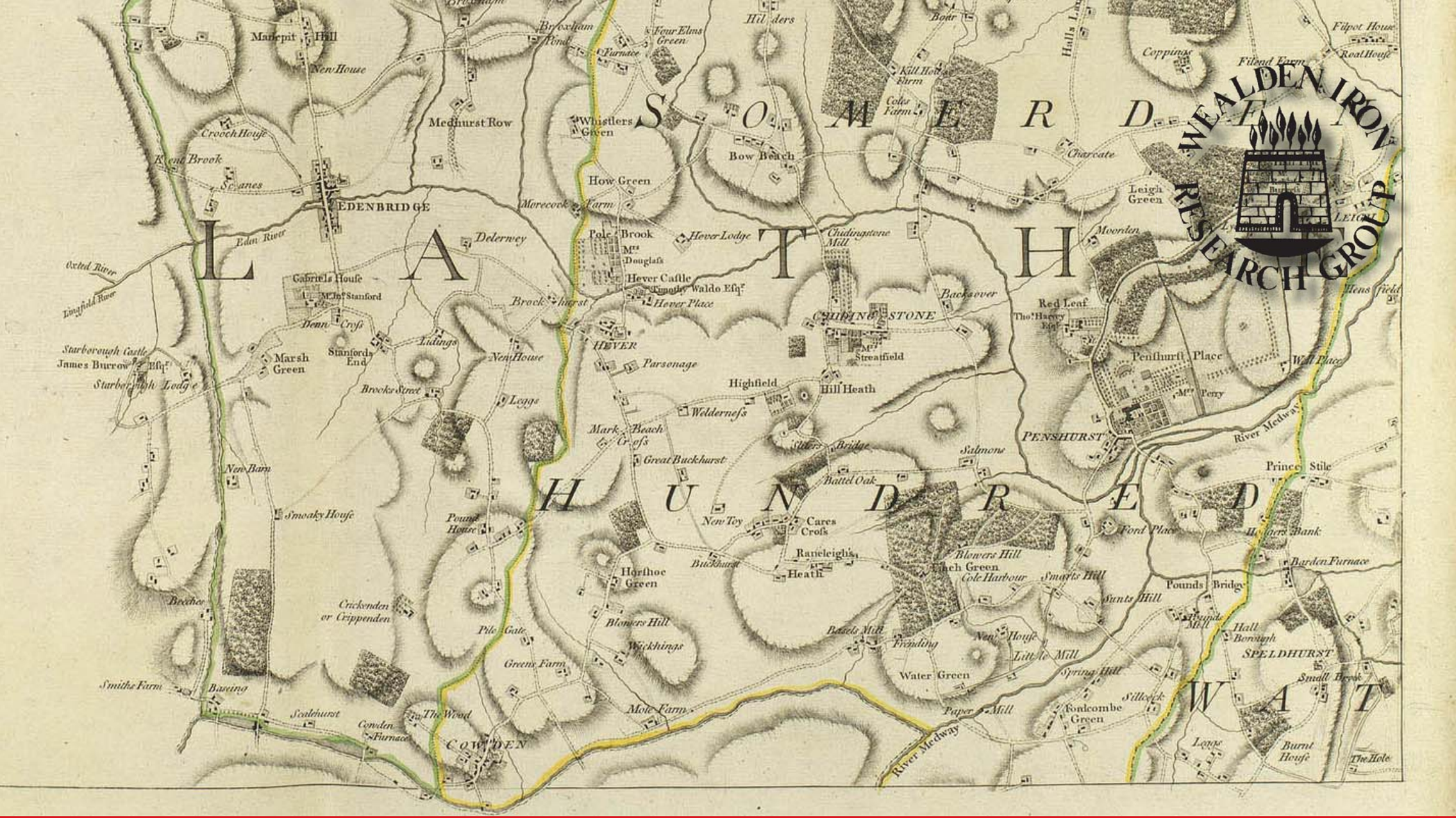

Field Notes
Boxley Abbey Iron
Cowden Paddock Furnace and Forge
George Browne: Gunfounder to Charles II
Notes on the closure of Wealden ironworks

Geraldine Crawshaw
J. S. Hodgkinson
Ruth Rhynas Brown
J. S. Hodgkinson

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Cover illustration:
Parts of the Hundreds of Washlingstone, Somerden and Westerham & Edenbridge,
from *A Map of Kent* by J. Andrews, A. Drury and W. Herbert, 1769.

FIELD NOTES

A Bloomery in Speldhurst, Kent

Test pits dug in the domestic garden of 1, Barden Road, Speldhurst (TQ 5541 4252) have yielded small quantities of bloomery slag, cinders, furnace lining and burnt stone. A few sherds of Romano-British and early-medieval pottery have been found although it has not been established which is associated with the slag. The site lies on Ardingly Sandstone. Our thanks to Nigel Stapple for notifying us of this site.

A Middle Iron Age Bloomery in Newenden, Kent

Excavations at Lossenham Farm (TQ 8470 2775)[1] have uncovered the remains of what has been interpreted as the base of a substantial bowl furnace, diameter approx. 0.5m with an associated slag-filled gully. Radiocarbon dating with a range of 364-175 BC places the site comfortably in the Middle Iron Age.

Four bloomeries in Wadhurst, East Sussex

Scatters of bloomery slag previously noted at Frankham Farm have been confirmed as bloomery sites.[2] At TQ 5957 3219, large pieces of slag had been observed in a stream at the eastern end of Frankham Wood adjoining a field which is described in the Wadhurst tithe apportionment as Cinder Field (parcel no. 1253). On revisiting the site one mass, which had probably come out of the base of a bloomery furnace, measured over 30cm in length, Above the stream probing revealed the heap of slag from which this and more were emerging, confirming the existence of the site of a former bloomery. A marked change in the colour of the sub soil of the stream bank was noted. The extent of the slag did not appear to be more than about 10m in any direction, indicating working over a short period.

Large pieces of slag had also previously been noted in the bed of the stream that runs across the north-west end of Sprayfield Wood. On revisiting the location and exploring downstream three concentrations of bloomery slag

1. This site was first noted in *Wealden Iron*, 2nd ser., **18** (1998), 4.
2. *Wealden Iron*, 2nd ser., **43**, 3.

were noted, at TQ 5998 3203, TQ 6002 3205 and TQ 6003 3207. In the last two of these slag was found on both sides of the stream although working was concentrated on the north-west bank. At the last of these sites a distinct platform was noted in the woodland some 15m north-west of the stream.

The locations where three scatters of slag had been previously noted, close to Frankham Farm, at TQ 5962 3183, TQ 5970 3190 and TQ 5986 3178, were revisited but at none of them was slag found, rubbish dumping, verdant undergrowth and earth moving, respectively, obscuring the ground.

No fewer than 13 bloomery sites, as well as three slag scatters, have been recorded in the vicinity of Frankham Farm and the adjoining properties of Earlye Farm and Colesgrove Farm, none of which, however, has been dated. Further sites have been found in Sandyden Gill, immediately to the south of the Mark Cross - Wadhurst Road. Saxonbury Hill with its Iron Age encampment lies a short distance to the north west though whether there is any connection between it and the sites around Frankham Farm remains to be discovered.

Probable minepits in Horley, Surrey

Excavations by Oxford Archaeology, Archaeology South-East and the Surrey County Archaeological Unit in advance of the building of a new school on land once part of Meath Green Farm (centred on TQ 2705 4455) has revealed over 330 back-filled pits varying in diameter between 1m and 4m, approximately divided between those 1-1.5m (possibly prospection pits) and those 2.5-4m (probably extraction pits), with an average depth of 2-2.4m. The geology is Weald Clay. Although little evidence of iron ore was found in the few pits that were excavated, the need to dig pits in such quantity and to back-fill them indicates that much of what was removed from the pits constituted only a small part of their contents, and that most of what was dug out was surplus and could be put back. Unlike the area between Crawley and Horsham, to the south, which was surveyed by Worssam,[3] the outcropping of iron ore in the area where these pits have been found has neither been explored or mapped. The density of the pits encourages comparison with

3. B. C. Worssam, 'Iron ore workings near Horsham, Sussex, and the sedimentology of Wealden clay ironstone', *Proceedings of the Geological Association*, **83**, *1* (1972), 37-55.

those excavated at Horam.[4] We are grateful to Rob Poulton for informing us of this site.

Markly (Rushlake Green) Furnace

Robert Turgoose

Markly furnace (TQ 6235 1825) is recorded by Straker.[5] It was visited by WIRG in November 1973 and a field report published in the Bulletin in 1974.[6] It was revisited in January 2024 after a dry spell which followed the exceptional amount of rain which fell on the Weald in November and December 2023. The stream at the site, a headwater of the Cuckmere river, was running fast. The stream runs from north to south at this point.

The site is now approached from Rushlake Green by a narrow footpath which runs to the south of the hollow way that formerly led to it. The hollow way is now blocked close to where it used to meet the road.

The site appeared unchanged from that reported in 1974. The breach in the bay is no larger than previously noted. There is no sign of material being removed or dumped. A large tree growing on the east bank of the stream at the foot of the bay has at some time fallen across the stream and some of its branches remain in the water.

The probable furnace site, identified by broken brick, tiles, masonry and slag, lies on the east bank in a flat area of about 15m by 15m. Slag extends some 20m downstream on both the east and west banks. The large bear reported in 1974 remains in the stream but there is no sign of a metal plate. At the furnace site the stream bed is about 1.3m below the surrounding banks and when the bay was intact the dry stream would have formed a ditch, some 5m wide close to the working area.

In the stream, running diagonally, there are two parallel rows of wooden boards on edge, about 1m apart. They continue into both banks. Inside the boards there are the stumps of two rows of wooden stakes, the tops of which were just above water level on the day of the visit. These stakes have not been

4. S. Stevens, 'Evidence of '*Throwing in the Clayes*': Backfilled minepits and other archaeological features at the Rosemead Place development, Horebeech Lane, Horam, East Sussex', *Wealden Iron*, 2nd ser., **42** (2022), 30-51.

5. E. Straker, *Wealden Iron* (London, Bell, 1931), 379.

6. *Wealden Iron*, 1st ser., **7** (1974), 24.

Figure 1: Boards in the Markly Stream

Figure 2: Stake associated with the boards

reported before. Strong flows in the stream on occasions in the past 50 years may have removed silt and other debris that previously covered them. Figure 1 shows the boards and the remains of a stake can be seen in Figure 2.

The purpose of the boards and stakes is uncertain. They may not be related to iron-making but remnants of landscaping since the furnace ceased operating in the seventeenth century. If they are connected to the iron industry they could have supported a channel, the tail race from the wheel pit, to take water over the dry ditch. On the west bank there is now a shallow ditch, perhaps much silted, which could have been the continuation of the tail race. The spillway from the bay is about 50m from the furnace site at the edge of the woodland in the valley and the tail race could have joined it (the spillway is a distinct feature on the LIDAR image of the area).

There was no evidence of a wheel pit in the stream. The 15m by 15m furnace site has ample space for the furnace and the wheel pit to be positioned some metres from the stream bank. The boards and stakes could not have formed part of a wheel pit because the placing of the stakes inside the boards would have prevented the wheel from turning.

The west bank of the stream opposite the furnace site has a low wall of masonry blocks which could be iron-related, or post-furnace works to limit erosion of the bank.

Upstream of the bay was not explored.

A probable Romano-British bloomery in Tenterden, Kent

A widespread scatter of bloomery smelting slag, including tap slag and a few fragments of furnace lining, has been noted centred at TQ 9160 3110 north-west of Reading Street, together with more than 70 sherds of 1st century Romano-British native pottery, a small quantity of ceramic building material and a sestertius of Marcus Aurelius, c.AD 171-2. The scatter extends to form the sub-surface of an apparent trackway (a public footpath) which descends for about 250m along the west side of the adjacent field to the east. Distinct charcoal staining has been noted about halfway down the track, and it and the slag scatter continue through to the west side of the adjoining hedgerow. The underlying geology is Wadhurst Clay. The site lies about 2.5km ENE of the recently identified Roman *Classis Britannica* site at Small Hythe.

We are grateful to Lindsay Akerman for details of his discovery.

BOXLEY ABBEY IRON

Geraldine Crawshaw

"*And well nigh no handiwork is wrought without iron; no field is eared without iron neither tilling craft used, nor building builded without iron.*"
Bartholomew of England, Franciscan, c.1250

Boxley Abbey (TQ 761587), the only Cistercian foundation in Kent, is here considered in respect of its requirement for iron and its purchases of iron which survive in various fourteenth-century accounts. Some of these were published, together with a great many other statistics from all over the country, by Thorold Rogers in his *History of Agriculture and Prices in England 1259–1400*, and are reproduced below.

Boxley Abbey was founded in 1146 by William of Ypres (c.1095-1165) to atone for his sins.[1] He was a military commander (and second cousin) to King Stephen, given control of all Kent.[2] The site he gave to the Cistercian monks was at the foot of the North Downs, just 3km north of Maidstone and 1km from the River Medway. The original endowment was never extended by the founder as, by 1158, William of Ypres was blind and had returned to Flanders. His son and heir had predeceased him leaving the monks to seek benefactors in their local area. As a smaller monastic house, their benefactors would be found among the "groups of lower social and economic standing".[3]

The Cistercian monks aimed to establish a self-sufficient economy, often using marginalised land. Their "zeal and their genius would be lavished in the creation of that characteristically Cistercian institution, the independent

1. J. Cave-Brown, *The History of Boxley Parish*, (Maidstone, published by the author, 1892), 29.

2. Oxford Dictionary of National Biography, William of Ypres; https://doi.org/10.1093/ref:odnb/29465 (accessed 12 Mar 2024).

3. E. Eastlake, Redressing the Balance: Boxley 1146–1538. A Lesser Cistercian House in Southern England, unpublished PhD thesis, University of Winchester, 2014, 18, quoting from L. Rasmussen 'Why small monastic houses should have a history', *Midland History*, **28** (2003), 16.

monastic farm or grange".[4]

The monks of Boxley were very successful in this aim. By the thirteenth and fourteenth centuries they had increased their lands in Kent and consolidated their satellite farm holdings through gifts, exchanges and purchases.[5] By 1360, they were farming:

- The Upper Grange (above the hill at Boxley)
- The Lower Grange (south of the Abbey)
- Newenham Court (east of the Abbey)

These three granges made up the home farm supplying wheat, barley, rye, oats, poultry, geese, pigs and cows valued at £67 12s 6d in 1360.[6]

- East Church (grain, pigs, poultry);
- Chessington (Surrey, an early endowment of 1189);[7]
- Hoo Grange;
- Ham Grange (on the Medway);
- Sharpness (sheep, fish);
- Romney Marsh (La Chene, over 1000 acres);
- Chingley Grange (near Lamberhurst, Kent/Sussex border).[8]

Despite its distance from Boxley, Chingley was to become a rich asset to the Abbey, partly as an industrial grange providing stone and iron from its own forge.[9] This will be considered in due course.

