board of Ordnance were systematically marked.



Trunnion markings on one of the Fort Nelson guns
Photo by Chris Broomfield



Ruth Brown (centre) explaining the characteristics of guns
displayed at Fort Nelson
Photo by David Combes

Put very simply Wealden guns are most readily identified by their trunnion marks. Always cast in relief they identify either the furnace or the founder and sometimes both. Pairs of letters on one trunnion identify the founder and a single letter the furnace, occasionally the two elements appear together on one gun. To be rejected from the corpus are guns with a loop on the cascabel and incised trunnion marks, Carronades with the Carron mark cunningly hidden on the base and Swedish guns with a sudden distinctive flare on the muzzle (and many others too numerous to identify here).

Ruth's explanation of the complexities of marking

on guns from different sources and different times was clear and concise and laid the foundation for an enjoyable afternoon when we were invited to put our new found knowledge to the test.

Ruth and Robert shared the task of taking the members round the displays of guns in the museum where they gently persuaded us to attempt to identify the source and date the guns without recourse to the labels! Many of the group have 'gun spotted' when on holiday both in Great Britain and around the world. We now have no excuse for being unable to identify the Wealden guns – judging by the enthusiasm shown by members of the group while putting their new found knowledge to the test the corpus of identified Wealden guns should increase substantially following this informative and enjoyable day.

I am sure that all the members who were able to attend would like to express especial thanks to Ruth, Robert and Nick for providing such a stimulating experience for us all. Thanks are due as well to our committee who organised the day, and to Ashley Brown who kindly acted as chauffeur to the mini-bus travellers.

ELIZABETH GIBB 1914-2000

Elizabeth Gibb, a member of WIRG and of the Field Group for very many years, died, aged 86, in Scotland on 10th September, and was buried in the churchyard of St. John the Baptist Church at Tidebrook, Wadhurst, beside her husband, Jock, and near her old home at Mousehall, on 20th September, 2000.

I first met Elizabeth some twenty years ago when we were students of David Freke of the Institute of Archaeology, who held evening classes for several years at Uplands College, Wadhurst. With her I learned to field-walk and, on joining WIRG, much enjoyed her company on 'forays'. Every outing in her company brought something interesting or funny into my life. I learned how she began to excavate, aged 18, under Mortimer Wheeler at Maiden Castle, Dorchester and much about her finds while walking with her husband in Scotland (a vitrified fort) and on the South Downs (a Romano-British farm). Until the last few years of her life she had very keen eyesight and could see a piece of

old pottery or a worked flint long before anyone else. She also knew a great deal about the birds, beasts, flowers and trees of the Weald, being particularly interested in the fate of a wild service tree she knew. Elizabeth was a dear and hospitable friend, sometimes 'scatty' and always great fun to be with.

Anne Dalton. October 2000.

REVIEWS

Sarah Barter Bailey, *Prince Rupert's Patent Guns, Royal Armouries Monograph 6* (Leeds 2000); vi + 153 pp.; frontispiece + 15 illustrs.; 5 appendices; endnotes; bibliography; index.

References to 'turned and neil'd' guns have puzzled scholars of the history of ordnance for many years, and Sarah Barter Bailey has produced a masterly account in her unravelling of this little-known mystery.

In 1671, Prince Rupert, erstwhile cavalry hero, was granted a patent, couched in the most general of terms, for 'preparing and softening all cast or melted iron so that it may be fyled and wrought as forged iron is...' Other contemporary documents refer to experiments the Prince had carried out to make iron cannon lighter and the colour of brass, and that he had conducted these experiments at Windsor, where he was Constable of the castle. Prince Rupert was no stranger to such developments; he devised a method of improving gunpowder and formulated a new alloy of copper and zinc, known thereafter as 'prince's metal'. The work at Windsor was supported financially by the Office of Ordnance, but the Prince was merely subjecting guns to a special treatment, not making them. Evidence points to the guns he worked on being made by John Browne, the Kent gun founder. By the end of 1671, Sir Thomas Chicheley, Master of the Ordnance, and Anthony, Lord Ashley, Chancellor of the Exchequer, had joined the Prince in partnership as patentees.

However, early in the following year the development of a new type of gun began to move away from Windsor when guns, which had been smoothed, filed and engraved (but not annealed or turned), were ordered from John Browne for a new ship being built at Woolwich. John Browne's grandfather, also John, had been involved in experiments in improved gun design before the Civil War, and it may be that this earlier experience was reused in connection with the Prince's experiments. In the summer of 1672, the

Ordnance Office set up an annealing furnace at Woolwich and, later, a turning mill on the river Lea in Essex. Another Wealden founder, Thomas Western, also seemed to be producing guns which had been 'turned'. A year later, John Browne was supplying guns which were described as 'Turned, but not as yet as Nealed', suggesting that they had to undergo a further stage in the production process, and the Ordnance Office were later paying £60 a ton for guns which had received the full treatment; ordinary iron guns cost between £16 and £22 a ton according to size. By 1674, it seems that all the new guns being ordered by the Office of Ordnance were being made using the new process. In the space of three years, John Browne delivered more than 800 tons of the guns at £60 a ton.

