HMS NEWS

Historical Metallurgy Society

58 Winter 2004/5

Smelting Experiments at Butser

Paul Craddock & Simon Timberlake

Birkbeck College, London University's faculty of Continuing Education, runs a 2-year MA course in archaeology for part-time students, introducing advanced archaeological methods and practice. This comprises a number of 2-day core courses and 5-day specialist modules. One of the modules this year was experimental archaeology, exemplified by smelting experiments. These were based at the Butser Ancient Farm Project in Hampshire, and organised by Simon Timberlake and Paul Craddock. There were 8 students, who we divided into three teams to carry out a number of experiments.

Figure 1 Clay-lined smelting hearth with tuyère in place before use. (Photo. PTC)

Smelting experiments to test hypotheses and evaluate early processes have an important role in archaeometallurgy as exemplified by the series of

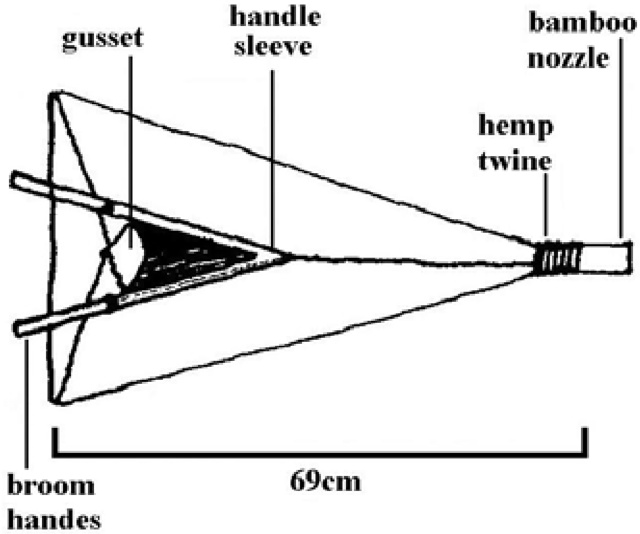

Figure 2. Simple bag bellows (drawn by J. Bourne)

experiments with non-ferrous metals carried out at the 1994 HMS meeting at Flag Fen (Timberlake 1994) and the iron-smelting work carried out by Peter Crew (Crew 1991 and in the previous Newsletter). The particular problem we chose to address was the absence of smelting evidence from Bronze Age Britain. We have the mines and the metalwork but as yet few traces of smelting activity have been recognised. One explanation could be that the smelting processes produced little or no durable waste. Thus we designed a number of smelting 'units' to see if metal could be produced in the most simple and ephemeral kind of hearths, and, if similar operations had taken place in prehistory, what sort of evidence the archaeologists should be looking for. It was hoped that this sort of carefully monitored experimentation would raise a host of new questions

Figure 3. A bank smelter in operation blown with a double bag bellows. (Photo PTC)

The first unit was small clay-lined hearth about 40cm in diameter (Figure 1) and blown either with a simple bag bellows (Figure 2) or by three blow pipes. The second unit was the 'post hole' unit, literally that, a conical hole about 20cm in diameter and 40cm deep, blown by a bag bellows through a tuyère entering about half way down, with the smelted metal collected in a rough clay dish at the bottom. The third unit was a small cylindrical shaft dug into the enclosure bank at Butser, once again about 20cm in diameter and 40cm deep, but this time with the tuyère entering from the bottom (Figures 3 and 4). Note none of the units had any superstructure as such but all were lined with clay.

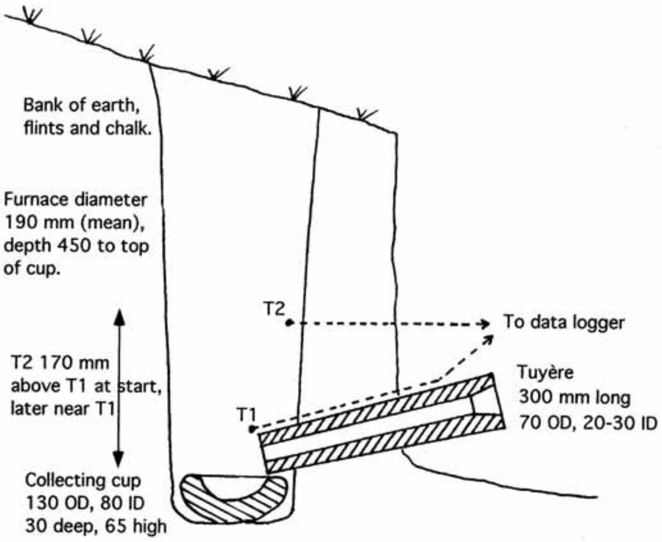

Figure 4. Section through a bank shaft smelter (drawn by R. Thomas)