The extent of the Boxley Abbey estate is important in order to gauge the quantity of materials and labour necessary to support the Abbey and agricultural holdings. The monks eventually turned to making profits from their lands to give themselves more purchasing power. After the Black Death (c.1348) it became more cost effective to rent or lease many of their grange

4. C. Platt, *The Monastic Grange in Medieval England* (Macmillan, 1969), 12.
5. Eastlake, thesis, 39
6. ibid., 43
7. The National Archives (hereafter TNA), SC 6/1011/25; also Eastlake, 66.
8. Eastlake, thesis, 74.
9. ibid., 63.

lands.

Looking at the iron supplies required, the original claustral buildings would have needed many bars for structural features such as the smaller columns and the windows. Also iron locks, bolts, keys, money/muniment chests and safe doors.[10] Masons and carpenters all needed iron or steel tools. Vast quantities of various sizes and types of iron nails were needed for the laths on the roof, board, floor and door nails.[11] In the fourteenth century, a smith was employed to make chains for the new church bells.[12] Domestic uses for kitchen paraphernalia and stable/horse requirements all added to a considerable quantity of bar iron being needed at the Abbey itself. By the fourteenth century horseshoes seem to have been purchased ready-made as Table 1 shows.

Each grange, whether it was run by lay brothers, the monks themselves, or a monk warden would have needed an agricultural and domestic local peasant workforce, known as *famuli* of up to 30 people.[13] Banish the idea of the devout lay brother ploughing the field with his robe hitched up.

As agriculture outposts, each grange would have needed iron and steel for its ploughshare tips, coulters, shearing clippers and other tools, plus iron work for the carts (wheels, with clouts to strengthen them, cart hooks, plates, axles) and the horses (shoes, shafts).[14] Carts were essential for transporting goods to and from the Abbey.[15] Where feasible, produce was sent to the Abbey by boat.[16]

The cellarer dealing with the non-domestic costs of the Abbey in 1336 was John Northbourne. His account for the cost of the carter for that year amounted to £6 6s 10d, of which 39s 6d was for iron, steel and iron goods,

10. J. E. T. Rogers, *A History of Agricultural Prices in England 1259–1400*, vol. 1 (Oxford, Clarendon Press, 1866), 515.

11. L. F. Salzman, *Building in England down to 1540* (Oxford, Clarendon Press,1952).

12. Eastlake, thesis, 132.

13. Platt, *Monastic Grange*, 76 – 93; Eastlake, thesis, 92, 96. The *famuli* were paid in cash and/or grain for continuous service. They did not reside in the grange building.

14. Rogers, *Prices*, vol. 1, 535-6; The parts and prices of medieval ploughs are listed here.

15. Eastlake, thesis, 145

16. ibid., 83, 84

1329 BOXLEY 50 @ 5 shillings 25 @ 4s 8d Nails 1000 @ 1s 2d	**1337** BOXLEY 100 @ 6s 2d 100 @ 4s 1d	**1355** BOXLEY 160 @ 7s 6d Nails 400 @ 2s 6d
1331 BOXLEY 100 @ 5 shillings	**1339** BOXLEY 70 @ 4s 3½d 140 @ 5s 4¼d Nails (lath) 13,000 @ 8½ pence 2000 @ 9 pence 3000 @ 8 pence 10,000 @ 1s 4d	**1361** BOXLEY 55 @ 11 shillings
1332 BOXLEY 440 @ 6s 5d Nails 10,000 @ 1s 4d	**1340** BOXLEY GRANGE 250 @ 5 shillings	**1368** BOXLEY 25 @ 10s shillings
1333 BOXLEY GRANGE 460 @ 4s 4d Nails 2000 @ 1s 2d	**1348** BOXLEY 75 @ 16 shillings	

Table 1: Prices paid for horseshoes and nails by Boxley Abbey/Boxley Grange. Horseshoes are reckoned by the 100, nails by the 1000;
from J. E. T. Rogers, *A History of Agricultural Prices in England 1259–1400*, vol. 2 (Oxford, Clarendon Press, 1866), 477, 508-10).

listed below:[17]

- 200 horseshoes bought by Adam Man 16s;
- 10 horseshoes and I--- bought by Robert Marshall of Maidstone 15d;
- 6 horseshoes bought by the same for the horses of Lord William Hillum 9d;
- Spanish iron bought by the lord abbot 6s 3d;
- Spanish iron bought at Maidstone 6d;
- Wealden iron bought 10½d;
- 2 blooms of iron bought 3s 4d;

17. TNA, SC 6/1251/8.

- 1 bloom bought on another occasion 3s 3d;
- 1 sheaf of steel bought 7d;
- 4--- for spades and forks 3d;
- 100 nails and 24 cart nails bought (gripnails) for the carts 3s 4d;
- 14 horseshoes bought by Robert Marshall 21d;
- 80 nails for carts 18d.

Some accounts for the Upper Grange, part of the Boxley Abbey home farm, still exist. The Ministers' and Receivers' accounts for 1334 refer to 100 lbs of iron purchased for the Upper Grange costing 3 shillings, and 6 blooms of iron were bought for the smith to make repairs to carts and ploughs costing 3s 7d per bloom.[18] Additionally 22 sheaves of steel were also purchased for 11 shillings. The smith received his meals plus a stipend of 16 shillings for the year. Here we have evidence that the smith was refining his own blooms to make malleable iron.

Thorold Rogers considered the "consumption of iron in the charge of the ploughs was one of the heaviest items of outlay on the farm".[19] He noted that towards the end of the fourteenth century bailiffs were abandoning the practice of buying blooms/bars of iron for their own smiths to fashion and relying almost entirely on the skills of the village smith.[20] Even before the Black Death, the cost of working iron was equal to that of the raw material (bloom).[21]

Accounts at the Abbey show occasional payments to a smith.[22] One was probably employed only when needed.

Hastings Area Archaeological Research Group (HAARG) conducted a thorough resistivity and magnetometer survey of the Abbey in 2020-1.[23] The magnetometer survey revealed the location of more than ten furnaces in the

18. TNA, SC 6/886/9.

19. Rogers, *Prices*, vol. 1, 539.

20. ibid., 470.

21. Ibid., 472

22. Eastlake, thesis,146

23. K. and L. Cornwell, Resistivity and Magnetometer Surveys, Boxley Abbey, Boxley, Kent, November 2021; https://www.spab.org.uk/content/boxley-abbey (accessed 10 Feb 2024).

field to the north of the Abbey (centring on TQ 76138 58879). This industrial area, they suggest, was a series of limekilns in use when the wall around the Abbey was under construction, or possibly furnaces for iron production.[24]

Boxley Abbey purchased Wealden and Spanish iron for its estates but there are no details as to the location of these purchases. Spanish iron, presumably of superior quality, is recorded being sold in Winchelsea in 1266 and in building records at Canterbury in 1275 for 3s 1d the hundredweight. At Leeds Castle, Kent, in 1370, the native iron cost up to 7 shillings the cwt and Spanish iron up to 10 shillings.[25] Boxley monks probably bought Spanish iron from markets and fairs as was customary then.[26] Iron from Spain was also imported via Sandwich in Kent and could have been transported to the Abbey via the Medway.[27]

That smiths were working in the surrounding Kent areas is evident from early accounts of the Abbey into the fourteenth century. Individuals and families with 'Smith' names are associated with granting land to the Abbey and as witnesses to land acquisition. It may be that they were granting iron-rich land to the monks or perhaps doing certain deals supplying the Abbey with iron/iron goods. Below are some examples:-

William Fabio de Sandling – 1228 - 1246 witness to a grant;[28]
John Fabris, Peter Fabris – 1307 - 1329 witness to a grant;[29]
Simon le Fevre – pre 1307 grantor;[30]
Ralph le Fevre;
Stephen son of Adam le Fevre;
Geoffrey Clittersmith;
Geoffrey son of John le Fevre;

24. op. cit., 54, 56-7, Figures 43 and 44.

25. Salzman, *Building in England*, 286

26. Rogers, *Prices*, vol. 1, 471, e.g. the Kenet bailiff purchased iron at Leche and Ely markets, the Cuxham bailiff from Southampton, and the Clare, Woodhall and Whaddon bailiffs from Stourbridge fair.

27. Salzman, *Building in England*, 286.

28. Eastlake, thesis, 186 Appendix 2.2.

29. ibid.

30. ibid, 185 Appendix 2.1.

All grantors of land before 1307.[31]

Geoffrey son of John Faber – 1307 - 1327 Grant of one virgate in Elyottfield;[32]
Geoffrey son of John le Fevre – grantor of land before 1327;[33]
Geoffrey son of John Faber – grantor before 1329, witnesses include Adam Faber.[34]

The Clerk seems to have given the same Geoffrey a variety of smith 'surnames':

Faber - Latin word for 'smith' and occupational name;
Le Fevre - Old French, an artisan who works with metal;[35]
Fabris - A 'surname'. Fabri was probably a latinization of a name like Smit, Smeets or le Fevre, all meaning smith.[36]

In the Weald of Kent we know that Tudeley ironworks were producing blooms.[37] Tudeley is about 25km from Boxley though, as will be considered, if blooms were purchased from here they may have been processed/forged elsewhere such as the Abbey's Chingley Grange, 17km to the south-east of Tudeley (Fig. 1).

For his tables on the prices of grain, stock and associated agricultural material, Thorold Rogers consulted about 5,000 documents in the Public Record Office. He found accounts of monastic expenditure were most

31. Eastlake, thesis, 188 Appendix 2.3.

32. ibid.

33. ibid.

34. ibid., 189 Appendix 2.4.

35. A. Rey (ed.), *Le Robert Dictionnaire Historique de la Langue Française;* Anne Drewery *pers.comm.*

36. https://en.wikipedia.org/wiki/Martinus_Fabri (accessed 7 Mar 2024)

37. M. S. Giuseppi, 'Some Fourteenth-Century Accounts of Ironworks at Tudeley, Kent', *Archaeologia*, **64** (1913); J. S. Hodgkinson and C. H. C. Whittick, 'The Tudeley ironworks accounts', *Wealden Iron*, 2nd Ser., **18** (1998).

plentiful amongst the Boxley and Bicester rolls.[38] Those collected for iron and steel purchased by Boxley Abbey/Boxley Grange (probably Chingley) are given for 1329-1389 shown in Table 2.

1329 IRON BOXLEY GRANGE 2 blooms @ 3s 6d 1 bloom @ 3s 7d	**1337** IRON BOXLEY 3 blooms @ 3s 6d 1 bloom @ 3s 2d STEEL BOXLEY 2 @ 7 pence	**1355** IRON BOXLEY GRANGE 5c lb (Spanish) @ 7 shillings STEEL BOXLEY GRANGE 1 @ 1 shilling 6 @ 9 pence
1331 IRON BOXLEY ½ blooms @ 3s 8d	**1339** IRON BOXLEY 2c lb (Spanish) @ 4s 8d 7 blooms @ 3s 5¼d	**1368** IRON BOXLEY 2c lb (Spanish) @ 7 shillings
1332 IRON BOXLEY GRANGE 1c lb (Spanish) @ 3s 6d 7 blooms (of Wealden) @ 3s 6d 3 bloom (Wealden) @ 3s 9d	**1340** IRON BOXLEY GRANGE 6 blooms @ 3s 6d STEEL BOXLEY GRANGE 16 @ 5½ pence	**1375** IRON BOXLEY GRANGE 96 lb @ 5s 2d STEEL BOXLEY GRANGE 4 @ 8 pence
1333 IRON BOXLEY GRANGE 4c lb (Spanish) @ 4shillings 6 blooms @ 3s 4d 2 bloom @ 3s 1d STEEL BOXLEY GRANGE 18 @ 6 pence 10 @ 7 pence	**1344** IRON BOXLEY GRANGE 1c lb (Spanish) @ 3 shillings 6 blooms @ 3s 7d 3 bloom @ 3s 4d STEEL BOXLEY GRANGE 22 @ 6 pence	**1389** IRON BOXLEY 2c lb @ 6s 8d

Table 2: Prices of Iron and Steel at Boxley and Boxley Grange 1329 – 1389;
from Rogers, *Prices*, vol. 2, 465-70.

38. Rogers, *Prices*, vol. 2, viii.

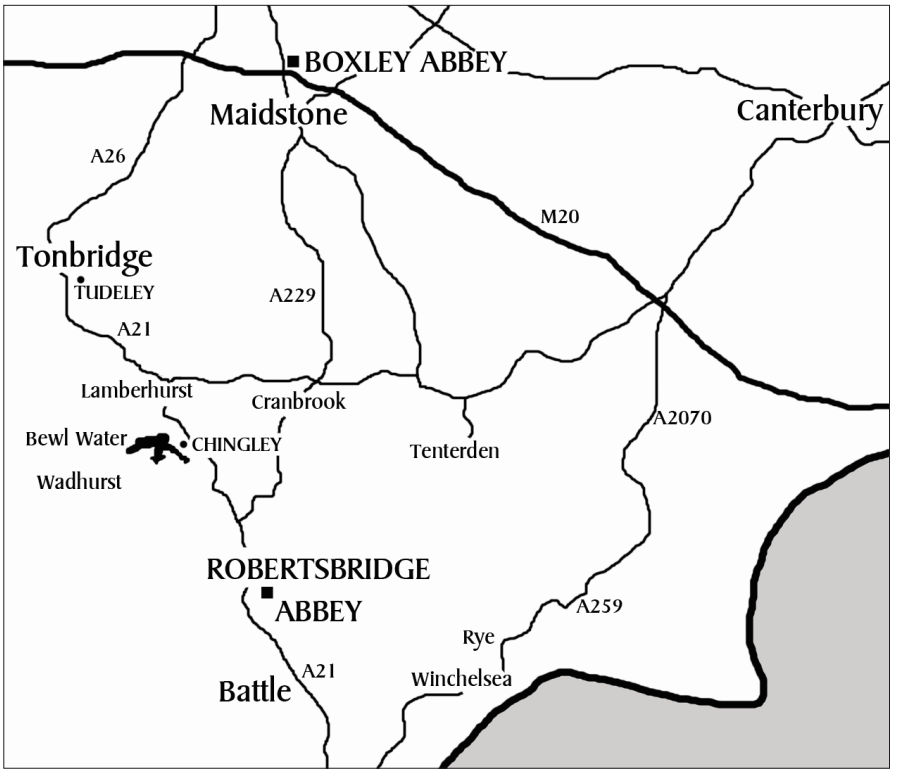

Figure 1: The location of Boxley Abbey

Thorold Rogers also listed prices for blooms sold at the ironworks at Tudeley, attributing them to ironworks he mistranscribed as 'Tendale' and which he placed in Cumberland.[39] There is no documentary evidence that the monks were buying Tudeley blooms but its proximity to the Abbey and its industrial grange at Chingley point to this possibility. Several of the Boxley purchases state the blooms were of Wealden origin.