A new twist in the tale emerged at this stage. A former employee at the Woolwich annealing works, disaffected by being put out of a job, sought to sell the secret of the new process to the French. The French were interested initially, but were distrustful of their source. A small number of guns was produced, but lacking in sufficient detail of the original experiments, the results were poor and not pursued.

Returning to the main story, the high cost, a third of which was a fee to the patentees, was causing some concern. A reduction to £40 was eventually agreed, perhaps with the patentees accepting their fee in guns. However, when parliament voted money for new ships, from 1678, it was with 'rough' iron guns, not the turned and nealed ones, that they were to be equipped. This was despite Mary Browne, John Browne's widow, coming to a new agreement with the patentees for the production of the turned guns. The significant documents of the Office of Ordnance have not survived from this period, so the reasons for the change in attitude towards these guns has had to be inferred. In 1679, Sir Thomas Chicheley, one of the patentees, was removed from his post as Master of the Ordnance, so it is likely that a change in policy occurred at the same time. Also it appears that the Brownes, anticipating new contracts, had overstocked with the turned guns. A reluctance to pay for turned guns that were no longer needed, together with a prohibition of their export, placed the Brownes in an invidious position. Eventually there was some relaxation in the export prohibition, but the Brownes and their partners had debts in the order of £40,000. Eventually, the family succumbed to the pressure of their debts, and, in 1692, transferred their warrants to William Benge. The Brownes were not the only gun founders to suffer from the reversal of the govern-

ment's policy. For several years after, nealed and turned guns were being offered for sale to the Office of Ordnance, but at the same price as the ordinary guns.

Perhaps the only frustrating aspect of this book is the lack of explanation, until near the end, of what nealed and turned guns actually were. Again the evidence has had to be pieced together from a patchwork of sources, and the result is unclear. Several different and exclusive processes seem to have been undertaken. Firstly, guns were turned, accounts say, on a lathe. For this to be possible, the iron must have been relatively soft. Annealing, if that is what also took place, generally implies a toughening, but also softening, process, caused by the formation of smaller crystals in the metal. More than one contemporary account refers to the purer quality of the metal, the lack of honeycombs, a truer bore and a large wastage of metal, suggesting the possibility of solid casting a century before it became obligatory. There is also the suggestion that another metal, presumably copper, was combined with the iron, if only on the surface. However, this may have resulted in a confusion between Prince Rupert's experiments with ordnance, and the Prince's Metal he made. The jury is still out, and it is a pity that the opportunity was not taken to carry out some metallurgical comparison between the metal of an ordinary iron gun and one of the surviving 'rupertinoes'.

Mrs Barter Bailey has written a very readable work, which anyone interested in the development of ordnance, or indeed in gun casting in the Weald, ought to read.

Jeremy Hodgkinson

Surrey Industrial History Group

Alexander Raby, Ironmaster – *Proceedings of a Conference held at Cobham on 28 November 1998, edited by Glenys Crocker*

This useful and well set out publication includes the following papers:

The Raby Background: The Midlands, London and the Weald - *Jeremy Hodgkinson*

Iron Working in Northern Surrey - *John Potter*;

Alexander Raby at Cobham - *David Taylor*

Downside Mill, Cobham - *Alan Crocker*

Raby's Mill at Addlestone - *David Barker*

Alexander Raby – Ironmaster and Coalmaster - *Lyn John*

There is also a summary of Raby entries in London

trade directories, 1749-1811 by *Peter Jenkins* and an Index of Persons, Places and Organisations.

In his Introduction Alan Crocker, the Conference Chairman explains that the Conference arose after the death of George Buttriss of Brooklands College, Weybridge. Mr Buttriss had collected information about Alexander Raby with a view to writing his biography. Unfortunately no-one could undertake to finish this task. So a Conference was decided upon as the next best thing.

The Buttriss Archive has now been deposited in the Research Collections of the Surrey Archaeological Society at Castle Arch, Guildford. It is to be hoped that this very well organized and produced Proceedings will one day form the basis of a new attempt at a biography. *Dot Meades*

Romano-British Iron production in the Sussex and Kent Weald: a review of current data – *Jeremy S Hodgkinson*

Published in The Journal of the Historical Metallurgy Society: Volume 33 Number 2 1999

This article is an attempt to indicate possible output for individual sites and to measure their relative importance. It reviews the data we now have as a result of the work published by Straker, Cattell, Cleere and Crossley as well as the more recent work of the WIRG field group.

