

# Wealden Iron

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Set by Denis Ashurst

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FIELD NOTES

COMPILED BY J.S.HODGKINSON

A Probable Medieval Ironworking Site in Crawley, Sussex.

Examination, in advance of building work, of the former gardens of nos 5 & 7, Spencers Road, Crawley (TQ/265365) has revealed seven small but distinct areas of bloomery slag. Both furnace cinder and tap slag were present on the surface, the topsoil having been stripped from the site, although the slag was generally confined to the small areas. Ten sherds of medieval pottery, including six from a green-glazed pot, similar to that found beside the Driftway [1], were found on the stripped surface. In the same area was a small heap of clay tiles of probable medieval or early post-medieval date.

We are grateful to Mr D.Edwards for drawing attention to this site.

Cocking Foundry - October 1988 [2]

In strict terms, the criteria for the Wealden iron industry do not fit this site. As its earliest known date of 1838 comes well after the closure of Ashburnham Furnace, the last works to cast from Wealden ore, it is unlikely that it drew its supply of iron from a Wealden source. However its situation in a wooded valley under the South Downs is unusual for a foundry, and doubt as to its sources of ore and fuel persuaded the Field Group to examine the site.

The foundry (SU/883185) lies on Costers Brook, a northward-flowing tributary of the Rother, about 1.2 km north of Cocking and 2.6 km south of the centre of Midhurst.

The pond, which has been dry since the early 1960s, has a brick-faced clay bay 78m long and 4m high where it is breached

by the stream at its eastern end. Evidence of working is confined to the western end of the bay where there are two water outlets through the bay, and traces of a third where the ground has been disturbed by the laying of a sewer. The main outlet was along an 8m-long stone sluice, 1.6m wide and 1.3m deep. At the lake end there is evidence of a flow-control mechanism. On the downstream side there is the collapsed remains of a metal sluice-gate beneath which is what is presumed to be a wheel-pit, approximately 3.5m deep and filled with stone rubble from the collapsed side walls. About 6m east of the wheel-pit is a 60cm-square section, ashlar-lined culvert stretching 13.2m under the base of the bay. It has been suggested that this may date from after the end of the foundry when the Foundry Pond was used as a pen pond for Bex Mill (SU/885188). The effect of opening the culvert would be to empty the pond rapidly and fill the mill pond downstream. Above the inlet for this culvert is a cast iron screw, supported above water level and presumably operated from the bay, to open and close the inlet.

The main outlet from the bay, through the wheel-pit, is shown on the 1840 Tithe Map of Cocking. On the 1875 25-inch OS map an overflow is shown which coincides with the third channel on the extreme west of the site. There is a considerable quantity of stone debris in the vicinity which may be the remains of a spillway or sluice. There are two channels which took water away from the site. The culvert emptied out into the same channel as water from the stone sluice. The present stream flowing through the breach on the east side of the site captures the lower part of the main outflow.

Between the stone sluice and the conjectured site of the spillway on the west side of the site is what appears to be the working area. On the 1840 Tithe Map, a building marked 'Mill' is

shown in this position, with a representation of a water-wheel next to it. There is a depression in the area between the sluice and the spillway and at either end are stone plinths, one forming the side of the sluice/wheel-pit. The foundations of a wall divide the depression. To the north of this is a raised area with a gently-undulating surface on which there may have existed workshops etc.

A lease of 1838 to Robert Chorley of Midhurst, millwright, refers to the above site [3] although the apparent existence of the pond shown on a plan of the same year may suggest use of the site earlier than 1838.[4] The waterwheel at Bex Mill (SU/885188), just downstream from the foundry, was cast by Moaze, Engineer & Millwright, of Midhurst, at Cocking Foundry although no other references to Moaze have been found.[5] In the Petworth House archives are the plans of a flax mill intended to be built in Co. Clare by Robert Chorley in 1846.[6]

#### Bardown Romano-British ironworking site - November 1988

Bardown has already been described, following excavations in the 1960's,[7] so this report is confined to observations which relate to features which merit comparison with the sites already examined at Footlands [8] and Chitcombe [9].

The similarity with the site at Chitcombe is striking. In both cases, the slag heap is formed as a tip over the steep side of a stream and excavations at Bardown showed both industrial and residential areas on the gently sloping ground to the south. This area corresponds with the fields called Cindrills at Chitcombe. The most immediate ore source at Bardown was a pair of quarries dug into the hillside on the opposite side of the stream. This arrangement more closely corresponds with the pits seen in Cinderbank Shaw at Footlands, although the causeway at Bardown,

which linked the mining and manufacturing operations, is not paralleled at either of the other sites. The slag heap at Bardown is not as extensive as those at Footlands or Chitcombe, yet is still prodigious, and samples of a wide variety of slag types and forms, as well as pottery, ore and tuyere fragments, could be picked from the surface. It is hoped that comparisons with other substantial Romano-British sites, on future forays, will enable conclusions to be drawn about the general nature of site layout at these ancient industrial locations.

#### An Area Devoid of Bloomery Furnace Sites

Visits in March and December 1988.

B.K.Herbert

A study of the book, The Iron Industry of the Weald by Cleere and Crossley, shows that there is an area devoid of bloomery furnace sites; although there are several blast furnaces. This may be seen on pages 58-9, a map of Roman bloomery sites, and also from the complete list of sites, pages 288-294, where there is a gap east and west of Nat. Grid line TQ/700\*\*\*, where each \* may be any digit within the Wealden area. The nearest bloomery sites are at TQ/682279 and TQ/674183. This latter reference corrects a small error in the book mentioned above. At the bottom of page 289, the bloomery site in the parish of Dallington should read approximately TQ/674183 not TQ/664173.

There are many potential sources of iron ore from the base of the Wadhurst Clay in the above area, from Ticehurst in the north to the Ashburnham area in the south. After transferring the Wadhurst Clay/Ashdown Sand geological boundary to the 1:25000 OS map,[10] it was decided to search an area to the north of Panningridge blast furnace (TQ/68751750). Northwards are Bunce's Gill, Grigg's Gill, Gifford's Gill and other minor streams, all of which pass across, or close to, sources of ore. On the basis of

this paper study a foray was organised for 26th March 1988 to search the area, although it would take several visits to cover the whole area.

The foray started at Panningridge Furnace, where the flat flood-plain has been caused by the silting-up of the dry pond area. At TQ/68711774, a very small bloomery site was found 4.5 metres up on the steep west bank of the stream. Most of the slag was under the roots of a storm-blown tree, but no dating evidence was found.

In Bunce's Gill, a seam of iron ore, 300mm thick, was found across the stream, forming a waterfall. Also at this point, a small bloomery furnace-bottom was found. It was about 23mm diameter and very heavy. Unfortunately no other slag could be discovered. Several charcoal platforms were discovered as well as many small minepits and two large ones, as expected on the geological boundary.

In one piece of woodland, centred on TQ/68641821, there were many large and small pits. In fact, the whole wood seems to have been 'turned over'. A very small stream flows on the west side of this wood, probably in Wadhurst Clay. In places, the stream is silted up, the water flowing underground, no doubt due to the disturbed ground to the side.

A further foray was organised for 17th December 1988, to walk up Gifford's Gill from TQ/68751790. It was expected that there would be fewer signs of iron working along this stream as the known sources of ore were some way to the north. However, some six bloomery furnace bottoms were found in the stream between TQ/682183 and TQ/678183 as well as small amounts of slag in the stream; but not tap slag. Unfortunately, no sign of slag could be found on the banks between these two points, and so it has not

been felt possible to add any further bloomery sites to the list. Two further charcoal platforms were discovered due to the metal detector indicating burnt soil rather than signs of slag.