39. Rogers, *Prices*, vol. 1, 469.

Chingley

Among the Ministers Accounts for Boxley Abbey is one showing that 53 shillings worth of iron was due from Chingley Manor to the Abbot *temp.* Edward I (1272–1307).[40] Between 1340 and 1354 there are Ministers Accounts describing iron on the Chingley demesne, referring to payments to smiths and money due to carriers of iron.[41] In 1343 iron was purchased at a cost of 12 shillings specifically for mending carts, plus 1 shilling paid for two sheaves of steel also for the carts at Chingley, along with a stipend of 8s 2d for the smith. The smith was named Roger Smith in the 1340, 1342 and 1346 accounts.

Boxley Abbey had been granted 150 acres of the tithing of Chingley from at least as early as 1242 with a further 30 acres before 1307. Piecemeal acquisitions of other lands in Goudhurst and Ticehurst occurred by the early 14th century.[42] Besides the stone quarry and reference to tile-making there, excavations of abbey land at Chingley, in advance of flooding by Bewl Water reservoir, revealed remains of a forge with a wheelpit on a tributary to the east of the Bewl river, dating from around 1300 (TQ 6820 3350) (Fig. 2).

Chingley medieval forge and its later re-incarnations (from c.1574) together with Chingley Furnace dating from 1565, were excavated by David Crossley in the early 1970s and detailed in his Royal Archaeological Institution monograph of 1975 *The Bewl Valley Iron Works*.[43] Construction of Bewl Water reservoir dam began in 1973, the excavations flooded by 1975. Excavation of the earliest forge revealed thirteenth-century pottery in the original filling around the oak timber wheel-race.[44] A remarkable view of the earliest structure was revealed, despite two later forge wheel-pits overlying it (Fig. 3).[45]

Fragments of a side board and three bucket boards, all made of oak, were also found, not necessarily in situ. The structure points to an overshot wheel.

40. TNA SC 6/1251/2; D. W. Crossley, *The Bewl Valley Ironworks, Kent c.1300–1730* (London, Royal Archaeological Institute, 1975), 2.

41. TNA SC 6/889/2-6; Crossley, *Bewl Valley Ironworks,* 2.

42. Eastlake, thesis, 62.

43. Crossley, *Bewl Valley Ironworks*, 16-17.

44. ibid., 46; the complete list of medieval pottery sherds found is listed on pp 46-50.

45. ibid., 7.

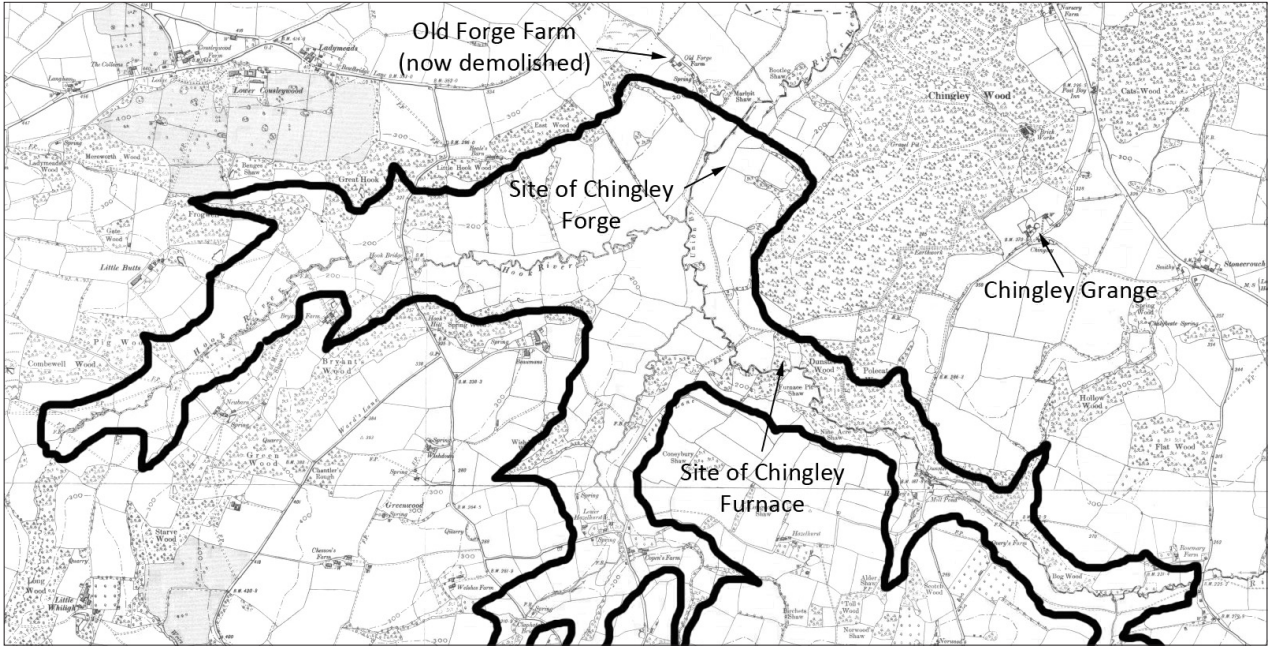

Figure 2: The location of Chingley Grange , the site of the Chingley ironworks and the outline of Bewl Water reservoir

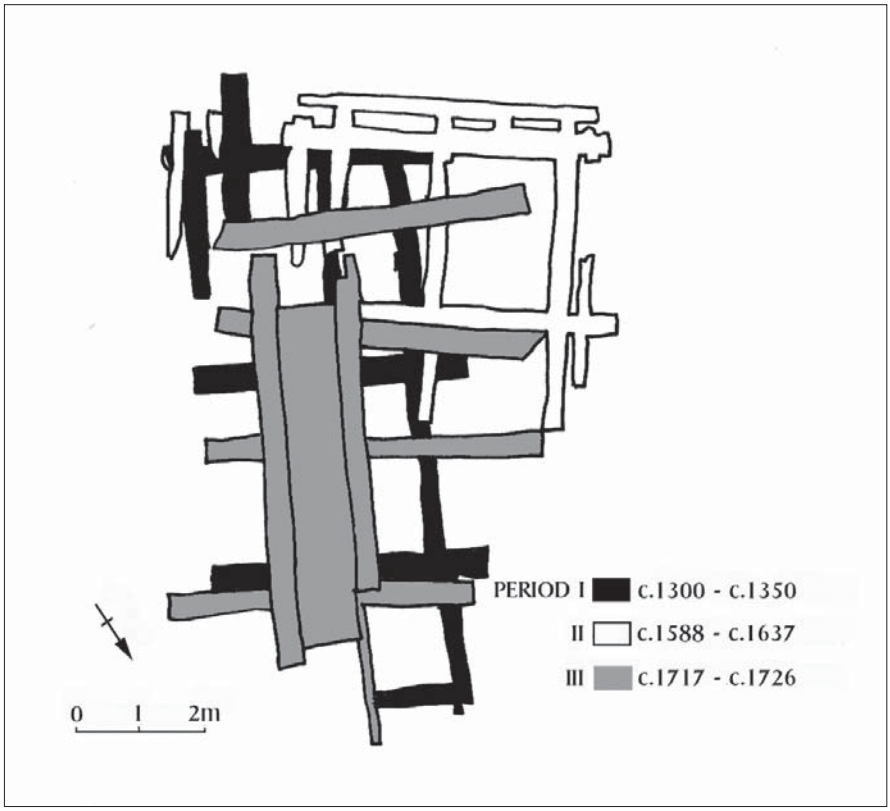

Figure 3: The Chingley Forge wheelpits, after Crossley,* Bewl ValleyIronworks, *8

The earliest ground surface had been much disturbed but thin layers of charcoal, cinder and slag were found, also tiles, suggesting a roofed building. The very small quantity of tap slag found, Crossley suggests, is because smelting had been carried out elsewhere, the blooms carried to the site for hammering.[46]

This is the only known example of water-powered iron manufacture in the medieval Weald. David Crossley suggested the construction of the 17th century anvil pit may have obliterated the pit foundation of the medieval hammer. A fragment of an early gear wheel with worn oak peg teeth was

46. Crossley, *Bewl Valley Ironworks*, 14.

found, indicating a sophisticated drive system, perhaps a hammer shaft to a bellows camshaft.[47]

So was Chingley Grange the destination for many of these these blooms of iron purchased by Boxley Abbey/Boxley Grange? Were the blooms being refined here in a forge to produce bars of iron for distribution to the Abbey and other granges? Chingley was a much favoured location for abbots to take a sojourn, sometimes with other senior monks or with friends.[48] The grange housing was substantial and a document records repairs to the dairy, cow shed, oxhouse, granary, cider press, dove cote, threshing barn and stables.[49] This was almost certainly on the site now labelled as Chingley Manor (TQ 694333)(Fig. 2). It was also en route to Robertsbridge Abbey, the only Cistercian foundation in Sussex, a daughter house of Boxley about 6km to the south (Fig. 1).

It would be unusual to find no evidence of early mining and bloomery smelting in the Chingley area being in an extensive outcrop of Wadhurst Clay, the iron bearing rock. However, no ore pits or slag scatters have been recorded in the immediate area.

Did the purchase of iron for Chingley Grange in 1343 mean it no longer produced its own iron from blooms? Thorold Rogers recorded purchases of iron and steel by Boxley Grange up to 1375 and 200 lbs to Boxley in 1389 but blooms are not mentioned after 1344. The wrought iron blooms would need reheating and hammering to extract any remaining slag before shaping into bars. This would have required a stringhearth and a hammer.

The early forge fell into disuse by the mid-fourteenth century, with natural silt accumulating and no new occupational deposits.[50]

Cistercian monks were renowned for their technical innovations, buildings and methods of agricultural improvement.[51] A water wheel, converting to

47. Crossley, *Bewl Valley Ironworks*, 15-16.

48. Eastlake, thesis, 84; TNA SC 6/889/2-4, 1342–1346, states that the Abbot and other monks consumed the profits from Chingley on site, mainly livestock and poultry.

49. Eastlake, thesis, 95.

50. Crossley, *Bewl Valley Ironworks*, 16.

51. A. Petyt, 'The contribution of the Cistercian order to the economic development of the north was little less than revolutionary. A discussion of this view of the Cistercians in the period 1130 – 1300', https://freepages.rootsweb.com/~petyt/genealogy/cist2.htm (accessed 11 Mar 2024).

power a hammer and/or bellows using a small flow of water, was developed (from continental origins) on Cistercian lands in the north of England from the 12th century. Examples include the iron forge near Kirkstall Abbey (Leeds) with a water wheel powered from the River Aire dating back to 1152 and Bordesley Abbey (Redditch, Worcs.) where timbers from 1174-6 (dated by dendrochronology) were used in the construction of a leat to power a forge hammer.[52]

The water-powered forge built at Chingley in the late-thirteenth or early-fourteenth century was almost certainly the work of Cistercian monks, perhaps with initial input from the northern brothers. Boxley Abbey may have imparted the knowledge to build and maintain the forge to local ironworkers. Its day-to-day operation for at least 50 years would have been skilled work needing the techniques to re-build and fix various parts (for example the gear teeth).

Perhaps the smiths were working under some form of Cistercian 'licence'. No other medieval water-powered forges have been located in the Weald, although they may have existed. It might have been expected that a similar water powered forge had been at Robertsbridge Abbey (in an iron rich area) but evidence is wanting – just grain, malt and apple mills in the Abbey complex.

The Boxley Monks became far more affluent from around the 1360s, well fed, well clothed and generous after their income was supplemented by their 'miraculous' acquisition of the Rood of Grace.[53] Pilgrims passing Boxley on their way to Canterbury paid to see the crucifix 'perform'.[54] The monks could probably afford to buy more ready manufactured iron goods from this time.

Boxley Abbey surrendered to Henry VIII in January 1538 as part of the dissolution of the monasteries.[55] An archive survives detailing the goods

52. The Cistercians in Yorkshire Kirkstall Abbey; https://www.dhi.ac.uk/cistercians/kirkstall/ (accessed 11 Mar 2024); G. McDonnell, 'Monks and Miners: the Iron Industry of Bisdale and Rievaulx Abbey' *Medieval Life*, **11** (Summer 1999), 20.

53. Cave Brown, *History of Boxley*, 46.

54. Eastlake, thesis, 122, 124.

55. M. Carter, 'The late monastery of Boxley in the county of Kent; Court of Augmentations accounts for the dissolving of Boxley Abbey', *Archaeologia Cantiana*, **142** (2021), 176.

taken from the Abbey to sell.[56] Few iron goods are mentioned beyond "imploments of the Church and necessaryes for husbandry".[57]

Ironwork, stone and timber from the demolition of the claustral buildings was sold to "sondry persons" for £22 8s 4d, just below 10 percent of the total value of Boxley Abbey's possessions.[58]

Acknowledgement

My thanks to Elizabeth Eastlake for her translation of many of the Boxley Abbey accounts.

56. TNA, SC 6/HENVIII/6119; this document is transcribed in the appendix to Carter, 183.

57. Carter, *Boxley*, 179, 184.

58. ibid., 181, 184.

COWDEN PADDOCK FURNACE AND FORGE

J. S. Hodgkinson

Documents relating to a Chancery case in 1589 refer to Cowden Paddock Furnace and Forge, an ironworks previously unrecorded.[1] No location is given for it but its operation is stated to have been in the hands of John Lunsford.