The students were required to make their refractories and bellows (Figure 5), and thus as well as learning something about metallurgy, they also gained experience working clay and leather. The refractories were a mixture of equal measures of Gault clay, crushed flint grit, sand and animal dung (the latter provided by the sheep of the Butser farm) mixed with some additional straw. This was used to line the smelting units, to make the simple thumb-pots that acted as primitive crucibles (collecting pots), and the tuyères

Figure 5. Sewing Class. Birkbeck MA students making their bag bellows at the Butser Ancient Farm under the supervision of Brenda Craddock (Photo. PTC)

which were made by pushing a pointed stick through a clay cylinder. These were all dried for half a day around a wood fire and then baked on and in the fire for 3–4 hours. The result was certainly not a true ceramic and they would rapidly disintegrate and revert back to mud when left on the ground, but being so soft and porous they could accommodate severe thermal shock and survive sharp thermal gradients in a way that ‘real’ properly fired ceramics could not. After use some of the tuyères had a glazed and vitrified end which may be durable, but this would appear just as fragments of unidentifiable vitrified dross after millennia of burial. This may be one of the reasons why crucibles and tuyères are so rare from prehistoric Britain.

High grade malachite from Zaire and cassiterite from Cornwall (panned from Geevor Mine tailings) were chosen for the smelting. Both of these ores contained approximately 60% metal. The various smelting units were given a short pre-heat mainly to dry the clay before serious smelting started, charging the ore as a powder or in some instances putting it in one of the rough crucibles in the charcoal before the tuyère or blow pipes. Thermo-couples were usually placed in the tuyère zone and at some point on the wall of the unit, and the temperatures rapidly rose to between 1,000° and 1,200°C. Smelting times were typically between about 90 and 240 minutes, by which time the surrounding soil was barely warm and the grass hardly singed (Figure 6).

Plate 4 Looking down at the top of the ‘post hole’ smelter after successfully smelting tin. Note the grass is barely singed, and the white coating of tin oxide on the heat-cracked clay lining. (Photo. PTC)

Put very briefly, all of the experiments produced metal some of which was retrieved after the fires had cooled, and in other experiments the crucible was pulled out of the charcoal and the contents poured straight into a mould, or the metal was remelted and poured. None of the units left any durable debris that could have been distinguished from that produced on a metal working site where metal was being cast. A smelting site could perhaps be expected to produce at least a little evidence in the form of ore fragments, and the surrounding soil could be expected to have a higher content of heavy metals. It was noted for example that the clay lining of some of the units used to smelt tin had become coated with tin oxide. The linings would disintegrate, but the evidence of the tin should survive. However, none of these indicators would be of much help in identifying smelting at the mine sites themselves as the soil there would have both ore fragments and an enhanced heavy metal content anyway. Droplets of smelted metal could be expected and would be good evidence at a mine site.

The week showed how easy it was to smelt well-beneficiated ores in the simplest of installations leaving little or no debris. The work also produced some surprises. One of the tutors (PTC) had believed that the surviving prehistoric tin was of high purity because it had been smelted under relatively poor reducing conditions, and the other metals present in the ore had not been reduced. The tin ore used in these experiments contained approximately 10–20% iron and 5–10% arsenic (we were first alerted to the arsenic by the strong smell of garlic during the smelting) and the ore could not have been smelted under more primitive conditions, yet the product of the first smelt was a fused mass of tin oxide and metallic tin that was highly magnetic. Subsequent X-ray fluorescence analysis showed the tin to contain 2–5% arsenic and 5–10% iron. X-ray diffraction analysis identified the presence of the intermetallic compound, FeSn, the notorious ‘hard head’ that was the bane of the Post Medieval tin smelters. After resmelting, the refined tin no longer contained iron but still had several percent of arsenic. As the tin ores smelted in antiquity are likely to have contained iron oxides, does this mean that they were deliberately smelted at much lower temperatures to stop hard head forming (as suggested by Earl 2003), or that all the surviving ingots are of refined metal?

