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FIELD NOTES

compiled by **J. S. HODGKINSON**

A possible Middle Iron Age Bloomery in Hartfield

In December 2004, members of the Field Group excavated two trial trenches into the slag heap of a bloomery site in Cullinghurst Wood, Hartfield (TQ 4796 3952). It immediately became apparent that the pieces of slag being found did not conform to the usual type. Instead, the pieces were irregularly shaped, with marks of wood or charcoal on them and clear evidence of the slag having run downwards, instead of in the usual horizontal direction typical of tap slag. All the slag found on this site conformed to this type and there was no tap slag. No dating evidence, in the form of pottery sherds, was discovered, but a sample of charcoal was recovered from within the slag layer, about 80cm below the surface.

The charcoal was submitted to the Centre for Isotope Study of the University of Groningen, in the Netherlands. The radiocarbon determination received from them is 2350±50BP.[1] Using the OxCal calibration software (v.3.10), the calibrated date for the sample is 750BC – 350BC at 90.5% probability.

This date is considerably earlier than any date for a bloomery site in the Weald hitherto. However, caution must be observed with a solitary C14 date and no other corroborating evidence.

A Romano-British bloomery in Maresfield

This site, located at TQ 4765 2499 (corrected ref.) in Hendall Wood, has already been reported.[2] In November 2005, members of the Field Group excavated a trial trench and recovered a single base sherd of East Sussex ware from within the slag layer, which averaged 40cm depth. Tap slag was present, as well as a number of cylindrical pieces of slag, which have been noted on other sites. Excavation exposed two substantial pieces of furnace lining, although neither appeared to be *in situ*.

A Late Iron Age bloomery in Maresfield

The second of the two sites discovered in Hendall Wood (see above), lying at TQ 4771 2502 (corrected ref.) was also examined by members of the Field Group who excavated a trial trench. Two small body sherds of East Sussex ware were recovered from within the slag layer, which averaged 15cm depth. No tap slag was noted, but several pieces of slag displayed markings identified as drips that would have formed in vertical or sloping situations, possibly within the furnace. Some of these bore marks suggesting that the slag may have flowed over strips of wood.

It is worth noting that, from the evidence of the slag found at this and the other site in Hendall Wood (above), a mere 100m apart, two different techniques were being used to smelt iron, suggesting differing traditions of iron making in the same geographical location, presumably separated by time. Whether this change in smelting technology was the result of an evolution in process or because of social changes in the area cannot be determined at present.

A bloomery site in Maresfield

A third site has been discovered in Hendall Wood, at TQ 4798 2504, on the steep northern slope of a small stream. Members of the Field Group excavated two small trial trenches, but no dating evidence was found. As with the site above, the slag discovered, the depth of which averaged about 15cm, bore evidence of having flowed vertically or at an angle, and could not be described as tap slag in the conventional sense of slag cooling while flowing on a horizontal surface. The excavation at the top of the slope produced no slag but the soil was found to be impregnated with fines of roasted iron ore.

Minepits in Milland, West Sussex

Field walking in search of evidence of ironworking in Milland parish has revealed a cluster of about 20-30 mine pits, distributed in a small area on the southern edge of Kingsham Wood (centred on SU 8392 2521). The pits cover an area of about 150m east-west, and about 40m north south. The geology is in the upper Weald Clay, just below the boundary with the Atherfield Clay.

A bloomery site in Hartfield, East Sussex

Brian Herbert

A trench was dug in patch of bloomery slag located at TQ 4807 3946. However, the soil was very clean, with no sign of charcoal dust and only about a 150mm depth of tap slag that seemed to have been selected for large pieces. A second, smaller trench was dug some 4m south and with a similar conclusion. However, some very dense, shiny, jet-black slag was noted suggesting a high temperature within the furnace. Here the depth of slag was nearer to 300mm thick but it was basically similar in the two holes. It is thought that this slag, probably from a local bloomery, was used to repair a trackway that is not now easily discernable.

At TQ 4807 3937 a patch of roasted ore was detected, and a small area of bloomery furnace slag was discovered only a few metres away. This was a definite smelting site and a small excavation was made but pottery could not be found. Close to these two sites was a small ditch that had been dug to drain a nearby mine pit. Approximately 30m in diameter, the pit was of later date

More roasted ore fines were noted high up on the bank of the stream at TQ 4807 3926, over a length of about 30m. Over-long for an ore-roasting area, perhaps this was a trackway where people carried roasted ore to another smelting site, the fines escaping from the containers.

Three bloomery sites in Rotherfield, East Sussex

Brian Herbert

The first bloomery site was found at TQ 5768 3053, about 3 to 4m up on the stream bank. The position of the tap slag, at the top of the bank, suggested similarities with the site at Little Furnace Wood, Mayfield, currently under excavation. A second site at TQ 5766 3049 may be slag washed down from above.

Although a bloomery site at TQ 576309 is noted by Cleere & Crossley,[3] this is well away from the stream; unfortunately, there is no record of who found this site or where it was originally recorded. Individual pieces of slag were detected from TQ 5732 3014 to where a small, site was found at TQ 5758 2993, this being some 6m up on top

of the vertical stream bank. However, this was not the main source of slag found in the stream. At TQ 5769 3003 more slag was found on the bank, but failing light prevented further investigation.

Four mine pits were identified, north of Stile House Farm; although only one showed signs of ore and Cyrena limestone, they were all in the same elevation and geological situation in the lower levels of the Wadhurst Clay. Another pit at TQ 5787 3052 and about 100m across, seemed very large for a mine pit and may well have been dug for marl.

Notes and references

1. Rijksuniversiteit Groningen, GrN-229552, Cullinghurst Wood.
2. *Wealden Iron*, 2nd ser., **25** (2005), 8.
3. H. Cleere & D. Crossley, *The Iron Industry of the Weald* (Cardiff 1995), 293.

STEPHEN AYNSCOMBE AND THE EARL OF GONDOMAR

TIM CORNISH

In her article for WIRG *Bulletin* 2005 about John Browne, Gunfounder to the Stuarts,[1] Ruth Brown refers to Stephen Aynscombe as a smuggler of illicit ordnance to Portugal in 1620, working in tandem with the Spanish Ambassador, the Earl of Gondomar. Her general point about the prevalence of smuggling of ordnance is correct and Aynscombe, who came from Mayfield and who ran Pounsley Furnace, south of Hadlow Down had a record as a gun-smuggler. However, there is some evidence that on this occasion Aynscombe was the victim of a false accusation which was inspired by national anti-Spanish feeling.

It seems likely that popular hatred of the Earl of Gondomar was behind it all. He was seen as a super-spy, prepared to use all the black arts to undermine England's protestant state. As Gondomar travelled through the streets of London, the mob hooted at him and pelted his sedan chair with stones and rotten vegetables. He suffered from an intestinal complaint so a popular cartoon showed Gondomar as the Machiavel, dealing in 'treacherous and subtile practices' and followed everywhere by a portable lavatory.

But what really stirred English hatred and was probably the main reason for the accusations against Aynscombe, was Gondomar's plan for a marriage between Prince Charles (later Charles I) and the Spanish princess, the Infanta. This plan was first mooted at precisely the time of the accusation against Stephen Aynscombe.

Gondomar had no need to be involved in illicit activity. Garrett Mattingley wrote that at this time: 'The Ambassador …was at once the dictator of England's foreign policy, the chosen companion of the king's leisure hours, and his closest friend. It would be hard to name an ambassador before or since who had attained such a position, or exerted by sheer personal force such influence upon the affairs of Europe. Only years of daily contacts, of careful study and preparation could have

achieved so much. Gondomar's success illustrates the potential of the resident ambassador at its highest.' [2]

Perhaps a hint of the wild nature of the accusation against Aynscombe can be seen in the minute of the Star Chamber of 22 November 1620 where a special committee was set up to look at 'general abuse of exporting iron ordnance and particularly touching the pieces of late from the port of Lewes upon pretence of a warrant granted to the Earl of Gondomar, ambassador with his Majesty from the King of Spain and therein likewise to examine by whose means the privy seal that should have remained with the Commissioners of the Treasury for their warrant, was conveyed to Lewes, where the same was found.'[3] It seems that the only way anyone can explain how Aynscombe has come by a warrant for exporting guns is that the Privy Seal has been stolen and moved to Lewes.

The effect on Stephen Aynscombe was catastrophic. Substantial quantities of his guns were impounded and the High Sheriff of Kent was told that 'he is now fleed away into forraine parts' and was ordered to seize Aynscombe's guns (which he had bought from the Brownes of Brenchley) at Millhall near Maidstone. The Privy Council also ordered the High Sheriff of Sussex to 'make your immediate repair to the aforesaid town of Lewis, where you shall find there several proporcions viz in the backeside of Edward Fittsherbert in Lewis 37 pieces, between his house and the bridge by the water side five pieces, in the backeside of Robert Hanson in Cliffe 5 pieces, in the backeside of Peter Stone 6 pieces, at the quarry side near the river, sixteen pieces, and in Mr Tower's warehouse 10 pieces…seize them…

'And we do likewise require you to make your repair to Pounsley Furnasse, and having in like manner seized and put into safe custody to his Majesty's use all the pieces that belonged to Aynscombe and given order that none of the rest be removed without special warrant, you are to cause the fyer of the said furnasse to be quite put out, and take order that there be not any further working there for the future.' [4]

By 2 February, the Privy Council had begun to draw back from the drastic action they had taken. They say they have simply 'made stay' the guns at Millhall and that the only guns they have seized are those made by Stephen Aynscombe 'and put into safe keeping'.[5] It seems possible that Gondemar's intervention has begun to take effect.

Stephen Aynscombe was pardoned by King James at the Privy Council meeting on 13 July 1621[6] by which time it seems that his furnace at Pounsley has been destroyed and his guns seized. They found 79 guns in all: 3 falcons, 22 minions, 28 sakers and 16 demi-culverins lying at Pounsley and 4 demi-culverins, 5 sakers and 1 minion lying at Lewes. The licence for the Earl of Gondemar was for 100 guns which were to have been shipped to Portugal by Lucas Weston, Captain of *The Pearl.*

The end of this story is that Aynscombe returned, was re-instated and continued his business. In 1622 it was recorded: 'Aynscombe hath had a discharge from this board, and from the exchequer of all arrests for such goods as were his, and hath sold them at Tower Hill'.[7]

It was another two years before any attempt was made to put Gondomar's plan into effect, an action played out in high farce. In 1623 the young Charles and his bosom companion, the Duke of Buckingham, crossed the Channel and rode on horseback directly to Madrid which they reached in sixteen days, with Charles disguising himself as a 'Mr Smith' with a false beard. The two young bloods discovered the whereabouts of the Infanta's chamber, scaled the wall and, to the horror of the Spanish Royal Family, introduced themselves to the princess. The King was unsure how to deal with this outrage, so simply kept them incommunicado for a fortnight and sent them on their way home by sea.

The arrival of Charles and the Duke at Southampton gave rise to some of the wildest and most heartfelt celebrations ever seen in England. Crowds cheered the young men over the whole route to London, marking their relief and jubilation that submission to their Catholic enemy was to be avoided. Three hundred bonfires were lit across London, followed by the fiercest wave of anti-catholic and anti-Spanish sentiment seen since the days of the Armada.

Little is known of Aynscombe and the Pounsley Furnace. The family came from Aylwins or Lower House in Mayfield. He may have learned his trade in the days when Mayfield's Furnace made guns under Henry Neville's Royal Patent. Why he was chosen by Gondomar for this contract is not clear: perhaps he thought that Aynscombe knew how to operate discreetly. The charge that the Privy Seal had been stolen and taken to Lewes is simply unbelievable. It should be read as a desperate attempt by Aynscombe's accusers to explain how his documents permitting export of guns came to have the official seal of approval.