In the lists of foreign ironworkers made denizens in 1544 three are named as working at 'Master Lunsfords Iron Worke'.[2] They were John Deford, Gilham Nuffyld and Everode Pynyon. Three years later the Sidney ironworks accounts noted that two loads of charcoal from Panningridge Furnace were loaned to Mr Lunsford.[3] The distance charcoal could safely be transported was about five miles (8km), suggesting that Lunsford's works were within that approximate radius. One further reference to Lunsford is in 1562 in a letter from Sir Edward Gage to Sir Richard Sackville in which Gage states that 'Mr Lunsforth' was among those who had dug mine from his ground without his consent.[4] The property which was the subject of the correspondence was Rest Hills (later Ryst Wood), which lay east of Forest Row, and just to the south of the road to Coleman's Hatch in the Manor of Maresfield, though whether Lunsford had taken mine from this location or another part of Gage's extensive estates is not clear. Awty speculated that Lunsford's works might have been at Catsfield, a mile directly SW of which lies Lunsford's Cross, a name which was in existence since at least 1574.[5]

1. The National Archives (hereafter TNA), C 2/Eliz/F1/2, C 2/Eliz/L10/43 and C 21/F25/9; the parchment of these documents is in very poor condition being much creased and with the edges probably eaten by vermin, so that some of the text has been lost.

2. B. G. Awty, 'Provisional identifications of ironworkers among French immigrants listed in the Denization Rolls of 1541 and 1544', *Wealden Iron*, 1st ser., **16** (1979), 6.

3. Kent History and Library Centre (hereafter KHLC), U1475 B8/5.

4. J. Brent, 'A dispute over iron ore between two county grandees', *Wealden Iron*, 1st ser., **11** (1977), 24.

5. B. G. Awty, *Adventure in Iron* (Tonbridge, WIRG, 2019), 452. East Sussex Record

The Chancery documents contain details of a claim by John Fenys, or Fynes, that his late father, Edward, was owed a sum of money by John Lunsford. While the claim does not concern the operation of the ironworks, the documents provide some background information about John Lunsford's works.

From a date unknown Lunsford had employed his cousin Edward Fynes to manage his ironworks, enabling Fynes (according to John Lunsford's son, who was defendant in the case) to become wealthy.[6] On the 19th July 1559 Lunsford had taken Fynes into an equal partnership, and they "did jointly buy divers woods and laid out divers sums of money for stocking the furnace and forge".[7] Mention is made in the documents to forge and furnace leases, though whether for the site of the works, for woodlands or for rights to water is not specified. Nor is any indication given of the dates or the length of the term of the leases.

Edward Fynes died in 1569. Then of Hurstpierpoint, he had made his will in February of that year.[8] In it he bequeathed all his lands, goods and chattels, leases, farms and other possessions to his son John, then a minor, appointing as overseers the same John Lunsford and Fynes' nephew, John Threele of Claverham (in Arlington), in both of whom he expressed his "specyall confydence". The ironworks were not mentioned but they were hinted at in references to the requirement in "all their doinge meadling and dealing" for his overseers to render an account of "the whole stock as also of the commoditie and proffite that happenethe or comethe thereby at the ende of everye yeare" to John Pelham of Laughton, John Fynes of Claverham (Edward's brother) and William Morley of Glynde. At the end of Edward Fynes' will he required his overseers to settle any debts referred to in notes kept in his cupboard or elsewhere. Probate was granted on 1 March 1568/9 but in a supplement to the probate dated 23 June of that year were the details of those debts:

Office, ASH/4501/204.

6. John Lunsford was the son of William Lunsford and Margaret Fynes, the sister of Giles Fynes, Edward's father.

7. The date given in the different documents is variously written as the first year of Elizabeth I's reign and the fifth year, so the date of the formation of the partnership could be 1563.

8. TNA, PROB 11/51/89.

A reckoninge of my estate the xxiiii of October, 1568, Debts which I owe firste to my cosin Elizabeth & Mary Threele v^{cli}, to my sister Margeri her stock lxvi^{li} xiii^{s} iiii^{d}, the p[ro]*fite w*[hi]*ch I rec*[eived] *of Eglesden for iii yeares xxli, to my sister Johan xl^{li},* ***Rec***[eived] ***frome the forge of my cosin Lunsford lxxiii^{li}, I owe my cosin Lunsford for p***[ar]***ok cxxxiii^{li}****, I owe hughe Thorpe xxx^{li} to John Sennock vi^{li},* ***One tonn of iron at p***[ar]***oke viii^{li}****, to Thomas Lux of Westm*[eston] *for xl wethers ix^{li}.*

The entries in bold type would appear to be related to ironworks. The first seems straightforward, perhaps a share of the profits of their forge (though why not the furnace as well, unless it had gone out of use?). From the form of the initial letter it is probable that "pok", and in the next line "poke", were an abbreviation of Parrock, the area of Upper Hartfield and also the name of a furnace and forge. The operational history of that ironworks, and its distance (about 25 miles) from Panningridge rules out any consideration that it might have been the Cowden Paddock works, but does not preclude Lunsford and Fynes doing business with its occupier, who may have been George Boleyn in that year. Parrock is, however, adjacent to the Rest Hills (Ryst Wood) area that had been the subject, mentioned above, of the correspondence concerning iron ore digging between Sir Richard Sackville and Sir Edward Gage in 1562. The debt to John Lunsford of £133 is more difficult to explain, particularly as it was "for parok". The final item in Edward Fynes' list of debts is more directly connected to the output of ironworks. Comparison with prices for iron at Robertsbridge in the same year indicates that the ton of iron valued at £8 would be bar iron.[9] Was Fynes purchasing bar iron from Parrock?

John Lunsford died in 1582 having made his will the year before at Clerkenwell in Middlesex. He desired to be buried in the parish church of East Hoathly, next to the grave of his father William.[10] The family home of the Lunsfords in East Hoathly was Wylye. The ironworks were not mentioned, but among the bequests to his servants was 40 shillings a year for life to John Pinyon, it being remembered that Everode Pynyon was one of his workers

9. H. Cleere and D. Crossley, *The Iron Industry of the Weald* (Cardiff, Merton Priory Press, 2nd ed. 1995), 284.

10. TNA, PROB 11/64/41.

who became denizens nearly 40 years before. No ironworks in the hands of John Lunsford, John Threele or John Fynes were recorded in any of the lists drawn up for the Privy Council in 1574, nor were any of them required to enter into a bond not to cast cannon, which suggests that the ironworks were out of use then or they were in other hands. Many of the ironworks listed in 1574 were not named and only identified by the parishes in which they lay. The names by which these are now identified have variously been accorded them in later documents or by writers such as Ernest Straker or even members of the Wealden Iron Research Group. It is entirely possible, even probable, that Cowden Paddock was subsequently given a different name. The only furnace and forge site within a reasonable distance from Panningridge for the carriage of charcoal, the operational history of which cannot be accounted for in the period between 1544 and 1569 is Cowbeech or Cralle in Herstmonceux parish, which was on land held by Lord Windsor as tenant of Lord Dacre,[11] and part of his manor of Warbleton; it was leased from Windsor by Pelham Cheyney. The last died in 1559 when an iron mill was listed among his possessions.[12] It was one of two ironworks in Herstmonceux parish, the other being Clippenham, otherwise Batsford, Furnace, built in 1571, which was also owned by Lord Dacre,.

Earlier references to Edward Fynes have him based at Claverham in Arlington, and with Lunsford based in East Hoathly a site fairly close to one or both locations would seem logical. In a search for the location of this furnace and forge on a hitherto unrecorded site, field walking by WIRG members at Cowden Farm, Wartling, a suitable distance from Panningridge, yielded no evidence. Other locations named Cowden or a close approximation include Cowden Hall, south-east of Horam, Cowden Farm, straddling the ridge between Five Ashes and Mayfield, Cowden Park Farm, SW of Hawkhurst, and Cooden, west of Bexhill. The only known ironworks with the name is Cowden Furnace in Kent, towards the north of the High Weald which, at least 27 miles (44km) from Panningridge, must be discounted as being too distant and was already active casting guns for William Levett during

11. Gregory Fiennes of Herstmonceux Castle, from 1558 10th Lord Dacre; he was a distant cousin of Edward Fynes.

12. L. F. Salzmann (ed.), *Calendar of Post Mortem Inquisitions 1 to 25 Elizabeth* (Lewes, Sussex Record Soc., **3**, 1903), 17.

the period in question.[13] The location of Cowden Paddock ironworks thus remains unidentified.

Acknowledgements

The writer is grateful to Peter King who first drew his attention to the documents relating to this site, to Geraldine Crawshaw for her tracing of properties associated with the Lunsfords and other helpful suggestions, and to Christopher Whittick for advice on the interpretation of Edward Fynes' list of debts.

13. Awty, *Adventure in Iron*, 445.

GEORGE BROWNE
PART 2: GUNFOUNDER TO KING CHARLES II

Ruth Rhynas Brown

The early years of the Restoration

In May 1660 the political landscape in the United Kingdom changed profoundly when Charles Stuart returned from exile in the Netherlands to reclaim the throne. But more was restored than just the king. We saw in the last article that George Browne had retired from an active part in gunfounding in the later 1650s, leaving the running to his brother-in-law, Thomas Foley and agents; now he retook the reins of the family business. In 1660 George was still only 32 years old. He already had a decade of experience in gunfounding, as he would aver in his petition to the King.[1] His surviving son from his first marriage was now at Oxford and he had a growing family with his second wife; another four children were to be born at his Buckland estates to add to the two children already in the nursery there.[2]

The return of King Charles opened up a number of old affairs. Firstly, that elderly cavalier and relic from the days of King James and Charles I, Sir Sackville Crowe, reappeared in the summer of 1660 to reclaim his monopoly on the export of iron ordnance. Sackville attempted to throw doubt on the career of John Browne, and by implication his son, and their dealings with Cromwell's regime:

> *Browne … has made great profits by selling ordnance, at greater rates than allowed, both to the late king and his enemies, and now he solicits a new grant; suggests whether he should not be called to account for his undue profits, and whether such a trust should be granted to one who has used it for His Majesty's enemies, and not rather granted to the*

1. Calendar of State Papers Domestic (CSPD), Charles II, Vol 1, 385.
2. S. Edwards, *Children of the Weald* (Tonbridge, published by the author, 1996), 138.

petitioner".[3]

Charles was at first attentive, suggesting it might be possible for Crowe to treat with the Dutch and get their cannon from England again, instead of Sweden.[4]

For the moment, a compromise was made. George Browne was granted the official office of Gunfounder, "Of the sole-making of brass and iron ordnance, grenadoes, etc, for the King by land or sea, and of the moiety of the sale of all iron ordnance etc, for the use of the home market at Tower Hill", while Sir Sackville gained "the making of the rest for the home market, and the making and transportation of all iron ordnance, grenadoes etc for foreign parts".[5] However, the Brownes were not prepared to let the matter rest there. George's petition for the patent for the sole casting of brass and iron ordnance for the government service stressed his father's sufferings, his own experience, his stock on hand, etc., also reasons why the grant should extend to the sole casting of ordnance, both for the King and for the market; viz that the furnaces cannot begin to blow merely when the king requires them, nor the workmen be scattered for want of employment, which would be the case unless they have a general sale of ordnance.[6]

The dispute rumbled on for almost a decade, although in practice the Brownes were by far the dominant gunfounders in 1660s England. In the August of 1668 the Council were still mulling over Sir Sackville's request. They referred the matter to the Ordnance Office and finally they got a reply. The Ordnance claimed the resolution of this matter had been delayed by the wars against the Dutch and the late dreadful fire in London. However, the Officers felt the King had nothing to gain from granting Crowe a monopoly and the matter was finally resolved; in October 1668 the Ordnance messenger was despatched with a letter to Sir Sackville in Surrey with the final refusal of his request.[7]

There were major changes in the running of George Browne's business with new agreements and partners in place. Thomas Foley was no longer

3. CSPD, CII, Vol 1, 186.
4. CSPD, CII, Vol 1, 255.
5. CSPD, CII, Vol 1, 283.
6. CSPD, CII, Vol 1, 385.
7. The National Archives (hereafter TNA), WO 47/19A, ff.199r and f.198r-v.

directly involved; he and his sons were now on different journeys, to extraordinary wealth from their Midland ironworks, with political careers in the Parliament. The petition mentioned above also shows us one black sheep had returned to the fold. From the shadows George's elder brother, Thomas, re-appeared; presumably in the laxer times of the Restoration his religious beliefs were no longer a bar to government employment. He became the London representative, effectively replacing Thomas Foley.

George Browne's main partners now were his neighbour, and husband of his sister-in-law, Alexander Courthope, and another local landowner, Edward Herbert.[8] Overall, they controlled the works at Horsmonden and Brenchley Furnace, Barden Furnace, Cowden Furnace, Benhall Forge, and Hawkhurst Furnace and Forge, with other works taken on short leases as needed.

Despite having won back the title of official gunfounder, work from the government was slow to come. The Ordnance had large reserves not only of iron guns cast in huge quantities for the Commonwealth Navy, but also captured Dutch bronze and Swedish iron pieces from the First Dutch War. Some of these were sold off, but the Ordnance were in no hurry to order new guns. Some smaller orders for ammunition were placed until finally the first prestigious orders from the government were given to Browne.