It is recognized that the question of output is fraught with difficulties, since in many cases a proportion of the slag has been removed at various times and for various purposes. This began with the large-scale metallurgy of Roman roads, identified by Margary, and continued throughout the ages with the use of slag for hard core. Moreover, because the data available on the area or depth of slag at Wealden sites is variable, the volume estimated for some of the sites is arbitrary.

With the proviso that the work is still incomplete and inaccurate in many respects, a map (Figure 1) has been constructed to show the best currently available information.

There are 538 known bloomery sites in the Weald, of which 133 (25%) have been dated. The proportions of those sites by period are shown in Figure 2, from which it will be seen that the 81 sites of the Romano-British period are approximately 60% of the total dated. In 1981, when the last assessment was made

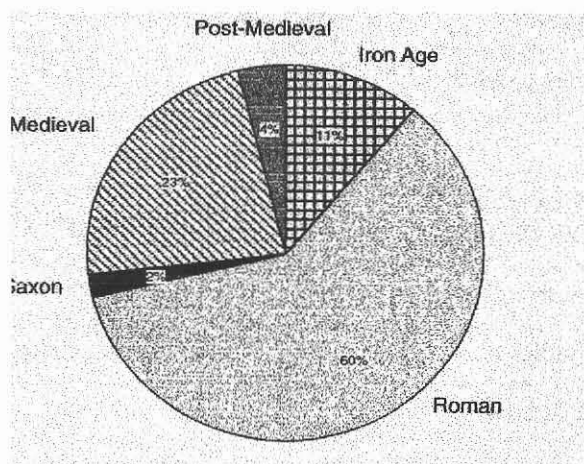
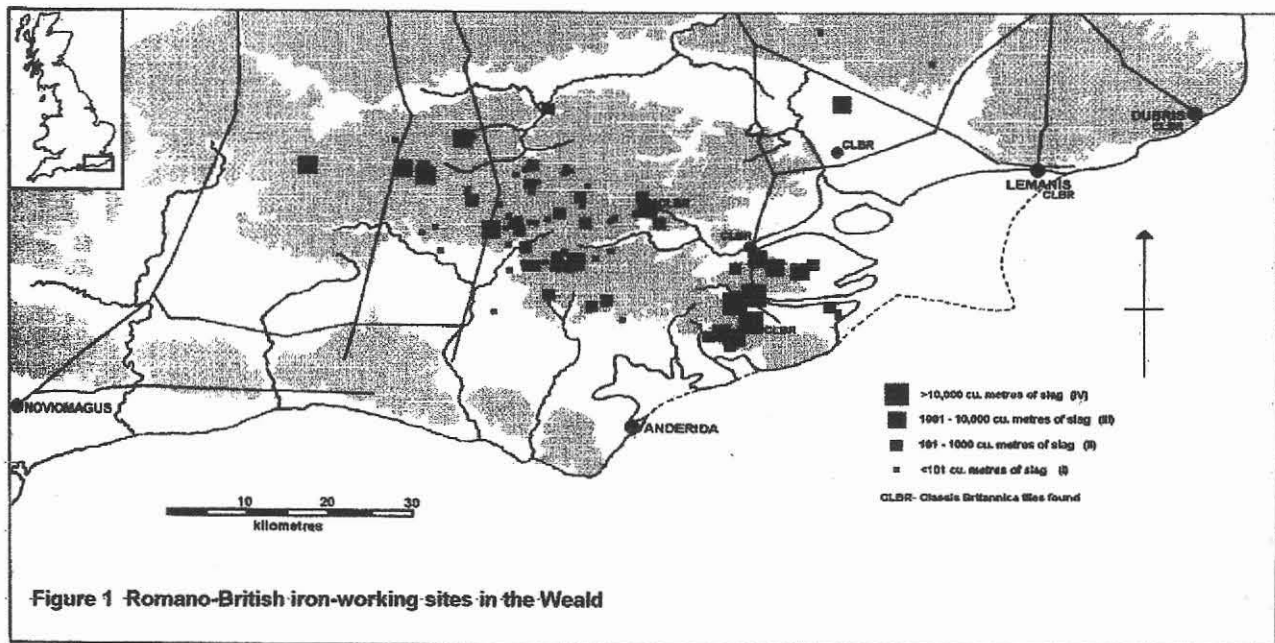


Figure 2 Wealden bloomery sites – distribution by period for 133 of 538 known sites

83% of the then dated sites were found to be Romano-British. Thus, the dating of 14 more sites has appreciably altered these proportions, which shows the benefit of continuing fieldwork and dating activities by the Wealden Iron Research Group.