At TQ/687179, on the floodplain area between Gifford's Gill and Bunce's Gill, are a series of three or four raised building-platforms, all interlinked with raised areas, including a 'causeway' leading to Gifford's Gill. It is thought that this area would be just above the blast-furnace pond but not a convenient place for a boring mill. In reality, it would be a very wet place to live; much better the hillside all round, unless of course water power was a requirement.

It is hoped to continue exploring this area in the forthcoming season, where further forays will, no doubt, re-discover the mis-referenced bloomery mentioned above, and an exact map reference will be given. In Straker's book, Wealden Iron, page 361, this bloomery is called 'Herrings', and pottery found during excavations in 1926-7 indicated that it was pre-Roman and late-Medieval, but not Roman.[11] The writer stated that there was an unusual absence of charcoal dust at this site when tons of slag were removed for use on the Ashburnham Estate.

#### A Bloomery at Smarden, Kent

R.G.Houghton

A concentration of bloomery cinder and tap slag has been noted in a field at TQ/882430, north east of New House Farm, Smarden. Slag was scattered over an area some 50m wide.

The site is on Weald Clay. Although the exact ore source is unknown, a number of small ponds in the vicinity may be evidence of surface mining. River gravel deposits also occur locally. One piece of slag had a fragment of flint embedded in it.

We are grateful to Anne Scott, of the Hastings Area Archaeological Research Group for drawing attention to this site.



References

1. WIRG Bulletin Sec. Ser. 8 (1988), 8-9.
2. We are particularly grateful to Tim Boxley, of Heyshott, and  
WIRG member Mr.T.E.Evans, for information about this site.
3. West Sussex Record Office (WSRO) Cowdray Archives 1791.
4. WSRO Cowdray Archives 1729.
5. E.M.Gardner, 'Bex Mill in Heyshott' Sussex Notes & Queries XIV  
no.12. (1956), 181-7.
6. WSRO Petworth House Archives 3494.
7. H.F.Cleere, The Romano-British industrial site at Bardown,  
Wadhurst, (Chichester 1970).
8. J.S.Hodgkinson, 'Footlands Ironworking site, Sedlescombe, WIRG  
Bulletin Sec. Ser. 7 (1987), 25-32.
9. J.S.Hodgkinson (ed), 'Chitcombe Romano-British Ironworks,  
Brede, Sussex', WIRG Bulletin, Sec. Ser. 8 (1988), 2-5.
10. B.K.Herbert, The Fieldwalker's Guide and an Introduction to  
the Iron Industries of the Weald (1985), 44.
11. Sussex Notes & Queries 3 (1930-1), 162-3.

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ADDITION TO THE CATALOGUE OF EARLY IRON GRAVESLABS  
IN THE WEALD.[1]

R.M.WILLATTS

RIVENHALL, ESSEX TL/8316

1706 THOMAS WESTERN, 210 x 90cm

HERE LYETH INTERRED THE / BODY OF THOMAS WESTERN /  
ESQUIRE, YOUNGEST SON / OF WILLIAM WESTERN OF / LONDON  
GROCCER, WHO / MARRIED MARTHA THE / YOUNGEST DAUGHTER OF  
/ SAMUEL GOTT OF LONDON / IRONMONGER, BY WHOM / HE HAS  
ELEVEN CHILDREN / FIVE SONS AND SIX / DAUGHTERS.  
ELIZABETH / SAMUEL. MARTHA. / THOMAS. ELIZABETH /  
MAXIMILIAN. MARY / WILLIAM. SARAH. / ROBERT. FRANCES /  
AGED 83 YEARS OBIT / THE XI JAN 1706

Roman capitals of 7cm and 4.5cm; moulded edge; full achievement;  
inscription centred.

This Thomas Western was the father of Martha, wife of  
Peter Gott, whose slab is at Streat. Martha and Peter's children  
recorded on the slab at Streat all bear the names of Thomas  
Western's children.

Note

[1] WIRG Bulletin Sec. Ser. 8 (1988) 12-47. Details of the above  
were recorded for the author by Martin Suchfield.

BLACKWATER GREEN, CRAWLEY

CHRIS PLACE

This report represents a brief interim account of the excavations that were undertaken by the Field Archaeology Unit of University College, London, at Blackwater Green, Crawley.

The excavation served to confirm the existence of a post-medieval iron-working forge in a variable state of preservation, consisting of two tail races without wheels, and a probable anvil base.

In Fig.1 the south race can be seen to consist of regular, tight-fitting planks nailed to horizontal sill beams. Upright posts are jointed to the sills with mortice and tenons to support the plank walls. The walls survived to one plank in height (25-30cm); though evidence suggests that they may originally have been three planks high.

The north race has been drawn to show the frame which held the posts and floor. The sill beams are joined together by cross braces which are mortice-and-tenon jointed, and occasionally nailed. The sill beams have slight recesses along their edges to allow the floor planks to lie flush with the top of the beams.

The anvil base consisted of three timbers, which were about 50cm by 30cm in cross-section, the largest being about 3m long. This was set into a cross-shaped foundation cut and then covered in thick clay (built up for floor levels?). The central portion was left free of clay, presumably to allow the anvil to sit directly on the base; this portion showed signs of wear and repair.

At some time after the forge went out of use and the buildings were no longer standing, the site became a ford. At this stage several hollow ways covered the site and severe rutting

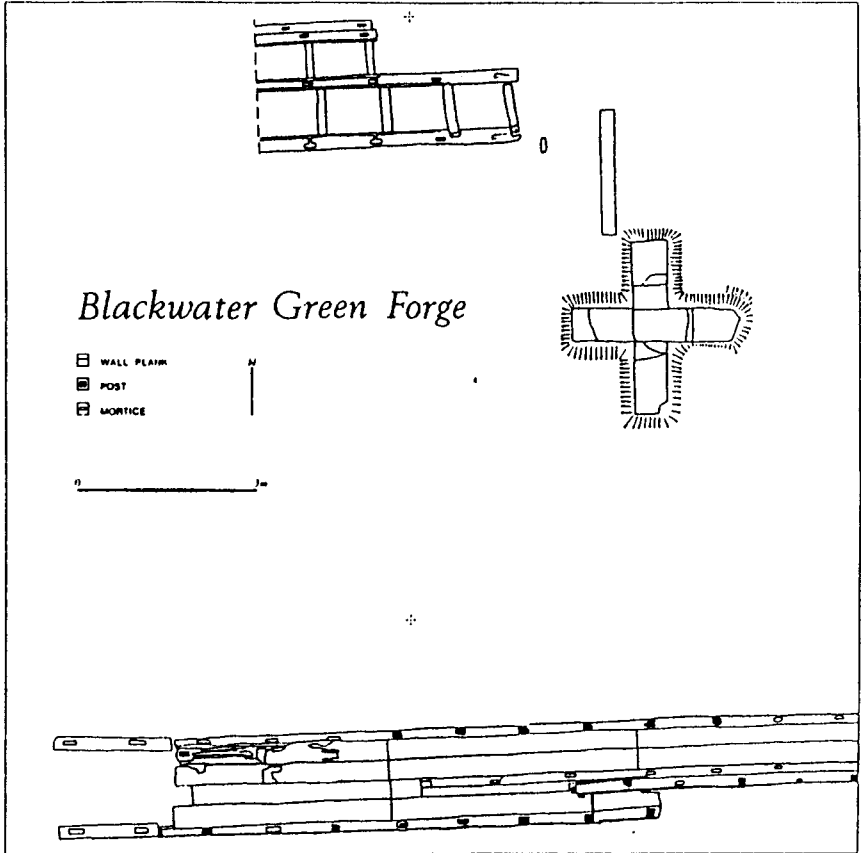


Fig.1

destroyed any working floors, hearth areas and evidence for a covering building.