As a gift to celebrate his return to this throne, Charles was presented by the City of Amsterdam with the yacht *Mary* complete with a battery of Dutch guns. Charles became so enamoured of sailing the vessel, he ordered two more yachts to be built, one for himself and the other for his brother the Duke of York, armed with sets of small calibre bronze pieces cast by George Browne. One set has survived, recovered from the wreck of the yacht *Mary* off Anglesey, and is now in the Maritime Museum in Liverpool (Fig. 1).[9] George Browne was paid not only for the casting, but for finding tin and engraving the elaborate inscriptions on the pieces. They are a testimony to the quality of work George and his workforce could produce. Ordnance officials selected foreign pieces for melting down and delivered them to Browne's

8. Herefordshire Archive and Record Centre, Foley papers, Loose; East Sussex Record Office (hereafter ESRO), QR/129/37.

9. M. Tanner, *Royal Yacht Mary: The Discovery of the First Royal Yacht* (Liverpool U.P., 2008), 99.

works in the spring of 1661. By May 1662 both sets of guns – eight 3-pounders for the King's yacht, the *Catherine,* and two minions and eight 3-pounders for the Duke of York's – were complete.[10]

With so little government work, Browne concentrated on supplying iron guns to the merchant market. A warrant from the Treasury to the Customs Commissioners states

> *…to suffer George Browne, his Majesty's gunfounder, to pass and ship free of customs or excise, such iron guns as Sir William Compton, master of the Ordnance, shall think fit; the said Browne having represented to the King how great consequence it will be to maintain a foundry for great guns and the great charge thereof, and that in regard his Majesty's stores are full and the merchants well supplied, the said foundry cannot possibly continue unless with such permission to transport guns not fit for his Majesty's service.*[11]

Figure 1: King Charles II's cipher on one of the bronze guns cast by George Browne recovered from the* Royal Yacht Mary *(photo: author)

The marriage of King Charles to the Portuguese princess Catherine with her dowry of the port of Tangiers led to extra planning and spending in the Ordnance Office; Browne supplied the Tangiers garrison with grenades, iron pots and bronze mortars and pestles.[12] In addition, he was keen to swap new iron guns for old damaged ones; we will see later what use these were

10. TNA, WO 49/97, f.66r; 51/3, f.57v.
11. Calendar of Treasury Books (CTB), vol 1, 248-49.
12. TNA, WO 51/3 f.77r.

put to. In October 1662 the Ordnance labourers were down at Deptford and Woolwich weighing out the old iron ordnance for him.[13]

The winter of 1662-3 had Browne working on a prestigious project; three bronze culverins sent as a gift to the Sultan of Bantam in the Spice Islands from the King under the auspices of the East India Company. This was such an important commission that a special draught by the Ordnance painter, Thomas Bayley, was prepared: "Drawing and paynting and laying in fitting Collours upon 5 skynns of Vellume the modell of one brass culvering of 10 foot long with a scale".[14] By February 1663 the three ten-foot culverins had passed proof and, along with a letter from King Charles, were sent in the East India Company's fleet in March 1663.[15] Browne received over £900 for his part in the venture.[16] Other smaller commissions included three bells for fortifications at Pendennis, Deal and Guernsey.[17]

Important challenges lay ahead. The worsening foreign affairs finally lead to the government to look at the state of the Navy, and a decision was taken to build new frigates. At this point we are still in the old Stuart world – at least some of new frigates must be armed with bronze pieces, not cast-iron. Thus, through the summer and early autumn of 1663 the Ordnance officials visited the Tower and Wharf, Deptford and Chatham, consigning old and foreign guns to the furnace, including one of the last surviving basilisks, a 16-foot monster.[18] Meanwhile, there were still orders for guns for the newest Royal yacht, the *Henrietta*. The initial order for eight 3-pounders was made on 16 October 1663. The guns were delivered by Christmas Eve.[19] The much larger order for the frigate guns would not be completed until the following summer when situations were rapidly changing. By July 1664 Browne had completed the first of the large contracts: 40 iron demi-cannon; 49 iron demi-culverin; 50 iron sakers; together with 10 bronze culverins and 10

13. TNA, WO 51/3 ff.99v & 118r; 49/77 f.56v.

14. TNA, WO 51/3 f.105r.

15. E. B. Sainsbury (ed.) *A Calendar of the Court Minutes etc. of the East India Company, 1660-1663* (Oxford U. P., 1922), 303.

16. TNA, WO 51/3 f.105r.

17. TNA, WO 51/3 ff.104r, 121r & 130r.

18. TNA, WO 47/5 f.44v.

19. TNA, WO 47/5 f.55v; 51/4 f.12v.

bronze demi-culverins.[20]

Agreements were drawn up for the next batch of guns and a budget of £2,795 to pay Browne for iron ordnance.[21] Browne wrote to the Ordnance officers in September stating, "I doe not question but to cast & deliver 50 [iron demi-cannon] at or before midsummer next & ye rest at or before Midsummer following wch shall be in ye year 1666".[22] Contracts were also issued to a number of new gun and shot founders: Thomas Western, Thomas Culpepper, Richard Alcon, James Littleton (Browne's step-brother), Jeremiah Johnson and John Newnham.[23]

Through the summer and autumn of 1664, the Ordnance yet again scoured the stores for old or useless bronze pieces. Guns were sent down from the stores at Chatham and the Ordnance labourer Thomas Perkins was paid compensation for the hurt received while weighing them.[24] However, there was still not enough metal and the Ordnance ordered raw copper to be bought in Sweden. Eventually in November 1664 stores were issued for the proof of ten bronze cannon of 7 and ten demi-cannon. As soon as they had been proofed they were sent straight aboard the *Royal Katherine*. In addition to the casting Browne was paid for the decoration and engraving early in December 1664.[25]

We know, at least partly, how Browne managed to meet these new targets as the work increased during the winter months. Arrangements were made between Browne and his partners and other local gentlemen to prepare Bedgebury furnace specifically to cast the iron demi-cannon, the second largest and heaviest gun in the fleet.[26] Later, in February 1665, the two partners rented Imbhams furnace from John Yalden, who was to be paid partly in broken iron cannon.[27] Browne negotiated a change in the price of

20. TNA, WO 51/4 ff.45v & 105.

21. TNA, WO 49/106 f.182r.

22. R. D. Smith, 'Cannon of 7', *The Journal of the Ordnance Society,* **4** (1992), 9–20.

23. TNA, WO 49/106 ff.101r-102v.

24. TNA, WO 47/6 ff.19v-20r.

25. TNA, WO 47/6 ff.76v & 80v; 51/4 f.105v.

26. R. G. Houghton, 'The recovered Courthope Manuscripts: Transcriptions' *Wealden Iron*, 2nd series, **3** (1983), 12-13; ESRO, SAS/CO 1/714/1.

27. J. S. Hodgkinson, 'Ordnance production at Imbhams Furnace: separating fact from

the guns and shot, as well as regular imprests – this is when money is released in advance of a bill – to keep the necessary work going. He was granted an imprest of £6,789 6s 8d; Thomas Western's was for £1,500.[28] Throughout December Browne was kept informed by letter of the lengths and weights of bronze demi-cannon urgently required by the Navy, with promises of deliveries of the necessary metal to cast them from.[29]

We also have a few surviving letters from Browne himself and his associates. Writing to Alexander Courthope, Browne asks him to supervise the casting of iron guns at Bedgebury, and describes the recently ordered large bronze pieces. The letters demonstrate the cooperation between the ironmasters in loaning and with moving equipment round the different works as needed and making sure of supplies of wood and charcoal. Browne finishes with the important reminder of a gift of tobacco for one of the founders.[30]

Early in January 1665, Browne had 28 iron guns, ranging in size from demi-cannon to demi-culverins, ready at Snodland for proof and shipping. Through January negotiations continued for the new contracts and delivery dates: "Mr Browne doe contract for the delivery of the whole of the proportion of ordnance for the new ships by Christmas 1666".[31] However, a few days later it was agreed

> *Mr Browne shall deliver 500 guns in April 1666 and shall have when part of the vallow of the Imprest to him at Midsommer 1665 which shall be repaid by deductions on his debentures for redy money upon the delivery into the store of every one of the said 500 guns and the impress to be cleared on the delivery of every last of the 500 guns.*[32]

In addition, Browne was able to extract favours from the Ordnance officers:

> *Mr Brown have the libertie of sending into HM stores in lieu of 7 di' Cannon of 9 foot by him contracted, for some di cannon of 8½ foot in case it be hazard to his furniss to cast those of 9 feet first provided that*

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fiction', *Wealden Iron*, 2nd series, **42** (2022), 25.

28. TNA, WO 47/6 f.89v.
29. TNA, WO 47/6 ff.91v, 93r, 93v & 95v.
30. Houghton, 'Courthope Mss', 12-13; ESRO, SAS/CO 1/714/1.
31. TNA, WO 47/6 f.113v.
32. TNA, WO 47/6 f.115v.

all industry for the casting those of 9 feet be used".[33]

In February the Ordnance wrote to Mr Browne "that hee cast in his furnaces all whole culverings and he give us notice weekley of his proceedings".[34]

The Ordnance still had to remind "Mr Dawson clerk at the furnace at Mr Browne's foundry works" to send a weekly account of ordnance cast at all the works under his care and other furnaces "about 6 miles distant". Dawson was informed that a proof should be held at Gunfields – 44 iron culverin and demi-culverins had been delivered there.[35] This was a major change from the First Dutch War. Guns were still proofed at Snodland and shipped from Milhall as before (and at Rye for Westerne's works), but now also at Gunfields close to the Tower of London. The cost of the shipping had to be borne by the founders, and this would become increasingly the normal practice, although later the main site for gun-proofing was moved to Woolwich, where it would remain for the rest of the era of Wealden gunfounding. One reason for the change may have been the difficulties and expense of arranging proofs at Snodland and Rye. Not only did the proof-master, surveyor and labourers have to attend, but also equipment and stores needed to be brought from Ordnance depots: powder, shot, lead weights, beams, ropes and triangles.[36] Unsurprisingly, Browne and his colleague Colonel Culpepper were anxious to keep the waterways on the Medway in good repair "as is very needful for the transport of the ordnance, which is to be ready by April 1, the roads being almost impassable".[37] There was a downside to this new policy. When the war began the Ordnance had to wait until the Navy could escort the shipping, keeping them safe from the Dutch privateers but delaying the arrival of much needed supplies.

Even more bronze cannon of 7 were ordered. This time the Ordnance looked even further afield for old guns, collecting pieces from Guernsey and Ireland as well as the usual stores; one old breechloader went for recycling.[38] Browne wrote to Courthope about the Navy's needs:

33. TNA, WO 47/6 f.121r.
34. TNA, WO 47/6 f.128r.
35. TNA, WO 47/6 ff.131r & 132v.
36. TNA, WO 51/6 f.34v.
37. CSPD, CII, Vol 4, 582.
38. TNA, WO 47/6 ff.125r-126v.

> *...there being several ships now ready to go forth and do stay for demicannon and culverins; His Majesty hath commanded that we do forthwith send away all that are cast and bored of those natures, though the charge light very heavy on us by this extraordinary haste, yet I am in hopes we shall be considered for the loss we shall sustain by our expediting his Majesty's service beyond our obligations of Contract.*

This letter also demonstrates how the different furnaces are being utilized by the partners, as well as showing that Browne was in London with his brother Thomas before returning into Surrey.[39]

War against the Dutch

War was finally declared on 4 March 1665. The Ordnance needs became much more pressing and the officers urged all guns to be bored as soon as possible and sent to Snodland and Milhall and asked about progress on the bronze casting.[40] Later in March the Ordnance were particularly anxious about the progress in casting brass cannon of 7. Earlier in the month one of the Navy's flagships, the *London,* had blown up in the Thames. She had only recently been re-armed with a very mixed bag of bronze pieces of artillery, including Commonwealth pieces cast by Browne, and now these needed to be replaced for the new *London.*

In March and April the Ordnance proofmasters and labourers went down to Snodland and Rye to prove the much-needed new cannon.[41] Sets of Browne's guns from demi-cannon down to saker cutts had already been allocated to the *Vanguard* and *St Andrew*.[42] However the Ordnance were still pressing Mr Dawson late in March 1665:

> *Mr Dawson to be writ to to send an count with all speed what demi-cannons are cast at Bedgebury and how many of them are board because Col Culpepper affirmed to Sir Jo Duncome that there was 18 demi cannon already cast and when they will be at Milhall. Col Culpeper affirmed they would be ready the week after Easter. Browne*

39. Houghton, 'Courthope Mss', 14; ESRO, SAS/CO 1/714/3.
40. TNA, WO 47/7 ff.9r, 15-15v & 21v-22v.
41. TNA, WO 51/5 f.95r.
42. TNA, WO 47/7 f.36r-36v.

to come to town, to give an account of the proceeds of his works.[43]

In the first two weeks of April the Ordnance were again sending out almost daily inquiries to Browne, asking what guns were bored, what calibres ready, but worse was to follow when the Ordnance received a complaint from the Navy via Mr Pepys. The influx of less experienced gunfounders and the large orders needing to be fulfilled could quickly lead to problems. Samuel Pepys complained in April 1665 about the recently received guns, particularly the "over-mettling of guns towards the Muzzle" making the guns top heavy and "in firing, upon the reverse to fall with their Muzzles upon the lower cill of the ports". The Ordnance blamed the founders, and promised that care would be taken to prevent the abuse in the future.[44] Throughout April the pressure increased. The Ordnance were forced to send their carpenter down to the Weald to make carriages on the spot so that guns and carriages together could be transferred straight onto ships immediately after proof.[45]

In June 1665 the Ordnance received the latest report from the Wealden works:

Mr Browne's furnaces:

Barden; ready to cast demy cannon iron ordnance within the fortnight

Horsmonden ready to cast in about a fortnight hence; casting demycannon withing 5 weeks

Ashburnham going before midsummer

Embham ready if required withing 5 weeks

Hawkhurst may be setting going beginning of September

Bedgebury may be ready by October 1

All stocked and the first 4 will blow winter and summer.[46]

This confirms how many of the Wealden ironworks were able to produce the heavy, large calibre guns needed to arm the Navy and out-gun the Dutch.

43. TNA, WO 47/7 f.35v.
44. TNA, WO 47/7 ff.47v & 48v.
45. TNA, WO W7/7 f.52r.
46. TNA, WO 47/7 f.77v.

In June and July 1665 Dr Richard Franklin, the proofmaster, proofed 202 guns from Browne and Western at Gunfields by Tower Hill.[47] Browne was rewarded with an imprest of £4,648 "for the better carrying on of a contract for the casting of …iron ordnance, he having already sent in 500 guns…".[48] Later in June he gave notice to the Board of the next batch of guns ready for proof at Snodland, which included the much-needed brass cannon of seven as well as iron culverins and demi-culverins.[49]

The first major action had already taken place a week or so earlier when the two navies engaged near Lowestoft in June 1665. One obvious result was the depletion in the Ordnance's stock of powder and shot. George Browne was written to at the end of the month, with instructions to set as many founders as he could to work on casting shot of all natures and to send up as soon as he could a considerable quantity of culverin shot. In addition, the Ordnance carried out a "computation" of how much shot Browne and Western still had on their contracts and what was in arrears, followed by more letters to hasten the sending of them in.[50]

As we have seen, George Browne and his colleagues kept up a regular correspondence with the Ordnance Office, reporting on progress in the different works. However, in September 1665 they hit a snag that even the enterprising Mr Browne could not solve – the weather. Lack of rain meant that across the Weald, the works were closing as the streams and rivers began to cease to drive the machinery. On 28 September 1665 George Browne was back at Horsmonden and wrote to the Board: (some words have been lost in the volume's binding).

