Foreword to the Digital Version

Published in 1931, with a number of facsimile reprints since, '*Wealden Iron*' by Ernest Straker is a monograph bringing together all the sites known at that time to the lost iron industry of the Weald of Southern England. This region lies between the North and South Downs, stretching over 100 miles from Hythe in the East to Petersfield in the West, and occupies the greater part of the counties of Surrey, Sussex, Kent and a fringe of Hampshire. Here, iron ore, wood for charcoal and abundant streams and rivers gave rise to bloomery furnaces from the Iron Age, through the Roman occupation, into Saxon times, and then the medieval era, eventually leading to the earliest charcoal Blast Furnaces in Britain, a technology which lasted in the Weald for 323 years, ending in 1813.

Now out of print, this digital copy of the 1931 edition, first reviews the geology and technologies of the iron industry before listing sites by river catchment area.

Straker was the first to actively look for sites using documentary sources, often held in private hands before the advent of County Record Offices. He recorded many sites for the first time. This monograph remained the standard work for 50 years and served as the basis for many of the records now held in the counties Historic Environment Records.

Since its publication 86 years ago, further field work by members of the Wealden Iron Research Group has located over 700 bloomery sites, and reinterpreted some of the 119 blast furnace sites and 109 refining forges.

All of these sites have been entered in a digital database providing location, historical evidence, where available - including ownership and workers - and relevant illustrations such as historic maps. When consulting the Survey of sites in Straker's book – in which locations are given in terms of latitude and longitude and proximity to the nearest church - it is recommended that the current digital database be consulted for OS grid references and the many additional sites and some reinterpretations in the light of new evidence.

The digital database can be accessed via the WIRG web site www.wealdeniron.org.uk/ by clicking on the 'Sites & People Database'.

In 2018, WIRG celebrates its 50th anniversary. This is the earlier of two books available to download from the WIRG web site, the other being '*The Iron Industry of the Weald*' by Cleere & Crossley, first published in 1985 and updated with additional information in 1995. Digitising this book is part of the celebrations to commemorate this occasion by making it widely available to all interested in the early history of the UK iron industry and to provide a searchable text for ease of reference.

Dr T G Smith
Hon Sec WIRG
January 2017

Photo : Ernest Straker.

The Broken Bay of Warren Furnace in 1887.

WEALDEN IRON

by

ERNEST STRAKER

A Monograph on the former Ironworks in the Counties of Sussex, Surrey and Kent, comprising a History of the Industry from the earliest times to its cessation; together with a Topographical Survey of the existing remains from personal observation.

G. BELL AND SONS, LTD., PORTUGAL ST., LONDON, W.C.2
1931

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"Full of iron mines it is in ſundry places, where for the making and fining whereof there bee furnaces on euery ſide, and a huge deale of wood is yearely ſpent, to which purpoſe diuers brookes in many places are brought to runne in one chanell, and ſundry medowes turned into pooles and waters, that they might bee of power ſufficient to driue hammer milles, which beating upon the iron, reſound all ouer the places adjoyning."—*Camden's* "*Brittania*."

PREFACE

THE story of the extinct Wealden Iron Industry has a far greater significance than a mere study in local archæology. Its history is very clear-cut and self-contained, both from the geographical and industrial point of view. Unlike that in other districts, it was never able to substitute coal for charcoal as its fuel, and so came to a complete and definite end, not, as is popularly supposed, by the exhaustion of the woods, but from economic causes.

Commencing in prehistoric times, it was of sufficient importance to have been noticed by Cæsar before the Christian era, and by Strabo shortly after. The Romans, soon after their advent, exploited it on a large scale, as witnessed by the size of their workings. After their departure, during the Dark and Middle Ages it appears to have declined in importance, but remained as a limited and almost domestic industry.

In Tudor times, about the close of the 15th century, a new process was introduced from the Continent, and soon after the casting of iron cannon, at first by the help of foreign experts, was commenced in Sussex. This manufacture rapidly grew in importance, notwithstanding restrictive laws, and soon led to a considerable export trade, frequently illicit. In our island this was the first step of the change from a practically self-supporting and mainly agricultural community, exporting their surplus produce in an unmanufactured state, to a nation depending for the greater part of its sustenance on manufactured exports, and was intimately connected with the rise of overseas trade and colonisation. The great landowners

embarked in this trade as providing a lucrative outlet for their woodland and mineral wealth. The merchant princes of London hastened to finance the industry, buying and selling the furnaces as investments or speculations.

The lesser gentry, yeomen and skilled tradesmen who had charge of the actual management, became an important and wealthy middle class. This is well shown by the number of their substantial houses, equalling or surpassing the manor houses of the same period, that still remain.

We can thus trace, after, possibly, 2,000 years of small things, a meteoric rise in less than eighty years to a maximum importance and thereafter a gradual decline ending in complete extinction rather more than 300 years after this rise commenced.

It has been stated that in its palmy days 200,000 persons were employed; this is a gross exaggeration, but the number in Elizabeth's reign may be safely estimated at not less than 7,000, a very substantial proportion of the industrial population at that period.

With the single exception of the admirable brochure of Miss M. C. Delany, "The Historical Geography of the Wealden Iron Industry," now out of print, no work dealing specifically with this exceedingly interesting chapter of our industrial history has been published.

The first investigator, Mark Antony Lower, of Lewes (1813–1875), who must be considered as the father of the subject, dealt with it in several of his books, and contributed very valuable papers upon it to the "Collections" of the Sussex Archæological Society, of which he was the founder and first president. Having regard to the meagre means of transit at that period, and the lack of large-scale maps, his work was very remarkable. Beside Lower's, there are numerous notes on ironworking included in the "Sussex Archæological Collections,"

notably, those of the late Charles Dawson, F.S.A., of Uckfield.

The Victoria County Histories of Sussex and of Surrey contain able chapters on ironworking by L. F. Salzmann, M.A., F.S.A., and Montague S. Giuseppi, F.S.A., respectively; the latter has also given us most valuable transcripts of records relating to certain furnaces, which will be dealt with under their localities.

Mr. Rhys Jenkins, in the Transactions of the Newcomen Society, 1920–1921 and 1922–1923, has treated the industrial side of the history very thoroughly, and has kindly placed much information at my disposal.

From the above sources, the manuscripts in the British Museum, the state papers and legal records in the Record Office, and numerous articles scattered in various English and foreign publications, and, more especially as regards the early history of iron, from the very thorough works of German, French and Scandinavian authors, I have endeavoured to compile a connected statement, and to give in the topographical section the results of several years' personal field research.

Where not otherwise acknowledged the illustrations are from negatives taken by myself.

I desire to express my indebtedness to the Ministry of Agriculture for giving me access to the tithe apportionments and tithe maps, which have assisted in the identification of many sites; to the officials in charge of the Inspection Room at the Old Bailey; to the Meteorological Office for allowing the reproduction of the rainfall lines on the maps; to the Director of the Royal Gardens, Kew, for identification of the charcoals, and to the Director of H.M. Geological Survey for permission to reproduce slides showing micro-sections of slags.

I have also to acknowledge the kindness of Mr. Rhys Jenkins, Mr. M. S. Giuseppi, F.S.A., the Society of Antiquaries of London, Mr. W. Ruskin Butterfield,

Mr. Sixten Rönnow, of Stockholm, Mr. J. R. Mc.D. Elliot, A.D.C., Uganda, and the executors of the late Charles Dawson, M.A., for allowing me to use their published articles and illustrations. I am indebted to the Editors of *The Times* and the *Connoisseur* for blocks, and the Trustees of the British Museum for permitting reproductions from Drayton's Polyolbion and Evelyn's Sylva.

My thanks are specially due to the Sussex Archæological Society for permission to embody much matter from the " Collections " and the loan of blocks, and to very many members for great assistance, among whom may be particularly mentioned the late Herbert Blackman, the Rev. Walter Budgen, Colonel D. MacLeod, Miss Catherine Pullein, Messrs. H. M. S. Malden, I. D. Margary, J. E. Ray, and S. E. Winbolt, M.A.

Mr. H. W. Dickinson, of the Science Museum, and Mr. A. F. Hallimond, of the Geological Museum, have given valuable help.

As the subject is by no means exhausted, any further information, especially as regards bloomery sites in any part of the country, would be very gratefully received.

ERNEST STRAKER.

Friarsmead,
Pilgrims Way,
Reigate,
Surrey.
April, 1931.

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PART II.—TOPOGRAPHICAL AND DESCRIPTIVE SURVEY

GLOSSARY

In the records and place-names of the industry certain words occur which have a local or specialised meaning. In order to avoid repetition they are defined below :—

Bay . . . The dam holding up a stream to form a pond.

Beach, Beech, Beechy. Stony or gravelly land, sometimes indicating cinder.

Bear . . A mass of imperfectly fused ore that has solidified in the furnace.

Bloom . . The lump of wrought iron produced at a bloomery.

Bloomery . . A forge that produced iron by the direct process.

Brook . . A meadow abutting on a stream, liable to flooding.

Budlett, Butlet. In many cases this field name indicated where the ore was washed.

Chafery . . The power forge in which bar iron undergoes its finishing process.

Cinder, Cynder, Sinder. The scoria or slag from iron smelting by either process.

Cinderbank . An accumulation of cinder in one place.

Cinderfield . A field containing cinder in more or less quantity, usually well spread.

Cole . . *S.* charcoal, *V.* to convert wood into charcoal.

Cord . . A pile of wood cut up and stacked for burning or making charcoal. It may variously be 14 feet long, 3 feet wide, 3 feet 2 inches high = 133 cubic feet; or 8 feet long, 4 feet wide, 4 feet high = 128 cubic feet.

S. A. C., VI., p. 6.

Dyk or Hammerdyk. (Pronounced Dick.) The ditch or leat conveying water to or from the wheel.

Finery . . The power forge used for the first process in converting cast into wrought iron.

Flash . . An old term for pond.

Forge . . In a place-name indicates either a bloomery or a power-hammer of the second period.

Furnace . . In place-names this word is sometimes used for a bloomery site, but much more usually for a high furnace of the second period or indirect process.

Gill . . . A narrow, steep-sided valley with a stream running through it.

It is somewhat curious that this word, so frequent in the north-west of England, is universal in, and practically coterminous with, the iron-bearing districts of the Weald. Professor Mawer thinks it possible that it may be a native English word, peculiar to this area, but as the earliest date for its use is 1404, and it only became common in the seventeenth century, it may well have been imported from the north.

"Place-names of Sussex," Vol. VI., p. 204.

Grove . . In place-names this sometimes means an excavation. Cf. "Grub."

Wright's "Dialect Dictionary."

Hammer . . A power-hammer.

Marlpit	An open pit, the primary purpose of which was to obtain marl for improving the soil, a frequent secondary one being the extraction of the iron ore below the marl.
Mine	The ore itself, not the pit.
Mine-pit	Usually denotes a bell-pit, sometimes an open pit or quarry.
Pen Pond	A pond above the main pond to conserve water.
Pig	A small sow, or branches from the mother sow.
Pitty	A kind of ore.
Plat	A small area of land at a house, about half an acre or less.
Ringer	Iron rod used by furnacemen.
Roman	The Sussex term for anything beyond living memory.
Row	The West Sussex term for shaw.
Scull.	The Tudor "tin hat."
Shaw	A narrow belt of woodland. "A wood encompassing a close." Ray.
Sow, Sowe	A long piece of cast iron made by running the molten contents of the furnace into a sand mould, somewhat of the shape of the hull of a racing skiff, for after conversion into wrought iron bars at the forge.
Spillway	A channel to take the overflow from a pond, often made as a series of stone steps with side walls.
Stumblet or Stumlet.	A frequent field-name, usually woodland, probably meaning full of stumps.
Veins	The best kind of ore.

CHAPTER ONE

IRON IN GENERAL

IRON is the most abundant and cheapest of metals, the strongest and most magnetic of all known substances, and perhaps the most indispensable save the air we breathe and the water we drink. There are now many varieties and alloys of iron, but previous to 1860, and therefore during the period of the Wealden industry, only three kinds were known, viz. :—

"Ency. Brit.," 11th Ed., p. 801.

Wrought Iron.—Slag-bearing or weld-metal series, containing very little carbon—say, less than ·3 per cent.—this does not harden greatly when cooled suddenly. Highly malleable.

Steel.—Intermediate between wrought and cast iron, containing between ·3 per cent. and 2·2 per cent. of carbon, malleable, and capable of hardening by cooling.

Cast Iron.—Not as malleable, containing 2·2 per cent. to 5 per cent. of carbon.

Paleolithic and neolithic man used meteoric iron in its natural state for fashioning weapons, in the same way as flint and other hard stones, but had not found out how to extract iron from its ores by the use of fire.

Professor F. W. Putnam, of Harvard University, writes as follows :—

"Iron in all Ages," Swank, p. 101.

"I have found in the ancient mounds of Ohio masses of meteoric iron and various implements and ornaments made by hammering pieces of meteoric iron. This native iron the ancient people of Ohio used the same as they did native copper, silver and gold, simply as a malleable metal. The Eskimos made knives and other weapons from the native iron found in Greenland, but always by hammering, not by melting and casting."

So far as our present knowledge goes, manufactured iron was not discovered until a date which appears comparatively recent in comparison with the long period of the Stone Age. Dr. Flinders Petrie suggests that iron was known from 6000 to 7000 B.C.

Reginald A. Smith, F.S.A., "Guide to Early Iron Age Antiquities."

The evidence at present available suggests that iron was known in Egypt as early as bronze or copper. Remnants have been found, together with a mirror and tools of copper, belonging to the 6th Dynasty (2700 to 2500 B.C.).

In the extensive deposits of iron cinder found in the Sinai Peninsula, probably worked by the Egyptians, many flint arrowheads have been found.

An antiquity almost as great is suggested by the recent discoveries at Mumbwa, N. Rhodesia, by the Italian Scientific Expedition. Extensive smelting works have been found in a cave, together with stone implements of the late Stone Age. The date is provisionally placed as 1000 to 2000 B.C.

The Times, August 22nd, 1930.

During the last few years evidence has been fast accumulating that iron was smelted in Sussex in neolithic times. The systematic excavation of the South Down camps by the Drs. Curwen and others has shown that iron refuse is frequently present. At Playden, near Rye, Mr. H. J. Cheney has found typical cinder associated with very primitive pottery, and at several sites near Hastings Mr. J. E. Ray has gathered flint implements at bloomery sites.

The archæological theory that there was a specific Bronze Age preceding the Iron Age, and clearly distinguishable from it, seems more of a convenient classification than a definite fact. Beck argues as follows:—

Beck, "Geschichte des Eisens."

The Bronze Age theory arose from a one-sided study of finds, regardless of metallurgy. Copper, although known first, is derived from ores that are rarer and harder to win than those of iron. It requires a temperature of about 1,100° centigrade to melt, as against that of 700° centigrade for

reducing iron. Bronze must be made by melting the required proportions of copper and tin, already in metallic form, as if the ores were mixed, the tin, requiring a much lower temperature, would have gone to slag before the copper was melted.

Dr. John Percy, in his inaugural address as President of the Iron and Steel Institute, delivered in May, 1885, briefly considered the question whether iron was or was not used before bronze. He said :—

James M. Swank "Iron in All Ages," Chap. I.

"It has always appeared to me reasonable to infer from metallurgical considerations that the age of iron would have preceded the age of bronze. The primitive method, not yet wholly extinct, of extracting iron from its ores is a much simpler process than that of producing bronze, and indicates a much less advanced state of the metallurgic arts. In the case of iron all that is necessary is to heat the ore strongly in contact with charcoal; whereas, in the case of bronze, which is an alloy of copper and tin, both copper and tin have to be obtained by smelting their respective ores separately, to be subsequently melted together in due proportions, and the resulting alloy to be cast in moulds, requiring considerable skill in their preparation."

Bronze was introduced into Europe from Asia by the Phœnicians. In comparison with iron it was rustless, easier worked, and capable of being cast into the forms required. If broken, it could be recast and it was stiffer than the soft iron then known. It is on record that in the struggle of the Barbarians with the Romans, the former had to pause in battle to straighten their iron swords, which bent with a heavy stroke, while the Romans could push on with their heavy bronze swords.

The more valuable metal became the evidence of rank and possessions, and was therefore more frequently buried with the chiefs, and remained practically uncorroded in their graves, whereas the iron weapons of the common folk usually rusted away, although at Hallstadt more iron than bronze has been found.

The Bronze Age period may therefore be defined as that in which bronze was the most prized and the pre-

dominant metal, the poor and soft iron then produced taking a very inferior place.

As the manufacture of iron improved, and more especially as the development of the harder varieties and steel took place, the indigenous and more abundant metal came into the ascendant.

Reginald A. Smith, F.S.A., "Guide to Early Iron Age Antiquities."

"There is little doubt that the headquarters of the early iron industry of Europe came within the borders of Noricum, a province of the Roman Empire corresponding to Styria and Carinthia, and a part of Austria, Bavaria, and Salzburg. It can hardly have been a local invention, and though the date of its inception is approximately known, the route by which the craft reached Central Europe has not been determined. The Adriatic would afford an obvious approach from the eastern Mediterranean; but the possibility of transmission through the Balkans from the fabled home of metal-working south of the Black Sea must not be overlooked. Once the art had been learnt, the abundant supplies of the metal in Noricum would create an extensive industry, and certainly led to important conquests and tribal migrations."

M. A. Quiquerez considered that the early smelting furnaces of Switzerland and the Jura date from at least 1000 B.C. These regions were later overrun by the Celts or Gauls, and they may well have carried the art of iron-making into France and Britain in their further progress. Another branch of the same race, the Belgæ, is known to have crossed the Rhine into Northern France about 250 B.C., and, according to Cæsar, invaded Britain, settling more particularly in the south-eastern counties. By that time, although perhaps not up to the Roman standard, they were by no means savages, but were well advanced in civilisation and the primitive arts.

As Cæsar tells us, they were skilled in ironworking and ironmining, and no doubt increased the already existing production of iron, as it became an article of export from Britain before the Roman period.

CHAPTER TWO

THE WEALD AND ITS GEOLOGY

THE Weald is one of the best defined geological tracts in England. Geologists bound it by the chalk escarpment, which, commencing at Folkestone, passes in a generally western direction through the counties of Kent and Surrey to the borders of Hants near Petersfield, this range being called the North Downs. From this point it runs in a direction slightly south of east to the sea again at Beachy Head, forming the South Downs. Before the formation of the English Channel this tract extended to what is now the French coast in the neighbourhood of Boulogne, and included the district called the Bas Boulonais, the total length from east to west, at present about ninety-five miles, being then roughly 125 miles, and the greatest width, from north to south, say, Snodland to Eastbourne, being forty miles.

Topley, "Geology of the Weald."

The Weald, properly so called, and regarded as such in ancient times, is the Lower Cretaceous district within the escarpment of the Lower Greensand. This is entirely of fresh-water origin, with the exception of the very small outcrop of the Purbeck beds.

F. J. Relf, Geo. Mag., III., 1916

The Wealden beds consist of clays or sands, the latter hardening in part to form sandstone. It is considered by geologists that the material was brought down by a large river from an Atlantic continent in the south or south-west, of which the granite of the West Country and of Ireland are the only relics to-day. This river flowed into a shallow inland lake with an excurrent river emerging

Jukes Brown, "Stratigraphical Geology," Map, p. 472.

from its southern side and running south-west through France. Whether the silt brought down by the river, and deposited in the quiet waters of the lake, was derived directly from the wear of igneous rocks or secondarily from older sediments, it contained a considerable percentage of iron and the lake water was strongly charged with iron.

Milner.

The iron could have been deposited as a sediment, but it seems probable that a great deal was formed by chemical precipitation due to the absorption by plants of carbon dioxide.

Herder, Molisch, and Winogradsky consider that much of the bog-ore was deposited by iron bacteria.

It will be seen from the map that the Hastings beds occupy a spear- or pear-shaped area, with the broad end bordering on Romney Marsh and the point about Horsham, and that the Weald Clay forms a fringe, narrow at the north and south sides of the spear, but extending some twenty-two miles west of Horsham to the Hampshire border.

Although geologists include in the Weald the whole of the beds below the chalk hills, the district anciently included in that term was bounded by the Lower Greensand escarpment. This is borne out by the fact that in the tithe maps of the parishes of Bramley and Hascombe in Surrey, the boundary line of the "wield" is marked at the southern edge of the Greensand. The reason for this is that by ancient custom woodland in the Weald was, and still is, free from tithe.

In Kent, however, the line of demarcation, south of which the woodland is exempt from tithe, is often the Pilgrim's Way, at the foot of the chalk escarpment. Furley, in his "Weald of Kent," quotes from Hasted and Lambarde as follows :—

P. 699.

"There are diversities of opinion touching the true limits of the Weald; some affirming it to begin at one place and some at another;

. . . it may more reasonably be maintained that there is no Weald at all, than to ascertain where it ought to begin or end."

The weight of evidence appears to favour the narrower interpretation. I therefore restrict the term to the Weald Clay and the Hastings beds, excluding the Lower Greensand and later formations. This agrees with the MS. in the Surrenden library, written by Sir Edward Dering in the time of Charles I. as recorded and adopted by T. D. W. Dearn in his "Weald of Kent" (1814).

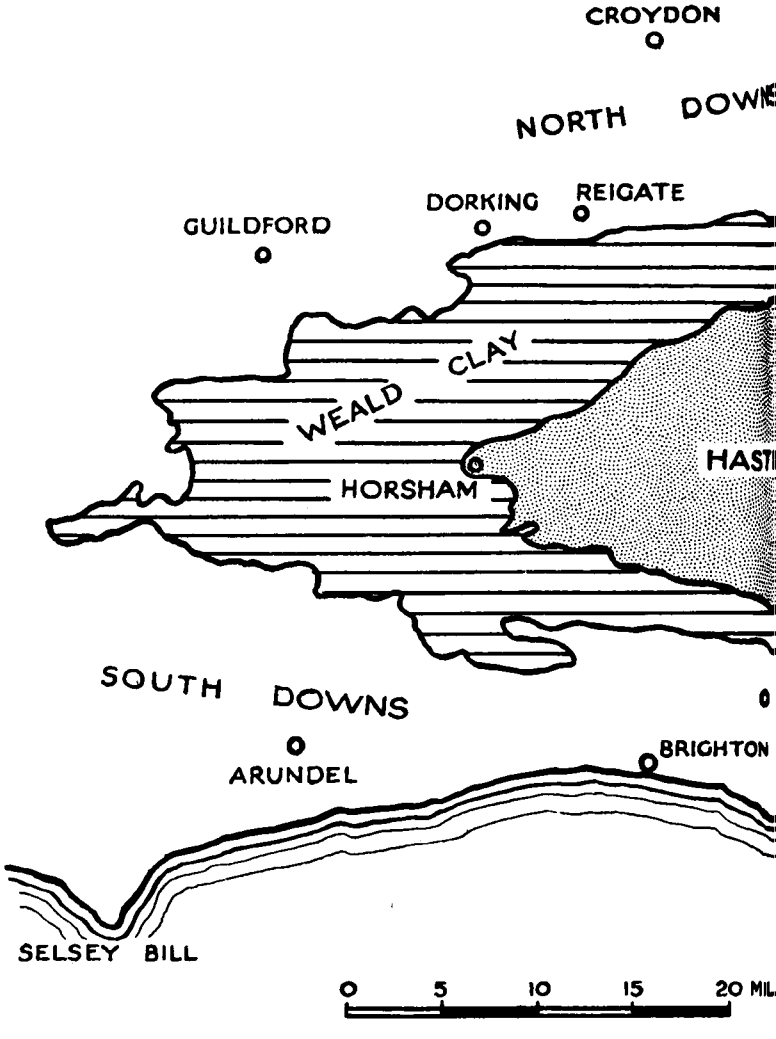
This area is practically coincident with the iron-bearing strata, as, although the Lower Greensand contains a brown siliceous ironstone called Carrstone, there is no definite evidence of its ever being smelted.

Some works were established on the Greensand, in the later period of the industry, to take advantage of the water-power of its streams, but the minepit place-names are all on the Weald clay, below the escarpment. Iron Hill, west of Haslemere, in Linch and Woolbeding parishes, may be named from the Carrstone, or it may be a corruption of "Higher Hill," being so spelt in the Linch tithe apportionment.

Although the Weald clay is gently undulating, it seldom rises more than 400 feet above sea-level. The Hastings beds, running in several more or less parallel ridges in an east and west direction, attain heights of nearly 800 feet in Ashdown Forest and 700 feet at Brightling Obelisk.

This area is drained not only by the main rivers, but by numerous tributary streams, which often form deep ravines called locally "gills," usually wooded. This picturesquely broken region, abounding in mires and bogs, together with its surrounding defence of the foundrous Weald clay, formed in ancient times the great forest called by the Romans Anderida, from the Celtic word Andred, meaning an unfrequented or untrodden spot. The Anglo-Saxons called it the Wild, and the

Lower's "History of Sussex."



THE STRATA ON THIS SKETC

Lower Cretaceous.	Fresh Water.	
	Hastings Beds	Ashdown Sa Wadhurst C Tunbridge W
Wealden Beds		(These sub-divisions a that they cannot on a small scale ma
	Weald Clay	

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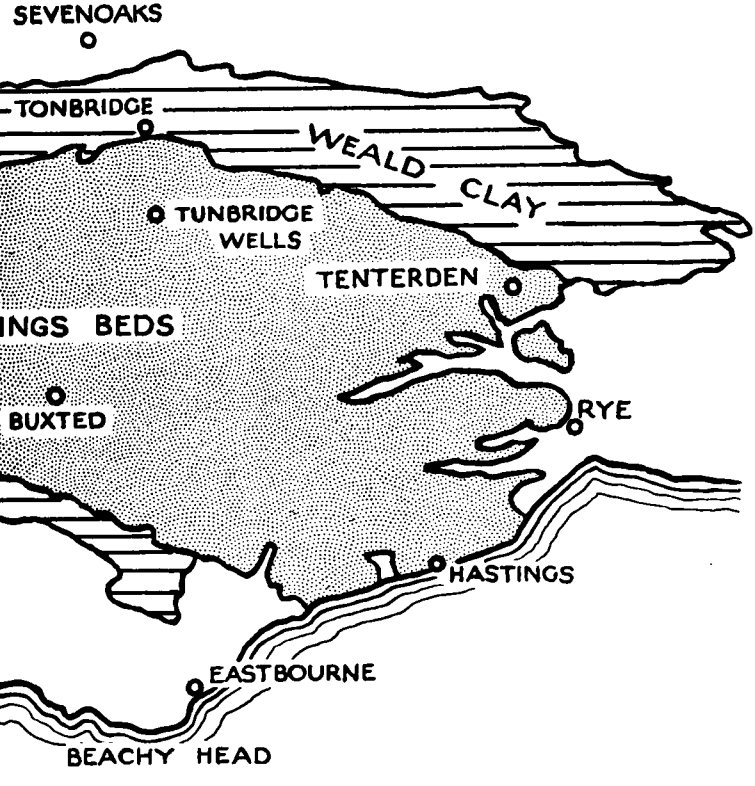


ES

CH MAP ARE AS FOLLOWS:

	Marine.	
nd	Lower Cretaceous	Lower Greensand
lay		Gault
Wells Sand		
are so intermixed be differentiated up.)	Upper Cretaceous	Upper Greensand
	(Blank on Map.)	Chalk

word was written Wyld up to the 17th century. On the sea side it was further isolated by tidal estuaries which extended far inland in what are now Romney Marsh and Pevensey Levels.

There is but little evidence of its occupation in prehistoric times, in striking contrast to the numerous traces on the chalk downs and the fertile valleys beneath them.

Apart from the sea-coast, the Romans seem to have left it almost untouched save by the military road of Stane Street. The iron works, not founded but exploited by them, are perhaps the most noteworthy relics of their rule. No traces of buildings at the early workings have yet been discovered, which leads one to the supposition that the industry was a seasonal one, carried on in the drier part of the year only, with temporary shelters. Such seasonal occupation certainly was the case in Saxon and early Norman times, when the people of the well-populated and fertile belts lying between the chalk escarpment and the Greensand hills during the summer months grazed their cattle and hogs in the forest and cut their fuel there. The nobles also had in it their hunting lodges, and in some cases it was the duty of their tenants to put up "summer houses" for them. A parallel may be instanced in Switzerland, where the villages each have their woods for fuel and their Alps for summer pasture.

In course of time clearances and permanent settlements were made and the forest gradually subdued.

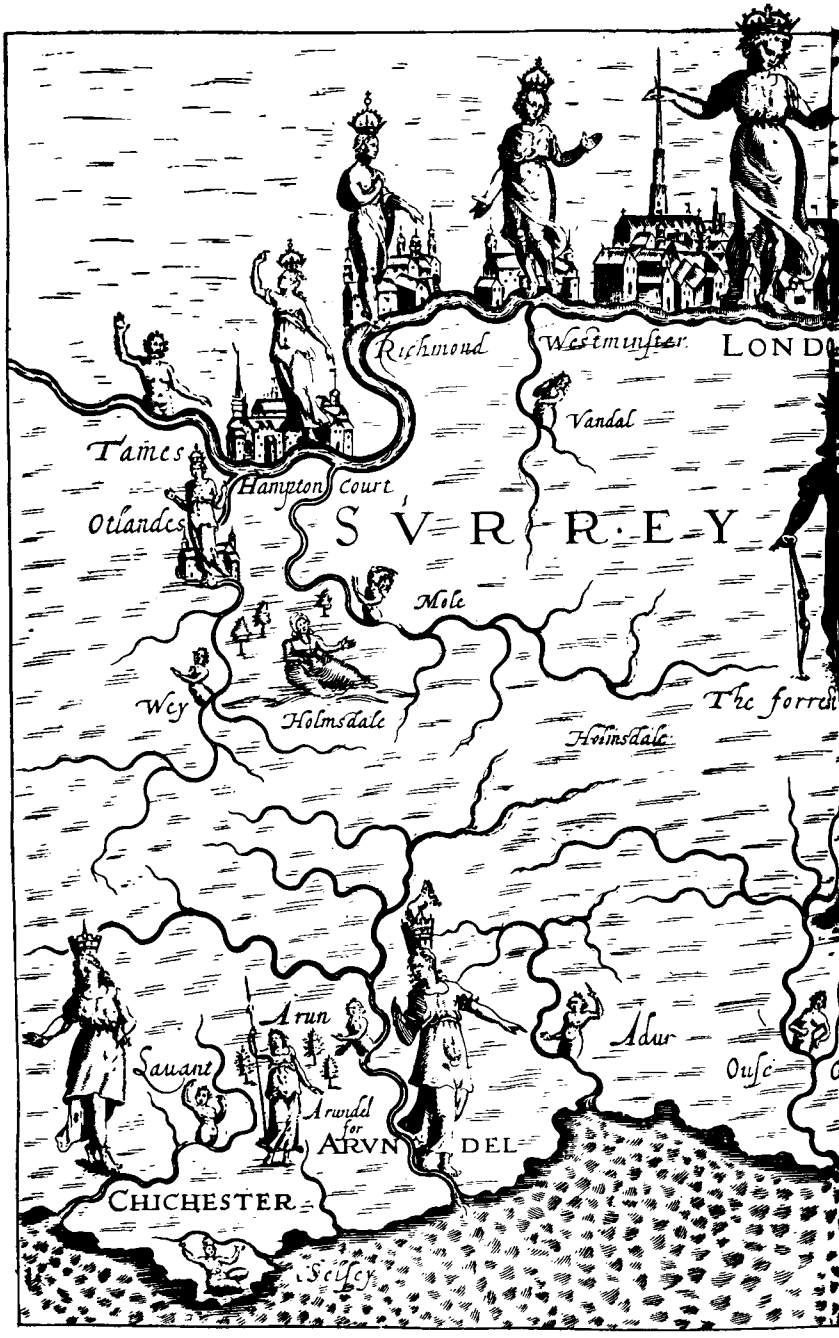
Many of the bordering parishes still have long strips of territory extending into the Weald, although in later times portions were cut off and formed into independent units.

Large areas, however, especially on the barren sands of the central ridges, remained as deer forests in the hands of the Crown and the great nobles, and to this day retain their wild character.

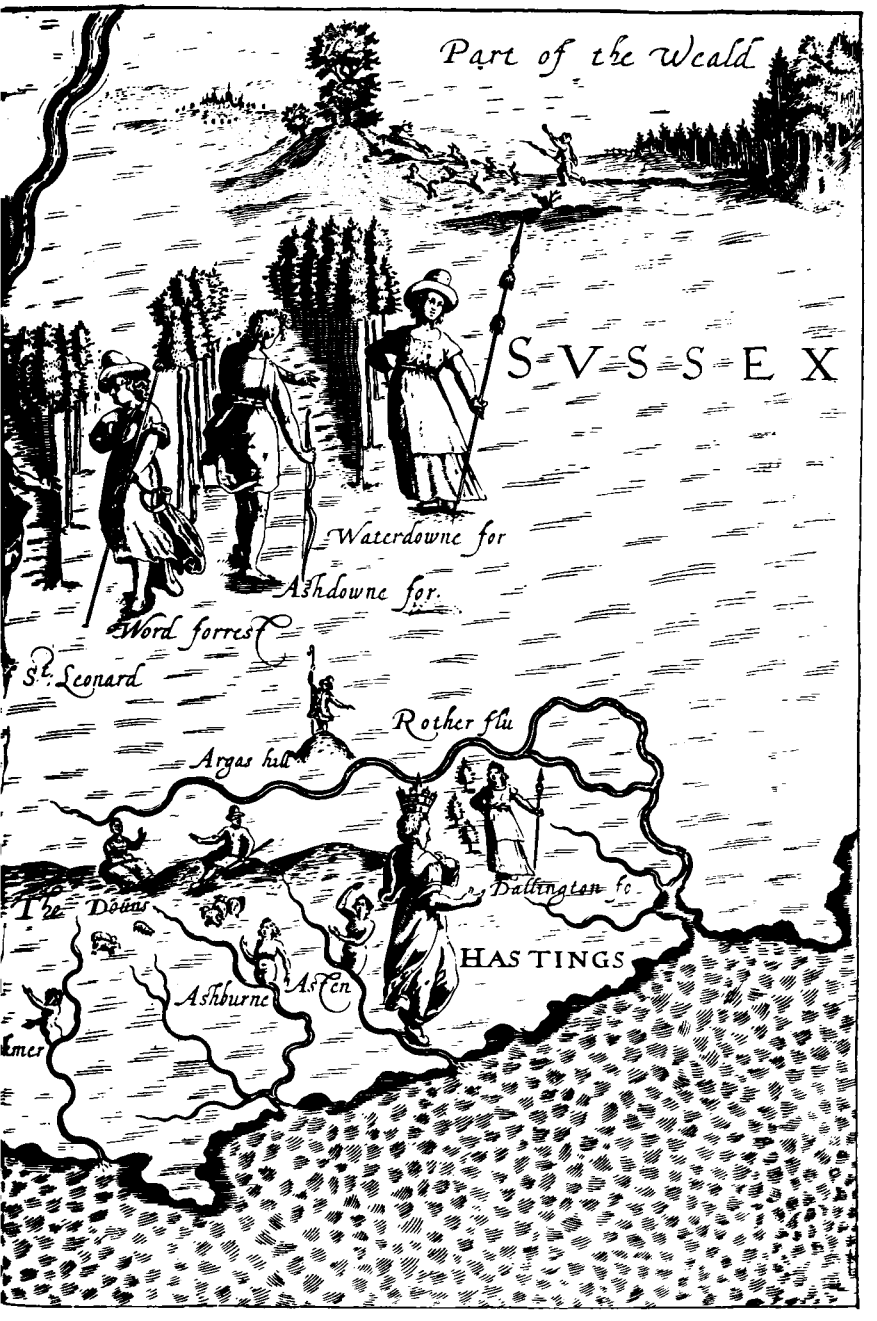
We have still the fine stretch of St. Leonards, Tilgate, Worth and Ashdown Forests, the stretch south of Tunbridge Wells formerly called Waterdown Forest, and Dallington Forest in the east. These forests largely consisted of open ground clad with heath and scrub; indeed, it is most probable that at the present day they are much more wooded than in ancient times, owing to the extensive planting of coniferous trees.

Camden, in his "Britannia," describes it thus:— 1610 Ed

The hithermore and Northren ſide thereof, is ſhaded moſt pleaſantly with woods, like as in times paſt the whole country throughout, which by reaſon of the woods was hardly paſsable. For, the wood Andradſwald, in the Britiſh language Coid Andred, taking the name of Anderida the Citty next adjoining, tooke up in this quarter, a hundred and twentie miles in length, and thirtie in bredth; memorable for the death of Sigebert King of the Weſt Saxons, who beeing depoſed from his roiall throne, was in this place ſtabbed by a Swineheard, and ſo died. Many prety riuers it hath, but ſuch as ſpringing out of the North ſide of the ſhire forthwith take their courſe to the Ocean, and therefore not able to beare any ueſsell of burden. Full of iron mines it is in ſundry places, where for the making and fining whereof there bee furnaces on euery ſide, and a huge deale of wood is yearely ſpent, to which purpoſe diuers brookes in many places are brought to runne in one chanell, and ſundry medowes turned into pooles and waters, that they might bee of power ſufficient to driue hammer milles, which beating



The Rivers of the Weald, as depicted in Drayton's



Polyolbion, 1612 edition, attributed to William Hole.

Reproduced by permission of the Trustees of the British Museum.

upon the iron, reſound all ouer the places adjoyning. And yet the iron here wrought is not in euery place of like goodneſse, but generally more brittle than is the Spaniſh iron, whether it bee by the nature, or tincture and temper thereof. Howbeit, commodious enough to the iron Maiſters who caſt much great ordinance thereof and other things to their no ſmall gaine: Now whether it bee as gainefull and profitable to the commonwealth may bee doubted, but the age enſuing will bee better able to tell you.