Maybe next year’s experiments will address these problems.

Paul Craddock, Dept. of Conservation, Documentation and Science, The British Museum, London WC1B 3DG

Simon Timberlake, Ash Tree Cottage, High Street, Fen Ditton, Cambridge CB5 8ST

References

Crew, P. 1991 The experimental production of prehistoric bar iron. *Historical Metallurgy* **25**: 21–36

Earl, B. 2003 Experimental smelting of Göltepe ores and powdered materials, in Analyses of Metalliferous R, Crucible Fragments, Experimental Smelts and Ores from Kestel and Göltepe, Turkey. Yener *et al* in *Mining and Metal Production Through the Ages*, P. Craddock and J. Lang (eds.) London: BMP, 189–96.

Timberlake, S. 1994 Experimental tin smelt at flag Fen *Historical Metallurgy* **28**: 121–8

Charles Dawson and the Earliest Cast Iron: His 100% fake record maintained intact!

Paul Craddock and Janet Lang

Charles Dawson, the perpetrator of the Piltdown forgery, already had a long string of other remarkable discoveries to his credit (or discredit) when he began his greatest escapade. Most of these were accepted during his lifetime, and their subsequent unmasking as forgeries remains one of the principal reasons for believing that Dawson was the main, probably the sole, perpetrator of the Piltdown fraud (Russell 2003; Walsh 1996). One of his discoveries, the small iron figure supposedly from the Roman iron smelting site at Beauport Park, near Hastings in Sussex (Figure 1), has a

Figure 1. Cast iron figure of a horseman, Hastings Museum and Art Gallery Reg. 917.4. (Photo. T. Springett)

rather different history from the others. It was the one find whose authenticity was publicly challenged almost immediately it was announced, but until recently its true age and even the material from which it was made had not been properly reported. The figure, probably representing a horse rider (Figure 1), was claimed by Dawson to have been found in 1877 by a workman engaged in digging the slag heap for road metal, and who sold it to Dawson the 1880s. He in turn took it to the British Museum in 1893 (these long lead in times between discovery and announcement were a favourite ploy of Dawson with all his finds, which ensured that it was always difficult to check his story). Shortly afterwards Charles Hercules Read presented the figure at a meeting of the Society of Antiquaries of London with Dawson in the audience (Read 1893). To what must have been his great mortification in the discussion that followed the authenticity of the figure was challenged.

Figure 2. Cast iron standing figure, Hastings Museum and Art Gallery Reg. 997.45. (Photo. T. Springett)

There were also doubts over its very nature. Dawson claimed initially that it was of cast iron. But just before the lecture a sample of drillings was submitted for analysis to Professor Roberts-Austen of the Royal School of Mines, who pronounced it to be of wrought iron, and so it was described in the lecture, with Read commenting, 'I assume that we may take the opinion of so high an authority as Professor Roberts-Austen as final'. However, Dawson was not one to give up easily, either on the figure's authenticity or material, and submitted it to Dr. Kelner of the Royal Arsenal at Woolwich, who pronounced 'that there was not the slightest doubt as to its being of cast iron', and Dawson duly published it as such in 1903, carefully noting its importance as 'the earliest known example of cast-iron in Europe'. Given these contradictory reports it is rather surprising that there has not been more interest in discovering its true nature, apart from some metallographic work done for Robert Downes in the 1950s which remains unpublished in the archives of the Sussex Archaeology Society (although recently quoted in part by Russell 2004: 67).

A new twist was added in the 1970s when a second figurine, also apparently of cast iron, was found at Beauport Park (Figure 2), and this has now been donated to the Hastings Museum, which also has the Dawson figurine. Recently we examined both of them and this note is ahead of their more detailed publication in the HMS Journal, and, it is hoped, in the Sussex Archaeological Collections. The metallographic taper sections show both statuettes to be of grey cast iron, and they contain several percent of silicon, and more significantly, the Dawson figurine contains between 0.05 and 0.1% of sulphur and approximately 1% of manganese. The sulphur content strongly suggests that the iron was smelted with coal or coke, and thus realistically must post date the mid 18th century. The high manganese figure suggests a deliberate addition, and thus is likely to post date Joseph Heath's 1839 patent on the addition of his 'carburet of manganese' to ameliorate the effects of sulphur in the metal, after which manganese became a regular addition to iron.

