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THE WEALDEN IRON INDUSTRY.

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C O N T E N T S.

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CHAPTER I.

INTRODUCTORY.

The Weald stretches north and south to within a few miles of the North and South Downs, eastwards as far as Boxley, Charing and Folkestone, and westwards over the Hampshire border.[↓] It was "in the earliest periods of historical record, one vast forest, designated Coit Andred, Andred's-Wald, or the Forest of Anderida,"[↓] its soil was rich in iron ore, and it was watered by numerous rivers and streams. Thus it possessed the three requisites for the manufacture of iron before the introduction of coal and steam, ore, charcoal and water power. "The strata which produced the iron ore lie in the central portion of the Wealden formation, in the vast beds of sandstone constituting what is provincially called the Forest Ridge, and known among geologists as the Hastings Sand. These beds extend from Hastings, inland, in a direction nearly west, and form

↓ Iron was worked at various places in Hampshire, at Sowley, Titchfield and Bramshott, while ore was found in large quantities round Christchurch and Beaulieu. But the industry never became general or attained any great importance. Vic. County Hist. of Hants, Vol. V, p. 464.
 + Suss. Arch. Coll., Vol. II, p. 169.

a ridge of elevated land, the course of which will be easily indicated by naming Ashburnham, Heathfield, Crowborough, Ashdown Forest, Worth, Tilgate Forest and St. Leonard's Forest as prominent points."[↓]

The stratum which yielded most iron-ore was the Wadhurst Clay, which was richest to the east of the Hastings Beds in the district stretching from Wadhurst into Kent as far as Brenchley and Cranbrook. As a rule it lay near the surface, and the ore has been described as "a kind of 'bog-iron', frequently turned up by the plough, and called iron rag. It is composed of clay, gravel, and perhaps about 25 or 30 per cent. of oxide of iron, and is a superficial and fragmentary formation - a recent 'pudding-stone'."⁺ At Ashburnham the Wadhurst Clay contains about 35 per cent. of iron, and sometimes as much as 50 per cent.^x The iron ore was not confined to the Wadhurst Clay, however, but was found also in various other strata of the Hastings Beds and Wealden Clay, and in the west of the Weald, on the Surrey and Hampshire borders, it was extracted from the Lower Greensand.

We possess an exact and detailed description of the

↓ Ibid.

+ Suss. Arch. Coll., Vol. II, p. 170

x Ibid. Vol. XLVI, p.6.

iron-bearing strata, compiled in the eighteenth century by John Fuller of Heathfield, iron master, for Hans Sloane of the Royal Society.[↓] He says, "All the names and measures of our mine[†] are accounted and begun from the Lowest Stratum of all which they call Bottom, from which they Count upwards to the surface, which Bottom lyes from sixteen to thirty feet deep." Then he gives the names of the strata in order from the Bottom, describing the appearance and use of each in turn.

The first or Bottom stratum "is a Course Indifferent sort of Mine having very little Iron in it but is usefull to work with the Richer Mines . . . The Second stratum next to Bottom is Bull . . . It is an Hard Hott mine, and abounds with Iron which is Hard to melt out of it, it is reckoned among the Course Mines." Next comes the "Three foot Pitty" of which there are three sorts, "White Veined Pitty, Pitty half white Half Gray, the Gray Pitty." The White Veined is a very good mine, but the Gray "works so very Hott and fiery in the Furance, that if they carry too much of it, it will Tear the Firestones to peices." The fourth stratum "is called Five foot because it is so far

↓ Sloane MSS. 4020, fol. 189, et seq.

† "Mine" = ore.

from the Bottom, a fine Curious soft Vein of Mine . . . This is one of the sorts of Mine which they call Veines in generall, that being the name by which they express the best sorts of Mine." Above that comes the Seven Foot, another useful vein, and above that again the "Nine foot Balls, Cabbalas, Hogsheds. The Lesser Sort are called Balls, the second Balls as big as ones Head, Hogsheds, the Middle Sort Cabbalas . . . They are very good and reckoned among the Veines." The seventh stratum is called "Eleven Foot or Grayes, a thick Hard Grey Stone fitt for nothing but paving or to make lime or Flux the Metall. It seems to be designed by Nature to cover the Mine on the Top.[↓]

The Wealden iron field was worked even before the coming of the Romans, for Julius Caesar noted that the Britons had a currency of iron rings, and that iron was found in the regions near the coast, though in small quantities.^x The Romans, however, seem to have undertaken a systematic exploitation of the Wealden iron, and traces of their works have been found at Balcombe, Beauport Park, Chiddingly, Chitcomb, Cowden, Horsted Keynes, Maresfield, Sedlescombe, Westfield and other places.^{*} After their

↓ Wealden ore is, on the whole, of poor quality, and produces an iron too brittle for modern uses. Moreover, the veins are too intermittent to repay exploitation on a large scale. A small furnace lately set up near Midhurst was intended to use local ore, but it was found more practicable in the end to buy 'pigs' from the north.

* Sussex Arch. Coll. Vol. II, pp. 171-5.

* Ibid. passim. See Map A.

departure the industry again relapsed into an inactivity which lasted apparently until the middle of the thirteenth century from which date until the beginning of the nineteenth century more or less complete records exist of its rise, decline and fall. During the fourteenth and fifteenth centuries the industry was establishing itself firmly, but it was not until the invention of cast-iron guns in the sixteenth century that the Wealden iron masters won a reputation which soon became world-wide. The sixty-years at the end of the sixteenth and at the beginning of the seventeenth century were the Golden or Iron Age of the Weald, when gun-founders made fortunes and every stream and every wood seemed to supply power and fuel for a furnace or forge. The seventeenth and eighteenth centuries saw the gradual decline of the industry, due partly to the exhaustion of the Wealden forests, partly to foreign competition, but chiefly to the introduction of coke smelting. At the beginning of the nineteenth century only one furnace, Ashburnham, was still working, and in 1820 that too had ceased.

In the following pages an attempt is made to describe in detail this development and decline.

CHAPTER II.

THE WEALDEN IRON INDUSTRY IN THE MIDDLE AGES.

From the time of the Roman occupation until the middle of the thirteenth century the records preserve complete silence on the subject of Wealden iron, a silence only broken for a moment by the mention in Domesday Book of an iron mine at East Grinstead.[†] It is difficult to account for this. The Romans apparently left the iron industry well established in the Weald; the Saxons were a warlike race and used iron for weapons; and at that time the amount of iron imported could hardly have supplied all their needs. Yet it seems unlikely that the Domesday surveyors who took account even of the pigs and falcons should overlook so valuable an asset as an iron mine or forge. It is possible, however, that they did not regard them in that light, for land dug for ore was useless for tillage for years afterwards, and the medieval forges of which accounts survive seem to have produced only such iron as was needed for the use of the manors in which they were

[†] Vic. County Hist. Sussex, Vol. II, p. 241.

situated and were often run at a loss. But as a matter of fact Domesday does mention iron mines and works in Gloucester, Somerset and elsewhere, and one is therefore forced to conclude that the Wealden iron trade had gradually died out and that the men of the Weald were already at the end of the eleventh century drawing their supplies from Spain and from the Forest of Dean.

By that time the iron-workers of the Forest of Dean had established their position and during the twelfth and thirteenth centuries they enjoyed a practical monopoly of the iron trade. Most of the work was done at small itinerant forges which were moved about as the fuel supply was exhausted, but there were a few important establishments. The king himself owned a 'great forge' there, which was valued at £50 a year.[↓] Gloucestershire iron retained its hold on the London and Sussex markets well into the thirteenth century, for in 1225 Simon de Senliz, steward of the Bishop of Chichester, advised his master to buy his iron from Gloucestershire.[•]

Towards the end of the thirteenth century, however, this ascendancy began to be disputed by the smiths of the

↓ Bazely, M.L. Forest of Dean in its Relations with the Crown in the twelfth and thirteenth centuries. (Bristol and Glouces. Arch. Soc. Trans. Vol. XXXIII, p. 267.)
 • Vic. County Hist. Sussex, Vol. II, p. 241 (from Royl. and Hist. Letters, Rolls Series, Vol. I, p. 278.)

Weald who, working apparently both with native and imported iron, competed with the Gloucester smiths in the London market. In 1253 the Sheriff of Sussex was ordered to supply the king with 12,000 nails to be sent to Freemantle,[↓] and again in 1254 with 30,000 horse-shoes and 60,000 nails. It is not stated that he was to buy them in Sussex but it seems reasonable to suppose this, since it is hardly likely that he would have been required to supply so much iron unless Sussex were beginning to be recognised as an iron-producing country.

A Sussex man, Master Henry of Lewes, was one of the smiths employed on iron-work in the king's palace at Westminster in 1259, and during the year various payments were made to him "for the iron work which supported the mantel of the chimney of the king's chamber, before it was taken down,"[†] and "about making the iron work which upheld the shaft outside the kitchen of the King's chamber against the force of the winds."^x In 1275 and 1276 entries in the Exchequer K.R. Accounts show that iron was being produced in the Weald and was already competing with Gloucestershire and Spanish iron on the London market. In the former year Master

↓ Sussex Arch. Coll. Vol. XVII, p. 117.

† Devon's Issues of Exchequer, p. 46.

x Ibid., p. 68. Also pp. 70, 71.

Henry paid £16. 17. 11d. for 406 rods purchased in the Weald, and in 1276 £4. 3. 4d. "to a certain smith in the Weald for 100 iron rods."[↓] Master Henry must have been a remarkably long-lived old man for those times; in 1290 he was still the king's smith, and was employed on ironwork for the tomb of his late master, Henry III.

Although from an examination of the Customs Accounts⁺ it seems clear that a good deal of the iron used by Wealden smiths was imported, there is nevertheless evidence that iron mines were actually being worked in Sussex in the thirteenth century though not always very successfully. In 1263 Agnes, wife of Nicholas Malemeins, and Isabel, wife of Thomas de Andeham, quarrelled about a third share in an iron mine at East Grinstead. Agnes, who owned the third share, complained that of late she had received nothing from the mine. On Isabel's behalf it was stated that during the lifetime of her first husband, Ralf de la Haye, one-third of the profits had always been sent to Agnes, but since the death of Ralf there had been no profits, Thomas apparently not being so good a man of business as his predecessor.^x

↓ Salzman, English Industries in the Middle Ages, 1913, p.24, (from Exch. K.R.Accounts, 467. 7.)

• See below, p.11-2

x Vic. County Hist. Sussex II, p. 241-2 (from Assize Roll, 912.)

Some writers have taken Henry III's murage grant to the town of Lewes in 1266 as evidence of the establishment of the iron industry in Sussex.[†] In consideration of the damage suffered by the town in the late struggles he granted them a toll on certain articles to provide funds to rebuild their wall. The grant runs[‡]:- "for every cart laden with iron for sale, a penny - for every horse load of iron for sale, through the week, a half-penny." Taken by itself this has been thought to prove that the iron trade was flourishing in Sussex. But since the grant goes on "for every cart-load of lead for sale, a penny - for every car or cart laden with tin for sale, a penny - for every tumbrel of squirrels for sale, a half-penny [etc.]," and we know that lead and tin must have been imported either by land or sea, it is dangerous to draw from this evidence any conclusion favourable to the growth of the Sussex iron trade.

In the fourteenth century evidence is at once more positive and more plentiful. In 1300 the ironmongers of the City of London made "grievous complaint" to the Mayor and Aldermen "of the smiths of the Wealds and other merchants bringing strakes of wheels for carts of much shorter

† Sussex Arch. Coll. XLVI, p. 3.

‡ Horsfield, T.W. History and Antiquities of Lewes I, p.162
(from Pat.Rolls 8 Ed.III, M.35, where the grant was renewed).

length than they are accustomed to be, to the grievous loss and scandal of the whole trade of ironmongers"...... To remedy this abuse it was ordered that standard rods should be made and entrusted to "lawful and trustworthy men" who should test the imported rims.[↓]

The Sheriff was frequently called on to provide iron for the king's armies. In 1320 he provided 3,000 horse-shoes and 29,000 nails,[†] probably made at Roffey, near Horsham, where in 1327 he bought 1,000 horse-shoes, paying for them £4. 3. 4d. and 3s. for carrying them from Roffey to Shoreham.^x Horsham seems at that time to have been a centre for the manufacture of such small munitions of war, for in 1338 he purchased 6,000 arrows there.[‡] But the supply was not big enough to meet all the demands of Edward III's wars, and in 1347 when the Sheriff had to provide 266 sheaves of arrows, he bought only 150 sheaves at Horsham and had to buy the rest at London Bridge.[•]

The record of iron purchased for the use of Boxley Grange in Kent gives some idea of the amount of iron used on an estate and shows too that English iron was a dangerous competitor of Spanish iron. Thorold Rogers^{•x} extracted the

† Sharpe, Calendar of the Letter Books of the City of London.

Bk. C. pp. 88-89.

‡ Sussex Arch. Coll. II, p. 178.

x Ibid, XVII, p. 117.

‡ Ibid, XVII, p. 117.

• Vic. County Hist. Sussex, II, p. 242. (from Pipe Roll, 20 Ed. III).

•x Rogers, J.E. Thorold, History of Agriculture and Prices in England, Vol. I, p. 465.

following figures from Ministers' Accounts:

1332:	1 C lbs. Spanish iron	at 3s. 6d. the C.
	7 blooms of Wealden iron	at 3s. 6d. the bloom.
	2 blooms	at 3s. 9d. the bloom.
1333:	4 C lbs. Spanish iron	at 4s. 0d. the C.
	6 blooms	at 3s. 4d. the bloom.
	2 blooms	at 3s. 1d. the bloom.

Thus it is obvious that Spanish iron here, as elsewhere, was usually bought by the hundred. On the other hand Wealden iron, in the only case where it is specifically mentioned here, was bought by the bloom. Rogers also quotes the price of iron made at Tendale in Cumberland, and there again it was sold by the bloom. It seems possible to argue therefore that English iron at that date was usually sold by the bloom and that the other iron mentioned in the Boxley accounts as being bought by the bloom was English and most probably Wealden iron. In that case Wealden iron was not merely a dangerous competitor of Spanish iron but was already ousting it from some markets.¹ Boxley itself was not a centre of the iron industry but it lies conveniently near the Medway and it would have been easy to carry iron down the river, for instance from Tudeley.

¹ Blooms of iron were also sold at Peckham in 1320.

Scattered references to the existence of the industry in various places are found in tithe and tax returns. The Nonaie rolls of 1343 prove its existence in Lynch[†] and Farnhurst[†] in both of which places the rector received a tithe on iron ore, for which, at Lynch he was paid ten shillings as composition. The Poll-tax returns of 1379^x for Crawley show that William Rokenham "factor ferri" was assessed at the high rate of 6s. 8d., and William Danecombe, similarly described, at 40d. In addition two smiths and a "ferour" (farrier) are mentioned. At Lindfield mention is made of a charcoal-burner and six smiths, which seems to point to the existence of the iron trade there, for six smiths could hardly have been necessary for the normal needs of the village.

From Edward III's reign also dates the first record of the iron industry in the Weald of Surrey. In 1372 John Neel and others were charged with digging up the highway in Horley and creating a nuisance by maintenance of John Wacche. Neel said there was an iron-mine in a waste of the manor of Banstead, and no highway but only a path. By licence of Wacche, the steward of the manor, he had bought 200 cartloads of ore for 50s. Finally he admitted the

† Dallaway, History of the Western Division of the County of Sussex, p. 300.

† Ponsonby, A., Priory and Manor of Lynchmere and Shulbrede, p. 181.

x Vic. County Hist. Sussex, II, p. 242.

damage and he and Wacche were fined 2s. each and had to repair the road.[†]

The manorial records and accounts, though they often give details as to purchases of iron, are for the most part silent as to its origin and manufacture. In an undated rental of the manor of Wiston,[‡] which is referred to in the Roll of 1357-8 as the *Vetus Custumale*, it is said that William Ismongere (or Ironmonger) held one messuage and eight fields in the villate of Ashurst, for which he paid yearly four shillings and one red rose. The name may simply be coincidence, but it is known that Ashurst did later become an iron centre. In the accounts of the Manor of Maresfield^x in 1387 among other expenses connected with the cornmill, there is an entry, "And for making 1 ring with the lord's iron." Iron-works are known to have existed at Maresfield at various dates, and it seemed possible that "the lord's iron" referred to iron made at works owned by the lord. But there is no other reference to it in the series of Maresfield accounts, so that the accountant was probably simply referring to a stock of iron that the lord had bought for the use of all his manors.

[†] Surrey Arch. Coll. Vol. XXXIV, p. (Coram Rege Roll, 45 Ed. III No. 443, ro. 15 Rex).

[‡] Sussex Arch. Coll. LIII. W. Hudson, p. 149.

^x Duchy of Lancaster Ministers' Accts. Bdle. 441, No. 7086 "Et infaciendum januli de ferro domini."

The Ministers' Accounts, however, though disappointingly uninformative on the whole, give us our earliest picture of a Wealden iron-works. A series of accounts relating to Tudeley (Kent)[†] traces, with some intervals, the history of the forge there from 1329 until 1374, and in some years details are given of its working expenses. Tudeley lies in the manor of Southfrith, near Tonbridge, and was part of the inheritance of Elizabeth de Burgh, Lady of Clare, a grand-daughter of Edward I. The accounts of the iron-works first appear in 1329 as part of the accounts of the keeper of Southfrith Chace,[‡] so that the works were then being managed by some official of the manor. Similar accounts appear until 1334, when the works were leased to Thomas Springet at a yearly rent of one mark. In 1343 the works were rebuilt at the expense of the Lady of Clare,^x but Thomas Springet for some reason failed to make them pay and in 1346 his rent of one shilling for the site of the ironworks was in arrears because the works were lying waste. In 1350, the year after the Black Death or First Pestilence, his rent, like many others, was still in arrears.

† Printed by M.S. Giuseppe in Archaeologia, Vol. LXIV, pp. 145 - 164.

‡ Archia. LXIV, p. 147, Ministers' Accts., Bdle. 890, Nos. 22, 24, 26.

x Ibid., p. 148. Ministers' Accts., Bdle. 891, No. 7.

The experiment of leasing out the works had proved unprofitable and in October, 1350, the Lady of Clare again took the works into her own hands, appointing Thomas Springet, late lessee, as keeper of the works.[†] His account covers a period of forty-one weeks (October, 1350 - July, 1351), during which 252 blooms of iron were made and 184 sold, and at the end there was a deficit of £2. 19s. 10¹/₂d, probably due to the fact that extensive repairs must have been necessary before work began. His next* account relates to the period from January to July, 1352, during which 143 blooms were made and sold, and shows a balance of £5. 3s. 1d. From that time until September, 1353, the works apparently lay waste again, but in September John Parker, the receiver, began to work them and carried them on for seven weeks. During this time 39 blooms of iron were made and sold, but it was only by including Springet's last balance in his accounts that he managed to show a balance of 18s. 11d. In 1354 Thomas Springet again took over the management of the works and during a period of twenty-five weeks 138 blooms were made and sold, giving a balance of £2. 2s. 9d.

In October, 1354, it was decided to farm out the works again, and a lease was granted to Richard Culpepper

† Ibid, p. 149. Exchequer Various Accts., Bdle. 485, No. 11.
 * Mr. Giuseppi believes that there is at least one account missing between July, 1351 and January, 1352.

for three years at a rent of twenty marks.[↓] The great difference between this rent and the rent of one mark mentioned in the lease of 1334 may be accounted for partly by the general rise in prices caused by the Black Death, and partly by the particular rise in the price of iron,⁺ a problem which was already exercising the mind of the government and was dealt with in the Statute 28 Edw.III, C.5.^x

Richard Culpepper renewed his lease and carried on the works with success until the Second Pestilence of 1360-1, when his rent fell into arrears and the works probably into decay "for default of a farmer and workman by reason of the Second Pestilence."^z

The only other Southfrith account of the fourteenth century is for the year 1374-5,^φ which simply says that the farm of the works yielded nothing.

This short summary of the accounts gives some idea of the extraordinarily haphazard way in which the works were carried on. The works fall into decay, are farmed out or carried on by manorial officials without any apparent rhyme or reason. When carried on by the latter the

↓ Ibid, p. 150. Ministers' Accts., Bdle. 891, No.13.

+ Ibid, p. 151.

x See below, p. 26.

z Ministers' Accts., Bdle. 891, No.16. p.151.

φ Arch^{ia}. LXIV, p. 151. Ministers' Accts., Bdle. 891, No.18.

works were presumably run to supply the needs of the manor, and some of the notices of payments must simply be payments by other officials of the manor to the keeper of the works. It does not seem possible that the works should have been run for the sake of profit, for the profits never, so far as is recorded, exceeded £5. 3s. 1d. (in 1352), although the keeper had to pay nothing for his ore, which was found on the manor, except for digging and carriage. Yet Thomas Springet and Richard Culpepper thought it worth while to farm the works, though Thomas was not very successful and was quite ready to give up his independent tenancy and become the paid official of the Lady of Clare. Richard Culpepper had to pay a high rent for the works but he obtained very advantageous terms in his lease. "The aforesaid lady grants that the said Richard shall have in each year of the said three years enough brushwood to make fifty duodenae of charcoal..... and orston for three hundred blooms which shall be dug by the said Richard's own men..... And moreover the aforesaid Richard shall have of elyngwode twelve cartloads by estimation."[†] This seems a very liberal allowance, for the manorial officials had never used more than 41 decenae of charcoal (1331), and had never made more than 252 blooms of iron (1350-1).

† Arch^{ia}. LXIV, p. 150.

Charcoal was usually bought on the estate at first by the decena (24 quarters) but later by the duodena (14 summagia or sumpter loads). Its price varied from 3s. 3d, the decena in 1332 to 8s. the duodena in 1354. Throughout the accounts there is evidence of a sharp rise in all prices after the Black Death. The prices quoted include the cost of carriage which in 1333 was 4d a decena and in 1352 7d.[↓]

The ore, variously described in the accounts as petrae, lapides or orston, was, as already stated, found on the estate and the only expenses in connection with it were for digging and carrying. It was reckoned by the number of blooms which could be extracted from it, and ore for one hundred blooms was taken as the basis of payment. "In digging ore for 231 blooms of iron, 41s. 5d, for the C, 18s. In carrying it to the furnace, 11s. 6d., for the hundred, 5s."[†] After the Black Death the price rose and in 1350-51 the digger, Thomas Judde, was paid 27s. a hundred and a tunic worth 5s.^x In 1352 the price fell to 25s. but in 1353 it rose again to 27s.

The accounts make very little direct reference to the processes employed in the manufacture of the blooms.

↓ All these details naturally refer to times when the works were under the management of manorial officials.

† Ibid, p. 156.

x Ibid, p. 159.

There is no mention of any water power, and the bellows were probably worked by the hands or feet of the workmen, which seems to be borne out by the name given to the workmen who are always described as the "forblouweris" or "anteriores flatores". The other processes were probably equally simple. In the lease of 1354 quoted above, Richard Culpepper was entitled to receive twelve cartloads of "elyngwode" a year, and in the accounts there are regular entries relating to a preliminary mollifying process, variously described as "in petris conflandis", "in petris combustis", "in petris comburendis", or "in elyngg' cxliij blomes". This preliminary melting was necessary before the iron could be taken to the furnace to be made into blooms. The furnace itself must have been a small one of a primitive type in which it was impossible to subject the ore to a great heat, for Tudeley did not produce any cast-iron but only wrought blooms and what were called iron "graynes". Until the Black Death the price of one bloom was 20d.; afterwards it varied between 3s. 1d. and 3s. 9d., while "graynes" were sold in 1350-1 for 6d. and in 1352 for 3d.

The staff at the ironworks consisted of four workmen, the Forblouweris or anteriores flatores, and in some years payments are also recorded to the keeper of the

works, Thomas Springet, though at first such an officer does not seem to have been considered necessary. No distinction is drawn between the functions of the four workmen; they are referred to individually as the "mayster-blower" or "magister" blower and the second, third and fourth blowers. Their wages were reckoned on a triple basis. They were paid between them one penny a week for drink money "according to the custom of the country", a not excessive allowance. They were also paid a "stipend which is called gersuma", which seems to have been a time rate or yearly wage. In 1330 it was 3s. 6d. between them, reckoned perhaps for the twenty weeks during which the furnace had been working. In 1350-1 the "maysterblower" received 2s. a quarter, the second 11d., the third 9d., and the fourth 8d. In 1352 the second and third rose to 1s., but the fourth had to wait for his rise until 1354, when he was paid 1s. 4d. the quarter.

Lastly they were paid a piece rate, the basis of which varied a good deal. In 1330 they received 5½d for every bloom made; in 1332 this was reduced to 2½d, but in addition every seventh bloom became their property.†

† "in mercede operariorum pro dictis blom' faciendis xxxij blom', capientium pro opere suo septimam blom'." Ibid, 156.

In the later accounts the rate varied between 7½d and 9½d. We are not told in what proportions the pay was divided between the blowers. Probably the masterblower took charge of that duty.[↓]

The Tudeley accounts contain several references to other ironworks in existence in the neighbourhood. In 1332-3 the accountant records the receipt of 12s. for ore ("petrae") sold for making 300 blooms of iron.[†] Since the Tudeley works did not pay for ore and since, moreover, there is no mention of this payment in the Tudeley account, the ore must have been sold to some other works. In 1340 there is reference to another works on the estate of Newefrith juxta Bournemelne.^x This was leased to Robert Springet, probably a brother of the Tudeley lessee, at a yearly rent of five marks, which, compared with Thomas's rent of one mark, would seem to prove that the Newefrith works were more flourishing than the Tudeley ones. In 1350 in the list of rents in default on account of the Black Death two other forges ("fabricae") are mentioned

↓ "Item in blowyng' vij^{xx} xviij blomys iijj li. xvijjs. ixd. ob. pro blome vij d. ob.....Item in potagio iijj blowers per xxxvj septimanas ijjs., pro septimana jd. Item solutos pro gersuma maysterblower pro tribus quarteriis vjs., pro quarterio ijs. Item in gersuma secundi blower per idem tempus ijs. ixd., pro quarterio xjd. Item in gersuma tercii blowere per idem tempus, ijs. iijjd. Item in gersuma quarti blower ijs per idem tempus, pro quarterio viijjd."

† Ibid, p. 147.

x Ibid, p. 147.

in addition to Tudeley.[↓] The word "fabrica" can mean simply a smith's forge, but in each case the site rent is the same as Tudeley, 1s.

Though the Ministers' Accounts and other manorial records tell us but little of the manufacture of iron, they are full of detail as to its use. Iron was an expensive and necessary article in agriculture and its purchase is carefully specified.* It was used for ploughshares, coulter, horseshoes, oxshoes, spades, picks and cutting tools, nails, bolts, and hinges. Cart and plough wheels were bound with it, and a good deal was used in the machinery of mills. Sometimes the bailiff bought in a stock of iron and gave it out to the smith to work up as required. Such was the practice of the bailiff of Milton and Marden (Kent) who paid 4s. 8½d for steel and iron for the ploughs in summer and winter, and 4s. 9½d for iron and for the smith's wages for making iron tyres for the carts.

↓ Arch^{ia}. LXIV, p. 148, from Ministers' Accts, Bdle.891, No.9.

* Dr. H. Hall says, "I notice that in Rent Rolls for the Bishopric of Winchester in the fourteenth and fifteenth centuries in the Inventories of Dead Stock special note is taken of any implement or utensil bound or shod or otherwise composed of iron. It is obvious that the wood in such articles was almost negligible and when specified is in distinction to the iron-work. Of course some other articles of Dead Stock were also relatively expensive, e.g. Mill stones, sacking, canvas, etc."

and shoeing the horses.[↓] But, increasingly as time went on, the smith became more independent. He bought his own raw materials and sold the finished product to the bailiffs. The keeper of Rotherfield manor in 1325[†] still bought a stock of iron for the plough, but he bought his horse-shoes and plough-wheels ready made. In the account of the clerk of works at Leeds Castle (Kent) in 1370^x all kinds of nails, cross-bars and other iron-work for windows, locks and keys and grappling irons, are bought from Solomon the Smith.

Turning to more general evidence of the Wealden iron trade we find that it was in the fourteenth century that the state first began to take an interest in its existence and to realise its importance. In 1353 Edward III sent orders to the Mayor and Bailiffs of Sandwich to proclaim that no merchant, mariner or other person, upon pain of forfeiture, should take corn, boards, iron or any victuals out of England to any parts beyond without the

↓ Ministers' Accts. Bdle. 1089, No.8. Manor of Milton and Marden, Kent, 4-5 Ed. I.

† Ibid, 1148/13. 18-19. Ed. II. "In xxx ferramentis equorum emptis xijd....In ij paribus rotulorum emptis ad plastrum iijjs." The wheels must have been shod with iron; otherwise they would have cost very little. In The Pipe Roll of the Bishopric of Winchester, edited by Dr. Hall, the difference in price caused by binding a cart with iron is clearly shown. "In careta empta, ijs. viijd. In careta ferrata empta ex novo, vjs. vjd." (p. 56).

x Excheq. Accts. Various, 544/23. 43 Ed. III.

king's special order.[↓] And similar orders were sent to Dover and Faversham and their dependent ports. These were followed in 1355 by a statute[†] forbidding the export of iron whether made in England or imported, on pain of forfeiture. The great increase in the price of iron was also noted, and the justices who administered the Statute of Labourers were empowered to inquire into the question and to punish those who sold at too high a price.

No documentary evidence exists of the manufacture of anything but wrought iron in the fourteenth century. Until the introduction of water-power to work the bellows it must have been almost impossible to keep up a blast strong enough to produce the heat necessary for the manufacture of cast iron in any quantity. But in Burwash Church there is a cast-iron memorial tablet which is usually ascribed to the fourteenth century.^x It is inscribed to "Thome Colins" who was possibly a member of the family of Collins who later on became ironmasters in the district. It is quite likely that although iron casting was not a regular process at this period, cast-iron was sometimes produced, perhaps accidentally, when the furnace was kept alight for an unusually long time.

↓ Cal. of Close Rolls, 26 Ed. III. m. 21d.

† 28 Ed. III. c. 5.

x M.A. Lower in Suss. Arch. Coll. II, p. 178.