Vol. II., p. 382. Hasted, in his History of Kent, 1782, says :—

"The soil on which these woods are situated is in general a stiff clay. They are mostly oak coppice, sometimes, though but rarely interspersed with oak trees which are much fewer in them than formerly owing to the great increase in the price of timber and the consumption made of them for these furnaces. There are plenty of little springs among them of a browner colour than is common to ordinary waters, which leave in their passage tinctures of rust. The iron ore is found in great abundance in most parts of these woods.

Great quantities of cannon as well for the use of Government as the merchant are cast at these furnaces besides backs for stoves and suchlike as well as bars from the best sort of the ore, after having been worked in the forges for that purpose."

From the earliest times this forest region, with its abundance of fuel and easily won ore, was the seat of the iron industry, which was mainly confined to the Wealden beds, or High Weald.

The chief source of the ore was the lower beds of the Wadhurst clay, the middle section of the Hastings Sands, although the veins of ferruginous sandstone that occur in the other beds were also worked. In the Weald Clay, or Low Weald, more especially in the western part of the Weald, the concreted ferruginous gravel,

called Ragstone, which lies on the clay, has been used, and there are occasional thin veins of sand containing a fair amount of iron, which were worked for a short time in the palmy days of the industry, but were quickly exhausted.

Martin, "Western Sussex," p. 41.

CHAPTER THREE

THE TWO PROCESSES

In tracing a clear history of the production of iron, the all-important fact to be borne in mind is that there were two distinct methods.

The first, the direct or bloomery process, produced from the ore in one operation a comparatively small mass of wrought iron, sometimes of a steely nature, fit for immediate forging into tools, weapons, bars and other small products. This survives to-day only among savage races. It required simply manual labour, with but few tools and appliances, and was usually carried on as a domestic or a nomadic industry.

The second, the indirect or blast-furnace process, even in its earlier and simpler forms, needs buildings, power, and plant, and therefore was a highly capitalised industry carried on in permanent quarters. This has now developed into the huge establishments of the present day, which, with their manifold dependent industries, have become the main element of our present-day civilisation.

Unlike the earlier process, the blast furnace produces cast iron only, which, apart from its direct use as castings, requires working in a forge to convert it into wrought iron, or other operations to convert it to steel.

The distinction between these two processes, the latter of which soon after its introduction quickly superseded the former, has been frequently ignored or slurred over by writers on the subject, either through want of

discrimination on their part or from their assuming that their readers possessed the necessary technical knowledge.

The extraction of iron from its ores in ancient times was always by the direct process, which is practised to this day by the natives of India, Borneo and Africa. The apparatus employed is of the simplest kind, consisting of a small furnace or hearth and some form of blowing machine. Only rich ores are employed, and the fuel is invariably charcoal. A lump of malleable iron is directly obtained, which is hammered out into a solid mass, called a bloom, which is afterwards extended under the hammer into bars. The term bloom is still in common use, and is clearly derived from the Saxon word *bloma*, which is defined by Bosworth as "metal, mass, or lump." The ancient furnaces in which the direct process was carried on were designated *bloomeries*. The phrase *bloma ferri* occurs several times in Domesday Book.

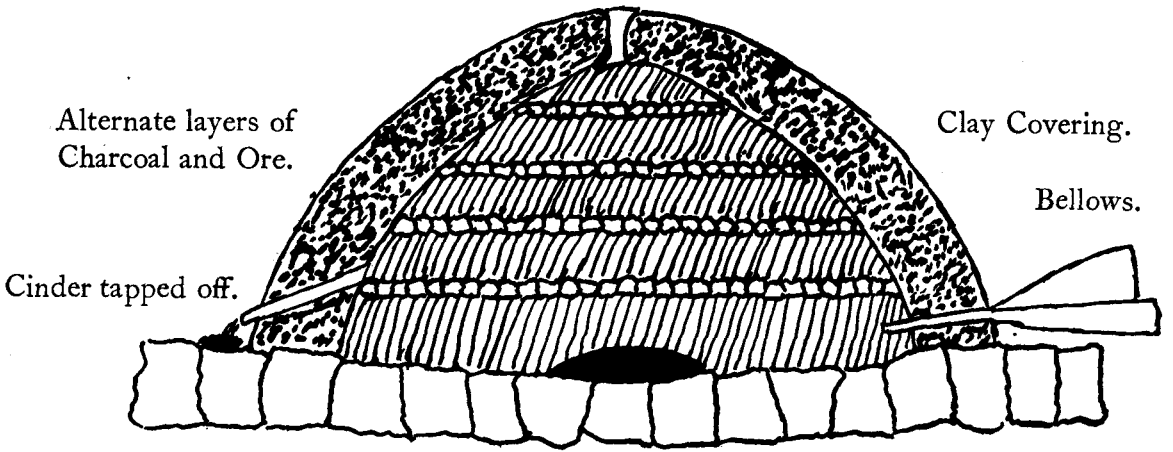
Percy. "Metallurgy of Iron and Steel," p. 254.

Lower. "Contributions to Literature," p. 117.

The iron thus produced is very impure, containing much cinder, which has to be beaten out by the further processes. The cinder drawn from the furnace contains a large percentage of unextracted iron. The method is therefore frequently stigmatised as being wasteful, but this is a moot point, as the complete product probably required less charcoal for a given weight than that produced by the indirect process, and the fuel must always have been the most costly factor.

These ancient cinders, rich in iron, have frequently been utilised in place of raw ore in blast furnaces, as in the Forest of Dean, where, in consequence, the deposits have been very largely exhausted. There is no evidence that the ancient cinder was so utilised in the Weald.

The cinderheaps in the Weald have been to a great extent destroyed for road-making, and practically no systematic excavations for the purpose of investigating



CONJECTURAL DIAGRAM OF A BLOOMERY HEARTH.

the method used have been made, so that the following description is to a large extent conjectural, and may be modified by future discoveries.

So far as our present knowledge goes, the bloomery hearths in the Weald were of a very primitive character, similar to those described by Bergrat Hundt, as used in Siegen, Westphalia. "Mittheilung des Vereins für Alterthums-Kunde."

A circular platform, some 7 to 9 feet in diameter and slightly concave, was formed of rough sandstone or other hard material, or even beaten clay. Surrounding this, at the same level, the surface of the soil was gravelled with fine broken material, frequently burnt clay from former smeltings. This made a standing place for the workmen and a floor for the bellows. It also received the slag when tapped off. Upon the hearth alternate layers of charcoal and ore were formed in a conical heap. The ore had probably been previously washed to remove the adhering dirt, etc., and then burnt. The burning got rid of some of the impurities and rendered it easy to break the ore into small pieces on which the glowing charcoal could act with more effect than if large pieces were used. The heap was then covered with a thick coating of clay, in a very similar manner to a charcoal "pit." The bellows, worked by hand or foot, perhaps several pairs, were placed round the hearth.

The erroneous idea, perpetuated by writer after writer, each copying from his predecessor, that the ancient furnaces were situated on windswept hills, and depended on natural draught, must be repudiated here. It is apparently based on the primitive practice for lead smelting in Derbyshire. This may possibly have sufficed for the reduction of lead ores, but the strong and continuous blast required for the reduction of iron ore could never have been obtained from the fickle winds. The place-name Cinderhill, which has been used to support this contention, though not infrequent, is far out-

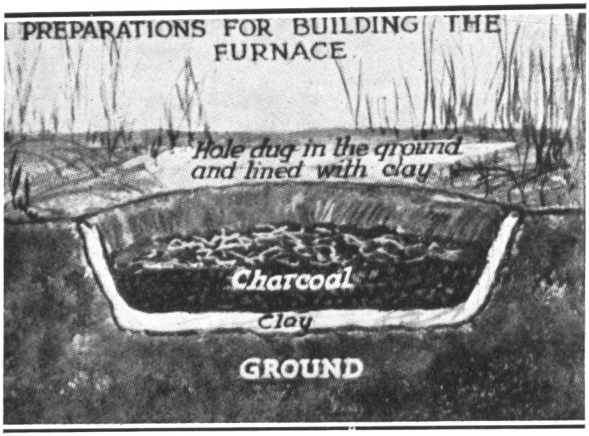
numbered by other compounds of "Cinder." The situation of the bloomeries conclusively contradicts this theory. They are almost invariably in a valley by a rill or stream, or, at any rate, a spring, and in many cases in such deep gills that calm prevails even in windy weather.

A supply of water seems to have been essential, either for drinking or, what seems more probable, for use in the troughs or "boshes" such as one sees to-day in any forge for cooling the tools. At this period the water was not used for power. The bellows, as well as the hammer and anvil, must have been used in the working of gold, silver and copper before iron was known, and it was owing to the development of these instruments that the extraction of iron from its ores became possible.

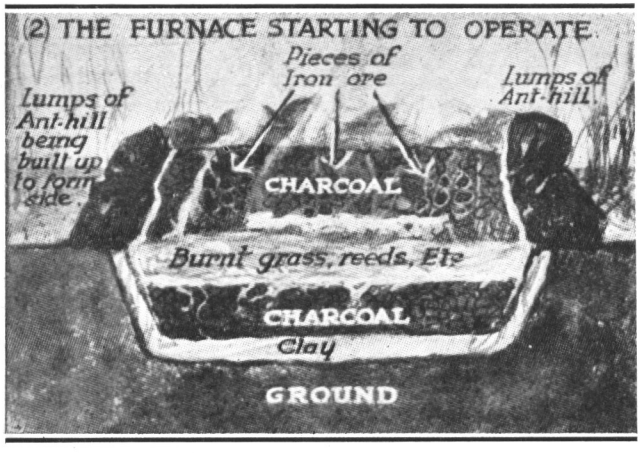
The shape of the European bellows was derived from its primitive form, namely, the skin of an animal made into an air-tight bag, with provision for admitting the air by a valve somewhere about the middle and expelling it through the neck into a clay or metal tube, called a tuyère, that projected into the furnace. This was improved later by the addition of wooden boards, forming the upper and lower surfaces. The African bellows is a drum-like vessel of earthenware or wood with a flexible leather covering. In the Far East a rude form of cylinder with a piston working in it has been used.

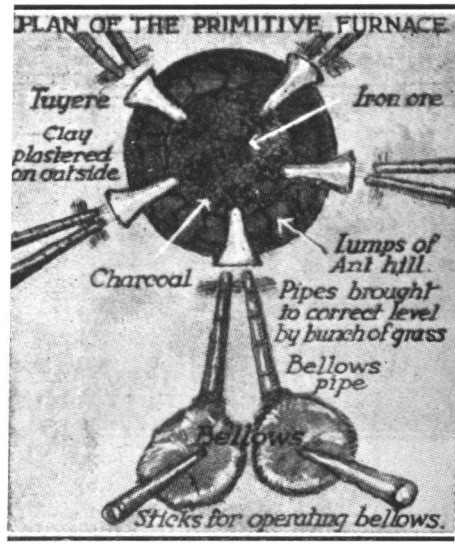
In all cases the bellows were in pairs in order to ensure a continuous blast by alternate working.

The nearest parallel at the present day is the method used in Uganda, as described by Mr. J. R. Mc.D. Elliot, A.D.C., in the *Graphic* of November 1st, 1924, which is here inserted by his permission :—



"When the natives want to produce iron they erect their furnaces on selected spots, and when the ore has been smelted, destroy them. The size of the furnace depends on the quantity of iron ore to be smelted. Some stand about six feet high, with a diameter, at the bottom, of about four feet, and have one bellows going; but the average size seems to be about three feet in height, two feet in diameter, and with anything from five to seven bellows blowing.





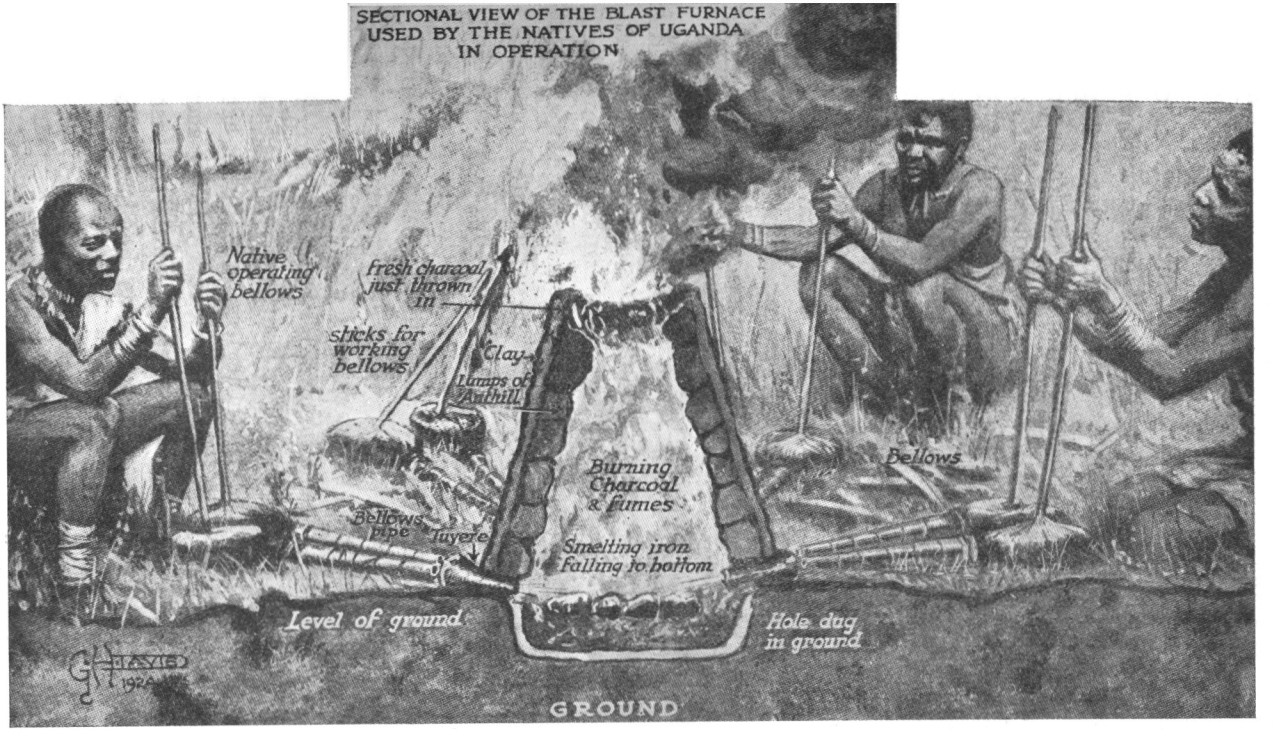
"The methods of procedure vary but slightly. In some instances a layer of about three inches of charcoal is first placed at the bottom of the circular hole, round which the furnace is constructed; in others this layer is omitted.

"Directly the building is finished the bellows men get their bellows in position and are working them before the plastering has been completed. Charcoal has been heaped into the furnace while the building was going on, and it is kept to the level of the top of the ant-hill lumps, above which a small plaster wall about four to six inches high is built.

"The time occupied by the whole of this procedure is not more than from three to five minutes. As soon as the plastering is finished, the bellows get agoing at full blast. The furnaces often threaten to collapse, and when signs of this appear they are simply tied round with "kamba" (reeds) and any bad cracks plastered up. Once the furnace is burning properly it is only a matter of the bellows being kept at full blast and more charcoal being piled on when needed. The whole operation of smelting takes anything from four to five hours.

"When the natives consider that the ore has been properly smelted the bellows are all taken away, and one or two men proceed to knock the walls down. Another man lifts the smelted iron out with a long stick, and several other men break it up into small and workable lumps.

"The bellows may thus be described: The leather covers are made simply by placing one end of a stick in the centre of a skin and then tying the skin round it, the skin being then thrown over the bowl of the bellows,



African Smelting.

with the fur underneath, and tied round the lip. The bellows is made to blow by working the sticks up and down."

See plate, p. 100.

It is a noteworthy fact that the micro-sections of the cinder produced from a similar Uganda furnace are identical in structure with some early Sussex examples.

It will be noticed in this figure that the lower portion of the furnace is slightly sunk in the ground, with a clay lining. This "pot," with varying degrees of depth, seems to have been used in Northern Europe, and it is possible that further discoveries may show that it was used in the Weald. Other methods were the use of clay pots, whether single, as in Jutland[1] or multiple, as in Swabia[2] and in China,[3] and the excavation of the furnace in a firm clay bank, as in India.[4]

To return to the Wealden practice, when fire had been kindled the heap or furnace was closed, and the bellows kept in blast for many hours. The purer iron settled in a spongy mass at the bottom, while the other constituents of the ore, mainly silica, remained above the iron as slag, and were in part drawn off through openings for that purpose. From the remains at Beauport, Footlands and Ridge Hill, it would seem likely that the whole heap was demolished to obtain the lump of iron, and raised anew on the debris for the next smelting. The spongy mass of iron was much intermixed with cinder, which had to be hammered out.

It was wrought iron, sometimes of a steely nature, and could be used by the smith without further processes.

It should be noted that the iron was never actually fluid, but only of a pasty constituency. If by accident too great a heat was used, a product similar to cast iron was occasionally made and rejected, as they had no know-

[1] "La Production du Fer en Jutland." Niels Nielsen.
[2] "Fundberichte aus Swaben." A. Schlegg.
[3] "China," V. 2, p. 412. F. von Richtofen.
[4] Percy. "Metallurgy," p. 254.

ledge of how to reconvert it. This appears sometimes among the refuse.

The blooms thus produced were sold to the consumer, as was the bar iron of the blast or indirect process. In neither case was any further working up done at the furnaces.

The sites can be readily distinguished, as the bloomeries were usually on very small streams, while the blast furnaces and their forges were on streams capable of supplying water-power, generally with bays forming, or having formed, ponds. The cinder is also quite different, as described later in the chapter on Cinders and Slags.

The completed furnace fired by charcoal, and the bellows men at work.

CHAPTER FOUR

THE EARLY HISTORY OF IRON IN THE WEALD

THE bloomery process, as described in the previous chapter, was that carried on in the Weald until Tudor times, when it was almost entirely superseded by the blast or indirect process, although it lingered on in some localities till the 17th century. Although he did not clearly differentiate it from the later method, Mark Antony Lower was the first to publish the discovery of Roman workings at Maresfield by the Rev. Edward Turner in 1844, and other Roman finds at Chiddingly, Sedlescombe, and Westfield, and mentions in his list of places a few other bloomery sites. Together with those recorded by other contributors to the Sussex Collections, up to quite recent years they numbered less than a score. Modern investigations have shown that they are very numerous, and the proved sites put on record in the Topographical section of this book are in all about one hundred. Colonel D. MacLeod has traced in a limited district around Heathfield and Warbleton no fewer than ten, and I have proved in other parts of the Weald about fifty, in addition to those noted by other observers. The only means of tracing the positions other than those accidentally exposed by excavations for drains or foundations are the field-names and the field knowledge of the workers on the land. Much remains to be done, especially by enquiry in each locality, and I should be very grateful for additions to the list.

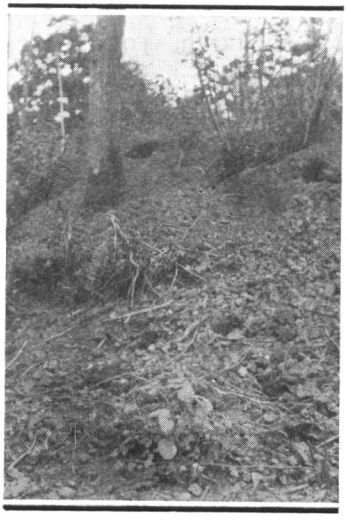
S. A. C., II., p. 169.

In the majority of cases the cinder has been spread over a large area by centuries of ploughing, so that the actual site of the hearth is not to be found. In many, although the field-names and sometimes tradition show that cinder existed, the land has been laid down to grass, or is covered with wood, and no vestige remains. Some of the cinder may merely indicate the site where the ore was burnt. This was done in the later period as well as in the earlier.

The deposits vary very much in extent. It will be seen from the maps that the bloomeries are most frequent in East Sussex on the Wadhurst Clay, and are scarce on the Weald Clay. With the exception of a very few sites of which we have written records, it is quite impossible to date them before and after the Roman period, the process and the cinder produced remained the same for perhaps 2,000 years.

The material for the history of the industry before Tudor times is exceedingly scanty. One might well adopt the words of Dr. Trevelyan, in his inaugural lecture as Regius Professor of Modern History :—

> "On the shore where Time casts up its stray wreckage, we gather corks and broken planks, whence much indeed may be argued and more guessed; but what the great ship was that has gone down into the deep, that we shall never see."



Cinderheap at Orznash.

It is certain that iron was produced in the Weald long before the Roman occupation. Pre-Roman pottery has been found a

Herrings (Dallington), Bardown, Ridge Hill, and Playden.

The excavations at Saxonbury Hill in 1928, under the supervision of Mr. S. E. Winbolt, revealed a fair amount of British iron cinder, which was probably taken to this high place for use in making pottery. This is identical in character with that found below the hill in Colegrove Wood and also at Sandyden Gill, not far away.

See pp. 274, 288. The date of this camp has been determined as between 750 B.C. and A.D. 43, and then extending also well into the Roman epoch.

I have also found similar cinder at the great camp at Dry Hill, near Lingfield, which is supposed to be neolithic.

The large accumulations of cinder at the known Roman sites would seem to indicate that the Romans continued to produce iron at spots where the industry had been carried on for a long period before they took it over, as is suggested by the occurrence at Ridge Hill of pre-Roman

See p. 235. pottery *below* the Roman. It was probable, however, that the Romans, following their usual custom, employed large bodies of servile workers at these sites.

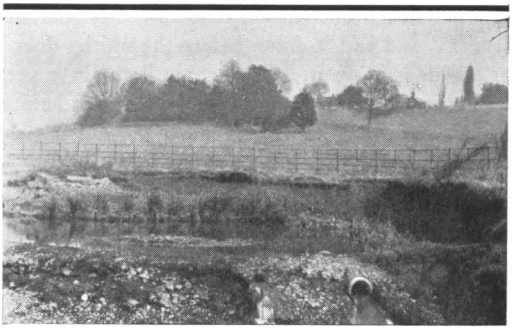
In March, 1928, Mr. S. E. Winbolt discovered a considerable section of Stane Street at Roman Gate near Slinfold. He says :—

The Times, April 3rd, 1928.

"Across the fields liable to Arun floods the exact course of Stane Street has not been known, but the matter has just been decided by digging 20 yards south of the Guildford road. The surface of the Roman road is 2 ft. 4 in. down in the centre, and a little deeper at the sides. The width is about 20 ft. It is the most solid piece of Stane Street I have yet seen. The level surface is composed of a double layer of thin slats of hard sandstone, under which is a foot of iron slag broken small and bound together with fine earth, and bedded on yellow clay."

This is undoubtedly bloomery cinder.

This very large quantity of cinder must have been the result of many years' working and must therefore considerably ante-date the Roman period.



Hearth.

Roman Bloomery at Ridge Hill.

We have, therefore, during the period previous to and during the Roman occupation clear evidence, well dated by pottery and coins, that the industry was a large and important one, which probably produced an exportable surplus after the supply of local requirements.

Although there is an almost entire absence of any record of iron in the Weald from the time when the Romans evacuated Britain till the 13th century, it does not seem conceivable that the industry died out there.

It was well known in Iceland previous to A.D. 1000, having been introduced into that island, according to the Landnabok, by Celtic colonists from Britain.

Aäboker Nordisk Oldkynst 1926. Niels Nielsen.

So far as I know, the only clear mention of the bloomery process, as distinct from the working up of the iron by the smith, occurs in Egil's Saga, recently made available in a masterly translation by Mr. E. R. Eddison. It runs as follows :—

" Skallagrim was a great iron-smith, and had great smelting of ore in wintertime. He let make a smithy beside the sea a long way out from Burg, there where it is called Ranfarness, he thought the woods lay not over far away there. But when he found no stone that was so hard and so smooth as might seem to him good to beat iron on, . . . Skallagrim went down to the sea and dragged down an eight-oar ship that he had, and rowed out to Midforth isles. . . . And now stepped he overboard and dived, and had up with him a stone, and brought it up into the ship.

Quoted by permission of Mr. E. R. Eddison and the Cambridge University Press.

And now fared he himself into the ship and rowed to land, and bared the stone to his smithy, and laid it down before the smithy door and thence-forward beat all his iron on it. That stone lieth there yet, and much burnt slag nigh; and that is seen of the stone, that it is hammered down, and that it is surfworn rock, and nought like to that other rock that is there, and now will not four men lift a greater."

The period to which this refers is between A.D. 879 and A.D. 901, and the scene was in the south part of Faxa Flow, in the south-west of Iceland. The mention of the slag clearly indicates that this was a bloomery, not a smith's forge.

There is also the following stanza :—

Much betideth that iron-smith
Early to rise, who pennies
Will lay up. The wind's weeds
Welcome Viddi's brother
Let the sledge hammers yell on glowing
Gold of Beam-enjoyer
While stirring cots that swallow
The storm-blasts whistle.

Mr. Eddison explains that "the wind's weeds" and "stirring cots that swallow the storm blasts" mean the bellows. Viddi's brother is the wind; it is not known who Viddi is.

Mr. Niels Nielson has recorded many bloomery sites in Iceland.

It is now well established that the Romanised Britons were not exterminated by the Saxons, but conquered and absorbed.

The conquerors, a warlike and agricultural race, had full knowledge of the value of iron, and it would seem most unlikely that they would neglect this valuable local product. The place-name Wyland, which occurs in several places in East Sussex, is suggestive. Nevertheless, the Saxon Chronicles, written by the monks, are silent, with the exception of the legend of St. Dunstan

and his encounter with the Devil at his forge. The original scene of this was Glastonbury, but it was afterwards transferred to Mayfield in the Weald, of which place, as Archbishop of Canterbury, in the latter half of the 10th century, he was the overlord.

He is said to have built there a wooden church, which not being properly oriented, he corrected with a gentle push of his shoulder ! The veritable tongs with which he seized the Evil One's nose are preserved both at Glastonbury and Mayfield; the latter place has also the anvil. "Mayfield," Miss Bell-Irving, p. 21.

Written Records.

The first written record we have of iron in the Weald is in the twelfth chapter of Book V of Cæsar's Gallic War. In the autumn of 55 B.C., and also in the following year, Julius Cæsar invaded, or more strictly speaking, made forays into the southern parts of Britain. In his description of the Britons he states : " They use either bronze or gold coins, or, instead of coined money, tallies of iron, of a certain standard of weight. In the midland districts of Britain tin is produced, in the maritime, iron, but of that there is only a small supply, the bronze they use is imported." Loeb Classical Library.

Strabo, writing circa A.D. 100, states : " Britain is level and woody, some parts hilly. The products are corn, cattle, gold, silver and iron ; skins, slaves and hunting dogs. They cannot make cheese and do not practice husbandry. They use chariots. There is more rain than snow, and only three or four hours sun, the rest is mist. At the present time they are leagued with Rome and pay tribute, but are not worth conquering." Bohns' Classical Library.

Tacitus, about the same period, states that the Britons " enriched their necks and loins with iron as evidence of wealth."

In that wonderfully meticulous record, Domesday Book, compiled in 1086, there is only one mention of iron in the Weald, The passage is usually translated as " a mine of iron in East Grinstead, belonging to

Ansfride." The actual words used are "una ferraria." The Victoria County History of Sussex states that it was, no doubt, the same as that which was in the hands of Isabel de la Haye of Brambletye in 1263 and was the subject of a lawsuit between that lady and Agnes Malmeins. A Wealden iron-mine was merely a pit, probably exhausted in one season, and not a property that would remain of value over a period of 170 or 180 years. I am therefore of opinion that "ferraria" should be translated "ironworks." The dictionaries take their example from Cæsar's Bello Gallico VII., 23, which reads, speaking of the Gauls and their skill in mining: "Quod apud eos magnæ sunt ferrariæ atque omne genus cuniculorum notum atque usitatem est," which may well imply a distinction between the works and the mine.

See p. 239.

I conjecture that these works were at Walesbeech.

The chartularies of the rich abbeys of Battle and Robertsbridge, whose vast possessions included much of the highly mineralised districts of East Sussex and most of the ancient Roman sites, while recording such minute details as the theft of a horse or the transfer of a few rods of land, ignore ironworking entirely, although it doubtless continued to exist. It is an interesting speculation as to whether the old taboo forbidding the violation of the sacred Roman soil by mining operations, enforced by specific laws, persisted like so many other Roman influences, in the corporate traditions of the monks. This may have been reinforced by the prominent position ironworking occupied in the supplanted and therefore hated Northern mythology.

The smith was a race apart, a magician, and, as such, not popular with the clerics.

This reticence, however, did not extend to the northern counties of England, where the monastic records show that iron was exploited for the benefit of the monasteries.

There are a few scattered records in mediæval times. In a list of the commodities imported into Bruges in the latter third of the 13th century, iron is only mentioned as coming from Germany and Spain, England supplying none, but curiously enough, among other staples, stone coal. Beck, "Geschichte des Eisens," V. 2, p. 583.

About this time the Cinque Ports and Southampton, instead of supporting home industries, in some cases at all events, obtained iron by piracy on the high seas.

It was remarked by Botero, in his "Weltbeschreibung":—

"The English would be a fine and praiseworthy race if they were not so given to rob the ships of Christian merchants."

London and even Chichester at this period derived their supplies of iron from the Forest of Dean, the other great Roman iron district.

In the reign of Henry III the Sheriff of Sussex was called upon, in 1253, to provide 30,000 horseshoes and 60,000 nails for the royal army. 1253.

In the same reign a murage grant was made to the town of Lewes, empowering the inhabitants to raise tolls for the repair of the town walls after the battle. Every cart laden with iron for sale from the neighbouring Weald paid one penny toll, and every horseload of iron half that sum. 1266. Lower.

Master Henry of Lewes, the King's chief smith, purchased 406 rods "in the Weald" for £16 17*s.* 11*d.*, and later 100 iron rods for £4 3*s.* 4*d.*, from "a certain smith in the Weald." 1275.

The Guild of Feroners (i.e., Ironmongers) of London lodged a complaint against the smiths of the Weald for making and selling iron tyres for cart-wheels too short for use, and several rods of standard length were made and ordered to be set up in the markets. 1300.

In this year Peter de Worldham, Sheriff of Surrey and 1320. Ed. III.

Sussex, supplied horseshoes and nails for the Scottish
1327. See p. 442. war, and the forge at Roffey, near Horsham, sent 1,000 horseshoes by way of Shoreham for the same war, at a cost of £4 3*s.* 4*d.* and 5*s.* for carriage.

1329 1329 is the first date mentioned for the forge at Tudeley, near Tonbridge.

THE TUDELEY RECORD

By a happy chance, the accounts relating to these works have survived. They are the only extended record we
Archæologia, V. XIV., p. 145. have of the bloomery period. We are indebted to Mr. S. G. Guiseppi, F.S.A., for a very full translation, which enables us to form a unique and very clear picture of the working of a Wealden bloomery. The only com-
Eng. Hist. Review, V. XIV., 1899, p. 509. parable accounts are those of Birkeknott in Durham, of about half a century later.

The works were situated in the manor or chace of Southfrith, near Tonbridge, which belonged to the great house of the Clares, earls of Gloucester and Hertford. During the period to which the records relate, Elizabeth de Burgh, the Lady of Clare, owned this chace, and her officers rendered her careful accounts. At times they were leased to farmers, at others they were worked by the Lady's officers, namely, from November, 1329, to March, 1334, and again from October, 1350, to 1354. Between these periods occurred the First Pestilence, the Black Death of 1349. After 1354 they were again leased to Richard Colepeper, of the Kentish family whose name so often occurs as interested in the iron trade in Tudor and later times, but apparently the Second Pestilence of 1360–61 caused their entire abandonment.

The forge was well situated on the northern edge of the Hastings Beds, with abundant supplies of ore and fuel from the extensive woods, and with water at hand for washing the ore. It was but a short distance from the bridge over the Medway at Tonbridge, protected by the

strong castle of the Clares, and had almost at its doors a valuable market in the rich Kentish plain.

The various operations were paid for according to the number of blooms produced. The ore or "mine" was dug in the forest and carried to the forge at a cost of about 18*s.* in the first period and 27*s.* in the second, per 100 blooms. It was then burnt or "elyed" (from the Saxon ælan, to burn), costing 2*s.* per 100. The fuel was cut and coled in the chace, or sometimes bought from outside "in the country" and carried to the forge at a cost of from 3*s.* 6*d.* to 4*s.* in the first and from 8*s.* 7*d.* to 9*s.* 2*d.* in the second period. We have no indication of the number of men employed in these services, but the actual smiths or "foreblowers" were four in number. These were paid piecework, and also in three of the four first accounts received each seventh bloom as part of their pay. The rates were in the first period 5½*d.* per bloom or 2¼*d.* plus the seventh bloom, and in the second from 7½*d.* to 9*d.* In addition, they had a small standing wage, called "gersuma," and also beer money of 1*d.* per week shared among the four.

In 1350 the forge was rebuilt.

The building was of wood, for which a carpenter was paid and nails bought, and then was daubed, perhaps on wattles. A hearth was made, bellows and tools were bought. Some of these tools cannot be positively identified from the names entered, but a hammer for breaking the ore, tongs, a pot for water and a lock and key are clear. It is noteworthy that the smith's hammer and anvil are not mentioned; these may have been either the property of the actual smiths, or else made at the forge and not bought from outside.

The output of the forge was approximately one bloom per day; unfortunately we have no clue to the size or weight of the bloom. The average price realised for the bloom was about 1*s.* 9½*d.* in the first period and about

3*s.* 4½*d.* in the second, and it will be seen that each item of cost of production was also approximately doubled after the First Pestilence.

1348–51. These accounts show very closely the tremendous effect of the depopulation caused by the Black Death. From the single glimpse thus afforded us, we may infer the heavy blow it must have struck to the Wealden ironworks.

Johann Nohl. "The Black Death." This pestilence or series of pestilences is computed to have swept away no fewer than 25 million souls in Europe alone.

In London and in Bristol it is stated that scarcely one person in ten survived, although this is hardly credible. The deaths in Norwich were 57,374, out of a population of about 70,000. This depopulation naturally caused a great setback in such a heavy manual industry. The prices of blooms quoted by Thorold Rogers for these dates in his "History of Agriculture and Prices" are more than double those given above; he gives the weight of the bloom as 108 lbs. The Tudeley bloom was either much smaller or the retail price as paid by the consumer was much above the price paid at the forge. He agrees fairly well, however, in the increase of nearly 100 per cent. after the First Pestilence. By the decennial period, 1391–1400, after the Second Pestilence, it had again risen to about the same extent, making the price more than three times that of the earlier period. This high price and the restricted production enabled the German and Swedish bloomery iron, imported by the Hansa merchants of the Steelyard in London, to compete with and supplant to a large extent the local product.

See p. 456. With the exception of a lawsuit in 1371 about an iron-mine at Horley, and poll-tax returns at Crawley in 1397, the succeeding period up to the end of the 15th century is practically bare of local records, and towards its close the introduction of water-power and the new process quickly superseded the old method.

It lingered, however, for about 100 years. In 1603 Edward Tamworth pleaded guilty to having erected a bloomery near Haslemere.

As the process was a simple one, it may very well have been carried on as a domestic industry for local needs, especially when the price of furnace iron was high. In order to preserve wood, the practice was forbidden by law, but the Wealden folk were not particularly law-abiding, and the King's writ did not run very far in the Forest country. Some of the sites may therefore be comparatively recent.

CHAPTER FIVE

THE EVOLUTION OF THE BLAST FURNACE

Rhys Jenkins, Newcomen Society, Transactions, Vol. I., 1920–21.

THE term Blast Furnace is used to indicate a furnace of some height, fed at the open top, and from which, at the bottom, fluid metal is tapped from time to time.

The bloomery process, as described in the last chapter, was a very laborious one, and as time went on the aid of water-power, that had been in use for centuries for corn-milling, was naturally adapted to assist the heavy manual labour in crushing the ore and working the bellows and hammer. It is probable that power was first used for the hammer.

Bennett and Elton, "History of Corn Milling," V. 2, p. 106.

We find in Domesday that at Lecheswrde (Somerset) there were " II molini redd. II plūbas ferri " on the land of Earl Eustace, and also two others on the land of Baldwin of Exeter. This rent does not necessarily imply that they were iron-mills, but the description " molendina ferrea " or " molendina fabrile " occurs in charters quoted by Du Cange and Carpentier as early as 1311.

There is a French record of a " moulin à fer " as early as 1249.

G. T. Lapsley, in English Historical Review, V. 14, p. 509.

At a forge at Byrkeknott, Durham, there was a water-wheel in 1408, which, although the accounts are not clear, seems more likely to have served the hammer rather than the bellows, although Mr. Lapsley expresses the contrary opinion.

On the continent of Europe the smelting hearths seem from a very early period to have been of a more permanent character than the heaps previously described. The ancient Swiss hearths were, according to M. Quiquerez, surrounded by large stones, the Catalan forges of the Pyrenees were stone-built, and in the Teutonic lands more or less permanent furnaces were constructed of stone. When water-power began to be substituted for human labour in serving the bellows, the size and height were gradually increased. This striving after greater production, owing to the higher temperature obtained, had the unwanted effect of causing that portion of the ore that was longer in the furnace and subjected to a greater heat to become fluid instead of remaining in the plastic state desired by the operator. This at first was a waste product, but it was soon discovered how to convert this cast iron by further heating and working under the hammer into the bar iron that was desired.

Although consuming much fuel, this double process so greatly increased the production as to oust the older and simpler method. These furnaces in Germany were named Hochofen or Blauofen (high or blow—not "blue"—furnaces). The production of articles by running the more easily reduced metals in a fluid state into moulds dates from the earliest age of metals, and it was soon recognised that the fluid iron could be utilised in a similar manner, but the uses for such products were limited.