References

1. Brown, Ruth, 'John Browne, Gunfounder to the Stuarts' in *Wealden Iron*, 2nd Ser, **25** (2005) 38-61
2. Mattingley, Garrett, *Renaissance Diplomacy* (1955)
3. *Acts of the Privy Council of England, 1619-1621*, (London 1890-1964) 316
4. ibid p.321
5. ibid p.340
6. ibid
7. (SP14/180/132)

THE CONSTRUCTION OF A WEALDEN BLAST FURNACE

R. G. HOUGHTON, R.I.B.A.

As an architect I have always been interested, not only in the construction of the furnace but in the relationship between that, the layout and the process as it affects the design. It seemed natural to try to understand it by drawing it. Hence this, the last in a series of 1:50-scale axonometric drawings (Fig. 9, pp24-25). It is not meant to show any particular furnace, but is an amalgam of details from various sites and sources, put together to try to give an impression of a 17th-century gun-casting furnace. It must be borne in mind that details may vary, not only at different times and places but with different ironmasters as well.

Over a hundred furnaces were operating in the Weald at some time or other over a period of at least three hundred years, but all that remains of their structures above ground are a few low mounds of rubble and slag. Fortunately there are still enough sources available to enable us to get a fair idea of a typical furnace.

1. Illustrations

a) Paintings

There are several paintings of 16th century furnaces by Flemish artists from the area around Liége, which is associated with the Wealden iron industry.

The artists were more interested in a work of art rather than accuracy, but the paintings do suggest a possible line of development of the furnace layout.

i) The painting, erroneously entitled 'Copper Mines', by Herri Met de Bles (early 16th century) (Fig. 1), seems to show the simplest, most primitive type.[1] It appears to consist of a small rectangular building divided into three 'cells', with a pitched, thatched roof projecting forward over an open veranda. At one end is perhaps a store or

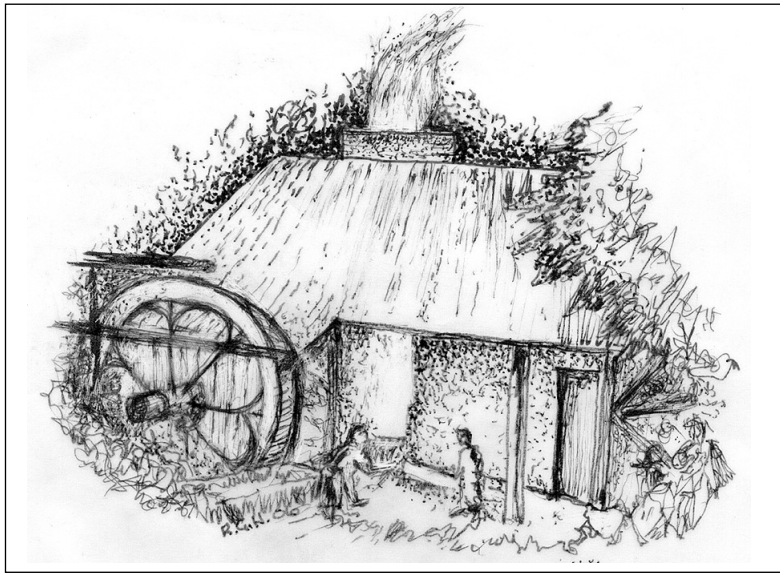

Fig 1: Sketch of blast furnace from 'Copper mines' by Herri met de Blès (Uffizzi Gallery, Florence)

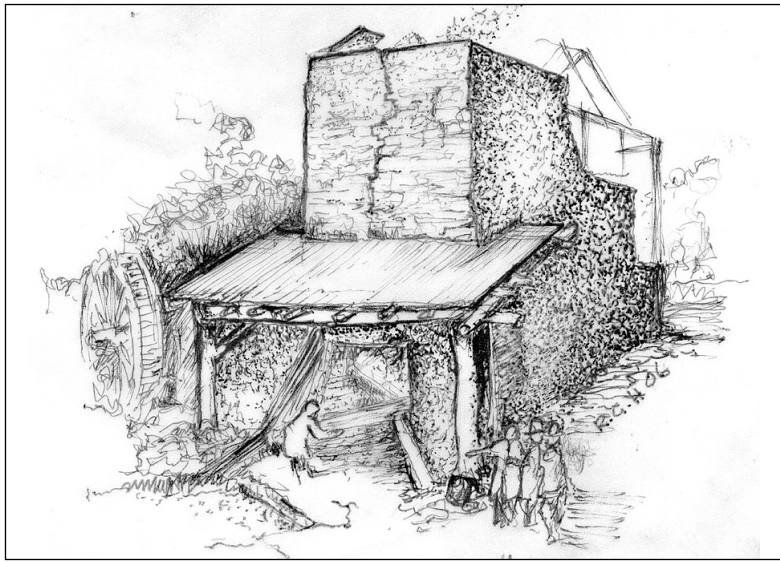

Fig 2 Sketch of blast furnace from 'Furnace in a wood' by Jan Bruegel (Galleria Doria Pamphilj, Rome)

workshop; at the other, the bellows in a room projecting into the veranda, with an overshot wheel on the external wall. In the centre, is a furnace, apparently casting sideways down the veranda. It is possible that the hearth is recessed, but this is very difficult to see. A large chimney discharges the furnace through the roof, but there is no visible means of charging it.

ii) The second painting, by Jan Bruegel,[2] dates from about 1610 (Fig. 2). It shows the enlarged furnace stack, now dominating the site, and with a recessed hearth. The workshop has gone and the veranda reduced to an open lean-to over the casting area, and extended sideways over the bellows. The waterwheel does seem rather far away; perhaps artistic licence. Access for loading appears to be by stone steps at the rear. Most interesting is what appears to be a penthouse just visible at the top of the furnace.

iii) A third stage could be represented by Lucas van Valkenborch's late-16th century painting (Fig. 3).[3] Here the stack is almost surrounded by lean-to buildings. A penthouse (possibly out of scale) appears on the roof, and although no access is visible, a

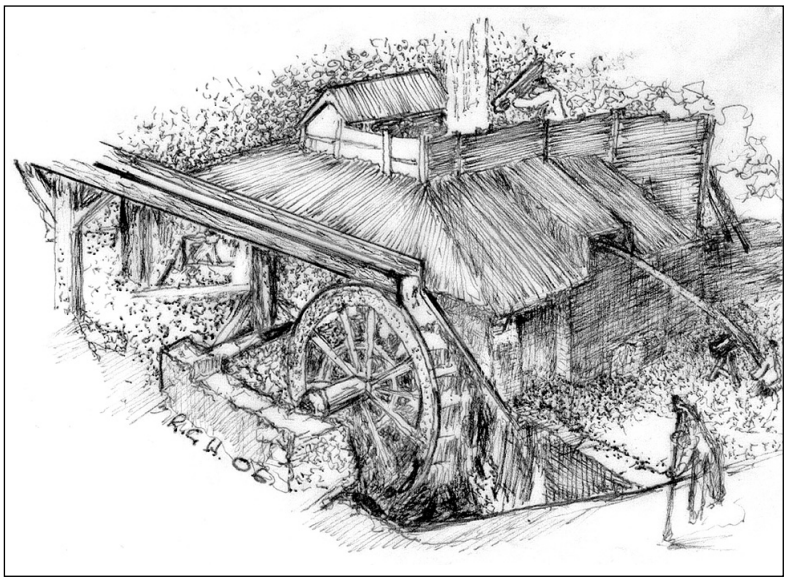

Fig 3: Sketch of blast furnace from 'Meuse landscape with mine and foundry' by Lucas van Valckenborch (Kunsthistoriches Museum, Vienna)

workman is loading the furnace. Hopefully artistic licence is responsible for the unlikely cramped and dangerous position of the hearth beneath the high level trough to the waterwheel. Only one counter-balance is shown for the bellows, but this appears to be rather unusual and will be referred to later.

b) Maps

Rather nearer home are the very small 17th and 18th century drawings from various old maps, collected and published by Jeremy Hodgkinson (Hodgkinson 1994, 20-7). Unfortunately, the originals are so small and primitive in style that it is almost impossible to interpret them with real accuracy.

The perspective drawing (Hodgkinson 1994, 25 fig.7) of Beech furnace shows a typical layout with buildings containing bellows, casting area etc., all closely grouped around the furnace stack (Fig. 4). This shows the corner posts of a timber bracing frame, a known feature of at least some Wealden furnaces.

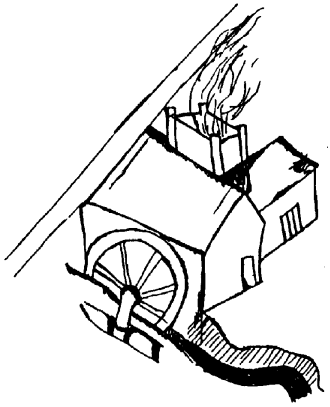

Fig 5 Beech Furnace, Battle, 1724, from a map of the Battle Abbey estate
(East Sussex Record Office, BAT 4421 map 11)

Fig 6 Beckley Furnace 1746
(East Sussex Record Office, D165/1526)

Beckley furnace (Hodgkinson 1994, 25 fig.8) is something of a puzzle (Fig. 5). The central building is the obvious candidate for the furnace. A culvert, possibly with a penstock, appears to enter this building at one end and, although the perspective is rather confused, a large chimney could be associated

with it at the other. If this is so, we may have a case of all the elements of a furnace contained under one roof. Beckley was known to have been in use until well into the 18th century and could be a final development of the furnace plan.

c) Fireback (Fig. 6)

The best contemporary illustration of the external timber frame to the furnace stack is that on the well-known Lenard fireback. Dated 1636, it was cast at Brede and is thought to represent the furnace and its ironmaster. Although it shows only half an elevation in one corner, it gives a clear indication of the frame construction.

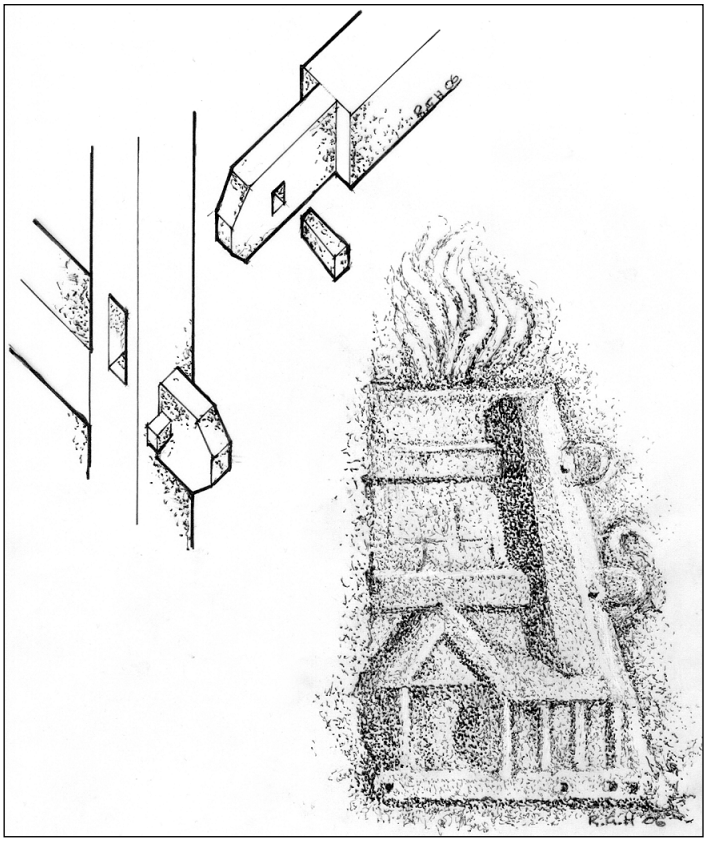

Fig 6: Diagram of tusk tenon joints, with sketched detail of blast furnace from the Lenard fireback 1636

2. Documents

a) The Sidney Ironworks Accounts 1542-73 (Crossley, 1975a)
These contain some accounts for the building of Panningridge furnace in 1542, and its operation until around 1560. Unfortunately details of the construction works are sparse, but the accounts for repairs are interesting.

b) The Diary of Sir James Hope 1646 (Marshall 1958)
Sir James was a Scottish entrepreneur involved in the lead industry. He appears, in spite of the Civil War, to be travelling through England on his way to the Continent, and visited the furnace at Barden. His diary contains a great deal of information about the site.

c) John Fuller's account (early 18th century) (Saville 1980)
A paper giving full instructions for the efficient running of a furnace, by a famous ironmaster.

