

## CHAPTER THREE

## PRODUCTS AND MARKETS

From the second half of the seventeenth century the output of the Wealden iron industry had changed from being concentrated on the production of bar iron, through the close integration of furnaces and forges, to a specialisation in the manufacture of castings and, in particular, ordnance (Cleere & Crossley 1985: 187). This trend, which is reflected in the changing proportion of forges to furnaces, is demonstrated in the succession of lists which appeared during the hundred years from 1650. In them the reduction in output of the forges is very evident, and the petitions and pamphlets which often accompanied such lists point to the increasing dominance of Swedish iron in the eastern half of England; the market earlier served, in part, by the Wealden forges.<sup>1</sup> Not only was the iron, that was imported from the Baltic, of a higher grade than the Wealden product but, despite export and import taxes and a long sea journey, was cheaper as well. The Crowleys, themselves manufacturers of ordnance in the Weald, were the largest importers of Swedish iron, at their extensive works on Tyneside (Flinn 1962: 107). Thus the Wealden forges were deprived of a wider market by cheaper, imported iron, and reduced to working up the limited surplus iron from furnaces, the production of which was geared to casting guns.

### Production at Forges

Of the twelve forges which had survived in the Weald into the 1750s, most were associated with one or more furnaces, and worked up the iron that was surplus to the castings that were the mainstay of their campaigns. Iron was surplus in several forms. Firstly there was pig iron, which was the output of the furnaces in the first weeks of a blast, before the iron flowed in sufficient quality for castings to be made. Secondly, there were the gunheads which were an essential part of each cast piece of ordnance, and which provided a volume of iron in the highest part of each casting for gas bubbles and slag to accumulate. The 'heads' were sawn off the guns before boring, and carried to the forge. Thirdly, there were failed castings. Although a founder would strive to minimise the occurrence of these, the accidental movement of the nowel bar during pouring, or a weakness in the mould causing a breakout, would necessitate the complete rejection of a casting. So long as a forge received most of its cast iron in the form of rejects, in one form or another, from the furnace, the quality of wrought iron produced would inevitably be poor. Furthermore, the time taken to convert poor quality cast iron into reasonably saleable bar would lower the output of the forge, so the average output of a Wealden forge at 40-60 tons a year, compared with 115 tons nationally, can be accounted for as much by the poor quality of the iron worked as by the small size of Wealden forges generally (Hyde 1977: 10). During periods when orders for castings were insufficient, ironmasters could increase production of pig iron, this time of probably better quality, for sale to forges.

From the distribution of forges and the pattern of their ownership, it appears to have been regarded as essential for gunfounders to have

access to one or more forges for the profitable disposal of their surplus cast iron. The number of forges seems closely related to the number of furnaces, so Harrisons', who operated up to five furnaces, had four forges, while the Fullers had one of each. Only the Crowleys appear to have managed without a forge. They had an extensive ironmongery business elsewhere and any surplus cast iron could be used to supplement imported Swedish iron.

Of the few forges that were not directly associated with particular furnaces, and only Maresfield, Abinger and Thursley can be so described at the beginning of this period, little is known of the last two. Maresfield, however, purchased both pig iron and gunheads from Heathfield furnace so, from the point of view of the quality of the iron it converted, it cannot be said to have been any better off than those forges which were more closely linked to furnaces. In the case of Abinger and Thursley, it is not known from where they obtained their iron, but it is conceivable that Warren or Northpark were the source, as Thursley lies at too great a distance from any other furnace but Northpark, and Abinger was to be associated with both furnaces in later periods. Of all the Wealden forges, Maresfield seems to have been operated on commercial lines to a greater extent than any other. There is evidence that it was directly associated with a retail outlet in Lewes. Benjamin Molineux, who occupied the forge in the later 1760s supplied a shop, run by other members of his family, with bar iron and edged tools. The shop had been in the hands of the Molineux family for some years and may have purchased iron from previous occupiers of the forge.<sup>2</sup> Both Mr Tidy and Daniel Beard, who successively worked the forge until 1761, are referred to as 'of Lewes' which hints at a similar commercial link.<sup>3</sup> Abinger may also have been commercially orientated from 1756 when James Goodyer began to occupy the works.<sup>4</sup> His family

had an ironmongery business in Guildford which he presumably supplied from the forge. Apart from Maresfield and Abinger, the only forges for which there is evidence of retail outlets for their products, the market for Wealden bar iron lay mainly in the country smiths, as it had done since the decline in the London market at the end of the seventeenth century (Cleere & Crossley 1985: 192-3). The Fullers operated a wholesale outlet to forgemasters and blacksmiths from their Iron House at Brightling, which seems to have been a clearing house for the products of Heathfield furnace.<sup>5</sup> The purchase of the lease of the forge and furnace at Robertsbridge in 1768, by James Bourne, William Polhill and David Guy, the last two being ironmongers, suggests that an attempt was being made to focus production at the works on a wholesale outlet, perhaps in Rye (Whittick 1992: 48-9).

Tomlinson (1976: 393) has suggested that the concentration on gunfounding was at the expense of the home market, with local, domestic purchasers of bar iron neglected in favour of lucrative government contracts. However, it could equally be argued that the growth in gunfounding in the Weald was a response to the declining market for bar iron because of foreign imports. Paradoxically the increase in the production of ordnance generated by the demands of the Seven Years' War stimulated the work of the Wealden forges, and it seems that the market for Wealden bar iron expanded in this period, despite the fact that Swedish iron imports were well established and American bar iron had been allowed into England since 1750. What may be regarded as a speculative venture, to take advantage of the increased output during the war, was the revival, in about 1756, of Howbourne Forge, Buxted, which had been idle since the mid-seventeenth century (Combes 1987: 16-9). Although initially not associated with any particular furnace, it worked up iron purchased

from Heathfield furnace, and was occupied later by William Clutton and subsequently by Edward Raby, both of whom occupied Gravetye furnace. Its apparent continuance after the demand for ordnance had subsided highlights a continuing local demand for bar iron, perhaps stimulated by increased mechanisation of agricultural methods in the Weald in the second half of the eighteenth century. This continuing demand is also illustrated by the fate of the forges occupied by Harrisons'. The bankruptcy of Richard Tapsell in 1765 liberated the tenancy of four forges (Bivelham, Hawksden, Westfield and Glazier's). The correspondence which survives from the attempts of the Glynde estate to relet Hawksden forge offers indicators of the problems facing the landlords of the others.<sup>6</sup> The prospective tenant, Samuel Baker, showed considerable concern for the viability of the forge both from the point of view of the markets for the iron, in view of growing American competition, and of the cost of wood. Apart from inquiring at Ashburnham furnace about supplies of pig iron, he had also written to an American ironmaster about the same. Of the three other forges, only with Westfield is there any uncertainty that it might not have been let; the others being sustained during the post-war years by Heathfield furnace, and probably by the other furnaces which continued in work.<sup>7</sup>