Mr. Rhys Jenkins states :—

"The date of the invention is obscure, but probably we shall not be far wrong in saying that such furnaces came into use some time in the 14th Century, and somewhere in a zone comprising Western Germany and Eastern France, extending from the Alps to Belgium. The invention has been claimed for the Liége district, and it has been stated that a furnace was built near Namur in 1340, and that by the

Newcomen Society, Transactions, V. I., p. 17.

year 1400 two furnaces near Liége—Les Vennes and Grivegnée—were well known.

However, from quite early in the 15th century we have documentary evidence that iron founding and iron castings were known in Germany, France, and Italy. There is in existence a letter dated September 17th, 1415, from the Town Council of Strassburg to the Council of Freiburg referring to an ironfounder—isengiesser. Then it appears that the Archives Dep. de la Côte d'Or, at Dijon, contain references in 1433 to 'pierres faites pour le plus gros canon de fer de fondue,' and in 1400 to 'un viel canon de fer de fondue.' In 1460–64, we have the account by an Italian architect, Antonio Averlino Filarete, of a visit paid to a works in the Alps. He remarks that the iron from the furnace is fluid like bell-metal, and that, like it, it may be cast in moulds; and he adds that there is at the Castle of Milan a cast-iron gun in the form of a lion."

It will be seen from the above that the earliest use of cast iron took place in France. In Italy it seems to have been introduced about 1450, as is shown in the quaint legend of the holy Antoninus, who was Bishop of Florence 1446 to 1459. It runs thus: "When the saint visited the mountains a few years before his death, he with his companions entered an iron foundry to see the new method. One of the men, tired out by his exertions and the heat of the fire, became exasperated, and using wild words, swore lustily. Thereupon the iron congealed, so that no heat or strength or means could make it flow, and so remained all night. Next morning the ironmaster went to Antoninus and begged him to return and bless the furnace by making the sign of the cross over it. Antoninus, moved by his entreaties, did this, and immediately the iron began to flow."

"Steel and Iron," 1908, p. 786.

We have a very full description of the French practice in a Latin poem by Nicholas Bourbon, the son of a French iron-master, published in Paris in 1517. A French translation was given in Annales des Mines Ser. III., T. XII, p. 137 (1837), of which, on account of its

interest, I append an extremely roughly paraphrased epitome, omitting much moralising:—

" At Vandeuvre in Champagne stands a forge
Near a high tower on the River Barse.
My father Bourbon directs the works,
May the gods long preserve him.
He leads the sturdy axemen to the forest,
They choose the oak, the ash, the beech, with pine and holm-oak.
The holly, larch and worthless box
They leave as useless for the fire.
They build the pile upon a dry spot
And cover it with green leaves and ashes.
For seven days it burns.
Sleeplessly the charcoal burner watches beside it.
When all is done, they summon
Horse and cart to come with speed
To bear it to the house, for rain would mar its use.
The miners dig deep into the earth to find the veins,
With rope and windlass the ore is drawn to the surface.
You ask how do they find the ore?
Any child knows this—
The red colour betrays its presence.
The heaviest is the best.
The ore must then be washed and carried to the furnace.
This is on the banks of the River Barse,
Its form is square, roughly built with stone.
Within is harder stone that can resist the fire.
The two immense bellows, of bull's-hide made
Serve the furnace at the rear.
They obey a wheel kept in motion by the stream,

They draw and blow in turn, keeping exact time.
Near by stands the founder.
He rules the molten iron,
He hastens or retards the bellows,
He removes the waste with iron hooks;
He regulates the ardour of the fire,
And separates the pure from the impure.
He is hardened to toil and to fatigue.
They say he sleeps but in half-hour snatches,
During the entire two months that the furnace is in blast.
The stream of iron runs from the furnace,
The liquid metal hisses,
Jets of flame and smoke gush forth,
Seeming to reach to the stars, like Etna in eruption.
During this time another worker aids the founder,
His duty is to keep the furnace full of ore and charcoal
As the iron is withdrawn below.
This man remains on the top of the furnace
Like a vigilant sentinel, a ferryman of Hell.
There are also with him other workers
These make round and hollow moulds
In which they cast the bombs, inventions of the devil,
That Vulcan first gave to the Germans.
They cast also mortars to destroy cities and fortresses.
The iron that flows from the furnace cannot be called pure,
Soon another worker places it again in the fire,
And a second time purifies it in a great furnace.
Here it is softened to form a ball.
Now come skilled workers who smooth and lengthen it,

They have a huge iron hammer.
This is worked by the force of the water;
They heat the iron again, seizing it with huge pincers,
They hold it in the midst of the flame until white-hot,
They then plunge it into vessels,
Thus imitating the Chalibees,
The water of whose country toughened the iron.
It is softened by the fire,
It is beaten with great blows of the hammer,
Which re-echo from the mountains and forests.
The blocks of iron stretch out most marvellously,
Taking the form of long bars.
One would think it wax.
When the iron is well forged, it is my father's duty
To weigh it exactly at the week's end.
My father, so that he deprives no one of his due,
Has a book in which he records what he owes the workers.
He neither wishes to cheat nor to be cheated.
In this manner he knows every man's due.
Soon come the charker, the miner,
The founder and the forgeman,
Happy to receive the reward of their labours.
They jocundly depart with their well-filled purses.
They unite to forget their fatigue in a jolly repast.
Wine and joy possess them.
One drinks a health to his comrade,
Who hungrily gnaws a bone.
Another is stretched on the ground,
Overcome by sleep and the bad wine he has drunk.

Our poet here excuses the workers on account of the bad example of their betters, and concludes the poem.

This spirited description agrees very well with the figures from the Encyclopedie of Diderot and D'Alembert, 1757–1765, reproduced in Mr. Rhys Jenkins' paper in the Newcomen Society's Transactions, Vol. I., and with that quoted by Lower, from Ray's "English Words not Generally Used," originally published in 1672, and shows that in France the process was practically perfected at that early date.

RAY'S DESCRIPTION

S. A. C., II., p. 200.

John Ray was tutor to Walter Burrell's son Timothy, at Cuckfield, and his description was the personal observation of a trained observer. Although out of chronological order, I interpolate it here, as no material change took place from the first introduction of the indirect process to the end of the industry in the Weald :—

"This account of the whole process of the ironworks I had from one of the chief iron-masters of Sussex, my honoured friend, Walter Burrell of Cuckfield, Esq., deceased.

The Manner of the Iron Work at the Furnace

The iron-mine lies sometimes deeper, sometimes shallower, in the earth, from four to forty (feet) and upward.

There are several sorts of mine, some hard, some gentle, some rich, some coarser. The iron-masters always mix different sorts of mine together, otherwise they will not melt to advantage.

When the mine is brought in, they take small-coal (charcoal) and lay a row of it, and upon that a row of mine, and so alternately S.S.S., one above another, and, setting the coals 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 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 (which is before charged with coals), casting it upon the top of the coals, where it melts and falls into the hearth, in the space of about twelve hours, more or less, and then it runs into a *sow*.

The hearth, or bottom of the furnace, is made of a sandstone, and the sides round, to the height of a yard, or thereabout; the rest of the furnace is lined up to the top with brick.

When they begin upon a new furnace, they put fire for a day or two before they begin to blow.

Then they blow gently, and encrease by degrees 'till they come to the height, in ten weeks or more.

Every six days they call a *founday*, in which space they make eight tun of iron, if you divide the whole sum of iron made by the foundays: for at first they make less in a founday, at last more.

The hearth, by the force of the fire, continually blown, grows wider and wider, so that at first it contains so much as will make a sow of six or seven hundred pound weight, at last it will contain so much as will make a sow of two thousand pound. The lesser pieces, of one thousand pound, or under, they call pigs.

Of twenty-four loads of coals, they expect eight tun of sows: to every load of coals, which consists of eleven quarters, they put a load of mine, which contains eighteen bushels.

A hearth ordinarily, if made of good stone, will last forty foundays, that is, forty weeks, during which time the fire is never let go out. They never blow twice upon one hearth, though they go upon it not above five or six foundays.

The cinder, like scum, swims upon the melted metal in the hearth, and is let out once or twice before a sow is cast.

The Manner of Working the Iron at the Forge or Hammer

In every forge or *hammer* there are two fires at least; the one they call the *finery*, the other the *chafery*.

At the finery, by the working of the hammer, they bring it into *blooms* and *anconies*, thus:

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

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 workings, they bring it to an *ancony*, the figure whereof

is, in the middle, a bar about three feet long, of that shape they intend the whole bar to be made of it; at both ends a square piece left rough to be wrought at the chafery.

Note.—At the finery three load of the biggest coals go to make one tun of iron.

At the chafery they only draw out the two ends suitable to what was drawn out at the finery in the middle, and so finish the bar.

Note 1.—One load of the smaller coals will draw out one tun of iron at the chafery.

2.—They expect that one man and a boy at the finery should make two tuns of iron in a week: two men at the chafery should take up, i.e,. make or work, five or six tun in a week.

3.—If into the hearth where they work the iron sows (whether in the chafery or the finery) you cast upon the iron a piece of brass, it will hinder the metal from working, causing it to spatter about, so that it cannot be brought into a solid piece."

Mr. Rhys Jenkins comments on this as follows :—

Newcomen Society, Transactions, Vol. I., 1920–21.

"The roasting or calcining of the ore, as described by Ray, was done in heaps in the open air; at a later date there is reason for thinking that kilns were used. The estimate for the output of the furnace, 8 tons per founday of six days, seems to be too high, for this period at any rate. Assuming there were forty foundays in a year, we get an annual output of 320 tons; it is doubtful whether at any period any furnace in Sussex did much more than half this quantity. The Gloucester furnace no doubt did more than that, but this was the biggest furnace in England at that time; it had been built in 1695. The furnaces were square truncated pyramids having walls of considerable thickness; possibly the best in Sussex in Ray's time was about 22 ft. square at the base. This was the size of some furnaces in the Forest of Dean erected apparently about 1611, and representing probably the best practice of the day. Inside they were approximately of egg shape, terminating at the bottom in a rectangular hearth of considerable depth."

It is to be noted, however, that the water supply and perhaps that of mine and coles did not often permit of working for more than a portion of the year. John Fuller made in 1727 at Heathfield 316 tons, the number of foundays is not stated for that year, but in 1703 there were 29, and in 1743, 35.

The new method was introduced into England towards the close of the 15th century, French workers at first

being employed, and a new era began. In 1492 there is an entry in the Court Rolls of Lambeth Palace of a payment of £67 0*s.* 2*d.* to "ye Iernefounders of Buxtede," and in 1493 Pieter Roberd alias Graunt Pierre (evidently a Frenchman) was an "yernefounder" of Hartfield. See p. 246.

Mr. Jenkins informs us that in 1544, when Letters of Denization were imposed, there were upwards of forty Frenchmen mentioned as ironworkers, and goes on to say :—

"On this evidence it seems impossible to resist the conclusion that the blast furnace, together with the finery process for converting cast iron into malleable, had been introduced into England before the year 1500, and that by that date there were at least three furnaces at work, i.e., Buxted, Hartfield, and Newbridge. Moreover, the fact that these ironworks were of French origin points to our having borrowed the new method of ironmaking from France. This view is supported by the terms used in the trade—founder, finery, chafery—all of which occur in the same or in a closely similar form in the French."

This importation of the French experts, with their by this time perfected methods, would necessarily have been a somewhat costly adventure, entered on, in the first place, by wealthy landowners who had seen the establishments in France. There is certain evidence to show that in some cases the conservative Englishman did not at once adopt the new method in its entirety, but installed the water-power to work either the hammer or the bellows, or perhaps both, in a modified bloomery process. Except for guns and shot there was little demand for cast-iron, and to produce bar or bloom iron the double or rather treble process of casting, fining and chafering was not necessarily required.

The water-driven bellows and the tilt-hammer are still in use in some of the Swedish charcoal furnaces and forges, producing a very pure bar-iron.

CHAPTER SIX

THE RECORDS OF THE BLAST-FURNACE PROCESS IN THE WEALD

I. THE TUDOR ERA

At the period of the invention of the blast-furnace printing had come into being, and there was a great advance in general education. The lay clerk, writing in English, gradually took the place of the cleric, writing in Latin, and the number of documents greatly increased. The first casting of iron cannon in England, which took place at Buxted in 1543, brought the Wealden industry into the forefront. There are many references from Tudor times onward to the provision first of shot, then of cast-iron cannon, for the wars, which give us a great amount of information about the trade in the Weald.

The trade was not uniformly prosperous. Depending in such a large degree on munitions, it waxed and waned with the alternations of peace and war. In order to follow its history, we must look beyond the Weald to the religious and political strife of those troublous times. The more important records are given below.

1512 In 1512 Henry VIII declared war against France. Calais, then in English hands, was the chief arsenal, and although much shot was purchased from Richard Fermer, a trusted agent and banker of the King, and merchant of the Staple of that town, as well as from Perpoynt Devanter, Easterling, of the Steelyard in London,

1513. Robert Scorer of Hartfield supplied 9 tons of iron

"gunstones" on August 1st, 1513, and in the same month John Bowyer of "Hatfield" (sic) also furnished gunstones. The guns themselves at that time were of forged not cast iron, and a good quantity of actual stone cannon balls were also used.

Robertsbridge Records.

The dissolution of the monasteries in 1538 made great changes in the ownership of Wealden land, and many of the new proprietors embarked in the recently introduced trade. The Abbey lands of Robertsbridge were granted to Sir Henry Sidney. In 1541 he erected a furnace and a forge near the Abbey, and in the following year a furnace at Panningridge. Extensive accounts concerning these, and a later venture in steel making, have been preserved at Penshurst, and have been recently published by the Royal Historical Manuscripts Commission. They give a valuable glimpse of the economy of the industry at that time.

1538.

1541.

See pp. 310, 362.

The First Cast Cannon, 1543.

In 1543 Peter Baude, a French founder of brass cannon in the King's service in London, and Ralph Hogge, under the superintendence of Parson Levett, cast iron cannon for the first time in this country at Buxted. From this beginning sprang the almost complete monopoly of iron-gun casting that the Weald enjoyed for two centuries thereafter.

The Denization Lists, 1544.

In 1544 war with France was again likely. All aliens here were required to take out Letters of Denization or leave the country, and the records show, beside the London foundries, no fewer than eight Wealden ironworks employing Frenchmen.

The Portsmen's Complaint, 1548.

In 1548 the number of works named by the portsmen in their complaint, which is given in full in the chapter on Fuel, was nineteen, but they stated generally that there were fifty or fifty-three in Sussex alone.

See p. 119.

Sheffield and Worth Accounts, 1549.

In 1549 Admiral Seymour's possessions were sequestered by the Crown, and we have valuable accounts of

these furnaces which are treated fully in the Topographical Section.

1553. After the accession of Mary, Sir Thomas Carwarden, who was a commissioner both in the fuel inquiry of 1548 and in the Seymour sequestration, and must therefore have had some knowledge of ironworking, was accused of See p. 457. complicity in the abortive rebellion of Wyatt, and at his house at South Park, Blechingley, Surrey, seventeen wainloads of munitions were seized.

1558. The loss of Calais in 1558, the last remaining possession of England on the Continent, had a twofold reaction on the ironworks. The large quantities of fuel hitherto exported thither from the Sussex ports became available for local use, and the royal guncasting establishments had to be removed to England. In the latter part of the same year Elizabeth came to the throne. Philip II of Spain, whom she refused to marry, became a potential enemy. Although her Protestantism was weak, and tempered by several projects of marriage with Catholic princes, the Queen was forced by circumstances and political pressure, often against her will, to assist the followers of the Reformed religion in France and the Netherlands. At the same time the English sailors were "singeing the King of Spain's beard" in various semi-piratical expeditions.

1562. In 1562 Sir John Hawkins sailed on his first slaving voyage, two of his six ships being lent to him by the Queen, and came into open conflict with the Spaniards; and in October of the same year Elizabeth was supporting

1563. the Huguenots in France. In the following year a penal law was passed against the Catholics in England, but was not enforced. Lingard, the Catholic historian, estimates that the number of Catholics in England was about equal to that of the Protestants, but this is probably an exaggeration, certainly so in the southern counties.

Hawkins, on his second voyage, in which the Queen again participated, sustained a severe defeat at St. Juan d'Ulloa, a great number of his men being captured. In August of that year, Alva arrived in the Netherlands for the purpose of enforcing Catholic uniformity, and executions on a large scale began in 1568. Five treasure ships from Spain bound to Antwerp were forced by stress of weather into southern English ports, and were promptly seized. Alva's operations were paralysed by the lack of the 550,000 ducats that they carried, but he advised against war with England until he had finished with the Netherlands. Trade with England was, however, forbidden. 1567. 1568. 1569.

Sir Francis Walsingham, a strong Protestant, and perhaps the most capable and unscrupulous head of the Secret Service that ever held office in England, was sent to Paris to press for better treatment of the Huguenots. He hoped to obtain French aid for the Low Countries, but in this he was unsuccessful; however, he helped Hawkins to plot with Louis of Nassau for "underhand" naval aid. Elizabeth, vacillating as usual, would not declare on one side or the other, and refused her permission, although she was secretly offered the island of Zealand. The Beggars of the Sea, who had no port in their own country, made their base at, and drew their supplies of provisions and perhaps armament from, the English Channel ports. The Cinque Ports, described by a contemporary as "a nest of robbers," eagerly joined in preying on the Spanish commerce. 1571.

However, on February 21st, 1572, all further supplies were refused to the Beggars, and they were forced by lack of food to capture Brill. Whether this refusal was collusive on the part of Elizabeth or not is unknown, but on April 1st the English Council sent £19,000 to the Beggars, and allowed, in the first place, Thomas Morgan to take 300 volunteers to their aid, and later, Sir Hum- 1572.

phrey Gilbert to cross with nine companies of foot, with cannon and ammunition.

In the same year Drake again pillaged the West Indies, and the massacre of St. Bartholomew on August 24th, in conjunction with the Spanish atrocities in the Netherlands, raised the fear and hatred of Spain among the English Protestants to the highest degree. All this land and sea warfare brought grist to the iron-mills, and many new ones must have been called into being.

CHAPTER SEVEN

II. THE LISTS OF 1574

THE above digression shows the circumstances under which the most complete record of the Wealden iron industry that we have was compiled. Walsingham, on December 20th, 1573, was appointed Secretary of State; in practice he was Foreign Secretary. It may be surmised that he had amongst his records full information as to the Wealden ironworks, and the importance of preventing the falling into Spanish hands of the cannon produced. With the diplomacy and duplicity of that period (if the words are not synonymous) he caused complaints to be made to the Privy Council, as follows :— 1575.

S. P. D. Elizabeth, V. 95, No. 20.

"A declaration of Christopher Barker touching Iron Furnesses

It maie please yo^{r} honor to consider the severall notes ensueing w^{ch} doe concerne the great spoile and consumation of Okes tymber and other woodes wthin the countyes of Sussex, Surrey and Kent by meanes of iron mylles and furnaces."

After naming several furnaces, he goes on :—

"Besides these furnaces aforesaid there (are) not so few as an hundred furnaces and Iron Mylls in Sussex, Surrey and Kent, w^{ch} is greatlie to the decaie, spoile and overthrowe 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 greate decaie to the highe wayes because they carrie all winter tyme.

"And furder if it maie please yo^{r} honors I am assured there hathe ben

solde to one stranger's shippe (being an Argosy) not past one moneth paste by Partridge and others, 20 peises of Ordenance at the leaste.

" Likewise there be divers and sundrie m'chants and m^{rs} of merchante shippes that doe finde themselves marvailouslie molested and otherwhiles robbed by reason of the great stoare of ordenance that hath ben convayed and solde to strangers out of this Realme, wherby their shippes are so well appointed that no poore merchant shippe maie passe, thorow the seas. Moreover beseeching y^{r} honor to p̄don me I doe thinke that this comoditie of ordenance that is made within this Realme and allredie solde will turn to a discomoditie when a time of service shall require.

" Item, it maie please yo^{r} honor to consider that the ordenance makeing is a comoditie to a few and a discomodite to the whole commonwealthe and no common marchandise for every privat subject to deale withall, but more meete for the prince onlie.

" The premisses considered of yo^{r} honors I have thought it my dutie to signifie unto the same that unless speedie remedie be provided in this respect there shall not be timber sufficient to be had within these few yeares and for Her Ma^{tie} to builde any shippes or otherwise."

S. P. D. Elizabeth, V. 95, No. 16.

" The humble complainte of Ralphe Hogge the Quenes Ma^{ties} gonstone maker and gonfounder of Yron onto her highness most honorable privie Councell.

" In most humble wyse complayneth onto yo^{r} honors yo^{r} poor Orator Raphe Hogge the quenes Maiesties gonnstone maker of yron for the office of her M^{ties} ordennance wthin her Ma^{ts} touer of London, that whereas ther is often complaints coming be fore yo^{r} honors y^{t} the shipping and selling of ordennance of cast yron to strangers to carry over the seas, as they saye such nombrs that yo^{r} enimie is better fourneshed with them then o^{r} owne contry ships ar, and that all the blame goeth upon a lycence granted by the quenes M^{tie} unto me the sayd Raph Hogg w^{ch} lycence was graunted unto me in consideration of s^{r}tine furnesses w^{ch} I mayde of owne charge, for the s'vice of her Ma^{tie} and in consideration that I s've her Ma^{tie} in shott of yron for viij^{li} the tonne, whereas other men sell for xij & xiij^{li} the tonne and besydes that I nether sell any ordenñce to any stranger to carie away, by vertue of the same lycence, but first I optaine the right honourable, my Lord of Warwick, M^{r} of her Ma^{ties} ordenñce his letter unto my constomer and so tak out a coket for the passing of the same, and a nott of the same taken by the serchers at the shipping thereof, yt may therfore please yo^{r} honor to understand that ther is so maynie furnesses that nowe of late yeares have ther owne trade of

casting of Sowes for maiking of yron and faull to casting of gonnes and shot of yron and caryd them to the seay syd to divers and sundry places, that is to say, Rye, Hastings and Portysmouth, th'eyle of Wight, Hampton Powle, Plymowth and to Bristow, and when they are in the sey they go into France and into Flanders wth them wthout any lycence at all as yt is to be provid synce mydsomer last there was a bote went out of Mytching Haven by Lewes in Sussex w^{ch} towk out a coket for London, laden wth gonnes of cast yron as assone as she was out of thes haven went into Holland and ther in Dorte lond, Aland and sould XXX p̄ts of cast yron, that is to say, 2 demy-coulverings and 4 sackes & 6 mynnyons, 10 facons and 8 fauconettes and this is dayly used, for yt is reported by dyvers marchants that ther goith many in to France wher as none did pass from London into France by lycence not this 12 monthes ther is dyvers of them that dothe mayke them, that bringeth very few or none at all to London, and under coullar of caring them along the cost they carye them where they lyst and maye do, for nowe yt is become a traid of marchandise wheras in the begyning ther was none that cast any gonnes or shott of yron but only p̄son Lovet who was my M^{r} and my p'decessor who mayde none but only for the service of the kynge Ma^{tie} and yf ther be no restraint for caring alongest the sea coste, whear ther passeth one by lycence there will iij goe wthout lycence, the names of the furnaces that casteth gonnes and shott of yron at this present doth appere in a pap̄ hereunto annexed, yt maye therfor plese yo^{r} honnors that p'sent order maye be taiken herein for there is above 4000 tonnes cast yearly and all thes will not be sold nor bought to remaine wthin the Realme, and yf ther be not order taiken, ther is mor about to sett up workes to caste gonnes both here and Wayelles and they being cast will mayke saill one way or other, ether by lawfull meanes or by stelth."

The response to these doubtless inspired complaints was immediate.

The Summoning of the Iron-masters, 1574.

At a council held at Hampton Court, February 3rd, 1574, a " placard " was issued to " Richard Pedley, one of the messengers of the Chamber, to warne and commaunde certein whose names are underwritten, with convenient hast, to repaire hither, being soche as were makers of iron pieces to be transported over the seas."

Acts of the Privy Council.

There are five copies of this list extant at the Record Office and at the British Museum, varying somewhat in arrangement, and very much in spelling.

It is probable that owing to Walsingham's fine organisation, they included practically every establishment then in existence, great and small—furnaces and forges. The net was cast very widely. Many of the furnaces must have been unable to cast cannon, though all could make shot, and the forges could only have produced wrought iron or steel for weapons. In all there are ninety-eight or 100 works mentioned, and Pedley, in a marvellously rapid journey for the time of year, summoned the owners of seventy-seven of these to appear before the Council.

S. P. D. Elizabeth, V. 95, No. 61.

I have printed the itinerary of his journey in "Sussex Notes and Queries," as follows :—

"Sussex Notes and Queries," V. 2, p. 5.

1574	CALLS MADE	MILES
Feb. 15	(*Sunday*) London—3 calls	
16	(perhaps on journey to Cranley, Surrey).	38
17	Cranley, Dunsfold, Farnham . .	26
18	Northchapel, Petworth . . .	27
19	Horsham	21
20	Cuckfield	11
21	Tinsley, Worth	19
22	(*Sunday*) nil	
23	West Hoathly, Hedgecourt, East Grinstead (two calls)	21
24	Hartfield, Ashurst, Maresfield . .	31
25	Maresfield (2nd call), Isfield, Buxted, Rotherfield (3 calls) . . .	31
26	Framfield, Waldron, Chiddingly. .	22
27	Heathfield, Crawle (Warbleton), Mayfield	24
28	Mayfield (2nd call), Burwash (3 calls), Brightling	21
Mar. 1	(*Sunday*) Brightling (2nd call), Battle .	11
2	Battle (2nd call), Crowhurst, Buckholt, Hastings	20

1574		CALLS MADE	MILES
Mar.	3	Winchelsea, Ticehurst . . .	37
		(I have taken the halt at Hastings, as the Winchelsea-Ticehurst road would have been a main highway and better going.)	
	4	Mayfield, Frant	23
	5	Ashburnham and return . . .	33
	6	Lamberhurst, Penshurst, Leigh, Tonbridge	31
	7	London, in time to make 2 calls: again the main highway. . . .	36

Although no doubt he was well-mounted, with, probably, servants and led horses, the distances covered are remarkable considering the time of year, and, as related by Christopher Barker, "the great decaie to the highe wayes because they [the ironmasters] carrie all winter tyme." It will be noted that he did not travel on the first Sunday, and that on each of the two following Sundays he covered 11 miles only.

The total is 483 miles in 19 days, an average of nearly 25½ miles per day.

In all 58 persons were warned to appear, and the bonds in £2,000 each of 32 are preserved.

The form of the bonds is as follows :—

"Noverint universi p̄ p'sentes int' Willm Walpole de Fittelworthe in Com̄ Sussex teneri et firmiter obligar̄ Serenissime Dn̄e Regine in duobz millibz librarz bone et legl̄is monet̄ Anglie solvend̄ eidem Dn̄e Regine hered̄ et successoribz suis, sub condicione sequent̄ Ad quam quidem solucēm bene et fidelr̄ faciend̄ obligō int' hered̄ executōr̄ et administratōr̄ meos firmīt̄ p̄ presentes datē apud Hampton Court xxij° die Februarii Anno Regni Dcē Dn̄e nr̄e Elizabeth̄ Dei gr̄a Anglie Francie et Hibnie Regine fidei defensōr̄ decimo sexto." S. P. D. Elizabeth, Vol. 95, No. 22, February, 1594.

"The condicon of this obligacōn is suche that if the above bounde William Walpole shall hereafter make no manner of caste peics of ordynannce of Iron without spīall licence had from the Quenes Ma^ty for the same, and upon such licence to make any this saide ordynnance shall not

sell them to any stranger unlesse bothe the saide strangers name & quality, the number and name of the said ordynance so to be solde shalbe expressed in the saide licence, then this presente obligacõn to be voide and of non effectt, Or ells to stand and abide in his full power, strength and vertue."

The great noblemen and Sir Thomas Gresham seem to have taken no notice of the summons, and some of the persons warned were unable to appear, and are noted as being "very sick," "an old man of 80 years and not able to travell," or "lame in his legges and feete." Of the balance we have no record.

As these lists were based on persons, and not on the localities, the total number of sites is somewhat doubtful. The forges definitely attached to and working with furnaces were in some cases on the same site, in others at varying distances from the furnaces, being dependent on the amount and head of water available. Of the twenty-six pairs named in 1574, I have traced that in at least thirteen cases the sites were separate, and possibly more may be differentiated. There were three known to have been in existence before and after 1574, Imbhams and Sheffield (two sites). This would make the total number of works then existing approximately 115.

1581. The expected rupture, however, did not then take place, but in 1581 there was open war. Elizabeth, in fulfilment of treaty obligations, sent a force of 5,000 foot
1585. and 1,000 horse to the Netherlands to assist the States General. Drake, after ravaging the West Indies, burnt
1587. eighty Spanish ships at Cadiz. By this time the preparations for the great Armada were well advanced. In January, 1588, two Spaniards in Flanders were asking for delivery of 20,000 crowns' worth of iron ordnance, but the records show that the Spanish guns were mainly of brass.

The "Invincible Armada" sailed from Lisbon on May 30th, and was dispersed on July 30th, 1588.

After this defeat, a letter was sent by the Lords of the Council, October 31st, 1588, to Lord Howard of Effingham, to appoint a discreet gentleman to visit the foundries and stop the casting of guns. The list, preserved at Losely, appears to have been based on the 1574 lists; it is evidently copied by some clerk having no local knowledge of the places, being full of errors and mis-spellings. There are only forty-four places named, Kent was not included. As many of the omitted works were in existence at later dates, this apparent decrease is no evidence that any material decay had taken place in the intervening fourteen years. 1588.

CHAPTER EIGHT

THE IRONWORKS IN STUART AND HANOVERIAN TIMES

THE period from the death of Elizabeth till the outbreak of the Civil War was almost free from foreign wars, so the demand for guns and shot was small. Fuel was becoming scarcer and rising in price. Although Norden, in his "Surveyor's Dialogue," printed in 1607, states that there "are or lately were in Sussex neere 140 hammers and furnaces for iron," Mr. Jenkins considers this to be almost certainly too high. It is probable that where a furnace and forge were adjacent they were each counted, and that the decline had already set in. Several Sussex men had migrated to Gloucestershire and had erected large furnaces with abundant water-power and fuel supplies.

At the time of the Civil War we find little mention of the ironworks. The Parliamentarians drew their supplies mainly from Brede and Horsmonden, but other works in East Sussex were controlled by them.

1644. In January, 1644, Waller sent a force to capture the royal works in St. Leonards Forest, and destroyed them, as well as other works belonging to Royalists. Possibly, owing to the disturbed state of the country and the divided allegiance of the owners and ironmasters, working was suspended in many cases. In Mr. Blaauw's paper on the Civil War in Sussex there are ten persons mentioned connected with the iron trade, five on either side, the most prominent being John Ashburnham, a great personal friend of Charles I, and, of the other party,

S. A. C., V., p. 29. Passages of the Civil War in Sussex.

Colonel Morley, "the crooked rebel of Sussex," the owner of Hawksden, Mayfield.

Sir Thomas Pelham, a Parliament man, continued his establishments at Waldron, Bibleham and Brightling, and we have a valuable series of accounts ranging from 1639 to 1715, which are dealt with in the topographical section.

The Pelham Accounts. See p. 381. 1651–4.

During the Protectorate a naval war, due to the passing of the Navigation Act, was waged with Holland, and again broke out in 1664. These wars gave rise to a slight revival in the industry, and from two documents, now apparently lost, but of which transcripts appear in the Sussex Archæological Collections, the following facts may be gathered :—

S. A. C., XVIII., p. 15, and XXXI., p. 21.

The 1664 Lists.

	Furnaces.	Forges.
Blowing in 1653	35	45
Discontinued before 1664, but repair'd stocked on account of the warre .	12	—
Ruined before 1664 and so remain .	9	19
Laid aside and not used . . .	—	5
In repair at beginning of 1664 . .	14	21

All the furnaces except two are noted as having "made gunns and shott in the late Warre for supply of his Ma^{ties} stores."

Connected with this return are three drafts of petitions, the most complete of which runs as follows :—

"Whereas by y^{e} greate plenty of woods & iron mine in y^{e} County of Sussex, The Stores for y^{e} Navy Royall in al former times, and especially in the late warrs wth y^{e} french and dutch have bin supplyed from y^{e} ironwork that are there wth al sorts of Ordinans B And y^{e} subjects in the Citty of London, & other parts of y^{e} Nation have also in greate part bin furnished thence for theyr necessary uses of Iron, without w^{h} comodity neyther husbandry, nor almost any trade whatsoever can subsist.

"And whereas the yearly benefit accruing to y^{e} faythfull subiects of that County by y^{e} said ironworks cheefly enables very many of them not

only for theyr familyes subsistance, but also to furnish y^e^ yearly payments for y^e^ Ma^ty^ the mayntayning theyr poore & other necessary publick disbursmencs, besides y^e^ constant imployment of at least 50,000 lusty able workmen, ready for defence of yo^r^ Majesty & y^e^ Nacion in case of generall needs.

"And whereas y^e^ incoppising from time to time of y^e^ sayd woods (wh^ch^ by computacion amount to 200,000 acres) for the use of theyr sayd ironworks prooves of greate advantage for y^e^ growth & preservacon of the timber trees growing therein, as may evidently appeare (what ever is suggested to y^e^ contrary) for that at this time timber in these parts is much cheaper than in most other parts of y^e^ Nation, notwithstanding the long continuance of ironworks in that County.

"Now for as much as some Northerne Countryes beyond Sea, are so extraordinarily abounding in woods iron mine & other conveniencyes for making Iron, and especially by y^e^ cheapnes of theyr mens labor who work as Slaves (nor w^th^ that liberty w^h^ the meanest of y^r^ Ma^ties^ subjects comfortably enjoy) that of late years (having erected greater store of ironworks than they had formerly) they are thereby enabled to send vast quantities of that commodity to other Nacions, and particularly since the yeare into this kingdome and dayly more & more continue to doe eaven from wares ready wrought to the undoing of our Smiths & the dishartening and (in short time) destroying of our said important manufacture of iron which once totally decayed is not recoverable in very many years half of the ironworks heretofore imployed in y^e^ s^d^ County being already layd downe, and most of these that are kept working is rather don to spend the whole stock then for other profit made thereby for they sell the s^d^ iron soe imported hither, at cheaper rates for the reasons abovementioned than is possible to be affoorded here without loss to the maker, w^h^ causes many to wish well to such strange importacion, not reflecting that when they shal haue engrossed into theyr hands the sole manufacture (w^ch^ wil inevitably follow upon the decay of our s^d^ ironworks that they (which is the design) which sale they will possibly not let us have it at all or by im on the seas, not be able to bring it, which in time of warr might absolutely ruin us, for the considerations abroad to w^h^ may be added theyr importing the s^d^ iron for the most part in theyr own bottoms to the increase of they^r^ shipping and the decay of ours which must be a great chardge uppon their lading iron more than the ships of that country are to pay upon such freight, nor are any of a native commodities transported into those parts for the iron w^ch^ they sent here as abou

"Therefore most humbly pray

"That the truth of the premises may be represented before y^r^ Mai: & the lords of y^r^ most hon^ble^ privy Councill and that according to y^r^ subiects good an import may be im uppon such furreyne iron imp as such in a reasonable manner may ballance the trade

thereof as to what is made in this Nation and that y^r^ Ma : wil graciously recommend the same to y^r^ parliament for the same, whereby may be prevented the imminent danger to the publick, by the loss of the said manufacture of iron, and the sendinge a begging of many thousands of y^r^ Ma : good subiects whose subsistence depends upon the same besides divers other public inconveniences that may occur by reason thereof w^h^ y^e^ jus^tus^ wil further represent to y^r^ Ma : uppon your gracious hearing of them in receiving y^e^ same."

As the aim of these petitions was the imposing of an import duty on foreign iron the decline may have been exaggerated. We know that some were again working at later dates.

The demand for guns and shot fluctuated with the incidence of peace and war, as witness the remarks of John Fuller of Heathfield in a letter dated October 23rd, 1749 :—

"The exigencies of the State during the Wars required great numbers of guns and the Board very wisely contracted with more gunfounders than before; the exigency set up numbers of little Foundries which I call Tinkers' shops, and supplied the Government with small guns; they contracted slapdash for all sorts."

The Fuller Manuscripts.

S. A. C., LXVII., p. 25 *et seq.*

The above extract is from the very instructive Fuller manuscripts unearthed by my late friend Herbert Blackman. Among them was a list of all the furnaces and forges in the kingdom, with their approximate outputs, dated 1717. From this and from Mr. E. W. Hulme's corrected statistics we obtain the following figures :—

	Furnaces.	Forges.	
In Sussex	11	9	
In Kent	3	1	
In Surrey	—	3	
Others also mentioned in the Fuller manuscripts . .	1	1	
	15	14	= 29

Budgen's Map.

Budgen's map of Sussex, of 1724, however, shows fifteen furnaces and ten forges in that county alone, so if these were all working the totals would be nineteen furnaces and fifteen forges, making thirty-four in all, as against eighty in 1664, some having apparently dropped out, while others had been restored or added. In the absence of detailed records of each site the figures must be treated with a good deal of caution. The furnaces and forges marked on the maps by the old cartographers, who frequently copied their predecessors, may well have been out of use at the time of the publication of the map. The industry was not static, and so long as the ponds were in repair a furnace or forge could easily be resuscitated.

From now on the decline was rapid. During the whole of the 17th century many men had been trying to solve the problem of how to substitute pit coal for the costly charcoal. Thomas Proctor, in 1607, in "A Worthy Worke profitable to the Whole Kingdom," suggested its use. Sturtevant, in 1611, was granted a patent for the use of "Sea-coale or Pit-coale," and others followed. About 1620 Dud Dudley apparently succeeded up to a point. The quality of the iron so produced was inferior, the price obtained was therefore low, and the charcoal ironmasters strenuously opposed him. In a riot the bellows of his furnace were cut. He suffered also from political opposition, being a Royalist. Dr. Thomas Fuller, writing in 1662, says :—

Percy's "Metallurgy," p. 814.