Post-excavation work has yet to commence, so no analysis of artefacts, or determination of wood species has been undertaken. A final picture including dating will thus only be available when the site report is compiled.

## ST. LEONARDS LOWER FORGE AND FURNACE SITE SURVEY 1988

Nuthurst/Lower Beeding TQ/213291; Cleere & Crossley (1985), p.354

R.G.HOUGHTON and J.S.HODGKINSON

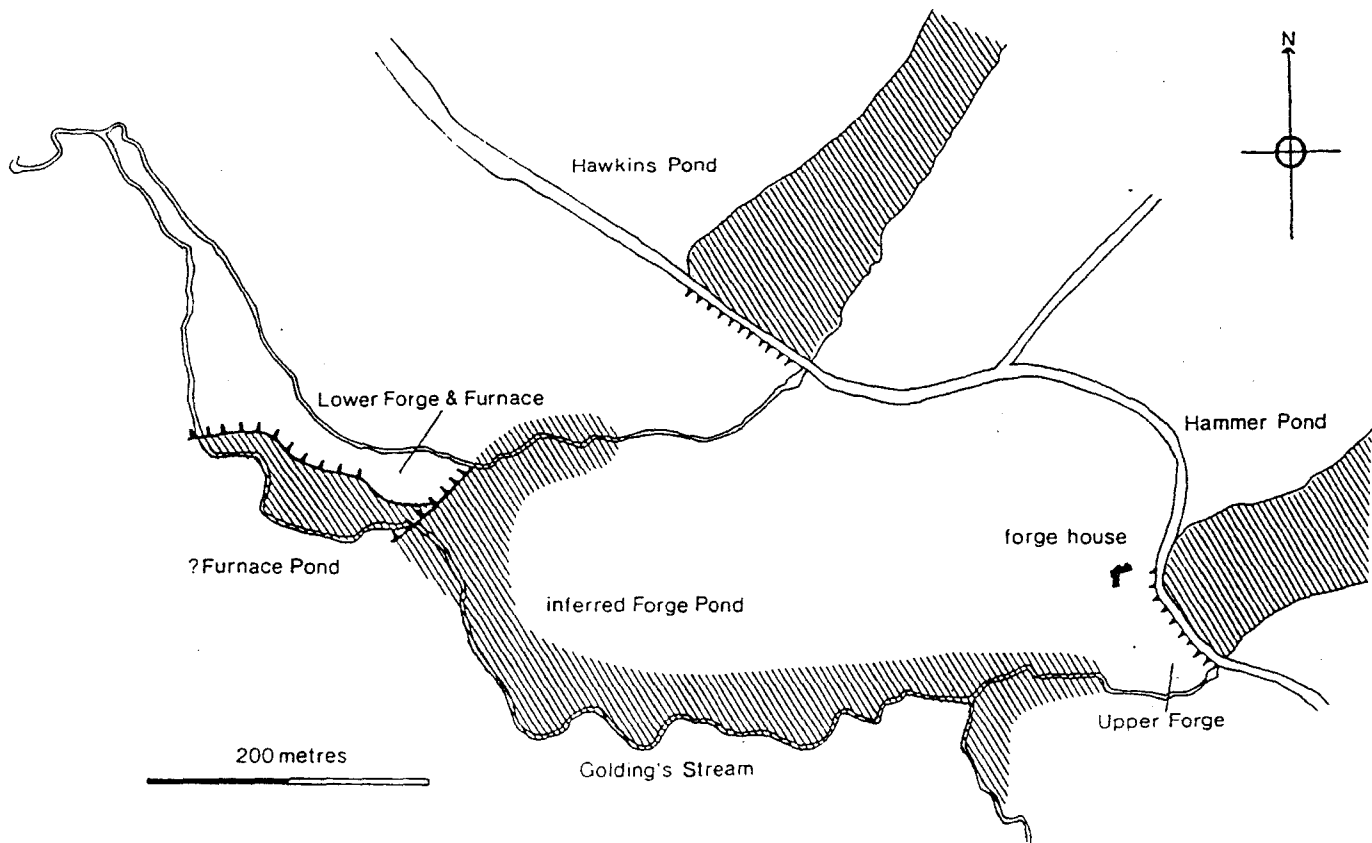
The WIRG Field Group made a number of visits to this site. Based on their discussions during and after their visits, this account supplements and re-examines the information given in the Gazetteer of The Iron Industry of the Weald. The site is a complex one and any interpretation must be tentative for the dual use cannot be explained as readily as at Langles [1]. Letters in the text refer to the site plan (Fig.2).

## WATER SUPPLY. (Fig.1)

The ironworks were fed by streams from both the Hammer Pond, just below which stood the Upper Forge, and the Hawkins Pond. The pond which supplied the Lower Forge is now dry but it seems probable that it was formed from both streams. As the stream from Hawkins Pond approaches the Lower site it runs beside a slope which appears to continue along the line of the bay, towards the Goldings Stream flowing from the Upper site. The stream, however, turns sharply through the bay and continues in an obviously man-made channel alongside the site. This suggests that the stream from Hawkins Pond originally joined the Goldings Stream close to where it is crossed by the main bay of the Lower site.

## THE POND BAYS

The main bay runs roughly north-east to south-west between the two streams. As the field notes in the Gazetteer describe, the irregular appearance of the bay is due to quarrying. On the downstream side of the bay, the ground level is raised, much of it with slag, but there is a general slope down towards



St. Leonards Forest Ironworks, Sx.

the Goldings Stream, lending credence to the belief that it was the only watercourse in the valley before the ironworks were established.

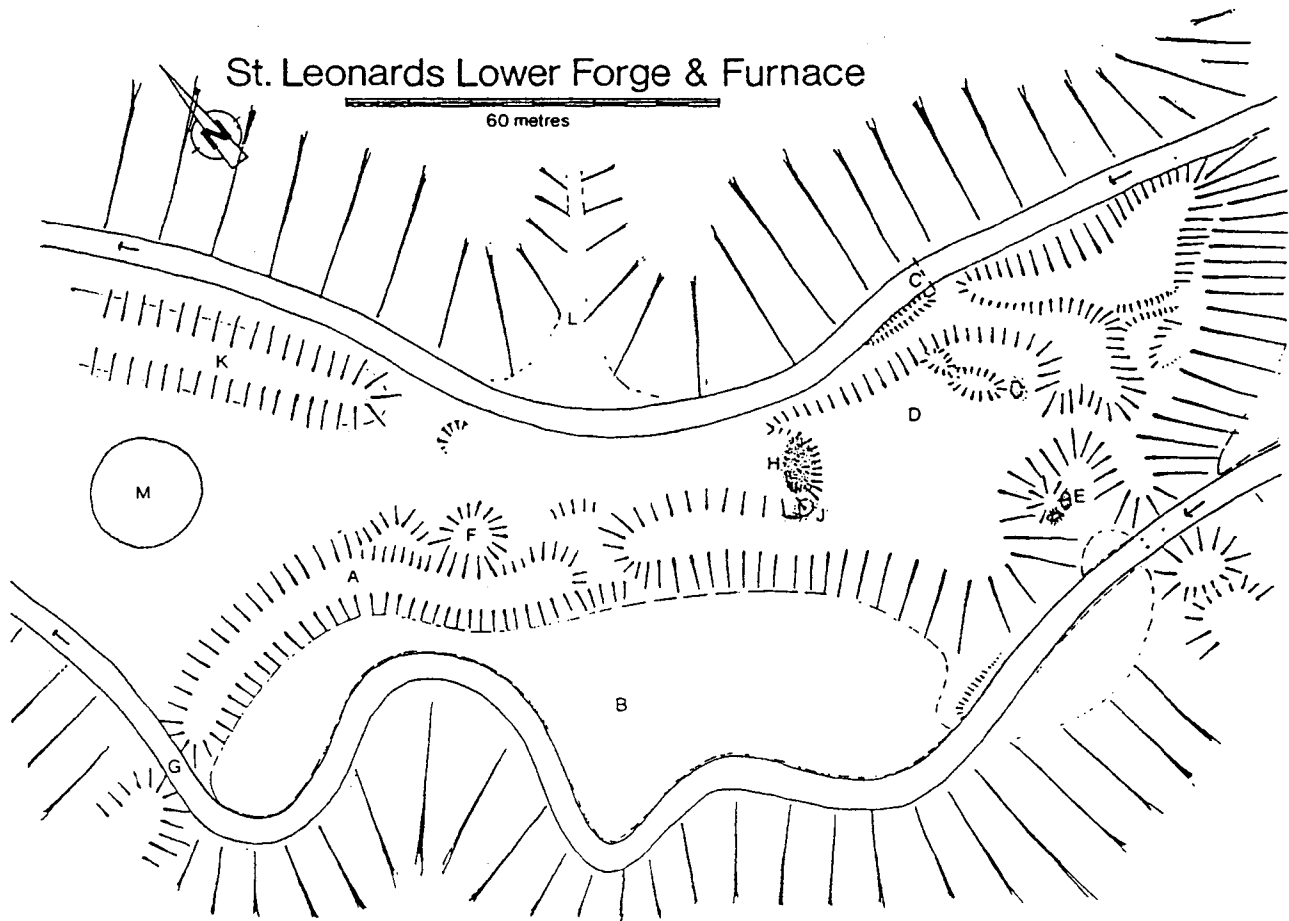
The unusual feature is the sinuous bank(A) which runs through the site. On its north and north-east sides, there is much slag. On its south-west side(B), across to the Goldings Stream, over which it continues, there appears to be no debris. It is suggested that this bank formed the bay of a further pond which may have provided power for the furnace.