Since in the sixteenth century the fortune of the Wealden iron trade was closely bound up with the developement of the manufacture of iron ordnance, it is of interest to note that the fourteenth century saw the first use of cannon in warfare. Edward III's first cannon were probably made of bars of wrought iron bound with hoops.¹ But it was very soon discovered that bronze cannon, though more expensive were much lighter, and therefore more mobile and useful. They were made in the same way of bars of wrought bronze and were probably bound with iron. And some at any rate were made on the Weald. In the account of Henry de Cobeham, keeper of forfeited lands in Kent, Surrey and Sussex, of the stores provided for Edward III's expedition to Aquitaine, we find that ten springalds had been made at Winchelsea and ten others at Tonbridge. The bronze barrels with their iron bindings and the iron-shod gun carriages had been made on the Weald, though the more intricate parts of the guns had been bought in London.*

¹ J. Starkie Gardner, "Iron Casting on the Weald", Arch^{ia}. LVI. p. 135.

* Excheq. Accts. Various. 24/6. 18 Ed. III. "Et in decem aliis springaldis cum ferramentis et maeremiis suorum cum carpentario ad eosdem factos apud Wynchelse ad castrum ex ita convencione facta cum Johanne de Bixle xxij li. In xx nucibus et L Ruellis eneis emptis apud London tam pro predictis decem springaldis factis apud Tonebregge quam pro aliis decem springaldis factis apud Wynchelse ponderis 66lxvij lb. eris precie cuiuslibet librate cum opera vd.ob. vj li. ijs. iiii d.ob." Mr. H. Jenkinson thinks that 'nux' was probably the trigger (it was used in that sense of a cross-bow) and 'ruella' was some kind of round plate used to take the friction of the nut.

Oddly enough the fifteenth century is even more sparsely documented than the fourteenth, though there are numbers of specimens of the work of that period.[†] They are chiefly fire-backs and fire-dogs which prove that iron-casting had become quite common by this time. This is also proved by the existence of a new type of cannon.[‡] The old outer barrel of wrought iron or bronze bars bound with hoops remained, but inside there appeared a second barrel of cast iron. It is probable that the making of cast-iron shot, which was a much simpler process, had preceded that of cast-iron barrels. But the first documentary evidence we have of it is in 1497,^x and in 1514 at any rate shot made of stone were still being used.[¶] The industry, however, must have been growing steadily throughout the century for when at length we find records of it, it is already so well established that the king is having some of his ordnance made in Sussex, and ecclesiastical princes are buying their iron there instead of in Gloucestershire. The first definite mention of Sussex iron is found in a Lambeth court roll of 1492 where there is note of a payment to "^{the} ~~ye~~ ^{the} Iernefounders of

† Described by M.A. Lower, op. cit.; ibid XLVI, p. 45;
J. Starkie Gardner, op. cit.

‡ Specimen, originally from Bodiam Castle, preserved in the Rotunda at Woolwich. There used to be another on Eridge Green (Frant). J. Starkie Gardner, op. cit.

x See below, p. 29.

¶ L. and P. Hen. VIII. Vol. II, Pt. II. App. II, p. 1521.
5 tons of Maidstone stone, rough hewn, for bombard shot,
at 12s. a ton..

Buxstede."[↓]

Ashdown Forest, on the edge of which Buxsted lies, was by that time the chief centre of the Sussex iron trade. There is evidence of works at Hartfield in the north of the Forest and of government ordnance works at Newbridge. In the period 1493 - 1500 "Pieter Roberd alias Graunt Pierre yernefounder dwellyng in Hertfelde" lodged a complaint against "Harry Mayer otherwise Harry Fyner of Southwarke, goldsmythe." He said he had entered into partnership with the said Harry, had delivered into his hands iron to the value of £157. 2s.6d. and had done some repairs in addition. Yet Harry had caused him to be arrested and "fetyred w^t grete yernes" for a debt of £20.*

This same Harry Fyner appears frequently in the list of payments relating to ordnance in 1497 as delivering iron to Simon Ballard at Newbridge. "Paied to Henry ffyner.... in prest upon certeigne yron to be forged and wrought withyn the fforest of Asshenden in to Strakes barres for extrees crosse barres forelockes boltes bolsters downelege and dowlege nayle with other things as shalbe necessarie for the bynding of the Stockes and Wheles of the Ordinance accordinge

↓ Lambeth Court Roll, 1352, Schedule. Quoted Vic. County Hist. Sussex. Vol. II, p. 143.

* Early Chancery Proc: Bdle. 222, No.112.

to suyche fourmes patrons and stanchyns as to him shalbe delyvered for Wirkemanship of the same - that is to say as nygh and to be as like unto the same fourmes and stanchons as may be possible for the great Water hamer to forge....." †

This is the earliest reference to the use of water power which afterwards was universal in the Wealden iron-works. It probably had been used much earlier in the century for working the bellows, at any rate, as the existence of cast-iron remains suggests. It is obvious that the water hammer was regarded as a rather clumsy, if a useful, instrument, and it could certainly only be used in making very simple articles, or in the preliminary working of the iron.

In addition to wrought ironwork for gun-carriages Simon Ballard was also employed by Henry VII in casting shot. "Also pd to Symond Ballard in prest upon making of C shott for bumbardes ^C shott for Curtowes and other ^C shott for sirpentynes to be cast in the fforest of asshenden of the kinges yron price of every C working xvj d." ‡ The "kinges yron" may have come from the royal works in the Forest, or more probably have been supplied by Henry Fyner.

From this evidence it is clear that the iron industry

† Misc. Bks. T.R. No.8. fol. 49. Other payments to Henry ffyner for "Rough yren" on ff.79, 96, 150, etc.

‡ Ibid, fol. 75.

was alive on the Weald during the Middle Ages. But at no time during this period did it acquire real importance. Judging from what we know of the East Grinstead mine and of Tudeley, work was carried on very spasmodically and with little profit. Moreover, the industry was confined to a few places. An examination of various Ministers' Accounts relating to manors where we know iron to have been worked in Roman times and later in the sixteenth century, proved fruitless, though that of course does not preclude the possibility or even the probability that iron was worked occasionally here and there. At any rate we may conclude that there was no widespread or systematic exploitation of the mineral wealth of the Weald.

Other, and more positive, evidence points to the same conclusion. Thorold Rogers found from an examination of manorial accounts that the greater part of the iron used in England in the Middle Ages was imported from Spain or Scandinavia.[↓] In the case of the Weald, this is borne out by the medieval Customs Accounts and Port Books. Sandwich and Southampton, which afterwards became centres of the iron export trade, were at that time centres for the import of Spanish iron. It formed the bulk of the imports of Sandwich

↓ Op. cit. Vol. I, pp. 145, 469, etc.

whence it was distributed throughout the Weald. The trade was for the most part in the hands of foreigners. In the account of the New Custom in 1307[↓] are entered the names of sixteen foreign merchants who paid custom on importing iron, which in one case was valued at £16. Southampton did a more varied trade, exporting cloth, corn and hides, and importing wine, dyes, oil and iron.[†] But there too iron held an important place, as is shown both by the Customs Accounts and by the fact that in 1413 the town ordinances fixed lading rates on wine, oil and iron.^x

The Patent and Close Rolls contain many instances of the import of Spanish iron. In 1294 in compensation for the injuries received by some English merchants who had been robbed by subjects of the king of Spain the king ordered the seizure of all Spanish goods in the port of Sandwich, and among these goods was a certain lot of iron.^x In 1357 La Seinte Marie de Port Valet in Spain was wrecked off the island of Selsea, and the inhabitants stole the wine,

↓ K.R. Customs Accts. 124/8. 1 Ed. II.

† Black Book of Southampton. Ed. A.B.Wallis-Chapman. Vol. I, Introduction, p. xxi.

x Ibid, Vol. III, p. 173.

x Cal. of Close Rolls. Ed. I. 1294. p. 364.

chests, plates of iron and swords that she was bringing.[†]

In the fifteenth century on the whole of the amount of iron imported gradually declined. In the 1440-1 customs ledger for Sandwich[‡] only three merchants, of whom one was an Englishman, appear to have imported iron, while the volume of other imports has considerably increased. On the other hand Chichester, one of the natural outlets of the Sussex Weald, shows an increase in imports of iron as late as Edward IV's reign. In 1467-8 fourteen ships entered the port with iron.^x

In face of the absence of evidence of the extensive manufacture of iron on the Weald, while at the same time we know that great quantities of iron were entering the Wealden ports from Spain, we are forced to the conclusion that the smiths of the Weald, though raw iron lay under their feet and they knew it, found it less trouble to use the Spanish iron, which moreover was usually reputed to be better than English iron. Dover is within comparatively easy distance of the Weald, yet in 1339 the clerk of the works at Dover Castle was buying Spanish iron from Sandwich for his repairs.[‡] Even in Henry VII's reign when Simon Ballard was making ironwork and casting shot in Ashdown Forest we do not know that he was

† Cal. of Patent Rolls. Ed. III, 1357. p. 546.

‡ K.R. Customs Accts. Sandwich, 127/18.

x Ibid. Chichester. 34/25. 6-7 Ed. IV.

‡ Excheq. K.R. Various. 462/15. 12 Ed. III. "Item in CCC^m de ferro Ispannio empto apud Sandwicum pro diversis necessariis in Castro. xxviijs."

using local iron. The iron was supplied to him by Henry Fyner, who was a Southwark goldsmith, and who may have bought the iron on the Weald or, quite as probably, have bought Spanish iron in London. Apart from that we know that the king was buying large quantities of Spanish iron for delivery to other smiths.[↓]

The Spanish import trade had developed rapidly in the thirteenth century, when the iron industry was declining in the Forest of Dean and the Wealden industry was not strong enough to take its place. Spanish iron was considered to be stronger than English and could be sold as cheaply. Thorold Rogers seems to suggest that imported iron was more expensive than English iron,⁺ but the prices he quotes of iron sold at Boxley disprove this.^x There Spanish iron cost 3s. 6d. a hundred, and the same price was paid for a bloom of Wealden iron. The weight of a bloom varied in different parts of England but on the Weald it was usually about three-quarters of a hundredweight, while Rogers reckoned it at one hundredweight.

Taking these facts into consideration it will be seen that it would hardly be worth while to exploit the Wealden iron-field unless the demand for iron increased to such an

↓ Misc. Bks. Excheq. T.R. No.8. 12 Hen. VII. ff.100,213.

+ Op. Cit. Vol. 4, p. 398.

x See above p. 11.

extent that imported supplies became insufficient to meet it. And in 1543 the casting of the first cannon in Sussex led to an unexampled demand for iron and gave the necessary impetus to the iron trade of the Weald.

CHAPTER III.

THE DEVELOPMENT OF THE INDUSTRY IN THE SIXTEENTH AND SEVENTEENTH CENTURIES.

The part played by cast-iron ordnance in the development of the Wealden iron industry in the sixteenth century has been sometimes over-emphasised, for it must be remembered that although those iron-works where ordnance was made attracted most attention, they formed only a very small proportion of the whole. The fact that the Tudors gave England internal peace and a feeling of national solidarity did quite as much for the native iron trade as the demand for iron created by their foreign wars. Years before the casting of the first cannon we have evidence that the English iron trade was developing. The Customs Accounts and Port Books show that even in Henry VIII's reign there was a considerable decrease in the amount of iron imported, and in Elizabeth's reign the trade had almost ceased. There are still isolated entries relating to Spanish iron, but these are negligible in comparison with the amount of English iron mentioned there. In 1571 the

Merchant Adventurers of Bristol could say that "iron and alum which were usually brought from thence [Spain], are now made better and cheaper in England".[↓] Henry VIII, however, at the beginning of his reign depended to a great extent on foreign supplies for his ordnance. He bought Spanish iron to be worked up by his smiths[†] and moreover purchased much of his artillery in Spain or Germany. In 1514 he bought "two gret bombards and fyve other bombards brought from Spayne" by John Danda "marchaunte of Spayne".^x In 1513 the ordnance accounts show that payments were made to Hans Popenruyter for forty-eight pieces of artillery made by him at Mechlin,[¶] and later in the same year for twenty-four courtaulx and twenty-four serpentines.[♠] Mention is also made of thirteen great guns cast in "Almayn" which the king desired to have with all speed.^{•‡•} This artillery was needed for Henry VIII's invasion of France in 1513, and apart from the consideration of whether or not it could be made in England it was in this case a good deal more convenient

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- ↓ Cal. of S.P.D. Eliz. Addenda. Vol. XX, No.19.
 † Excheq. K.R. Various, E 101/51/9; E101/67/24.
 x Misc. Bks. Exchq. T.R. I. fol. 85.
 ¶ L. and P. Henry VIII. Brewer. Vol. I, Pt. 1, No.1529, p.708.
 ♠ Ibid. No.324. p. 145.
 •‡• Ibid. No.1394, p. 640.

to save transport by buying it abroad. Ordnance seems very often to have been made abroad where it was needed. There was a foundry near Calais which supplied the garrison and would presumably work for general needs of the army in case of need. Moreover in 1518 Thomas Batcok of Bristol presented a detailed account for casting a bronze culverin for the king at Fontarabia.[†]

It is probable that all this ordnance was made of bronze as in one instance the price is mentioned as £6 per cwt. But the shot used was of iron and Henry bought this in increasing quantities from the Sussex smiths. The names of John Bower and Robert Scorer,[‡] gunstone-makers of Hartfield, appear frequently in the lists of those who supplied shot, together with that of "Clays hars gonnestone maker of the forest of Ayshdowne".^x

In the sixteenth century heavy ordnance was usually made of cast bronze. Agricola, writing in 1556, says, "Muskets are nowadays rarely made of iron, and the large ones never, but of a certain mixture of copper and tin".....[¶] The process of casting bronze was discovered

† Ibid. Vol. II, Pt. 2, No.4108, p. 1271.

‡ Exch. K.R.Var. E101/56/17. 5 Hen.VIII, and L and P.Hen.VIII. Brewer. Vol. I, Pt.2, pp.1164,1230,1231, etc.

x Exch. K.R.Var. E101/55/29. 3 Hen. VIII.

¶ Agricola De Re Metallica, Basle, 1556. Translated 1912, p.11.

earlier than that of casting iron, and cast bronze guns had two great advantages over wrought iron guns. They were much lighter and easier to handle and moreover were handsomer in appearance. Francis I and Charles V took great pride in their bronze ordnance and Henry VIII would have liked to compete with them. But the price of £6 per cwt. was prohibitive, and in 1543 he accepted the offer of Ralph Hogge of Buxted, who undertook to make cast-iron cannon at £10 a ton.¹ The king sent some of his own gunfounders, Pierre Baude, Arcanus de Cesena, Van Cullen, the Owens and the Johnsons, from London to help in casting the first pieces,² but with the possible exceptions of John Johnson and Peter Van Cullen (or Collet) these "foreigners" did not stay long on the Weald.³ Nor apparently were they converted to the use of cast-iron for in the same year John Owen and Robert Owen were paid £164. 9s. 2d. towards the cost of "castynge and makynge of XXV pecis of great Ordynance of Copper and belle metall" while "Peter Bawde" made "V Canons and V Culveryngs of Copper and belle metalle."⁴

¹ J. Starkie Gardner, "~~Iron Casting in the Weald~~" *sp. cit.*
Archaeologia, LVI, p. 136.

² Ibid.

³ Sussex. Arch. Coll. LVI, p. 138.

⁴ Exch. K.R. Accts. Various, E101/60/10. 34 Hen. VIII.

But in Sussex the new process took firm hold. The account of "Master John Shreve prest Surveyor & Master of the Workes of the Iron Mylls"[↓] belonging to the Crown in the forest of Worth shows that between 1547 and 1549 fifty-six tons of ordnance of "dyvers sortes" and fifty-two tons of shot had been cast there. Other furnaces where cast-iron shot was already made must also have begun to cast cannon, for in Mary's reign payments are made to "diverse persones for certein new cast peces made in diverse furnaces wth in the countie of Sussexviz. Di Culveryns vj, Sacres viij, ffaucons ij."*

So rapid was the development of the iron industry about this time that fears began to be entertained for the future of the Wealden forests and of other industries such as ship-building which depended on a plentiful and cheap supply of timber. The first attacks on the iron industry were probably led by local ship-builders, tanners and clothiers who saw their profits threatened by the increasing cost of timber and who were jealous of the big fortunes made by the ironmasters. The central government had not realised that danger threatened the navy from the iron-mills. Indeed in 1543 the woods of Sussex, Surrey and Kent had been expressly excluded

↓ M.S. Giuseppe, "Ironworks at Sheffield and Worth," Archaeological Journal, LXIX, pp.290 et seq.
Documents printed in full.

* Exch. K.R. Accts. Var. E101/64/4.

from the operation of the statute "For the preservacon of Woodes",[‡] which restricted and controlled the felling of timber and made provision for re-planting. But in 1548 a commission was issued to certain Sussex Justices to enquire into the question of certain enumerated iron-mills:-[†]

- "i. First the iron mill of Robertsbridge standing within 3 miles of the salt water.
- ii. ~~the~~ the iron mill of Etchingam within 5 miles of the salt water.
- iii. ~~the~~ the iron mill of Paschely within 4 miles of the salt water.
- iv. ~~the~~ the iron hammer of Mountfield within 4 miles of the salt water,"

and other mills at Chiddingly, Sheffield, Freshfield, Buxted, Framfield and four mills at Warbleton. It is obvious from this that the enemies of the iron trade were trying to arouse the fears of the government for the navy's timber supply along the coast. And it is equally obvious that they would not be too scrupulous in stating their case, for trusting in the government's ignorance of Sussex topography, they made entirely false statements as to the distance of the iron mills from the sea. Robertsbridge, for instance, which they place within three miles of the sea, is at least ten

‡ Statutes, 35 Hen. VIII, c. 17.

† Hist. MSS. Com. Report on Salisbury MSS. Vol. 13, pp.19 et seq.

miles as the crow flies and considerably more by road or river.

This commission apparently did not go far enough and shortly afterwards a petition was sent to the Duke of Somerset asking for a fresh inquiry. In response a detailed questionnaire was drawn up and issued to "certain men of Sussex concerning the hurts done by iron mills and furnaces."¹ The questions dealt mainly with the cost and scarcity of timber and answers were returned by juries from the Rapes of Hastings, Lewes and Pevensey in January 1549. They state that there are fifty-three iron mills and furnaces within these three rapes alone, and paint a lurid picture of the ruin and destruction that will result if they are allowed to continue. "We present that the number of the towns and parishes that must needs decay by the standing of the iron mills and furnaces is so great, and as to the number of such as lack livings and are like to lack through their means, we cannot number, the same is and will be so great." There will be no timber for ships, houses, bridges and windmills nor even for arrows, bellows, dishes and buckets. The iron furnaces will devour the brushwood and billets used "for fuel for the relieving of the poor fishers after their

¹ Salisbury MSS. Ibid.

arrival from their daily fishing to dry their clothes and warm their bodies, by whose trade chiefly the said towns [Hastings and Rye] stand, [so that] the same will shortly decay." Moreover, the price of iron, far from decreasing, has actually increased. "Where before these number of iron mills were erected men might buy iron for £4 the ton, iron now is worth £9 or £10 the ton or better." Such a comparison is rather misleading and disingenuous when the kind of iron referred to is not specified, for from the Sheffield and Worth accounts at about the same time we find that various qualities of iron were being sold at prices varying as much as £2, £6, £8, and £9. 6s. 8d.[↓] But the juries would not stick at trifles in order to make out a good case. They all agreed in demanding the suppression of iron-works within a certain distance of the coast. The juries of Hastings and Pevensey demanded a ten-mile limit and named certain iron-works which, with varying correctness,[†] they alleged came within this limit. The Lewes jury went further and recommended a twenty mile limit.

The prosperity of the Sussex iron trade led to

↓ M.S. Giuseppi, op. cit. Archaeol. Jour. LXIX, p.308.

† Such places as Etchingham, Pashley, and Sheffield come well outside the 10 mile limit.

the exploitation of the Surrey iron field. In 1553 we find the first mention of iron-works in Surrey when Lord Abergavenny conveyed to George and Christopher Darrell all his lands called Ewood in the parish of Newdigate together with "all the buildings, iron-works and offices set and being within the same."[↓] Though this is the first evidence we possess of ironworks it is probable that they had existed in this neighbourhood at an earlier date since we know that iron was mined in Horley in Edward III's reign.[♦] A few years later, in 1557, mention is made of an iron-mill and pond in the manor of Paddynden and its appurtenances in Abinger, Shere, Ockley, Effingham and Wotton.^x This was probably Abinger Hammer. Other forges grew up in the neighbourhood of Thursley, Haslemere, Dunsfold, Lingfield and Cranleigh. The Surrey iron-field however was simply an extension of three ferruginous districts of Sussex, the centres of which were Fernhurst, Ifield and Worth.[✱] For the most part the Surrey works were farmed out to Sussex iron-masters. For instance, Mr. John Gage farmed out his furnace and forge "about

↓ M.S. Giuseppi in Vic. County Hist. of Surrey, Vol. II, p. 263.

♦ See above, p. 13.

x. M.S. Giuseppi, op. cit. p. 263.

✱ H.E. Malden History of Surrey, p. 268.

Copthorne and Lingfield" to John Thorpe of East Grinstead,[↓] while Roger Gratwick, who held several forges in Sussex, also farmed Dunsfold for Richard March.[†] With the exception of Ewood, which was worked by Robert Reynolds, another Sussex ironmaster,^x none of the Surrey works equalled in importance the Sussex works in the same fields.

Meanwhile the manufacture of ordnance prospered exceedingly and presented the enemies of the iron trade with a new grievance and the government with a new anxiety. For so much ordnance was produced that the gunfounders could not sell it all at home and began to transport it overseas where they found a ready market. The result was that "there be divers and sundrie marchantes and masters of marchante shippes that do finde themselves marvailouslie molested and otherwhiles robbed by reason of the great stoare of Ordenance that hathe been conveyed and solde to strangers out of this Realme, wherby their shippes are so well appointed that no poore marchante shippe maie passe throw the seas."[‡] The grievances of the merchants found a spokesman in one Christopher Baker. It does not appear whether he had any official standing but he devoted most

↓ S.P.D. Eliz. Vol. XCV, No.20.

† Ibid, No.79.

x M.S. Giuseppi, op. cit., p. 269. See App. B.

‡ Ibid, No.20.

of his time in 1574 to acting as the government's enquiry agent in the matter of the Wealden iron-work, and the State Papers Domestic for that year bear witness to his industry. He first concentrated his attack on the export of ordnance, pointing out its dangers to merchants and especially to the state in time of war. But he did not ignore the danger which threatened the forests from the rapid growth of the iron industry as a whole, for in addition to the seven furnaces which cast ordnance he said there were "not so few as an hundred furnaces and Iron mylles in Sussex, Surrey and Kent, which is greatlie to the decaye spoile and overthrow of woods and principal tymber, wth a great decaye also of tillage for that they are continuallie employed in carrying of furniture for the said workes, and likewise a great decaye to the highe wayes because they carrie all winter tyme."[↓] After this general indictment he proceeded to draw up a list of the ironmasters of the Weald, usually adding a note as to the position of their works.[↑] He gave the names of upwards of seventy ironmasters, most of whom owned at least one forge and one furnace. Indeed many of them owned or at any rate managed several works in different parts of the

↓ Ibid, No.20.

* This list, supplemented by others which appear in the same volume, Nos. 21, 61, 79 and in Vol. CXVII, No.39, gives valuable information as to the exact locality of the works and draws distinction between the owner and the farmer.

See App. B.

Weald. For example, one "John Lambart alias Gardner"[↓] farmed two forges in Ashburnham and one furnace at Penhurst for John Ashburnham,[†] and held a forge at Cranleigh from the Lady Braye in partnership with John Duffield,^x who himself had a forge and furnace in East Grinstead and was partner in a forge and furnace in Shillinglee.[■] Christopher Baker was certainly not over-estimating the number of ironworks on the Weald when he put it at one hundred.

The government, thus prompted, was not slow to realise the danger which might threaten England in time of war if her enemies were allowed to supply themselves with her ordnance. Christopher Baker had considered ordnance "no comon marchandise for everie privat subiect to deale wth all, but more meet for the prince onlie" and Elizabeth and her ministers agreed with him in so far that they decided that the manufacture and export of ordnance must be controlled by the state. From then onwards to the end of Elizabeth's reign the Privy Council and Parliament were constantly occupied with this question of ordnance and of the Wealden iron industry in general. Elaborate regulations

↓ Ibid, No.61.

† Ibid, No.79.

x Ibid, Nos. 20 and 79.

■ Ibid, No.79.

were drawn up to check the manufacture of ordnance, to prohibit its export except under license, to prevent the erection of new ironworks and to preserve timber.

In spite of governmental interference, however, the last thirty years of Elizabeth's reign and to a lesser extent the first thirty years of the seventeenth century constituted the Golden Age of the Wealden iron industry. Every enterprising yeoman farmer in the iron districts, who had water-power on his land, set up as an iron master. There can hardly have been a parish where iron was not worked at some time or other. As a rule these unprofessional ironworks must have been very short-lived, being abandoned when the easiest iron seams had been exhausted, but many of them lasted long enough to make the fortunes of their owners. The government's regulations were to a great extent evaded, as regulations always were and are, and Sussex ordnance became famous throughout Europe. Large quantities were exported under license to the United Provinces, Italy, Spain, France and Germany. The home trade in iron and in ordnance developed amazingly. Meeching, a hitherto unimportant creek of Lewes, became one of the chief ports of that part of the Weald, and in 1573 between Easter and Michaelmas no less than 405 tons of iron and 140 tons of ordnance were exported along the coast to London

or Southampton, besides odds and ends such as spades, shovels and anvils.[↓] Rochester, the port of the north-eastern district of the Weald, between September 1581 and Easter 1582 exported 312 tons of iron and 117 tons of ordnance.[†]

Camden, writing in 1586 of the Sussex Weald, says, "Full of iron mines it is in sundry places, where for the making and founding thereof, there be furnaces on every side, and a huge deal of wood is burnt, to which purpose divers brooks in many places are brought to run in one channel, and sundry meadows turned into ponds and waters, that they might be of power sufficient to drive hammer-mills, which beating upon the iron fill the neighbourhood round about night and day with continual noise."^x In 1607 John Norden said that he had heard "there are, or lately were in Sussex, neere 140 hammers and furnaces for Iron."^x These words "or lately were" are the first hint we get of the gradual decline which henceforward was the fate of the iron industry. Perhaps legislative restrictions were beginning to sap its natural energy, for James I took legislation very seriously and was not prepared to nullify the laws regulating the export of ordnance by freely granting exemptions from them. He set up a commission to

↓ Exch. K.R. Port Books. Mechling cum Lewes. 739/20.

† Ibid, Port Bk. of Rochester, 642/1.

x Camden's Britannia, quoted in Sussex Archæol. Coll. II, p. 194.

x J. Norden, Surveyor's Dialogue, 1607, Book V, p. 214.

inquire into abuses connected with the transport of iron ordnance, and enforced its recommendations, the chief of which was that only two furnaces should be allowed to cast ordnance.[‡] The result was naturally to discourage fresh enterprise, and probably to close down two at least of the four Sussex furnaces where in 1618, according to John Browne, gunfounder, of Brenchley (Kent), much ordnance was made.[†] This John Browne was fortunate in being one of the two gunfounders who were allowed to continue. In 1620 he was appointed gunfounder to the king and the navy, while Sackville Crowe was granted a patent for making iron ordnance for ships other than the navy.^x

Other causes operated to rob the Weald of its iron supremacy. Even in Elizabeth's reign experiments had been made in smelting iron with coal or coke, and in the early years of James's reign patent after patent was granted to various inventors, Chauntrell and Astell, Sturtevant, Rolvenson and finally to Dud Dudley.[¶] In these circumstances it was natural that the Forest of Dean again became the centre of interest, for there iron and coal were found together, and if coke smelting failed the ironmasters could still fall back on charcoal.

‡ S.P.D. James I. Addenda. Vol. XLII, No.28.

† S.P.D. James I. Vol. CV, No.92.

x Cal. S.P.D. James I. Vol. CXVIII, Nos. 48, 49.

¶ W.H. Price, English Patents of Monopoly, p. 107.

Charles I did not give much attention to the particular question of the Wealden iron trade, but he was interested in the iron trade in general as a means of raising money, and the Weald suffered with the other iron-fields. He kept all the restrictive legislation in force, not, like his father, because he believed in it, but because he could raise money by compounding offences against it.[↓] In 1636 "for the reformation," as he said, "of the great waste of timber by converting the same into coals for making iron, and of other abuses in the said manufacture" he created the office of Surveyor of the iron works with a fee of 2d. per cwt. for surveying and marking all iron in sows and pigs and another 2d. per cwt. for iron to be made into bars.[†] The office was granted John Cupper and Grimbald Pauncefoot for twenty-one years at a yearly rent of one hundred marks payable to the king. This imposition roused a storm of protest^{*} and in 1639 it was withdrawn.^x

Another method by which Charles I habitually raised money and paid his debts was the granting of monopolies. In

↓ M.S. Giuseppi in Vic. County History of Surrey, Vol.II,p.267.

† Cal. of S.P.D. Chas. I. Vol. CCCXXXIV, No.3.

x Henry Penfold, a Northumbrian ironfounder, was imprisoned for non-payment of fees for marking iron. He said he could not "pay the imposition and be a saver by his commodity, for that no man values his iron the better for the marking, nor will give him a penny more for it." S.P.D.Chas.I, Vol. CCCXLI, No.128.

* Giuseppi, ibid.

1635 John Browne, the King's gunfounder, who had been complaining bitterly about the non-payment of royal debts and about the slump in the ordnance trade, was granted a monopoly for making various small iron articles, such as pots, kettles, firebacks, pans and weights.[↓] It is difficult to see how such a monopoly could have been enforced without an army of inspectors, for all the Wealden iron-works made these things at some time or other as bye-products. But even if it were only partially and occasionally enforced it must have been a fresh discouragement to the ironmasters. In 1639, Sackville Crowe having relinquished his patent in 1632,[†] John Browne was granted a patent for twenty-one years for sole making, new boring and selling iron ordnance and shot in England, Ireland and Wales and for sole transport to foreign parts.^x

Moreover, as time went on the effects of Charles I's policy and of the growing tension between him and Parliament must have made themselves felt in all trades and industries. An interesting commentary on the state of credit in the City in 1636 is provided by John Browne who said that unless his Majesty would pay what was owing to him his business would be ruined for lack of capital. There was "such scantiness of

↓ Cal. S.P.D. Chas. I. Vol. CCCVI, No.105.