> *Gentlemen*
>
> *Received yours of the 19th Instant, w'th a Noate inclosed of Shott and Guns to bee made and del'd betwixt this and the middest of Aprill next to w'ch I doe nowe returne my positive answere which before was uncertayne and only grounded on hopes. Since I came into this Country I have spoken with many iron Masters about Casting shott,*

47. TNA, WO 51/5 f.119v.
48. TNA, WO 47/7 f.102r.
49. TNA, WO 47/7f. 95r.
50. TNA, WO 47/7 ff.105v & 106v.

and I find that some are willing to undertake and others absolutely refuse sayeing they can convert their stock to better proffitt by makeing Sowes and Barr Iron w'ch is now advanced 3L per tunn more than it was sold for before the Warr began, Soe that at present I am defeated in my expectation, and am like to bee soe except I can finde out any that will undertake in other Countries, wh' I will indeavour to doe if you please to give incouragement and order to doe soe; the most I can at present bee certayne of will bee 600 tunn of shott, for wh' and ye 200 Gunns I will undertake by the last of Aprill next at such prices and times of payment as follows, Vizt- For ye d'canon and 24 pounders at ye rate of 18 lib per tun' and for ye shott 12 lib per tun' to be payd for one third by Bill of Imprest, to be repayed by aproportionable quantity of Gunns and shott of the last delivery, And to be payd readye mony by Debentures for other deliveries as they shall be made to you from time to time (as was in ye Contract made ye 1st November last) ; I shall continue my Care of makeing Inquiry for further supplyes, and will (as far as I can bee further furnished) give you notice and contract with you for such further proportions as I can be inabled to serve you with, I perceive the Com' anger arrises from a misunderstanding to thinck I worke upon the King's necessity, therefore I desire they may bee informed that I am but a bare Market Man (having no shott furnaces of my owne) and must give that price which will buy the Comodity is wanted at which is dearer this yeare than it was the last is no [..] but of the severall owners of those materialls [..] of making and carrying of shot and iron which are in price very much already , and like to be more by Winter, and though they do not consider the whole proportion must be Winter Carriage which be as dear again as Somer in Ordinary years but much more this year by reason of the great dearth and scarcity of hay in this Country wh'ch in the Judgement of many knowing men will hardly be enough to keep their cattle able to carry great quantities (as will be wanted) at any [..] which if it should soe fall out it will not bee in my power except the King's Authority be made of to deliver them at the rates proposed wh if [..] and ill accidents that may fall on me (which I neither see nor prevent) are the only causes that make me doubtful in the performance of the proposed Contract and my other formerly made; Others I have not. Therefore

if you please to let me have ye Order I will proceed or forbeare as you will direct, in the meantime I will hasten all that is possible in the compleating of our first Contract had been fully done at this present had not the dryness of the Springs caused our furnace to blow out for want of water and hindred us in the boring of gunns that are made. I sent you word that Ashburnham furnace had blown out for want of water and that Horsemondan furnace could not blow long for want of it which fell out accordingly on Saturday last; never any furnace made better di-Cannon and would have continued had not the water fayled , at present we have only Barden furnace going on demi-Cannon wh are very handsome gunns and good iron, shott furnaces that are going are Mr Litleton's Mr Baker's 2 furnaces one of wh will blow out for want of water and Mr Hayes whose furnace is newly begun; more shall be set at work as soone as water comes. If Mr Clayton has made his proportion wh he undertook to make 150 tunn I believe ye whole proportion of shott to be delivered on the contract made the 1st November is very neare made, if not finished, we have about 40 Culverin made and 60 and odd D'Cannon, and 40 d.cull & cutts which we are preparing for you as fast as man's industry can affect, ye boaring of your gunns at Snodland has been some hindrance to boaring ours but Mr Heaster is boaring there and wee are boaring here since the furnace is blowne out.

We have 33 guns boared which were cast at Ashburnham wh we must send to you by sea therefore we desire a convoy may be appointed for that vessel that shall carry them and ye shall have by the next have the name of the vessel and Mr. we are preparing to sett these following furnaces going this winter on guns. Vizt Embham, Hawkhurst, Ashburnham, Horsemonden, Budgebury and one other that is not absolutely agreed for yet, I doe not question but I shall if the occasions require it, beside Barden that will continue till after Christmas and besides the above named shott furnaces, I have agreed with Mr English and one Comber if you please to command them. As wt 2000 lb I did desire might be further impressed it was in me a mistake for my brother hath informed ther are severall debentures in Capt Wharton's hands wh' I hope has [..] bee speedily paid for the present supply of our Wants wh' at this present are very pressing I desire if they are not payd off,

that will you will be pleased to order the payment of them for I protest I have not many to keep my credit or to go forwarde w'th my business w'thout speedy considerable supply be sent be sent to by which you will very much incourage and oblige.[51]

The letter gives us a vivid picture of the works going on in the autumn of 1665 and the relations between Browne and his partners, sharing the work across the furnaces they owned or rented to carry out their casting orders. It confirms that Browne had access to two boring sites and that Thomas Hester was in charge of the boring operation at Snodland. On 30 December 1665 Hester was paid for boring out a brass culverin and three Swedish iron guns up to 24 pounders.[52] The letter also shows Browne perhaps a little touchy in his answer to the London Ordnance officials about his social position.

The letter also demonstrates the difficulties Browne had to convince his reluctant neighbours that it was worth casting the shot, as well as showing us that none of his furnaces were in a position to cast the ammunition at present. This might explain why the search for contractors for shot extended well beyond the south-east to make up for the lack of Wealden founders. As we shall see, Browne was directing William Clayton in Nottinghamshire whose shot was delivered to Hull for shipping south.[53] As Browne was also paid over £2,200 for 200 ton of iron shot ranging from demi-cannon down to minion, some of which had been delivered to Hull, he must have already been subcontracting the work out to founders like Clayton or George Sitwell in Derbyshire.[54] One more local man who did work with Browne was James Littleton, his stepbrother in Surrey, the son of his father's second wife, the London widow Elizabeth Littleton.[55]

The years 1665 to 7 were marked by a number of national catastrophes: outbreak of plague which affected much of southern England; the Great Fire of London which paralysed many of the nations' institutions; and the failure of the armed forces to prevent the Dutch raid on the Medway and the resulting damage both physical and psychological. The Medway was of

51. TNA, WO 49/112, no pagination.
52. TNA, WO 51/6 f.77v.
53. TNA, WO 51/7 f.29v.
54. TNA, WO 51/7f. 54v.
55. TNA, WO 47/8 f.147v.

course very close to the Browne works in Kent.

Meanwhile work continued through the early months of 1666 with proofs held every few weeks at Gunfields and Snodland for both bronze and iron pieces.[56] In February 1666 the Ordnance issued instructions that all the copper in store had to be sent to Browne as soon as possible, such was the urgency.[57] Proportions for the founder were laid out in contracts.[58] But the Ordnance was using up its supply of old, damaged and unwanted foreign bronze pieces and had to replenish its store with purchases of copper in different qualities and quantities from Richard Dickinson a London brazier; in May he was paid almost £1,000 for 12 tons of metal.[59]

These new copper supplies were needed for the cannon of 7. But there were problems. Early in May the Ordnance wrote to "Mr Banning" to send up to Snodland the new brass cannon of 7 to replace one whose muzzle had cracked at proof. In addition, it was ordered that the other cannon should be reproofed.[60] This seems to be the incident referred to by Samuel Pepys on 26 June 1666:

> *This day, in the morning came Mr Chichly to Sir W. Coventry to tell him the ill-successe of the guns made for the Loyall London; which is, that in the trial, everyone of great guns, the whole cannon of Seven (as I take it), broke in pieces – which is strange – mishap, and that which will give more occasion to people's discourse of the King's business being done ill.*[61]

This seems to be an exaggerated rumour since Browne's brass cannon of 7 were successfully proofed at both Snodland and Gunfields and paid for between May and July 1666.[62]

In contrast to the guns cast for the Navy in the 1650s which were short, light taper-bored drakes, the new guns were now described as "fortified and

56. TNA, WO 47/8 ff.118r-119v.

57. TNA, WO 47/8 f.26r.

58. e.g. Houghton, 'Courthope Mss', 15; ESRO, SAS/CO 1/715/6.

59. TNA, WO 51/7 f.32v.

60. TNA, WO 47/8 f.98v.

61. R. Latham and W. Matthews (eds.), *The Diary of Samuel Pepys Vol. 7* (G. Bell & Sons, 1974), 183.

62. TNA, WO 47/8 ff.164v, 169r & 170v.

home-bored", that is they were longer, heavier pieces. "Fortified" meant they were cast with a heavier, reinforced breech, so that unlike the taper-bored guns, they had a much longer service life. George Browne, Thomas Western and John Newnham produced 653, 163 and 72 cast-iron guns respectively in 1666.

During the War, the Navy and Ordnance decided to introduce new calibre guns, iron 24- and 12-pounders, modelled after the Dutch/Swedish examples. In the English system, most guns were of the nominal system; that is the guns had names: culverin, saker, minion, falcon and so on, although their calibres were standardized. The new calibre guns were introduced to fill gaps in the English system. There was nothing between the demi-culverin with its 9-pound shot and the culverin of 18 pounds, and then again, a big gap between the culverin at 18 pounds and the demi-cannon of 32 pounds. The Navy and Ordnance had seen the value of these medium calibre guns aboard the enemy ships in the First Dutch War. The poundage system, where the gun is named after the weight of the projectile it shoots, had been introduced into England in 1639 with light drakes for the field train; 6-pounders and 12-pounders followed in 1644 for the artillery train. But these were all bronze pieces and intended for land use, not sea service. Captured bronze and iron 24-pounders had been used aboard English ships since the previous war, but now the Navy and Ordnance set about casting their own new 12- and 24-pounders with orders being placed with the three gunfounders through December 1665 and January 1666. The first deliveries arrived in summer 1666. However, this was not simply a new calibre but also a new, different pattern which led to problems. The bills show the early guns to be much lighter than the later 24- and 12-pounders. It seems the first design was closely modelled on the Swedish guns in store – that is they did not have fortified reinforces at the breech of the gun, making them much too light. Browne's first 24-pounders weighing 39-40 cwt were delivered in May 1666 but his later 24-pounders could weigh as much as 45 or 46 cwt each.[63]

As the war continued, the government again turned to renewing its shot supplies. In July 1666, Major Bayley was at Snodland. Besides supervising the proof of the *London*'s cannon of 7, he was organizing the shipping of shot straight to the fleet at the Nore and instructing Jeremiah Johnson and

63. TNA, WO 47/8 ff.108v & 113r; 51/9 ff.30v & 40r.

James Littleton to stop casting the smaller sizes and concentrate on casting demi-cannon and culverin shot instead, as well as requesting weekly reports of the progress.[64] The Major also arranged for a number of Swedish guns to be bored up to English calibres at Snodland which could then be used on fortifications, releasing other pieces for other duties.[65] On 8 August 1666 the Ordnance pondered: "Whither Mr Browne imployes the furnace of Coursepley & what other furnaces by name he either imploys or hath quitted that they may be contracted with for ye Casting of Shott". Followed by a list of possible shot founders: Johnson, Littleton, Sitwell, Sir John Pelham, Mr Western, Mr Baker, Mrs Clayton & Col Culpepper.[66] A month later Browne delivered over 400 tons of shot, as well as 188 iron guns from demi-cannon down to saker cutts.[67]

Unfortunately, the Ordnance Minute books for the next few years are missing, so that we do not have the detailed accounts of the relations between Browne and his colleagues and the Ordnance Office. Through the winter and spring the work continued of casting bronze and iron guns and ammunition with a delivery of 57 brass cannon of 7.[68] Nicholas Ware, one of the Ordnance labourers received ten pounds "for a bruise received at Snodland by one of the great guns lately proofed there", a reminder of how dangerous the work at all levels in gunfounding and even proofing could be.[69]

Between 1664 and 1667 the English gunfounders cast 2,183 iron guns with totals of over 900 and 800 in the last two years. In addition, Browne cast 147 brass guns, including the guns for the new *Loyal London*, which replaced the lost *London.* The last guns from the war-time contracts were received in store through the last months of 1667, after the war had ended: 165 iron guns from 24-pounders down to saker cutts of 6 feet in June; in July 332 iron guns, including 69 9-foot demi-cannon; and in September another 346 cannon successfully passed proof.[70] The last batches were proofed at Snodland in

64. TNA, WO 47/8 f.175v.
65. TNA, WO 47/8 f.141r.
66. TNA, WO 49/111, no pagination; dated 8 Aug 1666.
67. TNA, WO 51/8 ff.136r-137r.
68. TNA, WO 51/9 f.65v; 51/7 f.143r.
69. TNA, WO 49/100.
70. TNA, WO 51/9 f.40r; 51/8 ff.130r- 133r; 51/9 ff.42r- 45r.

December 1667.[71]

The huge numbers of guns purchased in wartime meant that not only were the Ordnance depots full, but also that the Treasury was empty. Browne had more mundane orders to fulfil. Hundreds of cast-iron pots in two sizes were supplied for the Tangiers garrison while another iron pot and bell was delivered to the *Coppersmith*, the lighter based at Harwich and currently being used to salvage guns and stores from the wreck of the *London*.[72]

After the War

With the ending of the Dutch War, Browne's work to some extent went back to the pre-war patterns. The commercial market had remained important during the war; the merchant ships needed even more guns to defend themselves against Dutch privateers and hostile fleets. The English government was keen to make potential allies, particularly those who shared their antipathy to the Netherlands. Thus Browne was commissioned to cast three 11-foot demi-cannon, a present for the Sultan of Bantam, on 11 November 1667.[73] They were cast from the King's metal and ready by 22 January 1668 at a cost of £205 0s 1d.[74] The Ordnance engravers Benjamin Banbury and Henry Jones were paid for engraving the King's arms and the squares on the breech and muzzles of the three demi-cannon as well as cutting the names of the committee and the device according to a pattern. However, this turned out to be a less than straightforward job. In addition, they were paid for travel charges from 20 December 1667 until 27 January 1668 to Horsmonden, Snodland and finally on board the ships at Gravesend on which the demi-cannon were to be shipped.[75] The reason for the speed becomes clear; the East India Company fleet was anxious to sail. When it set off, it carried the three brass demi-cannon, each weighing 6,000 lb, with a travelling and fore carriage complete, and "300 round shott, fower ladles and spungees, eight tyn cases painted for cartouches, and 4 wadd hooks", as well as a letter from

71. TNA, WO 49/97. ff.184 & 182v.
72. TNA, WO 49/98 f.221; 47/8 f.74v; 51/7 f.77r.
73. TNA, WO 51/9 f.67r.
74. TNA, WO 51/9 f.67r.
75. TNA, WO 51/9 f.106v.