The second figurine is also of coke-smelted iron, but the deep penetration of the intergranular corrosion revealed in the taper section suggests that is had been buried for some length of time and thus is likely to be a genuine find, albeit not Roman. This in contrast with Dawson's figurine where the corrosion penetrates the metal much more superficially, suggestive of artificial patination at which he was latterly to become very adept.

Thus Dawson's little figure, far from being Roman is almost certainly Victorian.

Paul Craddock and Janet Lang, Dept. of Conservation, Documentation and Science, The British Museum, London WC1B 3DG

References

Dawson, C. 1903 Sussex ironwork and pottery, *Sussex Archaeological Collections* **46**: 1–62

Read, C.H. 1893 Comments on Charles Dawson's iron statuette, *Proceedings of the Society of Antiquaries* **14**: 359–61

Russell, M. 2003 *Piltdown Man*. Stroud: Tempus

Walsh, J. 1996 *Unravelling Piltdown*. New York: Random House

Edmond Truffaut has just sent HMS a copy of his doctoral thesis "Manganèse et acier. Contribution à l'histoire de la sidérurgie en France 1774–1906". If any member would like to consult it they should contact Justine Bayley (c/o the Newsletter editor). We hope to include a review of it in a future issue of the Journal.

Metallurgy – a touchstone for cross-cultural interaction 28th-30th April, 2005

LAST REMINDER

A three day international archaeometallurgy conference to be held at the British Museum to celebrate Paul Craddock's contributions to the study of historical metallurgy.
See the website for registration form and information (www.thebritishmuseum.ac.uk/whatson/events/conferences.html)
£130 (£145 after 25th March 2005)
Students and BM Friends £75

HMS Conference 2005: Wensleydale

In 2005 the HMS conference will be held in Wensleydale, North Yorkshire, 9th to the 11th September, based in Middleham. All lectures and meals will be at the Key Centre in the middle of the township which provides a wide range of accommodation. However, the area can be busy in September and early booking is advisable.

The conference theme will focus on lead/silver smelting and refining, with the opportunity to review work done since the *Boles and Smeltmills* conference in Swaledale in 1992, but we are also looking for papers on iron metallurgy, and associated subjects, related to the Yorkshire Dales area.

For details of accommodation on the Internet go to http://www.middlehamonline.com where you will also find information on the conference venue.

Offers of papers, help in organising field trips or any enquiries regarding the conference should be sent to:

Dr Peter Claughton, Blaenpant Morfil, Clynderwen, Pembrokeshire, Wales SA66 7RE
Email: P.F.Claughton@exeter.ac.uk

35th International Archaeometry Symposium in China, 11–15th May 2005

The 35th International Archaeometry Symposium will be held in 11–15th May 2005 in Beijing, China. The Symposium will include the usual session on metals; the special session is entitled "Achievements and Perspectives on Chinese Archaeometry". The deadline for the submission of abstracts and registration is the 31st December 2004.

Further details are available from:
Dr. Yaowu Hu
Department of Scientific History & Archaeometry,
University of Science and Technology of China,
No. 96 Jinzhai Rd., Hefei, Anhui, P.R. China, 230026
Tel: +86 551 3603914
Fax: +86 551 3603576
E-mail: ywhu@ustc.edu.cn
Web: www.archaeometry.ustc.edu.cn

1st International Conference of Palaeosiderurgy and Industrial Heritage Recovery
Sán Sebastian, Spain, 11–13th May 2005

This conference will examine iron technologies from their origin to the development of modern ferrous industries, as well as the ways in which the remains of such industries can be preserved for tourism and other purposes. The conference fee is €150 for registrations before 31st January 2005 (€200 for registration between 31st January and 11th May 2005).

Further details are available from:
INASMET – Marketing Department, Ana Olaizola, Mikeletegi Pasealekua 2, Parque Tecnológico, E-20009 Donostia San Sebastián, Gipuzkoa – Spain
Tel: +34 943 00 36 78
Fax: +34 943 00 38 00
E-mail: paleosiderurgia@inasmet.es
Web: www.inasmet.es/paleosiderurgia

2nd International Conference on Ancient Greek Technology
Athens, 17th–21st October 2005

The 2nd International Conference on Ancient Greek Technology will be held in Athens from the 17th to the 21st October 2005. This conference will cover ancient technology from prehistoric times to the Byzantine period. The conference includes sessions on a wide range of organic and inorganic materials (including metals and mining).