† Ibid, Chas. II. Vol. I, No.142.

x Ibid, Chas. I, CCCCXXIX, No.58.

money owing to the failure of many merchants of late and the doubt of many more, that there was none to be taken up at interest, especially by any man that belonged to the King's Majesty."[↓]

But the Wealden iron industry might have survived all these attacks on its prosperity had not a young and vigorous competitor appeared on the field. This was Sweden, a country rich in ore and water-power, and with vast forests still untouched. Gustavus Adolphus, in order to establish in his own country the manufacture of the ordnance he needed for his schemes of conquest, had granted certain mines and woods to Dutch ironfounders,[†] so that his people might learn from them. The industry quickly took root, and by 1634 the Swedes were not only making their own ordnance but were underselling the English gunfounders^x in the Dutch market and were beginning to import iron into England."^{*} John Browne asserted that the Swedes sold their guns at half the price the English could afford, and though he may have exaggerated we at least know that when Charles I exported ordnance to Holland in 1630 to redeem his crown jewels then in pawn to the States he was allowed only £11 per ton though

↓ Cal. S.P.D. Chas. I. CCCXLI, 57.

† Ibid, CCCVI, 102.

x Ibid, CCLXXIX, 38.

* See below, p.

the English price was £13.[↓]

It has often been suggested that one of the main causes of the decay of the Wealden iron industry was the destruction of ironworks during the Civil War. Dallaway set the fashion by declaring in his "History of the Western Division of the County of Sussex" (1815) that all the ironworks belonging to the Crown or to Royalists in West Sussex were destroyed in 1643 by Sir William Waller, lest they should injure the Parliamentary cause by making ordnance for the king. This seems to be little more than a picturesque statement of what, on the analogy of the behaviour of combatants in other wars, were the probabilities of the case. Such evidence as exists goes to prove that the analogy was not a true one. It is well known that during the Civil War remarkably little material damage was done by either side. It was the declared policy of the Parliamentarians to preserve the assets of the nation. In 1649, for instance, the destruction of timber in the Forest of Dean by "pretended Parliamentary servants" was punished, and regulations were drawn up for the preservation of the woods.[†] Following Dallaway later writers have assumed that the royal ironworks in St. Leonard's Forest were among those destroyed in 1643.

[↓] Ibid, CLXXIX, 50.

[†] S.P.D. 1649, Vol. I, No.35; Vol.III, No.102.

But in a Parliamentary survey made in 1655 of the possessions of Charles Stuart, late King of England,[†] it is stated that two forges belonging to the king in the Forest were still being worked, in one instance by the men to whom he himself had leased them. The furnace near the Lower Forge was in ruins, but as it had been "decayed and downe aboute fforty yeares past" the Parliamentary forces can hardly be held responsible. Moreover, if Sir William really believed that it was better to destroy iron works than to run the risk of their being used against him, it is strange that he confined himself so strictly to West Sussex, while a few miles over the border, at Tilgate for instance, he spared works which are known to have cast ordnance for the king.[‡]

In East Sussex, however, where by far the greater number of ironworks was situated, there is no suggestion that the Parliamentary forces did any damage, even in cases where the furnaces were being used to cast ordnance for the king. Waldron, Brede, Crowhurst, Darvell, Hamsell, Stream and Horsted Keynes all "made guns or shotte in the late warrs for supply of his mai'es stores" yet all were flourishing in 1664.^{*} The king's ironworks in Ashdown Forest were as safe as those in St. Leonard's. In the Parliamentary survey of

† J.R. Daniel-Tyssen, "Parliamentary Surveys of Sussex", Suss. Arch. Coll. Vol. XXIV, p. 239, et seq.

‡ "Sussex Ironworks", Suss. Arch. Coll. Vol. XXXII, p. 19.

— x J.L. Parsons, op. cit. But see App. C. & note.

1656[↓] his works in Hartfield, known as Cottesford Mill and Forge, were valued at £30 and £35 per annum, and must therefore have been in working order. Reference is also made to "the old hamer and furnace ponds, bayes and places where Iron works have been heretofore neere the said mill called Newbridg Mill."[†] There is, however, no suggestion of violence and these works too had probably died a natural death. John Browne, the King's gunfounder, so staunch a friend of Charles I that he was alleged to have accompanied him when he went to the House to seize the Five Members,^x yet found it possible to reconcile his conscience to his becoming the chief gunfounder of the Parliament. Parliament was apparently quite ready to employ him in spite of his antecedents and although there were strong grounds for suspecting that he was in secret communication with the King and was deliberately withholding or delaying Parliamentary supplies.[‡] A committee of the House of Commons was appointed to examine him and his son on these matters, but although the evidence against him was strong, no action was taken and he continued to cast ordnance for Parliament until his death.

It is quite probable that some ironworks were

↓ J.R. Daniel-Tyssen, op. cit. Vol. XXIII, p. 293.

† Ibid., p. 216.

x Cal. of S.P.D. 1645. Vol. DVII, No.151.

‡ Ibid., Nos. 151, 152.

destroyed here and there in local disturbances. As has been shown, few people except those who made their living by them, approved of ironworks, and their enemies may in some cases have seized this opportunity of national disorder to express their disapprobation in a practical way. But it seems unlikely, to say the least of it, that Parliament, which was wise enough to overlook John Browne's irregularities, should have countenanced a wholesale destruction of Royalist ironworks. The iron industry had never been so important in West as in East Sussex, for West Sussex is further from London and is not so rich in iron. It is therefore quite natural that the iron industry should have shown signs of decay more markedly there than elsewhere. The rapidity of that decay can best be realised by comparing the number of ironworks existing in 1607, in 1653 and in 1664. In 1607 Norden believed that there were about 140 ironworks in Sussex alone; in 1653 this number had been reduced to 33 furnaces and 40 forges in Sussex, Surrey and Kent, and in 1664 to 24 furnaces and 17 forges. ↓

In one respect the overthrow of the king was definitely favourable to the iron industry, for with him went monopolies, which had done much to check enterprise. At first John Browne maintained a practical monopoly in the manufacture

↓ J.L. Parsons, op. cit. p. 24.

of ordnance, but Parliament soon began to make contracts with other manufacturers. In 1653 Thomas Newberry was sent into the Weald to arrange for supplies of ordnance, and he found Mr. Everden of Lewes, Mr. Akehurst of Warbleton, Mr. Yalden of Blackdown and several others, quite ready to enter into contracts.[↓]

Cromwell, however, no less than Charles I, looked to the iron industry for revenue, and in 1654 an excise duty of 6d. was imposed on every hundredweight of English iron, the duty to be paid by the maker.* This "as it is credibly reported was done to gratifie the Swede according to some private agreement and transaction between them."^x The Swede was further encouraged by the fact that foreign iron was exempted from duty in the Navigation Act "upon a pretence that it serves only for balast whereas it is many great Shipps ladeing."^x

At the Restoration Thomas and George Browne of Brenchley and Horsmonden were appointed gunfounders to the king, in spite of their father's questionable behaviour during the Civil War.[↓] They shared this monopoly first with their father's old rival, Sackville Crowe,[↑] and later

↓ Cal. S.P.D. 1653. Vol. XXXIX, No.31.

* Ibid, 1654. Vol. LXXI, No.7.

x Addit. MSS. 33058, fol. 83.

x Ibid, fol. 84. Iron was simply not mentioned.

↓ Cal. of S.P.D. 1660. Vol. XVI, No.109.

↑ Cal. of S.P.D. 1660. Vol. XVI, No.108.

with two other Wealden iron masters, Thomas Culpepper[↓] and Alexander Courthope.[†]

This recognition of its old supremacy was all that the Wealden iron industry gained from the Stuart restoration. The excise on iron was too profitable to be ignored, and it was renewed in spite of protests that its imposition would kill an already moribund trade.^x Nor were any effective steps taken to check the import of foreign iron, which everyone agreed in condemning as the main cause of the decay of the iron trade, not only in the Weald but throughout England. John Browne had protested against the competition of Swedish iron in the Dutch market; by 1660, however, the Swedes had not only ousted the English merchants from the continental markets but were importing increasing quantities into England. In 1661 it was stated that at least 5,000 tons were imported annually.[¶] In 1686 over 6,000 tons were imported into the "Out Ports" and nearly 10,000 tons into London.[♠] Many petitions were presented calling attention to the danger not only to the manufacture of English iron but strangely enough to the existence of English forests, which the petitioners agreed

↓ Ibid, 1665. Vol.CXXIII, No. 104.

† M.A. Lower, *op. cit.* p. 203.

x Harl. MSS. 1243, p. 195.

¶ Addit. MSS. 33058, fol. 83.

♠ Harl. MSS. 1243, p. 195.

owed their preservation to the demands made on them by the iron works.[↓] They pointed out the danger of relying on foreign iron supplies in war-time, and suggested that if the king imposed an additional tax of 40s. per ton on all Swedish iron imported he would gain a revenue of £10,000 a year, the "trade between Native and fforraine Iron would be ballanced", and "the loss of the said manufacture in this Nation prevented."⁺

But even had the government been able or willing to take action and had felt as forcibly as did some petitioners that it "would be a strange imprudence in a martiall nation whom God and nature have armed with this martiall mettall to surrender up their owne stock of ammunition and to depend on the Seas and fforrainers for it," it would have been impossible to revive the iron industry of the Weald. It had depended for its prosperity on cheap and easy supplies of timber and iron. In spite of special pleading it must be admitted that the Weald had been stripped of its superfluous timber and though enough remained to feed a number of iron-works the price had gone up and it had sometimes to be

[↓] See below, pp. 179 *et seq.*

⁺ At the same time the import of Spanish iron was reviving. In 1686-7 it was estimated that 1,500 tons were imported into London alone. But for some reason it was suffered without protest. In one instance it was even suggested that all foreign iron "unlesse Spanish" should be taxed. Addit. MSS. ut supra.

carried some distance. Under these conditions the Weald could not hope to compete with Sweden which was "so extraordinarily abounding in woods iron mine and other conveniencies for making Iron, and especially by ~~the~~ cheapness of their mens labor who work as Slaves (not wth that liberty w^{ch} the meanest of y^r Maties subjects comfortably enjoy)." [↓]

↓ J.P. Parsons, op. cit., p. 25.

CHAPTER IV.

SOME IRON MASTERS AND THEIR WORKS.

The rapid development of the iron trade changed Sussex within a generation from one of the poorest into one of the richest counties of England, a position which it held, however, for only a short time. A similar change took place in the fortunes of those families who, at the time of the boom, were lucky enough to possess or to be able to buy land rich in timber, water and iron ore. All who could, nobles, gentry and yeomen, became iron masters. Great fortunes were made, and lost, too, by the over-ambitious who launched great schemes with insufficient capital, or by the romantic who, blinded by past glories, failed to see that the day of the Weald was over.

One of the most important iron masters was the Crown, which held John of Gaunt's wide estates in Sussex. As a rule Crown iron-works were farmed out, but occasionally and for short periods they seem to have been worked directly by officials of the Ordnance from the Tower of London, as for example were Sheffield and Worth by Parson Levett after the attainder of the Duke of Norfolk.¹ More important than these

¹ Acts of the P.C. Vol. I, p. 561.

were the works in St. Leonard's and Ashdown Forests. The St. Leonard's works[†] consisted of the Upper Forge "wherein standeth for the Workeing and Makeing of Iron One ffinery and one Chaftery with two greate Pair of Bellows one Hammer, with severall other Necessaries & Implements"; the Lower Forge, which was similarly equipped; and near it "One furnace for Melting and runing downe for Iron Oare". These works, in 1602, were leased for sixty years at a rent of £36. 13s. 4d.[‡] to Sir John Caryll, in whose family they remained until Charles I's reign. The Carylls apparently found it cheaper to buy their pig-iron elsewhere, for the furnace ceased work, in James I's reign, but the forges continued and were still being worked in 1655, the Upper Forge by William Collins and Edward Fenn of London, and the Lower by Walter Pawley.

In Ashdown Forest the Crown owned Newbridge furnace and forge, a furnace called Stomlett or Stimulet, a forge known as the Steel Forge, and Cottesford (Cotchford) Forge and mill. It was at Newbridge that the first iron shot were cast in the Weald by Simon Ballard, and there too the "great Water hamer"^x was installed. It is possible that Simon Ballard may have worked directly under the ordnance

† Suss. Arch. Coll. Vol. XXIV, pp. 238-9.

‡ In the Lansdowne MSS. (165, fol. 14) the farm of the iron mill "vulgariter nuncupatum the Iron Myll and forge of St. Leonards" is mentioned as £36.13s. 4d.

x See above, p. 29.

officers of the Crown, but the usual practice here as in St. Leonard's Forest was to lease the works. In 1517, the first year in which the iron-work appear in the Ministers' Accounts, the iron mills[↓] were farmed by Humphrey Walcot and the "fforge of stele" by John Glande,[†] who continued to work it until 1524. The iron mills were untenanted from 1517 until 1524 when Newbridge was let to Thomas Boleyn, later Earl of Wiltshire, at a rent of £4 a year.^x In the same year John Rowley took over the steel forge which he worked until 1558 when, together with the Stimulet furnace, it was leased for twenty-one years to Thomas Gaveller and Francis Challenor for £2 a year;[✱] the iron mills were again unworked.[♠]

In Christopher Baker's list of iron-works in 1574 the Queen's Majesty was stated to possess only one forge and one furnace in Ashdown,[♠] and they were leased to Henry Bowyer. This Henry Bowyer was the son of John Bowyer, one of the first native Sussex iron masters to cast shot. The family came originally from Newcastle-under-Lyme at the beginning of the fifteenth century and settled in Sussex.

↓ The mills are not named as a rule.

† Ministers' Accounts, Bdle. 445, No.7153.

x Ibid, No.7160.

✱ Ibid, No.7200.

♠ "Iacent in manibus domine Regine."

/ Probably Cottesford.

John's father was steward of the Earl of Northumberland at Petworth but John, the youngest son, went into the iron trade and was quickly successful. He leased works at Parrock near Hartfield (Ashdown Forest) and about 1513 began to supply cast-iron shot to Henry VIII.[†]

At his death his works seem to have been carried on by his widow, Dionyse, a woman of notable spirit, fully capable of defending her young son Henry's interests. She was no meek widow and those who tried to over-ride her she pursued to the Star Chamber itself. She had leased the iron-works in Parrock from Richard Warner for ten years, but when the lease had still seven years to run one William Saunders appeared and claimed that the land belonged to John Caryll who had leased it to him, and "mynding to expelle and avoyde your seyde Oratrice..... entred into the same premysses and dystreyned the Cattall of your seyde Oratrice then beyng and pasturyng uppon the premisses and then and there dyd also breke up the seid poles and waters" so that they were useless for the works. She brought an action for trespass at the King's Bench, and it was decided in her favour, but in spite of it Saunders and others "Riotously with force and armes and with sculles uppon theyr heddes in manner of

† Excheq. Accts. Var. 56/17.

Warre arrayed.... entred into the seyde premisses and wold then and there have letten out the water of the seide furnes... Of theyr further frowardnes and malyce having with them a carte and oxen" they riotously entered the forge and wounded her servants and broke three bellows. The result was that her servants were sick and like to die, and she could get no others for they were afraid.[↓]

William Saunders saw the matter in a somewhat different light. His intentions, he said, were peaceful and if he or his servants had hurt anyone it was in self-defence. He and his servants were peacefully carrying away Dionyse Bowyer's bellows and two pairs of tongues when her servants fell upon his hindermost servant and attacked him. Dionyse, seeing Saunders coming to the rescue, cried out with a loud voice, "Downe wyth Greyberde, downe with Greyberde". The venerable Saunders was struck to the ground and even then Dionyse showed no pity but cried, "Sley him, sley him". His servants rescued him just in time and as they retreated the redoubtable woman followed urging her servants to shoot, "Shoote at greberde."⁺ In her answer Dionyse denied all these charges, but whether in the end the Star Chamber decided in favour of the poor widow or of her peaceful assailant we do

↓ Star Ch. Proc. Henry VIII. Bdle. 24, No.422.

+ Ibid. Bdle. 25, No.107.

not know.

Her son, Henry, inherited her energy at least, and by his success as an iron master established the family fortunes. In 1574 he worked not only the Queen's furnace and forge in Ashdown, but also a forge in Tynsley, a furnace in Moor Forest, and a double furnace at Newbridge.[↓] In 1566 he bought Bentley Park from Lord Abergavenny and a few years later built himself a fine house at Cuckfield Park which became the family headquarters. But even when he had joined the ranks of the landed gentry he kept up his connection with the iron trade, and on his death in 1589 he left to his son, Henry, all his "landes, leases, store of wood, iron sowes, wrought iron, iron myne or any other goods."[†]

Many of the great Sussex landowners, such as the Montagues, the Sidneys, and the Sackvilles, followed the example of the Crown and developed the iron trade on their estates, either leasing out the works or in some cases having them run by estate workmen. Lord Montague had a forge in Frant, worked by John Porter, and also "one forge and one furnace in Haslemore or thereabouts" and a "furnace called Pophall" which Christopher Baker described in 1573 as having

[↓] This may possibly have been the Crown furnace.

[†] J.H. Cooper "Cuckfield Families", Suss. Arch. Coll. Vol. XLII, pp. 19 et seq.

been newly erected "and whether they shall blow sows for iron or ordnance" he knew not. The Pophall furnace was still in the possession of the Montague family in 1730 and only ceased to be used in 1776.[↓] The Sidneys kept their Robertsbridge works under their own control at any rate during the life-time of Sir Henry Sidney,[†] who took great interest in them and hired Dutch workmen to experiment in making steel.^x In the seventeenth century they were usually leased and in the eighteenth century they passed into the possession of the Websters who continued the practice. They continued to be worked until well into the second half of the century, presumably at a profit, for in 1754 Sir Whistler Webster leased to "John Churchill, of Hints, co. Stafford, ironmaster, the foundry called Robertsbridge furnace, with all buildings, lands, ponds, and water, ever held with the same."[‡]

The Sackvilles were perhaps the most important of the Sussex ironmasters. Richard, the first of the family to emerge from the obscurity of the landed gentry, began his career as steward to the Earl of Arundel and ended it as a knight and Privy Councillor.[♢] During its course he had

↓ A. Ponsonby "Priory and Manor of Lynchmere and Shulbrede" pp. 180-182.

† K.G., Lord Deputy of Ireland, Lord President of Wales, Temp. Eliz.

x See below, pp. III, 116.

‡ Suss. Arch. Coll. Vol. III, p. 245.

♢ 1553. Died. 1566.

acquired considerable estates in the Sussex iron districts, and had begun to work iron at Westwell (Kent)[↓] and at Maresfield.[†] His son Thomas, an accomplished poet and diplomat, who was created Baron Buckhurst and Earl of Dorset, drew a good deal of his income from the numerous iron-works on his estates. He owned a furnace at Brede, worked by the Leonards,^x another at Ore, forges at Fletching and Ashfield, worked by Mr. Leech and Mr. Relf, and a furnace and forge at Parrock work by George Bullen.

Sir Richard Sackville had used Maresfield Forge for the Queen's service,[‡] and though Maresfield was not mentioned in the 1574 list it seems likely that it remained in the family.[♠] At any rate its connection with the royal service remained, for in 1608 when one hundred tons of silver were sent from Scotland to be smelted in England for the use of

↓ See below, p. 167.

† S.P.D. Eliz. Vol. XXXVIII, No.66.

x See below, p. 113, 116.

‡ S.P.D. Eliz. Vol. XXXVIII, No.66.

♠ Sackville Crowe, who held patents for ordnance-making in the seventeenth century, seems to have had some connection with Maresfield Forge. It was by his direction that Michael Donnevide visited Maresfield Forge in 1627 to try to persuade some of the workmen to accompany him to France. (See below, p. 162). From his name one would suppose him to be an offshoot of the Sackville family, and I have not been able to connect him with any other works, though it is, of course, possible that he farmed out his patent. But he said himself that "his workes had bene antientlie employed for Gunnes....and lay more convenient then anie other for the bringing of peeces to London by hand." (S.P.D.Jas.I.Addenda. Vol. XLII, No.28). The latter part of that description cannot however be said to be true of Maresfield, where river and sea transport was usually employed.

the Mint, twenty tons of it were sent to Maresfield Forge, to be smelted under the direction of Doubleday, a Scotch goldsmith, and Thomas Russell, an official of the Mint.[↓] The smelting was done in the ordinary iron furnace and Doubleday did not think the experiment was very successful. He reported to Lord Salisbury that on the second day "the furnace beganne to clogg and put both us and the furnace maister and all the workmen into great doute that the furnace woulde blowe out. Whereupon after much care and long debating of the cause of the alteration of the state of the bodye of the said furnace and of the disease, we concluded that it was a surfeyte which would kill the projecte unless there was a present remedy provided which we resolved was then to be donne by evacuation of the melted substance, out of the body of the furnace and by drawing of the same to a more sparing dyett (I meane in giving it smaller charges of the myne) which was accordingly performed." After that things went better although the furnace had many "dangerous fittes". But after "diverse assayes made of the metalline body coming oute of the furnace" he found that only a very small percentage of silver was being produced and he was therefore unwilling that any more silver ore should be smelted

↓ W.V. Crake "Notice of Maresfield Forge in 1608", Suss. Arch. Coll. Vol. LV. pp. 278 et seq.

there, "which Mr. Russell is unwilling to yelde unto..... being in hope that the silver is sonke into the chinks of the earth of the furnace." In spite of Mr. Russell's hopefulness, however, the experiment does not seem to have been repeated. ↓

A much closer connection was established between Sussex and Wales at the end of the sixteenth century. Harassed by timber regulations, some of the more energetic iron masters saw in South Wales, where ore and timber were plentiful and their use unrestricted, the ideal field for the development of their industry. Members of the Morley, Relfe and Cheney families and others migrated thither in Elizabeth's reign, and opened up the Glamorganshire iron-fields at Aberdare, Merthyr Tydfil, the Taff valley, Pentwch and elsewhere. The Morleys of Glynde were an old iron-working family. Thomas Morley, when he died in 1559, was "seised of.....1 iron mill £3. 14s. 2d. rent in Mamgfeld otherwise Mayfeld and Heathefeld."† His son Anthony

↓ Many English iron-workers were sent to Scotland at the end of the sixteenth and at the beginning of the seventeenth centuries. But the connection was probably with Ulverston, whence, after the timber regulations were enforced, we know that ore was sent to Scotland. (Notes on the Ancient Iron Industry of Scotland, W.I. Macadam, pp.111-115).

+ L.F. Salzmann Post Mortem Inquisitions, Suss. Rec. Soc. Vol. III, p. 4. Hawksden Forge.

added to this a forge at Freshfield and a furnace at Horsted Keynes, and not content with these sought a new outlet in Glamorganshire, in partnership with two other iron-masters, Richard Cheney and Gregory Relfe.[↓] Near Merthyr Tydfil he set up a forge and furnace of his own and became part-owner with the other two of another forge. But his affairs did not prosper. "By the meanes of badd debtors and other casuall mysfortunes" he fell into debt to the extent of five hundred pounds, and his creditors, among whom was Constance Relfe, the widow of his late partner, made him bankrupt in 1586. A few months later he died.[†] Hawksden forge, however, remained in the family and was still worked by his grandson, Herbert Morley, the regicide.^x

Many others of the gentry were successful iron-masters, though they did not make great fortunes in the trade. The Ashburnhams, for example, in 1574 owned Pannyngridge, Penhurst and Ashburnham furnaces and Ashburnham forge. As a rule they were farmed out but at times they were worked by estate servants. Ashburnham Forge

- ↓ The Relfes of Warbleton had iron-works at Heathfield and Fletching, the Cheney's at Crawley and Westfield. Constance Relfe was a sister of Richard Cheney.
- † W. Llewellyn Sussex Iron masters in Glamorganshire, Arch^{ia} Cambrensis, 3rd series, Vol. IX, pp.81 et seq.
- x Sussex Arch. Coll. II, pp.214-15.

was the last place where iron was made in the Weald, about the year 1820.¹ One would suppose in this case that the works were continued rather as a family tradition than as a business for though the quality of iron-produced was said to be excellent the output must have been too small to allow of any appreciable profit. The Pelhams too seem to have clung to family tradition in this matter. The Sir John Pelham who held two forges and one furnace in Dallington, Heathfield, Waldron and Brightling in 1574 probably made a profit. But we know that in the eighteenth century the Pelhams were still running the same works often at a loss, and never at any reasonable profit.*

Others again, yeomen and gentry, who seized the psychological moment, made great fortunes, built great houses, and as often as not lost both as the prosperity of the iron trade declined. The Fowles, for example, were mere yeomen farmers until Elizabeth's reign. But Nicholas Fowle was enterprising. He seized the opportunity of the Wealden

¹ "The late Earl told me that when he went to the Continent in 1819 the forge was still working, but at the time of his return four years later it had ceased to work." (Suss. Arch. Coll. Vol. XXXIII, p.267.) An old Sussex smith, whose father saw the last casting, told me that the country people made a great occasion of it and flocked in crowds to see it. "It was like a fair," he said. The last article cast was a big fire-back with the design of a sow and her litter.

* See below, pp. 133, 134.

iron boom, set up a forge and furnace in Wadhurst, and was one of the first to follow Ralph Hogge in making iron ordnance. He made a great fortune and spent much of it in buying an estate and building himself a fine gentleman's mansion at Riverhall. His son William seems to have neglected the iron trade and concentrated his energy on living the life of a country gentleman. The result was that his grandson was forced to leave Riverhall for Wadhurst, where he earned a living as a keeper of the turnpike-gate.[↓] The history of the Barhams of Butts is very similar. John Barham of Butts in Wadhurst was one of the earliest and most successful of the Sussex iron masters before the days of iron ordnance. In Henry VIII's reign he worked a furnace near Bayham Abbey and Brookland Forge, Barkley Mill and Verredge Forge near Frant. His assessment in the subsidy of 1543 shows that he was by far the wealthiest man in Wadhurst. He left a great fortune to be divided between his five sons, the second of whom, John, inherited the iron works.[†] But he did not apparently inherit his father's business ability and tastes, for he farmed out the works. The works remained in the family until the middle of the eighteenth century,

↓ Suss. Arch. Coll. Vol. II, pp. 217-18.

† Ibid, Vol. LVI, p.110.

sometimes worked by them, sometimes farmed out, passing from one branch of the family to another. In William III's reign one of the Barhams was High Sheriff of the county; in 1788, Nicholas, last of the Scragoaks branch, died in a workhouse.[↓]

By far the most profitable branch of the iron industry was the manufacture of ordnance, and a gunfounder could be reasonably sure of making a fortune even in the eighteenth century. Of Ralph Hogge, the reputed inventor and first founder of cast-iron guns, we know remarkably little. In 1543 he agreed to supply Henry VIII with cast-iron guns at £10 a ton,[†] and the king sent Pierre Baude and others of his gunfounders into Sussex to help him. In 1574 he worked a furnace "called Marshall" and a forge near Buxted, was known by the official title of "the Quenes maties gonstone maker and gonfounder of yron", and had a licence to export iron ordnance. He himself called Parson Levet, one of Henry VIII's ordnance officer, his "master" and his "predecessor",^x but that probably means no more than that Parson Levet was the official of the Ordnance who dealt with him. At any rate popular history^x and tradition

↓ Ibid. Vol. II, ut supra.

† See above, p. 38.

x S.P.D. Eliz. Vol. XCV, No.16.

x Holinshed's Chronicles (ed. Hooker) Vol. III, p. 960.

have no doubt of Ralph Hogge's claim to be the first iron gunfounder, though tradition gives another version of his name -

"Master Hugget and his man John ↓
They did cast the first cannon" runs the

local couplet. The site of Hugget's furnace is still shown on the ordnance maps and his forge may have been Little Forge or Howbourne Forge. Local tradition asserts, however, that the cannon was cast not at Hugget's Furnace but at the place where still stands Hog House, which Ralph Hogge built in 1581. But Hog House is some distance from a stream, and apart from the evidence of the couplet Hogge, Hogget and Hugget were common variations of the same name. ^x

Of John Browne of Brenchley and Horsemonden much has already been said in tracing the general course of the Wealden iron industry in the seventeenth century. If one may judge by the amount of ordnance he manufactured he certainly made an enormous fortune. But the privilege of being the king's gunfounder was outweighed by the fact the king was Charles I. John Browne was determined and persevering, as the State Papers show, but even he could not make Charles pay his debts. He said that during the twenty years

↓ Suss. Arch. Coll. Vol. II, pp. 183 etc.

x But see App. B. Marshalls is some miles from Buxted, with - west of Maresfield.

he had been the king's founder he had lost £10,250 "long forborne to be paid".[†] Moreover, he never ceased to rail bitterly against the Swedes who were beginning to undersell him in the Continental market. Even so his profits must have been considerable, and he certainly deserved his success. He was the only one of the Wealden iron-masters who had sufficient enterprise and initiative to undertake experiments, which proved successful, in casting light weight iron guns, and when there was a demand for brass guns he quickly converted one of his furnaces for casting brass.

The Civil War, as we have seen, affected him very little, though he was a Royalist and suspected of helping the king. Sir Thomas Walsingham said that when he was a prisoner among the rebels in Kent he heard them say that if the Royalists got to Yalding they would do well enough for ordnance, for Mr. Browne was their friend.[‡] Moreover, Parliament intercepted a letter from Sir Thomas's son, Thomas, to Lord Digby, assuring him that the people in Kent, especially Mr. Browne, were the king's good friends, and advising him to march thither, first sending word to Mr. Browne to have a good supply of cannon and bullets ready.^x

† Cal. of S.P.D. Chas. I. Vol. CCLXXIX, No.37.

‡ Cal. of S.P.D. 1645. Vol. DVII, No.151.

x Ibid. No.136.

On this evidence Parliament appointed a committee to examine John Browne and his son. But both denied all knowledge of the matter. John Browne said he did not know Sir Thomas had a son at all and he had certainly had no letters from him,[†] while John Browne Junior said he knew none of the Walsinghams.

In spite of these denials there was enough evidence to have hanged John Browne if Parliament had chosen to pursue the matter, but he was useful to them, and the inquiry lapsed. He fully realised his value, and thinking himself indispensable, raised the price of his ordnance from £13 to £30 a ton. This was a mistake as he soon found out, for Parliament checkmated him by no longer recognising his monopoly and entering into contracts with other founders, notably with Robert Cheek. This was particularly annoying to John Browne for Cheek had been his "menial servant and clerk until his ungodly conversation cast him out,"[‡] as Browne reported, hoping to shock Parliament's Puritan consciences. Such competition was not very serious, however, and Browne enjoyed a practical monopoly to the end of his life.