Details of production at Wealden forges in this period are very scarce. In correspondence prior to the leasing of Robertsbridge forge in 1754, its output was said to be about seventeen hundredweights of bar iron a week, although no hint is given of the market for it (Whittick 1992: 58-9). The only accounts available are those for Burwash forge which show an average annual profit over the twelve year period, 1757-69, of £122, although the average becomes a deficit of £12 if the aberrant periods of 1763-6 and 1764-? are omitted.<sup>8</sup> No output figures are available for the same period. What does seem evident is that the

Fullers, who owned Burwash, did not expect to do any more than cover their costs and were regularly prepared to subsidise the running of the forge from the rest of their estate because of the benefit that the estate and its tenants would derive from it. So Burwash forge cannot be regarded as commercial in the sense that Maresfield can.

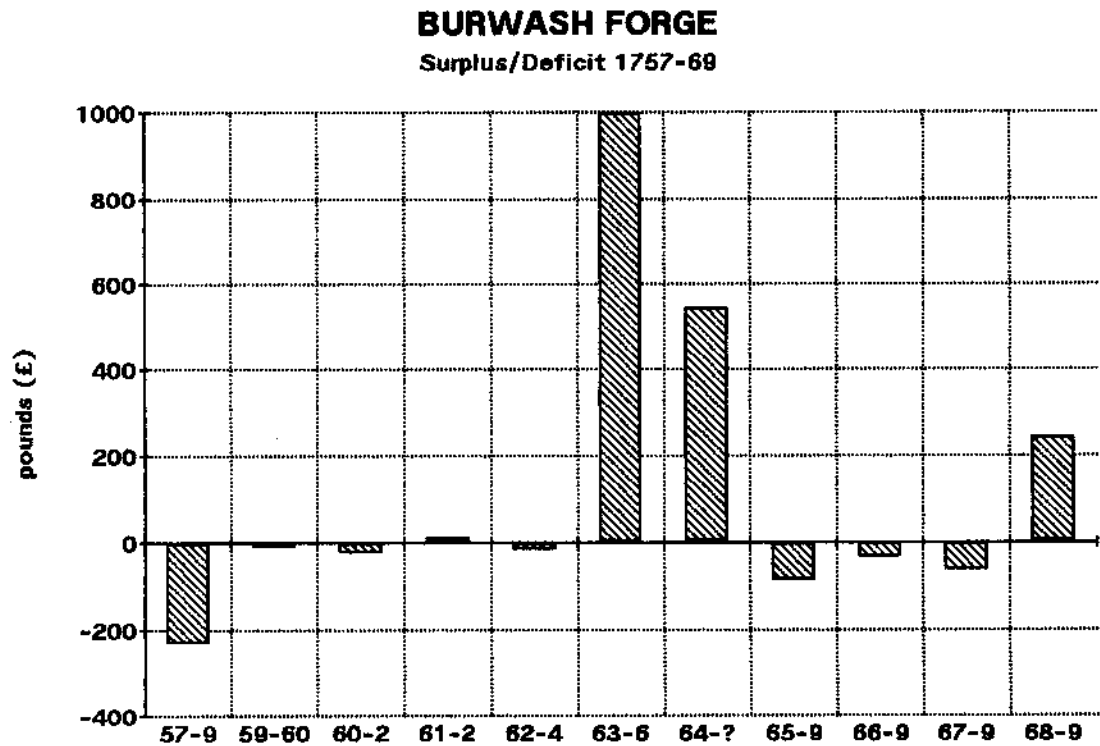


Fig.4

(ESRO uncatalogued ledger 1758-60)

Gunfounding had brought considerable income to the Fullers, and by the end of the Seven Years' War, when contracts were no longer available, their Jamaica estates had recovered from the management problems they suffered in the 1720s and 30s. Thus, money from sugar was able to make a greater contribution to the family's income just at the time when iron was ceasing to do so. The Fullers, however, remained hopeful that government contracts would come their way again, so Heathfield furnace was kept working intermittently, and Burwash forge was therefore kept in work.

### The Ordnance Trade

During the war years as many as fourteen furnaces were in blast in the Weald, probably all of them producing ordnance (only in the case of Northpark is specific evidence lacking). Ordnance cast in the Weald was produced for two main markets: the Board of Ordnance at their arsenal at Woolwich, and the merchant and privateer trade. A small number of guns were cast for foreign states early in the period, but they did not constitute a significant alternative market. An important purchaser in the private sector, which received some official assistance in the form of gun proving, was the East India Company.