Further details are available from:
Secretariat of the 2nd International Conference on Ancient Greek Technology,
Technical Chamber of Greece (408)
4, Kar. Servias, 10562, Athens, Greece
Tel: +30 210 32 91 291
Fax: +30 210 32 91 298
Email: emaet@central.tee.gr

HMS conference 10–12 September 2004

Robert Douglas Smith

Conference this year was held in Portsmouth under the title ‘A Portsmouth Promenade’ and organised by Justine Bayley and her colleagues at the English Heritage Centre for Archaeology at Fort Cumberland. For those arriving early, the weekend started off with a tour of the Royal Armouries artillery museum at Fort Nelson, a ‘Palmerston Folly’ fort high up on Portsdown Ridge close to Fareham. The extensive collection of cannon from the 16th century to the present day includes examples of almost every known innovation.

Following a refreshing pick-me-up in the bar and dinner we were then treated to an introduction to the Portsmouth area by Paddy O’Hara. He explained how the ancient River Solent deposited gravel beds which resulted in the present day coastline and formed the natural, sheltered inlet which now forms Portsmouth harbour. From small beginnings and the siting of the first dry dock at Portsmouth, construction of which started in 1495, the dockyard developed to become one of the industrial wonders of the Victorian World. David Dungworth then widened the scope and described the archaeometallurgy of the Hampshire area showing how the area developed over the centuries.

On the Saturday delegates travelled down to Fort Cumberland at the south-eastern tip of Portsmouth. The Fort and the work done there by English heritage formed the basis of the morning tours. Fort Cumberland is now the English Heritage centre for the conservation and investigation of the technology of finds – mainly from archaeological sites. Work is carried out on the whole gamut of metallurgical debris from smithing slag, tap slag, crucibles and furnace fragments using such techniques as XRF and scanning electron microscopy. Conservation of finds is also carried out, mainly for publication and/or investigation and we were shown the techniques they use including cleaning, X radiography and freeze drying.

Tours of the Fort were conducted by Paddy O’Hara. Originally a fairly simple star-shaped fort built in the mid 18th century; it was completely re-built starting in 1783 as a bastion-trace fort – the last of the type to be built. It was not finished till 1812 – so tales of construction over-runs and defences being ready just when the danger was past do not change.

There was also a chance to see Brunel’s first iron bridge from Paddington Basin re-discovered in 2003 and rescued after a spectacular collaboration between English Heritage, British Waterways and Westminster City Council. It is now being stored at Fort Cumberland before it’s hoped for re-instatement.

After lunch there was a chance to visit Portsmouth Dockyard and see the wide range of attractions on offer. Victory is such an icon that no visit to the Dockyard can be complete without boarding her though, as was frequently pointed out, only about 20% of what is there now would have known Nelson! Delegates were also free to roam the rest of the Dockyard. Late in the afternoon, Dr Fontana conducted a group over Warrior before we had a chance to look at the hull of the Mary Rose and the museum of artefacts brought up from the wreck. All this walking was then admirably countered by a champagne reception in the Mary Rose museum before delegates tucked into a hearty Tudor meal.

Members’ contributions followed. Louise Bacon spoke on ‘17th century copper alloys used for making brass wind musical instruments’, the subject of her PhD thesis. Following analysis, partly funded with the help of grants from HMS, Louise has established that alloys for making English trumpets consisted of copper, zinc, tin ternary alloys while instruments from Germany were made from copper and zinc. Sarah Paynter then spoke on ‘Analytical investigations of Iron Age and Roman bloomery iron smelting’. Her preliminary work is showing that it may be possible to identify ore sources from slag identification though her work is at an early stage. Martha Goodway’s contribution, ‘Correction to “Westphalian fining”’ pointed out that a tool identified by Schubert was not as he though for making iron wire but used in the puddling process. Finally Jeremy Greenwood, ‘Funtley ironmills 1750–1810’, attempted to unravel the complex series of iron mills which go under the general term of Funtley.