Walter Burrell of Cuckfield,^x who had been Carver to

† Ibid. Nos. 134 and 135.

‡ Cal. of S.P.D. 1651. Vol. XV, No.16.

x J.H. Cooper Cuckfield Families, Suss. Arch. Coll. Vol.XLIII, pp. 43 et seq. It was from Walter Burrell that Ray got his description of iron-making on the Weald.

Queen Henrietta Maria, was another of John Browne's competitors. He and his brothers, Thomas and John, had worked Tilgate Furnace and Holmsted Forge during Charles I's reign at a good profit. But Walter realised that ordnance was the most profitable manufacture and, though a Royalist, was glad to seize the opportunity of the abolition of monopolies, to begin to cast shot. He too apparently, though willing to sell to Parliament, thought that they should pay highly for the privilege of buying Royalist shot, for he demanded £14 a ton instead of the £12 offered by the ordnance officer.[↓]

Even in the eighteenth century when the industry was declining rapidly big fortunes could be and were made in the manufacture of ordnance on a large scale. The Fullers of Rosehill, for example, owed their wealth largely, as they admitted in their family motto, "Carbone et Forcipibus", to the success of their iron-works.[†] The family had worked iron at Heathfield Furnace and elsewhere in the seventeenth century, but it was not until the eighteenth century that they began to make guns at Heathfield and were so successful that they got important government contracts,^x and provided employment for many years for half

↓ S.P.D. 1653, Vol. XXXIX, No.31.

† Suss. Arch. Coll. XXV. p.101.

x See below, p.127

the parish.

The same thing happened at the Barhams' old furnace at Bayham Abbey. It was rebuilt on a much larger scale at the end of the seventeenth century by William Benge, and loyally christened Gloucester Furnace after a visit from Princess Anne and her son, the Duke of Gloucester. Benge himself failed, but the furnace passed into the hands of John Legas who, as his epitaph runs, "by his industry and diligence in the iron-works of this county, acquired a handsome fortune, with great credit and reputation," before his death in 1752.[↓] He succeeded, where Benge had failed, because he concentrated on the manufacture of ordnance. The works passed to Richard Tapsell, who had married Legas's niece, but by 1765 he was bankrupt and the works closed down. Tradition accounts for his failure by the story that cannon were often smuggled to France and that this was discovered and the government withdrew its contracts.[†]

In conclusion let us follow the history of Leonard Gale who began his career as a Kentish blacksmith and, thanks to the iron trade, ended it as a Sussex landowner. Proud of this achievement, he wrote a short autobiography^x for the

↓ Suss. Arch. Coll. Vol. II, pp. 212-13.

† It was at Lamberhurst that the railings were made for St. Paul's. See below, p. 115.

x R.W. Blencowe, Extracts from the Memoirs of the Gale Family, Suss. Arch. Coll. Vol. XI, pp. 45 et seq.

guidance of his sons, and from that the following extracts are drawn. "I was born,"¹ he says, " in the parish of Sevenoake, in Kent, my father, a blacksmith.....drove a very good trade." When Leonard was only sixteen his father died of the plague, leaving him the forge and about £200, which he quickly dissipated "not with ill husbandry, for I laboured night and day, to save what I had left me, but bad servants and trusting was the ruin of me." He quickly learnt his lesson and got rid of all his servants except one man and a boy to blow "but kept no maid nor woman in my house; and then I so thrived that, within two years and a half I got back all that I had lost before."

A few years later, "looked upon as a thriving man", he went into Sussex to collect a debt, and "before I went home again I took St. Leonard's Forge, and so kept a shop to sell iron, and let out the smith's forge.....I had not been in the country one year, but Mr. Walter Burrell, whom I looked upon as my mortal enemy, sent to speak with me, and when I came to him he told me he heard a very good report of me, and desired to be acquainted with me, and he told me if I would let his son Thomas come into partnership with me, he would help me to spws nearer and better and cheaper than

¹ In 1620.

I had bought before. I told him, I wondered to hear such things from him, for I heard he was my mortal enemy, because I took that forge, and I told him that if he would let me go partners with him in the furnace, he should go partners with me in the forge. He desired time to consider of it," being perhaps none too pleased with the blacksmith's independent attitude. But he was a business man and knew where his interests lay, and after making inquiries he entered into a partnership which lasted fifteen years.

All this time Leonard Gale had devoted himself strictly to business but now that he had succeeded, "considering that I had got about £5,000 or £6,000 having traded about thirty years, and being about forty-six years of age.....I bethought myself about taking a wife....and now, at the writing of these lines, I have attained unto the age of sixty-six years, having been married about twenty years, in which time as God hath been pleased to send me five children so hath he improved my estate to at least £16,000, which is £500 a year, one year with another, which is a very great miracle to me how I should come to so great an estate, considering my small dealings, the bad times, and my great losses by bad debts, suits of law, and by building", that irresistible temptation of the self-made

man. A hint as to the nature of the law-suits is given in his warning to his sons against their neighbours, who perhaps had not been too scrupulous in their dealings with the wealthy ex-blacksmith. "Next I advise you to have a care, and be not too familiar with your vile neighbours, as I have been, and you now see how they hate me; indeed they are but a beggarly and bastard generation, and whom I have been at great charges with." We may be sure that, like Walter Burrell, they met their match if they attempted to over-ride Leonard Gale.

CHAPTER V.

IRON-WORKS AND WORKERS.

In this chapter it is proposed to describe the methods employed in the manufacture of iron and in its subsidiary industries, coaling and mining, and to say something of the workmen and of the conditions under which they lived.

When one remembers that the manufacture of charcoal was essential to the making of iron, it is remarkable how little is known of the charcoal-burners of the Weald, though the industry remained important well on into the nineteenth century, and still exists to-day. The wood was "coaled" by charring it in a fire. Billets of wood were heaped into a cone-shaped pile so as to leave a ventilation shaft in the centre. The pile was covered with turf or wet soil to prevent its burning too rapidly and fire was applied in the centre. The charcoal-burners or "colliers" were sometimes attached to the regular staff of the ironworks.

At Lord Seymour's[†] works in the Forest of Worth (1549) there

[†] Lord Seymour held the Crown works in Worth and St. Leonard's Forests for about two years between the attainder of the Duke of Norfolk and his own.

were "ij coleyers and ij servants".[†] On the other hand, the Tudeley Accounts[‡] show that those works were staffed by only four men, the blowers, and that all charcoal was bought ready-made either elsewhere on the estate or in the neighbouring country. The Waldron accounts^x contain similar instances, and these facts, in conjunction with place-names such as Colliers Green (near Battle), suggest that the colliers were sometimes independent workmen who established their trade in some well-chosen spot. It is probable that some of the colliers were itinerant, going from place to place as they were required, and living in rough huts in the woods, as is still the case in some German and Russian forests.

The colliers probably often felled and corded their own timber, though in the case of large estates this work was done by the estate woodmen. Woodcutters were paid by the "cord", a heap of faggots which measured when piled up 8 feet in length, 4 in width and 4'2" in height, the 2 inches being allowed for springing or settling.^x In the sixteenth century at the Pannyngridge, Worth and St. Leonard's iron-works the usual payment for woodcutting was 3d a cord.

† Sussex Arch. Coll. Vol. XIII, p. 129. This was also the case at Heathfield Furnace in the eighteenth century.

‡ See above, pp. 20.

x Addit. MSS. 33154-6.

* Suss. Arch. Coll. Vol. XIII, p. 128.

At Waldron in the seventeenth century the cost had advanced to 9d or 1s. a cord, and in the eighteenth century to 1s.2d.

In England the law relating to metals did not, as on the continent, make the king the owner of all mines. He had only succeeded in making good his claim in the case of precious metals. Other metals usually belonged to the ground lord, though in certain districts mining rights were vested in a corporation of miners. Such was the case in the Forest of Dean iron and coal mines, the Derbyshire lead mines, and others.[↓] Thus one of the regular expenses of an iron works was payment to the lord of the soil for licence to dig iron ore or "mine" as it was usually called. In the accounts of Worth furnace (1547-9) the accountant records several payments for "the soyles out of which were drawn 3375 lodes the owners being agreed with at 1d ~~1/2~~ lode."[†] If the lord of the soil was also the owner of the works and wanted to dig ore in his tenants' lands it was customary for him to pay compensation, for mining naturally interfered with cultivation. The periods for which compensation was paid differed widely. The parson of Sheffield was paid 60s. a year for two years "for that the groundes of pasture erable & meadow be dygged for myne mych to his losse of ~~10~~ 10th

↓ Vic. County Hist. of Gloucester, Vol. II, p. 220.

† M.S. Giuseppe, Archaeol Journal, LXIX, p.301.

thereof."[↓] On the other hand Lord Abergavenny allowed his copyhold tenants 2d a load for the ore he dug in 1634 for the furnace at Pallingham, and it was stated that if land were dug for ore it meant the loss of seven years' profits.[†]

The fact that mining interfered comparatively little with the ordinary uses of the land is explained by the simplicity of the methods used. As a rule the lowest stratum of iron lay from four to forty feet below the surface of the ground.^x The shallow strata were sometimes dug in trenches six or eight feet deep.^x These were easily filled in again as the miners went on. Such methods however were wasteful in the case of deeper veins and were strongly disapproved by conscientious miners, who used the more scientific method of bell-pits, wider at the bottom than at the top, and reaching down to the lowest veins of iron. The pits were reached by a ladder and the ore had to be carried up in baskets on the miners' backs. In other parts of the country more elaborate methods were employed but in Sussex the iron veins were so quickly exhausted that it was not worth while to erect

↓ Ibid, p.296.

† Vic. County Hist. of Sussex, Vol. II, p. 244.

x Ray, op. cit, p. 125.

x Traces of such trenches can be seen at Weybridge.
Surrey Arch. Coll. Vol. XXXIV. Notes and Queries.

machinery. Even in these small pits flooding added to the miners' difficulties. The Sheffield accounts contain an entry for "making of dykes to convey ~~the~~ water to save ~~the~~ myne in Denewood."[↓] John Fuller, a Sussex iron-master, writing in the eighteenth century, said "the Miners are very often troubled with Water, which they draine by making Rock Pitts."[†]

The use of bell-pits did not necessarily mean that the mining was well done. In 1587 in a dispute between Edward Carryll and Roger Gratwick, Carryll complained that Gratwick's workmen "take onlie the uppermost veynes of myne which lie fleetest and are most easie to come by and many times have left undigged the lower veynes so that the miners of the complainant and others have drawn 7 or 800 loads after the defendant's workmen had left digging in the said pittes." Moreover they had "lost and spoiled great quantities of myne and ower by suffering the water (by their negligence in not digging the pits deeper) to drown the said myne."^x This suggests the fate of many of these old iron pits. On drier ground they were filled in again like the trenches and left no trace; but in wet places they

↓ M.S. Giuseppi, Arch. Journ. ut supra.

† Sloane MSS. 4020, fol. 189.

x Vic. County Hist of Sussex, Vol. II, p. 244.

were flooded with water almost before the miners left them and appear to-day as ponds.

The miners of the Weald do not seem, like the miners in some other parts of England, to have had any special organisation or privileges. Like the colliers they were either attached to some special ironworks, as at Sheffield where there were two miners on the staff, or else hired themselves out to various iron-masters when they were needed.

When the ore was dug it had to pass through a preliminary calcining process before it could be put into the furnace.* In the fourteenth century Tudeley accounts this process is referred to as "elyng", and the lessee of the works was granted a certain amount of "elyngwode" each year.† In 1672 John Ray described in some detail the process as it was carried out at Walter Burrell's Cuckfield works. "When the mine is brought in, they take small cole and lay a row of small cole and upon it a row of mine and so alternately, S.S.S.^x one above another, and setting the coles on fire therewith burn the mine. The use of this burning is to mollify it, that so it may be broke in small pieces: otherwise if it should be put into the furnace as it comes

* In some parts of the country the ore was washed in a coarse sieve before being calcined. (Salzmann, *op.cit.* p. 29). I have found no reference to this practice in the Sussex industry.

† See above, p. 20.

x "Stratum super stratum".

out of the Earth, it would not melt but come away whole. Care also must be taken that it be not too much burned, for then it will loop, i.e. melt and run together in a mass. After it is burnt, they beat it into small pieces with an iron sledge, and then put it into the Furnace....."[†] Elsewhere[†] Ray says that this calcining is "done in kilns, much after the fashion of our Lime Kilns". But in this case he does not seem to be speaking of Sussex, as even in the eighteenth century the open charcoal fire was used.^x

The furnace to which the calcined ore was brought naturally underwent considerable changes and modifications in course of time. There is unfortunately very little evidence directly relating to the type of furnace used in the Weald, but the methods employed by primitive ironworkers seem to have been very much the same in all countries and in all ages, so that it is possible by comparison to supply gaps in the story of the Wealden manufacture. The Romans, who were the first Wealden ironmasters to leave recognisable traces of their activities, used furnaces which were worked by natural not by artificial draught. Their method was to

[†] J. Ray, op. cit., p. 125.

[†] In Phil. Trans. Vol. XI. Quoted by C. Dawson, Sussex. Arch. Coll. Vol. XLVI, p. 9.

^x Sloane MSS. ut supra.

lay a hearth of charcoal, then a layer of ore on top of it and so on in alternate layers. The whole mound was covered with a layer of clay to keep the heat in, holes being left at the bottom to let the air in. Traces of this process have been found in several places in Sussex, notably at Beauport, near Battle, where a stratified mound of ore and charcoal, fifty feet high, was discovered.[↓] An alternative method was to dig a hole in the ground on the windy side of a high hill, line the hole with clay, and dig one or two covered channels to bring the draught to the furnace. The obvious defect of such a process was that it would only work on a windy day, but the method was very common in England and Belgium at the time of the Roman Empire and a similar method continued to be used in the Derbyshire lead-mines until the seventeenth century.[†]

Artificial blast, however, must have been introduced at a very early date, and until about the fourteenth century was supplied by one or more pairs of skin bellows worked by the hands or feet of the workmen. Women or boys were often employed in this so-called light work. The furnace or forge for which they supplied the blast at first was very much like the ordinary smith's forge except

↓ Sussex. Arch^{al}. Coll. Vol. XXIX, p. 124.

† J.M. Swank, Manufacture of Iron in All Ages, p. 36.

that it had a sunken hearth into which the iron settled. The total height of the furnace was about 2 feet and the lower part or hearth about 11 inches, at which height two holes ("tuyere" holes) were made for the mouths of the bellows.⁴ Later furnaces were simply extensions of this idea. The use of larger bellows and a stronger draught made it possible gradually to increase the height of the furnace and therefore the amount of iron made. In consequence of the increased height a much greater heat was produced and although the object of the ironworkers was only to produce malleable iron they must often have produced cast-iron, at first probably to their annoyance, because cast-iron was harder to work under the hammer, and they did not know its uses.

In all these early types of furnaces only malleable iron was as a rule produced. The smelting process was usually very imperfect and wasteful, for the heat was not sufficient to separate the iron completely from the stone. The result was that the iron, even after it had been worked under the hammer, contained many impurities. Until the fifteenth century the Wealden furnaces apparently produced little except iron "blooms",

⁴ Ibid. p. 75.

lumps of iron worked under the hammer, and weighing in Sussex about three-quarters of a hundredweight.[↓] These were sold to the village or manorial smiths to be worked up. Cast-iron was occasionally made in the fourteenth century, as we know from the cast-iron slab in Burwash church,[†] but it did not become a regular product until the introduction of water power. Not only did the iron blooms contain impurities but the waste or cinder run off during the smelting contained a large proportion of iron. Later Wealden iron-masters, with their high blast-furnaces, found this cinder very useful, sometimes using it as a flux in combination with other ores,^x and sometimes, especially if it were Roman waste, finding it worth while to re-smelt it simply for the iron it contained. *

The introduction of water-power to supply the blast of the furnaces and to work the hammers revolutionised the iron industry. Water-power could be used to produce a blast in two ways; indirectly, by working the bellows, or directly by the air given off from a current of falling water. The latter method was employed rather on the Continent than in England and had the disadvantage of

↓ See above, p. 1920

† See above, p. 25

x Ray, quoted by Dawson, op cit.

producing a blast of damp air, which to a certain extent diminished the heat of the furnace.[↓] It is not known exactly when the use of water-power was introduced into the Weald, but on the evidence of the number of specimens of cast-iron dating from the fifteenth century it is probable that water-wheels began to be used to blow bellows early in that century. We know that in 1497 there was a "great Water hamer" at work in Ashdown Forest,[†] though it was probably an innovation, for the king's Ordnance officers evidently did not think much of it. But the use of the water blast may very probably have preceded the use of the water hammer by some time. We know that in Weardale the water blast was being used in 1408.^x In this way a much stronger blast could be brought to play on the fire, and could moreover be sustained continuously so long as the water supply did not fail. Thus the size of furnaces could be greatly increased and the fire kept in for much longer periods, with the result that a fiercer heat was maintained and cast-iron became the normal product of the furnace.

We are able to conjecture with some accuracy as to

↓ Scrivenor, History of the Iron Trade, p. 82.

† See above, p.24

x L.F. Salzmann English Industries in the Middle Ages, p.28 (1923 edition).

the average size of the Wealden iron furnaces for in the sixteenth century some Sussex iron-masters migrated to Glamorganshire,[†] and in the valley of Cwm Aman the remains of one of their furnaces still stand.[‡] It was built and lined with sandstone, its total height being 16 feet and the square of the outer walls 24 feet. Inside was a cone-shaped cavity of sandstone, which was 5 feet in diameter at its widest points and narrowed at the base of the hearth to 2 feet. This was by no means the maximum size of a water blast furnace, for Ray gives the average measurements in the seventeenth century as 30 feet by 10. Whatever their size they all worked in the same way. The blast was supplied by two pairs of bellows, the nozzles of which met at the tuyere hole at the base of the furnace. The bellows were alternately opened and shut by the action of two cogs on the axis of the water wheel, one pair being open while the other was shut and thus a continuous blast was produced.^x

The furnace was filled from the top with calcined ore, charcoal and limestone or iron cinder^{*} in layers. The purpose of the limestone or cinder was to act as a flux,

† See above, p.70

‡ Arch^{ia}. Cambrensis, Series 3, Vol. IX, p. 86.

x Ray, quoted Dawson, op.cit.

* See above, p.88.

that is to say, to form a nucleus of waste matter which would attract and blend with the impurities in the iron ore and form a waste or slag which could easily be drawn off. Sometimes, instead of limestone or cinder, some of the poorer sorts of ore were used as, for instance, "Gray Pitty" or the "Eleven Foot".[†] In any case "the Iron-masters always mix different sorts of mine together, otherwise they will not melt to advantage."[‡] The furnace once lit was kept alight day and night, which "in the midst of the darkness maketh a terrible shew to travellers who do not know what it is."^x At frequent intervals the workmen recharged the furnace with coal, ore and limestone or cinders, and drew out the slag floating on top of the molten iron through the tamping hole.

Every twelve hours or so the iron was run off through a hole at the bottom of the hearth, which had been previously stopped up with clay. The iron was run into a bed of sand in which had been made several big channels with smaller ones leading off them at right angles. When the iron cooled the small "pigs" were broken off from the big "sows". The longer the blowing lasted the bigger grew the

† See above, pp. 3 and 4.

‡ Ray, op. cit. p. 125.

x G. Boate, Ireland's Naturall History (1652), p. 108.

hearth as the fire wore away the sandstone, "so that if at first it contains so much as will make a Sow of 600 or 700 pound weight, at last it will contain so much as will make a Sow of 2000 l."[†] The period of the blowing was divided into "foundays" (six days) though the division seems to have served no purpose except to provide a basis for the payment of the workmen. Ray says that "a Hearth ordinarily if made of good stone will last 40 Foundays, that is 40 weeks, during which time the fire is never let go out."[‡]

At the furnace were produced ordnance, fire-backs and such other articles as could be made by the single process of casting. The sows and pigs (pig-iron) however were taken to a forge to be worked into wrought iron. Ray gives an excellent description of a Wealden forge in the seventeenth century. "In every forge or hammer there are two fires at least, the one they call the Finery the other Chasery.^x At the Finery by the working of the hammer they bring it into Blooms and Ancoⁿⁱes, thus."

"The sow at first they roll into the fire and melt off a piece of about three-fourths of a hundredweight which so soon as it is broken off, is called a Loop."

† Ray's Collection of English Words, p. 126.

‡ Ibid. p. 127. A modern blast furnace hearth will last on an average three years, during which time it is constantly alight. In some cases where "hot" ore is not used the furnace will last nine or ten years.

x Or chafery.

"This Loop they take out with their shingling tongs, and beat it with Iron sledges upon an Iron plate near the fire, that so it may not fall in pieces but be in a capacity to be carried under the hammer. Under which they then removing it, and drawing a little water, beat it with the hammer very gently, which forces cinder and dross out of the matter, afterwards by degrees drawing more water they beat it thicker and stronger[↓] till they bring it to a Bloom, which is a four-square mass of about two feet long. This operation they call shingling the Loop."

"This done they immediately return it to the Finery again, and after two or three heats and working they bring it to an Ancony, the figure whereof is in the middle, a barr about 3 feet long of that shape they intend the whole barr to be made of it: at both ends a square piece left rough to be wrought at the Chasery."

"At the Chasery they only draw out the two ends sutable to what was drawn out at the Finery in the middle, and so finish the barr."[†]

Some of the smaller Wealden iron-masters owned

↓ The machinery of the water-hammer had obviously been greatly improved since 1497 when it was considered a rather rough instrument. It was now possible to regulate the force of the hammer by regulating the flow of water.

† Ibid. pp. 127-8.

either a forge or a furnace and depended for their raw material or their finishing processes on others. But the wealthy iron-master had his furnace and his forge, if possible, near each other to lessen the expense of carriage from one to the other. The Pelhams, for instance, had a furnace at Waldron and forges at Brightling and Bibleham. The furnace and forge were never found in the same spot, however, because one pond would not give power enough to drive the furnace bellows and the forge hammers, each of which might weigh about 2,000 lb. for the hammer-beam itself was "not less than seven yards and a half long, and four feet square at the barrel",[†] in addition to the iron nose and hoops. Therefore the furnace and forge might stand on different streams not too far apart, or about a mile apart on the same stream, as at Ashburnham, where the furnace lies a mile higher up the stream than the forge. Even so it was rarely that a natural pond provided sufficient head of water and the stream had usually to be deepened and dammed, until the water flooded an area of from ten to ninety acres.[‡] Many of the most delightful pools in Sussex to-day were made in this way, though others as at Ashburnham and Robertsbridge, were drained when they

[†] Evelyn, J. Silva, Bk. III, cap. 3, p. 207 (Edition 1812).

[‡] M.S. Giuseppe, Surrey Arch. Coll. Vol. XVII, p. 37.

were no longer needed for the iron mills and their position can only be discovered by the remains of the dams which appear as long mounds of earth, overgrown with grass and trees, on either side of the stream. "Recompence made to dyvers persones for their landes lyeing under water at furnes & hamer poundes" was a regular charge at Sheffield and at other iron-works as was also "Mendying the pole baile & skowring the furneyes & hamer dykes" ↓

The total number of workmen employed in the iron industry must, at the end of the sixteenth and at the beginning of the seventeenth century, have been considerable. Not only was labour needed in mining, coaling, and iron-making, but in repairing and rebuilding furnaces and forges and tools, in keeping the ponds and water-courses clear and free from obstructions and in carting the raw materials and the manufactured article, freight being even then one of the most expensive items in the cost of production. In 1549 Sheffield Forge[†] employed a hammerman and his servant, two finers and two servants, a founder, a filler, two colliers and six servants, two miners and four servants, a man "to attend upon the works and workmen, at all tyme, and wey the iron ffrom the workman to the merchaunte", and two waggoners

↓ M.S. Giuseppe, Arch. Journ. ut supra.

† Sussex Arch^{al} Coll. XIII, p. 128.

("wyenmen") - in all twenty-five men. At Lord Seymour's other works in Worth Forest,[†] where ordnance was made, he employed thirty-three men. In addition to these regular workmen extra labour was employed from time to time in carrying sand, ore, stone and iron, while the skilled labour of carpenters, sawyers, coopers, masons and plasterers was needed whenever the furnace had to be rebuilt, a new hearth put in, or cottages built for the workmen.[‡] Richard Woodman, an iron-master of Warbleton on his trial for heresy in 1557, pleaded for acquittal on the grounds that he employed a hundred workmen who would be thrown out of work on his death.^x In 1587 Edward Carryll is stated to have employed forty-nine workmen at his works in St. Leonard's Forest,^{*} while in 1618 the famous John Browne said he had two hundred men working for him at Brenchley.[♠] John Fuller's furnace at Heathfield, which continued to work until the end of the eighteenth century, "kept nearly half the population in constant employ."[♣]

In 1631 the justices of the "wildish part of the rape of Pevensey" reported that there was great plenty of

† Ibid. p. 129.

‡ Archæol Journal, LXIX, pp. 290 et seq.

x Suss. Arch. Coll. Vol. II, p. 186 from Foxe's Acts and Monuments".

* Exch. Dep. by Com. 30 Eliz. Easter No. 8. Vic. County Hist. Sussex. Vol. II

♠ S.P.D. Jas. I, Vol. CV, No. 92.

♣ Horsfield's Sussex, Vol. I, p. 573.

work there, for the Clothiers of Kent employ the women and children and the iron works of Sussex employ the stronger bodies.[↓] When the iron trade fell on evil days one of the strongest arguments of its friends in support of its plea for governmental protection was that it provided the livelihood of thousands of families who would otherwise be starving. A petition of Charles II's reign put the number of "lusty able workmen" who were in constant employment and "ready for the defence of yo^r Majesty & ~~the~~ Nacion" at 50,000.^x This was doubtless an exaggeration; but it can be seen from the figures given above that in the sixteenth and seventeenth centuries the iron industry provided employment for a considerable number of people.

In some places all the labour required could be supplied locally, but in others where there were several furnaces and forges at work labour had to be imported. Sometimes, as we shall see, workmen were brought from overseas; sometimes the need was supplied by the migration of the unemployed from other parishes. In either case a sudden influx of strangers created a housing problem, which was variously solved. Some iron-masters, such as Lord

[↓] Cal. of S.P.D. Chas. I, Vol. CXCI, No.99.
^x J.L. Parsons, ut supra.

Seymour, took the burden on their own shoulders, and the Sheffield accounts show an expenditure of sixty shillings on the "making of thre lytell howses for two fyners and one funder to dwell in."† Christopher Darrell of Ewood went still further and provided "cotages and howses with garden plottes and yarden necessary and meete for the woorkemen to inhabytt in."‡ Others, less generous, left the responsibility to the men or to the parish. At Ashburnham where the activity of Ashburnham Furnace and Forge, Pannyngridge Furnace and Penhurst Furnace, created a big demand for labour, the workmen and their families had to live in tents, the names of which still cling to the fields near Ashburnham Forge. The parish registers contain frequent references to the iron-workers. In 1600 these entries occur in the list of burials:- "Morgan Lawrence a welshman from the Tent called Mynters.....

John Morrell at the tent called Afrykie."x

At Cowden too the workmen seem to have lived in tents or huts near the furnace, and an old parish account book shows that the existence of an iron works in its midst was not always an unmixed source of profit to the parish.

† Archael Journal, LXIX, p. 303.

‡ M.S. Giuseppe, Surrey Arch. Coll. Vol. XVII, p. 37.

x Whistler, R.F. Ashburnham Registers, Suss. Arch. Coll. XXXIII, p. 58.

The hope of work attracted many who were unfit for it and simply became charges on the parish. The Cowden church-wardens do not seem to have spent much money on keeping these weaklings alive but at least they buried them. In 1643 they spent considerable sums in this way:- "for a sheet to bury a poore man in, and to four men to bring him from the furnace to be buryed, and for burying him, 6s; also for a sheet to bury a poore woman in, and for bringing her from the furnace, and for her buryal, 8s.2d; for a sheet to bury another poore woman in, and for the bringing of her from the lower furnace, and for her buryal, 7s. 4d." †

Most of these strangers must have been employed in the subsidiary industries or on odd jobs, for the number of workmen required for the actual manufacture of iron was small. At Tudeley the permanent staff consisted of the four "blowers".* At Sheffield in 1549 the furnace was worked by two men, a founder and a filler, who at Worth furnace, where ordnance was cast, were reinforced by two gunfounders and eight servants. At the forges were a hammerman and his servant and two finers with their two servants.^x The shrewd

† Turner, E. Ancient Parochial Account Book of Cowden, Suss. Arch. Coll. XX, p. 91.

* See above, p. 20.

x Suss. Arch. Coll. XIII, ut supra.

surveyor of the Newbridge forge in 1539 would have regarded this as overstaffing.[↓] He was obliged to admit that "oone man cannot kepe the hamo^r bicause the work must be kept in suche hete that they may not shifte handes" but he thought that two men were quite enough. The Sheffield founder was paid at the rate of 8s. the founday, and the filler at 6s, but at Worth the gunfounders were paid 10s. the ton. For working the sows into wrought iron a hammerman and two finers were paid 13s. 4d. a ton between them. But in addition it must be remembered that they were provided with houses and livery.

In 1696 Waldron Furnace^{*} staff consisted of two men, Joseph Mittell, the founder, and his man, John Wimble. These two not only made enough pig-iron to supply the forges at Brightling and Bibleham, but also produced a considerable quantity of shot and shot moulds^x and when required cast the hammers, anvils and plates used at the forges. In 1706 the furnace was rebuilt. John Wimble succeeded Joseph Mittell as founder, and apparently carried on the work single-handed. There were various casual labourers who did odd jobs about the

↓ Vic. County Hist. of Sussex, Vol. II, p. 245.

* For this account of Waldron, Brightling and Bibleham see Addit. MSS. 33/54-6

x The founder was paid at the rate of 7s. a ton for shot. This is 3s. less than the Worth founders' pay in 1549. The rest of his pay, however, was much higher.

furnace but in the actual casting he seems to have had no help. No shot was made and rather less cast-iron, but he still made enough to supply the two forges with their raw material and tools, and occasionally cast fire-backs.