There will always be doubts about the extent of the Romano-British industry, particularly with regard to the larger sites, which may hide remains of the original Iron Age ironworks. (The same problem arises with the post-medieval industry, where some sites have overlaid possible medieval water-powered bloomeries). However, despite all the difficulties Jeremy has written an interesting and valuable review of the Romano-British industry, using the knowledge we have so far, to put it into the context of the Wealden iron industry as a whole.

Dot Meades

FORAY NOTES

The Domesday Ferrara: No further forays have been made to Forest Row in search of the Domesday ferraria. However, there is news of the much damaged furnace that was found in that area on **Tablehurst Farm:** Carbon dating of the sample of charcoal recovered from this site (see Autumn 1999 WIRG Newsletter p9) has given us a date of 2110 +/- 70BP. BP stands for 'before present and always refers to AD1950. This gives the date as 160BC +/- 70 years, which makes this the first pre-Roman bloomery furnace dating in the Weald. The dating was carried out by Centrum voor Isotopen Onderzoek, Holland at a cost of about £130.00.

Readers will remember that this furnace was found at a depth of 2m, during excavation for a new reservoir. This is well below the detection level of our existing metal detector, but the proposed purchase by WIRG of a fluxgate gradiometer might have found it, providing that a thorough search of the field had been made during our visit. Had this magnetic anomaly been found, it would have been necessary to excavate to prove that it was a furnace and in that case a more intact structure might have been found. The second choice of a cheaper detector, a 'magnetic susceptibility' type, is unlikely to have discovered this magnetic anomaly at a depth of 2m.

The ongoing bloomery search area (Heathfield):

Only one foray was made to the bloomery search area, in September, this time to the next valley west of Herrings Farm. Surprisingly, very few pieces of slag were found; definitely not enough to suggest a new site. One large pit was discovered on the Wadhurst Clay/Ashdown Sand junction at TQ57142327.

Two forays to Blackham, Sussex: There were two visits: one foray and one excavation. This was in response to a request for information concerning the history of this village for a book that is being written.

A total of three new bloomery furnace sites were found in November, along with some suitably situated pits from which ore was probably dug. Slag had already been found by the owner at TQ48804015, this was measured to be a semicircle with an area of about 225m². Associated pits were found at TQ49134012, TQ48714006, TQ48714000 and TQ48874001; also a dip in the field at TQ48724014 was noted, where a pit had been filled in. Another bloomery site was found at TQ48453957, beside a small stream, a semicircle with an area of about 40m² with associated "bell" pits in the surrounding woodland.

A further magnetic anomaly was also discovered 50m upstream of the west bank; this will have to be investigated at a later date as it was thought we were on "next door's" land. A low-lying area in the field to the east was rather too high in the Wadhurst Clay to be a mine pit and might be the remains of a hollow way. The final site, beside the same stream at TQ485333983, covered a semicircular area of about 100m².

This latter site was excavated in December, on the next foray, where one piece of mediaeval pottery was discovered. Unfortunately the pottery was not found in a sealed layer, basically in the plough soil. No solid layer of slag was found nor any furnace structures; making the site undateable.

South Park, Blechingley, Surrey – bloomery site:

In the previous WIRG Bulletin, No.19, it was noted that Straker's bloomery "South Park", Blechingley, Surrey, had been rediscovered at the modern map reference of TQ33254825. On a further visit to the site, in February, two trial trenches were dug in search of pottery; unfortunately without success. It was thought that the field just to the south of "Poundhill Wood" (now mostly a field) called

"Cinderfield" contained the main area of slag; this was not so. The trench dug here contained very little slag apart from that scattered from a ditch. This ditch sloped down in a roughly SE direction, no doubt from the indistinct E-W ditch along the north boundary of Cinderfield".

The main area of slag was found to run along the southern boundary of the old "Poundhill Wood", where there is a dense concentration of slag for some 50m by about 10m wide. The second trench was dug at this location, where concentrated slag existed to a depth of 300 mm, but unfortunately, no pottery.

The metal detector found other magnetic anomalies in the old "Poundhill Wood"; these may have been charcoal making areas. *Brian Herbert*

IRONWORKING AT SHARPThorNE

There may be some relevance to the findings of the foray to Sharpthorne reported in Newsletter 31 (Spring 2000) in the bequest by William Infelde of West Hoathly of 3s.4d. 'unto the hye wayes betwene pauhache gate [and] Kooecam' in his will dated 25 February 1560 (Sussex Record Society vol 42 p 328. This road is part of the one which follows the ridge from Sharpthorne to Wych Cross along the southern boundary of the area investigated in the foray. The Infelds were involved in the iron industry in the 17th century, with two iron grave slabs in the village church. William is possibly an earlier ironmaster with a natural interest in maintaining the roads which tended to suffer from his traffic. *M J Leppard*

THE SMELTING TEAM; 2000

The smelting team have had 4 more successful smelts and one unsuccessful one during the year. It would appear that the scheme of getting the furnace to a smelting temperature of 800 to 900°C before adding the charges has provided the secret to a successful smelt. In all, we have made about 12lbs of iron from 5 smelts.