"History of the Worthies of England."

> "But it is to be hoped that a way may be found out to *charke* sea-coal in such manner as to render it useful for the making of iron. All things are not to be found out in one age, as reserved for future discovery: and that perchance may be easy for the next, which seems impossible in this generation."

Various other attempts were then made, until, in 1735, Abraham Darby met with complete success at Coalbrook Dale, Shropshire. It is worthy of note that he prolonged the use of the water in his ponds by setting up a "fire-

engine " (i.e., an atmospheric steam engine) to raise the water from under the lowest to send it to the upper pond, coal thus being used for power purposes as well as for fuel. The Sussex ironmasters, far from coal, had to rely on their meagre and intermittent natural water supply, which made it useless to increase the capacity of their works. They also had to meet the competition of the foreign iron brought in cheaply by sea to London, their chief market.

In 1760 the great Carron Ironworks in Scotland were founded by an English company, and there M. Gabriel Jars, the great French metallurgist, in his monumental " Voyages Metallurgiques," notes (in 1765) as a very surprising thing not seen elsewhere, a blast-furnace that had already been in operation without interruption for four years, and was expected to go on for yet another year. These works were, to quote M. Jars :— 1760. " Voyages Metallurgiques," V. I., pp. 277–79.

" without fear of contradiction the best equipped in existence. Everything tends to the advantage of this establishment. The owners themselves exploit a large coal-mine near the furnace. They have a very fine stream of water, in addition the foundry is very near a sea-port."

It was at these works that the first blowing cylinders were used by Dr. Roebuck, one of the Carron directors, at a date subsequent to M. Jars' visit in 1765. Here were produced the famous Carronades, light and powerful guns, which were made standard in the Navy in 1769.

It seems probable that the loss of the valuable naval contracts was the final blow to the Wealden industry. The Wealden ironworks, with their manifold disadvantages, especially that of costly transport, were unable to stand up against the formidable competition from all sides, and rapidly fell out of use. A contributing cause was the remarkable dryness of the first half of the 18th century, in which period approximate rainfall statistics

become available. Quoting from Messrs. Brooks and Glasspoole's "British Floods and Droughts":—

"The dryest period extended from 1737 to 1750 inclusive, the average rainfall of these fourteen years was only 87 per cent. of the normal. The dryness of the first half of the eighteenth century was so marked and persistent as almost to constitute a different climate from that of the last half of the nineteenth and the beginning of the twentieth centuries."

John Fuller, writing in February 4th, 1744, says:—

"We have not had two hours rain these six weeks. I presume you are not ignorant of the fact that both Mr. Crowley's furnaces are blown out for want of water, and as I previously stated they tread the wheel at Waldron, Robertsbridge, and Beckley, which is an excessive charge, and is the same thing as if men should walk in one of your Capstans, night and day for a quarter of a year together. If the weather continueth, want of water will blow out all the Furnaces in the County."

The most important factor, however, in the decay of the Wealden iron trade was the high price of fuel, caused by the competition of the hop industry and the rising costs of labour. In all the recorded accounts the charcoal is by far the most expensive item. The earliest figures we have, for Newbridge in Henry VIII's reign, show that the fuel amounted to 63 per cent. of the cost of sows and 51 per cent. of the cost of converting sows into bars at the forge. In Fuller's very carefully analysed account for the year 1746, the cost of the mine and the founder's labour was but 17½ per cent., while that of the fuel was 82½ per cent. of the total expenditure up to the point of moulding and casting the guns. It was small wonder, therefore, that not only the Wealden charcoal furnaces, but those in other districts went down before the competition of those using coke.

The following table shows the last dates on record for the furnaces, although in some cases they may have continued for a year or two:—

Gravetye was casting guns in . . . 1762
Millplace was casting guns in . . . 1763
Lamberhurst finally closed in . . . 1765
Brede finally closed in 1766
Beckley finally closed in 1770
Heathfield cast the last guns in . . . 1775
(John Fuller having died in 1775)
but finally closed in 1787
Fernhurst finally closed in 1790
Robertsbridge—the last rating was in . . 1793
Ashburnham finally closed in . . 1809 or 1810

It is curious that this last cannot be fixed more definitely; the recorded dates are conflicting.

The "Hastings Guide" of 1797 gives the following table of exports from that port, and states "the iron branch (which consisted chiefly of cannon from the founderies at Rotherbridge and Ashburnham) has failed considerably within these few years."

Exports of iron from Hastings in the years ending :—	Tons.
May, 1779	293¼
,, 1780	348¼
,, 1781	256½
,, 1782	224
,, 1783	266
,, 1784	78½
,, 1785	3
,, 1786	184
,, 1787	152
,, 1788	nil
,, 1789	¼

The forges seem to have remained at work somewhat later than the furnaces, probably working up scrap iron for local needs.

Wire Mill was working in 1763, Thursley in 1767,

Robertsbridge Forge was not sold till 1801, and Ashburnham Forge, the last of all, worked till 1820—William Hobday, the last surviving ironworker there, died so lately as 1883.

So ended, after some 300 years of life, one of the most important industries of these islands. In its prime it had employed a notable proportion of the inhabitants, and was not only a means of prosperity to the countryside, but a source of strength to the nation.

Little, save some of the ponds, remains to be seen to-day; many a once busy site is hardly to be distinguished in the dense tangle of brushwood and bracken that has overgrown it. The buildings have gone, almost every stick and stone has been utilised elsewhere. The great bays are crowned with noble trees of many years' growth, and the once threatened woods have come into their own once more.

SIC TRANSIT

CHAPTER NINE

HAMMERPONDS AND POWER

THE most conspicuous relics of the industry are the Hammerponds. The size and natural beauty of these miniature lakes, despite their artificial origin, attracts universal attention.

The term "hammerpond," used indiscriminately for a pond serving a forge, a furnace or both, would rather lead one to suppose that the forge preceded the furnace and was used to supplement the heavy labour in forging the blooms antecedent to the introduction of the new process. There is a French record of a "moulin à fer" as early as 1249, and at Byrke Knott, Durham, a mill was used in 1408.

The first mention we possess of power being used in the Weald is that of "the great water hammer" at Newbridge in 1492.

Salzmann, "English Industries of the Middle Ages," pp. 30 (N. i.), 111.

Water power was in the first place applied to corn-milling. The earliest form, the Norse mill with horizontal wheel and vertical shaft, has been in use about 2,000 years, and is, even now, not quite extinct in the Shetlands. This form was an application of power to the hand-driven quern, driving the millstones directly without the intervention of gearing, and was particularly suitable for corn-milling. Although in use in Asia Minor, Greece and the northern countries, it was not utilised to a great extent by the Romans, who ground their corn by human labour. The power was small and unsuitable for other purposes.

"History of Corn Milling," Bennett and Elton, V. II., p. 12.

The present form of vertical wheel was in all probability invented by Vitruvius, who described it about 20 B.C. This, however, was not generally adopted by the Romans until A.D. 398, and is hardly likely to have penetrated to distant Britain before the evacuation in A.D. 448. This form, however, was adopted by the Saxons, and it is supposed to have taken the place of the Norse mill.

Domesday Survey took careful account of mills, some of which may have been Norse mills. At Lechewyrde, in Somerset, the mills paid a rent in iron ; possibly they were used for crushing ore. In the succeeding three or four centuries tanning, paint, saw, and fulling mills are recorded in various charters. As might be expected, out of the 155 manorial watermills recorded in Domesday, the greater part of which were in West Sussex, only seven were in the Wealden parishes in which ironworks occur, and even these may not have been at the same sites.

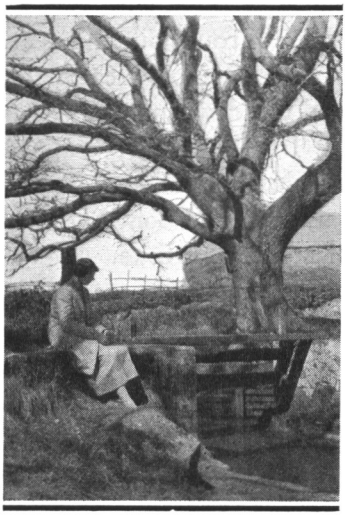
In all probability, therefore, the Wealden ponds were first established for the purpose of working iron and did not take the place of existing corn-mills, and this is the more likely as the power and therefore the size of the pond required was much greater than for corn-milling.

However, subsequent to the decay of the industry, many of the ponds were utilised for corn-mills. Although some of these continue in work for the provision of poultry food, the grinding of cereals for flour has practically ceased in the Weald. The greater number of these mills have become derelict in our own times, owing to the laying down to pasture of the arable land and the competition of the roller-mills at the ports. The same causes are rapidly sweeping away the picturesque windmills, not only in the Weald, but in the countryside everywhere.

The usual method of forming the hammerponds was to throw a substantial clay dam, or " bay," as it is called

throughout the Weald, across a somewhat deep valley. At one end of the bay, where the natural bed of the stream ran to one side or the other of the valley, an overflow or spillway was constructed, with hatches that could be raised or lowered to regulate the height of the water and to relieve the pressure on the bay in time of flood. In the later established ponds in the western part of the Weald these spillways were well constructed of masonry or brickwork, and where the difference in level between the surface of the pond and the stream below was considerable a series of steps similar to a staircase was installed, to break the fall of the water and prevent a deep pit being eroded, which would have undermined the bay. There are no traces of these in the eastern districts, except at Newbridge, which would seem to point to a timber construction. In the Pelham accounts the payments for repairs to the bay were chiefly for carpenters' work. At the making of the works at Robertsbridge in 1542, carpenters were paid no less than £52 8*s*. 9*d*. for the finishing of the forge,

Lurgashall Mill.



Spillway at Riverpark.

MSS. Lord de Lisle and Dudley, V. I.

furnace and "bayes." Unless constantly repaired the decay of the timbers would soon lead to a bursting of the bay at this point, and we find, as a matter of fact, that where the pond is dry the break is nearly always here.

The supply to the wheels was carried through the bay in massive oaken shoots, which could be extended if required to serve a wheel at some distance from the bay. The remains of such a shoot are still to be seen at Ashburnham Forge, and two were discovered leading through the bay by Mr. Lionel Robinson when restoring the pond at Warren Furnace.

At Korsa Hammer, in Sweden, where the old tilt hammers work to-day, the large water channel is entirely made of timber, and this arrangement is frequent in sawmills in the Alps.

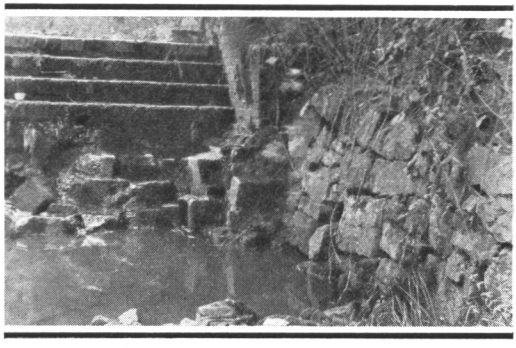
The furnaces were set up with special regard to the proximity of the mine and fuel, and therefore we usually find them on the smaller streams. This necessitated a large pond to accumulate the water. Although the rainfall was probably somewhat greater than it is at present, they were not able to work throughout the year. We see this very markedly in the case of Heathfield, which had a very small watershed to draw upon, and was considered a winter furnace. In the Fuller papers, 1703–1755, we can trace very clearly that the casting season commenced in the late autumn and continued till the early summer; in 1743 it lasted 29½ weeks.

Herbert Blackman, S. A. C., LXVII., p. 25.

In order to lengthen the run as much as possible, in many cases smaller ponds were constructed higher up the stream or its tributaries, Heathfield having no fewer than twelve of these supply ponds, five of which still hold water, although the main pond is dry. In the event of water failing during the casting period, it was sometimes necessary to work the wheels by "treading," after the fashion of a treadmill.

In October, 1754, Fuller writes : " I actually have not above three weeks water, and should I want water 'twill cost me £10 to tread the wheel."

The larger streams draining a large catchment area and subject to periodic flooding, usually running in a deep channel through alluvial soil, could not be entirely dammed in the manner previously described. The practice in such a case was to tap the stream at some considerable distance above the forge and to bring it by means of a leat to a pond at the works. As there would be in this case a greater flow of water, there was not the



Spillway at Newbridge.

same necessity for the pond to be a large one. Examples may be traced at Bibleham, Echingham Forge, and many other sites on the main rivers. This expedient had the further advantage of providing the requisite difference in level in a flat valley. It is to be remarked that this method was more usually applied to a forge than to a furnace, probably owing to the more continuous working required, which would be better served by the larger streams.

In the course of time the ponds became silted up with the sand and mud carried into them, and no doubt the heavy cost of clearing away the mud was one of the economic causes of the decay of the industry. Another remedy, that of heightening the bay, usually with the

heavier furnace refuse, was frequently adopted. This necessitated the provision of new flumes at a higher level, such as were found by Mr. Lionel Robinson at Warren Furnace.

The accumulation of silt at the bottom of the ponds is frequently 8 or 9 feet in depth, and one frequently hears that it is possible to drive a hop-pole down to this extent. Such pond bottoms, when drained, are eminently suitable for the growth of hops, and in the eastern hop-growing districts are very commonly used for this purpose.

It must be noted that not all of the large ponds in the Weald are hammerponds. The art of constructing them, being so well understood, was utilised for making ornamental lakes in parks. Examples of such are the lakes at Slaugham Place, Balcombe, the parks at Crabbett, Possingworth, Bedgebury and Wadhurst. Apart from their embellishment of the landscape, these lakes were highly valued in the 17th and 18th centuries for their provision of a supply of fresh fish, otherwise unprocurable away from the coast.

A pool or depression is frequently to be found where the stream of water was thrown clear of the wheel when a temporary stoppage was necessary. In some cases where the fall was slight, breast or undershot wheels were used instead of the more powerful overshot.

It must not necessarily be assumed that the wheel was always at right angles to the bay; a position parallel to the bay is sometimes used to-day.

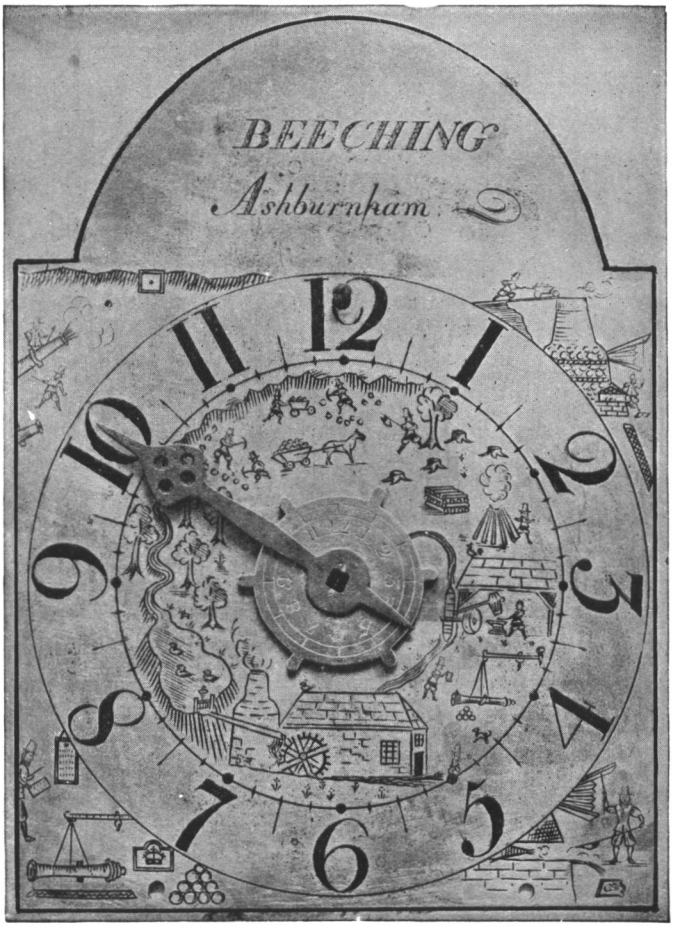
CHAPTER TEN

THE FURNACE

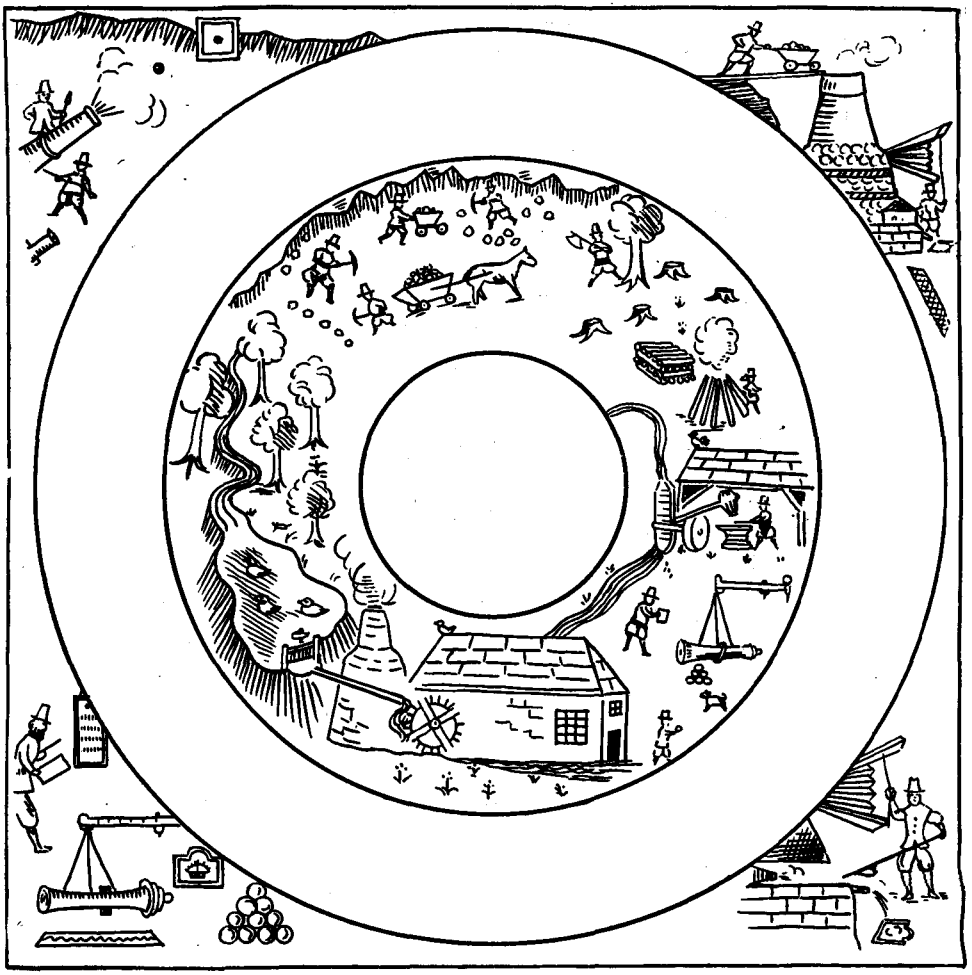
THE furnaces were situated just below the bay, and were usually built of the local sandstone and brick. When they fell into disuse the materials were used for other purposes and in no instance are there any remains. We can only gather some idea of their appearance from the four representations extant, namely, the Lenard fireback, the Ashburnham clock face, Swedenborg's diagram, and Edward Browne's figure. The first is dated 1636, and several examples of various sizes are preserved. The one illustrated is in the Sussex Archæological Society's Museum at Lewes. The clock was made, probably, in the 18th century, and its brass dial bears the name "Beeching, Ashburnham," and has engraved upon it a representation of the whole process of ironmaking; the cutting of the wood and its conversion into charcoal, the digging of the mine, the furnace with the water-wheel for its bellows, and the mill pond, the finery and hammer, and some of the products of the furnace—guns and shot. To make the detail clearer, a drawing of the clock face by Mr. W. A. Young is reproduced.

Rhys Jenkins, Newcomen Society, Transactions, Vol. I., 1920–21.

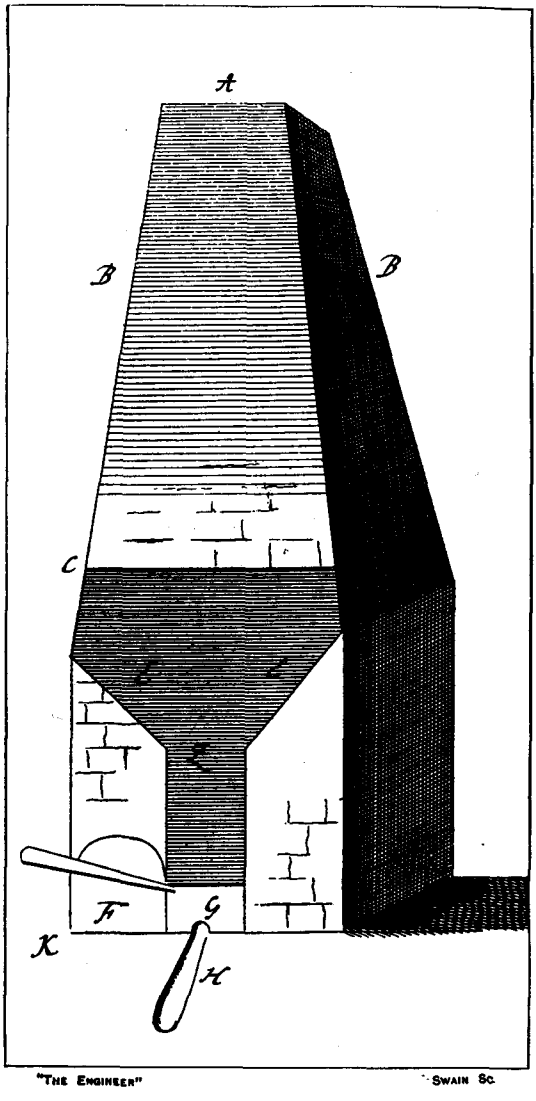
In Swedenborg's work on iron we find a rough drawing of the Gloucester Furnace at Lamberhurst, from a sketch made early in the 18th century. This is obviously altogether out of scale, and does not distinguish between the inside and the outside of the furnace, but is the only



Brass Dial of Thirty-hour Clock.
From Hayden's "Chats on Cottage and Farmhouse Furniture."
By permission of Ernest Benn, Ltd.



Clock Face, redrawn to show detail, by Mr. W. A. Young.



Gloucester Furnace, Lamberhurst.
From Swedenborg's "De Ferro," 1724.

engraving we have of a Wealden furnace. This furnace was 28 feet high, and it is stated that it was 4 feet higher than any other in England at that time (1724). The greatest size inside was $7\frac{1}{2}$ feet by 8 feet. For cannon the hearth was made 5 feet long and 21 inches wide, for ordinary work 4 feet long and 18 inches wide.

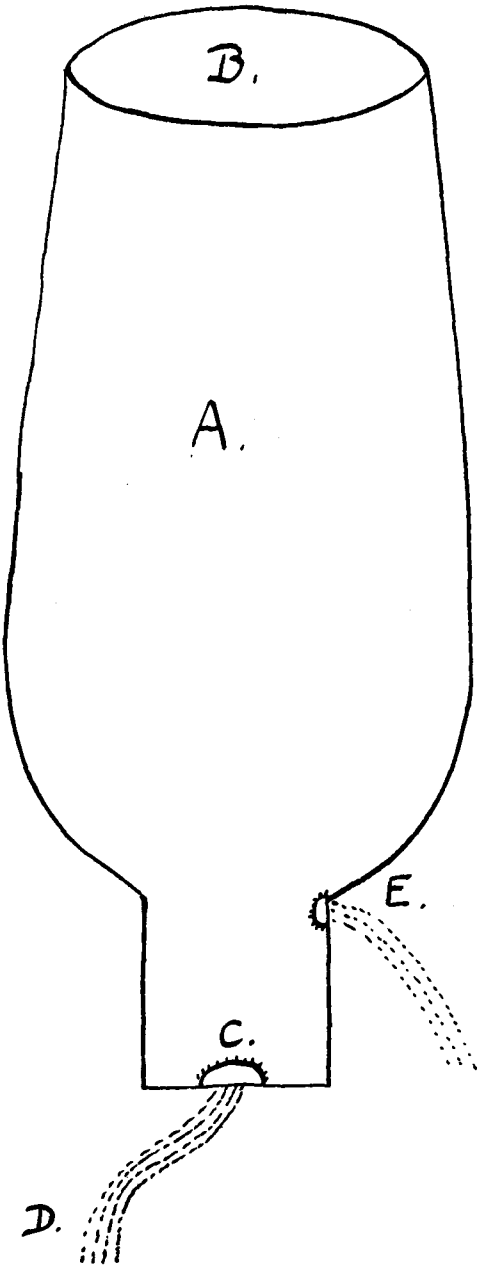
The internal section is shown in a rough drawing of the cannon furnace at Horsmonden, Kent, drawn by Edward Browne in 1669. His references are :—

A. The melting furnace.
B. The mouth where the ore or mine and charcoal is thrown in and the flame coming out.
C. The place where the metall or melted iron is let out and runneth into the
D. mould for ordinance
at E. the drosse is let out.

The text of the letter to his father in which it appears, is as follows :—

"At Horsmonden, four miles from Bayhall, a house of Mr. Amherst, and about 8 or 9 miles from Turnbridge are ironworks and brasswerkes in order to the making and casting ordinance. To make the ordinance they proceed thus—They take great quantity of iron ore or iron mine as they call it and charcoal, casting in first one and then the other into a furnace about 10 yards deep, so that the materials being thus placed *S S S* and set on fire, they continue the same for six or seven dayes, still supplying and filling up the furnace with the same materials as they decrease by the losse of what is carried up by the fire and what is let out as dross at a hole E above the place where they let out the melted metal C. Near to the bottom of the furnace A is the Cannon mould placed in the earth D, so that when the metall is ready and pure they onely open an hole at the bottom of the furnace and the metall runneth out so as to fill the Cannon Mould. Thus they make Ordinance at once melting the ore or mine. This mine or minera ferri is much of it like marle, some like white clay and some yellow, some of it sticketh to the tongue like bolus, the best is found in clods of almost a globular figure of a darke red colour, it laieth very shallow in the earth and in some places is digged out of the side of a hill as chalk. The iron furnace being deep and narrow in proportion to its depth, the flames rush forth

Landsdowne MSS., 5233, f. 53.



Edward Browne's Sketch.

with such violence and to so great a height that they are seen about the country at ten miles distance.

Your most obedient Sonne

1669. EDWARD BROWNE."

In Tudor times " double " furnaces, presumably a pair side by side, were used for casting large guns.

We have a record in the Worth accounts of the cost of erecting a double furnace in 1547, which shows a high cost for those days. It is interesting to see that iron forms a considerable item in the list. Probably long sows were used to form lintels over the openings and tie-beams; such still remain at Gunn's Mills, an 18th-century furnace in the Forest of Dean.

Making a Double Furnace

Day labourers	22	6	10
Masons	9	11	8
Carpenters and coopers	12	10	2
Sawyers	6	10	8
Timber, stone and clay	8	0	0
Carriage of sand	0	13	4
Daubing furnace walls	0	1	8
Iron, ironwork, and iron laid into furnace	15	9	9
Nails	1	3	8
Leather for bellows	2	18	4
	£79	6	1
Workhouse (of wood) for the gunfounders	4	12	3

From this it will be seen that there was a considerable amount of timber work, although no mention is made of the wheel, which perhaps did not require renewal.

The ore and fuel were fed into the top of the furnace

by means of a " bridge." In France and in the Forest of Dean there was a " bridgehouse " to protect this from the weather, and we learn from the Waldron and Ashburnham accounts that such existed at these furnaces and were roofed with tiles. The old-style charcoal furnaces in Sweden, however, have no roof, but merely side protection. There was a timber building to protect the bellows and the casting floor on the ground level, also roofed with tiles; broken fragments of these tiles are frequently to be seen.

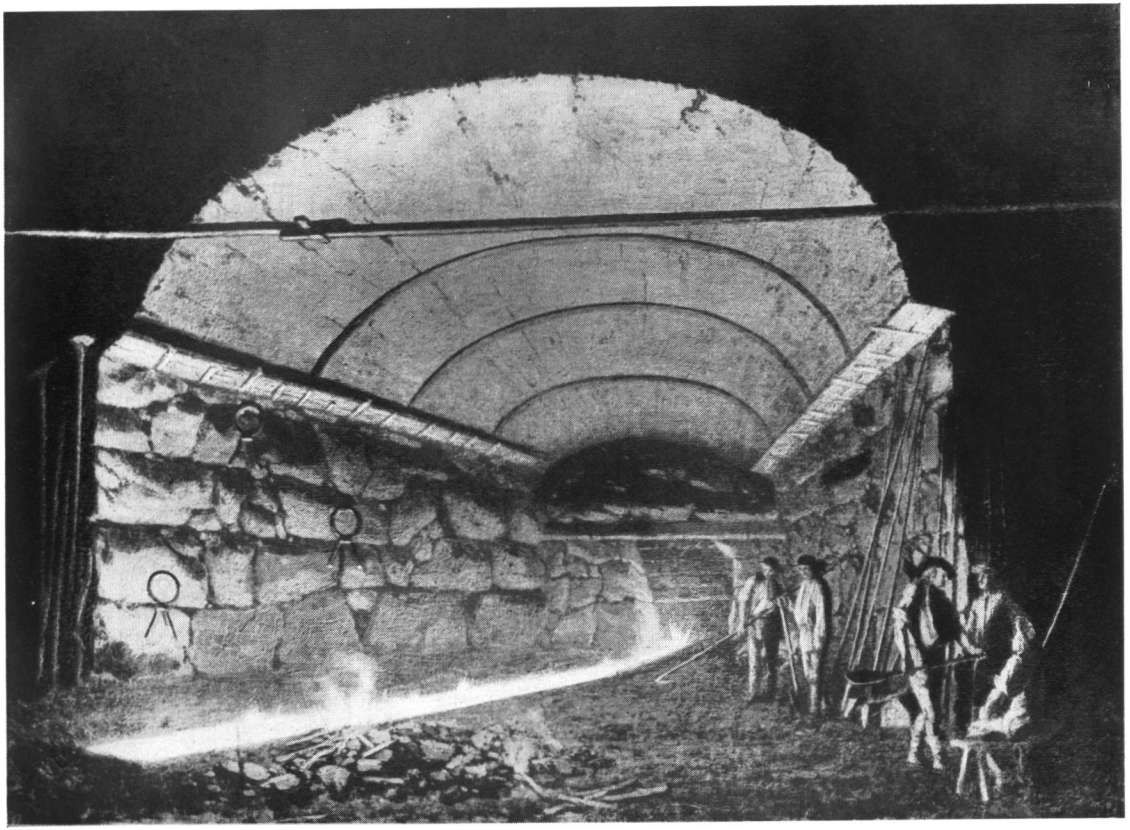
In front of the furnace a channel was formed by a triangular tool in the loam or sand floor, and into this the molten metal was run, forming the " sow," triangular in section and tapering at each end to a blunt point. There are examples extant at Lewes in the castle grounds and at Mr. J. H. Every's Phœnix Ironworks, also at Littlehampton Museum; the latter I discovered in situ at Hammer Farm, Shipley. At the present day smaller channels are run from the " sow " channel at right angles, forming smaller castings called " pigs."

See p. 44.

In Ray's account the word pig is applied to the smaller pieces, weighing 1,000 lbs. or under, made in the earlier stages of the blowing, but not branching from a sow. Probably the furnaces were of insufficient capacity to provide more metal than a sow at each tapping. Beck supposes the terms sow and pigs were originally contemptuous names for an undesired product when the intention was to produce wrought iron direct without undergoing the second process of forging.

The bellows used in the Weald, whether for furnace or forge, seem to have been invariably of the same form as the domestic or smithy bellows, although, of course, much larger. Fuller purchased timber 15 feet by 3 feet 3 inches to make the upper lids; in the Forest of Dean in 1635 these boards were 18 feet by 4 feet.

The sides were made of ox-hide, a costly item, and



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A Swedish Blast Furnace in 1793, from a Painting by Pehr Hillestrom.

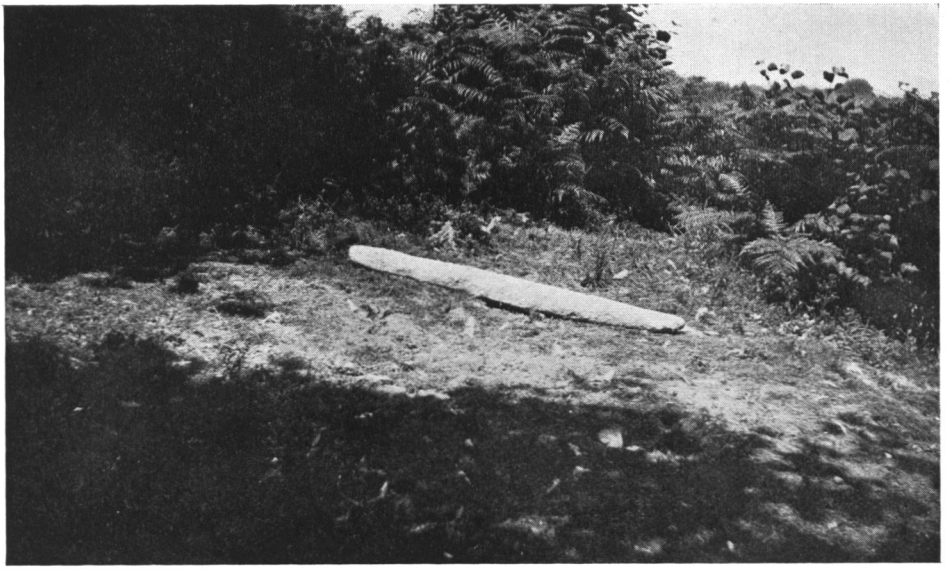


Photo : Miss Blackman.

Sow found near Brightling, now in possession of J. H. Every, Esq.

had to be well dressed with grease. Although wooden bellows were introduced in Germany at the beginning of the 17th century, there is nothing to show that the conservative Wealden ironmasters ever departed from the primitive type.

Johannsen, "Geschichte des Eisens," p. 91.

The bellows were in pairs, depressed alternately by cams on the shaft of the waterwheel and raised by counterbalances.

CHAPTER ELEVEN

THE FORGE

THE forges for converting the sows into bar iron were sometimes worked by water from the same pond as the furnace, but were more often placed at a short distance away either on the same or a neighbouring stream. There were also a number of forges which cannot be traced by their ownership as attached to any particular furnace, although this may have been the case.

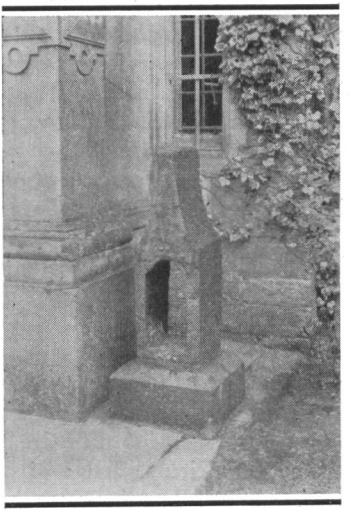
As examples showing the great distance that had sometimes to be traversed between the furnace and forge are Bibleham and Glaziers Forges, which were Pelham property, supplied with sows from Waldron Furnace, the respective hauls being eight and seven miles over very hilly country.

The following attempt at classification must therefore be taken as very approximate, owing to the absence of records, and the likelihood of failure in tracing the distinctive cinder :—

Furnace and forge on the same site .	10
Furnace and forge within a short distance of each other	29
Furnaces without connected forges .	62
Forges without connected furnaces .	32

Joseph Wright (of Derby), A.R.A. Pinxit.

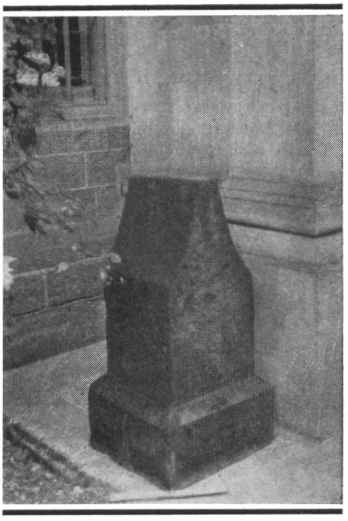
An Iron Forge, 1772.



Hammer at Boarzell.
From Echingham Forge.

The forge building contained two or more hammers, which are thus described by Dr. Lardner in his "Cabinet Cyclopædia," 1831 :—

"The earliest and most simple contrivance for reducing masses of iron into bloom as well as into bars, when the aid of machinery was brought in, was the working of a forge-hammer by means of a water-wheel. The common arrangements for this purpose, as they exist in some of our older establishments for the conversion and working of iron, are as rude as they are effective. The annexed cut will assist the reader, who may never have visited the interior of one of these forges, to conceive distinctly the construction and mode of using one of these powerful agents in the hammering of iron on a large scale.