#### THE FORGE

There is abundant forge slag in the area close to the main bay, and the deposit extends down the stream on the north-east side of the site from a point(C) where a narrow bank separates the stream from a dry channel. It is possible that this channel formed one of the wheel-pits for a forge building situated on the raised area(D). The question arises as to where the other wheel-pit might be. The three forge sites excavated to date (Chingley, Ardingly and Blackwater Green) all displayed features in the form of a rectangular building, approximately 10 metres wide, with single or double wheel-pits along each side. The surface features of the Lower Forge site make it difficult to suggest the location of such a building except possibly in the area adjacent to the supposed wheel-pit mentioned above. However, a wheel-pit running parallel to it would have to pass into the conjectural furnace pond, and there is no surface evidence to support this. What seems more likely is an outlet close to the low-lying area at the west end of the bay(E) where the stone blocks and traces of furnace lining, hitherto interpreted as the blast furnace, may have formed part of a forge hearth, to which a

# St. Leonards Lower Forge & Furnace

60 metres





wheel-pit would have had to be adjacent. This rules out a rectangular shape for the forge building but such a shape would not be obligatory. The 1573 inventory of St Leonards Forge [2] mentions eight iron finery plates suggesting two finery hearths, but it is not clear to which forge the inventory refers. It might even refer to both.

#### THE FURNACE

The furnace was built in about 1584 and therefore may have been pre-dated by the forge by as much as 37 years. The large amount of forge-type slag supports this, and the distribution of most of the furnace-slag, further west, suggests that the furnace may have been located away from the relatively narrow area, less than 50 metres wide, by the main bay. Although the site is well supplied with water, the considerable drain on that supply by a forge, possibly with four wheels, would have necessitated water conservation measures sufficient to ensure the unbroken supply required by a furnace. A further pond would have been a sensible solution and was achieved, it is suggested, by the construction of a long bay to form a pond down one side of the site. A series of undulations(F) may conceal structures which may include the remains of the furnace. A nearby gap in the secondary pond bay could indicate the position of the bellows wheel-pit, with the tail-race joining the stream from Hawkins Pond. The position of an overflow may be indicated by the gap formed by the Goldings Stream through the bay at the west side of the site(G).

## OTHER FEATURES

A concentrated area of charcoal waste(H) associated with evidence of brick or stonework(J) may point to a storage shed or indeed part of an end wall of the forge building.

A long bank up to 5 metres high(K) appears not to have any slag deposited on it, and may either represent the heap of earth excavated from the furnace pond area or be placed to protect part of the furnace area at times of heavy flow in the eastern stream.

On the north-east side of the valley is a gap, probably man-made, with a track rising from the furnace(L). Continued in the same direction, it joins a track on the far side of the Bucks Head - Mannings Heath road which heads in the direction of Colgate and which could have provided access on to the site for wagons or pack animals carrying ore to the furnace. Straker [3] mentions pits in the Colgate area as being a possible ore source for this furnace.

There is also an unusually circular pond at the north-west end of the site(M), and local people recall the crash of a military aircraft in this area during the Second World War. The pond has an earth lip redolent of a bomb crater.

References.

1. WIRG Bulletin Sec. Ser. 8 (1988), 48-53.
2. H.R.Schubert History of the British Iron and Steel Industry (1957), 277 & 400.
3. E.Straker Wealden Iron (1931), 434.

JOHN POOKE, yeoman, of Battle, Sussex, who made his will on 31st March 1610, was obviously a wealthy man as he was able to leave roughly £200 each to five sons, in addition to his tenement, barn and property with his farming stock and plant which he left to a sixth son. John's grandfather had been a farmer at Ninfield and when he died in 1558 he had left an estate worth £25 and land at Ninfield to his sons. As a child, John had almost certainly inherited lands and property at Whatlington and Sedlescombe from his uncle William who had died without issue in 1565 and whose estate had been valued then at £51.

John's will is of particular interest:

"I bequeath unto Suzan, my wife,...my furnace w'ch is at Ewhurst one box and six pewter plates the best."

His will also discloses that he has lent -

"One hundred pounds in the hands of Godherd Hebdon and fifty pounds in the hands of James Hodson [his cousin ?] and other fifty pounds in the hands of Richard Stilian."

All have been described earlier as gentlemen. The will also reveals that land has been rented to a Michael Younge and also land called Herndon near Sandhurst, Kent to Thomas Colepeper.

In her book, Sixteenth-Century England, Joyce Youngs states - p.239 : "By the 1570's most of the Sussex ironworks were worked by local yeoman farmers as a secondary occupation or by lesser gentlemen, both of these tending to operate on a very small scale and to invest any profit in the purchase of land."

Is it possible that this describes the activities of John Pooke and his associates and was his prosperity due mainly to his furnace at Ewhurst? Does his connection with Thomas Colepeper - a family known for wide ironfounding and landed interests in Sussex and Kent suggest anything?

I would be pleased to have any comment, via the editor.

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#### A METHOD OF DE-RUSTING ARCHAEOLOGICAL IRON ARTEFACTS

D.BUTLER and B.K.HERBERT

The method of de-rusting iron artefacts given here is essentially that described by Plenderleith and Werner [1].

The technique is based on electrolysis and uses readily-available materials and equipment, but certain safety aspects and precautions are necessary, and these are described later.

#### THE PROCESS

Not all iron artefacts are suitable for this treatment. The process removes all the rust layers, and unless the iron artefact has a substantial iron core and only a thin layer of rust it will not retain its shape; indeed, if the core is discontinuous it will fall to pieces during treatment. Iron artefacts which contain non-ferrous inlays are also unsuitable because the inlay material may be destroyed. A good general rule is that unless the iron artefact shows signs of active corrosion, it is best left alone and kept in a dry (dessicated if necessary) and benign environment.