Keeping the site infrastructure in reasonable repair keeps us busy; a new roof over the furnace area to keep out the weather was our main aim this year. Further modifications and repairs to the bellows was also necessary because they get a great deal of use. Also, the tapping arch of the furnace is getting bigger with each smelt; it would seem a pity to rebuild the furnace just for this reason.

As already noted in this Newsletter, Jeremy Hodgkinson's smelting weekend was a great success, with 2lb 10oz of iron produced to a strict timetable. The failed smelt, mentioned above, was due to using imported barbecue charcoal, made from a hard wood. This proved to be an inferior fuel, very hard and dense, as it is only partially converted to charcoal and still contains the carcinogenic tars which are almost fully removed from English charcoal made from coppiced wood. Although the furnace reached the desired temperature of 800°C before smelting started, the charcoal would not burn away to allow more charges to be added. Although this imported charcoal could not be used following our normal smelting procedure, it may be possible to work around the problem; but not by this smelting team!

With all these good quality steel blooms to hand, it was now time to consolidate some iron (and our expertise) and produce something worthwhile in the forging (blacksmith's) hearth: perhaps a knife as this would not require any fire-welding! Because we were low on charcoal, blacksmith's coke rather than charcoal was used in the hearth, this may be more cost effective than using charcoal at this early stage. Unfortunately, we are at the start of long learning curve!

The spongy bloom was heated to a red heat and one third chiselled off, to be hammered into an homogeneous piece. It would appear that this is going to be a difficult process. Although the metal could be consolidated, the surfaces of the globules of metal within the bloom could not be "fire welded" together, causing the metal slowly to break up, as crumbs of iron broke off after each reheating and hammering. Eventually, an approximation to a rather large, blunt arrow head was produced, but it still showed minute cracks where the original structure of the spongy bloom was not being fire-welded together. **BKH**

NEWS FROM ELSEWHERE

Thanks to Dr Tim Smith and Steel Times for the following interesting insight:

Restructuring of Ironmaking in Hunedoara, Romania in the 18th Century

By Romulus Ioan*

*The author is a lecturer at the Engineering Faculty of Hunedoara SC and member of the cultural foun-

dation, *Iancu of Hunedoara*.

During the second half of the 18th Century, the operation of blast furnaces and forges in the Hunedoara region of modern day Romania declined in output and quality as a result of the obsolete technologies still in use. Compared with the other major iron producing regions within the Austrian-Hungarian Empire, Banat, Styria (Austria) and lower Hungary, Hunedoara's output was low and inferior.

Vienna took measures to study the situation and introduced rapid changes to improve the socio-economic conditions following adverse reports about the region in 1774 – 1778.

In 1778, a commission was sent from Vienna lead by the official, Szeleczky who appointed Franz Joseph Müller von Reichenstein to reform the social and economic relations in the Hunedoara estate.

Franz Müller was a well known personality in the Austrian-Hungarian Empire, he had studied law at Vienna University and later became Professor of Mining at the Schemnitz Mining Academy. He also performed functions as an administrator in Tyrol.

The order appointing Franz Müller stated precisely what he was expected to do to improve iron production. His role was to inspect the mines, blast furnaces and forges and propose improvements.

Müller's 980 page report presented 221 years ago is an example of his meticulous approach and pragmatism in analysing the situation. It presents solutions, including better training and the use of consultants, which are still relevant today.

In the second half of the 17th Century and 18 Century, the Hunedoara district had 13 shops for iron smelting and processing, each driven by water power from the rivers Cerna, Govajdie and Runc. There were also two shops at Sibisel which were part of the estate. The total output from all ironmaking in the district was 21500 – 22500 'majas' a year (about 1200 – 1260 tonnes) In addition, there was one shop at Cerna owned by the Prince of Transylvania (Baia Cerna).

Economics:

Hunedoara was a good place to market iron (the German name for the region 'Eisenmarkt' means iron market). Prices were dictated by the Diet of Transylvania. Iron was collected direct from the iron shops and also from the workers who received wages in the form of iron rods. Negotiations on prices were undertaken by agents who used two forms of payment, cash and credit. Iron was purchased both in semi-finished form as bars, or as manufactured goods such as spades, hoes, shears and weapons. Iron was bought at 3.5 – 4.5 florins (per 'maja') [see Units of Meas-

ure below] in Hunedoara, and sold elsewhere at 6 florins for bar, and 10 florins for tools.