Over the period 1750-70, the Weald supplied about 80%, by weight, of the guns purchased by the Board of Ordnance (see Fig. 5; also Appendix III). The Board was responsible for the provision and equipping of the army and navy, and of the various forts, shore installations and vessels from which they operated. It was the most lucrative market for the gunfounder, offering prices which were consistently above those paid by merchants, for a high standard of workmanship, but at the disadvantage that the Board was bureaucratic and inflexible. Payment by the Board was slow, and the penalty system which was introduced to discourage late delivery paid scant regard to the practical difficulties which faced gunfounders, especially during wartime. From the Wealden ironmasters the Board of Ordnance purchased iron guns in a wide variety of sizes, from half-pounder swivel guns to 42 pounders. They also purchased iron round shot, and shells for howitzers and mortars. Trucks, the cast iron wheels for gun carriages, were also manufactured by a small number of founders. The requirement by the Board, that all the guns it purchased should be cast directly out of ore, favoured the Weald and other regional

gunfounders. The same stricture did not apply to shot and shells, although a sizable quantity was supplied by Eade & Wilton, William Ford

**BOARD OF ORDNANCE**  
Iron Purchases 1750-70

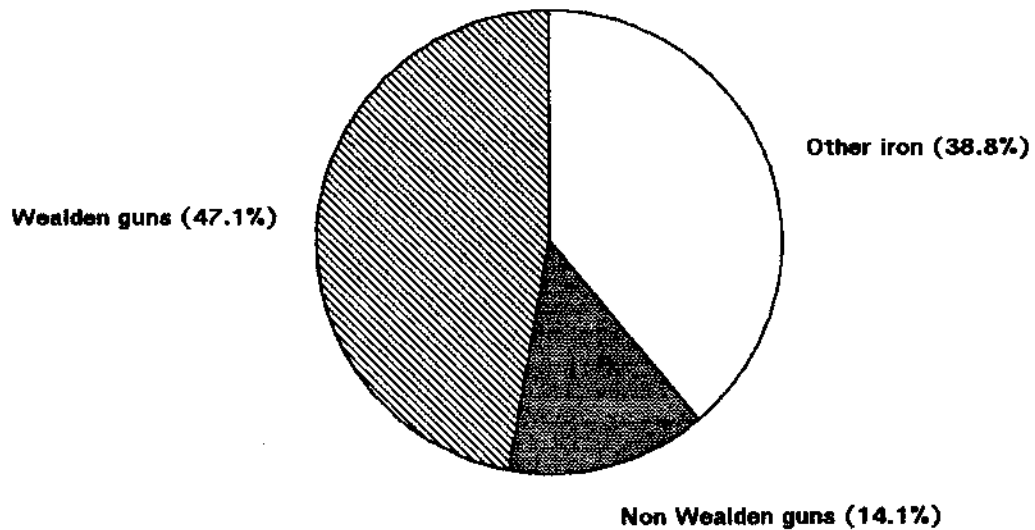


Fig.5

(PRO W051 173-246)

at Bonawe, and Thomas Pryce at Neath. With the possible exception of Eade & Wilton, no Wealden founder made shot in quantities of any significance. Of more importance was the ability of all the Wealden ironmasters to cast what John Fuller referred to as "great guns" (Crossley & Saville 1991: 254). When Fuller wrote of them in 1749, he stated that only Brede, Beckley, Lamberhurst, Robertsbridge, Ashburnham and Heathfield were capable of casting 32 and 24 pounders. To that list must be added at least one of Bowen's furnaces and one of Raby's, before or during the war period. Only Harrisons' cast 42 pounders during the war, although Rose Fuller considered doing so, the Board declining the £4 a ton advanced payment he required.<sup>9</sup> Later the Carron Company cast in that size also.



The link between the Board and the Weald went back to the sixteenth century and owed its resilience to the proximity of the region to London, and to the depth of skill in its personnel. Ashton (1963 ed.: 14) suggested that the Board favoured the Weald, and that the Board's conservatism was to the disadvantage of other regions. It must be said that evidence to support this is wanting. Tomlinson's comment (1976: 386) that "for more than 50 years of the eighteenth century the Wealden gunfounder had only to fear competition from his neighbouring tradesmen," suggests that the Board actively pursued a policy which discriminated in favour of the Weald, and mistakenly equates the mercantile background of the ironmasters concerned with the geographical location of the Wealden ironworks. The picture he paints of a gunfounding industry which is distinctly regional in management as well as geography is challenged by the industrial origins of many of the manufacturers concerned, as the previous chapter has shown. Furthermore, what monopoly the Weald might have enjoyed with the Board in earlier periods, was broken by the second half of the seventeenth century, and a major supplier in the early 1750s was the non-Wealden firm of Philip Sone & Son, at Sowley, near Lymington, Hampshire. In addition, a growing number of urban-based foundries cast guns in reverberatory furnaces for the merchant trade. A rare example of conservatism by the Board in this period was when they declined to grant a contract to Richard Tapsell, shortly after he had succeeded John Legas in 1752, because his prices were not significantly different from those of William Bowen, an established supplier, who had been willing to accommodate the Board by adjusting his price downwards.<sup>10</sup> The Board were strict but fair in their policy of awarding contracts. Even John Fuller fell foul of them when he tried to undercut all the other gunfounders in 1750 by five shillings below their lowest bid price. He was, instead, asked to submit a tender for

the quantity he was prepared to cast, at the price he would make them for, like his fellow founders.<sup>11</sup> When war loomed and the Board's requirement for guns increased, they showed no signs of discouragement towards non-Wealden gunfounders. Some they contracted with, such as Abel Walter, who succeeded the Sones at Sowley, and Thomas Pryce, of Neath, Glamorgan, were notably unsuccessful. Such was the demand for ordnance in 1758, that the Board, far from only looking to the Weald to satisfy its needs, vainly requested Wilkinson & Co., at Bersham in Flintshire, to supply guns and shot.<sup>12</sup> If the Board appeared to have a loyalty to the gunfoundries in the Weald it is much more likely that it was because its products were reliable. Only money deflected the Board, once the Seven Years' War was over, and even then, Bowen, the only Wealden founder initially to accept the reduced tender that the Carron Company submitted in 1764, retained his contract.<sup>13</sup>

The Board of Ordnance drew its supplies from a variety of manufacturers, some of whom were under the control of the Board, such as the Royal Brass Foundry, and others, like the Wealden gunfounders, who were independent private contractors. Contracts for the supply of guns were placed on the basis of tenders submitted by founders or their agents, either at the request of the Board or unsolicited. Warrants were issued for a number of guns of specific natures (the weight of shot fired) and lengths; often a variety of types.<sup>14</sup> Before hostilities began in 1756, the operation of a time limit for warrants was not practised. As payment for each warrant was not authorised until all the guns it applied to had been received (that is delivered and passed proof), and ironmasters found it unsatisfactory to cast different natures of guns in a batch, preferring to cast all their output of a particular nature in one go, the time taken to complete