A sure sign of active corrosion is the presence of beads of moisture on the surface of the iron or cracks in the rust layer. The main cause of this corrosion, particularly in artefacts that have been excavated, is due to the presence of chlorides, especially ferric chloride which is very hygroscopic. Removal of chlorides without removal of the rust layer is difficult, but if the rust layers are thin and can be removed without destroying the value of the artefact, then electrolysis is a way of removing both rust and chlorides. If an iron object shows signs of active corrosion but has a thick rust coating, the removal of which is not desired, expert advice and specialist techniques are required.

The technique of electrolytic de-rusting requires the object to be placed in a caustic soda solution electrolyte where it is used as the negative electrode (cathode), whilst a mild steel or stainless steel plate is used as the positive electrode (anode). Passage of a DC current through the electrolyte via the anode and cathode causes electrochemical reactions which generate hydrogen at the cathode (sample) and oxygen at the anode. The hydrogen chemically "reduces" the ferric oxide (red rust) on the sample to ferrous oxide, and this takes the form of a loose black deposit which can be removed using a steel-wire brush to leave a clean metal surface.

The hydrogen reaction does not reduce the rust to metallic iron, although in theory this is possible; special equipment is required to exclude all oxygen from the process.

The main advantage of this de-rusting process is that the metallic iron is not attacked; only the rust is altered and any chlorides present tend to be eliminated.

## MATERIALS.

The electrolyte is made up using commercial caustic soda (sodium hydroxide) which is available from hardware shops. A 5% solution (by weight) in distilled or de-ionised water is adequate. (1 oz to a pint of water). Care needs to be taken when making up the solution; being strongly alkaline it can cause burns. Should any caustic soda crystals touch the skin they should be brushed off with a dry brush and the area washed with a copious quantity of water. Rubber or plastic gloves and an apron should be worn and protective goggles are essential to protect the eyes from splashes of electrolyte.

The mixing container may be glass, glazed earthenware, or if a plastic container is used, it should be of a quality that will withstand boiling water and not split at the seams. As caustic soda reacts vigorously with aluminium, this material will dissolve in a short time and must not be used as a container.

The caustic soda should be added slowly to the total quantity of water necessary for the de-rusting treatment, stirring all the time. Considerable heat can be generated as the caustic soda dissolves and a wise precaution is to place the mixing vessel in another container in case of breakage. The solution should be allowed to cool before de-rusting is commenced.

The treatment container, which may also be the mixing container, must take the form of an open-top bath to allow the hydrogen and oxygen gases liberated during treatment to escape. If these gases are exposed to a naked flame or spark (when the leads to the electrodes are accidentally shorted, for example) they will combine with explosive force; thus a solid top must never be used to cover the bath. The gases liberated during the de-rusting process bring with them a fine spray of caustic solution which can

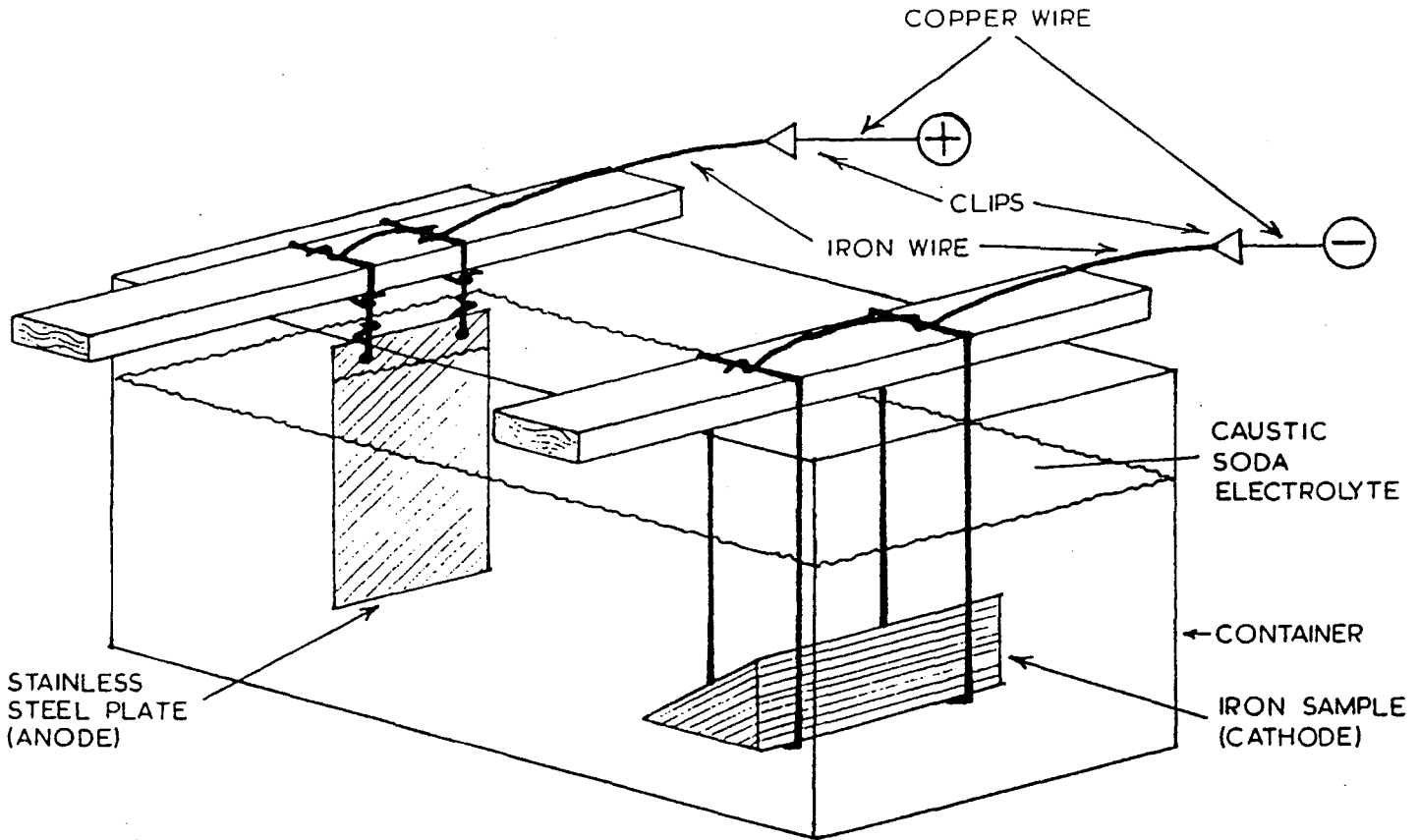


FIG.1 APPARATUS FOR DE-RUSTING IRON

irritate the nose and throat, and will also attack anything made of aluminium. In view of these effects it is best to position the bath in the open air, but if it must be in a building, good ventilation is essential to avoid trouble. The spray may be minimised by covering the top of the bath with a loose plastic sheet, bearing in mind that the gases must escape and the sheet must be loose, to accomodate any explosion of the gases.

#### METHOD

The iron artefact to be cleaned is immersed in the electrolyte and electrically connected to the negative side of a low-voltage DC source. Similarly, the anode plate is immersed in the electrolyte and connected to the positive side of the DC source. A practical method is to suspend the iron sample and anode plate by individual iron wires hung from wooden slats across the top of the bath, as shown in Fig.1. Only unplated iron wire must be used, NOT copper, and a suitable source is the plastic-covered wire sold for garden ties, where removal of the plastic should reveal unplated iron wire.

Only sufficient wire should be used to hold the iron sample firmly in place and at least one wire must make contact with the actual iron in the sample. If necessary, the rust layer must be picked off and the area filed to expose metallic iron suitable for the contact. The anode plate is easily suspended on an iron wire looped through a hole in the plate, but unlike the sample, not all the anode need be immersed in the electrolyte.