Iron workers were paid their wages in four ways: in coin (florin); in iron bar or flat iron; provisions (cereals); and in other goods (eg linen, clothes etc).

High officials such as superintendents and foreman had their wages laid down in a contract. Documents dating between 1700 – 1720 show such payments (see Table 1 below).

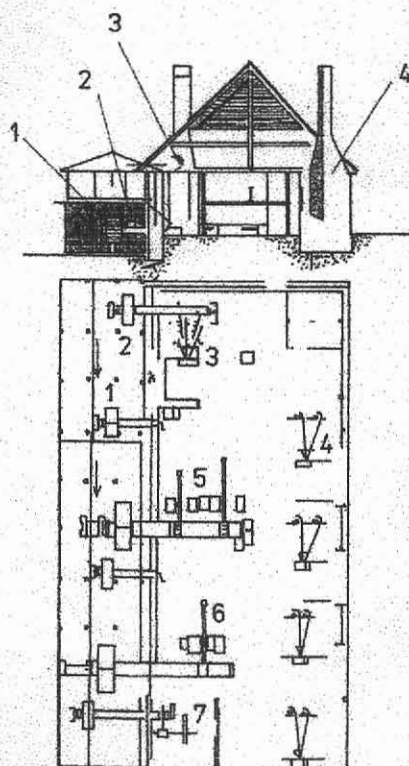
Every iron shop had to pay some bar iron to the Hunedoara city administration; this was used to pay Court employees. For example, a document of 1665 records the salary paid to a magistrate, Gheorghe Nagy of Alpestes as: 32 florins; 14 'coti' of cloth, 2 pigs of iron or 4 iron 'maja' for clothes, 2 pigs of iron, 8 small buckets of corn and 2 loafs of white bread and a pint of wine a day.

Working in the fields and the iron shops was part of a serfs' duties. Unlike other forms of work, wages were paid each week to ironworkers, the amounts being summarised in Table 2 below.

Equipment : Inventories of equipment used in ironmaking have survived from 1672 to 1710 for the five largest iron shops, Plosca, Baia Noua (Baia Doamnei), Toplita, Nadrab and Limpert. Each shop had the following: two furnaces for melting iron; two heating furnaces for forging; water wheels and drives; two pairs of bellows driven by water wheel; tongs for taking out hot iron; hoes and hooks for pulling out slag; iron rakes for charcoal; an iron stake to release the slag; and eight pairs of baskets to carry ore.

The forge was located near the blast furnace and was either of the 'German;' type with separate buildings for the blast furnace and forge, or the Romanian type with both housed in a single building (See Steel Times October 1999 p392). Other buildings were houses for the furnace workers, the furnace foreman and the forge foreman, and a store for the iron. Livestock was also kept with 12-16 horses with harnesses used to transport the ore, charcoal and iron. Quoting from a text of 1700: 'if the shop is to work properly, it will need 16 horses, in case a horse begins to limp, another will take its place'.

Working season: Usually iron production took place for



18th century Romanian ironworks with blast furnace and twin hearth forge in one building

1 Water wheel for forging hammer;
2 Water wheel for bellows; 3 Blast Furnace;
4 Forge hearth; 5, 6, 7 Forging hammers

26 weeks of the year, within an 8 month period from 20th March until 23 November, with short breaks at Easter and Whitsuntide, and an 8 week break from 13 July to 8th September when the workforce worked in the fields to fulfil their duties as serfs. The miners and waggoners began work from one to several weeks earlier. A document of 1681-1682 states that if summer work is finished early, the iron shops should begin work again so that the estate will not suffer too much loss. During this summer break, the horses would have rested and should be properly browsed and taken care of.

Franze Joseph Müller submitted his extensive report in March 1780 with 14 main recommendations for improving the method of working:

To introduce new processes of iron-making and improve the training of the workforce;

To bring specialists in from Tyrol (Schwatz) to assist in the start up and smooth operation of new equipment;

To send local workers to Banat and Styria to learn the new methods;

To invite a foreman from Resita, Tyrol and a Hunedoarian foreman who was working at Eisenärzt (Styria) to come to Hunedoara;

To improve the methods of mining and furnace design (based on a more efficient blast furnace already working at Toplita in Hunedoara);

The appointment of von Prugger from Kifer, Tyrol as administrator of iron shops (he had experience in reforming the industry there);

The appointment of Joseph Leitner, an accountant in Iaria, Austria, as superintendent of the Hunedoara estate so as to eliminate suspicions which had fallen on the previous administration;

The introduction of hired labour rather than serfs to work the mines and furnaces;

Improve standards and quality of workmanship (traders had refused to buy some Hunedoarian iron because of its poor quality);

Remunerate personnel according to their ability and competence;

To install new forge hammers for flattening bar and also undertake the manufacture of some tools to add value to

the iron sold;

Introduce production time tables and plans. Correlate time worked with wages paid; and reorganise the marketing of iron including the export of some for sale outside the region. Most of the recommendations were implemented by the Diet of Vienna, the success of the reorganisation being confirmed by Müller's participation in the installation of the seventh largest forge in Plosca on June 21st 1800.