After a leisurely start on Sunday morning delegates returned to the lecture theatre. Jeremy Hodgkinson delivered an authoritative account of iron working in the western Weald and unravelled the complex chronology of the iron works in the Fernhurst area. Dr Fontana then outlined the history of Warrior and its various innovative features. Peter King summarised the web of suppliers and contractors to the Navy in a paper entitled ‘The use of iron in 18th century naval hips and its suppliers’. And finally Justine related the adventures of a group of HMS members who had been over to France the week previously to look at metallurgical sites in Normandy.

After a well organised and thoroughly enjoyable conference delegates were regaled with a catalogue of sites to visit on the Sunday afternoon as they made their home – a splendid idea made especially interesting as many sites were open for Heritage Open Days which fell that particular weekend. While we must thank Justine for organising such an agreeable and worthwhile conference we must also thank her colleagues, especially Sarah Paynter, but also David Dungworth, Paddy O’Hara, Vanessa Fell, and Roger Wilkes.

Le Fer

M Mangin (ed)
€26.00 Éditions Errance (Paris)
ISBN 2 87772 260 0

Our knowledge about early iron manufacture in France (and in particular the period before the Industrial Revolution) has greatly increased in the last few decades. A number of research programmes have been established and a substantial number of archaeo-metallurgy posts exist. The fruits of this investment have been seen in recent years with the publication of major monographs on ironworking sites and surveys (e.g. *La Sidérurgie Chez les Sénons* and *Forgerons et Paysans des Campagnes d'Alésia*) while archaeo-metallurgical articles have featured in major regional (e.g. *Revue Archéologique de l'Est*) and national journals (e.g. *Gallia*). A number of these researchers have now pooled their knowledge and expertise to produce a single (affordable) volume that summarises the current knowledge of early French ironworking.

The first four chapters cover iron ores, smelting, smithing and scientific methods, while the last chapter uses the available data to explore social and economic aspects of ironworking. The strengths of the book reflect recent archaeological fieldwork, primarily the Iron Age and the Roman period, and there is very little space devoted to ironworking since the adoption of the blast furnace.

Like all volumes written by committees, the coverage can be variable at times and there is a tendency to start each new chapter with a repetition of the issues dealt with at the end of the preceding chapter. However, the book is liberally leavened with inserted articles/case studies. These are particularly useful as they provide easily digestible summaries of work reported in substantial monographs or of work which has yet to be published (e.g. the early Iron Age slag-pit smelting sites found during work on the route of the A28 to the north of Le Mans, or Jean-Claude LeBlanc's recent research on hammerscale). The book has an extensive glossary but there is unfortunately no index.

Reviewed by David Dungworth

Ebbw Vale — The Works 1790–2002

B Caswell, J Gaydon and M Warrender Price (eds)
£20.00 Ebbw Vale Works Museum (Ebbw Vale)

Ebbw Vale works in South Wales closed for good in 2002 after 212 years of operation in one form or another. A fully comprehensive 450 page book has now been completed by former employees of the works and curators of the Ebbw Vale Works Historical Archive.

Ebbw Vale Works was started as a blast furnace in 1790 to supply a local forge. It prospered under various ownerships — including Abraham Darby & Co of Coalbrookdale — expanding (as is the latest trend) to ensure raw material supplies by buying ore and coal mines.

In 1854 it started to make steel using the Martiens process which was quickly bought out by Bessemer as it was similar to, and challenged his, own converter method. Bessemer and Siemens open hearth furnaces were installed. It prospered for a while after the First World War and a new sheet mill was added in 1912. However, decline followed and the works closed in 1929 only to reopen in 1935 under Richard Thomas & Co who built a new integrated plant. The first continuous hot strip mill in UK (and the third in Europe) was commissioned in 1936, and 1947 saw the first electrolytic tinning line outside USA installed.

In 1958 the Bessemers were replaced with the new LD oxygen converters which, along with open hearth furnaces, operated until ironmaking ceased in 1975. One open hearth continued operations into 1978 to consume the scrap from dismantling the blast furnaces, steel shop and hot strip mill which closed in 1977.

Despite the end of steelmaking, a new tinplate line was commissioned in 1978 and Ebbw Vale continued as a tin and galvanising coating works until rationalisation under the ownership of Corus closed the works in 2002.