3. Excavations

Of all the furnaces in the Weald, only seven have been excavated, including one in which only the cannon casting pit could be dug. None stands more than a few courses high, so that plans form the basis of any reconstruction. For full details the reader is referred to their respective excavation reports.

a) Chingley (Crossley 1975b)
It has all the features and layout of what will be seen as a typical Wealden furnace without gun foundry.

Built some time after 1558, by 1588 it was 'fallen down and utterlie decayed'. At some point in that period it was rebuilt on the same base to an unaltered plan. The overall size of the furnace is 5.5m (18 feet).

The base course of the outer skin was faced with a worked sandstone with a rubble core, while the stones in the few remaining courses above were smaller in size and of poor construction with a clay core; a cheaper rebuild perhaps.

The hearth chamber was formed of thick rubble walls, but the hearth itself was partly robbed out and the remaining lining badly damaged by slag attack during the last campaign. Its size could only be

estimated at about 0.9m (3 feet). A drainage sump was formed beneath the hearth, covered by the roughly vaulted stones of its lining. A drainage channel was taken to discharge in the slag over the culverted tail race, while a second was not completed. It would seem that an original, choked drainage channel ran round two sides of the furnace into the tail race.

The corner posts, 0.3m (1 foot) square, to a timber bracing frame were found set directly on the ground at the corners.

Enough timber was found in the bellows area for a reasonable reconstruction to be made.

The timber-lined wheel pit contained remains of a wheel to indicate a size of 3.34m (11 feet) diameter with a width of 0.3m (1 foot). The timber-lined tail race was covered with timber boarding and overlaid with slag to form an extension of the casting area.

b) Panningridge (Crossley 1972)

First built in 1542, it was working until at least 1563. It was then carefully demolished and a second furnace superimposed on it, with a major repositioning of the waterwheel. By 1611 the furnace was no longer standing.

The construction of the second wheel and race destroyed the bellows and casting areas, together with the tail race, of the original furnace. Enough remained, however, for its size to be determined at 5.2m (17ft.) square, sitting on a pad of clay and sand.

The walls consisted of a worked stone outer skin, a core of rubble and clay, and a stone inner skin forming the hearth chamber. No remains of the hearth were found.

From the building accounts a timber bracing frame was built, but no evidence for this was found on excavation.

Fragments of both water wheels survived in their respective wheel pits: phase I with a diameter of 3.6m (12ft.) and width of 0.3m (1ft.), and the latest phase II, 3m (10 feet) in diameter and 0.4m (1ft. 4in.) wide.

No remains of bellows or casting areas survived.

Phase II was thoroughly demolished and no remains of the furnace structure survived.

c) Maynard's Gate (Bedwin 1978)
Built around 1560, it was casting guns in 1574, operating in 1653, but in ruins by 1664.

The furnace dimensions are usually given as 6.5m (21ft. 4in.) square. However, measuring the excavation plan shows this dimension only applying to the east wall, which projects well up to the cannon casting pit. The remaining walls scale at 5.5m (18ft.).

The furnace had been very largely robbed down to foundation level, including the casting and bellows arches with the pillar between. The remaining walls were formed with outer and inner skins of roughly shaped sandstone blocks with a rubble core. Again, the inner skin forms the hearth chamber.

Nothing remained of the hearth but, beneath its probable position, a brick sump was thought to be part of a system whereby any collected moisture evaporated by the heat of the furnace was discharged through vents.

Post holes with square sockets were found at two corners and a recess for a possible third. These did not seem to be integral with the structure, and I suspect they were roof supports rather than part of a frame, especially as roofing tiles were found among the debris in the bellows area.

No remains of bellows were found, although the area was covered with a floor of roughly-shaped stones at the same level as the furnace floor.

The wheel pit and tail race were stone lined and with a timber floor. The race was culverted with a roof of 0.075m (3in.) oak planks where passing the furnace. Enough was found in the wheel pit to reconstruct an overshot wheel 2.5m (8ft. 3in.) in diameter.

A gun casting pit was found set tight against the tail race in the cramped space before the casting arch. it was formed of narrow oak staves and was 1.5m (5ft.) in diameter and 3m (10ft.) deep, secured with lath hoops on a timber base. The whole was set in a wooden box packed tightly with clay. No details remained of either the finish of the top of the pit or of any adjacent timber working floor as at Scarlets and Pippingford.

d) Batsford (Bedwin 1980)

The history of this furnace seems to have been comprised of a series of litigations. It was built by 1571 and, on archaeological evidence, was down by 1620, during which time it had been rebuilt once.

The plan, while similar to the other sites, was asymmetrical. The casting side was 4.8m (15ft. 9in.), the bellows side, 5.5m (18ft.) and the other two sides each approximately 6m (20ft.) wide.

The casting and bellows areas and the intervening pillar were reduced to a single course of sandstone set in a matrix of clay and sand. Most of the rest had been destroyed although enough was left for an overall size to be determined.

The positions of the corner post holes were such that they could not be part of a frame and were most likely roof supports.

The position of the early furnace bellows was only shown by the holes for their supporting posts and stakes.

The wheel pit and tail race, found after diverting the modern stream and excavating the bed, seems to have served both furnaces. Parts of their timber sides and floors were found together with enough of the wheel to determine a size of 3.9m (12ft. 6in.) diameter and 0.45m (1ft. 6in.) width.

The remains of the later furnace are puzzling. Sized 8m (26ft.) by 5.5m (18ft.), the surviving walls were in very poor condition; a mass of burnt and unburnt stone, brick and slag, making them difficult to distinguish from surrounding rubble. There was no sign of a bellows arch and the narrow casting arch seemed to preclude any connection between the hearth and the cannon casting pit.

A brick sump, presumed to be beneath the hearth, appeared to have no drain outlet and could have had a steam vent as at Maynard's Gate.

The tail race made a sudden change of alignment by the casting arch, apparently top avoid a 2m (6ft. 6in.) diameter pit in the stream bed. Due to waterlogging, it could not be fully excavated but enough was found to identify it as a cannon casting pit, partly robbed out. Both pit and realignment have been assigned to the second phase furnace.

A rectangular patch of burnt sand, partly outlined by a course of unmortared stones 2m (6ft. 6in) long and 0.8m (2ft. 9in) wide, was probably a drying pit for cannon moulds.

e) Scarlets (Crossley 1979)
During repair work to a bay after flood damage, a circular pit and tail race were revealed. On excavation a casting pit was found.

The furnace was built in 1574 and the pit must have been constructed between that date and 1664 when gun founding was known to have been carried on there.

The pit was 3m (10ft.) deep and about 1.5m (5ft.) in diameter, constructed with timber staves set on an oak floor similar to that at Maynard's Gate. At the top, facing the hearth, was a two-course stone kerb over which the molten ran into the mould. On the opposite side an oak boarded floor 1.2m (4ft.) wide and 2.1m (7ft.) long, set just below working floor level, was constructed to help ease the mould into or out of the pit. A length of half-round wooden pipe 0.05m (2in.) in diameter was fixed to the side of the pit, starting at the bottom and broken off just below then top. Well caulked, this could have been used to pump seepage water from the bottom.

The wheel pit with stone walls and timber floor contained remains of a wheel 2.9m (9ft. 6in.) in diameter and 0.72m (2ft. 4in.) wide.

The stone tail race with vaulted roof had been realigned to avoid the casting pit as at Batsford.

f) Fernhurst/North Park (Magilton 2003)
Built in 1614 or earlier, operating in 1653 but ruined in 1664. Rebuilt at some time between then and 1762 when gun-founding was recorded, it probably closed by 1777.

The original plan is very similar in size and shape to others in the Weald, such as Panningridge and Chingley, with major

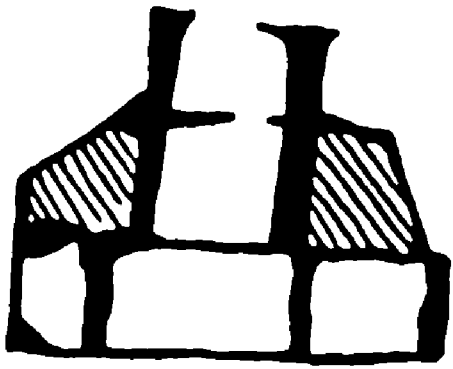

Fig 7: North Park Furnace, Lynchmere, 1660, from a map of part of the Cowdray estate (West Sussex Record Office, Cowdray 1640)

repairs at a later date in brickwork. The complete rebuilding of the original pillar is not surprising as a collapse of this feature was not unusual.

The complex tail races seem to have been the result of a series of realignments with the aim of enlarging the casting area, the first stage of which can be seen at Batsford and Scarlets. The final rearrangement here may well have been to accommodate the multi-cannon casting pit. Paintings of one of these in operation can be seen in De Beer (1991, 65, 76-7).

This is, so far, the only excavated furnace to have a contemporary illustration. Hodgkinson (1994, 25 fig.4) (Fig. 7) shows this furnace in 1660 with two lean-to extensions.

g) Pippingford (Crossley 1975c)

The westernmost of the two furnaces on this site, built around 1700¸ is the more complete of the two. Both were out of commission by 1738.

The furnace measured 7m (23ft. 3in.) square with, as at Maynard's Gate, a slightly greater length towards the casting pit. This extension may only occur at low level to form perhaps a platform for a foreman to oversee works at the casting pit or possibly for a crane for lifting or manoeuvring the cannon mould.

Solidly built in sandstone with ashlar inner and outer skins and a rubble core, the inner skin formed the wall to the hearth chamber. Nothing remained of the main hearth.

The bellows area could not be investigated due to the presence of a large tree.

A furrow in the sand floor of the casting area ran from the hearth to the casting pit, which has a total depth of 4.5m (14ft. 9in.) and a diameter of 1.8m (6ft.). The circular base consisted of a sandwich of puddled clay between two 0.05m (2in.) oak plank floors. The sides were 0.05m (2in.) staves, shaped so that external pressure forced the edges together, and were packed externally with clay. The top was finished with a stone kerb and timber loading bay similar to that at Scarlets. Unfortunately its full length could not be investigated.

A removable support table for moulds was found at the bottom of the pit. It could be adjusted in height by changing the legs to the required length. Fragments of similar tables were found at Scarlets.

The space beneath the table was used as a drainage sump. A lead pipe starting with a filter ran up the wall of the pit to pass out through the stone kerb. Unfortunately it was not possible to investigate for its pump.

Uniquely, among the excavated sites, the wheel pit and tail race were on the opposite side to the casting area, presumably to reduce water seepage into the pit.

The wheel pit was originally a timber structure but the walls had been rebuilt in stone. The area had been badly disturbed and it was only possible to estimate a wheel diameter of 3m (10 ft. 6 in.) and a width of 0.5m (1ft. 9in.). The tail race was stone walled with an arched stone roof and a timber floor.