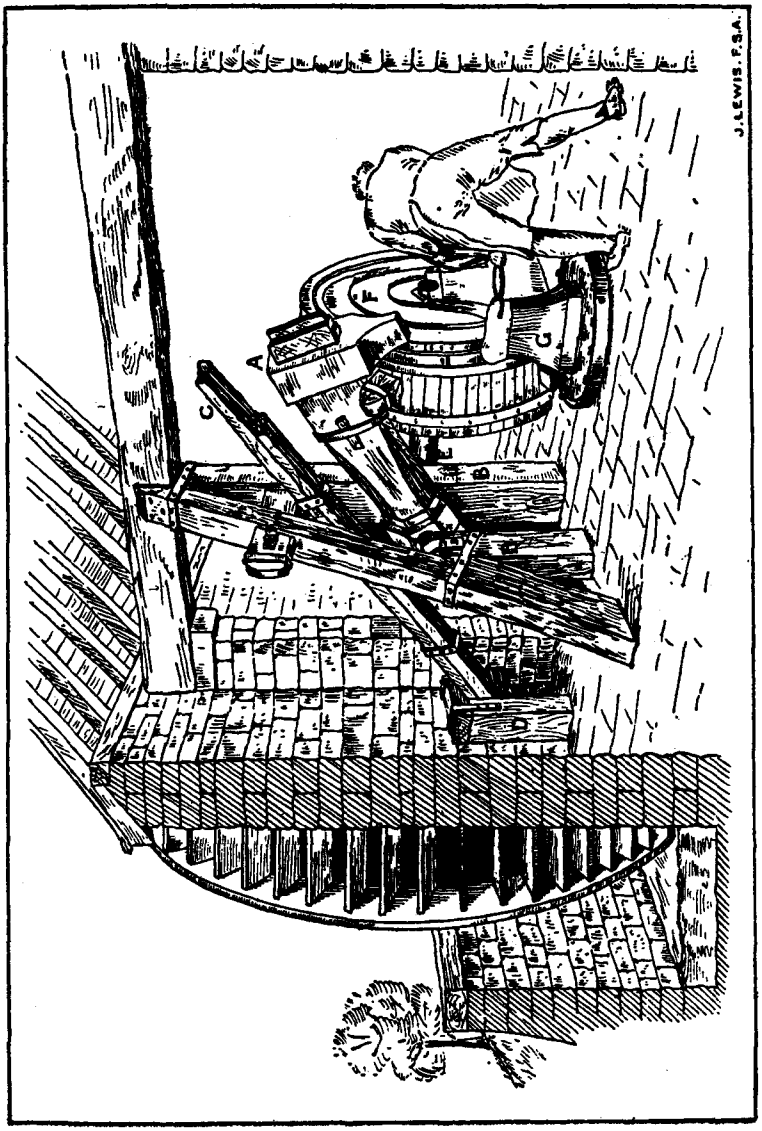


Anvil at Boarzell.
From Echingham Forge.

" The hammer is represented at A (in the figure), the shaft or *helve* is about 9 feet in length and 30 or 40 inches in circumference, made of ash and clamped at intervals with stout iron hoops. The head through which it passes in the manner of a common hammer-shaft is of cast iron and weighs 7 or 8 cwts. At the opposite extremity this helve passes through, and is firmly fastened with wedges into, a massy collar of cast iron, called the *hurst*, the two projections or pivots of which form an axis for the hammer, and work horizontally in and between the limbs of the support B.

" C is a strong but elastic rabbet or spring of timber; it is somewhat lighter and longer than the helve, but like it made of tough ash and bound with iron hoops. It is bolted firmly to the post or puppet D and likewise to the frame B, through which it passes; its use is, by acting as a spring, to send the hammer down towards the anvil with a degree of velocity greater than that with which it would fall by its own weight merely.

" On the near extremity of the water-wheel shaft, which extends in a direction parallel with the helve and reaching nearly to its head, is fixed a ponderous circular frame of cast iron, about four feet in diameter, technically called an arm-case; holes are cast in this case for the insertion of four knobs or blocks of wood, and these are shod with iron on their acting surfaces. To give motion to the hammer the water is thrown upon the wheel, the shaft revolves and the arms or knobs just described as projecting from the periphery of the block in which they are inserted, catch the helve under the belly and lift it against the rabbet, and, constantly proceeding in their revolution, the hammer rises and falls upon the anvil G with a rapidity proportioned to the velocity of the water-wheel and the circumference of the lever-block on its shaft. The pitch or fall of the hammer between the rabbet and the anvil varies at different forges. In some forges the water-wheel shaft, instead of being parallel with the helve, is placed at a right angle with it, the hammer in this case receiving its elevating impetus by the lever-block knobs acting upon the tenor, or that portion of the shaft which projects through the head of the hammer. An arrangement so obviously incommodious as that last described, and which compelled the forgeman to work only across the anvil, has generally given way to some better plan. The proprietors of the more recent establishments, and especially where steam is the moving power, have adopted various improvements: the cumbersome wooden frame-work of the old forges, including the timber, spring-pole and hammer-beam, has been generally discarded, and along with cast-iron supports of all kinds, a metal helve has been introduced: this is a ponderous cast-iron shaft, through the head of which is inserted the actual hammer, which, by this contrivance, admits of being removed when worn down and of being replaced by a new one without affecting the helve itself. These hammers,



Working Drawing of Hammer Forge.

instead of being lifted by an application in front or at the side, are elevated by the operation of what the workmen call a *cam*, revolving under the belly of the helve, as represented in the figure. This contrivance consists of two or three steel-faced levers, each half-crescent shaped and turning upon an axis, so that as they act in succession upon a projection under the throat of the helve, the latter is made to rise and fall as required, making about 150 strokes in a minute.

"These hammers, the faces of which are generally very large, having three degrees of projection, mostly work upon an anvil, the surface of which is likewise divided into three parts; the first is 10 or 12 inches wide, and upon this the ball or loop of metal is laid to be shingled. When sufficiently brought together it is rolled to the narrow or cutting face, and there drawn out in length, after which it is finished on the middle or straight face.

"The hammer B, the face of which is divided, as already mentioned, into three parts, for the better performance of its work, weighed about 8 cwt., and the anvil C, which in like manner is fitted into a cast-metal block itself, weighed upwards of 4 tons."

This tilt-hammer is still in use in Sweden to-day, for forging bar-iron, and in this country, in slightly modified forms, for scythe making and nail forging. A hammer-head and an anvil, originally from Echingham Forge, are preserved at Boarzell, Hurst Green, the seat of the late Sir Frederick Fison.

Korsa Hammer, Dalecarlia, Sweden.
Showing Tilt-hammers working to-day.

CHAPTER TWELVE

CINDERS AND SLAGS

" . . . *the purgings of iron,*
The villainous drool of the furnace."

From " The Cinder Buggy," Garet Garrett.

By whatever process iron is made, a considerable amount of refuse is produced. The oldest term " Cinder " is used for all kinds in Sussex place-names and in the old road laws. The Oxford English Dictionary quotes the following forms of the word :—

Sinder—Sindor—Sunder (before A.D. 1100); **Cyndyr—Cyndre** (15th–17th century); **Syndre** (15th–16th century); **Synder** (15th–16th century); **Sindar—Cindre—Zynder** (16th century); **Sinder—Cynder—Cinder** (16th and 17th century).

The S initial seems to have persisted later in manuscripts than in print.

The term " Scoria " is first found in English in 1398—" Syndre hyght Scoria and is the fylth of yren that is clensyd therefro in fyre."

The word " Slag " is of German origin, the first date is 1552. In Ray's " Collection of Words," 1691, he quotes : " The slags and cinders of the first melting they beat small with great stamps."

I retain the oldest term " Cinder " for bloomery and power forge refuse, and restrict the term " Slag " to that of the blast furnace.

In every form it is indestructible, and is the best evidence that we have of the character of the works.

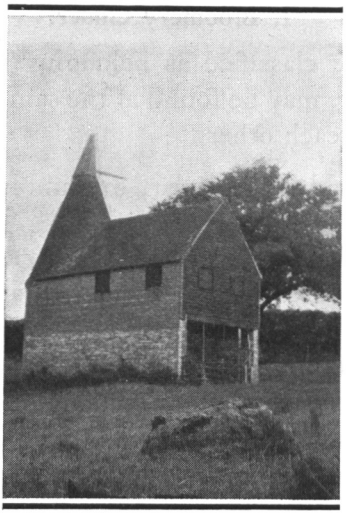
Being the hardest material to be found in the Weald, all varieties have, from the earliest times, been intensively exploited for road-making, so much so as practically to clear some of the bloomery sites. From this use, and from its accidental distribution by farm operations, mud adhering to cartwheels, etc., it frequently appears in places far from the actual sites where it was produced, thereby furnishing many false clues.

The occurrence of cinder or slag is of great assistance in finding the sites, and its characteristics, which I have attempted to describe on the following pages, enable one to fix or verify the period with some approach to certainty, although so far as bloomery sites are concerned, this must be qualified.

As the process was practically unchanged for perhaps two thousand years, the date cannot be definitely determined, although certain characteristics seem to connect with the dating shown by potsherds found with the cinder.

At the large Roman works, much broken pottery is usually to be found, but pre-Roman pottery is much less abundant, even in the ancient camps on the South Downs, where the presence of cinder has only recently been established by the excavations of Dr. E. Cecil Curwen and others.

Much more investigation is required before anything definite can be laid down on this point.



"Bear" at Beech Mill.

At some sites a mass of more or less pure iron is to be found, from 5 feet to 2 feet in the greatest diameter. This is called a "bear," and is exceedingly hard, it being almost impossible to break with a hammer. John Fuller (1737) says :—

"I attribute what they call 'tumbling' of mine in a Furnace to a quantity of hard mine getting together, which will not readily melt, or perhaps not at all, and then falls down in a lump, hard as it is and spoils the other metal in the hearth ; this they think they can help by the 'Boches' having an obtuser angle, but this must be very uncertain."

Herbert Blackman, S. A. C., LXVII., p. 31.

I. Bloomery Cinder.

This may be classified as belonging to seven forms, which, however, may be found at the same site, and blend insensibly into each other.

A. Rounded, globular, or nubbly, with smooth, blue-black surface.

B. With vermiform striations, caused by viscous flow over flat surfaces; surface clay-coloured to blue-black.

C. Rectangular fractured surfaces. The fracture of all these shows blue-black when freshly broken.

D. The form found in ancient camps, mainly on the South Downs, beyond the Weald, rough surface, rusty colour. Probably the refuse hammered out of impure blooms.

The specific gravity of A, B, C and D varies between 2·31 and 3·84. A typical specimen of A, however, collected at Niedersteinhammer, Kreis Olpe, Westphalia, shows the high specific gravity of 4·07.

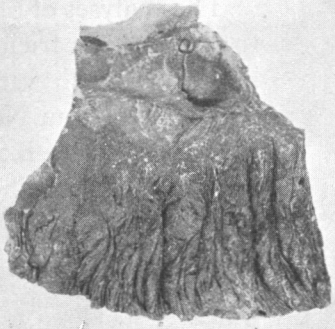
E. An abnormal form, found only at Tudeley and Colliers Green, in larger masses than usual, with rounded, rough surfaces; specific gravity, 2·43. Similar cinder has been found in the Highlands, of 15th-century date.

F. Amorphous, black or olive-green shiny fracture, sometimes slightly vesicular.

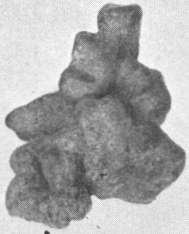
G. Black glassy, similar to blast-furnace slag, but rounded or amorphous.

F and G have a lower specific gravity, ranging from 2·04 to 2·65, probably showing a large proportion of silica.

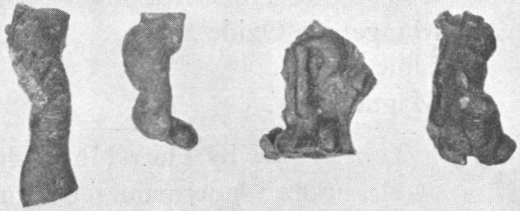
C. FOOTLANDS



B. BEAUPORT



A. PAGDEN



A. HOWBOURNE

A. SAXONBURY

E. TUDELEY

BLOOMERY

(One-half actual diameter)

The analyses of bloomery cinders that I have been able to obtain from friends or from published authorities do not show much variation. The following, that of the "ox-bone" from North Wood, Guestling, made by Mr. Harry Silvester, B.Sc., F.I.C., of Birmingham, is fairly representative. The extreme variations of analyses from other localities are appended :—

See p. 340.

North Wood.	Per Cent.	Others. Per Cent.
Silica	32·4 ..	29 to 38
Alumina.	7·1 ..	2 to 7
Iron Oxide	53·4 ..	31 to 59
Manganese Oxide	1·8 ..	2 to 12
Lime	3·2 ..	2 to 8
Magnesia	1·3 ..	1 to 3

Knaff. "Beitrage Zur Geschichte der Eisenindustrie an der Mittleren-Sieg."

Sondermann. "Geschichte der Eisen Industrie in Kreis Olpe."

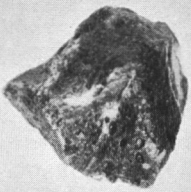
Those given by Herr Hüttendirecktor, A. Knaff and by Dr. Franz Sondermann for German cinder from Nassau and Westphalia, produced under similar conditions, and having the same characteristics, are much the same, the proportion of silica being somewhat lower and that of alumina higher.

Analyses of the cinder of the Catalan process from the Pyrenees, although the process itself is more advanced, agree very closely with the Wealden range.

In the Forest of Dean the heavy iron content of bloomery cinder led to its extensive use for mixing with ore in the later blast furnaces, so much so as to render it scarce there, but there is no evidence of such use in the Weald.

All bloomery cinders are frequently accompanied by pieces of Cyrenæ limestone, burnt or unburnt.

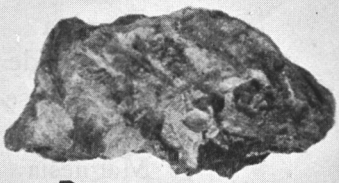
G. HORSTED KEYNES



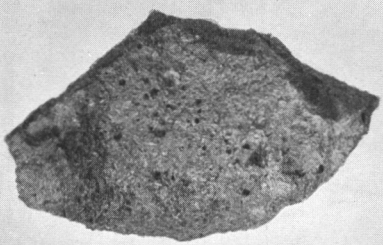
F. ROMAN GATE

D. STOUGHTON

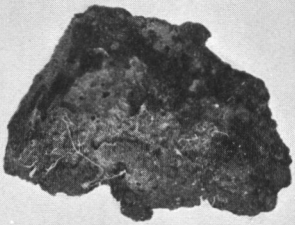
D. WOLSTONBURY



D. ALCISTON



D. FIRLE



D. CAMP HILL

BLOOMERY

(One-half actual diameter)

II. Power Forge Cinder.

H. Very similar to A, but somewhat larger. Perhaps the product from power bloomeries.

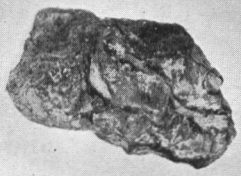
I. Irregular shaped masses, rusty colour throughout, with a rough surface except when exposed to wear (as in roads). It then assumes a kidney-like appearance. The specific gravity of these varies from 3·13 to 3·59.

I have only one analysis of power forge cinder, made by Mr. A. Anderson, of the Carron Company, from cinder collected by Mr. H. Jackson at Sowley Pond, Hants, and kindly sent me by Mr. J. W. Hall, namely :—

Sowley.	Per Cent.
Silica	23·9
Alumina	5·6
Iron Oxide	57·3
Manganese Oxide	3·4
Lime	7·7
Magnesia	0·8

Silesian charcoal finery cinder is very similar to this in composition, and neither of them differs greatly from the bloomery examples.

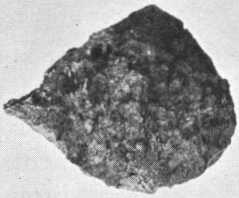
I. ROBERTSBRIDGE ABBEY



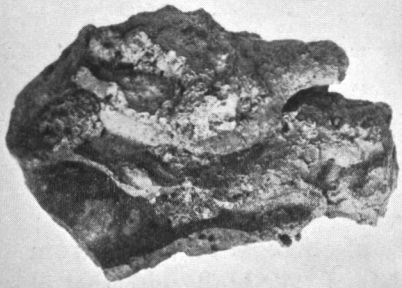
I. LAMBERHURST

I. WIRE MILL

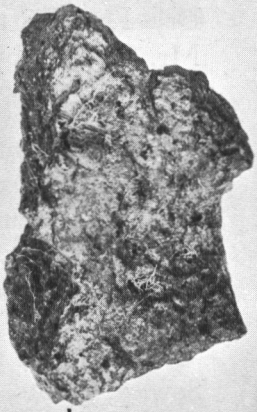
I. LEIGH HAMMER



I. HAMMER FARM, SHIPLEY



I. ROWFANT



I. POTMANS

FORGE

(*One-half actual diameter*)

III. Blast-furnace Slag.

K. This has the appearance of, and to all intents and purposes is identical with, bottle glass, consisting mainly of silica. There is great variety of colour, shiny black or olive green, sometimes veined with white, grey-green, rusty brown, and, rarely, a clear blue.

It varies greatly in the amount of air bubbles contained, ranging from a solid mass without vesicles to one containing as many as the lightest bread, and very brittle.

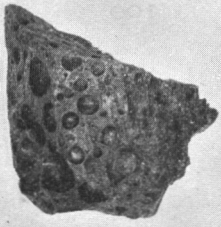
The latter shows the low specific gravity of 1·42 owing to the contained air, that of the solid form being 2·86. The lighter fragments are frequently washed a considerable distance down the streams from the furnace sites.

Blast-furnace slag, type K, is of very different composition to that of bloomery cinder. I give below one from Dry Hill, Surrey, very kindly obtained for me from Mr. Silvester by Mr. J. W. Hall :—

Silica	45·0
Alumina	20·0
Iron Oxide.	1·0
Manganese Oxide . . .	2·9
Lime	27·0
Magnesia	4·1

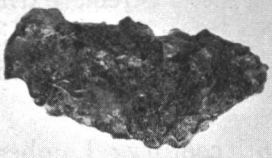
This is very similar to one of charcoal blast slag from Sowley, Hants, sent me by Mr. J. W. Hall, with that of the power forge cinder mentioned above, and to several recorded by Dr. Percy in his " Metallurgy of Iron and Steel." The minute quantity of iron oxide in this results in the microslides showing as clear glass, with practically no markings.

K. STONE

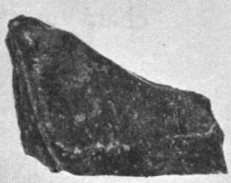


K. STANFORD

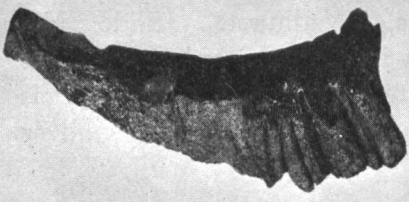
K. FARTHING LANE



K. HENLY



K. HUGGETTS



K. TOLLSLYE

K. BARDEN

FURNACE

(One-half actual diameter)

MICRO-STRUCTURE OF IRON CINDERS

By permission of the Director of H.M. Geological Survey, these photographs have been reproduced from slides in the Survey Collection, and described by Mr. A. F. Hallimond.

1. Roman Cinder; Footlands Farm, Sedlescombe; 1st to 3rd century A.D. Slide No. E.12818. Fayalite and magnetite with much interstitial glass. Type A.

2. African Native Cinder; Kumba, Uganda (modern). Slide No. F.2204. Fayalite, magnetite and silica. Type D.

Several of the Wealden slides are of the same character as this.

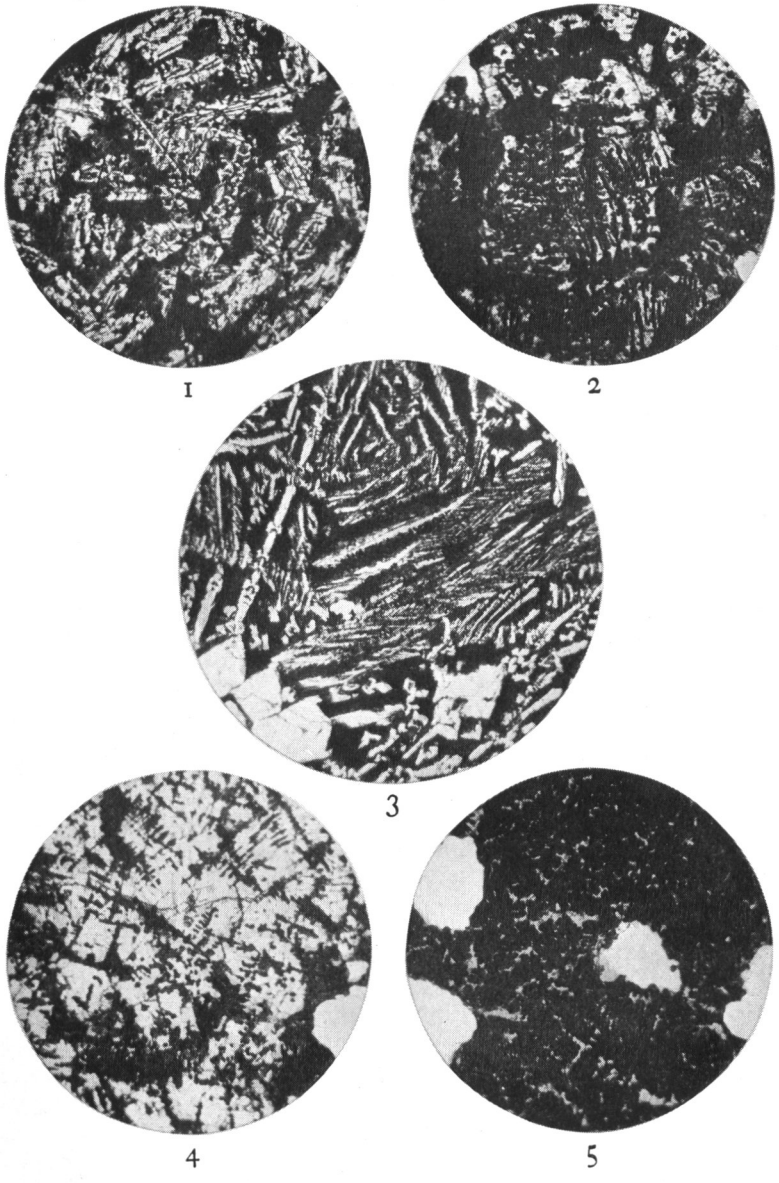
3. Dark Cinder, very early type. Streele Farm, Mayfield (Twitts). Slide No. E.14463. Thin platy crystals of fayalite in a dark glassy groundmass. Type F.

4. Power Forge Cinder; 16th century; Lamberhurst Forge. Slide No. E.15238. Dendritic magnetite in granular fayalite. Type H.

5. Black Forge Cinder; late 16th or early 17th century; Brooklands, Wadhurst. Slide No. E.15239. Very rich in finely granular magnetite with interstitial fayalite; the cavities represent gas bubbles, which give the slag its peculiar cindery aspect. Type I.

Note.—Fayalite is the orthosilicate of iron, $2_{Fe}O.SiO_2$, a transparent mineral. Magnetite is the opaque magnetic oxide Fe_3O_4.

Blast-furnace slag, type K, gives a clear glass slide, with no markings.



Micro-sections of Iron Cinders.

CHAPTER THIRTEEN

MINING AND ORE

THE best general account of mining and ore is to be found in Topley's "Geology of the Weald," from which I quote as follows :— P. 334.

"The ore most commonly used was the clay ironstone, which occurs in nodules and thin beds towards the bottom of the Wadhurst Clay. There is also a bed of shelly calcareous ironstone occurring a few feet above the Ashdown Sand, which would, of itself, serve for both ore and flux. It was probably extracted at the same time as the ironstone.

"The ore was worked mainly by means of bell-pits, of about 6 feet in diameter at the top, and widening towards the bottom. They were generally shallow, rarely more than 20 feet deep; sometimes they were connected by levels. Great numbers of these pits ('mine-pits') still remain in the woods, generally they are full of water. On the pasture fields they have been partly filled up, and here the surface very much resembles that produced by 'day-falls' near the crop of a worked out coal-seam. Scarcely any traces of workings now remain over the arable lands. Waste-heaps do not occur over the worked ground; it is therefore probable that the shale was carted away as 'marl,' and perhaps was paid for as such. This is a point of some importance in view of any proposed re-opening of these workings. There is now no demand for 'marl,' and the removal of a great quantity of waste material would be a serious item in the expenses of working. Large 'marl-pits' are often found near the base of the Wadhurst Clay, and from these the ironstone would of course be removed. The chief method of working was by bell-pits; and I am not aware of any traces of 'hushing' or 'scouring,' such as was formerly practised in South Wales. There is in other respects much similarity between the old workings of South Wales, the Forest of Dean, and the Weald."

Young, in his "Agriculture of Sussex," says :—

8vo. edition, 1808, p. 14.

"At the bottom of the Earl of Ashburnham's park, sandstone is found, solid enough for the purpose of masonry. Advancing up the hill, the sand-rock is 21 feet in thickness, but so friable, as easily to be reduced to powder (Rock sand at the top of the Ashdown Sand). On this immediately a marl rests on (Wadhurst Clay), in the different depths of which the ironstone regularly comes on in all the various sorts, as follows;" (see below).

"The Earl of Ashburnham communicated the following note to Mr. C. Gould; it is dated 14th February, 1836:

"Enumeration of Strata in the Iron beds on the estates of the Earl of Ashburnham in Sussex.

"Provincial names of the beds from Thos. Hobday, many years employed upon the estate in drawing mine (see below):

"These beds begin with No. 1 as the uppermost in the series, and always follow, in some of their numbers, the same order of succession, although in very few instances has Hobday seen the whole present. Sometimes the upper beds, sometimes the middle, and sometimes the lower series are only found."

YOUNG.	ASHBURNHAM
1. Small balls, provincially, "twelve-foots," because so many feet distant from the first to the last bed.	1. Twelve foots.
2. Grey limestone; what is used as a flux.	2. Greys. (Probably a limestone.)
3. Foxes.	3. Foxes.
4. Rigget.	4. Greys. (Probably a limestone.)
5. Balls.	5. Hazards.
6. Cabella Balls.	6. Bulls.
7. White-burn.	7. Cheveliers.
8. Clouts.	8. White bands.
9. Petty.	9. Pitty.
	10. Colours.

A more detailed description, unfortunately fragmentary, is quoted in the Victoria History of Sussex from the Sloane MS.—18th century :— Sloane MS., 4020, f. 189.

"The lowest is Bottom, 16 to 30 feet below the surface, indifferent but useful because it is a sort of Limestone which fluxes the metal. It is sometimes 2 and even 3 feet thick, next is Bull 1½ feet above sometimes in place of Bull is Pitty Rugg, or Colour like the cherry coloured Bottom. The 3 foot Pitty, which is 3 feet from Bottom, is of three kinds—Pitty white-veined; Pitty half white, half grey, and Gray Pitty. White vein is very good especially if it lye 16 feet deep. The Gray Pitty, which I take to be the gray measure of Mr. Plot, is hardest and worst, but has as much iron as any."

In the "Pick and Gad" there is the following note :— No. 2, December, 1857.

"The stone . . . seems principally to have been a spathose ore, or an altered spathose ore, where the carbonate of iron has been converted into a hydrated peroxide. The percentage of this class of ore seems to be very good, some of which, on being tried, produced as much as 50 per cent.; a fair average would seem to range from 25 per cent. to 40 per cent. Other classes of ores have also probably been used, for clay-ironstone is often found, although, so far as observed, generally poor and siliceous ores occur in other places. But the spathose ore is certainly the most valuable; indeed, as far as one can judge, it seems the only stone existing in sufficiently compact bodies to be worked to profit."

Topley continues :— P. 337.

"The more ferruginous sandstones seem to have been worked over the sandy areas of the Hastings Beds.

Over the Weald Clay the ore would be clay ironstone where this could be got, but it is not known if it keeps to definite horizons in the clay.

In Surrey and West Sussex the concreted ferruginous gravel, called 'Ragstone,' which lies on the Weald Clay, has been used for smelting.

We have no information as to what ores were got from the Lower Greensand. So far as I know there is no evidence of smelting having been carried on over the Lower Greensand of Kent or East Surrey. There seem to have been furnaces on this formation in West Surrey, and there certainly were some in Sussex. Perhaps the ore here would be the brown siliceous ironstone, or 'Carrstone,' which occurs in the Folkestone Beds. This contains a rather high percentage of iron (as hydrated sesqui-oxide), but it seems hardly suited for the purpose."

S. A. C., II., p. 170.

In respect to the "Ragstone," Mr. P. J. Martin says :—

"In the clay country of the Weald I have found sufficient evidence of the exclusive use of a comparatively recent concretion—a kind of 'bog-iron' frequently turned up by the plough and called iron rag. It is composed of clay, gravel, and perhaps twenty-five or thirty per cent. of oxide of iron, and is a superficial and fragmentary formation—a recent 'pudding-stone.'"

This is quite frequent on the clay, but the beds are local. In all probability the western furnaces, established much later than those on the Hastings beds, soon exhausted the available supplies, as except in the Haslemere district they had but short lives and have left very few records.

The "minepit" place-names in West Surrey and Sussex are invariably on the clay, none being found on the greensand.

The shelly ironstone mentioned above is composed of a dense mass of Cyrena shells, full of grey protoxide iron when unbroken, but if exposed to the air the outer skin is converted into peroxide, and is of a rusty colour. This Cyrena limestone is very commonly found on the sites of the furnaces, both ancient and modern, and is almost always present at the Roman sites, sometimes burnt.

John Fuller, writing on December 22nd, 1741, to Mr. Hans Stanley, in Old Bond Street, gives the following clear account of mining as then practised :—

S. A. C., LXVII., p. 43.

"Sir, In relation to Iron Oare: the price we give for it here is 12*d.* a load which is twelve bushels (the measure is one bushel by heap, the other by strike) if they take it as it ariseth, but if they take only the best sorts of oare, which we call veins and leave the worst, they call 'Eleven foot Pitty' and 'Bottom' they paid eighteen pence a load.

The Iron Master is at the whole charge of digging it, carrying it to his Furnace, and filling up the pits, only the Owner of the ground alloweth two pence for throwing in the Clayes, and also levelling the pits, if he will

have it done, which may cost about a groat a pitt more, and then the ground will look as well and be more profitable to the Tenant than it was before the oare was dug.

I wish you joy of so good an appendage to your estate, for if there should be but four load in a pit, it will yield you thirty two pounds an acre 12*d.* the load and the land never the worse.

The method of contracting is so much a load as above, which they will give you an account of at Michaelmas and pay for at Christmas.

Care should be taken if they find a Vein of Oare, that they should draw that which lyeth deepest first, and so follow it up along till they come to the flittest, for if they draw the flittest first, which they are apt to do if not looked after, the water which lyeth amongst all oare will drown the deepest, which will then be lost or at least made very difficult to come at by reason of the water which always followeth broken loose ground.

The Iron Master, if he have any understanding will take care of this, but the workmen will not who to get themselves a shilling will drown five pounds worth of oare.

You must trust the man that digs it, and he that carries it to the Furnace, and it will be difficult for the Iron Master to deceive you, because the person who diggs the oare, and he that carry's it will both be checks upon him."

The picking out of "the flittest," so deprecated by Fuller, was an ancient sin of the miners. In the amusing depositions in the suit between Edward Caryll and Roger Gratwick about St. Leonards Forest in 1588, it was alleged that Gratwick's "workmen do often in digging mine take only the uppermost veins which are most easy to come by, and many times have left undigged the lower veins of myne in the same pitts, which have been as good as the upper veins" and "by negligence in not digging deeper have suffered the water to drown the said mine." Exchequer Depositions, 30 Eliz., Easter, No. 17.

The bell-pits mentioned above are an exceedingly ancient method of mining. We find it in the flint pits of the South Downs, and in the "Deneholes" so frequent in Kent and Essex. Precisely the same method is used to-day for constructing sewers on the chalk. A hole is dug just large enough to work in, in which wooden shelves are place on alternate sides, at such intervals as to

allow the excavated soil to be easily thrown up on to the next above. When the excavation has reached the desired depth, a simple windlass is erected over it, by means of which the spoil is drawn up in baskets. The hole is enlarged at the bottom as far as the soil will allow without its falling in, either in from four to six branch caves or in a bell-shape. When all the mine has been extracted, the waste overburden is shovelled in again, the settling eventually leaving a round depression, which on the Wadhurst Clay is nearly always filled with water. These remain in the woods, but on arable land tend to be levelled with the ploughing.

The place-name "Minepit" is exceedingly common in the Weald, so much so that as a rule I have omitted to record it in the topographical section, the more especially as the pits need not have been definitely connected with the described site. They are very often in groups quite close together. A notable example of this is the "Minepits" in St. Leonards Forest, here illustrated.

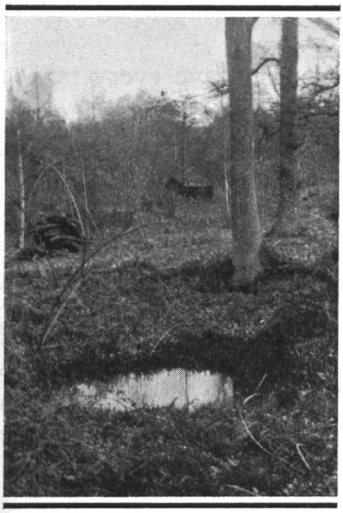
The second method, that of marl-pits, is quite as frequent, and, in some districts, notably on the Grinstead Sand, is the more usual. These are often found where the Wadhurst Clay is thrown up to the surface owing to a fault. The iron "mine" in this case was a bye-product, the main object of the excavation being to obtain the marl for spreading over the fields. The practice of marling, now obsolete, is a very ancient one.

Roman.

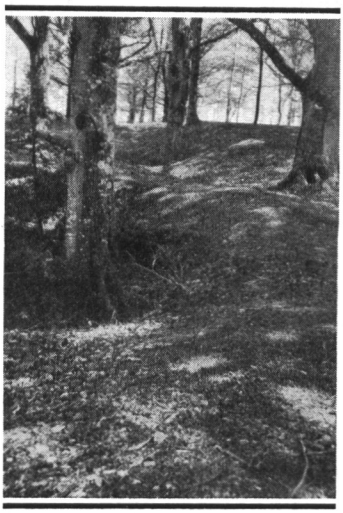
Pliny states :—

"Natural History," lib. xvii, c. 6.

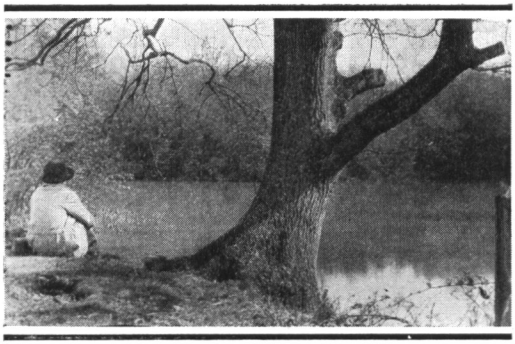
"The people of Britain have found out another kind of manure for their grounds, which is a fat clay or earth called 'marle.' Of those marles the white ones are the most valuable; of these there are several kinds; first, that which has the most sharp and pungent taste; another is the white chalky marle, which is most used in Britain, its effects are found to continue 80 years, and no man was ever yet known to have manured the same field twice in his lifetime."



Typical Minepit
near Castle Hill, Tonbridge.



Minepits in St. Leonards Forest.



Marlpit at Crippenden, Cowden.

This, no doubt, refers to the chalk districts, the seat of agriculture at that date, but the practice was probably transferred to the Weald when it was brought into cultivation.

A statute of 1225 (10 Henry III) gave every man a right to sink a marl-pit on his own ground, and there is other evidence that the application of marl to land was common in England in the 13th century.

Miss C. Pullein, "Rotherfield," p. 277.

In the Rotherfield Court Rolls of the early part of the 17th century there are mentions of licences to dig marl and for selling the mine found. In some cases no fewer than 1,200 or 1,000 loads were dug in a year. This explains the very large pits so frequent in the Weald, usually now wooded, with large and deep ponds in them. They sometimes bear the name of "Minepit," but more often are nameless.

Sloane MS., 4020, f. 189.

The Sloane MS. states: "The mine itself lying in beds of Blew Marle which is admirable mendment for sandy light lands, tho' it does very well on stiffer lands if not laid on in too large a quantity." The burning of the mine took place near where it was dug; possibly some of the bloomery sites recorded in the topographical section are the relics of ore-burning.

About 1737 the rich hæmatite ore of Furness was to be had very cheaply, as by then the wood in that district was exhausted. It was shipped to other parts, including Sussex, and at Darvel Furnace was found to be cheaper and better than the native ore. It does not appear, however, that this experiment led to a regular importation.

CHAPTER FOURTEEN

FUEL

THERE are two " facts " regarding the Wealden iron-works that every schoolboy knows; namely, that the railings of St. Paul's Cathedral were cast at Lamberhurst; and that the decay of the industry was due to the exhaustion of the fuel supply by cutting down the forests.

Both of these beliefs belong to the category of lies which are half-truths, and are hardest to kill. The first is dealt with in the chapter on products; we will now examine the second.

The fuel used from the earliest times was invariably charcoal, both for the smelting in the bloomery and reduction in the blast-furnace.

Charcoal is practically indestructible when buried in the earth, and therefore, when found, the species and the approximate size of the branches or tree can be determined.

Thanks to the courtesy of the Acting Director of the Royal Gardens, Kew, and the painstaking work of Mr. L. A. Boodle, of the Jodrell Laboratory there, specimens from some eighteen different sites have been identified.

The specimens from each site frequently consist of several species, as shown in the following table. " L " indicates that the charcoal has probably been made from large timber :—

Site.	Probable Period.	Species.
Footlands .	Roman .	Birch, Oak (L).
Ridge Hill .	,, .	Birch (L), Oak (L), Hazel, Maple. Ash and Plum have also been added to the species from this site by Mr. Maby, of the Forest Products Research Laboratory, from Mr. S. E. Winbolt's specimens.
Crowhurst Park.	Roman or early.	Oak (L), Ash.
Buckholt . .	Tudor .	Birch.
Tonbridge (Rats Castle).	,, .	Beech (L).
Pippingford .	,, .	Beech (L).
Steel . .	,, .	Oak, Hornbeam.
Maresfield .	Stuart .	Beech (L), about 12 inches in diameter.
Strudgate .	,, .	Birch (L), Beech (L).
Horsted Keynes	,, .	Birch, Beech.
Etchingham .	,, .	Hornbeam.
Coushopley .	,, .	Birch, Oak.
St. Leonards .	,, .	Birch, Oak (L).
Glaziers . .	,, .	Birch, Oak, Beech.
Bibleham. .	,, .	Oak, Beech, Poplar.
Boarzell (for Pashley)	,, .	Birch, Oak, Hazel.
Heathfield .	18th century	Birch, Beech, Hornbeam.