Throughout the period covered by the accounts (1639-1715) the founder's wages remained the same. He was paid a fixed yearly wage of £1.0.0., a sort of retaining fee, like the "gersuma" of the Tudeley blowers. In addition he was paid by piece-work, The pay for smelting was reckoned at 27s. the founday and he was paid separately for any extra things he had to make. In 1706 his earnings were considerable:-

"Ittem paid to John Wimble for Blowing of 27 foundayes at 27s. the founday the summe of	36. 9. 0.
Itt pd to him for Sifting the mine at 12d the founday	1. 7. 0.
Itt pd to him for weighing and pilleing of 166 Tonnes and 4 cwt. of Sowe Iron at 1d the Tonne the summe of	13. 10.
Itt pd to him for casting of one forge Hamer	1. 6.
Itt pd to him for Casting of Two forge Anvilles	2. 0.
Itt pd to him for casting of 5 forge plates	2. 6."

Brightling and Bibleham forges[†] were each manned by two skilled smiths. In 1690 John Simmons was the finer

[†] Also called Glaziers and Bevilham or Bivellham forges.

at Bibleham and Goodman Jorden the hammerman, while Brightling was worked by Henry and Germane Mittell, brothers probably of the Waldron founder. In the eighteenth century as trade declined it was possible to reduce the staff and in 1710 Stephen Collins, helped by a man and a boy, became finer and hammerman at both forges. The smiths' wages were reckoned on the same basis as the founder's. In addition to his standing wage of £1.0.0. the finer received 9s. for every ton of iron he worked, and the hammerman 7s. If, however, the finer, as often happened, had to work up scrap iron into bars, he received double pay. When Waldron furnace was turning out shells, defective shells were often used up in this way or sold to other forges for the same purpose. Very little iron was made at the forges and in order to live the smith had to supplement his earnings with all kinds of odd jobs. In 1707 Stephen Collins, then sole smith at Brightling, made only 45 tons of wrought iron. The rest of his time was spent in making new bellows and new coal baskets for the finery, clearing out the mill-pond and dykes, helping the mason with the new chafery chimney, "some gapping about the woods", and making faggots in the forest.

Waldron, Bibleham and Brightling were all under the general supervision of a clerk of the works who kept the

accounts, kept an eye on the workmen and arranged for the purchase of all raw materials and the sale of the iron. The accounts of Thomas Moore, who was clerk from 1690 until 1715, are the fullest and most interesting, though in times of stress he tends to become illegible. He spent most of his time at Waldron but often had to ride into Pevensey and Maidstone[†] where he had hired barns as warehouses for the iron. He sold much of the wrought iron locally in tons and half tons to the "contery smiths" and Mr. Galloway of Lewes bought a good deal of cast-iron direct from the furnace, but the more distant customers from Kent and London preferred to meet him at Maidstone or Pevensey. He found another market for his iron at Battle Fair where the country smiths often laid in their stock for the year. As an accountant he was admirably conscientious. There are no "Sundries". He particularises every detail, even threepence "for a quarter of a pound of packe thread to Sett out y^e furnaces walles" and fourpence "for two post Letteres about Iron to me in y^t yeare" (1708).

At John Fuller's furnace at Heathfield the regular staff consisted of four men, two founders and two fillers. But when, as in 1745-6 Fuller had a government contract for

† "Itt. pd in my jorney to Maidstone in May 1709 when I was up to deliver y^e Iron for London for myself and horse two nightes gone — 2s. 6d."

ordnance, they were directed by one John Hart, a skilled gunfounder, who worked there as long as the contract lasted. Mr. Fuller had a good deal of trouble with Hart who "said he would not worke under Ten Shillings a week more which they gave att other Furnaces, so I am forced to give having never given but three pounds before per week unless they went upon small guns."[†]

The wages bill for 1745-6 was as follows:-

		£.	s.	d.
"Cavey. Head Founder by Bill	)	60.	5.	7.
John Harmer by Bill. Upper Feller	)	32.	14.	0.
John Guir. Under Founder.	) Furnace	22.	10.	2.
	) men			
James King. Under Feller	)	16.	13.	7.
	)			
J. Hart	)	125.	9.	2.

£257.12. 6."[†]

In the ranks of the skilled iron-workers were to be found a number of foreigners. Religious troubles in France and Germany caused many intelligent artisans to emigrate in the sixteenth and seventeenth centuries. The ports of Kent and Sussex were their nearest refuge and naturally the iron-workers among them sought and often found employment in the Wealden iron-works. The parish registers show that

[†] P. Lucas Heathfield Memorials, p. 78.

[†] Ibid, p. 80.

many French people settled at Horsham[†] and Maresfield[†] in the middle of the sixteenth century, while an examination of a list of Sussex wills in the sixteenth and seventeenth centuries shows many foreign names among men engaged in the iron trade.^x The three Mittells at Waldron and Brightling were obviously members of a family which had sought refuge in England from trouble in Germany. John Browne, who employed 200 men, said that many of them were "outlandish men", and urged this as a reason for preferential treatment by Parliament in 1651, for he said that if Parliament cut down his prices he would not be able to pay his workmen so much and these outlandish men "will have good rates for their work, or else they will return to their own country and will not suddenly be brought over again."^{*}

The early Tudors indeed had definitely encouraged the immigration of aliens skilled in the making of ordnance and armour. As we have seen, Henry VII and for a time Henry VIII also relied almost entirely on foreign workmen for such things, whether made in England or abroad. Some

† Dallaway's Western Sussex, Vol. II, Pt. II, p. 359.

† Suss. Arch. Coll. Vol. IV, p. 247.

x Sussex Wills and Administrations, ed. W.H. Hall, Index Library, e.g. William Hato, hammerman; Thomas Catte, founder; Adrian Messant, finer; William Morrell, finer; Peter Minage, hammerman; Jerman Mittell, founder; Jorden de Verray, hammerman; etc. The Bramshott Parish Register records the baptism of children of "strangers at the Hammer" but these may not have been foreigners. (Cape, Rural Life in Hants, p. 169.)

* S.F.D. 1615. Vol.XV, No.16.

of these strangers found their way, or perhaps were sent by the king, into the Weald. One Clays Hars became a "gonne stone maker of the forest of Ayshdowne",[↓] possibly at one of the king's furnaces, while we know that Graunt Pierre held a furnace in Hartfield. Henry VIII's Denization Rolls contain the names of scores of workers in iron, steel or brass who came to England and decided to settle there. Among them were several who migrated to the Weald. Adrian Attour is entered as an ironworker and servant to the Duke of Norfolk, while Gilbert Averell was made a denizen for ironworks by William Levett, clerk. The Duke of Norfolk held the ironworks at Sheffield and Worth until his attainder in 1547 when Parson Levett became clerk of the works for a short time until they passed into Lord Seymour's hands. Another name is that of Pierre Baude[↓] (Peter Bawood) "maker of our bombards" whom Henry VIII sent into Sussex to help Ralph Hogge in casting the first iron cannon.

Some Wealden ironmasters may have preferred to employ foreign workmen in skilled processes such as making steel. This was the case at Robertsbridge where Sir Henry

[↓] Exch. K.R. Bdle. 55, No.29.

* In the list of "Francheman" who paid quarterage and enjoyed certain privileges of the Founders' Company is the entry "Hownysdyche Peter balde". He was probably working at the Owen's gun foundry in Hounsdsitch the site of which is still marked by Gun Yard. (J.C.L. Stahlschmidt, Notes from an old City Account Book (Founders' Co.), Arch. Journal, XLIII, p. 172.

Sidney had iron and steel works. But the aliens were unpopular, for in 1566 the Privy Council sent orders to the justices to enquire into a disturbance that had taken place there. John Sharpe "naming himself a master of fence, hath of late not only beaten diverse Duchemen which hath been employed.....by the procurement of Sir Henry Sidney.....for the making of steale, but also hath used suche unfitteing wordes against them as is not to be suffered."[↓]

On the whole it may be concluded that the Wealden iron industry owed very little to the foreigner. It was not widely spread at the beginning of the sixteenth century but it was so firmly established that the influx of foreign workmen had no effect on its general development. Henry VIII sent down his alien gunfounders to help in casting the first iron cannon, but Ralph Hogge of Buxted had invented it and was quite capable of making it himself. After Henry VIII's death foreigners went out of fashion, and as we shall see, foreign countries became just as anxious to attract English workmen as Henry VIII had been to attract aliens. The Weald was definitely a field of English enterprise and offered no opportunities to the foreign exploiter as did the Cumberland copper mines to Hochstetter and Thurland.

[↓] Acts of the P.C. Vol. VII, p. 353.

CHAPTER VI.

PRODUCTION AND COSTS.

The principal manufacture of the Wealden iron-works was pig-iron and, to a lesser extent, wrought iron. But numerous small articles of cast and wrought iron were produced also. In 1635 John Browne claimed to have introduced the manufacture of iron pots, kettles, chimney backs, salt pans, soap pans, pitch pans, iron weights and "other like things according to the French fashion,"[†] and was granted a monopoly. Whatever this "French fashion" may have been, it is certain that all these things and more had been made "English fashion" for several hundred years before John Browne's time, and continued to be made for many years longer. Weapons and tools must have been the earliest products of the industry,[‡] and the invention of cast-iron in the fourteenth century greatly increased the range of articles which could be made. Cast-iron grave slabs were common,^x but it was in the manufacture of chimney-

[†] Cal. of S.P.D. Chas. I. Vol. CCVI, No. 102.

[‡] Among the occasional products of the industry were wolf and man-traps, examples of which, once in use in Beauport Park, can be seen in the Sedlescombe museum.

^x Examples in Wadhurst and Burwash churches.

backs and andirons that the Wealden smiths showed their ingenuity, if not their artistry. The andirons often show the coat-of-arms of the family for which they were cast, or sometimes the upper part is cast in the shape of a human figure so that it is possible to date the andirons by the fashion of the clothes.[†] The usual method of casting fire-backs was to carve a wooden mould which was then pressed into the sand where the iron was to be run.[‡] The early fire-backs were very rough and crude. The pattern was made with separate movable moulds, of which the favourites were fleur-de-lys, crosses and rosettes. But the work must often have been left to illiterate workmen, who had no sense of design, whose only object was to fill up space, and who for this purpose used anything that came handy, even to the flat of their hands.^x Later the fire-backs were cast from a single-piece mould and the designs became much more elaborate. Coats-of-arms were used as in andirons, but in the seventeenth century the designers were more ambitious and classical and biblical scenes became popular.^x In the eighteenth century

† M.A. Lower, *op. cit.* pp.199-200.

‡ R.F. Whistler, *Suss. Arch. Coll.* Vol. XXXVI, p.4.

x. J. Starkie Gardner, *Archia.* LVI. *ut supra.*

* One of the most attractive of the seventeenth century fire-backs is that which shows Richard Leonard (who worked Brede Furnace in 1636) with his dog, tools, trademark and works. There is a copy of it outside Sedlescombe smithy.

such inspiration as they had seems to have deserted the English designers, who contented themselves with copying Dutch and German models.[†]

Iron pots or skillets were made in great numbers. Most of these were no doubt made at the furnaces by the regular workmen. But some seventeenth century skillets are stamped with the name of Rummins and there is a tradition that a Lamberhurst family of this name travelled about the country selling skillets, which they cast at various furnaces as they were needed.[‡] In the seventeenth and eighteenth centuries the Wealden iron-masters began to experiment in casting brass as well as iron, and brass pots were made. The Easebourne Churchwardens in 1651 paid 15s. to Richard Miller of Chittingley for two brass pots weighing 36 lbs. at 5d the pound.^x Iron pots were much cheaper, being sold at about 1d the pound.

Even in the eighteenth century when the industry was declining rapidly the manufacture of small ironware flourished. In 1751 Dr. John Burton, a fellow of Eton, made a tour through Sussex and was greatly impressed by the iron manufacture at Lewes. "Among these [buildings] the

† Lamberhurst furnace produced some good castings of biblical subjects, taken from German originals by Thomas Prickett about 1770. Suss. Arch. Coll. Vol. XXXIX.

‡ M.A. Lower, op. cit.

x Ibid.

magazine of iron-mongery is the most complete and worth seeing. In it a marvellous preparation goes on of all things worked out of iron, such perhaps as you would not find even in the iron-mongers' shop of London itself."[↓] Still later, in 1774, Campbell said that at Beckley and Brede "they make prodigious Quantities of Kettles, Chimney-Backs, and many other things."[†] At Lamberhurst Furnace in the eighteenth century were cast the much-criticised railings which used to surround St. Paul's. They were in their day "allowed to exceed in magnificence any other throughout the universe" but were so ruinously expensive that the order was never repeated. They weighed over two hundred tons and cost £11,202. 0s. 6d.^x

An important bye-product of the iron industry was steel. This was apparently made in furnaces of exactly the same type as the iron-furnaces and by very much the same processes. All that was needed was a variation of heat and of the proportions of ores and fluxes. Agricola, speaking of the German iron trade in the sixteenth century, said that steel could be and was made "by skill with fires and fluxes."[‡] The earliest mention of steel in the Weald occurs

↓ Burton's Iter Sussexiense, translated by W.H. Blaauw, Suss. Arch. Coll. Vol. VIII, p. 262.
 † J. Campbell Political Survey of Britain, Vol. I, p. 374.
 x Horsfield's Sussex, Vol. I, p.411.
 ‡ Agricola, op. cit, Bk. IX, p. 425.

in 1517-8 when John Gland was mentioned as holding a "fforge of stele" in Hertfield in the Forest of Ashdown at a yearly rent of 13s. 4d.,[†] which was increased to 40s. in Elizabeth's reign. More important were Sir Henry Sidney's steel-works at Robertsbridge, where were employed the Dutch workmen who were assaulted and insulted by John Sharpe, master of fence.[‡] These works passed into the hands of John Hawes, who in 1609 held the site of the abbey of Robertsbridge with eight steel forges, and continued for some time.^{*} There was another steel forge at Warbleton,^x but this branch of the iron-trade never became very strong on the Weald and seems to have died out very early.

Bell-founding was a seventeenth century development on the Weald. Previously church bells had been supplied from London and Reading or had been cast in local furnaces under the direction of itinerant founders.^φ In 1599, however, three brothers, Thomas, Joseph and William Hatch, set up a bell foundry on the borders of Ulcomb and Broomfield (Kent) and continued the work until 1633.[/] The first Sussex bellfounder was Edmund Giles of Lewes who had a foundry which

† Ministers' Accts. Bdle. 445, No.7153.

‡ See above, p.111.

x M.A. Lower, op.cit.

* Ibid.

φ Vic. County Hist. of Sussex, Vol. II, pp.249-250.

/ Tyssen, Suss. Arch. Coll. Vol. XVI, p. 169.

at his death in 1614, passed to Thomas Giles, bellfounder of Chichester. Horsham was a centre for a short time while Richard Eldridge worked at the Bell House (1610-22),[†] and John Lulham had a foundry at Chiddingley, where in 1651 he cast the Eastbourne church bells.[‡] There were a few other foundries in various places but the last bell cast in Sussex dates from 1687.^x The bell clappers seem to have been supplied in the ordinary way from any local iron-works. In 1651 the treble clapper of the Eastbourne church bells was made at Mr. French's Chiddingley works, and Bibleham forge supplied two new clappers for Heathfield bells in 1697.

Other branches of the iron industry grew up in the northern parts of Surrey and Kent, but they are outside the general development of the Wealden industry which for the most part steered clear of new inventions. Senex,[†] in his map of Surrey in 1729, marks an iron wire mill between Molesey and Esher, and there was an iron plate mill at Wimbledon.^x In Kent the Mineral and Battery Company set up "iron battrie works.....whereof are made plattes for armour" at Dartford (1595). Elizabeth authorised them "to

† Vic. County Hist. ut supra.

‡ M.A. Lower, ut supra.

x Vic. County Hist. ut supra.

x Surrey Arch. Coll. Vol. V. p. 136.

take up at reasonable prices, anywhere within the realme, as well all manner of artificers, workemen and instrumentes, as also all matter stuffe, woode, coales and necessaries", and ordered her officers in Kent, Surrey and Sussex to help the works as much as possible.[↓] There was another iron plate mill not far away at Crayford[†] and this probably belonged to the same company.

By far the most important product of the Wealden iron trade from the sixteenth century onwards was ordnance. As we have seen^x it was in the manufacture of iron shot that the Sussex founders first began to compete with the foreigners who supplied the ordnance stores. The shot were cast in moulds which were made at first of brass or copper,^x but later of iron.[♢] The liquid iron had to be ladled from the furnace into the moulds and in order to protect the workmen from the danger of splashes cotton was bought at Waldron "to macke ~~the~~ workemen Coofes and Sleeves when they Cast ~~the~~ Shelles." The same method was used in casting cannon, which was cast solid and then drilled, the drill being stationary while the cannon was fixed to a revolving boring wheel. The moulds themselves were cast from wooden

↓ Acts of the P.C. Vol. 25, p. 115.

† Furley, *op. cit.* p. 488.

x See above, pp. 29, 37.

x Excheq. Accts. Var. Bdle. 60, No. 10.

♢ There are specimens of these iron moulds in Sedlescombe smithy.

patterns. In 1695 the Waldron clerk paid 4s. 6d. for "a newe box to Cast the Shell Moulds by," and at Heathfield furnace in 1739 the carrier was paid 24s. for "bringing 3 Patterns for gunns and 7 devils."[†]

Shot and guns had to be proved before they were sold. In the sixteenth and seventeenth centuries, when the government kept a firm hand on the making of ordnance, the testing had to be carried out at Tower Hill or elsewhere in London by one of the king's master gunners, who loaded the gun with a double charge.[‡] But in the eighteenth century it seems to have been usual for the manufacturer to test his guns and shot at the furnace before delivering them to his customers. The successful proof of the guns, marking the completion of a contract, was, like a Harvest Home, an occasion of feasting. In 1753 Mr. Fuller made 90 guns for the King of Sardinia and the proof (which one gun failed to pass) cost £181. 7s. 8d. The details of the bill were:-

"Powder Ball Cartridges etc.	122. 9. 9.
Mr. Cockburn's charge for landing and drawing	20. 2. 6.
Mr. Angell the Cook's bill	18. 2. 0.
Mr. Merrick for Wine	20. 14. 5."x

† P. Lucas, Heathfield Memorials, p. 76. A "devil" was a small portable grate for drying the inner side of the moulds.

‡ Cal. of S.P.D. Chas. I. Vol. XXV, No. 79.

x P. Lucas, ut supra. p. 78.

The reason for the great and immediate popularity of cast-iron ordnance in the sixteenth century was its extreme cheapness in comparison with brass or bronze.

Henry VIII paid Ralph Hogge £10 a ton while he had to pay £120 for bronze cannon. This difference in price persisted. In 1598 "men of small experience will say that if they could not get iron pieces they would carry brass; but one piece of brass costs as much as 12 pieces of iron, weight for weight, and few owners could afford that."[†] John Browne sent in an estimate for ordnance for some new pinnaces in 1636, and he stated that if all the guns were iron the cost would be £598. 13s. 4d, but if six whole culverins were of brass the cost would be £1,637. 13s. 4d.[‡]

The great disadvantage of iron ordnance, however, was its weight, and it was for this reason that it never completely took the place of brass. Its weight told against it particularly for use on ships, and although it had been used in ordinary merchant vessels on account of its cheapness, in the king's service it had been "thought fit to furnish ports with iron ordnance and to reserve brass for the ships,"^x though it had not been possible to do so entirely.

† W. Salisbury MSS. Vol. VIII, p. 184.

‡ Cal. of S.P.D. Chas. I. Vol. CCCXLVI, No.104.

x Cal. of S.P.D. Chas. I. Vol. XIX, No.2.

The problem exercised the minds of the Commissioners of the Navy considerably, but in 1626 they thought they had found a solution. They reported that "having been directed to see what could be done towards reforming the abuse of the overweight of iron ordnance, they had consulted divers gunfounders, but found John Browne alone willing to assist them. He had succeeded in casting 6 pieces, which had endured the king's double proof, and yet were lighter than brass ordnance."[†] They recommended that Browne should receive £200 reward and that he should be ordered to make 300 guns for ships. John Reynolds, the master gunner who carried out the proof, was not so enthusiastic as the Commissioners. He had to admit that the guns had stood the test, but he thought that "by reason of the lightness of these pieces they would deliver their shot uncertainly."[‡] An iron culverin now weighed 3,730 lbs. as compared with 3,800 lbs. of the brass culverin. But in response to complaints the brass-founders also reduced the weight of their pieces,^x so that the position of the iron-founders was much as it had been before. Nothing daunted John Browne,

† Ibid. Vol. XXV, No.79.

‡ Ibid., Vol. XXII, No.87.

x The new weight of a brass culverin was 2,200 lbs.

Ibid. Vol. XIII, No.97.

however, and in 1650 we find him undertaking to prepare his Kent foundry for casting brass ordnance.[↓] Henceforth his official title was the King's Founder of Brass and Iron Ordnance and Iron Shot.

The amount and cost of iron produced by the Wealden iron-works differed considerably at different times and in different places. It must be remembered also that in no case was iron-making possible all the year round. The hearth could only be used for one blowing, and even if made of the best stone would not last more than forty weeks.⁺ In fact it usually had to be renewed much more often. During the two years covered by the Sheffield accounts the hearth had to be remade ten times.^x Again, many works relied for their power on small streams, and in a dry season were forced to close. In August, 1653, several Sussex iron-masters said they had no water and could not promise to deliver ordnance until March.^x

The clearest statement we have of the cost of producing iron on the Weald comes from the accountant of the royal iron-works at Newbridge in Ashdown Forest in 1539.[♢] Newbridge was typical of the smaller iron-works from the sixteenth century onwards. It consisted of a small furnace which cast just enough sows to provide raw material for the work of the forge. Wrought iron or bar iron was its chief product.

The clerk worked out the cost of production per ton. He

↓ Ibid. Vol. CCCCLXXV, No. 42.

+ See above, Chap. V, p. 96.

x Archaeol Journal, LXIX, p. 292.

* S.P.D. 1653. Vol. XXXIX, No. 31.

♢ Vic. County Hist. of Sussex, Vol. II, pp. 245-6.

reckoned that one ton of iron could be made from fourteen loads of ore, and on that basis the cost was:-

Licence to dig ore at 1 ^d a load	1.	2.
Cost of digging at 8 ^d a load	9.	4.
Carriage to the furnace at 4 ^d a load	4.	8.
Cost of casting into sows	3.	4.
Carriage of 1 ton of sows to the forge		10.
11 loads of coals at the furnace to make sows at 3s. a load	1.13.	0.
5 loads at the forge	15.	0.
Working the iron at the forges	13..	4.
Total ...	4. 1.	8.

Other expenses were forty shillings or more for repairs and tools ("after as the workemen ar so are the newe instruments preserved"), and 6s. 8d. a ton for carriage if the iron were taken to London. The mill, he said, was well watered and in good repair and should produce about eighty tons of wrought iron a year. This was sold either at the forge or in London at prices varying from five to seven pounds a ton. On an average he reckoned to make about twenty shillings a ton, and to have a yearly balance of between £20 and £26.

The Crown works at Sheffield and Worth were

considerably larger than those at Newbridge. At Sheffield between October 31st, 1546 and January 17th, 1549, 298½ tons of bar iron were made and valued at £2,135. 7. 2. The cost of manufacture was:-

Expenses at the furnace	609.	16.	10.
" " " hammer	514.	5.	10.
Sundries - rent, repairs, etc.	259.	0.	9.
Total ...	1,383.	3.	5.

This gives a cost per ton of about £4. 12. 6. made up roughly as follows:-

Raw materials	£2.	10.	0.
Wages	15.	0.	
Carriage of finished iron	9.	0.	(to Southwark)
Rent	8.	0.	
Repairs, allowances, etc.	10.	6.	
	4.	12.	6.

On these figures the balance should apparently have been £752. 3. 9. But after allowance had been made for bad debts and arrears the actual balance on more than two years' working was only £273. 9. 1.

Worth produced ordnance as well as bar iron. Between December 24th, 1546 and January 17th, 1549 were

made:-

155	tons	15	cwt.	3	qr.	of wrought iron valued at	1196.19. 6.
56	"	1	"	2	"	" ordnance	" " 560.15. 0.
52	"	5	"	0	"	" shot	" " 214.15. 3.
				4		chimney backs	" " 13. 4.
Total ...							1,973. 3. 1.

The cost of production was roughly £1,361. 13. 1½d, but the final balance was only £141. 8. 7½.

The manufacture of ordnance involved only the single process of casting so that the output of ironworks which confined themselves to casting guns and shot was considerably larger than it would have been if wrought iron were produced. In 1573 the average production of each of seven furnaces which cast ordnance was stated to be four hundred tons a year.[↓] In the seventeenth century the furnaces were much bigger and John Browne was not unduly excited by an order for 4,000 tons of ordnance[†] and asserted that he could cast 200 pieces in 200 days if the king needed them.^x But at that time he had a monopoly of the manufacture of ordnance, so that the total output of the Weald must have fallen considerably, in spite of

↓ S.P.D. Eliz. Vol. XCV, No.15.

† Cal. of S.P.D. Chas. I. Vol. CCCVI, No.105.

x S.P.D. Addenda Jas. I. Vol. XLII, No.66.

illicit trading. During the Civil War and Commonwealth periods; however, many iron masters fitted up their works for casting shot, if not guns. In August, 1653, several of them were ready to undertake to supply 100 tons by March and Mr. Strudwick, whose water supply was not affected by the drought, was casting 5 tons a week, and said he would provide 100 tons by the end of November as he intended to employ another furnace.[↓]

The accounts of the Pelham works at Waldron, Bibleham and Brightling give detailed information about a typical Wealden iron-works during the decline of the industry. Between 1639 and 1679 the amount of pig-iron produced at Waldron furnace and supplied to the forges averaged 160 tons a year.[†] During the same period the average production of bar iron at Bibleham was 57 tons and at Brightling 68 tons. It must be remembered that the English iron-trade was beginning to suffer from the

[↓] S.P.D. 1653, Vol. XXXIX, ut supra.

[†] Between 1639 and 1690 there are no accounts for Waldron so that one can only judge of its production by the amount of iron it sent to the forges. For the same reason it is impossible to work out any complete figures of costs. In 1632 however Waldron produced 239 tons of sows and in 1633, 213 tons. With this should be contrasted the production of a modern blast furnace. An average furnace in England produces about 1,000 tons of pig-iron a week, and in America and India, where the percentage of iron in the ore is much higher, between 2,000 and 3,000 tons a week.

competition of Spaniards and Swedes who could produce bar iron at lower rates than the English. We know from John Browne's complaints that the Swedes were competing in cast-iron also, but apparently the ordinary Wealden iron-masters did not feel this competition so keenly, for with the exception of Bibleham and Brightling those iron-works which persisted in the eighteenth century seem to have relied on their furnaces rather than their forges.

During the last ten years of the seventeenth century the Pelhams tried the experiment of having shot cast at Waldron. If this was done with the object of increasing their profits it was a failure,[↓] as can be seen from the table below. Indeed it seems extraordinary that the works should have been carried on so long, for at no time for which accounts survive did their profits justify it.

Ordinance making on a big scale, however, continued to be profitable even in the eighteenth century. John Fuller of Heathfield did very good business with his government contracts. In 1745-6 his accounts show a balance of £2,242. 15. 0.[†]

↓ The output at the forges was much less during these years.

† P. Lucas, op. cit. p. 80.

"Cavey. Head Founder by Bill	)	60. 5. 7.
John Harmer by Bill. Upper Feller	)	32. 14. 0.
John Guir. Under Founder	) Furnace	22. 10. 2.
James King. Under Feller	) men	16. 13. 7.
J. Hart	)	125. 9. 2.
		257. 12. 6.

Mephram	)	49. 19. 10.
Hannah	)	47. 2. 6.
R. Collins	) Colliers.	44. 17. 2.
W. French	)	46. 0. 0.
		185. 19. 6.

Woods		1203. 15. 0.
Carriage	ton ct. 255 7 to Woolwich at 1 lb. 4/- per ton	306. 8. 0.
Mine		310. 0. 0.
Furnace wear and tare		50. 0. 0.
Agency - Mr. Remnant at 5% on 4370		218. 10. 0.

Contra.

By 236 Ton of Guns re ^d at Woolwich at 19 l. per ton	4370.	0. 0.
By 25 Ton refus ^d at 10 lb. per ton	250.	0. 0.
25 Ton gun heads at 5 lb. per ton	125.	0. 0.
By Hammers Anvil for myself and others	20.	0. 0.
Do. plates for my house	10.	0. 0.
		4775. 0. 0.

Later still, from 1762 to 1769, Messrs. Masters and Raby of the Warren Furnace (near East Grinstead) and Messrs. Clutton & Co. of Gravetye Furnace a few miles south had government ordnance contracts.[†] In December 1763 the carrier's accounts for the Warren furnace show that the following guns were delivered at Woolwich:- two three-pounder guns, one four-pounder, five nine-pounders, two twelve pounders, one fourteen-pounder, two eighteen-pounders.[†]

The selling price of iron, like all other prices, rose steadily from the sixteenth century onwards without any violent fluctuations. During the sixteenth century as we have seen there was a good deal of opposition to the Wealden iron makers on the grounds that their iron was dearer than and not of such good quality as Spanish iron. Of the quality we cannot judge; many smiths continued to prefer Spanish iron throughout Henry VIII's reign, but skilled workmen are a conservative class. The price, however, seems to have remained more or less stationary during the early years of Henry VIII's reign. In 1513 Spanish bar iron cost from £3 to £5 per ton.^x In 1539 English bar iron

† W.P. Breach, Suss. Arch. Coll. Vol. XLVI, pp.63, et seq.

† At about the same time John Butler revived the old works in the corner of Sussex where it meets Hampshire and Surrey. At Fernhurst, near Lord Montague's old furnace at Pophall, he built his works and was successful in obtaining government ordnance contracts during the American and Spanish wars between 1762 and 1783.

x Excheq. Various. Bdle 61. No.9. etc.

was fetching from £5 to £7 per ton.[↓] During the same period shot cost £5 and ordnance £10 per ton.