At the top of the scarp to the west of the furnace were two beam slots, probably taking the beam supports to the charging bridge. From their spacing this was about 2.4m (8ft.) wide.

The Furnace Tower

From the illustrations and especially the fireback we have some idea of the elevation. While the excavation plans give us the scale and at least the basic construction, Hope has informed us that the height of the furnace was 20ft (6.1m), that the width at the top of the flue was 1ft. 3in. by 1ft. 6in. (0.4m × 0.45m) and at the middle 4ft. by 5ft. (1.2m × 1.5m) (Marshall 1958, 147-8). The tuyere was 2ft. (0.61m) above the bottom of the hearth, and the forehearth was 1ft. 6in. (0.45m) square and the same in depth.

The typical structure is shown in Fig. 8, modified from Schubert (1957, 202). It consists of an inner and outer skin of sandstone blocks with a rubble core, the inner skin forming the hearth chamber. This contains the hearth, the ling of which was specially selected tough stone, the chamber packed out as necessary with slag or rubble. No chimney lining remains but it could have been stone or possibly brick.

Fuller, in the early 18th century, refers to ‘bricks which make the inner walls’ and to ‘loamy joints’ (Saville 1980, 65). Bricks were certainly in use at an earlier date, and the loam long washed away.

Clay is mentioned at Panningridge in connection with repairs, probably for rebedding stone (Crossley 1975a, 78 n.13).

There appear to be no foundations as we know them.

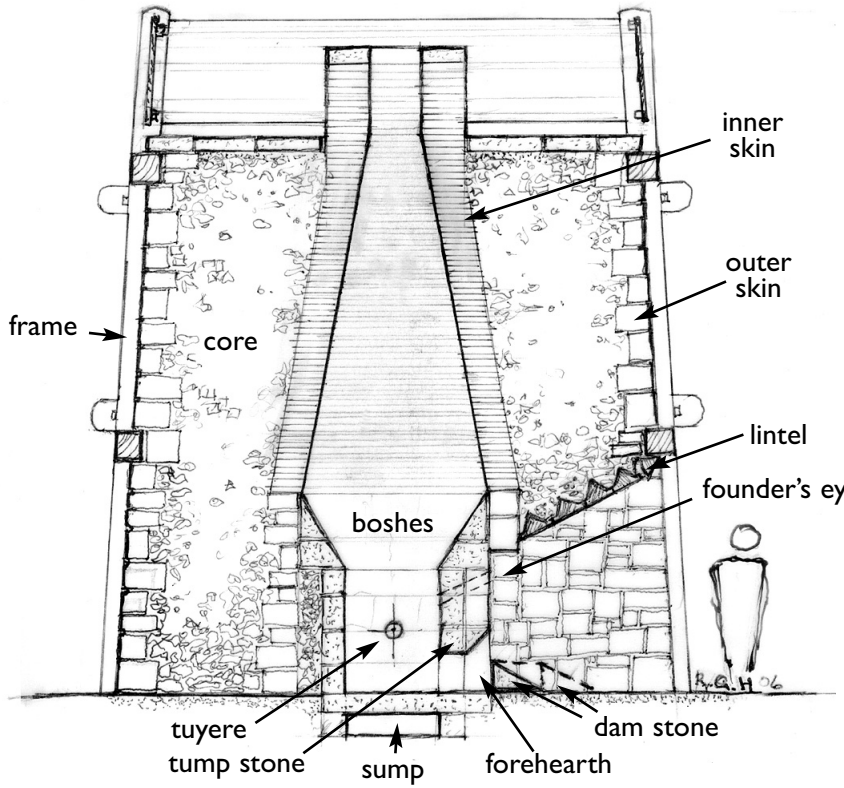

Fig 8: Wealden blast furnace (elevation), showing principal features

Panningridge was built on a pad of clay and sand (Crossley 1972l, 48).

The roofs over the bellows and casting arches were supported by cast iron sows. These were probably cast specially in series of lengths to suit the reducing span.

I am obliged to Brian Awty[4] for the following extract from the inventory attached to the lease of Newbridge furnace to Sir Thomas Boleyn in 1525: 'Four sows of iron, whereof two at the hole of the bellows and two at the issue of running of iron as it molt [sic] away'. This seems too few to support the roofs but they may be structural supports at the junction of wall and roof, sheltered from the worst of the heat by the lining. With this beam in place the founder would be able to remove the old hearth and rebuild it from the inside without the collapse of the structure.

The structure was inherently unstable. Lack of foundations made the walls highly susceptible to damage and cracking from subsidence. The same problems can be caused by differential movements in the structure arising from extreme variations between internal and external temperatures. The slim pillar between the casting and bellows areas was often destabilised by the concentrated loads from the adjoining roofs.. The Panningridge accounts are full of items for wall repairs including rebuilding the forepart of the structure and also the pillar on another occasion (Crossley 1975a, 109 n.13; 177, n.8).

To try and mitigate these weaknesses, a timber frame (Fig. 6) was often constructed of square posts set into the stone face at the corners. Horizontal members were framed into these with anchor joints secured with wedge-shaped pegs. Any structural movements would tend to loosen these pegs which could be periodically hammered tight. These timbers would be fitted together on the ground and hauled up into position to be used as a template for the structure. This technique was used in the construction of contemporary houses. In the Panningridge accounts is an item for 'brede … and one barrel of beere for such as did help to rere the timberworke of the said fornace' (Crossley 1975a, 44). Something very similar happens today at a topping out ceremony.

There is no illustration of a furnace penthouse in the Weald but we know that at least one existed. Repairs to one are noted in the Panningridge accounts (Crossley 1975a, 164 n.5). It is just possible that the post holes found at the side of the furnace contained poles supporting a penthouse at platform level.

Fuller refers to 'twiers' as the 'founder's eye' from which he could almost constantly monitor the smelt and through which he could keep the 'hole' clear as a blockage would extinguish the fire (Saville 1980, 65 para.4). He goes so far as to to call it 'the soul of the furnace'. Hope's 'open hole where the fyr irones [tuyeres] enter the furnace' cannot be the easily accessible 'eye', masked as it was by the bellows mechanisms (Marshall 1958, 147).

The best contender for this is the 'ergasterie'. It was described by Hope as being in the hearth wall where 'they did watch and pull out the slags' (Marshall 1958, 147). With easy access, good view of the smelt and in a good position to clear the ends of the tuyeres, it fits Fuller's

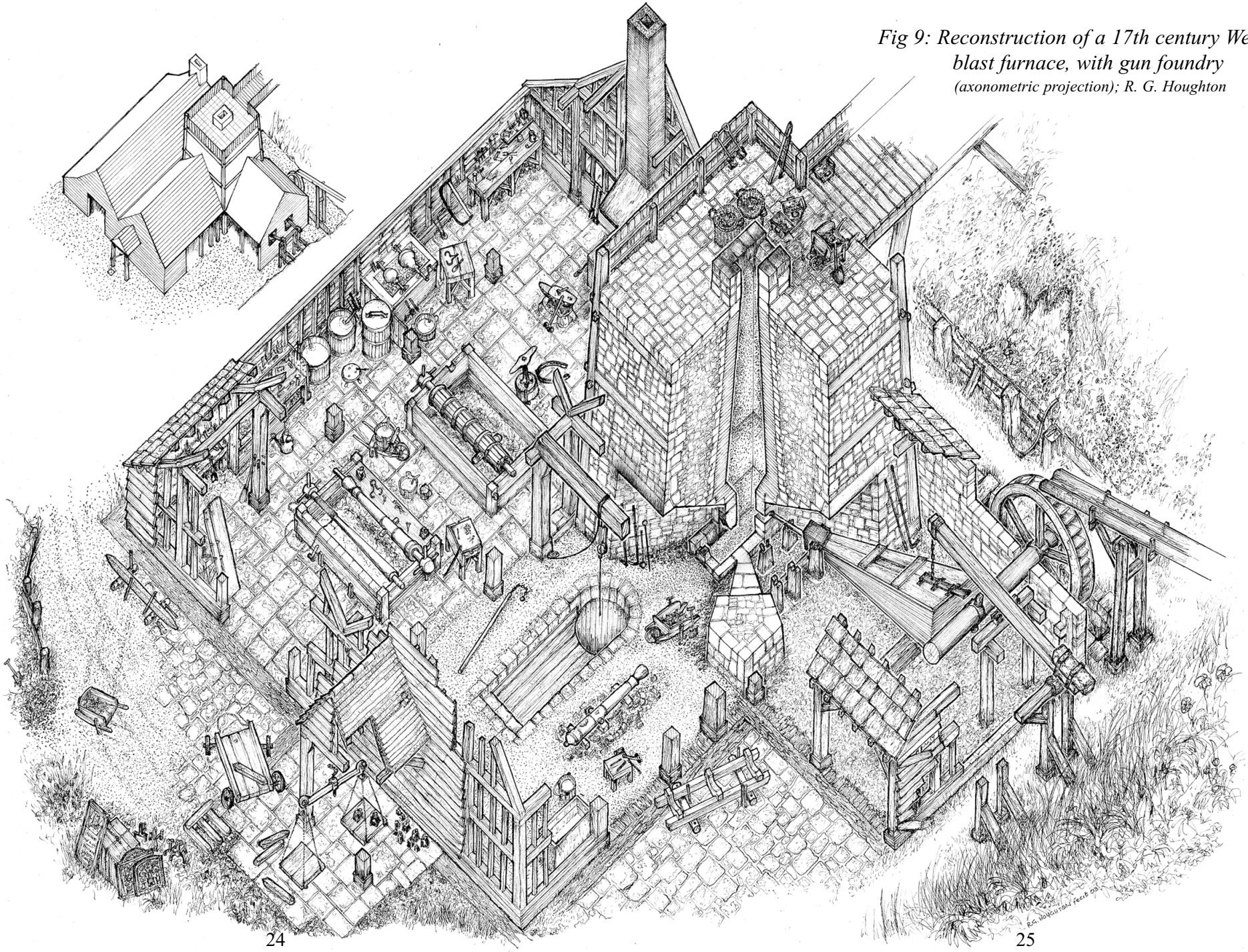

Fig 9: Reconstruction of a 17th century Wealden blast furnace, with gun foundry (axonometric projection); R. G. Houghton

specification very well. This use of the term 'twier' is misleading to us. A somewhat crude drawing in a letter of Edward Browne to his father in 1669 shows a hole where 'dross is let out' in this position (Straker 1931, 78-81).

The Bellows and Water Wheels (Fig. 10)

Only two excavated sites show any real details in the bellows area, and by far the best is Chingley furnace (Crossley 1975b, 32-4). Only leather staining and fragments of timber were left of the two bellows, but ground beams for the tuyeres and nozzles remained with pivot posts for the hinges. The remains of a cam shaft with housings for two sets of three cams, together with a bearing block were in position.