Units of Measure:

- a) the 'font' = 0.56kg
 b) the Hungarian 'maja' = 80 'fonts', the Viennese 'maja' = 102 'fonts' the German 'maja' = 100 'fonts' the 'maja' for iron ore = 115 'fonts', 'maja' for dead man = 110 'fonts' and for bars = 92 'fonts' (the hammer maja = Hammerzenter) as they admitted 18 fonts of losses during forging.

Beginning with the year 1779 the German 'maja' is generalised.

- c) 1 'sust' of ore = 100 'maja', 1 'sust' of forged bars = 22 'maja' but weighing 92 fonts/'maja'.
 d) The 'burden' used mainly for charcoal.

The currency used in that time was the silver Rhenish 'florin' subdivided into 60 'cruceri' of 4 'pfenings' each: 1Fl = 60cr = 240Pf. The Hungarian florin was subdivided into 100 'dinars'.

Personnel in iron shops:

Using the same documentary description (the inventories drawn up in 1681, 1682, 1695, 1874) the personnel employed in an iron shop was:

- 1 founder foreman
 1 manager, 2 vice managers
 4 hammer foremen
 3 founders
 1 ore waggoners and 2 coal waggoners
 1 worker who cut the ore in the mine
 5 miners and 15 workers who prepared the charcoal.

There were 30 workers in an iron shop with the exception of the five main iron shop where 150 workers were employed.

*Equivalent to 4 'majas' of iron

**There were 6 hirelings employed

Table 1
Allocation
of goods to
officials

Personnel	Iron quantity in 'majas'/year	Other goods
Administrator of the estates (povisor et rationists)	8.0	
Superintendent of the estate	8.0	
The great magistrate (supremus castellanus)	8.0	
Magistrate (castellanus)	2.0	14 'coti' of blue cloth*
Procurator of the district	2.0	
Hungarian preacher of Hunedoara	2.0	
The baker of the city	1.0	
Hireling**	1.5 for buying clothes	

Table 2
Wages
paid to
employees
per week

Function	Weekly quantity paid
Founder foreman	1 'maja' and 1 flat iron bar of 8 fonts
Administrator	½ 'maja'
Vice-administrator	¼ 'maja'
Founders	¼ 'maja' and 2 iron bars of 8 fonts for every three founders
Charcoal waggoners	¼ 'maja' and 1 iron bar of 8 fonts for every two waggoners
Ore waggoners	¼ 'maja' and 1 iron bar of 8 fonts
Miners	4 iron bars of 8 fonts
Workers in charcoal	For 33 'burdens' they received ½ iron 'maja' (the value of 33 burdens of charcoal = 2.5Fl)

DATES FOR YOUR DIARY

3rd February, 2001 WIRG Winter Meeting will be at Nutley Memorial Hall, Nutley – see notice with this newsletter.

Saturday 3rd March – Kent Archaeological Society Lecture ‘Documenting the Past for the future: New Directions for Sites and Monuments’ by Dr John Williams.

Foray Programme

Forays have taken place on 14th October and 11th November but there are still more to come:

Saturday 9th December 2000: Examination of Oaklands Park, Sedlescombe, Romano-British ironworks sites

Sat. 13th January 2001: Exploration of valley above Glazier's Forge, Brightling.

Sat. 10th February 2001: Fieldwalking area north of Forest Row, continuing study of Lavertye area.

Sat 10th March 2001: Investigation of surface features at Spoods Farm and Huggetts Furnace, both at Hadlow Down.

Sat 7th April: Fieldwalking north of Heathfield.

Anyone wishing to join the field group or join in any of these forays should contact Hugh Sawyer, Spindles, Hackwood Road, Basingstoke, RG21 3AF for further details.

EDITOR'S NOTE

Many thanks to all our contributors, who have sent in such varied and interesting items. Please keep them coming. If you have anything to put under Dates for your Diary, please note that we aim to publish the Newsletter in November and March, and allow time for this. Ideally, I should receive contributions by mid-October and mid-February.