King Charles "as a pledg of our sincere love and affection".[76] The East India Company Court agreed to reward John Banning, "the gunfounder's agent, a gratuity of £5 for his assistance in hastening the dispatch of the three demi-cannon for the King of Bantam.[77]

John Banning had been hovering in the background for some time. He was born in Horsmonden in 1641 and the earliest mention of him in the Brownes' employ was in May 1666 when he was asked to arrange for a replacement gun to be sent up.[78] Over the next few years, his name becomes more frequently mentioned, often related to smaller brass orders, such as for machine parts or bells.[79] By the time of George Browne's retirement, Banning was described as "Assigne & Deputie of George Browne & partners".[80]

The bread-and-butter work of cast-iron guns for the Navy and merchant market was interrupted by a series of Ordnance Office-sponsored experimental works which Browne and his experienced team were called on, on at least one occasion as we shall see, "working day and night". First was a large 15-inch bronze mortar, tested on Hackney marshes in the autumn of 1668. However the trials were not a success. The mortar was sent back to Kent to be recast, with instructions from the Ordnance that Browne was to "give charge to his workmen about being very carefull in the recasting".[81] The design needed significant modification, particularly to the chamber which needed reinforcing. The mortar was not the only victim of the proof; the Ordnance had to recompense John Bumpstead for the damage caused to his property nearby.[82]

The following spring, Browne was involved in another new experimental piece. On 3 April 1669 the Ordnance ordered George Browne to cast a short demi-culverin 4½ feet long, "according to Capt Deane's Moddill".[83]

76. E. B. Sainsbury (ed.) *A Calendar of the Court Minutes etc. of the East India Company, 1668-1670* (Oxford U. P., 1929), 17.

77. ibid., 17; 32.

78. TNA, WO 47/8 f.98v.

79. eg TNA, WO 51/8 f.105r; 51/9 f.25r.

80. TNA, WO 51/12 f.146.

81. TNA, WO 47/19A ff.19v, 25r & 29r.

82. TNA, WO 51/9 f.191r.

83. TNA, WO 47/19A f.129r.

Stores were sent for its proof and orders given for the Butts in the Artillery Garden north of the City of London to be faced with deal boards for a trial of experiment with 2 demi-culverins, one "lately cast (with his Ma'ty's leave) according to Capt Deane's direction w'ch experiment is to be made before his Ma'ty on tuesday next".[84] Samuel Pepys records in his diary for 20 April 1669, that in the afternoon he walked to the Old Artillery-Ground near the Spitalfields, by Captain Deane's invitation "to see his new gun tryed, …and when we come, did find that the trial had been made; and they going away with extraordinary report of the proof of his gun, which, from the shortness and bigness, they do call Punchinello." Pepys managed to persuade Colonel Legg to give him a private demonstration of the piece.[85]

The Punchinello gun had another outing in the summer of 1669 when it, along with the recast mortar-piece, was the subject of another experiment at Greenwich Park.[86] Browne and his workmen were rewarded in the payment for the two guns for their "Extraordinary charges of the di-culvering from ye furnace to ye Tower of London for an experiment before his Majestie" and the "Extraordinary charge to ye founder & his men working night and day for expedition" for getting the gun ready in such a short time.[87] While the mortar-piece has long vanished, the Punchinello gun was displayed for many years at the Tower of London and is now housed in the Royal Armouries Museum in Fort Nelson.

The next experimental trial suffered a more melancholy fate. The European fireworker "Mathias Curleback"– the English clerks made many valiant efforts to render his name in different spellings – invented a large shell to blow up wrecks. The Thames and Medway had become dangerous waterways to navigate because of ships lost in the late conflicts. A hundred shells were ordered from Browne and a demonstration ordered for June 1669.[88] The trials at the Artillery Ground went disastrously wrong; Mr Curleback was killed and three of his children and maid were injured. Richard Pine, chirgurgeon,

84. TNA, WO 47/19A ff.136v & 138r.

85. R. Latham and W. Matthews (eds.), *The Diary of Samuel Pepys Vol 9* (Bell & Hyman, 1978), 528.

86. TNA, WO 47/19A, ff.189r, 192r & 215r-216v.

87. TNA, WO 51/11 f.15r.

88. TNA, WO 47/19A f.186v.

was rewarded by the Ordnance with £20 for his care of the survivors.[89] The house in the Artillery Garden belonging to the Master Gunner, Valentine Pyne, was badly damaged and he was forced to assure the local residents that no more gunpowder would be stored there in the immediate future and would be removed to Woolwich instead.[90] However, despite this unpromising start, the Ordnance decided to continue with the use of the 18-inch shells to clear the wrecks, asking Browne to cast even more.[91]

As early as 1664, George Browne had refused to consider casting in iron cannon of 7, the largest gun in use at the time. In bronze, between 9 and 11 feet in length, these guns with 7-inch bores weighed in excess of 3 tons. We saw how the 1650s experiment had not proved a long-term success, but it seems a few years later the Ordnance thought it might be tried again. This time Browne replied

> *ye Cannon of Seaven cannot well be made but of Brasse in regard they will be soe heavy yt. Iron metal (wch. Must run all at one time into ye mold) being kept soe long as foure nights & days if not more in ye. Hearth wilbe in very great danger of cooleing in ye hearth when it should run, which when it happens (as in ye casting so great peeces as Cannon of Seaven is frequently to be expected) is ye losse of ye peece.*

Instead, he offered to complete the order in brass, but agreed to cast the heavy demi-cannon in iron.[92]

However, in 1668 the Ordnance found a more pliable and adventurous gunfounder in Thomas Western who partly succeeded in casting iron cannon of 7 later that year.[93] In 1669 the Navy began another campaign of shipbuilding, and the Ordnance ordered the guns for the new ships. In August they noted "Mr Browne be writ to touching the Cannon of 7 of Iron which was formerly writte to about casting convenient numbers of and he hath done or can do speedily".[94] In August 1670 Western delivered 20 more

89. TNA, WO 51/10 f.116v.
90. TNA, WO 47/19A ff.188r, 193r, 196r & 214v.
91. TNA, WO 47/19A ff.220v-221r.
92. Smith, 'Cannon of 7', 16.
93. ibid., 17-18.
94. TNA, WO 47/19A f.230v.

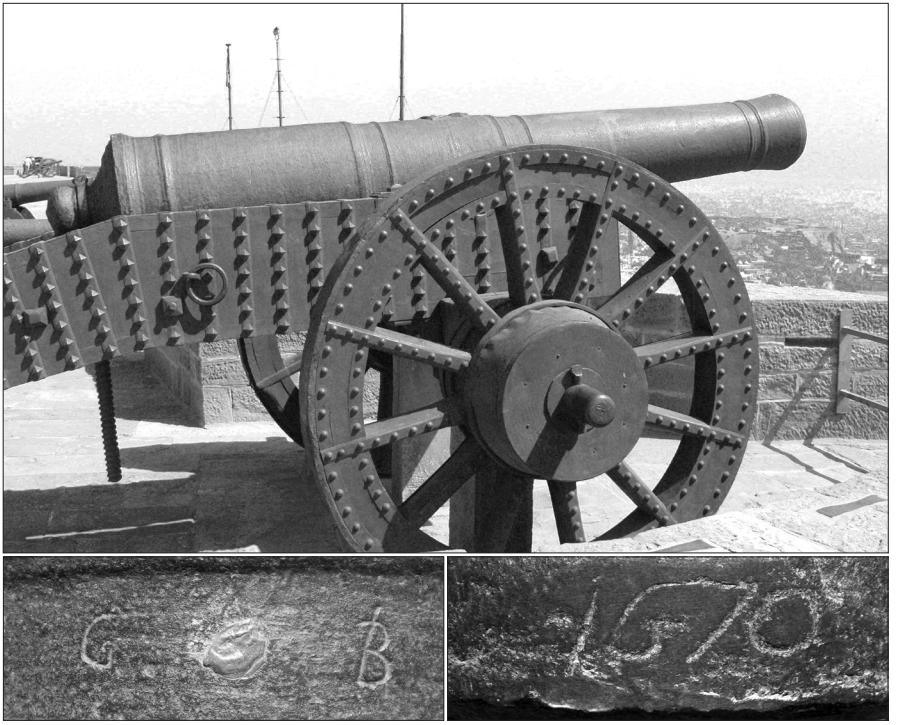

Figure 2: Cannon of 7 at Mehrangarh Fort, Jodhpur, India, cast by George Browne, with detail of initials GB and date 1670 (photos: Kay Smith)

iron cannon of 7 and in December Browne supplied 29; ten were eleven foot long, weighing between 63 and 66 cwt the remainder were ten feet in length, weighing between 58 and 63 cwt.[95] One of the ten foot cannon of 7 of ten feet has survived in Jodhpur, India (Fig. 2). It has the initials G and B engraved either side of the touchhole, and the date 1670. This is one of the last guns supplied by George Browne.

During the last years of the 1660s, John Browne (III), George's nephew and Alexander Courthope's stepson, had become more involved in the ironworks. The earliest mention of his participation was in a contract dated September 1668 when he became an official partner in the business.[96] The

95. TNA, WO 51/11 f.87r; 51/12 f.146r.

96. E. Melling (ed.) *Kentish sources Vol.3*, (Maidstone, Kent County Council, 1961), 102.

fourth partner was William Dyke. All four of the partners wrote to the Ordnance in June 1669 to inform them

> *Whereas there hath been lately setled a ioint Trade and Copartnershipp betweene all the said parties to theise p'sents in and about the makeing, and casting of Brass and Iron ordnance, shott and other things at their severall Forges and Furnaces in the Counties of Kent and Sussex, In and about ye Manager where of it is requisite and necessary that some one of the parties aforesaid persons one by them, authorized should bee and attend in and about the Citty of London and his Ma's Office of the Ordnance in the Tower of the said Citty of London as well for the making of Contracts with the said Office as for the paying and receving of all moneys payable by or due unto the said Copartners in and about the said ioynt Trade and Copartnershipp*

that in future, John Banning, gentleman of the City of London, was now their official "lawfull Deputy or Attorney", although as we have seen, Banning had been representing George Browne for some time.[97] There were other changes in personnel; Thomas Hester, the Browne foreman at Snodland had died the previous year.[98]

Within a short time, George Browne had retired from an active role in the Wealden ironworks. We know from his will that he leased to his nephew John much of the woodlands he had acquired.[99] We do not know if this second retirement was planned or forced by circumstance. He was now in his 40s with a young family living at Buckland. George Browne died in May 1675.

Of George's children, his eldest son, also George, made a prestigious marriage in 1670 to Jane Worsley, a wealthy and well-connected orphan whose family owned property in Hampshire and on the Isle of Wight; the elder George Browne had already bought a separate estate in the same county for his eldest son. The younger George, eventually Sir George, became a respected landowner in Wolverton, Hampshire, earning a reputation for his charitable enterprises. The Buckland estates were inherited in turn by George's sons Ambrose and John, eventually passing into the family of

97. TNA, WO 47/19A ff.213r-214r.

98. TNA, WO 51/10 f.4.

99. TNA, PROB 11/350/164.

his daughter's children, the Jordans of Gatwick.[100] George's brother-in-law Thomas Foley died in 1677, his sister Anne in 1682 and his brother Thomas Browne, the last of the siblings, survived until 1683. The aunt and uncle both outlived their nephew John Browne, the last of the family to be active in gunfounding who died unexpectedly in October 1677, leaving the Browne gunfounding business close to collapse.[101]

100. D. C. Ferns, *Buckland 1000-2000: A village history of Buckland, Surrey* (Buckland, published by the author, 2nd edition 2019), 31-33.

101. S. Barter Bailey, *Prince Rupert's Patent Guns* (Leeds, Royal Armouries, 2000), 49.

NOTES ON THE CLOSURE OF WEALDEN IRONWORKS

J. S Hodgkinson

The closure of ironworks in the Weald in the eighteenth century was sometimes marked in the newspapers of the time by advertisements for their sale or lease, and this writer has published a number of these in *Wealden Iron*.[1] Three more have recently been noted, together with records of the output of a fourth; each adds to our knowledge of the late occupation of these works. The first two relate to ironworks previously operated by William Bowen of Tonbridge.

Cowden Furnace

> *IRON FURNACE. To be sold, at Cowden in Kent, most conveniently circumstanced for casting Cannon, a very compleat and most substantial Furnace, together with a Water Corn-Mill, and about ten Acres of Ground, as the same was lately occupied by Mr. Bowen. Enquire of Mr. James Lukin, near the South Foot of Black-Friars Bridge, Surrey.*[2]

William Bowen had purchased Cowden Furnace in 1743, the works having been used for gun-casting since the sixteenth century.[3] When he died on 1 December 1771, at his home of Holden in Southborough, his estate passed to his late wife's niece, Mary (née Noye), who in 1758 had married John Warren, then Vicar of Kempsford in Gloucestershire.[4] By 1771 Warren had moved parish a few times and was then Rector of both Kinwarton in Warwickshire

1. In particular *Wealden Iron*, 2nd ser., **2** (1982), 30-6; and **32** (2012), 11-27.
2. *Daily Advertiser*, 11 May 1778
3. Kent History and Library Centre (hereafter KHLC), U1280 T2.
4. *Bingley's Journal*, 7-14 Dec 1771; The National Archives (hereafter TNA) PROB 11/973/132; J. S. Hodgkinson, 'The Sussex Weekly Advertiser - Further extracts relating to the iron industry', *Wealden Iron*, 2nd ser., **21** (2001), 28-29, 30n.

and Ripple in Worcestershire.[5] Married women's property at that time falling under the control of their husbands, and unencumbered by the rent charges placed by Bowen on his properties in Tonbridge, Cowden Furnace effectively came into the ownership of John Warren. The fact that the furnace was not put up for sale until more than six years had elapsed since William Bowen had died, suggests that it could have been kept in operation and this is reinforced by the appearance of James Lukin as agent for the sale.