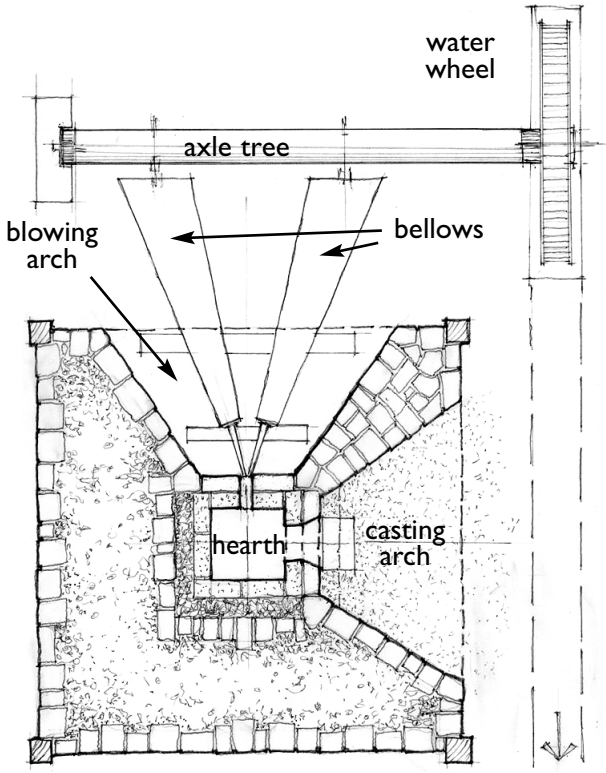

Fig 10: Wealden blast furnace (plan), showing principal features

A ground beam with remains of tenoned uprights showed the position of the back wall to the bellows house which presumably had a lean-to roof over.

There were no signs of pivot posts for a counter weight system at the rear of the house and it would seem that the bellows were worked either directly by the cams as shown by Biringuccio (1540, 301 fig.47), or by a system of levers with counter weights as shown by Agricola (1556, 359).

Hope records two bellows at Barden, each 13 – 14ft. (4m – 4.3m) long and 2 ft. (0.61m) wide at the head, and says that 'they rose in the blast two footes scarce' (Marshall 1958, 147). His description of the counter-weight system is interesting. To paraphrase it: They worked the bellows with cams and rods 'lyke unto our own'. but instead of a beam each had a long pole with a weight on the end of it, 'such as we use to draw water with for salt pannes'. At the bottom right-hand corner of van Valckenborch's painting, there is just such a pole, the upper end passing through a dormer in the roof, and a pivot at the other end with, apparently, two men acting as counter weights. There is only one, where we would expect two – perhaps another case of artist's licence. The date of the painting is about 60 years earlier than the diary. The description also fits the definition of a *shadoof*, a Middle Eastern contrivance for raising water by a bucket on a counter-poised pivoted rod.

Hope also tells us that the cam shaft is 2 ft. (0.61m) in diameter and that of the waterwheel, 12ft. (3.7m) (Marshall 1958, 147).

Water wheels, as described under individual excavations, range from 2.5m (9ft. 6in.) to 3.9m (12ft. 6in.) in diameter, and from 0.3m (1ft.) to 0.7m (2ft. 3in.) in width. Most were fitted with six to eight spokes, set either in a single row or occasionally double. Constructional details as reconstructed from excavated remains are shown in Cleere & Crossley (1995, 240 fig.53).

The Casting Pit

Where found, they are described under individual excavations.

The mould would be carefully lowered onto the mould table in the pit and carefully plumbed upright, before sand was shovelled in to secure it into position. After cooling the sand would be removed and the

whole lifted out onto the adjacent wooden floor. Apart from cannon, the pit was used to cast rollers of several descriptions.

Subsidiary Units

The Moulding Shops

In the late 18th century, Jan and Peter Verbruggen, gun founders, were engaged by the Ordnance Board to modernise the Woolwich Brass Foundry where bronze guns were cast. They were also very fine water-colourists and have left a series of paintings showing, among other thins, the processes involved in the making of cannon moulds, which is the same whether casting in iron or bronze. For the earlier period under consideration the processes would be very similar, if perhaps less sophisticated, and the paintings have been used as the basis for these in the drawing.

The probable drying pit found at Batsford could, in reconstruction, bear a great similarity to those in the paintings. These have now been published in colour (de Beer 1991).

A second kind of moulding shop would have been required in any furnace. This would have housed the specialist carpenters who made the wooden moulds for smaller items such as cannon balls and cooking pits. It would probably also have been used for general carpentry repairs.

The Forge

A blacksmith's forge would probably have been set up on a larger site to deal with repairs to equipment.

Ore and Charcoal Stores

As he arrived at Barden, Hope commented on what we would call the ore-roasting, which seemed to him rather haphazard (Marshall 1958, 146-7). He does not mention any storage facility that would probably have been close to the charging bridge. here it would have been broken into small pieces and loaded into the wood or metal boxes called boshes, holding some 40 or 50 pounds for filling the furnace (Saville 1980, 66).

The charcoal store would have been close by. It had to be kept dry and very carefully stored. When visiting Duddon furnace in Cumbria, we were shown large areas of burning on the store walls where

spontaneous combustion had taken place in incompletely burned charcoal which had been piled high. To avoid this, the store had been divided with low partitions down one side.

For loading, charcoal was measured in baskets, each holding about three or four bushels. These, in fact, can be seen on the Lenard fireback (Saville 1980, 66).

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Notes and references

1 Detail from 'Copper Mines' by Herri Met de Blès (also known as Herri Patenier), Uffizi Gallery, Florence.
2 'Furnace in a Wood' by Jan Bruegel, the Elder ('Velvet Bruegel'), Galleria Doria Pamphilj, Rome.
3 'Meuse landscape with mine and foundry' by Lucas van Valckenborch, Kunsthistoriches Museum, Vienna; reproduced in Schubert 1957, pl.XVI opp p.182.
4 Brian Awty, pers. comm.

JOHN BROWNE, GUNFOUNDER TO THE STUARTS

Part 2 Bronze and Iron Guns, 1630 – 1645

Ruth Brown

A new challenge – setting up the bronze foundry

With the combined skills and enterprise of Sweden and Holland blocking his international iron trade, John Browne had to find other ways to increase his income. One possible client was the Ordnance Office; after his drake sales in the late 1620s, Browne had sold no iron guns to the government for several years. His chance came when it was decided to embark on a programme of shipbuilding, beginning in 1633 with the *James* and the *Unicorn*. Sir John Heydon, of the Ordnance Office, had now to produce 74 new guns.[1] Browne had tried the previous year to persuade the Navy to substitute cast-iron guns for the bronze: '90 tons of brass ordnance would cost £14,332 5s but if made of fine turned iron £3,600', but this was not favoured by the navy hierarchy who still preferred bronze guns for shipboard use.[2]

By spring 1634 the question was becoming acute. The founder at Houndsditch, Richard Phillips, had died in May 1633 and the future of the foundry was in doubt. This left only the establishment at the Tower, run by the Pitt brothers. Having discussed the guns required, the Officers of the Ordnance wrote to Secretary Coke as 'for the new pieces to be cast of brass of the old unserviceable or useless pieces, the writers have always been and will be ready to further the same, wherein they conceive the greatest want will be of founders and foundries'.[3] This was confirmed the following week when Heydon reported the two surviving founders in London 'will undertake but 12 in one year' when the Navy needed 74. Other possibilities were considered, such as employing bell founders from as far away as Bristol, refurbishing Houndsditch, or building a third 'furnace alone and the kiln will make it as serviceable as any of the two with less expense.' King Charles was even considering inviting Italian workmen to set up a cannon foundry.[4]

However, Heydon sent a 'Proposition of Brown, founder of His Majesty's Ordnance, sent and thought the most probable means of despatch'.[5] Browne wrote that while repairing Houndsditch would cost about £150, 'he will undertake to prepare his own foundry in Kent for the casting of 10 tons of brass ordnance according to his first proposal of £100, whereby also much charge may be saved in removing of instruments, workmen, etc., prays that the Lords would give such order as may warrant and discharge the Lieutenant of the Ordnance for the impresting of £211s 16s 8d advanced to Browne on account for preparing the said furnace, providing 15 cwt of tin for the mixture, carriage, fuel, etc, that whilst he is employed on a service of this haste and consequence, he may not be necessitated to absent himself from the work, and that he may have a warrant from the Board to press men'.[6]

It was decided to accept Browne's proposals and through the summer of 1634 the Ordnance officials were busy choosing old or obsolete brass guns at Chatham and Portsmouth to send to Kent for re-casting.[7] In addition 30 tons of copper and tin was needed, at a cost of £4,778.[8] The conversion of the foundry at Brenchley took Browne longer than he expected. Writing on the 17 August to Secretary Coke, Browne explained he had only begun casting in the last 10 days 'by reason he could not be furnished with moneys sooner, and now he would follow it whilst fair weather lasts, that he may deliver them before wet and cold weather comes, which he hopes to do in reasonable time, if he be not again hindered for want of moneys'.[9] The expense of the building or conversion of the new furnace is given in the Ordnance papers which also indicate another problem; the first furnace burned down and had to be replaced. Building and erecting of a foundry viz: timber, stone, tiles, ironwork etc for the casting of bronze ordnance including wages of a carpenter, smiths, etc. for £312 8s. This was followed by a payment for 'repayring the Foundery after it was burnt' and a 'for building of a to house to fyle and pollish the Brasse ordnance'.[10]

To achieve this it seems Browne called on the skills of workmen from London, possibly from the now defunct Houndsditch furnace, as some years later John Round complained to the Ordnance: 'Being entreated to certify the truth, whether William Laud sought to be entertained by Mr Browne, or the latter sought after him; these are to

certify that Browne sent for me, and upon my going to him, he told me that his Majesty had put a business upon him that he durst not undertake without advice, and therefore he had sent for me to know my advice and demanded if I had skill in casting ordnance. I told him that I was no professed founder, but I could help him to one who was in Queen Elizabeth's time; and further I told him in a way whereby he should perform the business with credit…. Mr Browne then told me that if I would do so, it should be the best business that ever I took in hand in all my life; and although I have directed him, yet he has not performed with me. Browne further told me that if he could not happen on one to go through with the work, the King would send to Italy for workmen; to which I replied that there would be a shame to our nation, and thereupon I told him of William Laud, and, upon Browne's request, I sent Laud to him.'.[11]

However it was done, Browne successfully produced the first three bronze cannon which were subsequently sent to Greenwich for 'his Maj'ies view'.[12] This shows how much personal interest Charles took in the new bronze foundry, which would eventually lead him to Brenchley to watch a cannon being cast. The guns were successfully proved.[13] The first castings were not without problems; demi-culverins were supposed to be 15 cwt apiece but they weighed over 16 and 17, while one weighed 22 cwt. The guns were shipped to London, then back to Kent for finishing.[14] By the end of 1635 Browne had cast 62 bronze guns, all drakes: 2 demi-cannons, 40 culverins and 20 demi-culverins. The Pitt brothers had cast another 20.[15] These totals included extra guns for two more ships, the *Leopard* and the *Swallow*. Nicholas Cox the Ordnance messenger went to Kent to measure the new guns so that their carriages could be made and to discuss the heavy 20 demi-culverins.[16]

In 1636 more old cannons were sent to Browne and Thomas Pitt to be cast into new ordnance: Pitt cast 16 while Browne cast 28: 2 demi-cannon drakes; 6 culverin drakes; 18 saker drakes; 2 demi-culverin drake cuts, particularly short light guns, possibly because of the previous complaints of overweight guns – these weighed only 8cwt each.[17] Nicholas Cox, messenger, was paid for going to Mr Browne the founder to bring up of brass ordnance for two new pinnaces.[18] The new guns were proofed and weighed.[19]