The ends of the iron wire are connected to copper leads, which in turn are connected to the positive and negative terminals of the DC source. These connections should not be above the bath, otherwise the spray will corrode the contacts and copper wire, causing contamination of the electrolyte.



The DC supply should be a full-wave rectified AC source, and many 12V battery chargers of 5A rating are suitable for the task. The current density at the sample need not exceed 100mA per square cm., and either the circuit or the charger should include an ammeter so that this parameter may be checked. Both the mains output and low voltage output should be properly fused or fitted with a cut-out, and the whole system earthed. If the de-rusting process is conducted out-of-doors, the charger itself must be protected from the weather and preferably be inside a building with the DC leads going to the bath outside. The connecting leads should be kept as short as possible to avoid voltage loss; if this is impractical, thicker leads will be necessary.

As soon as the iron sample is totally immersed in the electrolyte, the DC source should be wired up and switched ON. If the sample is left in the electrolyte without current flow, impurities can be "plated out" on to the surface of the sample. To ensure that a large current is not taken immediately at switch-on, the anode plate should be only partially submerged in the electrolyte and as far away as possible from the sample. The current flow can then be adjusted by increasing or decreasing the distance between the sample and the anode plate, or else by varying the amount that the anode plate is immersed in the electrolyte. Another method of varying the current is to use a variable resistance (of suitable power rating) in the low voltage circuit or else a 'Variac' transformer may be used to regulate the mains voltage to the DC supply.

The current flow should be adjusted to give a gentle gassing at the anode and cathode. During the process, the current flow will increase and gassing will become more vigorous. This indicates that the current should be reduced by adjusting the position of the anode or one of the other methods discussed above.

The shape of the anode plate may suit the shape of the sample, even to using a cylindrical anode to surround a rod-shaped object. To ensure even de-rusting when the sample has a large surface area, if for example it is very long, it will be necessary to move the anode along the sample so that each part receives a suitable current in turn. The time required to remove the rust varies with the type and condition of the iron sample. Small items such as nails may need only an hour or so, whilst larger samples may require days or weeks, particularly where it is necessary to move the anode plate around or along the sample in stages.

It is recommended that experiments are conducted using a piece of scrap iron to determine the technique and correct conditions before a valuable artefact is de-rusted.

When the red rust shows signs of becoming black, the sample is ready for cleaning with a wire brush. First the DC supply must be switched OFF and the sample removed from the bath and washed in running water to remove the caustic solution. After rinsing in alcohol (methylated spirit) to remove the water and drying with a hot-air blower, as much of the black deposit as possible is removed using a steel-wire brush. Rubber gloves are essential at this stage to protect the hands from the caustic solution still held within the rust. It is preferable to perform this task by hand, as a power-operated wire brush tends to smear the surface due to its high speed.

After wire-brushing the sample, it will probably require further treatment in the bath and the above process must be repeated until the surface of the iron is completely clear of rust. Small pockets of rust may be removed by careful hand picking using a sharp tool, although, with wrought iron, care is needed to distinguish between rust and pockets of slag which are part of the original structure and should therefore not be removed.

## FURTHER TREATMENT

After the final de-rusting treatment the surface of the clean metal is very reactive and must be washed, treated with alcohol, dried and given a protective coating as quickly as possible to prevent further rusting. If the latter does occur, it can again be removed by wire brushing.

The protective coating should be non-sticky, not contaminate the surface and be easily removable should further treatment be required. Silicone or phosphate-based coatings should not be used as they lead to false results in any later chemical analysis.

The preferred coating is bees-wax, perhaps mixed with microcrystalline wax, dissolved in white spirit. This can be brushed on to the surface and, when dry, leaves a non-sticky coating resistant to the ingress of moisture. The coating can be removed by repeating the de-rusting process, where the gases formed will blow off the wax coating. It is preferable not to use any colouring matter in, or on, the wax coating as the patina is hidden; this especially applies to wrought iron with its grain-like structure. Museum curators, unfortunately, seem to like matt black iron samples, but such colouring hides early signs of corrosion and by the time it does show, considerable damage may have taken place.

Immersion of the artefact in molten bees-wax is sometimes recommended; considerable caution is required when using this technique as any trapped moisture converts to steam which will blow molten wax off the object and serious burns may result.

Reference. Plenderleith H.J. and Werner A.E.A.,  
Conservation of Works of Art, (1971).

WILLIAM CLUTTON - IRONMASTER

J.S.HODGKINSON

The brief re-vitalisation of the Wealden iron industry, brought about by the Seven Years' War (1756-63), caused an upsurge in the fortunes of established ironmasters, such as the Fullers and the Harrisons. It also brought to the fore a small number of entrepreneurs whose involvement in the Weald was much shorter. Among these can be numbered Edward Raby, John Churchill and James Bourne. Perhaps the briefest career was that of William Clutton.

Clutton's appearance as an iron founder is difficult to explain. He was born at Portslade in August 1735,[1] the fourth son of Ralph Clutton, vicar of that parish. In 1738 his father obtained the living of Horsted Keynes and the family moved there.[2] For the next few years the record is blank. Then, in 1761, the Rev. Ralph Clutton died.[3] It must be presumed that this was unexpected as no record of a will has been found. This is unfortunate in that some knowledge of his father's financial state might well have explained William Clutton's venture into the iron trade in the same year, at the age of 25. As the lease had 18 years still to run when the property was put up for sale in 1764, it seems likely that Clutton's tenure of the Gravetye Estate and furnace, in West Hoathly, Sussex, ran for 21 years from Lady Day 1761. However, that Robert Knight, the East Grinstead carrier, recorded the first of many consignments of guns from Gravetye to Woolwich in April 1761 suggests that Clutton and his partner, John Norden, must have had the furnace in blast for some weeks beforehand.[4] John Fuller noted that several weeks of pig-iron production were usually necessary at the beginning of a blast before the metal was suitable for ordnance.[5]

Many guns were carried to the Royal Arsenal at Woolwich until the end of June. If this marked the end of the first

campaign, perhaps due to lack of water, then, despite a start after the new year, Clutton could have achieved a campaign of a respectable length.[6] No more guns were carried by Knight until September when the flow was resumed. Allowing a month for repairs and relining, a new campaign beginning in August, again with a period of working up before guns could be cast, indicates confidence in the water supply. The work necessary between campaigns must have been foreseen, as it was unusual for the Wealden ironfounders to continue smelting through the summer. But the early re-start might suggest that Clutton was being pressed. In October, the furnace had to be blown in again, and this early loss of production must have reduced the partnership's working capital. With a new furnace, at the beginning of a campaign, almost certainly with no payments yet received for the guns cast, the projected costs of the venture may have been considerably upset.

From September, Knight's accounts show the carriage of a variety of guns right through to the following August. No interruption in the work of the furnace is indicated, because production would have exceeded Knight's ability to carry away the guns, so there would be an increasing backlog at the furnace. Almost all the guns, from 3 pounders to 32 pounders, 135 in all, were taken to Woolwich. The rest went to London. Periodically, Knight returned with 'coles'; presumably mineral coal which would probably be used for drying cannon moulds. Occasionally Clutton also used Knight to carry iron ore and, in one instance, two barrels of powder were carried to Gravetye, presumably for proving the guns.

In August 1762, Clutton was bankrupt.[7] Immediately, the furnace was taken over by the partnership of Jonathan Eade and William Wilton who were long-standing contractors for ordnance to

the Board at Woolwich and for whom, it must be assumed, Clutton had been casting.[8] The furnace was kept in blast and Knight continued to carry guns to Woolwich.