In 1548-9, partly no doubt owing to Henry VIII's financial policy, the price of bar iron had risen to prices varying from £7 to £9. 6. 8. per ton according to the expense of carriage, though if bought at the forge £8 was the highest price.[†] Shot and ordnance remained the same. During Elizabeth's reign England shared in the general European rise in prices, consequent on the influx of gold and silver from Spanish America. Bar iron rose to £9 or £11 a ton, and ordnance to £11.^x The opponents of the English iron trade, however, made no allowances for the vagaries of Henry VIII or of the gold supply and were loud in their demands that this evil should be remedied.[✱] One petition went so far as to ask "that iron mills be banished out of the realm"[♢] altogether.

Throughout the reigns of James I and Charles I prices went up steadily. Between 1620 and 1630 pig-iron which in 1548 had cost about 35s.[♣] a ton, was sold for

↓ Vic. County Hist. of Sussex, Vol. II, p. 246.

† Archæol Journal, ut supra. Vol. L XIX. *Salford & Worth.*

x Salisbury MSS. ut supra, Vol. II, p. 216.

✱ See above, Chap. III, p. 42.

♢ Salisbury MSS. ut supra, Vol. I, p. 164.

♣ Archæol Journ. ut supra.

£5.[↓] Bar-iron fetched £14,⁺ shot £11,^x and ordnance £13.^{*-}

During the time of the Civil War and the Commonwealth, a rapid increase took place. Pig-iron cost £6,^ø bar-iron from £16.10s. to £18.10s. (including excise),[/] shot from £12 to £14.[!] The most marked increase was in the price of ordnance, for which John Browne, secure in his monopoly, had the audacity to ask Parliament £30 a ton.^o

During the eighteenth century the price of bar iron remained pretty steadily about £16,^x though the price of ordnance rose. In 1695 it only fetched £16. 10s.[!] but in 1745 John Fuller was getting £19 a ton.^o

↓ Addit. MSS. Waldron Accts.

+ Ibid. Bibleham accts.

x Cal. of S.P.D. Jas. I. Vol. CXXVIII, No.99.

x Ibid. Addenda. Vol. XLII, No.28.

ø Addit. MSS. Waldron Accts.

/ Ibid. Bibleham accts.

! S.P.D., 1653. Vol. XXXIX, No.31.

o Cal. of S.P.D. 1649, Vol. VIII, No.1.

x Addit. MSS. Bibleham accts.

! Suss. Arch. Coll. XXXII, p. 32.

o See above, p. 128. In *Archia* LVI, p. 139, note a, is quoted an inventory of works at Hamsel in 1708, which shows that the price of cast cannon had fallen to £5. a ton. I think the price must refer to rejected guns. At any rate all other evidence points to a much higher price for ordnance.

Date	Production			Cost of production		Iron sold	Selling Price
	Waldron	Bibleham		Bibleham	Brightling		
	Tons of sows.	Tons, wrought	Tons of wrought	£. s. d.	£. s. d.	Tons, wrought	Per ton, wrought.
1650	189	64	129	183. 1. 10.	325. 19. 11.	380	From £16. 10s. (excise paid by the buyer) to £18. 10s.
1651	217	66	74	223. 18. 9. ^a	267. 13. 3	183	
1652	131. 10 cwt.	62	88	92. 8. 6.	130. 1. 11.	No record)	
1653	145	55. 1	73	341. 2. 11. (Newham-mer beam)	175. 6. 1.	90	
1654	179. 18	65	50	93. 16. 2.	224. 16. 8.	150	
1655	189. 14	61	75	388. 2. 2 $\frac{1}{2}$ (New forge built)	337. 2. 2. (New chafery beam and wheel)	136	
1670	167. 16	55	53	173. 17. 6.	211. 3. 10	331	
1671	104. 3	52. 10	56	141. 4. 5.	155. 2. 11 $\frac{1}{2}$	108. 10	
1672	117. 10	51	48	177. 11. 2.	202. 4. 7	98	
1673	160. 17	51. 4	60	201. 7. 5.	240. 11. 5 $\frac{1}{2}$	12	
1674	190. 3	58	60	192. 19. 10.	290. 2. 7.	117	
1675	140. 17	52	58	228. 4. 3.	219. 2. 0.	110	

a. The following detailed account of the expenses of Bibleham for 1651 is typical of the others:

"The Charge of Iron-Makeing at Michaelmas	51. 3. 0.
Iron Carriage this yeare to Pemsey	28. 17. 6.
Wood Cutt in the Deanes Coalinge carriage, etc.	93. 15. 4.
Sowe Carriage to the ffoarge this yeare	22. 19. 4.
Necessaries expended this yeare	15. 15. 4.
Carpentures Sayers and Masons Woorke	11. 8. 3.

223. 18. 9.

Date	Production			Cost of production £. s. d.	Receipts £. s. d.	Selling Price. Per ton, wrought	Balance £. s. d.
	Waldron Tons	Bible- ham Tons, wrought	Brightling Tons, wrought				
1691	100 shot 90 sows 3 Plates, anvils, hammers.	25	39	1615.8.0.	1836.13.4.	£14 - 15	221.5.4.
1692	169 sows 3 anvils, etc.	38	28	990.15.8.	1163.5.4.	£14 - 15	172.9.8.
1693	56.14 sows 61 "granado" shot and moulds. 75.16 "granado" shot.	36	53	659.4.7.	723.10.8	£14 - 15	64.6.1.
1694	157.8 sows, hammers &c.	9.8	26.10	1459.16.0.	1466.2.5.	£14 - 15	6.6.5.
1695	151 shells and "carr- acases" 3 shell moulds 38 sows.	45	27.18	1397.12.2.	1413.10.11	£16	15.18.9
1696	100 shot 3 shot moulds 82 sows.	31.5	18	941.17.6.	966.4.1.	£18	24.6.7.
1697	196.7 sows, hammers, etc.	39	15.12	1131.7.8.	1175.17.6.	£18	7.3.7.
1698	180.10 sows, hammers, etc.	50	41.7	874.14.1.	882.4.9.	£16	7.10.8.

Date	Production			Cost of Production £. s. d.	Receipt £. s. d.	Selling price. Per ton. wrought	Balance £. s. d.
	Waldron Tons, sows	Bible- ham Tons, wrought	Bright- ling Tons Wrought				
1705	Furnace repaired	48	33.10	988.19. 9.	1024.6.0.	£16	35. 6. 9.
1706	166.4	43.10	40.10	1032.17. 3.	1109.4.5.	16	76. 7. 2.
1707	209.10	42	45	580. 3. 6.	695. 8.10.	16	115. 5. 4.
1708	New wheel & beam	40.10	43.4	787. 6. 7.	874. 7.11.	16	87. 1. 4.
1709	198.1	40	34	406.15. 6.	464.10. 6.	16	57.15. 0.
1710	Did not blow	17	36	333.17.11.	386. 9. 8.	16	52.11. 9.
1711	New furnace	32.8	33.10	501. 2. 4.	554. 7. 2.	16.	49. 4.10.
1712	Did not blow	In re- pair	24.10	584.13. 7.	616. 3.11.	16	31.10. 4.
1713	194.5	"	25.10	419.16. 6.	504. 0.10.	16	84. 4. 4.
1714	Did not blow	30	32	848. 1. 8 ¹ / ₂	872.11. 5 ¹ / ₂	16	24. 9. 9.
1715	124.6	35	25	520.13. 2.	686. 3. 5.	15.10	165.10. 3.

CHAPTER VII.

TRANSPORT, EXPORT and GOVERNMENTAL CONTROL.

One of the causes to which the Wealden iron field owed its ascendancy over the Forest of Dean in the sixteenth century was its proximity to London and its consequent accessibility to the central market. Generally speaking the Surrey, Kent and north Sussex works reached London by land, while the south Sussex works found their outlet by the sea. Both road and river transport were employed to carry the iron to market or port. The heavy soil of the Weald makes bad roads, and Sussex roads were a bye-word. Even Fuller was moved to protest; "a fruitfull Country," he says, "though very durty for the travellers therein."¹ Dr. John Burton² is most vigorous in his condemnation. On leaving the Roman road at Slave Street he says, "I fell immediately upon all that was most bad, upon a land desolate and muddy, whether inhabited by men or beasts a stranger could not easily distinguish, and upon roads that were, to explain concisely what is most abominable, Sussexian."

¹ Fuller's Worthies, Vol. II, p. 381.

² See above, p. 114.

For this deplorable condition the iron-works were certainly in part responsible. Heavy iron-shod carts laden with iron would cut up the best macadam road, and in the sixteenth and seventeenth centuries little was known of scientific road making and mending. Indeed it was difficult enough to make landowners realise the most elementary responsibilities with regard to the upkeep of the roads. In 1549 a complaint was lodged against Alexander Collins because, in order to carry water to his new forge at Lamberhurst, he had dug a great ditch right across the public highway.[↓] One of Christopher Baker's charges against the iron-masters in 1574 was that they caused "a great decaie to the highe wayes because they carrie all winter tyme."[†] In 1585 the government awoke to the scandal and an act was passed for the preservation of the timber of the Weald and for the "amendement of High Waies decaied by Carriage to and fro Iron Mylles there."^x This act made the iron-masters responsible for the repair of the roads they used. It ordered that occupiers of iron-works should, for every six loads of charcoal or ore and for every ton of iron carried between October and May "by the space of One Mile thorowe any High Wayes being under any of the Hilles commonly called

↓ Salisbury MSS. Vol. 13, pp. 19, et seq.

† See above, p. 45.

x 27 Eliz. cap. 19.

the North Downes of Surrye and Kent," carry one load of "Sinder Gravelle Stone Sande or Chalke meate for the repairing and amendinge of the said Highways", to any place appointed by the Justices of the Peace. The penalty for default was ten shillings a load.

This act, however, as was officially admitted a few years later, did not produce "the same good effecte....in Surrey and Kent as hath ben expected." Few acts did, and in this case it was hardly surprising for the men appointed to enforce the act were in many cases themselves iron-masters, or members of families of iron-masters. Moreover, by some inexplicable negligence, Sussex had not been included in the scope of the act. Therefore in 1597 the act was repealed and a new one passed.[↓] This enacted that the owners or farmers of iron-works within the counties of Sussex, Surrey and Kent should pay a highway rate of three shillings for every three loads of charcoal or ore and for every ton of iron carried between October and May. During the summer months, when much less damage was done to the roads, for every thirty loads of charcoal or ore and for every ten tons of iron, they were either to deliver one load of road-mending material or to pay a rate of three shillings. Moreover, surveyors were appointed to see that the roads were repaired, and penalties

[↓] 39 Eliz. cap. 19.

imposed if they should fail in their duty.

In spite of this act, which was re-enacted in 1674,[↓] the state of the Wealden roads improved very little, if at all, and under such conditions road transport was naturally expensive.* The royal works in Ashdown, Worth and St. Leonard's Forests all sent their iron by road to Southwark, where a room was hired at the White Hart for storing it. In 1497 the charge for carrying iron shot from Ashdown to Southwark was 2d a mile per cart load.^x From Sheffield and Worth (1546-9) the cost varied from 8s. to 10s. per ton according to the sort of iron carried.^z Bibleham and Brightling used the coastal market and sent all their iron to Pevensey and Lewes, or occasionally to Maidstone. The cost from Brightling to Lewes was about 8s. 6d. per ton, from Waldron to Lewes 5s. 6d. The rates varied considerably according to the time of year. In 1641 the clerk of the works

↓ 14 Chas. II, cap. 6.

* The question of the road transport of iron remained a vexed one to the end. The last reference to the existence of iron-works in Surrey occurs in a dispute between Guildford and Godalming in 1767 about the position of the turnpike on the Portsmouth Road. Some said that there was great traffic to and from the iron-works on Witley and Thursley Heaths, but others asserted that it only amounted to one cart a week. (Vic. County Hist. Surrey, Vol. II, p. 267.)

x Misc. Bks. Excheq. T.R. No.8, fol. 107.

z Archæol. Journal, LXIX, ut supra.

paid 3s. a ton summer carriage from Waldron to Brightling, but in winter, when the roads were almost impassable, 5s. a ton.[↓]

Considering the difficulties of road transport it is probable that many iron-works situated on or near the big rivers of the Weald used water not only for power but for transport. Definite evidence of this exists in the case of a few works, and it seems likely that where conditions were favourable the practice was general. Maresfield Forge, for example, carted its iron to the Ouse and shipped it down to Newhaven.[†] From Robertsbridge Furnace ordnance was shipped down the Rother to Rye. "Shuts" or locks had to be constructed to make the river navigable, and remains of these have been found in the river bed.^x Brenchley, Horsemonden, Cowden and other works in the north-eastern corner of the Weald used the Medway as their road to Rochester, where the iron was often re-shipped to London. The iron-masters of this district were alive to the possibilities of improving river transport. In 1665 George Browne and Colonel Culpepper, the king's gunfounders, petitioned "that the undertakers to whom by Act of Parliament the making of the River Medway is consigned, will take care

↓ Addit. MSS. ut supra.

† W.V. Crake in Suss. Arch. Coll. Vol. LV, p. 278.

x Suss. Arch. Coll. II, p. 216.

that the branch from Broadford Bridge to Yealding may be done at once, as very needful for the transport of the ordnance.....the roads being almost impassable."↓

The chief port of the Sussex export trade in the sixteenth and seventeenth centuries was Meeching, a hitherto unimportant and nowadays unknown village standing on the mouth of the Ouse ^{near} ~~opposite~~ Newhaven, which inherited its prosperity. In 1554,[†] 191 tons of iron were exported;^x in 1573 the amount increased to 405 tons, besides 140 tons of ordnance, and sundry spades, shovels, scythes and anvils;[✱] in 1596 the total was 713 tons of iron, excluding ordnance and sundries.[♢] Other Sussex ports, placed roughly in order of their importance in the iron export trade, as far as can

↓ Cal. of S.P.D. 1665. Vol. CXXIII, No.104.

† It has been difficult to select from the Port Books and Customs Accounts any figures which will not be misleading. The accounts seem to have been very badly kept. In some cases there are no records at all for a whole year or more; in others two accounts (Collector's and Controller's) cover the same ground twice. Many of the port officials seem to have ignored accounts altogether and to have returned the account book to the Exchequer as empty as when they received it. Many of the bundles of Port Books and Customs Accounts at the Record Office are composed largely of such blank books. Moreover, only certain of the ports were considered important enough to have Customers resident in them, and therefore no returns exist for certain places such as Newhaven, which afterwards became very important, and which in the sixteenth and seventeenth centuries must have carried on a huge contraband trade.

x Exch.K.R. Customs Accts. E122/37/9.

✱ See above, p. 48.

♢ Exch. K.R. Port Books. 746/25.

be discovered from the Port Books and Customs Accounts, were Pevensey, Rye, New Shoreham, Chichester, Winchelsea, Hastings and Arundel. Sixteenth century Port Books show that all these places did a fairly regular trade in iron. But most of the other ports at one time or another must have taken their share,[↓] though they were not large enough for the government to think it worth while to appoint Customs officers there, and therefore they do not appear in the official accounts. The chief Kentish ports were Sandwich in the south and Rochester in the north. Of the two Rochester was by far the more important by reason of its nearness to London and its position on the Medway. Indeed it did more trade than any of the Sussex ports, for it was the outlet for John Browne, who had a monopoly of gunfounding, and was used by many other Kent and Sussex ironmasters, even by the Greshams⁺ whose furnace was at Mayfield, and by the Sackvilles who had works in Ashdown Forest. In 1558-9, 118 tons of iron were exported;^x between Easter and Michaelmas, 1566, 404 tons.[•] During the same period in 1599 this figure was increased to 582 tons, besides 45 tons of ordnance exported by Robert Sackville.[♢] In the year 1631-2

↓ Christopher Baker gives a list of over twenty ports used by the iron trade. See Appendix. A.

• In 1581 Lady Anna Gresham exported 60 tons of ordnance. Port Bks. 642/1.

x Exch. K.R. Customs Accts. 133/2.

• Port Bks. 638/4.

♢ Ibid, 647/1.

John Browne exported no less than 550 tons of ordnance and shot.[↓]

For the most part the trade described above was simply coasting trade. The iron was carried in small vessels to London or Southampton, where it was re-shipped either for English distribution or for export beyond the seas. At no time, however, was much iron exported direct from the local ports to the Continent. The Port Books[†] show that a little trade was carried on by Meeching and Pevensey with Dieppe, Hamburg and Middleburg, but it never became very general. Europe did not want wrought iron but iron ordnance from the Weald, and ^{owing} as we shall see, to governmental control the Wealden ports had little share in the export of ordnance.

An English merchant exporting iron had to pay poundage on it at the rate of one shilling in each pound sterling of its value. An alien in addition had to pay a customs duty of threepence in the pound. In order to avoid delay and disputes in assessing poundage rate books were issued from time to time fixing the rateable value of commodities in view of the current market price, though there was no exact agreement between one and the other. The Rate Book of 1507 fixed the rateable value of iron at £2 a ton,

↓ Ibid. 657/1.

† K.R. Port Bks. 742/4, 746/20, 751/9, etc.

which was considerably less than market price. In 1552 a commission of inquiry recommended that all rates should be raised.[↓] The assessors then erred in the other direction. In 1578 pig iron was rated at £8. 6. 8., and bar iron at £16. 13. 4.⁺ though market prices were respectively about £4 and £10 a ton.^x "For iron ordnance there is no rate, but they take the best rate for the Queen's advantage, the rather because it is ordnance and (though it be cast) we say it is wrought in his nature and kind for that service and use." Trouble arose when the port officials tried to make Sir Thomas Gresham pay on his ordnance at the rate of wrought iron. He said it was worth £11 and he "would pay poundage but after that rate". And as he was "no common merchant" the official wrote to ask Burghley what should be done in the matter.[¶]

So long as the Wealden industry was confined to the manufacture, sale and export^φ of pig or bar iron the government interfered very little, except in the interests of timber. But ordnance was another matter. Nationally it was uneconomical that a few Wealden iron-masters should make their fortunes by selling guns to foreigners who used them to sweep English merchant ships off the seas. Even before the

↓ Gras, N.S.B. Early English Customs System, pp. 123, 128.

+ Salisbury MSS. Vol. II, p. 216.

x See above, p. 130

¶ Salisbury MSS. Vol. II, p. 216 ut supra.

φ The Statute 3 Hen. VII. cap. 8 forbidding the export of iron seems to have been ignored.

manufacture of cast-iron ordnance had become very general on the Weald the government had realised the danger of allowing the export of any kind of ordnance or of any metal which could be used in its manufacture. Henry VII had already forbidden the export of iron and Henry VIII repeated that prohibition and extended it to the export of "Brass Copper Lattyn Bell mettel Panne mettel or Gunne metall."[↓] (After his dissolution of the monasteries there was a great deal of bell metal on the market. The Wealden iron-masters probably re-smelted much of it and perhaps used it for their cannon, but the Port Books show that it was a regular article of export too.) At that time gun metal by no means necessarily suggested iron, and the Wealden exporters of iron ordnance used that loophole for a time, though it was finally decided in the courts that "whoever transports guns transports Gun-metal."⁺

A decision in the courts had little effect, however, and definite legislation was necessary. In 1572 the London merchants petitioned the queen to restrain this abuse and as a result a proclamation was issued forbidding all export of iron except under licence and limiting the size of ordnance.^x

↓ 33 Hen. VIII, cap. 7.

+ Simon D'Ewes Journals of the Commons, p. 670.

x Suss. Arch. Coll. Vol. LVI, p. 138.

At the same time a monopoly for exporting ordnance was granted to Ralph Hogge, now the queen's gunfounder, in order to give him an interest in checking the contraband trade which immediately resulted from the proclamation. He suffered a great deal from the smugglers and in 1574 presented a "humble complainte" about them to the Queen. There were "So maynie furnesses," he said, "that nowe of late yeares leave ther owne trade of casting of Soves for maiking of yron and faull to casting of gones and shot of yron and carye them to the seay syd to dyvers and sundry places"[†] where under cover of carrying them to London or along the coast, the merchants shipped them overseas. This report was confirmed by Christopher Baker,[‡] who drew up a list of the works which produced ordnance:-

"Rauffe hogge the quenes	)	Theis thre have contynewyd
maties gonneston maker of yron)	)	long and was the fyrst
Robert hodshon	)	begynners in person
Arthur mylton	)	levettes tyme and onely
	)	cast for the Tower.
 Sir Thomas gresham knyght	)	 Theis have begunne to cas
Nycolas ffowle	)	gonnes and shott nowe of
Alexander ffermer	)	late w th in this v or vj
Mycaell weston	)	years.

† S.P.D. Eliz. vol. XCV. No.16.

‡ Ibid, No.15.

All theis ffurnesses)
 will cast yearlye one) CCCC tonnes."†
 wth an other above)

Of these gunfounders Alexander Farmer and Nicholas Fowle sell far more "alongest the coast" than they send to London, and Mr. Baker evidently suspects that their guns seldom reach the small English port for which they are billed. He asserts that "there hath been solde to one stranger's shippe (being an Argosy) not past one monethe past.... XX peeces of ordenaunce at the leaste." He also noted that there was a "new furnace sett up in Sillinglee parke by one Smithe of Petworthe and one Enfeild of Grensted" and another "sett upp in haselmoore by my L. Montague wth as yet hath never wrought, and whether they shall blow sowes for Iron or Ordenance I know not."‡

Acting on his information the Privy Council decided to make illegal export unprofitable, and the leading iron-masters of the Weald were summoned to London and there forced to enter into bonds of £1,000 or more not to export any ordnance.^x As, however, this plan was not thoroughly or

† The above furnaces were situated as follows:- Ralph Hogge, Buxted; Robert Hodson, Pounsley, near Framfield; Arthur Milton, Rotherfield; Sir Thomas Gresham, Mayfield; Nicholas Fowle, Wadhurst; Alexander Farmer, Hamsell, near Eridge; Michael Weston, Cowden.

‡ Ibid, No.20.

x Ibid, No.61 et seq.

generally carried out - Arthur Milton, for instance, does not seem to have been summoned - it was not so effective as had been hoped. The Council went on to draw up elaborate regulations "for the founders and buyers wherby the numbers of peeces cast may be employed for the onely use of this Realme."[†] The founders should only cast a limited number of pieces, which should all be brought to the Tower Hill for sale. All pieces were to be stamped so as to make identification and checking easier, and they should not be sold to foreigners without special licence. The buyer had to declare that all the pieces he bought were for the "use of his owne proper shippes or vesselles trafficable", and once a year his ship was to be inspected to see that his tally of guns was correct. All guns bought and sold illegally would be confiscated and the founder would lose his bond into the bargain.

Yet five years later the Privy Council were again discussing the problem of the "greate quantitie of iron ordnance daily transported out of this Realme into the partes beyonde the seas" and finally they ordered "that such iron forges as were especially within the county of Sussex, where the moste parte of the said iron ordnance is made, shoulde be for a tyme stayed and not suffered to make any more."

† Ibid. No.70. See also Acts of the P.C. Vol. VIII, p. 254.

Commissioners were appointed to carry out this order and also to inspect the furnaces, demand an account of sales during the past few years, and make an inventory of such ordnance as was in stock.[↓]

In 1589 the Council made a fresh effort to check the export of ordnance. Seeing "the lyttle regard the oweners of furnysses and the makers of those peeces had of theire bondes, and howe yt imported the Estate that the ennemyes of her Majestie and the Realme should not be furnished out of the land with ordynaunce to annoy us, therefore theire Lordships thought good to prais there Lordships to cause the Justices of the Peace where the forges were to take a true inventory of soch quantytie as allready had ben made, and to give straight order in her Majestie's name that no iron peeces hereafter be made without speciall lycence from theire Lordships."[†] The Lords Lieutenant of Kent, Surrey and Sussex, to whom these orders were addressed, were evidently unsuccessful in carrying them out, although Lord Buckhurst addressed reproachful letters to the Sussex justices urging them to see that founders kept their bonds.^x In 1590 the Council being "credibly enformed that great quantities /of ordnance/ are still transported, to the great

↓ Acts of the P.C. Vol. VIII, p. 345.

† Acts of the P.C. Vol. XVIII, pp. 7 - 8.

x Horsfield's Lewes, ut supra, Vol. I, p. 192.

prejudice of the state and the manifest contempt and breach of our.....ordres," urged the Lords Lieutenant to put their orders into execution and, moreover, to take sureties of £1,000 from every gun-founder in their districts that no gun larger than a minion should be made until further orders. Even these fresh bonds did not stop the illegal manufacture of ordnance. In the same year the Council discovered that their orders were being evaded by "divers personnes having furnaces, which before their Lordships' letters of inhibition did onely make iron and no ordinaunce", and who now "finding themselves at lybertie and not bound as the rest, did leave to make iron and convert their furnaces to the making of ordnance." Bonds were therefore to be taken both of the farmers and the owners of all Wealden furnaces.*

The very reiteration of these orders is proof of their ineffectiveness. In certain cases and places, however, they seem to have been rigidly administered, and when this was so, caused such inconvenience not only to honest merchants but to the government itself, that special orders had to be issued setting them on one side. A particularly tiresome regulation was that which ordered that all ordnance must be taken to London and there bought and licenced for

↓ Acts of the P.C. Vol. XIX, pp. 461-2.

* Acts of the P.C. Vol. XX, p. 5.

shipment, irrespective of where it was needed. Thus a merchant, who wanted a few guns for the protection of his ship, could not get a licence and buy the ordnance from the nearest maker, but even if he ordered it from the maker, had to wait while the ordnance was taken to London, licenced, and brought back to his ship. The Council recognised this disadvantage and issued letters of privilege in special cases. In 1578, for example, a letter[↓] was sent to the Customer of Chichester, Meeching or elsewhere, authorising the direct shipment of the ordnance ordered by William Nutshawe and John Martyn of Southampton "althoughe it ought first to be brought into Tower Wharf at London and there hence licenced to be shipt to the use of the owners, forasmuche as their Lordships are informed by the said Nutshawe and Martyn that their shippes being presentlie readye and prepared to the seas in a voiage, may not well abyde the staye of much tyme in conveying the ordnance firste to London and then to Southampton without their greate hinderance."

Moreover owing to the occasional zeal of some justice, customer or founder the Queen herself sometimes found it difficult to obtain sufficient supplies of ordnance. Lord Buckhurst, Lord Lieutenant of Sussex, who held a licence

↓ Acts of the P.C. Vol. X, p. 338.

for exporting ordnance, and whose son was a gun-founder, must sometimes have been amused by the manoeuvres of the Council and by the difficulties in which they were involved by the spasmodic conscientiousness of the founders. In 1588 the Council wrote to Lord Buckhurst about one Arthur Milton (or Middleton) who had undertaken to deliver 20 tons of shot at Shoreham, but had not made it because he understood it could not be "uttered" without licence. But as the Queen needed much shot and ordnance Lord Buckhurst was to give him permission to make the shot.[†] In 1595 Thomas Johnson, the Queen's founder, was unable to make certain ordnance by the appointed date without the help of some other furnaces, "and having dealt with the owners of such furnaces as he thincketh most convenient for that purpoze, they do (as he informeth) utterly refuze him the use thereof, for that they alleadge they standbound in recognizance to her Majesty that they shall not suffer any guns or shot to be cast in the same." Lord Buckhurst must therefore release from their recognisances such founders as Johnson should require.[‡]

But there were many other founders less conscientious or more skilful and the contraband trade prospered. The creeks and havens round Chichester, Lewes and Pevensey were

† Acts of the P.C. Vol. XVI, p. 359.

‡ Ibid, Vol. XXV, p. 227.

made for smuggling and the Sussex men could never resist their suggestion. Moreover although in 33 Hen. VIII, cap. 7 it had been enacted that metal should only be shipped from ports where there was a Customer, the regulation was impossible to enforce, and the smaller ports were centres of illegal traffic. Iron guns were clumsy things, difficult to disguise and heavier to handle than the kegs of French brandy with which Sussex smugglers later tricked the customs, but the game was profitable and its danger made it the more exciting. Nor were the Customs officers over-zealous, as may be deduced from the penalties which every act prohibiting exports imposed on them if they should connive at smuggling or take bribes, and the Privy Council had made the mistake of ignoring them and giving the task of suppressing the smuggling of ordnance to the Justices of the Peace. In 1591, however, this blunder was rectified. A warrant was issued to John Yonge, Customer of Chichester, authorising him with the help of the officials of all ports along the coast, to inquire "what quantityes of ordnance have ben.....imbeaseled and conveyed over the seas sithence the moneth of Aprill last," and to send offenders to London to answer for their offences.↓

This experiment met with more success. In 1591 there

↓ Acts of the P.C. Vol. XXI, p. 431.

were fourteen cases of conviction and forfeiture of ordnance at Lewes and Newhaven, and in 1597 six other cases were recorded at Chichester, Newhaven, Shoreham, Arundel and Rye.[†] But the contraband trade went on. In 1598 it was said that Spanish ships going to the Indies mostly carried "cast pieces of iron", and all sailors agreed that "they never see no cast ordnance of iron but such as be made in England."[‡] The penalty for unlawfully transporting ordnance was the forfeiture of the ordnance and of the bond, and occasionally imprisonment as well. The forfeited bonds brought in a useful income to the government, which often granted them by way of pension or reward to various people. In 1616 John Frenche, Sergeant-at-Arms, was granted the benefit of a bond of £250 forfeited by Stephen Aynscombe (or Enscombe) of Mayfield for failing to produce a certificate of permission to export.^x In 1621 again various grants were made of bonds forfeited at Chichester.[‡] In spite of this vigilance on the part of the customs officers and of the government's determination to enforce the statutes, illegal export continued. Stephen Enscombe seems to have been a hardened criminal. In 1614 a letter was sent to the justices

† Vic. County Hist. of Sussex. Vol. II, p. 248.

‡ Salisbury MSS. Vol. VIII, p. 183.

x Cal. of S.P.D. Jas. I. Vol. LXXXVIII, No.32.

‡ Cal. of S.P.D. Jas. I. Vol. CXXIII, Nos. 61 et seq.

"for stay of iron ordnance intended to be transported from Mayfeild, in the countie of Sussex, by Stephen Enscombe and George Bynlis."[↓] In 1616, as we have seen, he forfeited £250 for another offence. In 1621 he was pardoned for still another.[†] But the demand for iron ordnance abroad was great and the profits enormous; prohibitions and forfeitures were not enough to stop the trade.