The order of frequency of occurrence is thus seen to be :—

Birch	9	Hazel	2
Oak	7	Poplar	1
Beech	7	Maple	1
Hornbeam	3	Plum	1
Ash	2		

Beech has also been identified in the Roman cinder at Roman Gate, and oak in what is probably pre-Roman cinder at Camp Hill.

"Sussex Notes and Queries," V. II., p. 150.

See p. 253.

The present order of frequency in the Weald to-day is roughly as follows :—

Oak—called "the Sussex Weed"—is the predominant tree on the heavy soils. Birch and beech largely take the place of oak on the lighter sands of Ashdown and St. Leonards Forests, the least changed from the primitive aspect of Anderida. It is to be noted that birch, which shows the greatest number of specimens, is also preferred in Sweden, where charcoal iron is still extensively produced, to coniferous charcoal, as giving a greater heat.

Loudon states that beech charcoal is about 10 per cent. better than that from oak, ash, and hornbeam. The proportion of the latter species is much smaller. Hornbeam takes kindly to pollarding, and then produces a considerable quantity of faggot wood on the picturesque gnarled trunks. Hazel is the main constituent of the native coppices.

Loudon's "Arboretum," Vol. 3.

It is somewhat strange that charcoal from the smaller trees, alder, willow, holly, thorn, crab and cherry, has not been traced ; this may be either because they do not produce much large wood suitable for coaling or merely accidental.

As might be expected, the trees foreign to the ancient forest do not occur in the charcoal. Elm (supposed to have been introduced by the Romans) is purely a hedge-row tree—fir and pine are non-native in the Weald, and doubtless have been planted.

Chestnut, thought to be the "fagus" noted by Cæsar as being absent in Britain, and not what we know as beech, is supposed to have been introduced by the Romans. It was brought to Italy from Asia Minor about 504 B.C. In a book published about 1612, "An Old Thrift newly revived," it is said to be "a kind of timber tree of which few grow in England." Evelyn, and his contemporary Cook, recommend it for hop-poles, for which purpose it is planted thickly, to obtain a pole thin for its length, to enable the young hop shoots to climb more readily. The charcoal is not of first quality, but is valued in Switzerland, Biscay and Spain for forge use, and also formerly in Pennsylvania, where native chestnut woods have been turned into coppices for coaling. It is much planted as cover for game, sometimes producing large "standels," and is the staple of the comparatively new industry of chestnut fence making.

Loudon's "Arboretum," Vol. 3, p. 1985.

Elwes and Henry, "Trees of Great Britain," V. 4, p. 845.

Michaux, "N. American Sylva," V. 3, p. 12.

It will be seen from the table that, broadly speaking, the larger timber has been found on the older sites. In the earlier stages of clearing land in the forest for agriculture, the trees must have been cut down with little reference to their further disposal, and the few bloomery specimens show a good deal of large timber. The consumption then was small, and negligible in comparison with the vast extent of the woods. These, however, were being rapidly cleared for the extension of cultivation; at the same time, the growth of the towns, more especially London, led to a demand for more fuel. Coal, or as it

was then called, sea-coal, because brought in by sea, was first used in London about the end of the 13th century. It was at first used for manufactures only. As we have seen, the blast-furnaces came rapidly into use in the first half of the 16th century. In order to conserve fuel in the country generally an Act of Parliament was passed in 1541, in which it was laid down that after Michaelmas, 1544, when a wood was cut, 12 standels or storers of Oke were to be left per acre. If not Oke then of Elm, Ashe, Aspe or Beech, and these were not to be felled till they contained 10 inches square three feet from the ground, that wood should not be coppiced at less than 14 years' growth and fenced for the first four years to protect it from animals, unringed swine being forbidden. It was forbidden to clear woods for pasture or tillage. If the wood consisted of great trees, the standels still had to be left for twenty years. Wood, however, was allowed to be cut for the owner's own use. The Weald was excepted, notwithstanding the blast-furnaces which by this time had greatly increased. The price of wood there rose rapidly.

33 Henry VIII, c. 6.

At this period Rye, Winchelsea and Hastings had a very considerable export trade in fuel, especially to Picardy, where England held the towns of Calais and Boulogne and a tract of country round them. The supply was needed not only for the garrisons and inhabitants, but for the extensive gun foundries that Henry VIII established at Calais. The ancient ports, whose harbours were already silting up and their trade diminishing, were up in arms against the competition of the iron-mills.

On November 13th, 1548, a commission was issued to Sir Thomas Carden.

Iron Mills and Furnaces in Sussex.

Hist. MSS. Commission, Hatfield MSS., Carden XIII. Quoted by permission of the Controller H.M. Stationery Office.

1548, 13 Nov. to 1549, Jan. 14.—(1) Commission to Thomas Carden, knight, Edward Shirley, John Thetcher, Edward Bellingham and 16 others (named), or any 6 or more of them, to examine witnesses on oath on the interrogatories enclosed.—Westminster, 13 November, 2 Edward VI.

i. First the iron mill of Robertsbridge standing within 3 miles of the salt water.

ii. The iron mill of Etchingham within 5 miles of the salt water.

iii. The iron mill of Paschely within 4 miles of the salt water.

iv. The iron hammer of Mowntfild within 4 miles of the salt water.

v. The iron hammer of Chiddingly within 4 miles of the salt water. *Interlined:* "beseeching your Grace to give commandment especially that it may go no longer."

vi. The iron mill of Sheffield within 7 miles of Lewes.

vii. The iron mill of Freshfield within the parish of Horstead, 6 miles of the town of Lewes.

viii. The iron mill of Bucksted within 8 miles of Lewes.

ix. The iron mill of Framfield within 6 miles of Lewes.

x. Also the 4 iron mills of Warbleton standing within 6 miles of the salt water.

(2) Petition to the Duke of Somerset, for a new commission.

Articles to be inquired of by virtue of the King's commission to be directed to certain men of Sussex concerning the hurts done by iron mills and furnaces made for the same.

1. How many iron mills and furnaces for the same be now in Sussex ?

2. How much great wood by estimation is yearly destroyed by the said mills and furnaces ?

3. How much the price of a load of wood is already enhanced in divers places in Sussex by occasion of the said mills and furnaces ?

4. Whether the said iron mills and furnaces be occasion of great detriment as well to the inhabitants in the towns of Calais and Guisnes, Bullen (Boulogne), &c., as also to the inhabitants of many towns and parishes in Sussex concerning their fuel.

5. If the said iron mills and furnaces be suffered to continue, then whether thereby there shall be great lack and scarcity of timber and wood in the parts near the mills for the making of houses, ships, &c. All the wood now standing within the county is not able to satisfy the ordinary occupations and necessary fuel wood for the poor commons the space of 20 years.

6. What number of towns are like to decay if the iron mills and furnaces be suffered to continue ?

7. What number of persons are like to want livings if the iron mills, &c. be suffered to continue ?

8. What hurts and harms have been done by occasion of the mills ? and what be like to follow if they continue ?

9. Whether notwithstanding the said great number of mills iron is of a more greater (*sic*) price than it was at before there were so many ?

10. How many of the iron mills and furnaces may conveniently be suffered to continue, and which of them the same is ? (*sic*).

These be the names of all the parishes in Sussex which ought to be inquired of and how many men, women and children be in every of them, which parishes are next unto the sea, and 10 miles from the wood, which is like to

decay for lack of timber and wood which they cannot live without.

First Pevensey, Westham, Eastbourne, Friston, Eastdean, Jevington, Westdean, Littleton, Loynton, Anfriston, Seaford, Bletchington, Bishopton, Heyghton, Denton, Myching, Pedinghow, Telscomb, Rotingdean, Ovingdean, Brighthemston, Howve, Aldrington, Southwick, Kingston Bowsee, New Shoreham, Old Shoreham, Portslade, Hangleton, West Blatchington, Petcham, Preston, Stamner, Falmer, Kingston Iford and Radmyle. And to these may be joined Hastings, Winchelsea and Rye, with all those towns that have wood, timber, lathes, board and such like from the said towns of Rye and Winchelsea, as Hythe, Dover and Sandwich, Calais, Guisnes, Hammes, Blacknes, Hambleter and Boulogne, with all the rest of the King's Majesty's towns and pieces that are on th'other side the sea which in short time shall much more feel the great incommodity that daily groweth through those iron mills that are near the sea coast than those other parishes and villages and towns on this side.

(3) The certificate made into the King's Majesty's High Court of the Chancery the quindene of St. Hilary, by John Thatcher, Thomas Morley, William Oxenbridge, Thomas Darrell, William Thrille, Richard Sharpe, John Moore, James Hobson and Thomas Birchet, commissioners with others concerning the iron mills in Sussex and by division limited to the Rape of Hastings in the said county.

The names of the jury of the townships of Rye, Winchilsea, and Hastings taken in the name of the whole inhabitants of the said towns. [Twenty-three names given.]

The presentments of the aforesaid jurors for and concerning the annoyances of the iron mills in Sussex exhibited at Battle the 14 January 2 Edward VI, as followeth :—

To the first article we present that in the Rapes of Lewes, Pevensey and Hastings are iron mills and hammers to the number of fifty and upward.

To the second we present that the iron mills and furnaces do spend yearly by estimation one with another above 500 loads of coals, allowing to every load of coals at the least three loads of wood; that is every iron mill spendeth at the least yearly 1,500 loads of great wood made into coals, besides the great and noisome spoil of the said woods which is engendered for lack of cherishing of the increase of the same so felled to the use of the iron mills.

To the third we present that not only within these 7 years last past the price of a load of wood by reason of the number occupied at the iron mills is enhanced to the inhabitants of the aforesaid towns at the least *6d.* upon every load, but also 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 of the said towns a quarter of a load of wood in every load.

To the fourth we present that the iron mills and furnaces, and especially all those that are within ten miles of the seaside, as the mills of Robertsbridge, Etchingham, Warbleton, Penhurst, Chidingly, Pascheley, Montfeld, Sheffield, Freshfield and such other within ten miles of the seaside or six miles of the Downs of Sussex will not only bring to pass, and that in short time, that 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 the sea shall have no kind of wood for their fuel out of Sussex from whence they make their chiefest provision; but the towns of Rye and Hastings with Winchelsea, Hythe, Dover and

Sandwich with divers other towns and parishes that make their provision at Rye shall not have wood for their money if the iron mills stand any while, for they shall not have it to be gotten in the country.

To the fifth we present that if the iron mills be suffered to continue there will not only be such 'scantie' of timber that there will not be to build in the parts near them either houses, water mills or windmills, bridges, sluices, ships, crayers, boats, and especially for the King's Majesty's towns and pieces on the other side the sea; besides the lack of timber that will be for the making of gunstocks, wheels, arrows, pipes, hogsheads, barrels, buckets, sieves, saddletrees, 'dossers,' bellows, showles, 'skopets,' bowls, dishes, bills, spears, morrispikes with such like necessaries; but also the aforesaid towns of Hastings and Rye which are at a daily charge in making of 'jutties' and piers for defences of safeguard against the seas shall not be able to have in the country nigh by reason of the iron mills timber sufficient to maintain their piers and 'jutties.'

To the sixth we present that if remedy for the iron mills be not shortly had, the towns of Hastings and Rye for lack of timber to maintain their daily buildings against the seas, for lack of timber to repair and new build houses, and for lack of necessary wood for fuel for the relieving of the poor fishers after their arrival from their daily fishing to dry their clothes and warm their bodies, by whose trade chiefly the said towns stand, the same will shortly decay.

To the seventh and eighth articles we present that the number of the towns and parishes that must needs decay by reason of 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 mean, we cannot number, the same is and will be so great.

To the ninth we present that if the iron mills continue only there shall be but a few take commodity by them, and many a thousand not yet born feel with their parents the great hurt and incommodity engendered by their continuance.

To the tenth, that 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.

To the eleventh we present that those iron mills and furnaces which are above ten miles off from the seaside and 6 miles from the downs, and not within 10 miles of the sea coasts or 6 miles of the downs, may best be spared to stand.

Commissioners' seals attached.

(3) The names of the jury of the Rape of Hastings [16 names]. Presentments of the said jury to the above articles: brief and to the same effect as the above.

(4) Certificate made into the King's Majesty's High Court of Chancery the quindene of St. Hilary by Edward Shorley, John Staple, Edmund Michell, Thomas Challoner, John Batnour, Robert Morley and John Stemp commissioners with other, concerning the iron mills in Sussex, and by division limited to the rapes of Lewes and Pevensey in the said county.

The names of part of the jury of the borough and rape of Lewes, besides 80 persons sworn also with the other, taken in the name of all the whole inhabitants [35 names].

The presentment of the aforesaid jury concerning the annoyances of the iron mills in Sussex exhibited at Lewes January 12 in the year 2 Edward VI, as hereafter ensueth :—

To the first article we present that there be within the shire of Sussex to the number of 53 iron mills and furnaces.

Unto the second, that a hammer and a furnace spendeth yearly a thousand loads of coals, which amounteth to three thousand loads of wood, besides the waste, which we be not able to answer unto.

To the third article, that within 15 years last past upon the downs a load of wood was commonly bought and sold for 14*d.*, and now by occasion of the mills and furnaces every load is enhanced to 2*s.* 8*d.* and 3*s.* And in the Weald among the woods a load of wood was commonly brought and sold for 4*d.*, and now by occasion of the mills every load is enhanced to the sum of 12*d.*

To the fourth, the mills and furnaces do damnify and hurt as well the inhabitants of the towns of Calais, Guisnes, Boulogne and other beyond the sea as the inhabitants of Sussex.

To the fifth we present that if the mills and furnaces be suffered to continue, whereas now all manner of timber and wood for all manner of occupations as well for the sea as for the land is very scanty already, by the said mills and furnaces hereafter should be scarcity and almost none to be gotten.

To the sixth we present that if the mills and furnaces be suffered to continue all the towns and villages upon the downs between Lewes and Bramber are within a short while like to decay and not to be inhabited for lack of timber and fuel.

To the seventh, that all the inhabitants of the towns and villages abovesaid shall be driven to seek their living in other places and there utterly to forsake their dwelling, whose number we be not able to express, if the mills and furnaces be suffered to remain.

To the eighth we do present that what hurts and harms hath been done by occasion of the mills and furnaces we

cannot express, it is so great, and what will follow hereafter we be not able to say.

To the ninth, whereas before so great a number of these furnaces and iron mills were erected and set up iron was at £3 the ton, now it is enhanced to £8 the ton and upward.

To the tenth article we present that if the mills should be suffered to continue, then within short time tanners should not be able to occupy their tanning for lack of tan, because they fell the woods out of season.

To the eleventh article, we think there may no iron mills and furnaces conveniently continue and remain within the space of 20 miles of the sea.

The names of the jury for the rape of Pevensey (30 names).

To the first ten articles we present in every point according as the jury of the rape of Lewes have presented.

To the eleventh article we do present that the furnace and the hammer now being within the forest of Worth may conveniently continue and remain: and unto all the residue we do refer us to the King's most honourable Council.

Signed and sealed by the commissioners.

The full-blooded pessimism of the portsmen as compared with a modern application for "safeguarding" is as strong drink to milk and water.

It does not appear, however, that any definite action was then taken. Although Calais was lost in 1558, the towns were still jealous of the iron-mills. Among the considerations delivered to the Parliament of 1559 was No. 19, "Iron Mills. That Iron Mills be banished out of the realm. Where wood was formerly sold at the

Hatfield MSS., Hist. MSS. Commission, V. I., p. 64.

stock at one penny the load, by reason of the iron-mills it is now at 2*s*. the load. Formerly Spanish iron was sold for 5 marks the ton, now there are Iron mills English iron is sold at £9."

1 Eliz. c. 15, 1558–59.

Thereupon was passed "An Acte that timber shall not bee felled to make Coles for the making of iron," which ordered that "No oak, beech, or ash 1 ft. square at the stub should be felled for iron making" within 14 miles of the sea, or navigable river, or the Thames, under penalty of 40*s*. per tree, half of which was to go to the informer. However, there was again an exception made of "Sussex, Weild of Kent, Charlwood Nudigate and Lighe in the Weylde of the Countye of Surrey."

See p. 445.

There is preserved at the British Museum a "Licence to cut and cole wood" dated 5th May, 2nd Elizabeth, to Thomas Elrington Tate, or Thos. Elington, for 15 years to make cole or other fewell.

Hist. MSS. Commission Report, p. 616.

The exceptions did not suit the burgesses of the town of Kingston-on-Thames; they petitioned against iron mills, as using wood and coles, as they drew their supplies from Dorking and thereabouts.

1574. S. P. D. Eliz., V. 95, Nos. 20, 21.

In one of the engineered complaints, mentioned on page 53, Christopher Barker, who apparently was a timber surveyor, says :—

"It maie please yo^{r} honor to consider the severall notes ensueing w^{ch} doe concerne the great spoile and consumation of Okes tymber and other woodes w^{tch} in the countyes of Sussex, Surrey and Kent by means of iron mylles and furnaces" and "that unless speedie remedie be provided in this respect there shall not be timber sufficient to be had within these few yeares and for Her Ma^{tie} to builde any Shippes or otherwise."

23 Eliz. c. 5, 1580–81.

In 1581, a very similar Act was passed, with slightly varied boundaries of the Weald, and again excepting, more specifically, "any Woodes or Underwoods nowe

standing or growinge, or which hereafter shall stand or growe in or upon any lands of Christopher Darrell, gentleman in the Parishe of Newdigate within the Weilde of the Countye of Surrey: which woodes of the said Christopher have heretofore been and be by him p'served and coppysed for the use of his Iron woorkes in those parts."

Here we have the recognition of the fact that the main source of fuel for the furnaces was not large timber, but coppice wood.

The question was again raised 4 and 5 James I, 1606–7, in a Bill for Iron Mills and the preservation of wood, but apparently the question was then better understood, for the quaint record stands: "The committee, for some mischief apparent in the Bill, have thought it fit to sleep." Journals of the House of Commons.

Sir John Pelham's will, dated July 28th, 1580, mentions:—

"All my manors which lyeth within the Rape of Hastings . . . within which manors I have certain Iron Mylles, and divers Young and copsed woods . . . and my full meaning is that she [his wife] shall not take or employ any of my great woods . . . as hath not been cut down heretofore within this forty years last past . . . that the places where the woods stand to be incopsed, for the preservation of the spring of that wood for the better continuance of the wood there."

The Pelham accounts in the following century show that a very small proportion of "Logwood" was cut, and give a very instructive example of the rotation of the felling. It was spread over many woods mainly on Pelham land, although some was bought "on the stub" from other proprietors. As is usual many of the names of the woods survive to-day and show what a great extent of country was covered.

For some years the clerk made a careful summary, which I give in the table below:—

Date.	For Waldron Furnace.		For Brightling and Bibleham Forges.	
	Copse Wood.	Logwood.	Copse Wood.	Logwood.
	Cords.		Cords.	
1646	948	—	1533	—
1647	1300	—	1431	—
1648	1319	—	1169	—
1649	1141	132	1600	17
1650	808	29	778	11
1651	1280	—	1370	21
1652	698	—	702	—
1653	597	—	497	—
1654	—	—	269	—
1655	2289	—	1579	3
1656	1420	—	Not recorded.	
1657	1748	—		
1658	886	—		
1659	794	—		
1664	899	—		

The small amount cut in 1654 did not affect the tonnage of iron made; they perhaps had overstocked in previous years.

John Evelyn, in his "Sylva," first published in 1664, says :—

V. II., p. 148. "Finally, that the exorbitance and increase of devouring iron-mills were looked into, as to their distance and number near the seas, or navigable rivers; and what if some of them were even remov'd into another world? the Holy-Land of New-England, (there to build ships, erect saw-mills, near their noble rivers) for they will else ruin Old-England: Twere better to purchase all our iron out of America, than thus to exhaust our woods at home, although (I doubt not) they might be so order'd, as to be rather a means of conserving them." . . .

"But yet to prove what it is to manage woods discreetly; I read of one Mr. Christopher Darell a Surrey gentleman of Nudigate, that had a particular indulgence for the cutting of his woods at pleasure, though a great iron-master; because he so ordered his works, that they were a means of preserving even his woods; notwithstanding those unsatiable 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; I suppose, by increasing the industry of planting, and care; as what he left standing of his own planting, enclosing and cherishing, lately in the possession of my most honoured brother George Evelin of Wotton in the same county (and now in mine) did (before the late hurricane) sufficiently evince; a most laudable monument of his industry, and rare example, for without such an example, and such an application, I am no advocate for iron-works, but a declared denouncer: But nature has thought fit to produce this wasting oar more plentifully in wood-land, than any other ground, and to enrich our forests to their own destruction." V. II., p. 150.

In Kent, the clothing industry was a great consumer of wood for heating the dyeing vats, and a return made in 1573 states that in the twenty years last past, 6,542 acres had been felled in Cranbrook and seven other parishes adjoining; 3,618 acres for fuel and clothing, ?,9?4 acres for ironmaking. Of this total, 4,316 acres, nearly two-thirds, were coppiced only. Nevertheless, the reporters make a calculation that the remaining woods would be exhausted in two years, ignoring altogether the new growth of the coppices! S. P. D. Eliz., Vol. 93, No. 37.

Another competing industry was the cultivation of hops. This was first introduced by Leonard Mascall of Plumpton, Sussex, in 1525, and extended more especially into Kent, but hop gardens were much more widely spread in Surrey and Sussex than is now the case, as the field-names bear witness. The old system of drawing the poles at each picking and piling them into the picturesque "wigwams," so largely superseded in late years by permanent wiring and strings, required a constant Lower's "History of Sussex."

supply of poles to replace those that became broken or rotted. There was also a very considerable amount of charcoal used for the oast-houses.

In the 17th century the controversy between town and country over the iron-mills raged furiously, and from the literature of the town party comes the tradition of the extermination of the woodlands.

This town-bred stunt was accepted by those ignorant of the woodman's orderly coppicing of the woods and shaws, and the rapid " spring " of the new growth. At the present day, unfortunately, this, like other rural arts, is falling into decay owing to the high cost of labour and lack of demand for hurdles and other products. The jungle growth of many coverts renders penetration difficult.

S. P. Dom., Chas. I, 1637, p. 290.

In 1637 there was a petition of the inhabitants of Cranbrook, Kent, that stated: " This town and parishes adjoining have for many hundred years subsisted by the trade of clothing. John Browne (of Horsmonden) by a commission for making brass and iron ordnance and shot has seized upon the greatest part of such woods as were felled."

Browne, in reply, states that he only continues the use of one ancient furnace in Cranbrook, that ordnance and shot cannot be made without wood, but sea-coal can be used for cloth. In London the dyers of cloth and far richer stuffs use nothing but sea-coal.

Vol. II., p. 97, 1662 Ed.

In Dr. Thomas Fuller's " History of the Worthies of England," published in 1662, is to be found the following passage:

Great the quantity of *Iron* made in this county, whereof much used therein, and more exported

into other parts of the land and beyond the seas. But whether or no the private profit thereby will at *long-running* countervail the publick loss in the destruction of woods, I am as unwilling *to discuss* as unable *to decide*. Onely let me adde the ensuing complaint, wherein the *Timber-trees* of this County deplore their condition, in my opinion richly worth the reader's perusall—

Drayton's "Polyolbion," 1612, the seventeenth song, p. 265. (A longer extract than that quoted by Fuller.)

These forrests, as I say, the daughters of the *Weald*
(That in their heauie breasts had long their greefs conceal'd)
Foreseeing, their decay each howre so fast come on,
Under the axe's stroak fetched many a grieuous grone.
VVhen as the anuil's weight, and hammer's dreadful sound,
Euen rent the hollow vvoods and shook the queachy ground.
So that the trembling Nymphs oppress'd through gastly feare,
Ran madding to the Downes with loose dishev'll'd hayre.
The Syluans that about the neighbouring woods did dwell,
Both in the tufty Frith and in the mossy Fell,
Forsook their gloomy Bowres, and wandred farre abroad,

Expelld their quiet seats, and place of their abode,
When labouring carts they saw to hold their daily trade,
Where they in summer wont to sport them in the shade.
Could we, say they, suppose, that any would vs cherish,
Which suffer (euery day) the holiest things to perish?
Or to our daily want to minister supply?
These yron times breed none, that minde posterity.
'Tis but in vaine to tell what we before haue been,
Or changes of the world that we in time haue seen
When, not deuising how to spend our wealth with waste,
VVe to the sauage swine, let fall our larding mast.
But now, alas! our selues we haue not to sustaine,
Nor can our tops suffice to shield our Roots from raine.
Joue's Oke, the warlike Ash, veyn'd Elme, the softer Beech,
Short Hazell, Maple plain, light Aspe, the bending Wych,
Tough Holly, and smooth Birch must altogether burn

What should the Builder serue, supplies the Forger's turn;
When under publike good base priuate gain takes holde,
And we, poore woful Woods, to ruin laſtly solde.

But it is to be hoped that a way may be found out to *Charke Sea-cole* in such manner as to render it useful for the making of *Iron*. All things are not found out in one age, as reserved for future discovery; and that perchance may be *easy* for the next, which seems *impossible* in this generation. . . .

We must now look upon the other side of the shield. In the Lewes petition, quoted on page , stress is laid on the " incoppising proving of greate advantage for ye growth and preservacon of the timber trees " . . " whatever is suggested to the contrary."

The war was carried vigorously into the enemies' camp by Andrew Yarrenton in " England's Improvement by Sea and Land," published in 1677—we read on page 56:

" The ſecond Manufacture to be encouraged, to ſet the poor people at work, is that of Iron. But now I am ſure I ſhall draw a whole Swarm of Waſps about my Ears. For ſay ſome (and many too who think themſelves very wiſe) it were well if there were no Ironworks in *England;* and it was better when no Iron was

made in *England:* and the Ironworks deſtroy all the Woods and foreign iron from *Spain* will do better and laſt longer.

"And I have heard many men both Rich and Sober often declare theſe things; and it hath been and is the opinion of nine parts of ten of the people of *England* that it is ſo, and by no arguments whatever will they be beat from the belief of it, although there is not one word true. . . .

P. 60. "The next thing is Ironworks deſtroy the Woods and Timber. I affirm the contrary; and that Ironworks are ſo far from the deſtroying of Woods and Timber, that they are the occaſion of the increaſe thereof. . . . 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 make but 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? . . .

"At preſent moſt of the Works in *Suſsex* and *Surrey* are laid down, many in the North of *England* and many other parts muſt follow if not prevented by encloſing Commons to ſupply them with Wood."

In 1724 Daniel Defoe, in "A Tour thro' the whole Island of Great Britain" (page 192), says :—

"From hence (Battle) it was that, turning North, and traversing the deep, dirty, but rich part of these two Counties, I had the curiosity to see the great Foundaries or Ironworks, which are in this County, and where they are carry'd on at such a prodigious Expence of Wood that even in a country almost all over-run with Timber, they begin to complain of the consuming it for those Furnaces, and leaving the next Age to want Timber for building their Navies. I must own, however, that I found this Complaint perfectly groundless, the three Counties of *Kent*, *Sussex*, and *Hampshire* (all of which lye contiguous one to another) being one inexhaustible Store-House of Timber never to be destroy'd, but by a general Conflagration, and able at this time to supply Timber to rebuild all the Royal Navies in *Europe*, if they were all to be destroy'd and set about the building them together."

Vol. I, Letter II, p. 54, 1724 Ed.

A letter from John Fuller, copied by Mr. Herbert Blackman, but not printed, reads as follows :—

"Brightling. December 17th, 1748.

To Mr. Lothbury at Mr. Birch's in Warwick Court, Holbourne.

SIR,

You ask me advice about your Woods, you have had it over and over again; one of the Fellings was in 1735, the other in 1736, so one is thirteen years growth, the other twelve years; it will be time enough to bargain when the Woods are fellable which they are not now, nor will be in less than two years . . ."

"Agricultural Survey of the Counties of England."

Arthur Young, Jnr., in 1793, states that coppices were cut every thirteen to seventeen years, and that very few ironworks remain, as the dearness of fuel caused removal to cheaper situations.

A. Knaff, "Geschichte der Eisenindustrie an der mittleren Sieg," p. 7.

This is a similar period to that laid down in the ordinances of the lords of Wildenburg in the Rhineland, in 1592, 1607 and again in 1773: "That the forest or heath be divided into sixteen parts, and each year only one-sixteenth be cut, and no wood before it is sixteen years old." They also had the "standel" rule; "on each morgen (about an acre) sixteen stems of Birch or Alder must remain."

The conclusion to be drawn from the above evidence is that in the earlier stages there was some waste of timber, which from its situation and the cost of transport was of little value, while later on the supply was practically all coppice wood (although "trees" were carried to Warren Furnace in 1762), together with loppings and toppings of timber felled for other purposes. A very large proportion of the total area of the Weald was, and is now, occupied by woodlands. The tithe apportionments of circa 1840 show this very clearly, as, by prescription, woodland in the Weald was not subject to tithe, and the acreage was separately shown.

The process of converting the wood into charcoal has been well described by Evelyn, as follows:—

"Sylva," 1679 Ed., p. 212.

"But I will now deſcribe to you the *Myſtery* of *Charing*, (whereof ſomething was but touch'd in the *proceſs* of extracting *Tar* out of the *Pines*) as I receiv'd it from a moſt induſtrious *perſon*. . . . There is made of *Char-coal* uſually *three* ſorts, *viz.*, *one* for the *Iron-works*, a *ſecond* for *Guu-powder*, and a *third* for *London* and the *Court*, beſides

Small-coals, of which we ſhall alſo ſpeak in its due place.

"We will begin with that ſort which is uſ'd for the *Iron-works,* becauſe the reſt are made much after the ſame manner, and with very little difference.

"The beſt *Wood* for this is good *Oak,* cut into lengths of *three* foot, as they ſize it for the *Stack:* This is better than the *Cord-wood,* though of a large meaſure, and much uſ'd in *Suſsex.*

As in 1664 Ed.

"The *Wood* cut, and ſet in *Stacks* ready for the *Coaling,* chuſe out ſome level place in the *Copp'ce,* the moſt free from ſtubs, *etc.* to make the *Hearth* on: In the midſt of this *area* drive down a ſtake for your *Centre,* and with a *pole,* having a *ring* faſten'd to one of the extreams (or elſe with a *Cord* put over the *Centre*) deſcribe a *Circumference* from twenty, or *more* feet *ſemi-diameter,* according to the quantity of your *Wood* deſign'd for *Coaling,* which being near, may conveniently be *Chared* in that *Hearth;* and which at one time may be 12, 16, 20, 24, even to 30 *ſtack:* If 12 therefore be the quantity you will *Coal,* a circle whoſe *diameter* is 24 foot, will ſuffice for the *Hearth;* If 20 *ſtack,* a *diameter* of 32 foot; If 30, 40 foot, and ſo proportionably.

"Having thus marked out the ground, with *Mattocks, Haws,* and fit inſtruments, *bare* it

of the *Turf*, and of all other combuſtible ſtuff whatſoever, which you are to rake up towards the *Peripherie*, or out-ſide of the *Circumference*, for an *uſe* to be afterwards made of it; plaining and levelling the gronnd within the *Circle*: This done, the *Wood* is to be brought from the neareſt part where it is *ſtack'd*, in *Wheel-barrows*: and firſt the ſmalleſt of it plac'd at the utmoſt limit, or very margin of the *Hearth*, where it is to be ſet long-ways, as it lay in the *ſtack*; the biggeſt of the *Wood* pitch, or ſet up on end round about againſt the *ſmall-wood*, and all this within the *circle*, till you come within five or ſix foot of the *Centre*: at which diſtance you ſhall begin to ſet the *Wood* in a *Triangular* form (as in the following *Print*, *a*) till it come to be three foot high: Againſt *this* again, place your greater *Wood* almoſt *perpendicular*, reducing it from the *Triangular* to a *circular* form, till being come within a yard of the Centre, you may Pile the *Wood* long-ways, as it lay in the *Stack*, being careful that the ends of the *Wood* do not touch the *Pole*, which muſt now be erected in the *Centre*, nine foot in height, that ſo there may remain a round *hole*, which is to be form'd in working up the *Stack-wood*, for a *Tunnel*, and the more commodious *firing* of the *pit*, as they call it, tho' not very properly. This provided for, go on to *Pile*, and ſet your *Wood* upright to the other, as before; till having gain'd a *yard* more, you lay it long-ways again, as was ſhew'd: And thus

b *The* Central Pole *or place of the* Tunnel *with the* Area *making ready.*
a *The* Wood *plac'd about it in Triangle.*
c *The* Coal-Wood *pil'd up before it be covered with Earth.*
d *The* Coal-pit *or* Pile fir'd.

Reproduced from "Sylva" by permission of the Trustees of the British Museum.

continue the work, ſtill enterchanging the *poſition* of the *Wood*, till the whole *Area* of the *Hearth* and *Circle* be filled and piled up at the leaſt *eight* foot high, and ſo drawn *in* by degrees in *Piling*, that it reſemble the form of a *copped* brown *Houſehold-loaf*, filling all inequalities with the ſmaller *Trunchions*, till it lie very cloſe, and be perfectly and evenly ſhaped. This done, take *ſtraw*, *haume*, or *fern*, and lay it on the out-ſide of the bottom of the *heap*, or *wood*, to keep the next *cover* from falling amongſt the *ſticks*: Upon *this* put on the *Turf*, and caſt on the *duſt* and *Rubbiſh* which was grubbed and raked up at the making of the *Hearth*, and reſerved near the *circle* of it; with *this* cover the whole heap of *Wood* to the very top of the *Pit* or *Tunnel*, to a reaſonable and competent thickneſs, beaten cloſe and even, that ſo the *fire* may not *vent* but in the places where you intend it; and if in preparing the *Hearth*, at firſt, there did not riſe ſufficient *Turf* and *Rubbiſh* for this Work, ſupply it from ſome convenient place near to your *heap*: There be who cover this again with a *ſandy*, or finer mould, which if it cloſe well, need not be above an *inch* or two thick: This done, provide a *Screene*; by making light *hurdles* with *ſlit* rods, and *ſtraw* of a competent thickneſs, to keep *off* the *Wind*, and broad, and high enough to defend an oppoſite ſide to the very top of your *Pit*, being eight or nine foot; and ſo as to be eaſily removed, as need ſhall require, for the *luing* of your pit.

"When now all is in this poſture, and the *Wood* well rang'd, and cloſ'd, as has been directed, ſet *fire* to your *heap:* But firſt you muſt provide you of a *Ladder* to aſcend the top of your *Pit:* This they uſually make of a curved *Tiller* fit to apply to the *convex* ſhape of the heap, and cut it full of notches for the more commodious ſetting the colliers feet, whiles they govern the *Fire* above; when now they pull up, and take away the *Stake* which was erected at the *centre,* to guide the building of the *Pile* and cavity of the *Tunnel.* This done, put in a quantity of Char-coals (about a *peck*) and let them fall to the bottom of the *Hearth;* upon them caſt in *coals* that are fully kindled; and when thoſe which were firſt put in are beginning to ſink, throw in more *fuel;* and ſo, from time to time, till the *Coals* have univerſally taken *fire up* to the top: Then cut an ample and reaſonable thick *Turf,* and clap it over the hole, or *mouth* of the *Tunnel,* ſtopping it as cloſe as may be with ſome of the former duſt and rubbiſh: Laſtly, with the handles of your *Rakers,* or the like, you muſt make *Vent-holes,* or *Regiſters* (as our *Chymiſts* would name them) through the ſtuff which covers your *Heap* to the very *Wood,* theſe in rangers of two or three foot diſtance, quite round within a foot (or thereabout) of the *top,* tho' ſome begin them at the *bottom:* A day after begin another row of *holes* a foot and half beneath the former, and ſo more, till they arrive

to the ground, as occaſion requires. Note that as the *Pit* does *coal* and *ſink* towards the *centre*, it is continually to be fed with ſhort and fitting *Wood*, that no part remain *unfir'd*; and if it *chars* faſter at one part than at another, *there* cloſe up the vent-holes, and open them where need is: A *Pit* will in this manner be burning off and *charing*, five or ſix days, and as it *coals*, the *ſmoke* from thick and groſs clouds, will grow more blue and livid, and the whole maſs ſink accordingly; ſo as by theſe indications you may the better know how to ſtop and govern your *ſpiracles*. Two or three days it will only require for *cooling*, which (the *vents* being ſtopped) they aſsiſt, by taking now off the outward covering with a *Rabil* or *Rubler*; but *this*, not for above the ſpace of one *yard* breadth at a time; and firſt remove the courſeſt and groſseſt of it, throwing the finer over the *heap* again, that ſo it may neither *cool* too haſtily, nor endanger the *burning* and reducing all to *Aſhes*, ſhould the whole *Pit* be uncover'd and expoſ'd to the *Air* at once; therefore they open it thus round by degrees.

"When now by all the former *Symptoms* you judge it fully *chared*, you may begin to *draw*; that is, to take out the *Coals*, firſt round the bottom, by which means the *Coals*, *Rubbiſh and Duſt* ſinking and falling in together, may choak and extinguiſh the *fire*.

"Your *Coals* ſufficiently *cool'd* with a very long-tooth'd *Rake*, and a *Vann*, you may load them

into the *Coal-Wains*, which are made close with boards, purposely to carry them to *Market:*"

Although almost extinct, this is carried on at the present day on the remoter hop farms by itinerant charcoal burners, in precisely the same manner, to provide fuel for curing the hops instead of the normal anthracite.

Charcoal Pit at Orznash, 1929.

Cooling the Charcoal, Orznash, 1929.

The charcoal was used not only for melting in the furnace, but also for calcining the ore, usually at the place where it was mined; evidence of burning and fragments of charcoal are to be found near minepits.