Reviewed by Tim Smith

Workington Iron and Steel

R L M Byers
£12.99 Tempus Publishing (Stroud)
ISBN 0 7524 3196 X

The history of iron and steel production in Workington is described concisely in eight short chapters, starting with the first records of iron making in 1763 and continuing up to the establishment of the British Steel Corporation in 1967. The first seven chapters consider the origins of each of the companies that were eventually consolidated into the Workington Iron & Steel Co. in 1909. The last chapter briefly covers the history of WISCO, initially operating as an independent company and, after 1919, as a part of The United Steel Co. Each chapter is well illustrated with contemporary drawings and engravings, supported by clearly drawn maps for each of the sites as they existed when they were operational, with more modern aerial photographs covering much of the area described for identification of remaining features. The first of these aerial views provides one of the very few minor lapses in the production of the book, since the photograph and accompanying map can only be reconciled by assuming that the photograph has been reversed.

While a history of the steel industry in Workington might be thought of as being mainly of local interest there is a second theme in the book which should give it a wider appeal. Although it is not spelt out, the magnificent colour picture on the front cover of a Bessemer converter during the blow, provides the clue, for Workington was intimately associated with this process throughout its history. Bessemer first became involved with Workington in 1858, in order to take advantage of the low phosphorus content of the local haematite ores. The association continued until 1974, when the last Bessemer charge was blown at Workington, marking the final use of the process in the UK. The later chapters are well illustrated with photographs of all aspects of the Bessemer process and provide a valuable record of its operation.

This is a well-produced account of both the steel industry in Workington and a well illustrated record of the Bessemer process at a very reasonable price.

Reviewed by Brian Bastow

Obituary: ROY DAY

Roy Day, a member of the Society since its early days and latterly an Honorary Member, died on 11th October 2004 at the age of 80. He was production editor from 1973 to 1993, first for the *Bulletin of the Historical Metallurgy Group* and from 1974 for *Historical Metallurgy*. He also edited the HMS *Newsletter* from the mid-1970s to 1984. The 1970s brought changing technology to publishing: it became possible to change the appearance of a relatively modest journal to a standard hitherto the preserve of the expensively-equipped printing-works. Roy welcomed the opportunity to use the then-new offset equipment to generate a quality of layout which transformed the journal to a standard which he maintained for 40 issues. By 1990 the world of printing had moved on, and setting direct from editorially-generated computer disc had become reality. Roy stopped short of this, but the Society owes him a debt of gratitude for his work, which provided a journal whose standard of production was much admired in its time.

Our sympathies go to Joan, whose interests in industrial archaeology received Roy's staunch support.

David Crossley and Justine Bayley.

The first HMS conference I attended was at Penzance in 1969. I remember walking along the beach with Joan and Roy Day at the end of the week-end, and on the way home we met at the Iron Age village of Chysauster and spent a pleasant time looking at the remains of the round houses. It was the beginning of a long friendship. In the years that followed we went several times to an Industrial Archaeology Summer School in Aberystwyth, where, although we attended a certain number of lectures, we spent rather more time, together with David Bick, exploring the remains of the local mines.

Joan and Roy were always interested in Industrial Archaeology and when the Association for Industrial archaeology was formed, Roy was a founder member. He designed their early newsletters and put the first ones together. He was for a long time a Council Member. Roy, together with Joan, was also very active in the Bristol Industrial Archaeology Society where they did much work, especially in restoring the Brass Mills at Saltford and in raising money for the project. Roy's interest in designing and printing was quite passionate, and anything he designed for the various societies he helped had to be meticulous and of the highest standard.

Amina Chatwin

While submissions to the Newsletter are welcome at any time, if you want to have something in a specific issue of the newsletter then it needs to be with me by the following deadlines.
1st March, 1st July, 1st November
Contributions can be sent in any format (hand-written, typed, email, floppy disk, CD-ROM, etc).

The Hon. Newsletter Editor David Dungworth, English Heritage, Centre for Archaeology, Fort Cumberland, Portsmouth, PO4 9LD. Tel 023 9285 6783 Email: **david.dungworth@english-heritage.org.uk**

Any business for the attention of the Membership Secretary and the Treasurer will not be dealt with during the period 14th October to 12th December, whilst they are away on holiday. Any urgent business should be directed to the Company Secretary.

The Historical Metallurgy Society Ltd. Registered address, 1 Carlton House Gardens, London, SW1 5DB. Registered in Cardiff number 1442508. Registered Charity Number 279314