**BOARD OF ORDNANCE**  
**Ordnance Suppliers 1750-70**

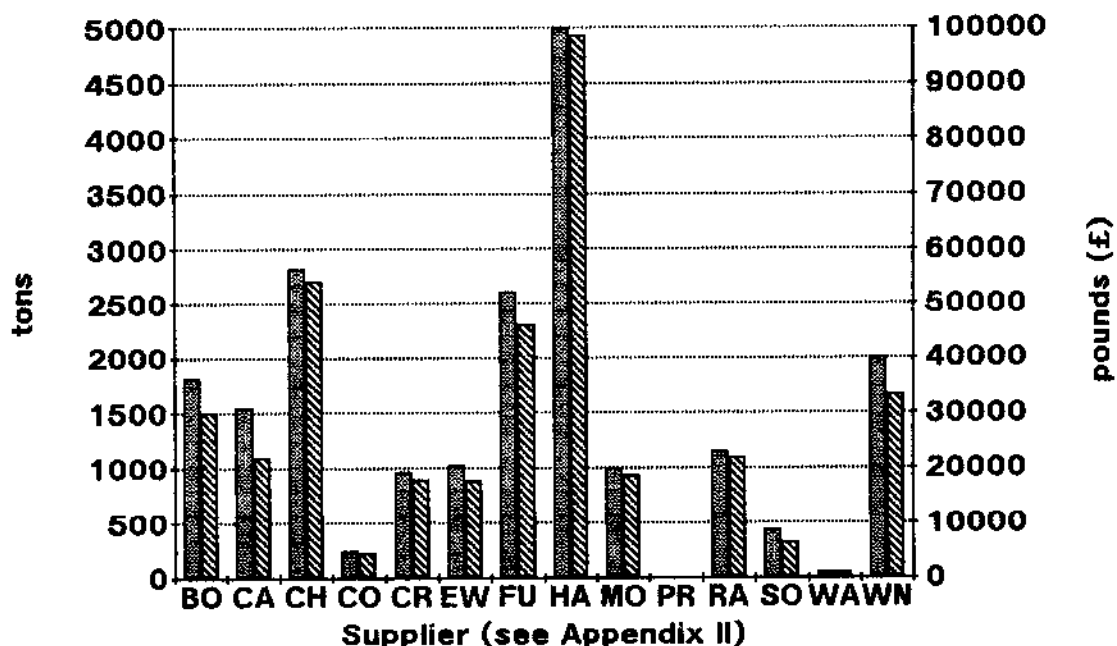


Fig.6

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individual warrants was often counted in years. Payment was therefore frequently delayed for a similar length of time. Various methods were employed by ironmasters to overcome this delay as cash flow problems could seriously jeopardise the viability of an ironworks. They would apply for the cancellation of a warrant, and the issue of a warrant of justification for those guns already received; then ask for a new warrant to cover the uncompleted part of the original one. The Crowleys attempted a more underhand method in 1750. They asked for warrants for small numbers of guns, having failed to complete earlier warrants for larger numbers. They then claimed that the guns subsequently delivered were to complete the later warrants, thus ensuring earlier payment. This "most barefac'd fraud" was unmasked when their warrants were called in and discrepancies of more than a year were discovered.<sup>15</sup> During the Seven Years' War, such was the Board's demand for ordnance, several gunfounders were able to ask

successfully for cash payment rather than the debentures the Board usually made payment with. In 1759, the Board received a petition from Fuller, Harrisons' and Churchill asking for six-monthly payments to maintain the gunfounders' cash flow, or, failing that, interest on their outstanding payments of 4%. The Board offered some unspecified relief.<sup>16</sup> After the war, the Board allowed William Bowen several imprests in part payment prior to the completion of orders.<sup>17</sup> The Carron Company, heavily committed financially because of the scale of its orders, was able to benefit from a similar arrangement.<sup>18</sup>

To speed up the delivery of guns when demand for them was at its height during the war period, the Board began to place time limits on the warrants they issued. Warrants completed within the specified period would be paid for at the contract price. Thereafter the warrants would be void and any guns delivered might not be received, or paid for at a lower price if demand had slackened in the meantime. The customary expiry date was the 31st December, which was not a particularly convenient one for the Wealden gunfounders; it generally being a couple of months into their winter campaign and at a time of year when overland transport was difficult because of the impassability of many of the roads, and poor weather was liable to delay coastwise shipping. The rush to complete warrants was often fraught with last minute difficulties, and the Minutes of the Surveyor General of the Ordnance, who had responsibility for quality, note many letters from gunfounders appealing, usually in vain, for exemption from the time penalty because of circumstances, which they often claimed were beyond their control, such as contrary winds, distemper among the horses, the lack of a convoy, press gangs, or in an extreme instance, the Churchills' furnace blowing up.<sup>19</sup>

The fluctuation in prices paid for guns by the Board of Ordnance between 1750 and 1770 reflects the changing international situation. As has been noted above, peacetime posed the greatest threat to the financial buoyancy of the gunfounder, for prices paid by the Board were at their lowest and greater reliance had to be placed on sales on the merchant market. In 1750, the Board accepted tenders by Fuller and Bowen on a sliding scale according to gun size. The largest guns, 32 and 24 pounders, were £15 a ton; 18 and 12 pounders, £14 10s. a ton; and the smaller calibres, thirteen guineas, except for half pounders which, because of the proportionately higher labour input into the manufacture of their moulds, were seventeen guineas a ton.<sup>20</sup> At the outbreak of hostilities in 1756, the Board offered an increase in price of between 25 and 30%. Guns which were 12 pounders and upwards fetched £20 a ton; the lower calibres, £18, except half pounders which were £24 a ton.<sup>21</sup> Almost immediately the war ended, the price paid by the Board for ordnance went down from £18, for medium calibre, to £15 10s; smaller calibres to £14 a ton. In late 1764, however, Messrs. Roebuck, Garbett and Cadell, who had formed the Carron Company, near Falkirk in Scotland, proposed to the Board that they should cast guns of all natures at £14 a ton.<sup>22</sup> In this instance, technological not political change had allowed Carron to bid for the Board's contract, though Roebuck & Co. gambled on the boldness of the bid winning the company sufficient orders, the price undercutting their own conservative estimate of £16 a ton (Campbell 1961: 83). Rose Fuller declined to match the price, observing that only with coked pit coal, which, seemingly unknown to him, Carron was using, might it be possible to cast guns at that price.<sup>23</sup> Evidence of the ability of the other charcoal gunfounders to match the Carron price is confused by the fact that both John Churchill & Son and Theodosia Crowley & Co., whom Campbell believed had continued to cast at the new price, only