The causes of the bankruptcy may lie in a combination of local and general factors. Firstly, Clutton had leased the whole of the Gravetye estate, and his costs included having to construct Gravetye Furnace which was, to all intents and purposes, a new furnace. Although there had possibly been a furnace on the site late in the 16th century,[9] a complete rebuild would have been necessary after 150 years. That would have been expensive, for not only would work be necessary on the furnace tower and the workshops required for cannon-mould assembly, but also bellows, water wheels, boring machinery and lifting gear, had to be fabricated or purchased, either new or from some furnace recently closed down. Waldron and Hansell, both of which had been used for gun-casting, may be in this category. Secondly there had been the delay early in the second campaign. In those lost weeks, as many as forty 9-pounder guns might have been cast, for which the Board would have paid over £800.[10] Thirdly, the Board of Ordnance were notoriously slow at paying their suppliers: Bill Books frequently show the payment of accounts fifteen months after the warrants had been issued for the original supply of the pieces. Whether the sub-contractors had to wait until the contractor was paid by the Board is not known in this case, but Clutton may not have received any payment from Eade and Wilton. Finally, there would have been on-going expenses, such as wages for his workmen, payments to Knight for carriage, and to the suppliers of ore and charcoal.

It is possible that Clutton was not running a 'tight enough ship'. Following the blowing-in of the furnace in October 1761 there had been a fatal accident. Accidents were not uncommon at ironworks, but they were sufficiently rare to raise a comment

in the Sussex Weekly Advertiser. In this case, Thomas Todman, a labourer from Clutton's own village of Horsted Keynes, had been suffocated by poisonous gas being emitted from the furnace, as the newspaper report at the time stated, 'on first lighting the fire'.<sup>[11]</sup> Although, in this case, the victim seemed to be at fault, if any blame for the accident were attached to Clutton, labourers might have needed an inducement to work for him. Also, there is a tantalising reference to eight 'brass' guns carried to London in May 1763, when Clutton's business was being wound up.<sup>[12]</sup> Had he ventured into bronze founding? Undoubtedly, if he had, his financial commitment would have been greater still.

There were other factors which may have played a part in Clutton's bankruptcy. We know nothing of his partner, John Norden, except that he seems to have avoided joining Clutton in bankruptcy. A Mr. Norton was paid for drawing the draughts for guns for John Legas in 1745.<sup>[13]</sup> It is possible that Clutton provided the finance for their ventures and Norden the technical expertise. Whichever way it was, Gravetye was not their only ironworking concern. In the year work started at Gravetye, Clutton and Norden rented Howbourn forge in Buxted.<sup>[14]</sup> This forge had been working in the 16th and 17th centuries but had been disused during the Commonwealth. It had been re-instated in 1756, presumably to capitalise on any demand for forgings generated by the Seven Years' War. In 1762, Clutton (with or without Norden) rented Maresfield Forge as well.<sup>[15]</sup> It is likely that the forges were leased to use the pig iron produced at the beginning of each campaign and also the feeder heads which were removed from the cannon before boring. Clutton's occupancy at each forge ended after his bankruptcy, but both forges had been worked, for iron

from them was put on sale by the assignees of Clutton's bankruptcy in 1763.[16] To what extent the renting of the two forges contributed to Clutton's financial collapse cannot be estimated. Nevertheless, to start up in the iron trade on three sites almost simultaneously suggests a certain recklessness.

The assignees of Clutton's bankruptcy were named as the Rev. Ralph Clutton, his elder brother, who had succeeded his father as Rector at Horsted Keynes, Samuel Durrant Esq., of Lewes, and Robert Chatfield, of Cuckfield.[17] From the accounts of Robert Knight, they appear to have carried on smelting at Gravetye at the beginning of 1763.[18] But a different interpretation may be that from February through to May Knight merely carried away the backlog of ordnance that had been stored nearby at Mill Place, thus giving Ralph Clutton and his co-assignees funds to pay off creditors, in addition to the bar iron they were selling from the forges. In 1765, Gravetye Manor House, its farm and 200 acres, together with the furnace, were auctioned at the Star Inn in Lewes.[19] William Clutton was appointed Steward to the Manor of Horsted Keynes Broadhurst in 1762 [20] and married Sarah, the daughter of Robert Chatfield, in the next year.[21] He pursued a career in land agency and stewardship thereafter, dying in old age at his home of Ockenden, in Cuckfield, in 1821.[22] Through his son and grandson, the present firms bearing the family name directly descended.[23]

#### Notes and References.

1. West Sussex Record Office (WSRO) Bishop's Transcripts;  
Portslade. EpsII/16/156A. 29th August 1735.



2. WSRO Chichester Diocesan Institutions 1660-1754 (MS), 74.
3. WSRO Parish Registers (transcript); Horsted Keynes. Burial  
12th January 1761.
4. J.S.Hodgkinson, 'The Carriers Accounts of Robert Knight',  
WIRG Bulletin First Series 14 (1978), 16.
5. R.V.Saville, 'The Operation of Charcoal Blast Furnaces in  
Sussex in the early Eighteenth Century',  
Historical Metallurgy 14:2 (1980), 65-73.
6. In the period 1723-39 Fuller achieved an average of 167 days  
per campaign, compared with 136 days for the years 1769-80;  
see R.V.Saville, 'Income and Production at Heathfield  
Ironworks', WIRG Bulletin Second Series 2 (1982), 36-63.
7. Public Record Office (PRO) Court of Bankruptcy Docket Books  
B.416 p.238.
8. J.S.Hodgkinson op.cit. 18.
9. E.B.Teesdale, 'The 1574 Lists of Ironworks...(etc.)', WIRG  
Bulletin Second Series 6 (1986), 30. The reference to John  
Blacket's works in relation to other works in the vicinity  
of West Hoathly suggests a furnace in the parish, although  
the cross-reference with 'Mr Michael' (? Michell) may  
indicate that both were connected with Chittingly Manor  
Furnace.
10. e.g. PRO Ordnance Board Bill Books WO 51,211 p.379. Edward  
Raby, casting at the Warren Furnace nearby, was getting  
18s per cwt. for 9 pounders, from the Board.
11. Brighton Reference Library (BRL) Sussex Weekly Advertiser 19th  
October 1761 (note Todman not Podman). Also WSRO Horsted  
Keynes parish registers (transcript).  
Burial 19th October 1761.

12. J.S.Hodgkinson op.cit.,19.
13. Guildhall Library Mss. 3736/6 and 6483.
14. P.Combes, 'The Eighteenth Century Revival of Howbourne Forge, Buxted', WIRG Bulletin Second Series 7 (1987), 16-19.
15. East Sussex Record Office (ESRO) ELT/Maresfield.
16. BRL Sussex Weekly Advertiser 25th April 1763.
17. see note 16.
18. J.S.Hodgkinson op.cit.,18.
19. BRL Sussex Weekly Advertiser 31st December 1764.
20. ESRO GLY 1096.
21. WSRO Parish Registers (transcript) Horsted Keynes  
17th May 1763.
22. WSRO Bishop's Transcripts; Cuckfield. EpsII/16/50B.  
Burial 15th May 1821.
23. Cluttons 1765-1965 (1965); a bicentenary volume published  
privately by the firm of land and estate agents.

A NEW FORGEMASTER, WILLIAM BASSETT  
and AN OLD NAME, GRUBSBARS, for CROWBOROUGH FORGE.