The small cole—called "brayds"—was used for drying the moulds; in the later years small quantities of sea-coal, brought back in returning wagons, was also used for this purpose, and for the forges. In April, 1767, no less than 20 loads of "coles" (from the context sea-coal) was brought from "the Brail Lewis" to Woodcock Forge. The carrier Knight hauled large quantities of timber to Lewes for shipment. Small quantities of sea-coal were also brought from Woolwich.

CHAPTER FIFTEEN

THE IRONWORKS AND THEIR PRODUCTS

THE bloomery period, as we have seen, produced wrought iron only. Some of this may have been further worked at the bloomery, e.g., the Roffey horseshoes and the rods for tyres, but the bulk was sold as blooms. Mediæval accounts show that iron was a comparatively costly commodity, carefully husbanded by the stewards of the manors, and worked up locally for agricultural and other uses as occasion required. There is evidence to show that in some cases, e.g., Lamberhurst and St. Leonards Forest, the water-power was first used to produce blooms direct. This was definitely the case in Germany and Sweden. In the Pyrenees the Catalan process, which employed a low furnace, producing wrought iron without actually melting the iron, survived until recent times. The early forges in the North American Colonies were also power bloomeries. It would therefore seem probable that this intermediate stage also existed in the Weald, although quickly superseded by the perfected process of first casting into sows at the furnace and then converting them into wrought-iron bars at the forge.

The uses of cast iron, until well on into the 18th century, when the substitution of coke for charcoal as fuel had greatly cheapened its production, were very limited. By far the greater portion of the output of the Wealden furnaces was converted into bar iron at the power forges, and sold in that form either in the London or other markets or to local smiths.

There is no evidence whatever of wrought-iron articles being manufactured at the power forges, although the forms of the bar iron were varied to suit the purchasers. I have therefore excluded from this account, as not being definitely local, any reference to smith's work. This has been adequately dealt with by several writers, especially by Professor J. Starkie Gardner. On the other hand, the production of cast-iron articles was naturally, for the most part, carried on at the furnaces although a small amount of casting was done in London foundries.

Ordnance and shot were by far the most important of these; firebacks, grave slabs and hollow-ware were also made.

GUNS

On account of their military and political importance there are many references to the production of cannon in the State Papers. For a long period, from the time of Henry VIII until the latter half of the 18th century, the Weald had a practical monopoly of cast-iron guns in this country.

Gunpowder, although known to the Chinese at an early date, and to the Greeks of Constantinople in a form called Greek fire, was not used in Europe for the propulsion of missiles until the early part of the 14th century. There is a quaint Elizabethan account in the British Museum which ascribes the invention to the evil one :—

Egerton, 2642, f. 150.

"Of the first invention of that Horryble Instrument of Gonnes.
In the year of our Lord God 1380 [this should be 1320] the first invention of this devilish and most deadly engine began after this maner, that is to saye:
One Bertholdus Swartz, an Almayne, did first invent the makyng of Gonnes by the putting of the powder of brimstone in a mortar for a medicine, who covered the mortar by a stone, and striking fyer it so fortuned that a sparke fell into the said powder, whereby there arose a very sudden flame oute of the said mortar and herewith lifted upp the stone wherewith it was covered a great hight, which thing the said Bertholdus perceiving did this devise by the Suggestion (as it was thought) of the Devyll himself, a Pipe of iron, and loaded it with the powder, and so finished this deadlye and horryble Engine, and then taught it to the Venecians when they had warres against the Genaces, which was in anno domini 1380. . . . So that the first that used shot in Gonnes to their profit were the Venecians in the warres which they had against the Genoas or Genowayse. And that in anno dm. 1543, and anno regno Henrici VIII, xxx^mo., the first cast pece that was ever made in the realme of England was made in Buckestede in the county of Sussex by Ralph Hogge."

The relator thus leaps over two centuries; the intermediate history was as follows:—

Guns took part in the siege of Baza in 1323, and were known at Metz in 1324. At first the projectiles were in the form of crossbow bolts or "quarrels," but these were superseded by pellets of iron, lead or brass. These early guns were of wrought-iron bars welded together and hooped in barrel fashion, and were quite small and portable. They were used by the English in the Scottish War of 1327, on warships in 1328, and played a part in the battle of Crécy in 1346. Towards the end of the century brass or bronze guns were cast by bell-founders.

In its older use the term "brass" was rather applied to alloys of copper and tin, now known as bronze, than to what we now call brass, i.e., an alloy of copper and zinc. In these notes this usage has been retained in order to follow the terminology of the State Papers and accounts.

"*Encyclopædia Britannica.*"

In the 15th century large wrought-iron guns were made for siege purposes, to throw stone shot of considerable diameter. Both these and the small guns were breech-loaders, the charge being placed in chambers, two or more of which were provided for each gun. We used these in the sieges of Mont St. Michel in 1424 and of Orleans in 1428. The former were of 19 and 15 inches calibre; the latter shot stone balls weighing 116 lbs., but were outranged by the French guns, which fired balls about 15 inches in diameter. Large guns of this class were made in Flanders later on in the century, such as the "Mad Greta" of Ghent and "Mons Meg" of Edinburgh. In 1514, when Henry VIII made peace with France, the "Kynges Shippes" were laid up, and from a very thorough inventory of their "Ordynance, Artillerie, and habillaments for the warre" we get a good idea of the very heterogeneous collection of all kinds and sizes of guns that formed their armament. In the flagship, *Henry Grace de Dieu*, there were twenty-three brass guns of nine kinds and seventy-three of iron, also in nine varieties. These latter were evidently of wrought iron, as they were all provided with chambers, i.e., breech-pieces, usually two for each gun. Another of the fleet, the *Mary Rose*, of sixty guns, was sunk at Portsmouth in 1545 and some of her guns were recovered in 1846. One of these, a wrought-iron gun 9 feet 8 inches long and 8 inches calibre, and a cast-iron ball found with it, is in the Rotunda Museum at Woolwich, and another is in the Royal United Services Museum. Two other ships, the *Grete Nicholas* and the *John Baptist*, had a few cast-iron guns, no doubt imported, as cast-iron guns had been introduced in Germany late in the previous century. These were also breech loaders. At one time one of these built-up guns remained at Eridge, and is figured and described in "Archæologia," Vol. X., p. 472.

T. R. Miscellaneous, E. 36, V. 13.

The writer has confused this built-up gun with the casting of guns at Buxted; it is quite likely that it was made at Eridge Forge. There is a representation of this mortar on the signboard of the village inn, which is called "The Gun."

Another example from Sussex, but more probably of foreign manufacture, is the Bodiam mortar, now in the Rotunda Museum at Woolwich. "This very curious piece of ordnance is said to have been found in the moat of Bodiam Castle, and was preserved for many years at Battle Abbey. It is at least as old as the earlier part of the 15th century. The interior is of cast-iron and probably one of the earliest known specimens of iron in that form. The length of chase is 34 inches, of chamber 14 inches; calibre 15.1 inches, weight of shot about 160 lbs." Rotunda Catalogue.

At this period, as we see by the "Kynges Shippes" inventory, stone and iron shot were both used. In 1513 Robert Scorer of Hartfield supplied 9 tons of iron "gunstones" for the *Mary and John*, and in the same year John Bowyer supplied iron gunstones and dies (or dice) of iron. These latter were cubes or polygons, perhaps forged, which were covered with lead before using. At the same time stone shot were bought at Maidstone. The Weald was evidently then unable to supply all the shot that was required, as much was also bought on the Continent. In 1523 the Emperor sent to England, by Henry's request, the best cannon-ball maker in Spain. Cast bronze guns (always called "brass"), although very costly, were much superior to those roughly built up of iron, on account of their comparative lightness and more accurate shooting. Henry VIII imported foreign experts to cast these brass guns, several examples being preserved at Woolwich and the Tower. Among these founders were Arcanis de Arcanis, an Italian; Rauff Frances and his two sons (presumably "Archæologia," Vol. LI., p. 27.

Frenchmen), and Peter Baude, a Frenchman. The latter came to England in 1509. There are accounts preserved at Loseley showing that he cast a number of brass guns in 1533, the metal used being very carefully checked, as there were complaints of wastage. In 1542 he was made a denizen, and described as "maker of our bombards." His foundry was in Houndsditch.

There are also mentioned in the 1533 accounts Robert Owen and his brother John, specifically described as "Englishmen." These latter apparently had to assign one-third of their remuneration to Peter Baude, possibly as royalty or tuition fee.

There is a very well-made brass saker at the Rotunda, Woolwich, inscribed :—

JHONE AND ROBERT OWEN
BRETHERYN MADE THYS SAC
AR WEYING IZIZ ANNO DMN
1538

It is possible that John Owen was Peter Baude's deputy or assistant at Buxted, and was referred to in the jingle :—

"Master Huggett and his man John
They did make the first can-non."

John Owen was drowned in shooting London Bridge in July, 1553.

Another important founder was a cleric belonging to a Sussex family, namely, Parson William Levett. He was rector of Buxted from 1533 to 1545, when he was deprived (probably for refusing to acknowledge the King's supremacy), but he was apparently restored on the accession of Mary, as he describes himself as "parson of Bucksted" in his will dated March 6th, 1554. In

Hogg House, Buxted, with the Hog Rebus over the doorway.

this will he bequeathed to " Raffe Hogge my syrvnte foure poundes and VI tonne of sowes." It would thus seem that Hogge worked Levett's furnace. Hogge, in his complaint of 1574, speaks of " pson Lovet, who was my m^{r} and my p'decessor." He had a foundry "near the Tower," and in 1544 no fewer than seven Frenchmen in his employ were made denizens. In 1546 he was appointed a commissioner to oversee the iron-works of the Duke of Norfolk, confiscated on his attainder; in 1549 he was a debtor to Worth Furnace for 33 tons of iron, and in the following year supplied Eastbourne with two sakers and three robinets, costing 20 marks, for a fortification.

Sussex N. & Q., Vol. II., p. 147.

Hogge probably took over the foundry after the death of Levett.

These three men, Baude, Levett and Hogge, were the fathers of the Wealden cannon-founding industry. Mr. Rhys Jenkins says :—

Newcomen Society, Transactions, Vol. I., 1920–21.

" A great landmark in the history of the Sussex Iron Industry was the founding of the first cast-iron gun—that is to say, in England, for iron guns had been cast long before on the Continent. This took place in 1543 at Buxted. The makers were Ralph Hogge and Peter Baude. Hogge was the owner of the furnace, and Baude was one of the founders of bronze

guns in the service of the King. The reason he was brought down to Sussex is clear enough. Hogge knew how to work a furnace and could furnish the molten iron; he knew nothing about guns or the preparation of the moulds for gun-founding. Baude, on the other hand, was an expert gun-founder in bronze and was learned in the proportions of the various pieces. We do not know that he adopted the same proportions, for instance in regard to the thickness of metal, or exactly the same methods of moulding, but in any case, the cast iron guns were a success. As compared with bronze guns there was an enormous advantage in cost, even after the founder had made a good profit and paid the carriage to London. We do not hear that Baude continued to be concerned with iron guns, possibly some of his assistants were left to carry on the work, but at any rate, the production went on steadily. . . ."

"The manufacture of cast guns soon became a prominent feature in the Sussex trade, and it is of this branch that we have most information. It seems to have been the first manufacturing industry in which the English distinguished themselves. During the reign of Elizabeth and onwards to the time of Charles II., the English cast-iron guns were in demand all over the Continent. The historian, Hume, noticed this fact, and remarked: 'Shipbuilding and the founding of iron cannon were the sole (arts) in which the English excelled. They seem, indeed, to have possessed alone the secret of the latter, and great complaints were made every parliament against the exportation of English ordnance.'

Hume, "History of England," Appendix to the reign of James I.

The particular reason why we excelled in the production of cast-iron guns is not clear. No doubt the Sussex iron was a good foundry iron, but such was to be found in a good many places on the Continent. Possibly there had been some development in the construction and working of the furnace; it would seem that the double furnace such as has been referred to in connection with the Worth ironworks may have been an English invention. Swedenborg states that cannon-founding was established in Périgord by the aid of workmen brought over from England, and that some of the furnaces there were double, i.e., two furnaces built on the same block, in order to procure enough metal to cast large guns.

Swedenborg, "De Ferro," 1734, p. 145.

But the most likely explanation is that the Sussex men had invented some better and cheaper mode of making the moulds than that which had been in use by the founders of bronze guns; for not only were the guns better, but they were also cheaper than the foreign guns. Of the attempts made to induce the Sussex workmen to go abroad there is ample evidence in the Register of the Privy Council."

Register of the Privy Council, 1624–1627, Vols. 32–36.

(*Note*.—It is possible that the tenacious Wadhurst Clay, in which the ore is found, was particularly suitable for making the models and moulds.—E. S)

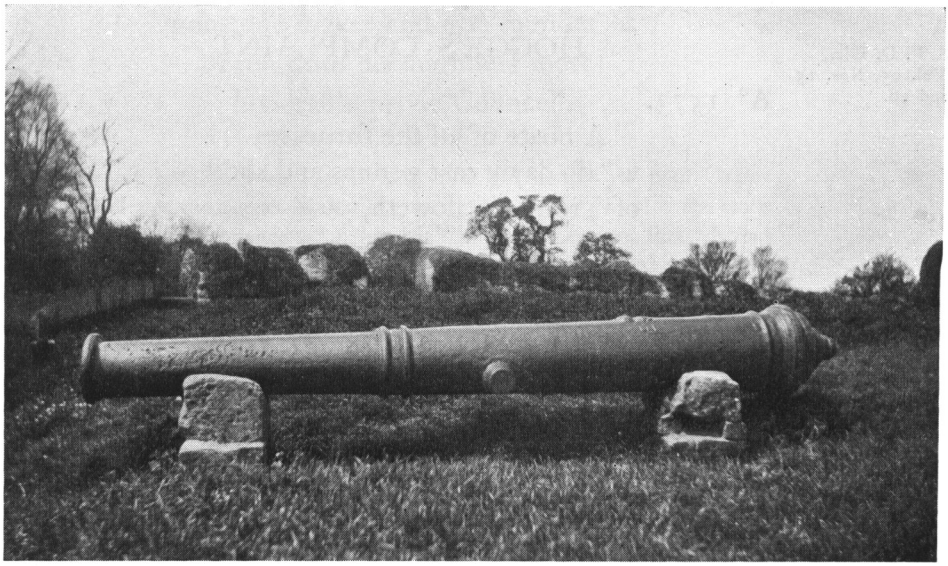


Photo : Miss Blackman.

The Pevensey Gun.

" It is necessary, however, to guard against the idea that the production of guns became at any period the largest item of production of the Sussex works. It was, no doubt, the most profitable, the foreign demand in the reign of Elizabeth, for instance, was very considerable, but all the iron-makers who may have wished to enter upon this branch of the trade could not do so simply because the workmen capable of making the moulds were few in number and the training of new men took time ; and then later on came Government measures in restraint of the manufacture of guns for export."

The number of furnaces casting large guns was not great at any one time. All we can be sure of before the accession of Elizabeth are the three first mentioned in Hogge's note below and Admiral Seymour's at Worth. We have an account of the position in 1573 in Hogge's note and complaint :—

S. P. D. Eliz., Vol. 95, Nos. 15 and 16.

HOGGE'S COMPLAINT

A° 1573.

A noate of all the furnesses w^ch^ do dayly cast gonnes and shott of Yron as followeth, viz.,

Suggested Identification.		
Oldlands.	Raffe Hogge, the Quenes Ma^ties^ gonnestone maker of Yron.	This thre have cotynewed long and was the first beginners in p̄son Levetts tyme and onlye cast for the Tow^er^.
Pounsley.	Robert Hodson.	
Huggetts.	Arthur Mylton.	
Mayfield.	Sir Thomas Gresham, knight.	Theis have begonne to cast gonnes and shott nowe of late w^thin^ this V or VI years.
Riverhall.	Nicolas Fowle.	
Hamsell.	Alexander Fermer.	
Cowden.	Micaell Weston.	

All theis furnesses will cast yearly one w^th^ another above c.c.c. tonnes.

of the w^ch^ furnesses y' is twoo of them that sellyth more ordeñnce, to go alongest the coast then thay send to London, y' is one John Harman of Lewys w^ch^ doth by and sendyth theym alongest the coast, he bythe most of them of

Nycolas Foule and Alexander Fermer.	Theis 2 sell mytche alongest the coast at Lewys in Sussex.

The humble complainte of Ralphe Hogge the Quenes Ma^ties gonstone maker and gon'founder of Yron unto her highness most honorable privie Councell.

In most humble wyse complayneth unto yo^r honors yo^r poor Orator Raphe Hogge the quenes Maiesties gonnstone maker of yron for the office of her Ma^ties ordennance w^thin her Ma^ts tower of London, that whereas ther is often complaints coming be fore yo^r honors y^t the shipping and selling of ordennance of cast yron to Strangers to carry over the Seas, as they saye such nombrs that yo^r enimie is better fourneshed with them then o^r owne contry ships ar, and that all the blame goeth upon a lycence granted by the quenes M^tie unto me the sayd Raph Hogg w^ch lycence was graunted unto me in consideration of s^rtine furnesses w^ch I mayde of owne charge, for the s'vice of her Ma^tie and in consideration that I s've her Ma^tie in shott of yron for viij^li the tonne, whereas other men sell for xij & xiij^li the tonne and besydes that I nether sell any ordeñnce to any stranger to carie away, by vertue of the same lycence, but first I optaine the right honourable my Lord of Warwick, M^r of her Ma^ties ordeñnce his letter unto my constomer and so tak out a coket for the passing of the same, and a nott of the same taken by the serchers at the shipping thereof, y^t may therfore please yo^r honor to understand that ther is so maynie furnesses that nowe of late yeares have ther owne trade of casting of Sowes for maiking of Yron and faull to casting of gonnes and shot of yron and caryd them to the seay syd to divers and sundry places, that is to say, Rye, Hastings and Portysmouth, th'eyle of Wight, Hampton Powle, Plymowth and to Bristow, and when they are in the sey they go into France and into Flanders w^th them w^thout any lycence at all as yt is to be provid synce mydsomer last there was a bote went out of Mytching Haven by Lewes in Sussex w^ch towk out a coked for London, laden w^th gonnes of cast yron as assone as she was out of the haven went into Holland and ther in Dorte lond, Aland, and sould XXX p̄ts of cast yron, that is to say, 2 demy-coulverings and 4 sackes and 6 mynnyons, 10 facons and 8 fauconettes and this is dayly used, for yt is reported by dyvers marchants that ther goith many in to France wher as none did pass from London into France by lycence not this 12 monthes ther is dyvers of them that dothe mayke them, that bringeth very few or none at all to London, and under coullar of caring them along the cost they carye them where they lyst and maye do, for nowe yt is become a traid of marchandise whereas in the begyning ther was none that cast any gonnes or shott of yron but only p̄son Lovet who was my M^r. and my p'decessor who mayde none but only for the

service of the kynge Ma^{tie} and yf ther be no restraint for caring alongest the sea coste, whear ther passeth one by lycence there will iij goe wthout lycence, the names of the furnaces that casteth gonnes and shott of yron at this present doth appere in a pap̄ hereunto annexed, yt maye therfor plese yo^{r} honnors that p'sent order maye be taiken herein for there is above c.c.c.c. tonnes cast yearly and all thes will not be sold nor bought to remaine wthin the Realme, and yf ther be not order taiken, ther is mor about to sett up workes to caste gonnes both here and Wayelles and they being cast will mayke saill one way or other, ether by lawfull meanes or by stelth."

See p. 52.

As stated in a previous chapter, the lists of 1574 included every known works as possible if not actual producers.

Landsdowne 683.

We have a list of gunfounders in January, 1576, giving the number as ten, and in a petition of 1592, seven only, (five furnaces), but this is probably much understated in order to support the petitioners' argument.

Landsdowne 70, f. 27.

From Tudor to Hanoverian times the export of guns was a burning question. It would be tedious to enumerate the constant succession of petitions and proposals to prohibit export, counter arguments of the founders in favour of export under licence, Acts of Parliament, and regulations for licences that were made.

An undated Elizabethan example may be quoted for its bland assumptions :—

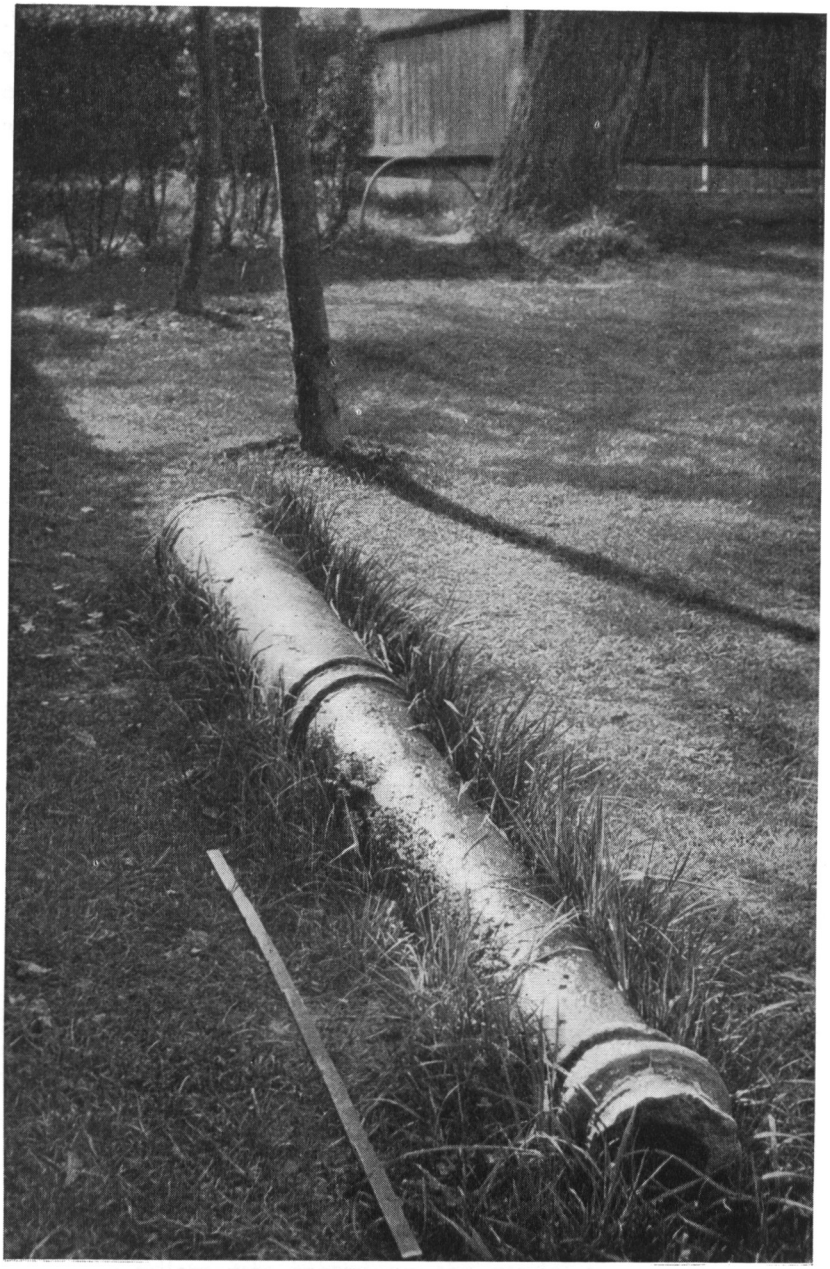
"An Advice touching Iron Ordynance

It appeareth to be a peculiar blessynge of god given only to England for defence thereof, for albeit most countries have their iron, yet none of them will have their iron of the sort, toughness or valydytie to make such iron ordinance of, therefore the singularitie of our iron sheweth in itself to be a gifte so given by god only to us for our peculyer defence as is aforesaid."

Harleian 6850, f. 174.

To which the reply is "Utterlye untrue—not only in Sweden but in High Germanie in the country called Surland in Westphalie do they make guns," etc.

Notwithstanding the regulations, there were constant evasions by the Sussex founders, and, by one means or



The Cowden Gun at Crippenden.

another, much ordnance was smuggled out of the country. One method of evasion was the casting of the smaller calibre guns, for which an export licence could be obtained, of such diameter that the foreign purchaser could bore them out to take much larger shot.

CHAPTER SIXTEEN

GUN CASTING

OWING, probably, to its being a jealously guarded process, there is no English description of gunfounding either in the Weald or elsewhere. From the fragments of moulds occasionally found it would seem that the loam process was used. There is no evidence that casting in sand was ever practised. It may be confidently assumed that during the whole period with which we have to deal the process remained practically unchanged, as it did in the allied art of bell-founding, from which, as we have seen, it was adapted.

There is, however, a description in French in the "Dictionnaire des Sciences," published in 1767, with the Royal Regulations of 1732, specifying the dimensions of the various pieces, annexed, of the process of casting of brass cannon as carried out in France.

In Monge's treatise, "L'Art de Fabriquer les Canons," published in 1795, this description has been amplified and extended to casting in iron. Monge was appointed by the Committee of Public Safety to organise the provision of munitions when revolutionary France was facing the rest of Europe.

The Fuller accounts of Heathfield Furnace agree very well with Monge in the materials used, except that butter or tallow was coated on the model to facilitate

withdrawal, and there is little doubt that the Wealden practice was identical with the French loam-casting, as described below. Some of the terms noted by Fuller, as used by his workmen, are clearly French.

A full-sized model of the gun was prepared in the following manner :—

A spindle of light wood, octagonal in section, and about the length of the finished gun, tapered to the same degree, was furnished with pins at each end so that it could be revolved by hand in bearings on a rigid frame. Round this twisted bands of hay were wound spirally in two or more layers. The hay bands were then coated with several successive dressings of a mixture of clay, hair and manure, each coat being thoroughly dried by artificial heat. The hay served to vent the steam driven off. When the desired diameter was attained, the final coat was turned, by means of a board or strickle carefully cut to the exact external shape of the finished gun, with the various rings and thickenings. The trunnions and ornaments (if any) were modelled separately, and fixed to the gun model. When thoroughly dry the model was dressed with a preparation of ashes (at Heathfield with butter) to prevent adhesion, and the mould coated round it in the same manner, each successive coat containing a larger proportion of manure. After several coats iron hoops were secured with wire round the mould and again buried in further coats of clay. When quite dry, the wooden spindle was knocked out and the hay bands with their clay coating, together with the trunnion and ornament models, were withdrawn, leaving the mould hollow. Moulds of the breech end and of the "gun-head," having been prepared in like manner, were attached to the gun mould by means of wire. The gun-head was a mass of metal about one-fifth of the length of the gun, of bulbous shape, somewhat greater in diameter than the muzzle, beyond which it projected. Its object

was threefold: to give such a head to the molten metal that it filled every part of the mould, to provide for contraction in cooling, and to receive any slag or other impurities floating on the surface of the metal. The gunhead was afterwards cut off and sold cheaply to the forges for working up into wrought iron. It is probable that this device was also used when guns were cast hollow.

All being prepared, the mould was lowered, breech downward, into a pit in front of the furnace, the space between the mould and the sides of the pit being tightly packed with earth, and the molten metal run into it. Originally guns were cast hollow and the bore merely scraped clean by a riming tool set vertically in the ground. The gun being suspended above it, was revolved by horse-power, and gradually lowered by means of pulleys until the tool reached the breech end. The model for the bore was formed in a similar manner, except that its foundation was an iron rod wound round with wire and then coated with clay. This was placed within the large model and kept central at the breech end by means of an iron chaplet or distance piece with three arms, which had, of course, to be left in the mould and was thus embedded in the metal.

There are some broken guns at the Rotunda Museum, Woolwich, from their style made by Fuller at Heathfield, with the bore some inches out of centre, and no doubt rejected and broken for that reason.

At a later period the guns were cast solid and bored. In France this was first introduced by Maritz, a Swiss, in 1713. It is, however, probable that guns were bored much earlier in Sussex. In an Ashburnham deed of 1677 a "boring-place" is mentioned, and in a lawsuit of 1680 this is described as "now called the boring pond," which would point to the process being novel.

Ashburnham Muniments, No. 983.

In the Heathfield accounts there is a mention of boring robinets in 1713. These were the smallest guns made, and perhaps could not be cast on cores. There are boring tools mentioned in the Hamsell inventory of 1708.

In 1740 Fuller erected a new boring-house, not necessarily his first. On the site is a very large mass of borings, rusted together in the stream, and there is similar material near Robertsbridge Abbey.

It would seem probable from his letters that Fuller used a horizontal boring machine, in which the gun was revolved by the waterwheel, and the drill, supported between slide-rails, was gradually advanced by means of a chain wound round a form of windlass.

Place-names indicating that boring was practised occur at Ashburnham, Maresfield and Imbhams.

Comm. S. Ward-Evans.

Cannon boring was also carried on at Carshalton, Surrey, in the latter half of the 18th century, but whether the guns cast in the East Grinstead district were bored there or cast on cores is not known. The waterwheel is still at work.

The experiment tried by John Browne in 1640 of turning down the exterior of cast-iron guns to reduce their weight so as to take the place of brass guns seems to have been a failure. No doubt they were too much weakened by the removal of the outer skin.

As may be imagined, guns cast in this manner varied immensely in dimensions and weight, the naval guns being usually shorter for convenience in loading. The early built-up large guns had individual names like ships, but the nomenclature in the following lists was used in the 16th and 17th centuries. It is taken from Laird Clowe's "History of the Royal Navy," Vol. I., page 408, and is stated to be an average from various sources :—

Name.	Bore.	Length.	Weight of Gun.	Weight of Shot.
	Inches.	Ft. Ins.	lbs.	lbs.
Cannon Royal.	8·54	8 6	8,000	74
Cannon	8·0	—	7,000	66
Cannon Serpentine	7·0	—	5,500	42
Bastard Cannon	7·0	—	4,500	42
Demi Cannon	6·4	11 0	4,000	32
Cannon Petro	6·0	—	3,800	26
Culverin	5·2	10 11	4,840	18
Basilisk	5·0	—	4,000	14
Demi Culverin	4·0	—	3,400	8
Culverin Bastard	4·56	8 6	3,000	11
Saker	3·65	—	1,400	6
Minion	3·5	6 6	1,050	5·2
Falcon	2·5	6 0	680	2
Falconet	2·0	3 9	500	1
Serpentine	1·5	—	400	0·5
Robinet.	1·0	—	300	0·3

The above may be taken as representing the approximate particulars of Tudor ordnance. The "Complete Souldier," 1628, differs but little from it, although the pieces tend to be somewhat heavier.

In a manuscript list of the "Allowance of Ordnance to his Maj^ts^. Ships," of 1695, many of the guns were designated by the weights of the shot, and in the 18th century the old names were entirely dropped and a certain amount of standardisation achieved.

The following table is based on those cast at Heathfield in 1735 and 1742 and at Warren Furnace in 1769. There is no record of larger guns than 32-pounders having been cast in the Weald; probably the furnaces were not large enough. Fuller refused to make 42-pounders and remarked, "Guns are always best when you begin on small and rise by degrees—*vestigia nulla*

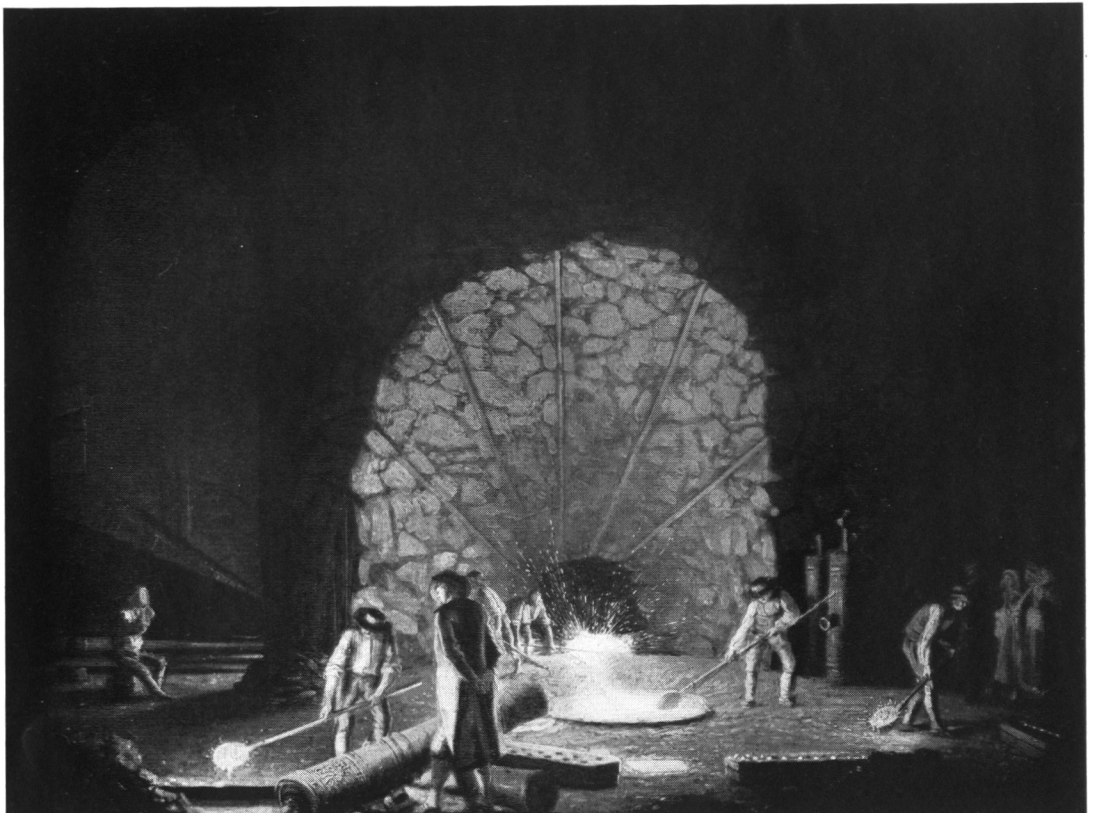
retrorsum is a good motto for a Gun Founder, for when they go from great to small, and then up to great guns again, I desire them to know what they are about, or that they can depend upon their work."

Name. Eighteenth Century.	Length.	Approximate Weight.	Name in "Navy Allowance" of 1695.
	Ft.	lbs.	
42-pounder .	Not made.		Cannon of 7.
32-pounder .	10	6,384	Demy Cannon.
	9½	6,160	
24-pounder .	9½	5,488	24-pounder.
18-pounder .	9	4,368	Culverin.
12-pounder .	—	—	12-pounder.
9-pounder .	9	3,136	Demy Culverin.
	7	2,548	
6-pounder .	8	—	6-pounder.
	6½	1,932	
4-pounder .	6½	1,270	Saker.
3-pounder .	6½	980	3-pounder.
2-pounder .	5	532	
	4½	476	
	4½	336	
1-pounder .	4	280	
	3½	252	

The dimensions and weights of the French Republican navy guns, as specified by Monge, agree fairly well with the above.

In 1695 the number of shot allowed for each gun was forty for the heavier and fifty-five for the lighter pieces. The more important furnaces cast but little shot, which was generally produced by the lesser furnaces. Large quantities must have been required, not only for the navy, but also for the armed merchant ships.

"Pehr Hilleström has given us, from 1790, a scene from the casting of small cannon balls in moulds—so-called



By permission of the Jernkontoret, Sweden. Copyright.

Casting Cannon Balls in Sweden, 1790, from a Painting by Pehr Hillestrom.

'coquilles.' We see the workers fetching the iron, which has run from the furnace in the background to a central hollow, with their scoops and filling the moulds standing in the foreground. A Government officer is inspecting the work as it proceeds, and in the background, near the blast, with two bellows, is a man drinking a stoup of ale. The forgers became very thirsty at their warm and heavy work. To the right in the painting reproduced is a group of distinguished visitors, evidently the owner of the works himself, with ladies. From the point of view of composition the painting is very effective. The casting of the cannon balls is executed against the fine background of the furnace with its heavy stonework lit up by the fire. One can almost imagine that the interior has features which make it look like the illuminated stage of a theatre."

From Sixten Rönnow's "Pehr Hilleström."

CHAPTER SEVENTEEN

THE LATER GUNFOUNDERS

The Brownes

After the accession of James I there was a long period during which England played a very minor part in Continental affairs; although, in 1624, she joined the Protestant side in the Thirty Years' War, which lasted from May, 1618, to October, 1648.

Acts of the Privy Council.

In 1589, Thomas Browne had entered into bonds regarding the casting of iron ordnance. In 1609 he was casting guns at Ashurst, and in 1612 was granted a pension of eighteenpence for life, which was later continued to his son John Browne, of Brenchley, "in consideration of his extraordinary skill and experience."

S. P. D., James I, CV. 92.

There are very many references to him in the State Papers. In February, 1613, he was examined by a Commission and deposed that he was master of a furnace at Brenchley, Kent, employing two hundred men, and had made guns for the Dutch. He stated that there were at that time four furnaces in Sussex also casting guns. On February 4th, 1614, he was granted the monopoly of making iron and brass guns for the Navy, and in the following year the office of gunstone maker for life. Another courtier, Sackville Crowe, afterwards Treasurer of the Navy, working Maresfield Furnace, had a similar monopoly for merchant ships, and had to keep the public

market on Tower Hill supplied. There were constant dissensions between the two gunfounders, and attempts to divide the monopolies failed. Crowe seems to have been implicated in an attempt by agents of Cardinal Richelieu to induce Maresfield gunfounders to go to France, and Browne also complained of similar attempts. During the reign of Charles I Browne had constant difficulty in obtaining payment for the Navy guns, and a complaint was made that he and other contractors were charging excessive prices.