accepted £14 a ton for guns which were received late for their warrants (Campbell 1961: 83). Of the charcoal gunfounders, initially only Bowen continued to undertake orders for guns for the Board at the new price. Later, Eade & Wilton, whose source of guns is a matter for some speculation, also offered to cast guns, as did Edward Raby, who had re-established himself after his bankruptcy. Thus the only gunfounders to continue to supply the Board, and offer competition to the Carron Company, were all based in the Weald.

The East India Company enjoyed semi-official status, and the increasing involvement of the British army against the French in India allowed the Company to use the Board of Ordnance for the proving of the guns it purchased, although at the gunfounders' expense. It was not, however, constrained by the necessity of only purchasing guns cast out of ore, and advantage was taken of the supply of less expensive guns cast at the air furnaces of Richard Gilpin, Stephen Remnant and others. Partly as a consequence of this, Wealden guns accounted for only 16% of the Company's purchases of ordnance in the period 1750-70, although it is likely that a considerable additional number were purchased by the Company from merchants, those having been cast surplus to other orders or having marginally failed the Board's own rigorous proof (see Appendix IV). The majority of the guns purchased directly by the Company from Wealden founders were for the arming of its forts and forces (Brown 1990: 18). However, requests to the Board for the proof of guns destined for the Company, from Harrisons', are likely to have been related to the arming of East Indiamen, as no business with Harrisons is recorded in the cash journals of the Company's Accountant General. Prices paid were considerably lower than those paid by the Board. For example, Crowleys were paid £14 for a twelve pounder in 1758, when they had been paid £22 by the Board.<sup>24</sup>

### EAST INDIA COMPANY Ordnance Suppliers 1751-70

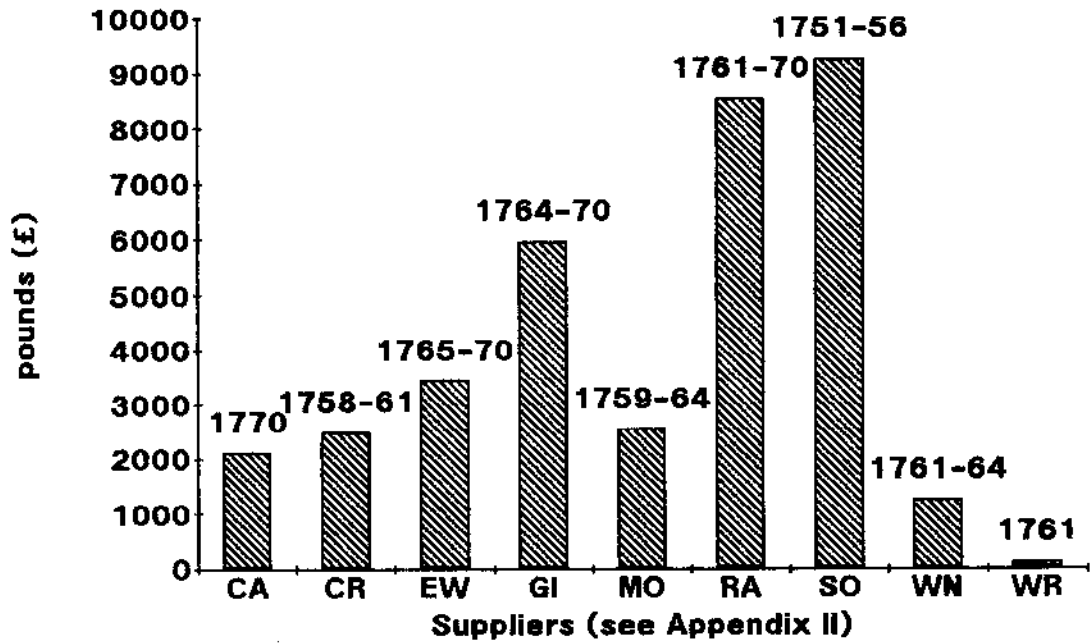


Fig.7

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### EAST INDIA COMPANY Iron Purchases 1750-70 (see Appx. IV)

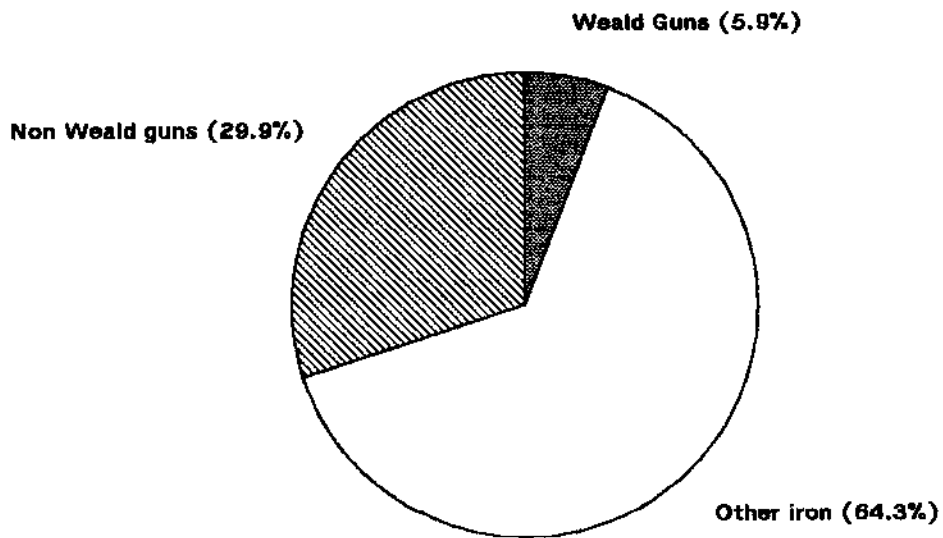


Fig.8

(BLI L/A/G/1/5/15-19)