In February 1637 the Admiralty and the Ordnance were

considering the armament for ships intended for the expedition to North Africa against the pirates. Again they considered the difference in price of iron and brass: **'**if they be all iron £598 13s 4d, or if 6 whole culverins be of brass £1,637 13s 4d'.[20] Browne offered to cast 30 tons of brass ordnance for the sum of £4178, which he calculated 'is £600 less than His Majesty would have to give at the market rate'.[21] At the same time Browne was anxious to get the warrant signed for £2,399 16s 0d for ordnance.[22] The timing appears tight; the Ordnance wrote to the Admiralty informing them 'Mr Browne, His Majesty's founder, assures them that the ordnance will be ready by the time allotted, which is Lady Day'.[23] Almost 4 tons of copper and 9cwt of tin was bought and several Ordnance officers went down to the foundry of John Browne's in the parish of Horsmonden in Kent to see the weighing of tin and copper early in March 1637.[24] Browne cast a number of different types of gun for the 'Sally ships': 8 cast-iron demi-culverin drakes, each weighing about 17cwt at £35 per ton; 4 fortified (i.e. heavy) guns from ordinary iron at £13 6s 8d per ton[25] and 6 brass culverin drakes, weighing about 22-23cwt and 4 ordinary demi-culverins weighing 31cwt each. Again there was a dispute over the guns being too heavy.[26]

Iron guns in the 1630s

This last payment reminds us that Browne was still casting iron guns; he had already supplied 10 demi-culverin of iron for the Isle of Wight in 1636.[27] Even earlier in June 1635 Browne wrote asking to be permitted to send 25 falcons and 15 minions directly to Plymouth as they were too small to sell in London.[28] In addition he supplied a variety of shot for the fleet in May 1637.[29]

Browne certainly had not abandoned his iron interests and now he grew bolder and sent a petition to the Admiralty, asking for an extension of his monopoly for casting iron goods: iron pots, kettles, backs for chimneys, salt pans, pitch pans, iron weights and such like in July 1635. He repeated his usual mantra, claiming that 'the Swedish Ordnance has so beaten down the market beyond seas, that the Petitioner makes no Ordnance for exportation and only a small quantity to supply the market in England'. He argued that 'unless there may be some other employment to keep Petitioner and his servants at work, they will be compelled to seek employment beyond seas, and the trade

of making iron Ordnance, first invented in England, will be lost'. Now that he was the major supplier of both cast iron and bronze ordnance he was in a much stronger position, so that the Admiralty supported him, writing, 'The Lords conceive therefore that the prohibition of importation of the said commodities may be granted to Petitioner with proviso, that if at any time such grant be found inconvenient, the same shall be revocable. And for the other part of the Petitioner's proposition the Lords conceive it requisite that he should have the sole making and selling of iron ordnance and shot according to the contract made with the late Lord Treasurer until he be satisfied the money he has already disbursed in His Majesty's use'.[30]

When word got out about Browne's new monopoly, his old adversary, Sir Sackville Crowe, petitioned the king to re-hear the case between him and Browne and re-judge it in his favour.[31] A year later in 1636 John Browne asked for his grant to be renewed for another year.[32] In another undated document, he explained how he was unable to pay any more for the privilege, because of the 'the disastrous consequence to him of the opposition of the Swedish manufacture, and that owing to the failure of many merchants of late, and the doubt of many more, there was such scantiness of money that there was none to be taken up at interest, especially by any man that belonged to the king's majesty'.[33]

Captain Thomas Whitmore and experiments

In May 1637 John Browne became involved in one of the more intriguing aspects of his working life. A debenture in his name, dated 11 May 1637, states, 'For the Casting of a Sacre Drake beeing transmuted out of iron into Copper by Captains Whitmore (as hee affirmed) the tryall of which peece of Ordnance was made before his Matie at the Military Yard which saker did weigh x c i qtr xv lb'. Browne was paid just for the casting, for tin and carriage of metal to the foundry and the gun from it.[34]

Captain Whitmore, with his colleague Sir Philiberto Vernatti, a Dutchman of Italian extraction who worked in fen reclamation, was involved in the exploitation of the copper minerals in England. In this year Charles appointed him to inspect the copper mines in Cumberland.[35] He was paid £102 2s for 17cwt 2lb copper delivered for His Majesty's use, as certified by Browne.[36]

Given the paucity of information, it is impossible to say whether this was a deliberate attempt at falsification or a genuine if misguided experiment. This was not Browne's last involvement in experimentation. In 1639 an unnamed Dutchman cast a pair of experimental demi-culverins which broke in proof; the Dutchman had better luck with a light demi-culverin cast by Thomas Pitt which passed proof.[37]

Problems and difficulties

Mysterious captains and Dutchmen were not Browne's only problems in these years. The inhabitants of nearby Cranbrook complained to the Council about Browne, claiming in 1637 he, 'by a commission for making brass or iron ordnance', had 'seized upon the greatest part of the woods as were felled', and the inhabitants were now worried this would have a serious effect on their cloth manufacturing. They asked for him to be restrained from removing any more wood and erecting a new furnace in their parish. They suggested he move to Sussex, as there was no cloth making there. Browne replied that the poor could not live on clothiers' wages, and that he bought wood from a variety of sources and returned what he did not use. He pointed out that he 'only continues the use of one ancient furnace in Cranbrook' and that 'ordnance and shot could only be made with charcoal while the clothiers could use coal'. He ended with a flourish that it 'argues ill affection to his majesty's service to desire his founder to pull down his works'.[38] This suggests that Browne must have been using Bedgebury at the time.

In May 1636 the East India Company asked some of its members 'to treat with Mr Browne, the King's gun founder, about the sale of the Company's iron ordnance'.[39] However a year later in May 1637, having discussed what to do with 125 broken cannon, the Company decided to sell them to Philip White, the Admiralty's Blacksmith.[40] However in August that year White found himself attacked by Browne, who claimed his activities were breaking his patent. White explained he 'has these twenty years past bought of the East India Company and others broken iron ordnance and at his great charge, makes them useful again, and some do better service than when they were first cast. Mr Brown His Majesty's gun founder, threatens to arrest the said ordnance, although the greatest part of them, which were sold by Browne to the East India Company were so defective that they lost about £1,500.

Prays the Lords to consider the reasons annexed, and to grant petitioner their warrant that Browne shall not molest petition'.[41] He wrote to the Admiralty, who asked in October for both parties to be called in to 'compose the differences between them, certify what prejudice he conceives it may be to the patentee or the kingdom to permit the petitioner to sell within the kingdom such ordnance as he mends'.[42]

Now another dispute cropped up that had been simmering since 1633. On the 2 Dec 1637 the Admiralty ordered an investigation into the complaint of John de la Barre, merchant. In May 1633 the Lords allowed John Sulke to transport 20 pieces of iron ordnance, which belonged to his ship which had been wrecked near Cromer. However John Browne had prevented their removal as he considered this in an infringement of his patent and threatened to take the affair further. In May 1638 the Ordnance were still investigating the matter.[43]

The *Sovereign of the Seas*

From the later 1630s there is a problem interpreting the debenture books. Following a reorganization of the finances, the debentures were now arranged by budgets instead of in a chronological sequence. Moreover it is clear that the dates on the debentures are not when the items were accepted, but possibly when they were paid for. For example the debentures for the *Sovereign of the Seas* for guns cast and proofed in 1638 are dated February 1641. This hampers attempts to build an accurate chronological survey for these next few years.

Browne's major project in the late 1630s was supplying the guns for the *Sovereign of the Seas,* Charles I's giant three-decker ship. Again this was another project in which Charles took a personal interest, designing the emblems and inscriptions on the guns himself, and increasing the number of guns carried. It seems that six of the guns were cast by Thomas Pitt, while Browne produced the remaining 96. Such a project would have been unimaginable in the preceding decade and even now Browne had either to rebuild his old furnace or erect a completely new one. The charge for building a new foundry was included in the Ordnance's estimates.[44] Browne was awarded £1000 for 'the building and forming of a newe foundrey and furnace, being made of purpose in the Parish of Branchley, Kent …to cast divers peeces of brass ordnance …for the Soveraigne of the Seas; for making a vault, for

iron and wooden tools and other necessaries requisite and useful for a founder of brass ordnance, together with all Instruments fitting thereunto to perform this'.[45] Other items were needed – a new weighing apparatus and set of weights for 2½ tons were needed for the heavier guns.[46]

As before, Ordnance officers supervised the transfer of unserviceable brass guns and saw them weighed and delivered to Browne.[47] Additional metal was also sent.[48] In April the Ordnance messenger made two visits to Browne in Kent.[49] Three proofs were held in May, June and July for the guns, which were dragged to a nearby field for proof and then weighed; the Ordnance had to pay for the use of the field and road and for the land spoiled by the shot.[50] Afterwards the guns had to be engraved with an elaborate coat of arms and inscriptions; rose and crown, sceptre and trident, anchor and cable, an inscription in Latin, *Carolus Edgari Sceptrum Stabiliuit aquarium,* and other titles.

The guns themselves, including the six cast by Pitt, were 16 cannon of seven; 4 cannon of seven drakes; 8 demi-cannon drakes; 6 culverins; 22 culverin drakes; 2 culverin cutts; 4 demi-culverins; 38 demi-culverin drakes; 2 demi-culverin drakes. In addition to £1000 for the new furnace, Browne's debenture for the *Sovereign's* armament came to an astonishing £23,528 19s, which included the payments for guns cast by Pitt.[51] Significantly it appears not to have been paid for many years.

The *Sovereign* remained a potent symbol of Charles I's ambitions; her nautical career was not distinguished, but the harnessing of the state's resources to build her through the detested Ship Money hastened on the Civil War. Out of the 102 guns cast for the *Sovereign* a single demi-culverin drake remains, in the Royal Artillery collection at Woolwich. Casting of the armament of the *Sovereign* – 96 bronze guns, including cannon of seven, demi-cannons and culverins, weighing between 45 and 57 cwt – in the space of a few months, was probably Browne's finest achievement.

However Browne did not rest on his laurels; the government required cast-iron guns for Jersey: 8 demi-culverins; 4 sakers.[52] There were also a number of bronze 3-pounder drakes required for the artillery train early in October 1638, which represented a new venture for Browne as these were field guns for the artillery train. King Charles,

accompanied by a party of Ordnance officers, attended the casting of a 3-pounder drake at Browne's furnace; it was inscribed with 'CAST IN PRESENCE OF HIS MAJSTY OCTO THE FIFTH 1638' (Blackmore, 64-5). This was probably one of the 20 3-pounder drakes listed in the debentures for 1640.[53] Cox, the Ordnance messenger, had gone to Kent with a warrant for Browne about the casting of drakes and the day after, 6 Oct 1638, he went again to Mr Browne in Kent about 20 brass drakes that he was 'to cast by my Lord of Newport's order', taking 5 days.[54] This shows the personal interest which Charles took in his gunfounder's work. Another series of guns from this period also survives, part of a set of small guns cast for Charles, Prince of Wales. The king continued to show a personal interest in Browne and his works, when the Master of the Ordnance, Lord Newport, wrote to Heydon on 19 April 1639, 'I am commanded by the King to order you to send with all speed the 10 pieces lately provided by John Browne the founder, of 3 bullets'.[55] The following month Browne received a debenture for ten 3-pounder drakes.[56]

Outbreak of war

These guns would be an indication of Browne's future work for the government; for the next few years field guns and iron guns for defences would dominate his workload. Rumblings of war in what from Kent must have been immensely far off, in Ireland and northern Scotland, would in the course of a few years lead Browne himself to incarceration on the orders of Parliament.