I am always pleased to receive letters and will publish those of general interest. We rely on all our members to keep their eyes open for ‘iron-rich’ happenings around them – the Field Group does sterling work but can only cover a relatively small area each year. Wishing you all a rain and flood-free Very Happy Christmas and a good 2001.

Dot Meades

ODDS AND ENDS

Copper and iron armaments:

It was interesting to read in Jeremy's review of Prince Rupert's Guns that surfacing the guns with copper may have been tried. Particularly so in view of a recent item in the Historical Metallurgy Society's Newsletter, which described the finding of copper surfaced iron arrow heads.

DMM

St Dunstan and the Devil The following picture, obtained from the web***, shows the Sussex tradition of St. Dunstan the blacksmith, grabbing the devil's nose with his tongs. In one version of the story, written by Hilaire Belloc, ‘The Four men, a farrago’, this is supposed to have taken place in Mayfield, presumably at Devil's Bridge. Unfortunately, the foray team were not able to confirm this happening on a recent visit! *BKH*



***The American Society for Metals web site at www.asm-intl.org/www-asm/library/rare/dunstan.jpg

Other useful web sites:

There is a list of books held by the Society in the ‘William Hunt Eisenman rare book collection’ at www.asm-intl.org/www-asm/library/rarebook.html, all associated with metals. However, I suspect that one would have to become a member to consult microfilmed copies. *BKH*

<http://www.bibliofind.com> and <http://www.abebooks.com> are useful for locating out of print books – including books on the iron industry. *JSH*

Kent Archaeological Society – details of lecture programme on the web at http://ourworld.compuserve.com/homepages/ai_moffat/Lectures.htm

Also our own WIRG web site at www.wealdeniron.org.uk

LETTERS AND EMAILS

Judith Brent has very kindly passed on to me extracts from a Scot ref ESRO GLY84 Scot levied by Sewers Commissioners on Ouse Levels 1537. The following entries appear under Buxted:

"Tomas Wells, gent, Wilhain Baybrooke, Thomas Waddy, Wilham Olyffe, Thomas Monsherst, Thomas at Well, John Page, John Petit and John Burgys sworne presenteth upon their oath taken before the Kings Commissioners of the Sewers at Uckfield the day & year above written that all such land hereafter following be within the levell of the Sewers and is once in the year surrounded by freshwater – payable to the Commissioners scot of the Sewers

Thomas Wells	15a*
William Braybrooke	2a
Thomas Woodley	2a
William Olyffe	2a
Thomas at Well	3a
Richard Stapely	2a
The heirs of William a More	2a
The heirs of Thomas a More	1a
Richard Delve	½a
William Dyker	1a
John Hoth	½a
Robert Whytfeld	2a
The heirs of John Warnet	1a

William Olyffe hath in the hammer pond at Avenstoke 6a
 Thomas Hudson in the same hammer pond 3a
 Thomas at Well in the hammer pond at Osborne 3a
 John Page hath in the same hammer pond ½a

We think that the last two entries may refer to the hammer at Howbourne. If so, this gives us a much earlier date than the Framfield Manor survey (c1560). So now the hunt must be on for the hammer at Avenstoke. Any ideas?

DMM

*acres

How interesting. I agree with you about Howbourne. My only suggestion about 'Avenstoke' is that the Thomas Hudson listed as an occupier/owner might be connected with the Hodsons or Hodgsons who later had Pounsley (which is in Framfield not in Buxted, I know). A later Hodgson was called Thomas, so this might have been his grandfather. A trawl through SAC for Olyffe or Hudson or Avenstoke yielded nothing.

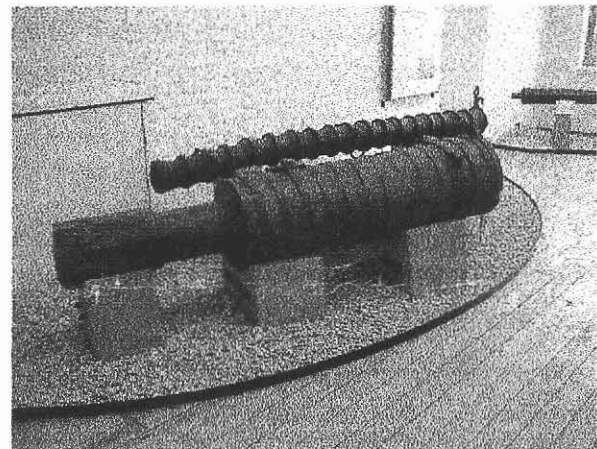
JSH

GUNS GALORE!

Here are some of the guns we saw at Fort Nelson – can you remember their dates and where they were cast? *Thanks for the photos to David Combes and his new digital camera :*



This one looks familiar! Why?



Not from our local blast furnace – how old?



From a blast furnace this time – but whose?