The campaign against the export of ordnance had hitherto been carried on by the Privy Council by means of orders and warrants. But the House of Commons was becoming increasingly interested in the question, especially in its Spanish aspect. In December, 1601, an "act prohibiting the transportation of Iron Ordnance beyond the Seas" was introduced and got as far as its second reading. The chief argument of its supporters was that the "Ordnance be carried to Callais, Embden, Lubeck, Rochell, Brest, St. John de Luce, and other places, and these be confederates with Spain and Friends with Dunkirk, so that in helping them we do not only help our Friends, but succour the Spaniards their friends and our Enemies."^x The opponents of the bill held that it was an attack on the prerogative and apparently they carried their point, for a few days later "Mr. Hackwell made a Motion that

↓ Acts of the P.C. Jas. I. Vol. I., p. 428.

† Cal. of S.P.D. Jas. I. Vol. CXXII, No.4.

x Simon D'Ewes, Journals of the Commons, p. 670.

the Speaker might say something [i.e. to the Queen] touching the transportation of Ordnance,.....seeing the Bill in the Lower House is fallen into an everlasting sleep." The Speaker promised that he would, but did not, "which was greatly murmured at."[†] The Privy Council, however, had not forgotten the question, and had as much faith in their orders as the Commons had in their bills. In 1602 still more stringent orders were issued controlling the transport of ordnance. They particularly insisted that no ordnance should be carried from port to port along the coast, but only direct to London, which was to be the staple for the whole kingdom.[‡]

James I realised that former measures had had little effect and in 1618 he appointed a commission to inquire thoroughly into the whole question and to suggest possible remedies.^x Their finding was that the abuses sprang from the multiplication of furnaces and from carriage by sea, conclusions at which Elizabeth's Privy Council had already arrived. They recommended that only two furnaces should be allowed to cast ordnance, and that only under licence from the Lord Admiral and the Master of the Ordnance. Whoever had such licence should be obliged to keep a certain number of pieces on the market so that merchants should not be unduly restricted in their choice, and should also provide

[†] Parliament was dissolved soon afterwards before anything was done.

[‡] S.P.D. ELiz. Vol. CCLXXXIIIIa, No.73.

^x S.P.D. Jas. I. Addenda, Vol. XLII, No.28.

for those workmen who were thrown out of work by the closing-down of the other furnaces. The price of ordnance was to be fixed at £13 a ton, which was slightly higher than the current market rates in view of the above requirements. Moreover, all ordnance was to be carried to the Tower Hill by land and proved and sold there only.

It was decided to accept the report, and as a result monopolies were granted to John Browne and Sackville Crowe for the manufacture of iron ordnance, and to Philip Burlamack and Philip Jacobson for exporting it.[↓] The division of the monopoly of manufacture between Browne and Crowe caused much trouble between them. It was arranged that Browne should make all ordnance for the use of the King and the Navy, while Crowe was to supply the merchants. This Browne considered a most unfair division, for he said that the King's service would only take him ten days a year, and what could his men do the rest of the time? His father for the last thirty years had cast ordnance for the late Queen and for the King and "for years maintained the trade alone. At request of the ordnance officers and the East India Company, I was put to the trade, that I might continue it if my father failed, which I have done, and produced lately too such

[↓] Rye MSS, p. 178.

pieces as I challenge others to do the like.....If anyone thinks he can perform the service without me, let him try... If Mr. Crow will join me friendly there will be work for both."[†]

Mr. Crowe, however, was not at all disposed to be friendly. He said "his workes had bene antientlie employed for Gunnes, his Mines were as good as anie for the purpose and....his Workes lay more convenient then anie other for the bringing of peeces to London by land." It was ridiculous to suggest that Browne would be ruined and his workmen cast adrift if Crowe got the patent for the merchants, for Browne had two pensions from the king and by the terms of the patent Crowe was obliged to maintain any workmen who were unemployed as a result of it. "And that Browne called the Kinges ffounder is noe Workeman. Hee never served to the Trade, nor can hee sett his hand to the manufactorie and workmanship of a Peece. Hee is but a Pattentee under the King as this Pattentee is, and hireth his Workmen as this doth."^{*} No agreement was reached between the two, but in 1632

Crowe^x resigned his patent at the king's request. The

[†] Cal. of S.P.D. Jas. I. Addenda. Vol. XLII, No.66.

^{*} S.P.D. *ibid*, No.28.

^x I have been unable to find any definite information as to Sackville Crowe. He seems to have been a courtier who took out any patent which seemed profitable. Later, for instance, he had a patent for tapestry making. He may have been a descendant of the Sackvilles of Knole and Brede, but what he says of his works does not apply to theirs. He seems to have had some connection with Maresfield (see *abov* below, p.68). Possibly he put his orders out to contract at various furnaces.

divided monopoly had not been a success and thenceforth until the Civil War John Browne enjoyed the sole monopoly, at least in theory, though he was soon complaining about the unlawful competition of certain ironmasters in the Forest of Dean.[↓]

It might be imagined from this formidable series of rules and restrictions that the government intended that Europe should cry in vain for the ordnance of the Weald. In fact, however, the government did a good business in issuing licences to export, a plan by which they could also to some extent prevent the ordnance being sold to the enemies of England. In this they were not entirely successful, however, for in 1598 John Borrell, a government agent, advised that Lord Buckhurst's licence to export one thousand tons of ordnance to Flanders, France and Scotland "should be called in as the ordnance is re-transported into Spain and Portugal and used against us."⁺ Moreover, some ordnance was exported direct to those countries, for in 1582 the Portuguese ambassador received a warrant to export from Southampton 45 pieces of iron ordnance, 5 tons of shot and a variety of small arms and armour.^x

A great deal of ordnance was exported under licence

↓ Cal. of S.P.D. Chas. I. Vol. CCCCXXIX, No.94.

+ Salisbury MSS. Vol. VIII, p. 183, ut supra.

x Ibid. Vol. II, p. 165. Two other licences were also granted him 1581-2. It is possible that these licences were issued before the Spanish annexation of Portugal (1581) was really effective.

to the United Provinces. In 1587, for example, Elizabeth granted Leicester a licence to export into Holland and Zealand 320 tons of cast-iron ordnance "to be made, gotten, and procured in our county of Sussex, or elsewhere in our domynions."[↓] In 1597 again, a licence was issued to M. Noel de Caron, the agent of the States-General, to transport seventy demiculverins. The guns were supplied in two or three deliveries from one of the Sackville furnaces (probably at Brede) and M. de Caron complained that five of them burst in proof and had to be "made good" to him. His letter suggests another method by which even licenced exporters might trick the government. "I shall, therefore, want leave to transport those 5 pieces, and I beseech you, therefore, that the letters of Warrant to the customers of Lewes and Chichester may be for 25 pieces in all. To show that I do not mean to be always pleading burst guns, I have had the last mentioned pieces accepted unconditionally. If they will burst, burst they may."⁺ In the seventeenth century, as we have seen, the Brownes transported great quantities of ordnance to the United Provinces. In 1631, in spite of Swedish competition, John Browne exported 6,000 tons of ordnance and 900 tons of shot.^x

France and Italy were regular customers, and warrants

↓ Suss. Arch. Coll. Vol. LVI, p. 138.

+ Salisbury MSS. Vol. VIII, p. 131. Printed in translation.

x Cal. of S.P.D. Chas. I. Vol. CCIV, No.8.

for export were also issued at various times to the Russian ambassador, Olexey Evaneniche Zozazanna, and to the Dukes of Brunswick, Stettin and Pomerania.[†] Even Spain received her share of legitimately exported guns in James I's reign. "Count Gondomar well knew their goodness when of King James he so often begged the boon to transport them."[‡] Gondomar got his licence from the Peacemaker of Europe, but in the Commons, where the late wars died hard, there was "much murmuring" thereat,^x and in 1621 when James issued a proclamation for the "suspension of certain grievances", the patent for exporting iron ordnance was among them.[¶]

Not only Wealden guns but Wealden gunfounders were in demand abroad. In 1599, when Sir Anthony Shirley set out for Persia, he was "accompanied by his younger brother Sir Robert and twenty-five other gentlemen; among whom were some cannon-founders, then much wanted in Persia."[♂] The founders cast guns and Sir Robert showed the Persians how

† Salisbury MSS. passim.

* Fuller's Worthies, Vol. II, p. 383.

x Cal. of S.P.D. Jas. I. Vol. CXVII, No.37.

¶ Ibid. Vol. CXXII, No.10.

♂ Nichols, J., History of Leicestershire, Vol. III, p.722. Another story tells that Sir Anthony presented 100 cannon to the King of Spain, and as a result, fell into disgrace with James I, and died in poverty after teaching gunnery to an Arab king. (Archia. Vol. LVI, p. 139.)

to use them, finally being made a "general of artillery" and a prince by the grateful Shah. In Charles I's reign so many workmen were enticed away beyond the seas that the king issued a proclamation prohibiting the departure of all men versed in the mystery of making iron ordnance and shot. In spite of this foreigners still tried to attract English workmen. In 1627 Michael Donnevide, a Frenchman, was examined on the charge of having visited Maresfield gun foundry for the purpose of enticing one Thomas Weeken, a gunfounder, and another man, to go with him to France.[↓] John Browne lost some of his men in the same way. In 1631 he petitioned the king for a warrant against one Nathaniel Edwards who, under cover of a warrant from the king, had enticed away divers of his workmen to go beyond seas in discovery of the said mystery to other nations.[†]

Owing to faulty administrative machinery and the government's generous habit of granting exemptions in particular cases, all these regulations restricting output and export had far less effect than might at first sight be supposed. Taken in conjunction with the regulations protecting timber, however, they had a steady wearing effect and certainly contributed to the difficulties of the Wealden iron

↓ Cal. of S.P.D. Chas. I. Vol. LXV, No.25.

† Ibid. Addenda, Vol. DXXXIII, No.84.

industry if they did not markedly hasten its end. The end was inevitable and was due to natural causes. In 1694 William and Mary inaugurated a new policy by repealing all the statutes prohibiting the export of iron and other metals.[↓] By that time however the decline of the industry was well advanced and few Wealden iron-masters can have profited by it, while the subsequent statute of 9 Geo. III. cap. 35 which forbade the export of pig and bar-iron unless pre-emption were first offered to the Navy commissioners, can hardly have affected it at all.

[↓] 5 and 6 Wm. and Mary, cap. 17.

CHAPTER VIII.

TIMBER.

In the sixteenth century the State intervened to check not only the manufactures and export of the Wealden iron industry but also its consumption of timber. This was not the original attitude of the government, which at first was inclined to encourage the clearing of the Wealden forests. As we have seen, the Weald was so thickly wooded as to be almost impassable, and for a long time it was considered that the man who cut down trees and thus cleared land for corn-growing, was doing a public service. Ships and corn were the main pre-occupations of the government and it was felt that the Weald was so far above the average in timber and so far below it in corn that some kind of equalisation would be useful. Thus the woods, "except common woods", of the Wealds of Kent, Surrey and Sussex, were expressly exempted from the working of the act for the preservation of woods passed in 1543,[‡] which forbade the felling of young woods and the conversion of woodland into pasture or arable land.

[‡] 35 Hen. VIII. c. 17.

But the shipbuilders, tanners and wood-brokers of Sussex cared nothing at all for agriculture, and quickly realised that if the ironworks were allowed to consume timber unhindered, the price would rise and their profits would disappear. It was probably in answer to a petition from men of this sort that a commission was issued at the end of 1548 to inquire into the whole question of the ironworks, and in particular into their use of timber for fuel.[†] The commissioners were to summon juries from the Rapes of Hastings, Lewes and Pevensey and inquire how much "great wood" was yearly destroyed by the ironworks, how much the price of a load of wood was enhanced by occasion of the said works, whether the works were a great detriment to the inhabitants of Calais, Guisnes, etc., as well as to the people of Sussex, and whether, if the works were suffered to continue there would be great scarcity of timber and wood in the parts near the works. The answers showed that the juries thought it was quite time the government took action. Each forge or furnace used in a year at least "1,500 loads of great wood made into coals, besides the great and noisome spoil of the same woods which is engendered for lack of cherishing of the increase of the same so felled to the use of the iron mills." The price of wood

[†] Salisbury MSS. Vol. 13, pp. 19 et seq. See above, Chap. III, pp. 40 et seq.

had gone up at least 6d a load, and moreover "the sellers of the wood weighing the 'skantie' of woods grown by occasion of the iron mills do bring less loads daily, and that way also besides their daily rising in price do nip the poor inhabitants.....a quarter of a load of wood in every load." The "King's Majesty's towns of Boulogne, Calais, Guisnes, Hammes and other the King's Majesty's pieces and holds on the other side of the sea shall have no kind of wood for their fuel out of Sussex from whence they make their chiefest provision", nor will there be timber in Sussex for houses, watermills or windmills, bridges, sluices, ships, crayers, boats, gunstocks, wheels, arrows, pipes, hogsheads and innumerable other things.

So serious a report, which had a basis of truth though we know it to be false in detail,[†] was calculated to move the government to immediate action. But the government, perhaps because it was too much occupied with other things, perhaps because it appreciated the motives of the petitioners, ignored the report. In 1558 another act was passed for the preservation of timber, ordering that no timber should be felled for iron-making within 14 miles of the sea or of any part of the Thames, the Severn and other rivers. But again the act was not to extend to the Weald of Sussex, Surrey and

[†] See above, Chap. III, p.40.

Kent.[↓]

But if the government treated the matter lightly other people, besides those financially interested, were beginning to think that the iron-mills were a danger to the nation. In 1570 Archbishop Parker wrote to Elizabeth[†] "Sir Richard Sackville intends, as I am credibly informed, in this wood [Longbeech Wood, Westwell, Kent] to erect up certain iron mills, which plague, if it shall come into the country, I fear it will breed much grudge and desolation." Christopher Baker complained that the iron works were "greatlie to the decaye spoile and overthrow of woods and principal tymber", and far from encouraging agriculture by clearing the land they hindered it by absorbing all available labour.^x

Complaints against the rise in the price of timber and the scarcity of fuel poured in on the Privy Council and the Commons from all quarters. Whenever a town suffered from a shortage of fuel petitions were sent up asking for a local act prohibiting iron works in that neighbourhood. Cranbrook sent up such a petition in 1576, and the Council issued a commission "to make inquerie whither aboutes Crambrock by the late erection of certaine iron milles there

↓ 1 Eliz. cap. 15.

† Suss. Arch. Coll. Vol. II, pp. 186-7.

x See above, Chap. III, p. 45.

be any such dearthe of woode as by complainte from the inhabitauntes is declared."[↓] Cranbrook was probably persevering and kept up a stream of complaints, and in 1593 its industry was rewarded by the introduction of a bill for the "maintenance of clothing" within the parish of Cranbrook. It was stated that cloth-making was dying out because the iron-works used all the timber, and therefore forbade the erection of any new works in the district. The bill, however, went no further.[†]

Tenterden was another of the towns which tried to use Parliament to reduce the fuel bills of its inhabitants. In 1606 an act was introduced asking that the bounds mentioned in 23 Eliz. cap. 5 might be extended to include Tenterden. The excuse was that timber was needed for ships, but in the course of debate it appeared that it was chiefly "for the benefitt of the said Towne of Tenterden and of the tradesmen and Inhabitants therein dwelling." The bill passed a second reading, but in committee it was rejected as being "for some private ende, clooked with a pretence of a publique benefitte." Sir Francis Fane was therefore ordered to report to the House that "their desyer was to have yt sleepe." And sleep it did.^x

↓ Acts of the P.C. Vol. IX, p. 195.

† Hist. MSS. Com. Rep. III, App. 7. House of Lord's MSS. 1592-3, March 10.

x Addit. MSS. 34,218, fol. 92. In 1562 the inhabitants of Kingston-on-Thames complained about the rise in the price of their firewood. (Vic. County Hist. of Surrey, Vol.II, p. 264.)

The Cinque Ports were particularly concerned about their timber supply, for a great part of their export trade consisted of billets and timber, which were carried along the coast and across to France in great quantities. To the Privy Council they could urge a shortage of timber for ship-building. They opposed every attempt to start iron-works in their neighbourhood. In many cases they probably succeeded in their obstruction even though they were forced to compensate the prospective iron master,[↓] but when he happened to be Lord Buckhurst they were not so successful. In 1576 Lord Buckhurst began to build iron-works at Ore and the Mayors, Bailiffs and Jurats of Hastings, Winchelsea and Rye wrote to him in protest. He obviously did not take their protest very seriously and it is unlikely that he stopped building on their account. In his reply he thanked them for their "neighbourly manner of proceeding", and said "It is manifest that the abundance of woods within three miles of every of your towns is so great that it would be impossible for twenty such towns as yours to use them as fuel." He could hardly believe they were short of wood when he knew that they exported "no small quantity.... even to parts beyond the seas."[†]

↓ Acts of the P.C. Vol. VIII, p. 123.

† Rye MSS. p. 57.

In 1580, moved by the destruction of their woods "by sundry iron workes and glasse houses", the Mayor and Jurats of Rye gave "instructions to Mr. Gaymer and Mr. Carpenter, barons to the Parliament for our towne, for a bill to be drawn to the Parliament house therby to have a statut to passe for the preservation of the woddes growinge within certaine parishes *Byinge* nere and aboute the said thre townes" (Hastings, Winchelsea and Rye).[↓] It was perhaps as a result of this pressure or perhaps because Burghley was persuaded that the supply of Wealden timber was not inexhaustible, that in 1581 Parliament at last passed an act which took the Wealden forests under its protection.⁺ No timber was to be felled for iron-making within twenty-two miles of London and its suburbs, or within twenty-two miles of the Thames, or within four miles of the Downs between Arundel and Pevensey, or within four miles of Winchelsea and Rye, two miles of Pevensey and three miles of Hastings. The act was not to extend to such woods on the Wealds of Sussex, Surrey and Kent as were eighteen miles distant from London and eight from the Thames. No new iron-works were to be built within twenty-two miles of London, fourteen miles of the Thames and four miles of

↓ Ibid, p. 75.

+ 23 Eliz. cap. 5.

the Downs and the towns above-mentioned. But one iron master at least was excepted from the general condemnation implied in the act. The woods of Christopher Darrell[†] of Newdigate were exempted from its working, "which woods have ben and be by him preserved and coppiced for use of his Iron works."

It was found however that this act did not give sufficient protection to the timber of the Weald, and in 1585 a new act was passed extending its scope.[‡] Henceforward no new "Fornace Finarie or Bloomerie" was to be erected anywhere within the counties of Sussex, Surrey and Kent except "upon such olde and former Bayes or Pennes whereupon hath lately bene or at the time of the new Erection shalbe then standing, som yron Milles Fornace or Hammer", or upon land where the owner of the mill can furnish it with fuel from his own woods. Moreover, no timber tree one foot square at the stub was to be used for fuel. The penalty for breaking this law was a fine of £300 for each mill and 40s. for each tree.

According to later evidence^x these statutes "did much good to the comon wealth and would have dunn more yf the trew meaning of them had bin kept.....But maney have

† See above, Chap. III, p.43.

‡ 27 Eliz. cap. 19.

x Harl.MSS. 6838, fol. 150.

very cunningly and playneley agaynst the subiect and trew meaning of the sayd lawes found the meanes to frustrate them wherby ther followed not the hoped for good to the comon wealth." For instance, a man who wanted to build a new iron-works would satisfy the statute by planting some trees on his land and then would build his works long before his woods had grown enough to supply fuel. Another man who had one works would build another on the same bay and the two working together starved the district of wood. ↓

"Others having one yron worke cheafly mayntayned by woods growing on ther owne land have bilt a new worke within halfe a mile.....in the which they spend the sayd woods growing on ther sayd land, and bye for the sayd old worke all the wood that is spent ther."

In one way and another the statutes were evaded and the disappearance of the Wealden forests continued. In the seventeenth century there are many instances of public concern for their fate. Norden, writing in 1607, says that there has been such "an alteration within lesse than thirty yeares, as may well strike a feare, least few yeares more, as pestilent as the former, will leave few good trees

↓ This may be an imaginary case. At any case it can only have happened occasionally, for as a rule there was not enough water to work more than one wheel at a time.

standing in those Welds. Such a heat issueth out of the many forges & furnaces, for the making of Iron, and out of the Glasse-kilnes, as hath devoured many famous woods within the Welds."[†] Three years later Speed, describing Sussex in his Atlas, says, "The commodities of this Province are many and divers, both in Corne, Cattle, Woods, Iron and Glasse, which two last as they bring great gaine to their Possessors, so doe they impoverish the Countie of Woods, whose want will be found in ages to come, if not at this present in some sort felt."[‡] Even the poets and playwrights joined in the hue and cry. Drayton made the trees lament their fate:

"Jove's oak, the warlike ash, vein'd elm, the softer beech,
Short hazel, maple plain, light asp, the bending wych,
Tough holly, and smooth birch must altogether burn.
What should the builder serve, supplies the forgersturn;
When under public good base private gain takes hold
And we, poor woful woods, to ruin lastly sold;"^x

while Massinger referred to "Builders of iron mills, that grub up forests."^x John Evelyn, to whom silviculture was a religion, hated the iron-works. "And he that should

† Norden, op. cit. pp. 213-14. The woods he mentioned were "Burningsfold, Laxwood-grenee, the Mens, Kirdford, Petworth Parks, Dalington, the Dyker: and some forests and other places infinite."

‡ Quoted Sussex Arch. Coll. Vol. XLVI, p. 26.

x Quoted ibid, vol. II, p. 197, from "Polyolbion, 1612.

* From The Guardian, Act II, Scene 2. Quoted by H.G.

Richardson Remarks on British Forest History, Trans. of the Royal Scottish Arboricultural Soc. Vol. XXXVI.

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deeply consider the prodigious waste which these voracious iron and glass-works have formerly made in one county alone, the county of Sussex, for one hundred and twenty miles in length and thirty in breadth, (for so wide and spacious was the ancient Andradswald, of old one entire wood, but of which there remains now little or no sign,) would be touched with no mean indignation."[†]

The actual amount of timber or wood used as fuel in the making of iron was very considerable. This was partly owing to wasteful methods of charring the wood, and partly also to the primitive type of furnace in use. Thus the consumption of wood per ton of iron in the sixteenth century was considerably greater than in the seventeenth and eighteenth centuries. As charcoal-burning became more scientific less wood was wasted in the process. In the sixteenth century an average of three cords[†] of wood produced one load of "coals"; in the eighteenth century at Waldron 92 cords made 51 loads. Similarly as the furnace improved less fuel was needed in proportion to the amount of iron produced. At Newbridge in 1537 11 loads of coals

↓ Evelyn Silva, Bk. III, Chap. VII, p. 295.

† A cord = 126 c. ft. See above, p. 84

made one ton of iron; at Waldron in 1632 rather less than three loads were used to a ton. The annual consumption of timber at Newbridge (furnace and forge) was twelve or fifteen hundred loads;[†] at Waldron furnace it varied between five and six hundred; but at a gunfoundry, where the production might amount to several thousand tons a year, an immense quantity must have been used. The total amount of wood used by all the Wealden iron-works must have been enormous, but even that can be exaggerated, as Norden's surveyor reminded the Bailiff:-

Bayly. ".....the hammers and furnaces spend each of them in every 24 houres, two, three or foure loades of Charkecole, which in a yeare amounteth to an infinite quantitie....."

Surveyor." That which you say, is true, but they worke not all, all the yeare: for many of them lacke water in the Summer to blow their bellowes."[†]

The iron-works, however, were by no means the only devourers of timber. Norden and Evelyn both held the glass-furnaces to be equally guilty, though they were not so numerous and cannot have done so much damage. It must be remembered too that even when alarums about the scarcity of

† Between 1547 and 1549 Worth furnace used 2418 loads; Worth Forge, 1136 loads.

† Norden, ut supra.

wood were loudest, great quantities of timber, boards and billets were being exported from the Weald. This trade was of old standing and had long exercised the mind of the government. As early as 1344 a commission[↓] was issued to certain men "to make inquisition in the counties of Surrey and Sussex touching the taking of timber and boards from those counties to Normandy and other foreign parts for the succour and solace of the king's enemies, contrary to the king's inhibition and proclamation made about this." In 1572, before he started on his campaign against the iron-works, Christopher Baker attributed the "waste of okes" in Sussex to the rise of a class of woodbrokers, "too numerous to name, who sell everything they can lay hands on, shipping the timber not only along the coast, but even into France."[†] It was not until two years later that he made the discovery that the iron-works were the real culprits. Four years later one Mr. Baeshe, asked to report on the "causes that occasion the present shortage of casks in the navy", mentioned in passing that timber was "wasted by yron Milles and otherwise", but apparently did not think it so important as the fact that nobles nowadays, instead of

↓ Cal. of Pat. Rolls. Ed. III, 1343-45, p. 419.

† S.P.D. Eliz. Vol. LXXXV, No.67.

importing French wine in casks, brewed their own beer, for which they needed new casks. ↓ Particularly in the eighteenth century did the iron trade suffer from the development of the beer trade, for owners of woods began to preserve them for hop-poles and the iron-works were starved of fuel. Fuller suggests that the Marian persecutions were still another cause of the consumption of timber. "Grievous the Persecution in this County [Sussex] under John Christopherson the Bishop thereof. Such his havock in burning poor Protestants in one year, that had he sat long in that See, and continued after that rate, there needed no Iron-mills to rarify the Woods of this County, which this Bonner Junior would have done of himself."*

There were many people, on the other hand, who regarded the iron-works as the preservers of the forests. The enemies of the iron-works always asserted that the works used not only brush-wood but timber as fuel, and it was on this point that the government entered the lists. But Yarranton,^x in 1677, said that "iron-works are so far from the destroying of Woods and Timber, that they are the occasion of the increase thereof. For in all parts where

↓ Ibid. Vol. CVIII, No.59.

* Fuller's Worthies, Vol. II, p. 386.

x Yarranton England's Improvement by Land and Sea, Vol. I, p. 61; Vol. II, p. 163.

Iron-works are, there generally are great quantities of Pit Coals very cheap,, and in these places there are great quantities of Copices or Woods which supply the Iron-works: And if the Iron-works were not in being, these Copices would have been stocked up, and turned into Pasture and Tillage, as is now daily done in Sussex and Surrey, where the Iron-works or most of them are laid down.....And as to making charcoal with Timber in those parts, so much talked of, it was and is most notoriously false; for Timber in all these parts is worth thirty shillings a Tun, and a Tun and three quarters of Timber will but make one Coard of Wood. So let all rational men consider, whether an Iron Master will cut up Timber to the value of fifty shillings, to make one Coard of Wood, when he pays for his Wood in most of these places but seven shillings a Coard?" But in spite of this stout defence he had to admit that timber was to some extent used for charcoal. And in the actual construction and repairs of the iron-works much timber must have been used. The floodgates, wheels and hammer beams were all made of the best and largest timber. It seems, however, to have been admitted by unbiassed witnesses that an intelligent and careful iron-master was one of the best conservers of timber. Evelyn himself paid tribute to Mr.

Christopher Darrell, who had special exemption from the Elizabethan timber laws,[↓] because "though a great iron-master,.....he so ordered his works that they were a means even of preserving his woods, notwithstanding those insatiable devourers. This may appear a paradox but it is to be made out; and I have heard my own father (whose estate was none of the least wooded in England) affirm that a forge,[†] and some other mills, to which he furnished much fuel, were a means of maintaining and improving his woods."^x

At the end of the seventeenth century when Parliament was bombarded with petitions to protect the English iron trade against foreign competition, the petitioners made great play with the idea that the disappearance of the iron-works would result in the death of the forests, for they knew that Parliament was always concerned about the navy's timber supply. "As woods maintaine iron workes soe doe iron workes mutually maintaine them and in them great quantities of timber soe that timber is not cheaper in any part of this Island.... Nor can any timber be destroyed by iron workes being above

↓ See above, p. 171.

† Probably Abinger Hammer.

x Evelyn, op. cit. Bk. III, Chap. VI, pp. 279-80.

4 times in vallue more then the price of Cordwood commonly used for that purpose."[↓] Another petition deplores the decay of the iron works and says that as a result the woods are "grubbed up or sold for Billet and Faggott."[†]

In fine, had all iron masters been as intelligent and public-spirited as Mr. Darrell and Mr. Evelyn silviculturalists would have had no quarrel with the iron trade. Afforestation is expensive and does not offer quick returns, so that the average landowner does not undertake it unless he has a safe market. This the iron-works provided. He could sell his brushwood and poor timber to them and would thus be able to afford to grow good timber for other purposes. Unfortunately Mr. Darrell and Mr. Evelyn were exceptional. The average iron master did not look ahead. He recklessly felled whole woods in the neighbourhood of his works and very rarely troubled to replant them. The Weald is still well-wooded, judged by modern English standards, but many of the old forests, such as Dallington Forest, remain only as names. The most wholesale destruction took place during the period 1570-1630 when the iron trade was at its height. In Henry VIII's reign Ashdown Forest was densely wooded and supported

↓ Addit. MSS. 33058, fol. 83.

† Harl. MSS. 1243. fol. 195.

innumerable iron-works. In 1632 the King's Surveyor reported that in several places the fences had fallen into decay and that repairs would cost £800 "because Timbor is very scarce thereabouts."[↓] St. Leonard's Forest, which was further from London and therefore not so eligible a site for iron-works, fared better. In 1655 the surveyor reported that there "hath binn very greate Distrucion of the Woods within the afforesaid fforest since the Said graunts [of iron-works in Elizabeth's reign to Sir John Caryll], but there is sufficient coppice Wood yet remaineing to make good the said Coales and Woods [for the works] if well preserved."⁺

A cheap fuel supply was essential to the success of the iron industry and as the forests disappeared so too did the iron-works. Thus in the end Drayton's "poor woful woods" were avenged. Already in 1664, as we have seen,^x more than half the iron-works that had flourished in Elizabeth's reign were out of action. In 1724 Budgen marks only 28 forges and furnaces in his map of Sussex and it is not certain that all these were working. In 1740 only ten of these still existed, and by 1788 this number was reduced

↓ Sussex Arch. Coll. Vol. LV, p. 312.