William Bowen's career as an iron founder was first noted in 1717 when he was in partnership with Anthony Ireland junior at White Friars Dock, Water Lane, off Fleet Street in London, selling a variety of cast-iron wares principally aimed at commercial clients.[6] Ireland was the sole operator there two years later but by 1720 Bowen, without Ireland, had set up on his own and built a foundry at Marigold Stairs, on Upper Ground in Christ Church parish, Southwark, leasing the site from the Edward Edwards Charity.[7] Bowen retained his Southwark foundry for the rest of his life, obtaining a new lease, for 31 years, in 1748. The lease was still in force and had eight years to run when Bowen died.

James Lukin, who John Warren evidently engaged to oversee William Bowen's former works, was first noted in Christ Church parish, Southwark, when his son, James William, was baptised there in August 1774. He is recorded in the Surrey Quarter Sessions Freeholders' Books from 1775 until 1802, described as an iron founder, and as both James Lukin and James Lukin & Co. in Land Tax records in 1799-1801.[8] In 1779, when Bowen's lease of the foundry ran out, Lukin took out insurance on the property, implying that he (or he and Warren) had extended the lease.[9] In 1792 the theft of some bar iron from the foundry named Lukin's partners as John, Thomas, Charles, Sarah and Charlotte Warren, i.e. five of John Warren's children, indicating

5. https://theclergydatabase.org.uk/jsp/persons/DisplayPerson.jsp?PersonID=122272# (accessed 16 Mar 2024).

6. *Post Man and the Historic Account*, 15-17 Aug 1717.

7. *Weekly Journal or Saturday's Post*, 5 Mar 1720; Southwark Archives, Calendar of Deeds, 8287, Leases 1 Feb 1722 and 20 Sep 1748.

8. Surrey History Centre (hereafter SHC), QS3/10A/3-6; QS6/7/240.

9. https://www.londonlives.org/browse.jsp?id=persName7fire_1775_1780_376_37607&div=fire_1775_ 1780_376_37607#highlight (accessed 21 Mar 2024); I am grateful to Ruth Brown for this reference.

the continued family interest in the foundry.[10] Warren had retained the Southwark foundry under Lukin's management and, given the distance from the west Midlands to Kent, presumably relied on Lukin to manage Cowden Furnace as well.

The furnace was advertised as equipped for gun-founding, which would have required the continued use of the boring mill shown on the map of the site in 1743 (Fig. 1).[11] The later corn mill made use of the former boring mill, begging the question: where was the corn mill located in 1778?

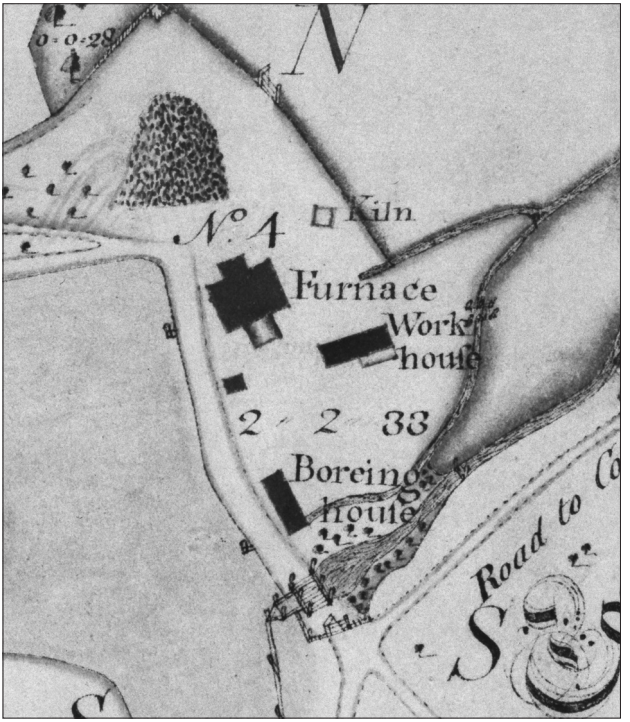

Figure 1: Plan of Cowden Furnace; detail of a map of 1743 by John Bowra. Kent History and Library Centre, U650/P1.

10. SHC, QS2/6/1792/Mid/64.
11. KHLC, U650-P1.

Barden Furnace and Forge

To be LET or SOLD

And Entered upon immediately

BARDEN FURNACE and FORGE

in the Parish of Tonbridge, late in the Occupation of WILLIAM BOWEN, Iron and Brass Founder, with two Dwelling houses, and diverse Erections and Buildings upon an excellent Stream of Water, and 13 Acres, one Rood, and 14 Perches of Land, six Acres and upwards of which are covered with Water and used as a Pond. The Estate is well adapted for carrying on any large Manufactory, in which extensive Buildings and a plentiful Supply of Water are required, and is thirty Miles from London, and five only from the Navigation of the River Medway, and two Miles only from Tonbridge Wells.

For further Particulars apply to

Mess. SWAYNE and BOWDLER, Tonbridge Town.[12]

Although no deed appears to have survived, William Bowen will have leased Barden Furnace and Forge from the Smythe family of Bounds in Bidborough, whose forebears had owned the works since the sixteenth century. Bowen was a shareholder of the Medway Navigation and he had made regular use of it to transport guns, in particular, made at Barden from Tonbridge to Millhall, beyond Maidstone, where they would be loaded onto sea-going vessels.[13] From April 1772, five months after Bowen's death, John Warren was continuing the traffic along the river. Apart from a few guns in August of that year, which had probably been cast by Bowen, the few products carried from Tonbridge were forgings, such as bar iron and squares (square-section bars). Most of the traffic came upstream and consisted of scull and burnt iron, both of which were varieties of decarburised metal. This suggests that Barden Furnace was no longer in use. On average just over four shipments were made each year but in 1778 and 1779 there were fewer. Just over 576

12. *Kentish Gazette*, 15 Oct 1783

13. Medway Archives Centre, Strood (hereafter MAC), Freight Account Ledger S/MN/FLf1a.

tons of scrap iron were carried to Tonbridge from Millhall, while only 95 tons of iron products were shipped downstream, 16.5 percent of the iron brought to the works.[14] Presumably most of the output at Barden was being sold and transported elsewhere.

Dividends from Bowen's shares in the Medway Navigation continued to be received by his estate annually after his death via Stephen Remnant, one of his executors.[15] The end of John Warren and James Lukin's business with the Navigation coincided with the notice advertising the disposal of the furnace and forge.

Evidently no one could be found to take it, another briefer advertisement appearing in the same newspaper a year later.[16] Some doubt must attend role of Chalklin's stated successors to the ironworks, Robert Young and Thomas Ashby.[17] John Warren, by then Archdeacon of Worcester, died in 1787; James Lukin was one of his executors.[18]

Birchden Forge

The manor of Birchden and Orznash, in Rotherfield, was purchased from the Baker family by William Harrison, the London merchant and ironmaster, in 1741.[19] When he died in early 1745 he left it to his son John.[20] However, while the manor included both Birchden Forge and Hamsell Furnace, the furnace was bequeathed separately to Andrews Harrison, John's older brother. While subsequent production at the furnace has been noted, the later working history of Birchden Forge has hitherto been uncertain.

Examination of the records of the Medway Navigation has revealed that from 1771 until 1783 products of the forge were being carried down the river from Tonbridge for Joseph Malin and that his business with the Navigation

14. op.cit., ff. 87, 126, 153 and 200.

15. MAC, S/MN/FL/3.

16. *Kentish Gazette*, 18 Dec 1784.

17. C. Chalklin, 'Iron manufacture in Tonbridge parish with special reference to Barden Furnace c. 1552-1771', *Archaeologia Cantiana*, **124** (2004), 108.

18. TNA, PROB 11/1155/23.

19. C. Pullein, *Rotherfield - The Story of some Wealden Manors* (Tunbridge Wells, Courier Publishing, 1928), 280.

20. TNA, PROB 11/73784.

immediately followed the transportation of similar products for Andrews and John Harrison from an unnamed source from 1765 until 1771.[21] The last regular business of the Harrisons, whose address was given as Broad Street, London, and the first of Malin, whose was of the forge, were on the same date, 11 November, and on the same page of the ledger, implying that they related to the same ironworks.[22] The last shipment from Birchden for Joseph Malin was on 7 November 1783, almost exactly 12 years after the first, suggesting the length of his tenancy. John Harrison was still paying Land Tax for Birchden Forge and Hamsell Furnace in 1785.[23]

Joseph Malin has not been associated previously with the iron industry in the Weald, but he had family connections with the Legases. The gunfounder John Legas, who had died in 1752, had a brother Paul, who also lived in Wadhurst. He had two sons, John and Joseph, and Malin married Mary, presumably the daughter of Joseph, in Wadhurst in 1772.[24] They had three children baptised at Frant: Mary in 1773, Paul in 1774 and Joseph in 1776. Much later, in 1808, both Andrews and John Harrison would make Paul Malin one of their executors and leave both him and his unmarried sister Mary sizeable legacies.[25]

Robertsbridge Forge

TO IRONMONGERS AND BLACKSMITHS

TO BE SOLD BY AUCTION

BY GEORGE VINALL

AT ROBERTSBRIDGE IRON FORGE, about a mile from the town of Robertsbridge, in the county of Sussex, on Monday the 23rd day of this instant March, by order of the Assignees of THOMAS WILLIS, the younger, late of Robertsbridge, iron-worker, bankrupt.

21. MAC, S/MN/Ffl1a ff. 60, 83, 97and 116 .

22. op. cit, f.116.

23. R. Davey (ed.), *East Sussex Land Tax 1785* (Lewes, Sussex Record Society, **77,** 1991), 182.

24. The younger John Legas had appointed his niece Mary Malin, Joseph Malin's wife, one of his executors in his will of 1803; TNA, PROB 11/1421/159.

25. TNA, PROB 11/1550/81, 1588/475 and 1605/92.

All the STOCK in TRADE

of the said bankrupt, consisting of a large quantity of well-finished Ploughshare Moulds, and Iron Plates, many ton weight of bar and cast iron, and several lots of old wrought iron, all which will be put up in lots most likely to accommodate the above trades. And also all the Household Furniture of the said bankrupt, comprising bedsteds and furniture, feather beds and bedding, chairs, tables, drawers, and other useful articles.

The sale to begin precisely at ten o'clock

And at one o'clock of the same day will be peremptorily sold to the highest bidder.

All that valuable Leasehold Mill and Iron Forge, called Robertsbridge Forge, well supplied with water from the river Rother, with the iron-house, hammers, anvils, bellows, pipes, wheels, and other utensils thereto belonging, fit for immediate use, situated within a mile of Robertsbridge, late in the occupation of the said Thomas Willis.

Also all those two Cottages or Tenements, with the gardens and appurtenances, situated on a certain Green, called the Forge Green, adjoining to the above-mentioned premises.

Immediate possession may be had, and Mr John Catt of Robertsbridge, one of the assignees of the said bankrupt, will on application, shew the premises. which are held under a lease granted by the late Sir Godfrey Webster, bart, deceased, eleven years of which will be unexpired on the Fifth day of April next, at the very low rent of £30 per annum.

The counterpart of the Lease may be seen, and further particulars known, by applying to the Office of R. G. DE LASAUX, solicitor, Ashford, Kent.[26]

The Thomas Willis whose bankruptcy presaged the sale of the lease of Robertsbridge Forge was described as 'the younger' and hitherto of Robertsbridge. This implies that a Thomas Willis the elder was previously

26. *Kentish Gazette*, 6 Feb 1801

known in connection with Robertsbridge or with iron production. One such was Thomas Willis, who had worked Glazier's Forge at Brightling from 1768, when the forge had passed from Pelham ownership to Lord Ashburnham, until 1781.[27] His successor at Brightling in 1782 was Michael Dale, who had been described as a forgeman of Ewhurst, indicating his probable employment at Robertsbridge, which had been in the hands of James Bourne since 1768.[28] In 1785 Bourne leased the forge at Brightling in succession to Dale.[29] Willis, meanwhile, had moved to Maresfield Forge, belonging to Lord Gage, following the one-year tenure of a William Willis, who may have been a kinsman. Thomas Willis occupied Maresfield until it closed in 1802.[30]

The question is: was Thomas Willis the younger the son of the Thomas Willis who operated the forges at Brightling and Maresfield? The forgeman of Maresfield died aged 77 in 1812, having made his will in December 1808.[31] He left bequests to his wife, Sarah, to his sons Thomas and James and to his married daughter Sarah. He made his two sons his executors, both of whom obtained probate.[32] It is clear from his will that all his children were adults. The marriage at Maresfield in 1790 of Thomas Willis to Sarah Wise, which produced two sons in the succeeding years, is likely to be that of the younger Thomas. It may have been he who had been baptised at Salehurst on 17 January 1768 to parents Thomas and Sarah, and if so, may indicate that the elder Thomas had been working at Robertsbridge then before taking on the forge at Brightling later that year. Thus, if the Thomas Willis, whose bankruptcy in 1801 forced him to give up the running of Robertsbridge Forge, was indeed the Maresfield, Brightling and probably Salehurst forgeman's son, the sobriquet 'younger' would have been entirely appropriate. The younger Thomas was rendered homeless by his bankruptcy. If indeed it was he who obtained probate for the older Thomas, perhaps he, his wife and surviving

27. East Sussex Record Office (hereafter ESRO), ELT Brightling.

28. ESRO, PAR477/34/1/4, Dale had been the subject of maintenance order that year, having sired an illegitimate child; ESRO, HEH/BA/VOL 71/30, the lease was initially for one year but evidently extended.

29. ESRO, ASH 4500/192.

30. ESRO, LT Maresfield.

31. ESRO, PBT/1/1/71/382.

32. ESRO, PBT/1/3/21, p.158.

son returned to Maresfield.[33]

Unfortunately, the younger Thomas Willis's lease has not survived among the other Robertsbridge ironworks papers acquired by Henry Huntington and held in his library in California so it is not possible to state when it had commenced or for how was long its term.[34] In 1801 11 years of the lease of the forge was still to run. Had it been for a term of 14 years it would have commenced in 1797.

33. Thomas, the older son of the Thomas and Sarah Willis who had married in 1790, died aged four months after his birth in January 1791.

34. C. H.C. Whittick, 'Wealden iron in California', *Wealden Iron*, 2nd ser., **12** (1992), 29-62.

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