Early in 1639 Browne appears to have concentrated on iron guns; the proofmaster was paid for proving 20 iron pieces, of which one broke in proof.[57] These appear to be the guns in a debenture of 1 April 1640: 4 iron culverins, 6 demi-culverins and 4 sakers, all engraved with the rose and crown and costing £13 6s 8d the ton. In addition there were two demi-culverin drakes, described of 'very fine mettle and of extraordinary workmanship in the making, turning and graving' at 40s the cwt., the total bill coming to over £400.[58] The broken gun was replaced by one brought up from Deptford.[59] Other iron guns were ordered for fortifications, one demi-culverin for Deal and two demi-culverins and 3 sakers for Archcliffe Bulwark at Dover.[60]

Bronze field guns were still required and the small, cheap

3-pounder drakes were ordered in batches; in October twenty larger 6-pounder drakes were ordered.[61]

However at this stage Browne clearly saw the outbreak of war as a selling opportunity; in September 1639 he managed to have his monopoly 'for the sole making, new boring and selling of iron ordnance and shot in England, Ireland, and Wales, and as HM's agent, to have the sole transportation and sale thereof to foreign parts' extended for 21 years.[62] The same month he laid complaints against ironmasters in Gloucestershire: John Hannis, of Bishopswood, George Williams, the founder of the said works, William Shingleton, and William Little, accusing them suffering 'divers quantities of cast-iron manufactures to be made, contrary to His Majesty's further patent'.[63] It was probably on this occasion Sir Sackville Crowe made another attempt to have his monopoly restored, sending in a history of the 'grant for making and transporting iron ordnance about to be made to John Browne'. Sir Sackville Crowe narrates the history of his own grants in connection with iron ordnance, that of several previous grants obtained by Burlamacchi and Browne, and states a variety of objections to the grant now under consideration.[64] However Browne was no longer a mere artificer but someone who could count the king as his patron, with friends in high places and an important part of England's war effort. This was demonstrated in May 1640 when John Browne was able to use his position to put pressure on local officials to release 'Robert Tredge and John Harding, junior, lately pressed for soldiers, and of any others of the workmen in the employ of HM gunfounder, John Browne, and to provide that there be no more of his workmen or servants pressed or hindered in their works'.[65] In August 1641 the Ordnance messenger visited the foundry, then went to Yalding to examine the riverbanks to find what was causing the obstructions to the boats carrying ordnance and then to investigate the turning out of the river from its usual route, preventing Browne from turning and boring his cannon.[66]

Moreover in January 1640 when the Council of War looked at the estimates for making of several sorts of iron and brass ordnance, they noted that the price had increased and asked the Ordnance for an explanation.[67] The Ordnance replied that this was because the guns were of a different length from previously. They also suggested that the shot allowances per gun now be increased.[68] In March the council were still

examining the two estimates for arming both the king's ships and hired merchant ships. It was decided to order 120 pieces of cast-iron of 'fine metal turned for furnishing' for the smaller king's ships, whose bronze guns had been removed, at a cost of £5,220 16s 8d. and 120 ordinary guns for the merchant ships.[69] This may be connected with Browne's offer 'to buy at a disinterested valuation all the East India Company's iron ordnance; Alderman Gayre and Captain Stiles are desired to ascertain the terms and report to the Court' in July 1640.[70]

The troubles in Ireland led Charles to order fresh guns for that province, 6 demi-culverins and 2 sakers to be cast from old guns in March 1639.[71] The following year 20 demi-culverin drakes were ordered for Ireland but before they were finished the civil war had begun and the guns were impounded in the Tower with Browne left demanding payment from Parliament or at least the return of his guns.[72]

The outbreak of hostilities also led to fresh demands for ammunition. In December 1638 the Ordnance messenger arrived with warrants for making petards and grenadoes.[73] In the next year Browne delivered a variety of ammunition: round shot, including exceptionally large bastard of cannon of seven shot, weighing over 35 pounds each for the Duke of Lennox, burr shot, shells and hand grenades.[74]

In the winter and spring of 1640-41 Browne was casting guns for the crown's special service, two 12-pounders and six 6-pounders. Old ordnance was delivered to the foundry in October 1640 and they were engraved with the rose and crown, CR and inscriptions of the name of the Master of the Ordnance, the earl of Newport. Yet again the guns were heavier than expected, due, Browne claimed, to the 'extraordiniary length and Weight' and had had to add some of his own metal, The debenture came to £686 8s 3d. The guns may have been intended to strengthen the defences of the Tower of London.[75]

The Forest of Dean

Around this time Browne became involved in the royal Forest of Dean. This seems to have been seen as a cheap way of paying off Browne rather a way of using his knowledge and technological skills to exploit the resources there. This is probably connected to the late dates on the debentures. The crown was in financial straits and owed Browne £8,000. Although there were various attempts to harness the resources

of the Forest of Dean for ordnance production it never rivalled the Weald in importance or production. The matter became immaterial with the outbreak of civil war in which Kent was quickly secured for Parliament, and stranding Browne in the south of England. Browne was allowed 5,604 tons of cut timber in the Forest of Dean at the rate of 10s per ton, to be spent in the making of iron, as well as the use of Cannop and Lydbrook furnaces and forge for two years and three months. Paradoxically this affair brought him into conflict with the Sir John Wintour, farmer of the Forest of Dean and local landowner.[76] Browne later claimed Wintour refused to deliver up the furnaces and forge.[77] Interestingly Browne had acquired some connections in the Midlands as his daughter Ann had married Thomas Foley, son of a Staffordshire ironmaster in the 1630s.

Civil war- a dangerous position

With the outbreak of the civil war in summer 1642 the Ordnance records come to an abrupt end and the continuous series do not reappear until the Restoration. There are occasional volumes in the Minute Books,[78] Debenture Books[79] and Bill Books[80] which give us glimpses, but we miss the larger, consistent picture built up over the preceding decades. In particular we have little information about 1643, an important year when the Kentish royalists were defeated at Yalding Bridge close to Browne's works and the county was held for Parliament. The Ordnance clerks, that Browne was used to dealing with, decamped with the king and new men were put in charge of the Ordnance Office which was eventually subsumed into the naval department. Browne, like many of the other Ordnance suppliers was left in the south and had either to deal with Parliament or face a difficult future, although many of the minor officials like Nicholas Cox, the messenger, and William Frankyn, the proofmaster, remained in position, giving some continuity. Despite his previous close connections with the king, he decided to stay based in Kent and London and deal with Parliament as best he could. Paradoxically his daughter's father-in-law, the puritanically inclined Richard Foley, found himself supplying iron and arms to King Charles' army at Oxford.

Browne had early warning of his future dealings with Parliament in 1642. In June of that year he was asked to give the Commons a list

of the grenades in his possession and who had ordered them.[81] Then in October he tried to either retrieve or get payment for the 20 demi-culverin drakes ordered for Ireland which the House of Commons ordered to be detained in the Tower.[82] The matter was referred to the Committee for the Navy, but Parliament insisted the guns stay in the Tower in the mean time.[83] The following year Parliament ordered eight brass guns in Browne's keeping to be taken into their custody, and inquired into the whereabouts of his grenades again.[84] In July 1643, 25 small iron guns were transported from Snodland in Kent to the new dock at Chatham for the fleet, while brass and iron guns for the navy were proofed at Mr Browne's.[85] However with 1644 we have much more information again about Browne.

Although we primarily think of the Civil War as a land engagement, there was also a naval side to the conflict. Parliament began to build up the navy, adding new ships each year. Early in 1644 Ordnance officers visited Mr Browne's in Kent.[86] A few weeks later four tons of obsolete brass chambers were carried to Mr Browne's in Kent.[87] As usual, Browne was pressing for an advance of £1000 which the Committee for the Navy agreed to pay out of the Levant Company's loan.[88] At the same time Browne owed money to the East India Company – he had probably bought some of their old ordnance – and when they heard about the money, they suggested trying to recoup the £59 3s from the money assigned to him.[89] He was still in debt to them in July and the Court suggested taking 'a small gun or two from him in payment'.

Family and work

It was in this same month, July 1644, that Martha Browne died. John had married Martha Tylden, a Brenchley woman, in 1616 and they had four children who survived into adulthood: three sons John, Thomas and George and a daughter Ann. Ann was married into the Foley dynasty of ironmasters and had borne at least one son by this time. John had married Susan Langley, the daughter of a Colchester merchant and by 1644 was already the father of a little girl, named after his mother, Martha. John's mother, Anne, had died at Horsmonden in December 1637.

The questioning of the Brownes and the survival of one of their

business letters from the times gives us a glimpse of how the business was run at this time. John Browne the elder often stayed in London at his base near Martin's Lane off Thames Street near the Tower of London while John Browne the younger ran the business in Kent. Browne used a number of agents and managers. In London he had two agents, Richard Piece and Samuel Ferriers. In Kent a number of workmen are mentioned, Robert Cheek or Clerke was a clerk, Hugh Richardson was an engraver and clerk who surreptitiously joined the Royals with another of his colleagues, Henry Quintyne was the trusted deputy in Kent and continued working for the family until his death in the 1650s. In June 1645 he wrote to John Browne, sending up a packet with his passes and Ferrers' accounts of casting at Barden and Cowden. He promised to send later a corrected account from Brenchley.[90] In 1646 the Scots politician Sir James Hope visited the works at Barden and left a vivid picture of the furnace and workforce.[91]

In the summer of 1644 he was producing ammunition for the parliamentary forces: round shot from demi-cannon, down to falcon and hand grenades.[92] By September copper was purchased from the Dutch and sent to Browne to cast 'into so many drakes of 3lb ball as it will make'.[93] In addition he provided three cast-iron culverins at 16s 8d per cwt, and 6- and 3-pound shot.[94] On 3 October 1644 the Ordnance Committee sent a letter to Mr Browne to send up the 14 drakes for the Lord's general's army with all speed.[95] By the end of the month 14 brass 3-pounder drakes and over 26 cwt of 3-pound shot had been received.[96]

In November 1644 Browne supplied a larger number of iron guns for Parliament's ships: 6 culverin drakes; 10 demi-culverins drakes; 4 saker drakes; 12 minion drakes; four 3-pounders. In addition there were a number of cutts: 12 demi-culverins cutts; 5 saker cutts; 4 minion cuts-cuts- 4, as well as 5 bronze demi-culverin drakes. Finally for the fleet he also supplied round shot from culverin down to falcons as well as cross-barred shot, double-crossed barred shot, bace and burr shot and hand grenades. The two bills for all this came to almost £2,800.[97]

At the beginning of 1645 the Navy and the Ordnance were discussing the armament for the new ships for the next summer's fleet and a letter was written on 24 February to Mr Browne to supply 20 iron demi-culverins, 20 sakers and 20 minions as well as round shot cross-barred shot and hand grenades.[98] The following month he was granted

an imprest of £1,000 towards fulfilling the contract.[99] Also in March the navy ordered guns and ammunition for the *Dove* and *Robert* but the Ordnance officials had to write that having sent the order to Mr Browne 'he refuseth, saying there is noe order yett taken with him either for Ordnance or shott'.[100] On 7 April another contract was drawn up with Mr Browne for, 2600 round shot and 1000 hand grenade and one brass mortar piece of 8½ inch, 'to be paid halfe in hand and halfe at 3 months'.[101]

In the summer Browne was concentrating on supplying ammunition; his agent, Richard Pierson, was contracted with 300 granado shells for the great mortar piece in Sir Thomas Fairfax's train as well as round shot.[102]

Trouble with Parliament

Unknown to Browne a storm was about to break over his head. On 15 June Parliament won a decisive victory at Naseby. In among the abandoned baggage were found bundles of royalist correspondence; one item appeared to cast doubt on John Browne's loyalty to the Parliamentarian cause. On 23 June 1645 the House of Commons set up a committee to investigate the matter and ordered 'That Mr. Browne the Gunfounder, and his Son, shall be forthwith sent for in safe Custody: And that all their Papers be seized on: And that no Person be suffered to speak with either of them, but in the Presence and Hearing of their Keepers'.[103]

The papers under investigation included a letter from Thomas Walsingham to Lord Digby on Kentish affairs, assuring him of the devotion of local people to the king's cause, 'especially Mr Browne, the King's gunfounder, who makes all the cannon and bullets for Parliament's service'. He suggested Charles 'should send 10 days before to Mr Browne, so that he may come from London into Kent, where his works are, and against the King's coming he will provide cannon and bullet…The rebels have no guns or bullets but from him, and that from hand to mouth, there being none in the Tower which he is forced to provide else they would put others into his works. He hath not provided half so much bullets as was required for the expedition. If the King comes, he will deprive the rebels of all the ammunition and guns…By this means the King will not only gain this county but all the

works which now make the ammunition to fight against him'.[104]

On the 24 June both the Brownes were examined:

John Browne senior was reported to live in Martin's Lane by the Old Swan, in the city 'and came out of Kent upon Thursday was sevennight; he went thither on the 12 May. He knows none of the Walsinghams but Sir Thomas, and knows not whether he has any son. Denies having received any letters for Mr Walsingham. He knows nothing of bringing any of the King's party into Kent, nor of any direction to be given to him when the King comes into Kent. Particulars of ordnance bespoken for the Parliament and by order of the Committee of the Navy. Mr Fermers hath bespoken 300 small pieces for the market, but he has received no letters or orders from the King or Oxford. Has not heard of any commission of array to be brought into Kent, or that his name was used.' He also stated that his chief workmen in Kent were Henry Quintyne and Thomas Hawkins.