If the purchases of ordnance by the Board peaked during the war years of 1756-63, purchases by the East India Company, while showing a lesser peak during the same period, began to rise considerably towards the end of the 1760s because of the Company's greatly increased activity in India following the establishment of control over Bengal in 1765. Edward Raby and Eade & Wilton were responsible for 100% of the ordnance supplied to the Company in 1769 and almost 50% the year after. There may also have been an illicit trade between the Weald and India. Correspondence between the Company's head office in London, and their office at Fort William, Calcutta, in the 1760s reported that, on a number of occasions, outgoing vessels bound for India were shadowed by ships as they left England. Making a rendezvous near one or other of the Atlantic islands, guns would be transhipped to be subsequently off-loaded and sold to native rulers before the East Indiamen docked at Bombay, Madras or Calcutta (Srinivasachari 1962: 142 etc.). There is no direct evidence that Wealden ironmasters were involved in this activity although John Legas was allegedly fined for illicit trading.<sup>25</sup> There is also the mysterious instance of ships carrying guns from Rye for Harrisons' in 1757, slipping away from their convoy and not all of them returning.<sup>26</sup> The third market for Wealden ordnance was the merchants who sold guns to commercial shipping and, during the war, to privateers. Because of the often informal nature of this trade, details are only sketchy. A list of ordnance proved for merchants by the Board between 1750 and 1753 notes the frequent involvement of most, if not all, of the Wealden founders of the time; Fuller, Bowen, Harrisons' and Crowley, as well as the Sones from Hampshire.<sup>27</sup> The Fullers certainly made use of the market for disposing of surplus or sub-standard guns. Robert Bagshaw, as well as being a partner of the Harrison brothers, seems to have acted on his own as a merchant, or at least an agent. Some other



**EAST INDIA COMPANY  
Ordnance Purchases 1750-70**

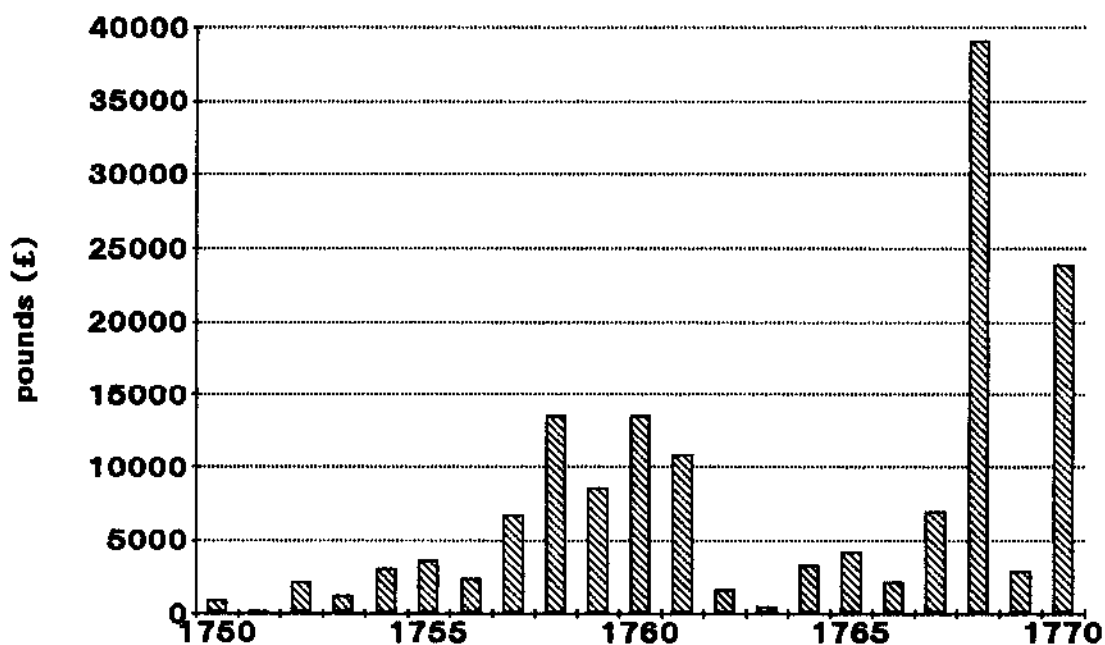


Fig.9

(BLI L/A/G/1/5/15-19)

ironmasters of Wealden furnaces appear to have carried on a business with merchants, mainly in London. During the war years the coastal traffic in "warlike materials" (gunpowder, saltpetre, arms and ammunition) was banned, except under licence from the Privy Council. Some gunfounders like John Churchill sold guns directly to specific buyers. The Crowleys annually shipped guns out of Hastings, invariably of small calibre, and often for the East India Company.<sup>28</sup> Sometimes the names of other merchants or agents are mentioned. Some, like Roger Hanmer, were directly linked to individual founders. Others were merchants whose deals with founders included shipping the goods from the furnaces. The Jukes family, who had been tenants at Robertsbridge until 1754, later turned their attention to buying and selling ordnance, purchasing guns from Sowley furnace as well as from one of the works in eastern Sussex. Eade & Wilton, who contracted for the casting of guns for the Board of Ordnance, also dealt widely in the