+ Ibid. Vol. XXIV, p. 239.

x See above, p. 56

to two,[↓] Farnhurst and Ashburnham, which latter was the only one to survive in the nineteenth century. It was still possible in the eighteenth century for a shrewd man to make his fortune in the iron trade if he concentrated on ordnance,[†] and as late as 1774 Campbell said that the manufacture of iron ordnance and small iron ware was still important in Sussex. But he referred to it as a dying industry which "is still carried on in several Places, and has been carried on in many more."^x Barry, writing of Hastings in 1797, said: "A great deal of plank, iron and grain are brought here from the country to be exported coastwise, though this branch (which consisted chiefly of cannon from the foundries of Ashburnham and Robertsbridge) has failed considerably within these few years, owing to the great scarcity of wood for heating the furnaces: for since the hop-planting is become so principal a branch of the farmer's system, the woods that are now remaining are chiefly reserved for hop-poles."^z

This collapse of the iron trade was not however confined to the Weald; for a time the Forest of Dean and other iron-fields suffered equally from the exhaustion of

↓ J.M. Swank, Iron in All Ages, p. 52.

† See above, pp. 117, 119.

x J. Campbell, op. cit. Vol. I, p., 374.

z Quoted Suss. Arch. Coll. Vol. XLVI, p. 18.

the timber supply. Meanwhile England relied increasingly on the foreigner for her supplies of pig-iron. Russia, Syria, Sweden and Spain all ^{all} imported great quantities. In 1687 17,505 tons were imported, chiefly from Sweden.[†] In 1720 20,000 tons were imported,^{*} and between 1761 and 1766 the amount increased to 48,000 tons.^x Meanwhile the English iron trade was shrinking rapidly; in 1740 there were only 59 furnaces in England and Wales with a total production of 17,350 tons.

It was obvious that if the iron trade were to live some other fuel must be found to take the place of charcoal. This had been realised even in Elizabeth's reign before the shortage of timber became acute. In 1589 she had granted a patent to Proctor and Petersen for the use of coal in smelting.[‡] They were unsuccessful but they had pointed out the way which was followed by many others, Chauntrell and Astell, Sturtevant and Ravenson, until in 1619 Dud Dudley actually succeeded in making good iron with coke as a fuel. The successful inventor was met with jealousy and suspicion however, he lost his patent and his works were destroyed. Others followed him, experimenting on the same lines, and in Charles II's reign when his son published "Metallum Martis" giving an account of his work,

† Harl. MSS. 1243, fol. 196.

‡ G.J.H. Lloyd, Cutlery Trades, p. 69.

x S. Dowell, History of Taxes, p. 460.

‡ W.H. Price, English Patents of Monopoly, p. 107.

the method was in use near "Sheffield and other places" where "they now smelt iron ore with charred pit-coal, which answers equally well with charcoal, and comes much cheaper."[†] The process spread very gradually and it was not until the last twenty years of the eighteenth century that it became general. In 1788 there were 24 charcoal furnaces in England and Wales and 53 coke furnaces; in 1796 there were 121 furnaces of which only one, Ashburnham, used charcoal.[‡]

The introduction of coke-smelting marked the end of the Wealden iron industry. The Weald could not compete with districts where coal and iron ore lay side by side. There is in fact plenty of coal in Sussex but it is a fibrous lignite, unsuitable for smelting. It was first noticed early in the nineteenth century on the Fuller estate at Heathfield, and Mr. Fuller probably dreamt of reviving the old Heathfield Furnace.^x But it was proved unsuitable, and since the Wealden ore itself is of poor quality for modern uses even the rumoured exploitation of the Kentish coal-field will hardly re-establish the Weald as the Black Country of England.

† Evelyn's *Silva*, Bk. III, p. 279, note 1.

‡ Scrivenor, *op. cit.* pp. 87 and 95.

x P. Lucas, *op. cit.* p. 91.

A P P E N D I X A.

Christopher Baker's list of ports and creeks used by
iron furnaces in Kent and Sussex.

<u>Kent</u>	<u>Sussex</u>
Quinborowe	Camber
ffeversham	Rye
Whitstable	Winchelsey
Reculver	hastinges
Tennet	Bulverhier
Milton	Pevensey
Margat	Cockermouthe
Sandwiche the cheefe Porte	Newhaven
Deale	Brighthelmeston
Dover	Shoreham
ffulkston	Arundell
Lyde	Alingborne
Runney	Selsey
Heathe	Chichester the cheefe Porte
Lydde	Cuding and Miching, Lewes creekes thereof
Tenterden	How
ffordewiche	Bonneporte
The Downes	Seaforde

A P P E N D I X B.

["Peces" against a man's name
means that he cast ordnance.]

(Compiled from Christopher
Baker's lists and from
ordnance bonds.)

Name	Works	Other particulars.
Abergavenny, Lord.	1. Forge and furnace in Waterdown. 2. Two forges and one fur- nace in Moor Forest	Part owner with Earls of Derby and Surrey. Farmed by John Effield.
Ashburnham, John (of Ashburnham)	1. Furnace at Horsemonden 2. Pannyngridge Furnace 3. Penhurst " 4. Ashburnham furnace and forge.	Farmed by Thomas Bratell. Bond shows that John Gardener was work- ing these for Isabel Ashburnham, widow, and her son John.
Baker, John (of Battle)	Furnace and forge at Withiam.	
Baker, Sir Richard (of Sissing- hurst).	1. Forge and furnace in Cranbrook and Hawk- hurst. 2. Two forges and two furnaces in Heathfield and Warbleton Two forges in Framt	Thomas Stollion farmed Warbleton furnace. "in other mens handes".
Barham, John (of Butts)	Forge and furnace at Horsted Keynes.	
Barrington, Mr.	Furnace at Hadley.	
Blacket, John (of Hellingly)		
Blackwell, William)	1. Furnace and forge in Petworth Great Park.	Held from the Earl of Northumberland.
Blackwell, Mrs.)	2. Furnace and forge at North Chapel.	William Walpole occupied a "furnes

Name	Works	Other particulars.
		and a forge in the Parishe of Petworthe...belonginge to one Margaret Blackwell of London late wife of William Blackwell towne clerke of the said city."
Bratell, Thomas.	See Ashburnham.	
Bowyer, Henry	1. Forge and furnace in Ashdown. 2. Forge at Tinsley. 3. Double furnace at Newbridge 4. Furnace in Moor Forest	Held from the Crown.
Braye, Lady	Forge at Cranleigh	Worked by John Gardener and John Duffield.
Breechers, -	Two forges at Frant	Worked by Mr. Wyborne and Mr. Leech.
Bruggsell, -	One forge at Salehurst	
Buckhurst, Lord	1. Forge at Fletching 2. Forge and furnace at Parrock 3. Forge at Sheffield.	Worked by William Relf. Worked by George Bullen.
Bullen, George	1. Forge "called Parforge". 2. See Buckhurst.	
Burrell, Ninian	Furnace	Probably Tilgate Furnace, which his son Walter worked later.
Carpenter, John (of Frant)	Forge "called Brokelane" at Frant	Held from Sir Thomas Gresham

Name	Works	Other particulars
Challoner, Ninian (of Cuckfield)	1. Forge in Ardingly 2. Forge and furnace at Slaugham 3. Furnace at Blackfield. 4. Forge at Gaston's Bridge	Held from Francis Challoner. Worked in partner- ship with Walter Covert.
Collins, John (of Burwash)	Forge "called the neither forge" in Burwash	
Collins, Stephen	Forge at Lamberhurst.	
Collins, Thomas	Furnace "called Stokense"	Socknersh in Burwash.
Colman, Simon (of Brightling)	Furnace "called Batsfordes"	
Covert, Walter	See Challenor.	
The Crown	1. Forge and furnace in Ash- down (See Bowyer) 2. Two forges in St. Leonard's Forest	Probably Cotchford. Farmed by Roger Gratwick.
Culpepper, Sir Alexander	1. Furnace at Goudhurst. 2. Furnace "called Badberie" at Cranbrook.	
Dacres, Lord	1. Forge and furnace at Buck- holt 2. Chippenham furnace at Horsemonden	Farmed by Bartholomew Jeffrey. Farmed by Thomas Gleede.
Darrell, Thomas	Furnace at Shingley (south of Lamberhurst)	Farmed by Thomas Dyke.
Darrell, Christopher (of Newdigate)	1. Forge and furnace at Ewood. 2. Forge at Frant.	

Name	Works	Other particulars
Duffield, John (of East Grinstead)	1. Forge and furnace at East Grinstead 2. Forge and furnace at Shillinglee 3. Forge at Cranleigh (see Braye)	In partnership with Mr. Payne. In partnership with William Smith In partnership with John Gardener.
Dyke, Thomas (of Horse-monden)	1. Forge at "Dornedale". 2. See Thomas Darrell.	
Effield, John (Also written Everfield and Erfield)	1. Forge and furnace at Cruckford. 2. See Abergavenny.	
Elderton, Edward (Also written Ellerton or Eldrington)	Forge at Shere	
Ellis, Thomas (of Bibleham)	Bibleham Forge	Held from Sir John Pelham.
Fane, Sir Thomas	Two furnaces at Tonbridge.	
Farmer, Alexander (of Rotherfield)	Furnace at Hamsell	"peces".
Faulkner, John (of Waldron)	1. Furnace and forge at Maresfield 2. Part of furnace and forge at Hedge Court (see Gage).	Held from Lady Gage.
Finch, Mr.	Forge at Netherfield "or thereabouts".	
Fowle, Nicholas (of Mayfield)	Forge and furnace at Wadhurst.	"peces".

Name	Works	Other particulars
French, John (of Chiddingly)	1. Forge at Chiddingly 2. Forge and furnace at Hedge Court near Copthorne.	Farmed part of it from John Gage.
Gage, John and Lady	See Faulkner and French	Hedge Court was also said to be farmed by John Thorpe.
Gardener, John alias Lambert (of Cranleigh)	See Braye & Ashburnham	
Gleede, Thomas (of Burwash).	1. Forge at Etchingham) 2. Furnace at Darfold) 3. See Dacres	Held from Sir Robert Tirwight.
Gratwick, Roger. (of Shilling- lee)	1. Forge at Ifield 2. Forge at Dunsfold 3. See Crown.	In one list he is said to hold a furnace at Ifield. Held from Richard Marsh.
Gratwick, Thomas (of Cherford)	Forge in Dunsfold	This was possibly the same forge as Roger held. The two names occur in separate lists and it may be simply a mistake in Christian names.
Green, Richard (of Winchelsea)	Forge at Mayfield.	
Gresham, Sir Thomas	1. Furnace at Mayfield. 2. See Carpenter.	"peces".

Name	Works	Other particulars
Haye, Thomas (of Hastings)	Netherfield Furnace.	
Hodgson, Robert alias Saunders (of Framfield)	1. Furnace at Pounsley 2. Furnace at Framfield	"peces".
Hogge, Ralph	Furnace called Marshall at Buxted	"peces".
Isted, Thomas (of Mayfield)	Forge at Mayfield	
Jeffrey, Bartholomew (of Buxted)	See Dacres.	
Leech, Richard	1. Forge "called Benehall" in Frant. 2. See Breechers.	Farmed by Robert Woodye.
Marsh, Richard (of Farnham)	See Gratwick.	
May, George (of Burwash)	Forge "called Bugsell" in Salehurst.	
May, Thomas (of Winchelsea and Ticehurst)	Forge at Etchingam.	
Milton (Middle- ton) Arthur (of Rother- field)	1. Furnace at Rotherfield 2. Furnace at Maynard's gate in Rotherfield.	"peces".
	3. Huggen's Furnace 4. Buxted Little Forge	Does Huggens = Huggetts?

Name	Works	Other particulars
Mitchell, Mr.	Furnace at West Hoathly.	
Montague, Lord	1. Forge at Frant	Farmed by John Porter.
	2. Forge and furnace at Haslemere.	
	3. Furnace called Pophall.	
Morley, Anthony (of Glynde)	1. Forge at Freshfield.	
	2. Furnace at Horsted Keynes.	
Northumberland, Earl. of	See Blackwell.	
Payne -	See Duffield.	
Pelham, Sir John	Waldron Furnace.	Thomas Stollion farmed half Waldron furnace and Brightling forge.
	Brightling forge (or Glaziers)	
	Bibleham forge	
Pollor (Palor) John (of Rotherfield)	Howbourne forge at Buxted	Held from John Wells.
	Furnace "called Hendall" at Buxted.	
Pope, Nicholas (of Burwash)	1. Forge at Boxham or Bayham.	
Porter, John (of Battle.)	2. See Montague.	
Quintine, -	Furnace at Cowden.	
Relf, John (of Crowhurst)	Forge at Crowhurst	Farmed by brother, William.

Name	Works	Other particulars
Relf, William (of Warbleton)	1. Furnace at Heathfield. 2. See Buckhurst and John Relf.	
Reynolds, Robert (of East Grinstead)	1. Furnace at Milplace (East Grinstead) 2. Forge at Brambletye.	"Farmer to Milles for the furnace and to one Mr. Picasse for the forge".
Sidney, Sir Henry.	Forge and furnace at Robertsbridge.	
Smith, Thomas (of Petworth)	1. Double furnace at North Chapel 2. Forge at Hatfield 3. See Duffield	Held William Bow- yer of Hampshire. "He hath also in- Cherford a forge a building in his owne groundes which is yet hath not wrought."
Stacie, John (of Ashurst).	Forge and furnace at Ashurst.	
Stollion, Thomas (of Heathfield)	1. Priory furnace 2. Bartling forge. 3. Warbleton forge. 4. See Pelham.	Probably on the Cuckmere below Hellingly.
Thorpe, John (of East Grin- stead).	See Gage.	
Tirwight, Sir Robert.	See Gleede.	

Name	Works	Other particulars
Waller, Sir Walter	Forge at Brichenden.	William Webb, citizen and salter of London, entered into bond for him.
Walpole, William (of Fittle- worth).	See Blackwell.	
Weston, Michael	1. Forge at Causiron. 2. Furnace at Cowden.	
Whitfield, Robert (of Worth)	1. Forge at Rowfaut. 2. Forge at Worth.	
Wicks, Richard (of Battle).	1. Furnace at Netherfield 2. Forge at Mountfield. 3. Furnace at Whatlington.	
Willard, David	Two forge and a furnace at Tonbridge.	
Woodye, Robert	See Leech.	
Wyborne (Wilborne) -	See Leech.	

A P P E N D I X C.

WEALDEN IRON-WORKS IN 1653-64.[↓]

"In the year 1653 did blow these 27 Furnaces in Sussex;

viz:-⁺

- m Waldron
- m Bread
- m Crowhurst
- m Barvil /Darvell
- m Hamsell
- m Custraplea
- m Streame
- m Horsted Keynes
- Pullingham
- Frith

These 11 were continued in repair and found partly stored at the beginning of 1664.

- m Mayfield
- m Milplace
- m Ewhurst at Norjam /Northiam
- m Couster /Probably Beckley Furnace in Couster manor
- m Ashburnham

[↓] The following list is compiled from two versions of a contemporary list made in 1664 or thereabouts. Versions have been printed in the Sussex Arch. Collections, Vol. XVIII, by M.A. Lower, and in Vol. XXXII by J.L. Parsons

m. Beach
 m Pounslow [Pounsley]
 m Tilgatt
 m Socknesse

These 9 were discontinued before 1664, and partly ruined, but repaired and stocked on account of the Warr and hopes of encouragement.

Cobeach
 Snape
 Riverhall
 Maynard's Gate
 Warnham
 Northparke
 Baybush.

These 7 were ruined before the year 1664, and so remain.

In all 27 in Sussex 1653, reduced to 11 before 1664.

* All those marked with an m made guns or shotte in the late warrs for supply of his maiesties stores.

Blowing Anno 1653, 7 in Kent viz:-

m Horsmonden
 Biddenden or Cissingherst
 Scarlets

These 3 were found stocked in the yeare 1664.

m Hawkhurst
 m Bedgbury.

These 2 were discontinued before 1664 but repaired stocked upon account of the warre.

m Barden

Cowden the lower - Ruined before 1664 & so remain.

Blowing Anno 1653 in Surrey.

m Imbhams which Mr. Brown Stocked to make Gunns & is
aside.

In the year 1653 42 fforges or Ironmills working in Sussex,viz:-

Ashburnham

Bugsill

Bur

Coustance [Conster]

Hoodshall

Ashburnham Minor

Cobeach

Steele

Rivershall

Hoboorne

Tickridge

Kinians

Freshfield

Holmsted

St. Leonard's

Leonard's Minor

Pounslow

Rowfant Supra

Couserne /Causiron/

These 19 were ruined before 1664 and so remaine.

Itchingham

Sheffield

Buckhall /Buckholt/

Rowfant

Crowhurst

These 5 are laid aside, and not used, only Buckhall is sometimes used.

Westfield

Robertsbridge

Glaziers

Bibleham

Hawksden

Bayham

Eridge

Hordley /West Hoathly/

Streame

Ardingly

Tenceley /Tinsley/

Birchden

Pophole

Dunsfold

Burton

Burwash

Maresfield

Buxted

These 18 as yet continue in hope of encouragement.

In all 42 fforges reduced now in '67 to 18 only.

In Kent:-

Horsfeild near Cissingherst

In Surry, on the edge of Sussex

Woodcock forge

Sheer forge further in Surry."↓

↓ The list seems to have been compiled by several people and at different times - 1653, 1664, 1667. No indication is given in the printed versions as to whether the references to the "late warres" were added in 1664 or in 1667; if in 1664 the Civil War must have been meant, if in 1667, the Dutch war. In Chapter III I assumed the former to have been intended.

A P P E N D I X D.

IRON-WORKS MARKED IN BUDGEN'S MAP. †

Gloucester Furnace

Conshoply " [/Possibly the "Custraplea" of the 1664 list. On tributary of the Rother near Rotherfield.]

New Furnace [/In Ashdown Forest.]

Frith "

Beckley "

Brede "

Robertsbridge Furnace

Bugsell "

Darvell "

Ashburnham "

New Furnace [/near Heathfield. This was the Fuller Furnace.]

Huggetts Furance

Tanners "

Pounsly "

Stream "

Cralle "

Beach "

Pophole Forge

Shinglely Forge

† It is not at all certain that all these were working at the time.

Hawksden Forge

Etchingham Forge

Burwash Forge

Brightling "

Bibleham "

Maresfield "

Brede "

Eridge "

Ashurst "

B I B L I O G R A P H Y.

A. MS. Sources.

At the British Museum:

Additional MSS.

Harleian MSS.

Lansdowne MSS.

Sloane MSS.

At the Public Record Office:

Chancery Proceedings (Henry VIII^f)

Exchequer K.R. Accounts Various

Customs Accounts

Port Books

" T.R. Miscellaneous Books.

Forest Rolls.

Ministers' Accounts of certain manors in Sussex,
Surrey and Kent.

Star Chamber Proceedings. (Henry VIII^f)

State Papers Domestic.

At Lambeth Palace:

Court Rolls of certain manors in Sussex, Surrey and Kent.

B. Printed Sources. (Dates are of editions actually used.)

Acts of the Privy Council.

Agricola. *De Re Metallica*. (Translated 1912)

Aubrey, J. History of Surrey (1719)

Boate, G. Ireland's Naturall History (1652) 1860.

Brewer^{J.S.} & Gairdner^{J.}, Letters and Papers of the Reign of Henry VIII.

Budgen, R. Map of Sussex (1724)

Camden, W. Britannia (1586) 1789.

~~Campbell. Materials for the Reign of Henry VII.~~

Chamberlain, H. New and Compleat History and Survey of the Cities of London and Westminster, the Borough of Southwark, etc. (1770)

Close Rolls, Calendar of.

Daniel-Tyssen, J.R. Parliamentary Surveys of Sussex. (Sussex Arch. Coll. Vols. 23 & 24)

Devon, F. Issues of Exchequer.

D'Ewes, Simon. Journals of all the Parliaments during the reign of Queen Elizabeth (1692).

Evelyn, J. Silva (1664). 1812.

Fine Rolls, Calendar of.

Fuller, T. Worthies of England (1662). 1811.

Giuseppi, M.S. Fourteenth Century Accounts of Ironworks at Tudeley. Archaeologia, Vol. LXIV, pp. 145 et seq.

Accounts of Ironworks at Sheffield and Worth. Archaeological Journal, Vol. LXIX, pp. 290 et seq.

Harleian Society's Publications, Vol. 53. Visitations of Sussex.

Harris, J. History of Kent. 1719.

Historical MSS. Commission's Reports on Rye, Lambeth Palace, House of Lords and Salisbury MSS.

Holinshed, R. Chronicles (1587).

Huguenot Society's Publications. Vol. VIII. Westminster
Denisation Rolls, Henry VIII.

Index Library, Vol. XXIV Sussex Wills and Administrations
(British Record Society).

Lambard, W. Perambulation of the Weald of Kent (1576).

Leadam, I.S. Select Cases in the Court of Star Chamber.

" " " " " of Requests.

Newenham, T. View of Ireland (1809)

Norden, J. Surveyor's Dialogue (1607).

Patent Rolls, Calendar of.

Ray, J. A Collection of English Words not generally used (1674).

Saxton, C. Atlas (1579).

Senex, J. Map of the Counties of Surrey, Kent, etc. (1729)

Sharpe, R.R. Letter Books of the City of London. (1899)

Speed, J. The Theatre of the Empire of Great Britaine (1611).

State Papers Domestic, Calendar of.

Statutes of the Realm.

Wallis-Chapman, A.B. Black Book of Southampton.

Yarranton, A. England's Improvement by Land and Sea (1677).

C. Modern Works.

Alexander, J.H. Report on the manufacture of iron. (1840)

Archæologia.

Archaeologia Cambrensis.

" Cantiana, *passim*.

Archaeological Journal, *passim*.

Bazeley, M.L. The Forest of Dean (Bristol and Gloucester
Arch^{al} Society. Trans. 1911.)

Campbell, J. Political Survey of Britain (1774).

Capes, W.W. Rural Life in Hampshire. (1901)

Cunningham, W. Alien Immigrants in England. (1897)

Dallaway, J. A History of the Western Division of the County
of Sussex. (1815)

Dawson, C. Sussex Iron Work (Suss. Arch. Coll. Vol. XLVI.)

Delany, M.C. Historical Geography of the Wealden Iron Industry.
(1921)

Dowell, S. History of Taxes and Taxation. (1884)

Encyclopaedia Britannica, Iron.

Eyton, R.W. Domesday Studies. (1880)

Furley, R. History of the Weald of Kent. (1871-4)

Gardner, J.S. Iron Casting in the Weald. (Arch.^{ia} LVI)

Gras, N.S.B. Early English Customs System. (1918)

Hall, H. History of the Custom Revenue. (1885)

Holloway, W. History of Rye. (1847)

Horsfield, T.W. History and Antiquities of Lewes. (1824)

Ireland, W.H. New History of Kent. (1828-30)

Lapsley, G.T. Account Rolls of a Fifteenth Century Ironmaster
(English Hist. Review XIV.)

Howellin, W. Sussex Ironmasters in Glamorganshire (Arch.^{ia} Cambrensis. Series III
Vol. IX)

Legge, H. Forests.

Lloyd, G.I.H. The Cutlery Trades. (1913)

- Lower, M.A. Various articles in Suss. Arch. Coll.
- Lucas, P. Heathfield Memorials. (1910)
- Macadam, W.J. Ancient Iron Industry in Scotland. (*Proc. of the Soc. of Antiquaries of Scotland, Vol. 71.*)
- Malden, H.E. History of Surrey. (1900)
- Manning, O. History and Antiquities of Surrey. (1804)
- Nicholls, H.G. Ironmaking in the Forest of Dean. (1866)
- Nichols, J. History of Leicestershire. (1795-1811)
- Noble, T. History of the Ironmongers' Company. (1889)
- Patrick, R.W.C. Early Records relating to mining in Scotland. (1878)
- Percy, J. Metallurgy, ~~Iron and Steel~~. (1861-80)
- Ponsonby, A. Priory and Manor of Lynchmere and Shulbrede. (1920)
- Price, W.H. English Patents of Monopoly. (1906)
- Richardson, H.G. Remarks on British Forest History (Trans. of the Royal Scottish Arboricultural Soc. XXXVI.)
- Rogers, J.E.T. History of Agriculture and Prices in England. (1866-1902)
- Salzmann, L.F. English Industries in the Middle Ages. (1913 & 1923)
- Scott, W.R. Joint Stock Companies. (1910-12.)
- Scrivenor, H. History of the Iron Trade. (1854)
- Smiles, S. The Huguenots in England. (1867)
- Industrial Biographies. (1863)
- Stahlschmidt, J.C.L. Notes from an Old City Account Book. (*Arch. Trans. XLIII.*)
- Stanford, C.T. Sussex in the Civil War. (1910)
- Surrey Archaeological Magazine ^{Collections, passim.} (especially articles by M.S. Giuseppe.)
- Sussex Archaeological Collections ^{passim.} (especially articles by M.A. Lower, C. Dawson, J.L. Parsons.)
- Sussex Record Society's Publications, *passim.*

Swank, J.M. History of Iron. (1892)

Swanton, E.W., and Woods. Bygone Haslemere. (1914)

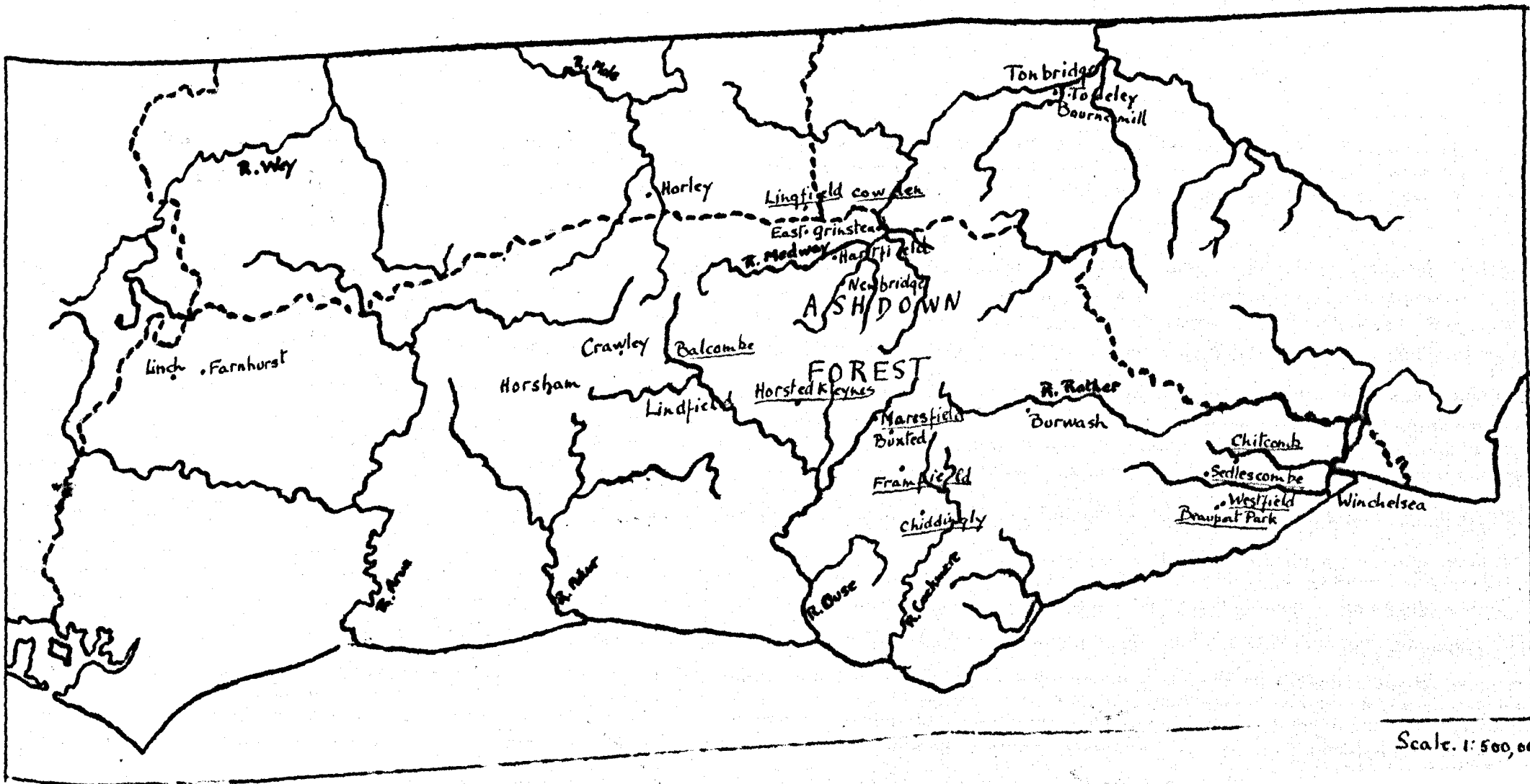
Thorpe, T. Catalogue of Ancient MSS. (1837)

Victoria County History's Sussex iron. L.F., Salzmann.

Surrey iron. M.S. Giuseppi.

MAP A.

The Wealden Iron Industry before 1500.



Scale. 1:500,000.

Places underlined show traces of Roman workings.
 --- County boundary.

MAP B.

--- - County Boundary.

H = Hammer or Forge.

F = Furnace.

(Red) H or F = work continued into the eighteenth century.

Every place marked on the map possessed at least one iron-works, but it has not always been possible to show their exact nature and position. Thus there were iron-works at Kirdford, but whether a forge or a furnace or both is not known. At Frant again there were seven forges. It has been impossible to trace their exact positions and they are therefore indicated thus: Frant 7 H.

A hand-drawn map of the Surrey and Sussex region, showing the River Wey, River Mole, River Rother, and River Arun. The map includes numerous place names such as Frensham, Thursley, Cranleigh, Dunsfold, Chiddingfold, Dorfold, Haslemere, Basingstoke, Farnhurst, Chithurst, Midhurst, Petworth, Pallingham, Slindfold, Horsham, Slaughterham, and Ashurst. The map also shows the River Adur and the River Arun. The map is divided into Surrey and Sussex, with a dashed line indicating the boundary between the two counties.

This map illustrates the Kent Forest area, highlighting the boundaries of three main forest regions: Worth Forest, Ashdown Forest, and Waterdown Forest. The map is oriented with North at the top. Key geographical features include the River Medway flowing through the northern part of the area, the River Eden to the west, and the River Ouse and River Cuckmere to the south. Major towns and villages are marked with dots and labeled, including Tonbridge, Maidstone, Canterbury, Dover, and Ashford. The map also shows various smaller settlements and hamlets, such as Brenchley, Goudhurst, and Tenterden. The forest boundaries are indicated by dashed lines, and the names of the forests are written in large, bold letters. The map is a detailed representation of the Kent Forest area, showing the distribution of forests and the surrounding landscape.

Scale, 1 in. = 4 mi.