John Browne junior also claimed to know nothing about Walsingham. His testimony gives a picture of how the Brownes' business was run:

'He lives at Horsemonden in Kent with his father. They have three furnaces for the casting of whole and demi-culverings etc and all kinds of round shot. His father by letters every week gives direction what shall be cast. He keeps no accounts, but his father does of such as are for the Parliament.' He further stated, 'What is sent up for the market is delivered to Richard Pierson dwelling in Philpot Lane, but if for Parliament they go through his hands and are sent unto the Tower. Guns which are for the market or merchant are delivered to Mr Samuel Ferrers of the Half Moon in Thames Street.'[105]

Having examined the Brownes, the committee then set about interviewing on 27 June a number of other witnesses, most of whom seemed hostile to the Brownes. First was Thomas Oldfield, described as 'dwelling in Old Street, once a workman of John Browne' who claimed that Browne 'did send unto the King four men to cast ordnance about 2 years since. A woman living with Mrs Hester, a kinswoman of Browne, said she knew the King had intelligence weekly and daily from London'.[106] Robert Clerke, or Cheeke, servant to Mr Browne claimed that Browne 'with the King when he came to the Parliament for the five members', which given Charles' interest over the years in the

gunfounder was certainly plausible. Meanwhile Sir Thomas Walsingham was interviewed, who claimed, 'in the year 1643, he being a prisoner amongst the rebels in Kent, he heard there said, that if the Royalists got to Yalding they should do well enough for ordnance for Mr Browne was their friend'.[107]

Richard Pierson, Browne's agent who lived in Philpot Lane off Eastcheap was the last to be interviewed; he said that Hugh Richardson, one of Browne's workmen, 'left him about 2 years since, and is now at Oxford, working for the King' .He claimed that they should have delivered 4,000 saker shot for Sir Thomas Fairfax's army, had only sent 2,000. Under cross-examination, he admitted he was not sure about the shot orders.[108] Bizarrely while Browne was still incarcerated, the Ordnance business had to be carried on; they made a contract with Pierson for 300 saker shot on the 17th July.

A month later on the 24 July 1645 Brown was examined a second time. When questioned about his workmen, he admitted that thirty men had left about 2½ years before, but claimed it was because there was no employment for them. He explained that Hugh Richardson had been an engraver and the clerk at the brass foundry and that Browne had dismissed him for fraud. As far as he knew he had left to pursue a career as a gunner with the Earl of Essex. Browne admitted he had helped Richardson's wife with money and that he had heard subsequently that Richardson had died. He spoke a little about other workmen such as Larking who had assisted in boring, Edbury and Jasper Dimond who were employed in casting.[109]

The affair put Parliament in a quandary – they still needed guns and ammunition and while Browne was kept under arrest being investigated, the business was run with Richard Pierson acting as agent supplying shot and grenado shells.[110] It was not till 28 August 1645 that Browne 'now under Restraint upon Order of this House, be forthwith inlarged, upon good Security, to attend the Pleasure of this House upon Summons'.[111] However control of his business was vested in Samuel Ferrers, one of his London agents, and his son-in-law Thomas Foley. He continued to be given contracts, for a mortar and shot.[112]

However the Commons hit a crisis towards the end of 1645 with the Admiralty's need to arm three new frigates then being built; Browne was able to turn his monopoly position to his own advantage. On the 13

December 1645 the Lords discussed a paper from the Navy Commissioners, 'concerning Eighty-six Pieces of cast Iron Drakes, for the Three Frigates ordered to be built for the State'. Browne had been consulted about 'his Prices, and Times of Payment'; he demanded 'for Four Demy Cannons of Thirty three Hundred Weight apiece, Fifty eight Demy Culverins of Twenty-five Hundred Weight apiece, and Twenty four Demy Culverins of Seventeen Hundred Weight and One Half apiece, after the Rate of Thirty-two Shillings per C't which amounts unto Three Thousand Two Hundred and Three Pounds, Four Shillings, and for Shot for the said Pieces, Two Hundred Ninety-seven Pounds, Eight Shillings, and Six Pence' and being Browne 'humbly praying, that he may have One Half in Hand, and the other Half by Monthly Payments at Four Hundred Pounds a Month'. The Lords suggested to the Commons that this be agreed as soon as possible so the work could start.[113] The Commons were forced to agree, stipulating them to contract with 'Mr. Browne, or any other Person'.[114]

The whole business showed up the weakness of ordnance supply and the result of twenty-five years of government policy of reducing the gun producers to one single source; this lesson would not be lost on the Navy and Ordnance Committees in the next few years. At this time there was only Mr Browne and no 'other person'.

On the 30 December 1645 Sir Walter Erle of the Ordnance reported to the Commons about the proposed contract. They agreed 'that Mr. Browne's Works for the Making of Ordnance and Shot, in Prosecution of an Order of the House of Commons, committed to the Charge and Managing of Mr. Samuel Ferrers and Mr. Thomas Folley, be delivered up to the Possession and Government of Mr. Browne…That before Mr. Browne be repossessed of those Works, that he give Security to Mr. Ferrers and Mr. Foley, to satisfy them One thousand Pounds, or such other Sums of Money, as, upon Account, shall be found to be by them disbursed in the Managing of those Works, by virtue of a Contract made with the Committee of the Navy…That what Monies shall appear, upon Accompt, to be received by Mr. Ferrers and Mr. Foley, from those Works, shall be allowed to Mr. Browne, upon the Accompt…That Mr. Browne do enter into a new Contract with the Committee of the Navy, for the Delivery of Ordnance and Shot for the Use of the State…That the Committee of the Navy do take Security, of Mr. Browne, to appear

upon Summons when he shall be required by this House; and not to do any thing to the Prejudice or Disservice of the Parliament'.[115]

John Browne was back in charge of his own works again.

Abbreviations in references

CSPD Chas I	*Calendar of State Papers Domestic, Charles I*, eds J Bruce, W D Hamilton and S C Lomas, 23 volumes, (London, 1858-1893).
CSP-EI	*Calendar of State Papers, Colonial Series, East Indies, China and Japan, 1513-1634*. ed W Noel Sainsbury, 5 volumes, (London 1862-1892)
PRO	Public Record Office (now National Archives, Kew)
WIRG	Wealden Iron Research Group Bulletin, *Wealden Iron*
WO/49	Ordnance Office Bill books, Public Record Office (now National Archives), Kew.

1. *CSPD Chas I* , **5**, (London, 1858-1893) 554
2. ibid. 499
3. *CSPD Chas I* , **6**, (London, 1858-1893) 473
4. *CSPD Chas I*, **14**, (London, 1858-1893) 327-28
5. Historical Manuscripts Commission, 12th Report, Appendix, part II, The Ms of the Earl Cowper, **II**, London, 1888, p. 46)
6. *CSPD Chas I*, **1640-1641**, (London, 1858-1893), 365
7. WO 49/65, 42v, 79v
8. *CSPD Chas I*, **8**, (London, 1858-1893), 501
9. *CSPD Chas I*, **7**, (London, 1858-1893), 197
10. WO 49/65, 159v
11. *CSPD Chas I*, **14**, (London, 1858-1893), 327-28
12. WO 49/65, 97v
13. WO 49/65, 145
14. WO 49/65, 157
15. WO 49/65, 103, 134, 157, 159
16. WO 49/66, 34
17. WO 49/67, 54-55
18. WO 49/67, 13
19. WO 49/67, 62; WO 49/70, 96v
20. *CSPD Chas I*, **10**, (London, 1858-1893), 437, 443
21. *CSPD Chas I*, **23**, (London, 1858-1893), 512
22. *CSPD Chas I*, **10**, (London, 1858-1893), 446
23. ibid. 441
24. WO 49/70, 135v
25. WO 49/70, 137v
26. WO 49/70, 171
27. WO 49/67, 54-55
28. *CSPD Chas I*, **8**, (London, 1858-1893), 102-03
29. WO 49/67, 161
30 *CSPD Chas I*, **8**, (London, 1858-1893), 288
31. *CSPD Chas I*, **23**, (London, 1858-1893)
32. *CSPD Chas I*, **10**, (London, 1858-1893), 35
33. ibid. 291
34. WO 49/70, 193
35. *CSPD Chas I*, **12**, (London, 1858-1893), 58, 482
36. *CSPD Chas I*, **11**, (London, 1858-1893), 98m 109
37. WO 49/75, 161
38. *CSPD Chas I*, **11**, (London, 1858-1893), 290
39. *CSP-EI*, **178**
40. *CSP-EI*, **265**, **270** and **278**
41. *CSP-EI*, **287**
42. *CSPD Chas I*, **11**, (London, 1858-1893), 493

43. *CSPD Chas I*, **12**, (London, 1858-1893), 3, 30-31, 450
44. ibid. 151
45. WO 49/75, 219-222
46. WO 49/ 69, 7v; 16v
47. WO 49/67, 169ff; 171ff; 176
48. WO 49/70, 227v
49. WO 49/75, 77v
50. WO 49/ 69, 83v; WO 49/75, 43v, 219-222
51. WO 49/75, 219-222
52. WO 49/75, 57v
53. WO 49/68, 48
54. WO 49/ 69, 77v; WO 49/75, 92v
55. *CSPD Chas I*, **14**, (London, 1858-1893), 61
56. WO 49/75, 130v
57. WO 49/75, 113v
58. WO 49/71, 33
59. WO 49/76, 13
60. WO 49/75, 177, 189
61. WO 49/ 69, 157; WO 49/75, 158
62. *CSPD Chas I*, **14**, (London, 1858-1893) 531
63. ibid. 543
64. *CSPD Chas I*, **13**, (London, 1858-1893), 239
65. *CSPD Chas I*, **16**, (London, 1858-1893), 129
66. WO 49/77, 36
67. *CSPD Chas I*, **15**, (London, 1858-1893), 337
68. ibid. 340
69. ibid. 586
70. *CSP-EI*, **68**
71. *CSPD Chas I*, **13**, (London, 1858-1893), 571
72. *CSPD Chas I*, **18**, (London, 1858-1893), 400
73. WO 49/75, 92v
74. WO 49/71, 16v; WO 49/72, 17; WO 49/75, 106v
75. WO 49/72, 68
76. *CSPD Chas I*, **18**, (London, 1858-1893), 233, 348
77. ibid. 360-61
78. WO 47
79. WO 49
80. WO 51
81. *Journal of the House of Commons*: **2** (1802)
82. *CSPD Chas I*, **18**, (London, 1858-1893), 400
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84. *Journal of the House of Commons*, **3**
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