merchant trade, supplying ordnance for fitting out coastal and overseas shipping, or buying and selling captured guns. Gunfounders in the Weald were, by no means, the only suppliers for merchant shipping. Robert Morgan, at Carmarthen, and the Wilkinson family at Bersham, and later at Willey, sold guns to merchants in Bristol and Liverpool for the Africa and West Indies markets. Towards the end of the war, Roebuck & Co. at the Carron works entered the trade. As much of the ordnance which found its way into private hands may have been rejected by the Board at Woolwich, and therefore would not have been subject to the Privy Council orders, the extent of Wealden involvement in the merchant trade is not possible to measure. Clearly, there were a few who cast specifically for this market. Output at Ashburnham continued to include guns for at least two campaigns after they had ceased to supply either the Board or the East India Company.<sup>29</sup> With others, like Fuller and the Harrisons, their involvement was largely incidental to their main business of casting for the Board. In 1757, Harrisons' were requested, by the Board, to supply some half pounder guns they had cast for the merchant fleet. Harrisons' were concerned that the guns would not withstand the Board's proof; an indication of the higher standard of casting which the gunfounders lavished on the more highly priced work they did for the Board. The wartime control of coastal shipping was lifted in 1763, after which movements of ordnance for the merchant trade are harder to trace.

A small trade existed in supplying foreign governments with ordnance. The Fullers had a good reputation and did business with Sardinia, and with the Kingdom of Naples, in the early 1750s. An earlier deal with Austria was not finalised because they were to be of French bore, of which there was no English equivalent, and any rejects would be

difficult to dispose of other than as scrap (Crossley & Saville 1991: 271). Harrisons sold rejected guns to Genoa in 1755, and Eade & Wilton sold to the Kingdom of Sardinia and to Russia in the late 1760s; the latter also purchasing from Crowleys'.<sup>30</sup>

#### **Other castings**

It has been estimated that casting specific items accounted for about 20% of the output of the iron industry nationally in about 1750 and that, apart from the Weald, centres of the trade were at Coalbrookdale, Rotherham, the Wilkinsons' works at Bersham and Willey, and at Backbarrow in Furness (Hyde 1977: 219). This percentage was increasing as casting techniques improved (Schubert 1957: 268-9). Very little information is available about specific casting methods used in the Weald in the third quarter of the eighteenth century, so it is not possible to do more than speculate as to the extent to which the Wealden ironmasters adopted methods which were being developed elsewhere in Britain. Apart from guns, products cast at the Wealden furnaces can be divided into two main categories; military materials in the form of shot, shells and trucks, and decorative, domestic and agricultural ironwork.

As in the case of guns being sold to the merchant trade, there was no requirement, even from the Board of Ordnance, that shot or shells had to be cast out of ore. This opened up the market to the London foundries, notably those of Richard Gilpin and Stephen Remnant. However, because it was relatively easy to cast and could be transported by sea conveniently, shot could be cast at furnaces which did not have available to them the skilled workforce necessary for casting guns. Abel Walter, of Sowley, and Thomas Pryce, of Neath, both

failed gunfounders, cast shot in considerable volume for the Board.

### BOARD OF ORDNANCE Shot & Shell Suppliers 1750-70

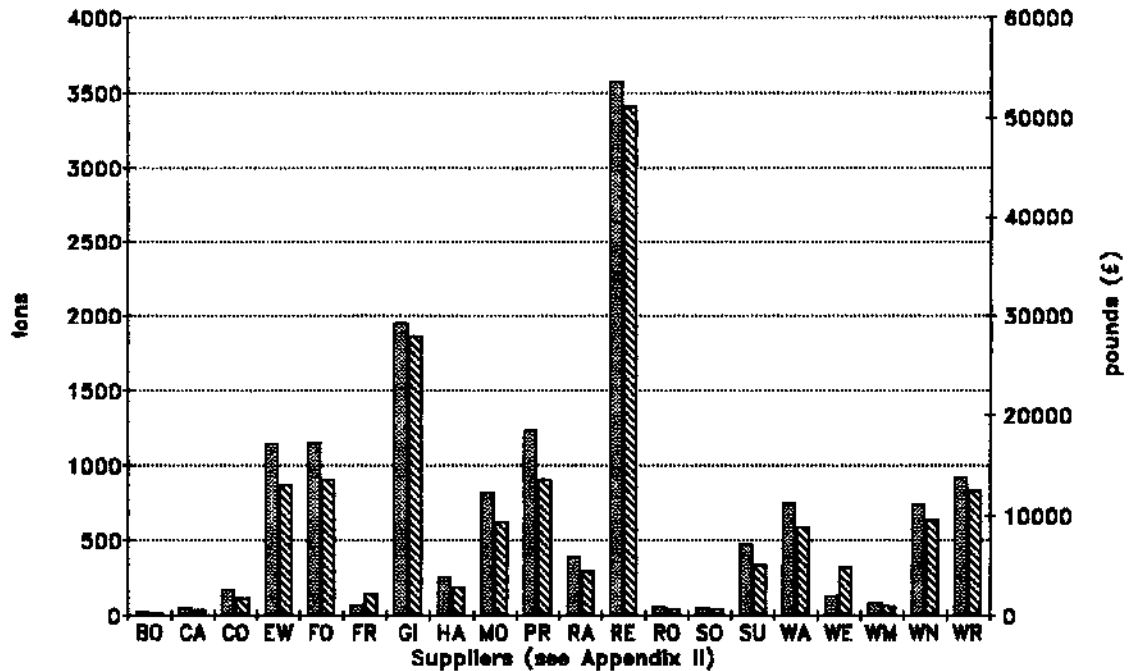


Fig.10

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Other prominent shot founders who operated out of blast furnaces, rather than air furnaces, included Robert Morgan and William Ford. Wealden furnaces, concentrating on ordnance, do not figure greatly among the suppliers of shot or shells. Eade & Wilton supplied over 1000 tons to the Board during this period, but it is unclear what their source was. Neither the Fullers nor the Crowleys supplied the Board at all, although shot moulds were made at Ashburnham. Harrisons' only cast just over 250 tons, despite the exclusive use that John Legas had made of Waldron furnace for casting shot in the late 1740s.<sup>31</sup> Some of their output, somewhat experimentally, was in shells for mortars and howitzers, as was some of Edward Raby's. Shells were more specialized, being cast hollow, and attracted a significantly higher price (£15/ton, as against about £11/ton for round shot).<sup>32</sup> Harrisons' experienced some problems in casting shells, theirs being singled out as over-

repaired, with voids in the iron needing filling.<sup>33</sup> Trucks, the wheels of gun carriages, were produced by both blast furnaces and air furnaces and were, like shot and shells, cast in greatest numbers in the London foundries. Again, only Harrisons' and Raby cast trucks in the Weald, indicating, perhaps, a particular expertise in box casting.