BRIAN G.AWTY

(Extract from Public Record Office STAC 5.B 90/39.  
13 Feb. 35 Eliz I. [1593])

Wm. Bassett of Witheham, forgemaster - was possessed for divers  
yeares yet induringe of and in one furnace...commonly called Olde  
lande furnace...in Buxsted...and in one iron Forge commonly called  
Ashehurst Forge...in Ashehurst...and in two other Iron forges...in  
Hartfield...and in one other Iron Forge commonly called Grubsbares  
Forge..in Witheham...for the stockynge of which...your said

Subject hath disbursed greate sommes of money...so yt is...That  
 one Richard Maynarde of Buxstede...yeoman, John Walcott of  
 Buxstede...John Bense [?Beuse] of Mayfield...George Huton of  
 Buxstede...Bartelmew Romesey late of Buxsted...John Russell  
 otherwys Angell of Buxsted...John Holdeley of Retherfeild...the  
 yonger, Edward Holdeley of Retherfeild...the yonger, Danyell Poste  
 late of Buxsted, Moyses Poste late of Buxsted, George Marchant of  
 Buxstede...Henry Tryme of Buxsted...Thomas Kenworth late of  
 Buxsted...Allexander Muddell of Buxsted...Edward Welles late of  
 Buxsted...Samuel Muddell of Buxstede...Edward Stevens of  
 Buxsted...Thomas Barton of Retherfeild...John Marchant, Nicholas  
 Stocker, James Bonicke, Goddard Crittenden, Stephen Funnell, Peter  
 [?Cooke], Allexander Middellton and divers others to the number of  
 fortye persons and upwards the seconde daye of August  
 [1591]...being weaponed with swords, daggers, staves and other  
 weapons...did pull up a Bridge standing over a River there, beinge  
 the necessarye and usuall carrynge waye of...coles unto divers of  
 his aforesaid Ironworkes and after this donne, the said ryottous  
 persones upon the said seconde daye of August in riottous and  
 terrible manner did enter...Buxstede woode...and there did make an  
 assault upon one William Growte Collyer and servant unto your said  
 Subject and him did beate and greveously wounde and mayme in one  
 of his handes by reason whereof he is not able to worke to gett  
 his livinge and...did take and carrye awaye Tenne loads of Cole  
 and fowerscore & tenne Cordes of woode...in waynes and  
 cartes...That the said Richard Maynard and all other the  
 aforesaid ryotous persones and others to the number of fortye  
 persones and upwardes...did the thyrde daye of August in the three  
 and thyrteeth yeare of your highnes Raigne...did enter  
 into...Buxstede woode and...did take and carrye awaye...two and  
 twenty Cordes of woode and two loades of Cole...by reason

wherereof[!] his said Iron Workes were unstocked to the greate losses and hindrances of your said Subject, etc. etc.

There seems no doubt that William Bassett's main antagonist in this Star Chamber case was Richard Maynard of Birchden forge (d.1618), who was also associated with Old Mill and Hamsell furnaces (Cleere & Crossley, pp.316,318: PRO, PROB 11. 133/63). Maynard set out his own version of events in his reply to a Chancery bill (PRO, C 3.247/36). According to this, on 1 July 1590, Sir Thomas Palmer of Angmering sold Maynard 6750 cords of wood for £575, to be taken over a period of eight years commencing 10 October 1590, from any of several 'wood grounds', Buxted Wood, Eching Wood, Langhurst Wood, Ridgewood, Copwood, Barnet Wood and Estons Green, at his own choice and liking, 'the said cords to contain in length 8 foot, in height 4 foot, and the axewood to be cut 4 foot in length and the small wood 3 foot in length'. However, Palmer had made an earlier sale of 4250 cords of wood out of Buxted Wood, Eching Wood and Estons Green to Robert Cornford and it was under this agreement that Bassett had taken wood out of Buxted Wood, which Maynard had marked, and in some cases cut, for his own use. Palmer had also sold wood out of Eching Wood and Estons Green to Thomas Saunders alias Hudson, contrary to the agreement with Maynard. Maynard obtained only 4055 cords of wood and he set Palmer's bond, in £1000 for the supply, in suit against him.

William Bassett is certainly the man who owed suit of court for property in Blackham borough in Hartfield in the period 1587-1591 (ESRO, SAS, unaccessioned Box 1[1]), but in default of the 16th-century Withyham parish register closer identification is difficult. He is not to be found in the Buckhurst Terrier.

The connection with Ashurst forge suggests he might have been second son of Henry Bassett of Chiddingstone who died in 1585, leaving to William Waltershill Lands in 'Pendesherst', lately purchased of Thomas Jervys and Jane, his wife (PRO, PROB 11.68/16). William Bassett of Chiddingstone married Mary Cleve at Bolney in 1570 and she was buried there in 1583, which demonstrates a Sussex connection. However, was not the William Bassett of Waltershill Lands the person who was buried at Penshurst on 19 August 1592? This seems to be too early for him to have been the instigator of the Star Chamber case.

Grubsbars is mentioned near the start of the Buckhurst Terrier. The road from Crowborough to Grubsbars bordered no less than three parcels of land belonging to Robert Baker and from the context it is evident that Grubsbars lay to the west of Crowborough. David and Pamela Combes suggested that the site at TQ/498326 (Cleere & Crossley, p.326) was the forge concerned and kindly took me to view the site. A subsequent hour pouring over local maps at their home tended to confirm this identification, though the site is almost NNW from Crowborough. After supper Pamela produced a pot of tea served on a tray embellished with a 1564 plan of the bounds of the Forest of Ashdown drawn by Edmund Twynyho. Here Grubs Bars was shown located between Friars Gate (to the north) and Newnham Gate (to the south), which finally confirmed Grubsbars as the contemporary name for the forge at TQ/498326. [2]

The new reference to Oldlands furnace is 20 years earlier than the one cited by Cleere & Crossley (p.348), but does little to corroborate the suggested connection with William Levett and cannon founding. Grubsbars was clearly Bassett's nearest forge to Oldlands.

However, Bassett's remaining forges have no furnaces linked with them in the Star Chamber document, and the Blackham borough suit-of-court reference, together with the fact that two further of his forges were situated in Hartfield parish, suggest that his main interests were well to the north of Oldlands and Crowborough. The supposition that Bassett's furnace was subsequently built by him is a tempting one. The EPNS volume suggests a medieval origin for Bassett's Farm, adjacent to the furnace site, but cites no early examples of this place name, and bases its suggestion on the fact that the surname Bassett occurs in the Hartfield area in medieval subsidy rolls. Until a quite specific pre-1590 reference linking the name Bassett with the area of TQ/468374 is produced, the suggestion that Bassett built the furnace there must remain a valid one.

Ashurst forge (TQ/505403) is but half a mile from Walter's Farm in Penshurst, and it will be seen that in addition to Bassett's Farm in Sussex, there is a Bassett's Farm in Kent approximately one mile north-west of the forge. Though this forge was linked together with Ashurst furnace in the tenure of John and Thomas Stace in 1574, by 1588/90 this link was probably broken because the furnace was in the hands of John Phillips of London, and later in those of Thomas Browne, both of them associated with cannon founding (Cleere & Crossley, p.311).

#### NOTES.

1. This court book gives conclusive dates neither for Bassett's arrival in the Blackham area, nor for his departure; there is a gap between Nov.1581, when Bassett is not recorded at Blackham, and Oct.1587, when he is; he is still at Blackham in the last entry for Hartfield hundred in April 1591. I am grateful to Christopher Whittick for drawing my attention to this book, one of

the few sources for names of inhabitants of the Witherham and Hartfield areas in the last quarter of the century.

2. Pamela Combes has since suggested that some parts of the map probably owe something to 'The Parliamentary surveys of Ashdown Forest - topographical details', by Ivan D. Margary (SAC, 81 (1940), pp.136-39) and the accompanying map. Here 'Grub's Bars' is again shown between 'Fraye's Gate' and 'Newnham's or Water Gate'.