The manufacture of castings not associated with either the government or merchant gun markets, nor with the supply of pig iron to forges, was largely subordinate to them until peace came in 1763. Records of specific furnace output are only available for Heathfield and Ashburnham. At the former, output was concentrated on ordnance until 1764 so the peacetime years from 1750-56 are not distinguished by the extensive manufacture of domestic and agricultural castings. However, throughout the war period, it was to Heathfield that forge hammermen turned when hammers, anvils and other forge tackle needed replacing.<sup>34</sup> The Crowleys purchased several boring bars from the Fullers' forge at Burwash, having converted the forge at Ashburnham to a boring mill. At Ashburnham, records survive only from 1756 but, again, despite the wartime demand for guns, the furnace was able to retain some of its output for civilian purposes. Mill cases, used for holding the lower mill stone in a corn mill, required boring, as did garden rollers. This operation of the boring mill, which would have been specifically built for gunfounding, was an effective use of resources which could be underemployed at certain times during a campaign. Other domestic castings included stoves, plates (firebacks), pans and grates.<sup>35</sup> Ornamental work included some "cockles" for Sir Whistler Webster, suggesting that Robertsbridge furnace, of which Webster was the owner, was not able to manufacture such items. The sow iron and gunheads from Ashburnham could not be refined into wrought iron on site and, instead of selling them to other forges as

the Fullers did, they were exported from Hastings, presumably to the Crowleys' forges elsewhere. Correspondingly, wire and bar iron for use at the furnace was brought by sea, probably from the firm's warehouse at Greenwich. As to the output of the other Wealden furnaces, there is little evidence available, although some specialised decorative castings appear to have been made at Lamberhurst in the late 1760s (Phillips 1896: 214-5).

Wealden gunfounders had been attracted to casting in "brass" at least since John Browne had a brassworks probably at his furnace at Horsmonden (Cleere & Crossley 1985: 179).<sup>36</sup> In the period 1750-70, William Bowen manufactured brass ordnance, presumably at his foundry in Southwark, and Harrison & Co. offered to cast brass cannon in 1755, although no indication is given as to where they intended carrying this out.<sup>37</sup> At the end of the period, Edward Raby offered to cast brass mortars for the Board, claiming some success with the East India Company.<sup>38</sup> His evident facility for boring and turning using water power suggests use of one of his Wealden furnaces.

#### Notes and References

<sup>1</sup> See Hulme 1928-9, Parsons 1882, Riden 1977, and Cleere & Crossley 1985: 187-91.

<sup>2</sup> BRL *Sussex Weekly Advertiser* 6th January 1772, 21st June 1762.

<sup>3</sup> ESRO SAS RF/15/30.

<sup>4</sup> SyRO PI/6/1-.

<sup>5</sup> See ESRO RAF/F uncatalogued ledgers 1758-60 (the Fifth Ledger) and 1765-71 (the Sixth Ledger).

- <sup>6</sup> ESRO GLY 2770-1.
- <sup>7</sup> See KAO U274 T54; Westfield was later in the occupation of John Standen, then of Henry Bourne, both probably scions of ironworking families, and suggesting a later association with Robertsbridge furnace.
- <sup>8</sup> ESRO RAF uncatalogued ledgers 1758-60 & 1765-71 (the Fifth & Sixth Ledgers; see Saville 1982: 53-4).
- <sup>9</sup> PRO W047 53 f.218.
- <sup>10</sup> PRO W047 40 f.40.
- <sup>11</sup> PRO W047 35 f.195.
- <sup>12</sup> PRO W047 47 f.676.
- <sup>13</sup> PRO W047 64 f.197; 65 f.27.
- <sup>14</sup> Guns were identified by the weight of shot they fired; their "nature". The following were standard: 1/2, 3, 4, 6, 9, 12, 18, 24, 32 and 42 pounders. There were also length variations with 1/2, 6, 9, 12, 18 and 24 pounders.
- <sup>15</sup> PRO W047 36 ff.383-5.
- <sup>16</sup> PRO W047 53 f.560.
- <sup>17</sup> PRO W047 65 f.129.
- <sup>18</sup> PRO W047 69 f.215.
- <sup>19</sup> PRO W047 63 f.112.
- <sup>20</sup> PRO W047 35 f.260.
- <sup>21</sup> PRO W047 47 f.188.
- <sup>22</sup> PRO W047 64 f.197.
- <sup>23</sup> PRO W047 65 f.56.
- <sup>24</sup> BLI L/A/G/1/5/17 March 31st 1758. PRO W051 200 f.131.
- <sup>25</sup> ESRO PAR498/7/10.
- <sup>26</sup> PRO W047 49 f.294.
- <sup>27</sup> PRO W047 42 f.27; probably for East India Company shipping.
- <sup>28</sup> PRO PC2 105 ff.359 & 657; 106 ff.149, 246 & 469; 108 f.206.
- <sup>29</sup> ESRO ASH 1815 Campaigns AM & AN.

- 30 PRO W047 46 f.526; 73 f.313; 76 f.17.
- 31 Guildhall Library Ms.6482.
- 32 PRO W051 172-246.
- 33 PRO W047 54 f.496.
- 34 See particularly ESRO AMS 5622/5.
- 35 ESRO ASH 1815.
- 36 Brass is used here in its archaic sense, i.e. bronze, in the proportions of 10% tin and 90% copper.
- 37 PRO W047 46 f.197.
- 38 PRO W047 76 f.187.



# Wealden Ironworks 1750-70

(for key to sites see Table 1)

Fig.11