The United Provinces, then the greatest sea Power, bought a great number of guns from Browne, and the King was a partner in this traffic. The Dutch obtained concessions of mines and forests in Sweden, and the competition of Swedish iron guns so affected Browne's trade that he asked for, and obtained, a patent for the monopoly of casting pots, backs and pans. The dissensions between King and Parliament culminated in the affair of the five members in January, 1642, and although Browne was among the King's retinue on that occasion he became official gunfounder to the Parliament, and two of the King's furnaces in the Forest of Dean, Connop and Lydbrook, were ordered to be delivered to him. The Royalists, however, had hopes of his allegiance, and Thos. Walsingham, then a prisoner in Kent, wrote as follows to Lord Digby :—

"Be assured of the people there, as well gentry as common, especially Mr. Browne the King's gunfounder, who makes all the cannon and bullets for the service."

His (Walsingham's) advice is "that His Majesty march hither with 4,000 horse and foot, and ten days before to send intelligence to Mr. Browne, who will provide guns and bullets. The rebels have no guns or bullets but from him, and that from hand to mouth, there

being none in the Tower, which he is forced to provide else they would put others into his works. If the King comes he will deprive the rebels of all the ammunition and guns wherewith they fight against him, and then it cannot be doubted that the country will rise generally and will be glad to express their true affection to His Majesty. By this means the King will not only gain this country but all the works which now make the ammunition against him and so deprive the rebels of all their resources by sea and land to offend His Majesty any longer."

This letter was intercepted, and a committee of the House of Commons examined Browne, who had been ordered into custody, and other witnesses, and although evidence was given that some of Browne's men had gone to Oxford for the King's service, Browne's denials resulted in his exoneration. He was liberated, and his works restored to him.

He continued to cast guns for the Commonwealth until his death in January, 1652, and during that period the Parliament gave him the control of various furnaces in Surrey and Sussex, six in all, as well as his own.

His eldest son, George, had predeceased his father, leaving a son, George. At the Restoration this grandson of John Browne was granted the position of King's gunfounder, notwithstanding the application of his uncles Thomas and John.

He married, in 1654, his kinswoman, Elizabeth Browne, of Betchworth, and is afterwards described as of Buckland, Surrey.

We find his name in association with Sir Thomas Culpepper, George Courthope, and T. Foley at various furnaces, and the grant to him of the position of King's gunfounder was renewed in 1681.

In the lists of 1664 fourteen furnaces are stated to be working, of which eleven made guns and shot for the Dutch War. This war also brought into temporary use

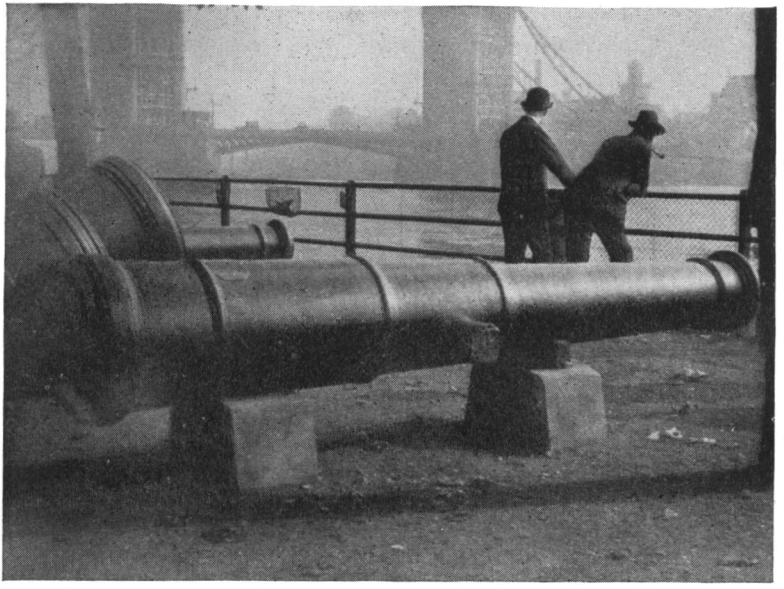
a further thirteen. There is evidence in the State Papers of great exertions to induce founders to cast shot, and it is likely that the majority were not equipped for gun-casting.

THE 18TH CENTURY

The next census we have is in a letter from John Fuller in 1749 :— S. A. C., LXVII., p. 47.

"The exigencies of the State during the Wars required great numbers of Guns and the Board very wisely contracted with more gunfounders than before ; the exigency set up numbers of little Foundries which I call Tinkers shops, and supplied the Government with small guns ; they contracted slap-dash for all sorts.

"There is Brede, Beckley, Lamberhurst, Robertsbridge, Ashburnham and my own are the only furnaces which can make great guns, and I really had hope that when the exigency ceased, the Board would have brought things into the old channels again, and have dealt with those and those only who could make all sorts. . . ."



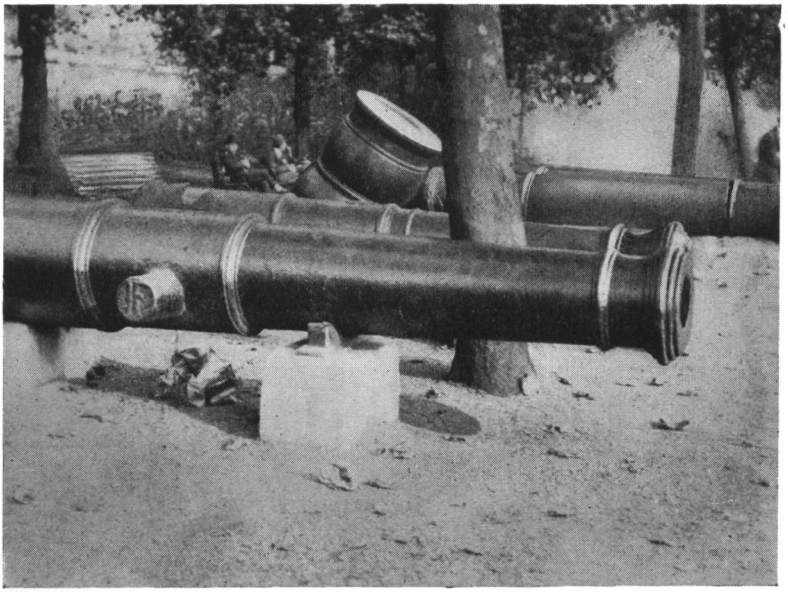
Fuller's Irish Guns on Tower Wharf.

Fuller at this time made guns for Ireland and the Kings of Sardinia and of Naples and Sicily at Heathfield.

The gun trade was fairly active in the East Grinstead district in 1769 at Warren Furnace, Gravetye and Mill Place. Fernhurst, Robertsbridge and Ashburnham were casting guns towards the end of the 18th century, but were then superseded by the Carron works. The number of furnaces we know to have been casting guns at the dates mentioned may be thus summarised :—

In the reign of Henry VIII	4	
Hogge's list	7	
1576	10	
1630	2	
1653	10	and 14 more, probably casting shot only.
Fuller's list, 1749	6	
Late 18th century	6	

It is probable that other furnaces also cast guns from time to time.



Fuller's Irish Guns on Tower Wharf.

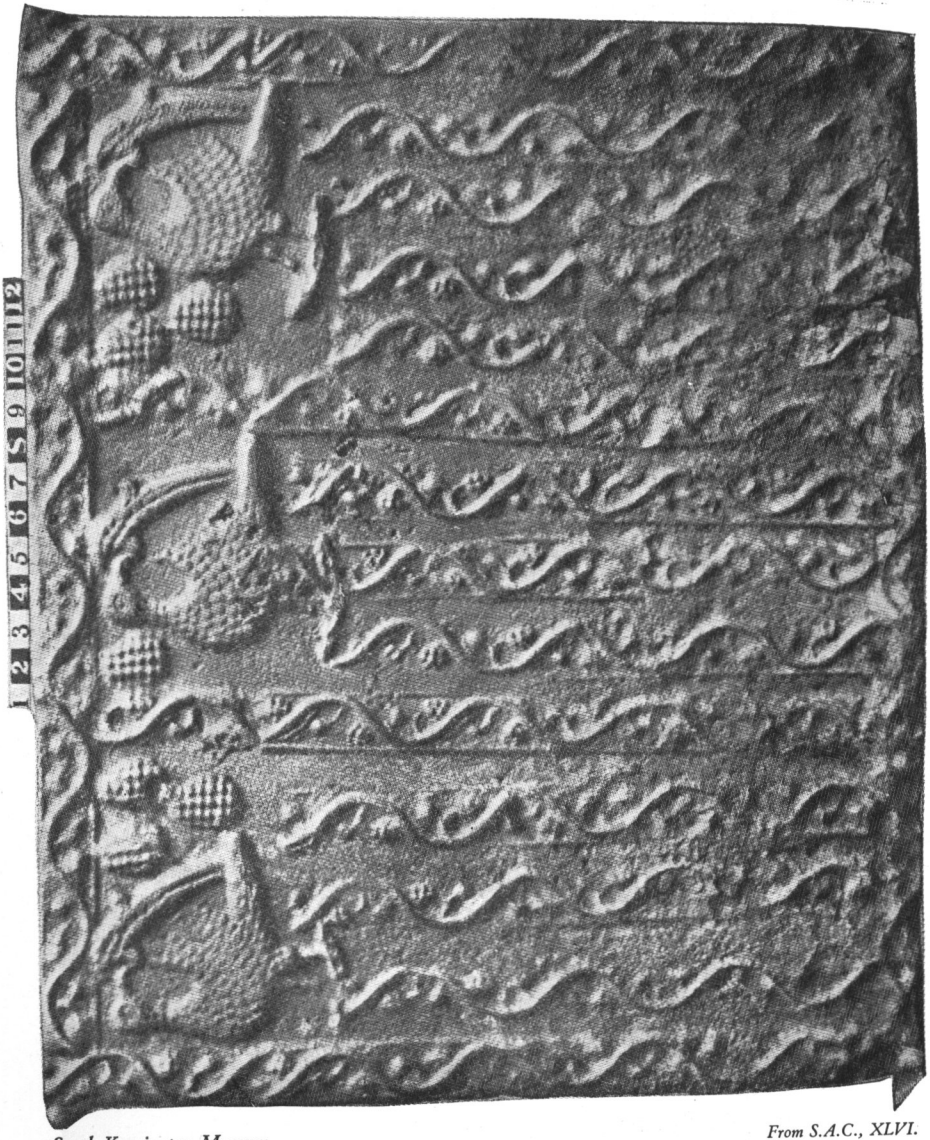
CHAPTER EIGHTEEN

FIRE-BACKS

THE best known and most widely distributed products of the furnaces, other than guns, are the fire-backs, now so greatly prized by collectors. Unfortunately, owing to the ease with which they can be reproduced, many specimens are of modern manufacture, cast from genuine old backs. These can only be distinguished by an expert.

From S.A.C., XLVI.

Fire-back with Royal Arms, Badges and Supporters.

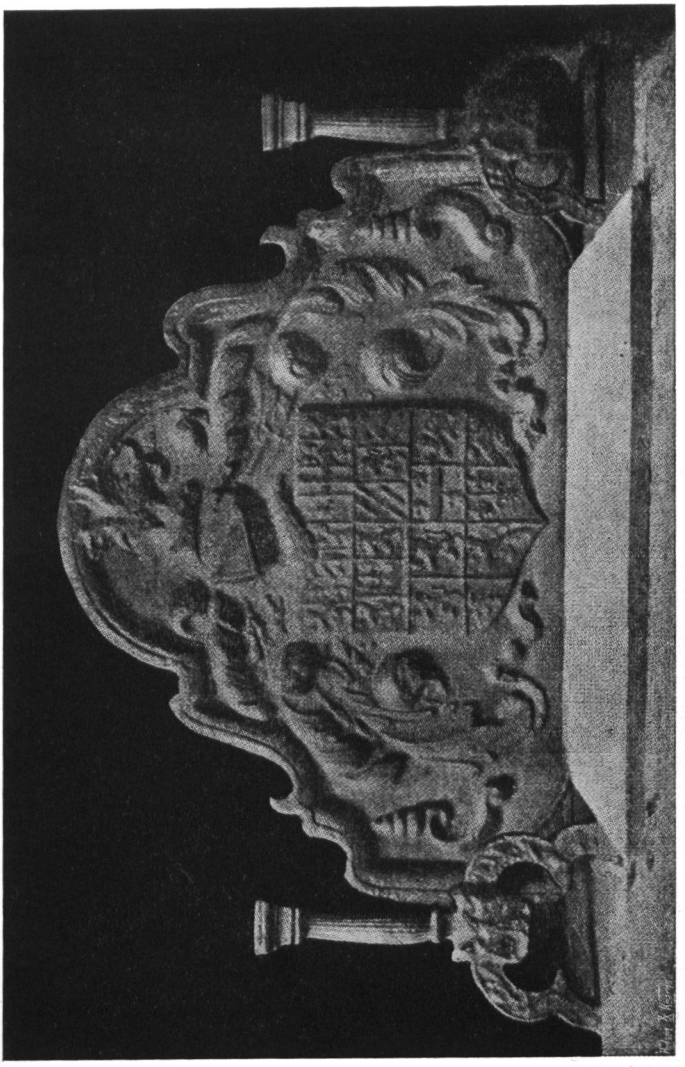


South Kensington Museum. *From S.A.C., XLVI.*

Fire-back from the Mayfield Foundry.
The badge is perhaps the rebus of the Fowles.

Wealden fire-backs have been so fully described and so copiously illustrated by Mr. J. Starkie Gardner in "Ironwork," Part III, Mr. W. R. Butterfield in the *Connoisseur*, Vol. XLVI, No. 184, and Mr. Nathaniel Lloyd in the *Architectural Review*, Vol. LVIII, No. 345, that it is unnecessary to cover the ground again. They were cast in sand or loam moulds, at first rectangular, low and wide in shape, and later on narrower, with curved tops.

Fire-back, depicting the Martyrdom of a Sussex Man and Woman.
Seventeenth century. *Hastings Museum.*
By courtesy of "The Connoisseur" and Mr. W. Ruskin Butterfield.



Dawson Collection, Hastings Museum. *From S.A.C., XLVI.*

Fire-back and Brand-Irons from Hurstmonceux Castle.

Mr. Butterfield classifies them into three types, which, however, overlap considerably in point of time.

I.—Early. These were made by forcing a stout plain board into the sand floor of the foundry, and then impressing into the level surface thus formed separate wooden stamps of various ornaments. The edges are frequently of a rope pattern.

II.—Middle. These were moulded from a complete carved wooden pattern, generally coats of arms, but sometimes representations of scenes, such as the Lenard fire-back.

Fire-back, Seventeenth Century.
Hastings Museum.
By courtesy of "The Connoisseur" and Mr. W. Ruskin Butterfield.

Photo : J. E. Ray.

Fire-back, with figures of Hercules and the Hydra.

Eighteenth century. *In the possession of Mr. J. T. Ade.*

By courtesy of "The Connoisseur" and Mr. W. Ruskin Butterfield.

III.—Late. These, of greater height than width, usually represent classical or biblical subjects, and were produced from elaborately carved patterns, probably imported from the Low Countries or Germany. They are similar in style to the richly decorated cast-iron stoves used on the Continent in place of open fires. There are original wooden patterns of this class preserved at Ashburnham Place.

A great variety of fine examples of fire-backs is to be seen at the Victoria and Albert Museum, South Kensington, the Hastings Museum, and at the Sussex Archæological Society's museum at Lewes. Probably the best private collection is that belonging to Mr. J. T. Ade.

ANDIRONS OR BRANDIRONS

Cast-iron andirons, used for supporting the burning wood on a " down hearth " or hearth level with or but slightly raised above the floor, were used with the fire-back with a similar evolution of ornamentation. Wrought-iron brandirons were in use before the cast-iron period.

GRAVESLABS

Another interesting product of the furnaces was the cast-iron graveslab.

When the development of the technique of the fire-backs had advanced to the point of reproducing coats of arms, inscriptions and dates, it was a natural step to adapt the same methods to memorial slabs let into the floors of churches. As with fire-backs, they may be roughly classified as either being produced with separate stamps impressed on a flat surface or from a complete carved pattern.

In an intermediate class the inscription was apparently cut in several separate narrow strips or fillets. All these

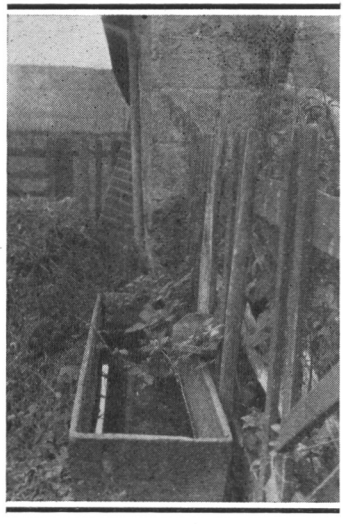
Graveslab of Cast Iron in Crowhurst Church, Dated 1591.

forms, ranging in date from 1617 to 1771, are to be seen at Wadhurst Church, where there are twenty-six. The finest are those of the Barham family. Some of the later ones bear initials only. There is also in the churchyard an iron headstone, and a large slab forming the cover of a box tomb dated 1799. The only Sussex furnace then at work was Ashburnham, but the custom may have survived and the slabs have been cast at iron foundries.

The earliest in date is that of Jhone Colins in Burwash Church. This is fully dealt with under Socknersh Furnace, on p. 306.

Perhaps the most elaborate is the well-known Anne Forster graveslab in Crowhurst Church, Surrey, dated 1591.

A broken specimen of this was found at Ardingly Forge. It was very likely cast at Strudgate, and, being fractured, sent to the forge to be worked up into bar iron. Besides the very fine series at Wadhurst, examples may be seen in the churches at Rotherfield (undated), East Grinstead (1570), West Hoathly (1619 and 1624), Salehurst (1649 – 1713), Sedlescombe (1664), Maresfield (1667), Mayfield (1668 and 1708), Hartfield (1702), Uckfield (1707), Streat (1731–1735), and in the churchyard at Cowden, Kent (18th century).



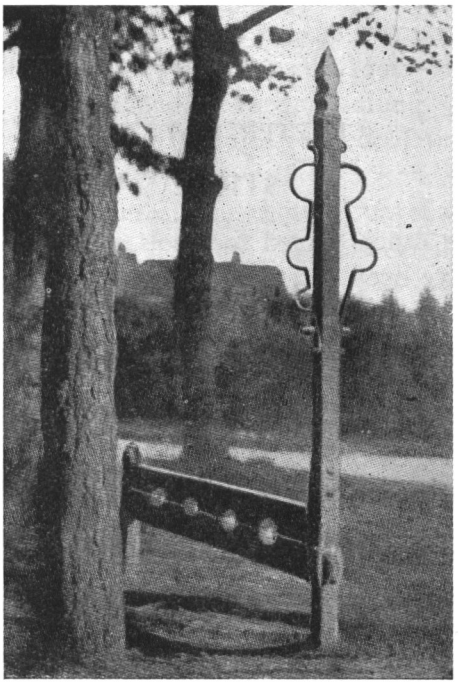
Iron Trough at Orznash.

S. A. C., V., p. 203.

It is a curious fact that these graveslab patterns have sometimes been used for fire-backs, e.g., one from Coombe Place, now in the Barbican Museum.

Other products of the

furnaces were garden rollers, anvils, hammers and plates for the forges, iron pots, pans and skillets, and the Sussex



From S.A.C., XLVI.

Iron Stocks at Ninfield.

utensil called a gresset, a boat-shaped vessel for melting fat for rushlights.

The St. Paul's railings, a very unusual job, are dealt with under Lamberhurst, and in the chapter on Finance. See pp. 272, 207.

CHAPTER NINETEEN

STEEL

STEEL, so much prized for tools and weapons, seems never to have been a prominent product of the Wealden ironworks.

Probably the Sussex ore was unsuited for its manufacture; we know that Sir Henry Sidney's German experts soon abandoned its use.

During the bloomery period the production of steel in Europe was a very uncertain matter, dependent on the skill of the smith, often assisted by some magic formula. It was dimly recognised that the varying of the proportion of fuel to ore and the angle of inclination of the bellows nozzles, the use of certain woods for the charcoal, and more especially the mixing of animal matter, such as horns, hoofs and bird dung, had the effect of so increasing the proportion of carbon in the bloom as to convert part into steel. The mass was not uniform, and it was customary to divide it into small pieces and select the best.

The swordsmith, invested with magical powers, was a very important personage in primitive times. The legend of Wayland Smith, perhaps originating in Greece, is found in the earliest Icelandic Sagas and in the mythology of most northern nations. In its German form, the Amelungenlied, we have evidence of the use of animal matter.

It relates how Wayland refined the magic sword by filing it to dust, mixing the filings with milk and meal,

and giving this to hungry birds to eat. After voiding the particles the master prepared the fire and from the dung obtained metal "without slag." He filed this again and repeated the process, the birds having been kept without food for five days. Again smelting the dung, he forged the magic sword, Mimung.

Precisely the same legend is related of the smiths of Baghdad.

There is an interesting, though unreliable, Welsh tradition recorded by "Iolo" (Edward Williams) about 1812 or 1814, and preserved in the Llanover MS. in the National Library of Wales, which, after describing the bloomery process as formerly practised in Glamorgan, goes on to say :— Transcript by courtesy of Sir John Ballinger.

"In converting it into steel they passed it thro' the fire in a proper process many times, some say nine times, the fires for such purposes were made in addition to charcoal of horns, hoofs of horses and cattle, bones, and animal substances in due proportions. After it had passed thro' the whole process, it was (witness Tradition) most excellent steel. Those old Iron Makers, or if you please Iron Masters, had it seems a strong predilection for the *number nine*, or at least tradition has it for them. But the following Ancient Triad indicates clearly that steel was passed thro' *nine fires*.

"Tri chaled Byd, y maen Cellt, Dur naw Gwynias, a chalon Mab y Crinwas."

In English :

"The three hardest things in the World—a flint-stone ; the steel of Nine Fires ; and the heart of the Miser."

The evidence from the place-names is scanty. Steel cross, Crowborough (a bloomery site), and Steel Bridge, Eridge, were from the personal name Styl or Still.

In the early days of the blast-furnace steel-making was attempted at certain forges. At Woodman's Steel Forge, Warbleton (circa 1553), we have only the place-name as evidence. Steel Forge, near Newbridge in Ashdown Forest, was called "a forge of steel" as early as 1523, and is referred to in an undated pleading of

Duchy of Lancaster Pleadings, V. 41, B. 29.

Elizabeth's reign as " one howse or forge for the making of Steele or Iron."

The Germans of Siegerland and Sauerland long had a practical monopoly of the best steel. As early as 1320 the magistrates of Soest, a Sauerland town belonging to the Hanseatic League, sued the Corporation of Southampton over the piratical capture of a vessel carrying 34 casks of Sauerland steel. William Harrison, in " A Description of England," printed in Holinshed's Chronicle, 1577, writes :—

" As for our steele, it is not so good for edge-tools as that of Cullen (i.e., Cologne) and yet the one is often sold for the other, and like tale is used in both, that is to saie, thirtie gads to the sheffe, and six sheffes to the burden."

Harleian MSS. 6850, f. 174.

This superiority continued, in spite of improvements in the English product, and it was urged as a reason against restricting the export of guns, that other countries might retaliate by placing an embargo on steel and brass.

There is no record of steel-making in the Weald later than that of 1609 at Robertsbridge, and even then the account does not allow us to say definitely that the establishment was still in operation.

Soon after this the cementation process of making steel was invented by Ellyott and Meysey and the earlier methods superseded.

CHAPTER TWENTY

TRANSPORT

In early times the position of the bloomeries was naturally chosen close to the ore and fuel supplies. The product was limited by the capabilities of the process, as we see by the Tudeley accounts in the 14th century. The output of this well-organised forge was only about 200 blooms per annum. That of the smaller affairs, which may have been worked by semi-nomadic craftsmen, in a similar fashion to the " forgæ errantes " of the Forest of Dean, for a short period only in the most favourable time of year, would have been much less. The transport of the resulting blooms, whether by animal or man power, over the many primitive trackways would present no difficulty.

Perambulation, Ed. I, 1282.

Coming to the time of the Romans, there were not only the major roads of Stone Street in the west, and Watling Street, with its branches to Richborough, Dover and Lympne (also called Stone Street) in the east, but also a well-aligned road along the Kent and Surrey boundary recently traced by Mr. Graham, and in the same alignment southward from Edenbridge across Ashdown Forest, by Mr. I. D. Margary. This latter passes in close proximity to several bloomery sites.

At Holtye, Butcher's Cross, and Camp Hill it is solidly paved with primitive cinder, and at many other points along its courses cinder is to be seen.

Beside these there were intermediate subsidiary roads, perhaps primitive tracks improved by the Romans,

running north and south, which have been traced at Selsfield Common, and through Staplehurst and Benenden to tidewater at Bodiam.

A side branch of the latter, running at a right angle to the main road from Hempsted towards Tenterden, is interesting as having much ancient bloomery cinder on its surface.

The iron-bearing localities were usually either within easy distance of navigable streams or tidal waters or connected with them by ridges of dry ground. It must always be borne in mind that up to mediæval times the southern coast of Sussex was deeply indented by tidal estuaries, and what are now Romney Marsh, Pevensey Level, and the lower portions of the valleys of the Ouse, Adur and Arun were under water.

In its pristine state Anderida contained large tracts of heath and grass land, especially on the higher ground of the Hastings Sands. It would have been good going along the ridges, as in the absence of enclosures a fresh track could have been taken as soon as any part became worn by animal traffic, while the bare or soft-shod feet of porters would not have broken the surface. The late Mr. H. E. Malden, in an interesting note in *Sussex Notes and Queries*, shows that in the 13th century horsemen could traverse the Weald quite quickly, even over the clay.

V. I, p. 7.

With the advent of the new process in Tudor times a very different state of affairs came into being. The furnaces and forges were of necessity erected on the streams in the valleys. The ore and fuel had to be carried a greater distance, and in large quantities. Although, where possible, the furnace and its attendant forge were placed on the same stream either close together or within a mile or two, in some cases the conditions of ownership made quite long hauls necessary.

A notable example of this is shown in the Pelham accounts (1625–1715). The fuel was cut and coled in woods scattered over a large extent of country, and carted to Waldron Furnace. The sows from there were sent to be forged at Bibleham and Brightling, and the resulting bars either to Pevensey or Maidstone.

At about the same time as the rapid increase in the traffic in guns and iron, there was also a considerable expansion in the transport of heavy timber to the naval dockyards at Deptford, Woolwich, and Chatham, and to the yards engaged in building merchant vessels.

The soil of the Weald is eminently favourable for the growth of the large oak timber required. There was a continuous advance in the tonnage of the vessels built and of the amount of timber consumed.

"SOUSEX DIRT AND MIRE"

The transport of the iron and timber, and the general increase of other traffic wrought havoc with the unmade highways, many of which became impassable save in the summer.

Defoe tells us:

"I have seen one Tree on a Carriage, which they call there a *Tug*, drawn by two and twenty Oxen; and even then 'tis carry'd so little a Way, and then thrown down, and left for other *Tugs* to take up and carry on, that sometimes 'tis Two or Three Years before it gets to *Chatham;* for if once the rains come in, it stirs no more that Year, and sometimes a whole Summer is not dry enough to make the roads passable. Here I had a Sight which indeed I never saw in any

Defoe, "Tour thro' the whole Island of Great Britain." Vol. I, Letter II, p. 196, 1724 Ed.

other part of *England:* Namely that going to Church at a Country Village not far from Lewis, I saw an antient Lady *and a Lady of very good Quality I assure you,* drawn to Church in her Coach with Six Oxen, nor was it done but out of mere Necessity, the Way being so stiff and deep, that no Horses could go in it."

It was not unusual for sums of money to be left by testators for repair of the roads. Richard Leeche, an ironmaster, who was high sheriff of Surrey and Sussex, left, in 1596, as recorded on his monument in Fletching Church, "threeskore ponndes to the amending of the wayes leading from Godstone to Lewes."

Stanford, "Civil War in Sussex," p. 210.

During the Commonwealth a tariff for coaches was published showing uniform rates "except in Sussex roads, which being worst and hardest for journeying, shall be travelled as far only as is reasonable, or shall be agreed or undertaken by the coachman upon hire."

S. A. C., LXVII, p. 44.

Fuller writes in July, 1743: "I have gotten 20 9-pounders of 9 feet to Lewes . . . these 20 have torn the roads so that nothing can follow them, and the Country curse us heartily."

Paterson's Road Book, 17th Edition. p. 18.

Even so late as 1786 Paterson says of the Roman Stane Street: "This is not a Road for Carriages beyond Stone Street, except in a dry Summer, hardly for Horses in wet weather."

In order to cope with this state of affairs, several Acts were passed dealing with roads in the Weald. The first two, 14th and 15th Henry VIII, c. 6 (1523), and 26th Henry VIII, c. 7 (1534), provided for the substitution of a new road for an old one, but 27 Elizabeth, c. 19 (1584), laid special burdens on the ironworks. It was enacted:—

"Forasmuch as the Highwayes in the said Counties of Sussex, Surrey and Kent are in many places greatly empared and spoyled, by meanes of carriages of coales mines and yron to and from the yron workes in the said Counties, to the great hinderance of the common passages of the Queene's Majesties Subjects travailing through the same," therefore, "the occupiers of all mannor of yron workes whatsoever as Awners or Farmours of the same, which shall at any time hereafter cariee, or caused to be caried, any coales mine or yron, to or for anie their yron workes betwene the twelft day of October and the first day of May yeerely, shall likewise yerely carie and lay, or cause to be caried or layed, for everie six loads of coalls or mine, as well as also for everie tunne of iron, which shalbe caried by anie mannor of wayne or cart betweene the said twelft day of October and the first day of May yeerely, by the space of one mile thoroue any High Wayes being *under any of the Hilles commonly called the North Downes of Surrye and Kent*, to or from any maner of yron worke, one usuale carte loade of sinder, gravell, stone, sande, or chalke, meate for the repairing and amendinge of the said Highways." S.A.C., XV, p. 141.

Again, by 39 Elizabeth, c. 19 (1597), the occupier of any ironwork in Sussex, Kent, or Surrey, carrying coal, mineral, or iron within the period of the year extending from October 12th to May 1st is ordered to pay to a justice of the peace a highway rate of 3*s*. for every three cartloads of coal or mineral, and for every ton of iron conveyed a distance of one mile along any roads within the said counties. No option is given the ironmaster of substituting the cartage and laying of materials for this money payment towards the maintenance of the roads during the winter months. A fresh liability is imposed upon him by section iii during the summer. For every thirty loads of coal or mineral and for every 10 tons of iron conveyed between May 1st and October 12th, he is to carry and lay, in the manner prescribed by the Act of 1584, one load of cinder, gravel, stone, or chalk, or pay in lieu of each such load a sum of 3*s*. For every load of materials he omits to carry, and for every rate he fails to pay, he becomes liable to a penalty of 10*s*., applicable to the repair of the roads.

At the Quarter Sessions at Lewes, January 15th, 1629,

several ironmasters were indicted for carrying between May 1st and October 12th in 1628, and not laying down cinders, as follows :—

Alexander Thomas.	200 loads coals	To Snape Furnace.
,, ,,	200 loads mine	,,
,, ,,	20 tons sows.	From Snape to Chingley Forge.
Richard Ballard and Thomas Sanders.	80 tons sows.	From Snape to Hoadley Forge.
Thomas Sanders and Thomas Butcher.	50 tons sows.	From Snape to Brooklands.
John Barham of Shoesmiths. .	30 tons sows .	From Snape to Verredge.
,, ,,	15 tons sows .	From Coushopley to Verredge.

Kindly communicated by R. Garraway Rice, F.S.A.

This record shows very clearly the frequent cross-transactions between furnace and forge in different ownerships.

This law was still in force in 1763 ; there is an entry in Robert Knight's carriers' accounts for April 22nd :—

" Cared 4 loade of synders from the furnis " (probably Warren Furnace) " to Mr. Staples Laine for Duty." It was only repealed in 1767. By that time many turnpike Acts had been passed, commencing in 1696, but mainly between 1750 and 1780, and the roads improved, but this came too late for the iron industry. There are entries in the Ashburnham accounts for tolls. Even then the cost of carriage in winter was about double the summer rate and an allowance was made for bad roads.

Photo : Miss Blackman.

Oxen at Excete.

OXEN

The greater part of the transport of cole and mine to the furnace, of the sows to the forge, and of the finished product to the water was in ox-wains. In the inventory of Sheffield Furnace, 1549, there were " 14 drawynge oxen for th'use of the iron mylles there and two wyenmen, hyred by the year for all careges, and their weges yerly, every of them xl^{s}, a ly'ury, mete and drinke." In the Fuller accounts the transport was apparently all done by the farmers' ox-teams at a price per load ; by exception, in the spring of 1728, 774 loads of mine were brought in on horses' backs.

Oxen have the special advantage in the deep and foundrous Sussex mire, as their hooves are so formed as to spread when entering the mud and to contract as they are withdrawn. They were used from the earliest times for agricultural purposes and all heavy traction, and were particularly suited for the hauling of heavy ordnance over rough country, as we found to our cost in the Boer War. By their use the Boers were enabled to mount their guns on heights thought to be inaccessible, according to our ideas of horse traction.

In 1793, when the ironworks had almost ceased, Arthur Young, Jnr., reported that oxen were used extensively in Sussex, although there were very few in Surrey. He states that on the clay north of the Downs the soil was so stiff as to require teams of ten and even fourteen oxen for ploughing. As evidence of the number then in work may be instanced a painting reproduced in Bennett and Elton's History of Corn Milling, depicting the removal on March 28th, 1797, of a windmill from Regency Square, Brighton, to Preston, a distance of two miles. This took eighty-six oxen, apparently in six rows of twelve or more abreast.

Forty years ago teams could still be seen at work in the valley of the Ouse, and the illustration is from a photograph taken by the writer near Hastings in April, 1886. The late Mr. Herbert Blackman wrote respecting this: "The photo quite brings back old times to me. The oxen were of Pepper-in-Eye Farm, near Battle, and the oxman's name was Edmund Dawes, who worked in the Press building at Battle Gunpowder Works previously."

To-day there is but one team remaining at work.

WATER CARRIAGE

Wherever possible, advantage was taken of the rivers for the transport of iron and guns. London was the chief

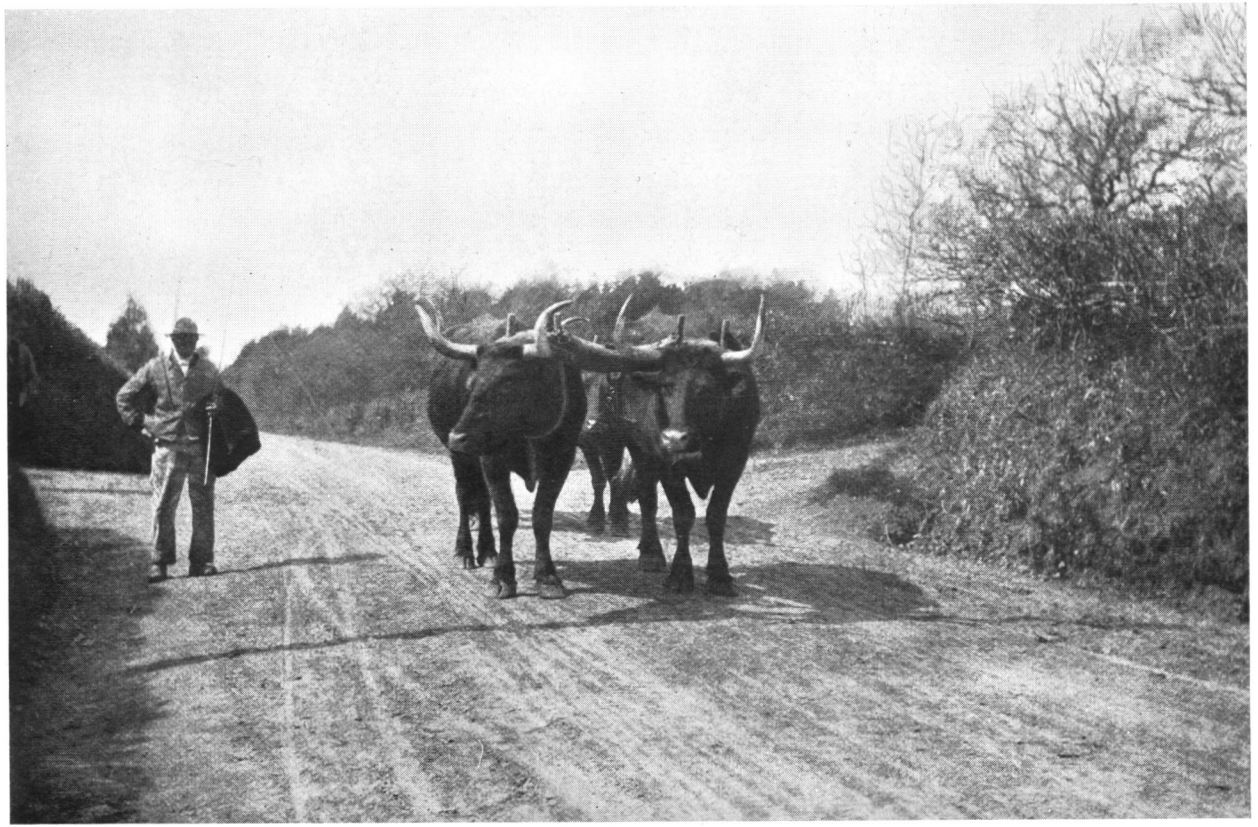


Photo : E. Straker.

A Team of Oxen near Battle, taken in 1887.

market, and for a long period in the 16th and 17th centuries the only port from which guns were licensed to be shipped abroad. The Medway had the bulk of this traffic, mainly from Maidstone. John Browne had a depôt at Milhall, near Aylesford, in Charles II's reign.

In September, 1665, a request was made by George Browne and Colonel Thomas Culpepper, the King's gunfounders, "that the undertakers, to whom by Act of Parliament the making of the River Medway is consigned, will take care that the branch from Broadford Bridge to Yalding may be done at once as very needful for the transport of the ordnance, which is to be ready by April 1st, the roads being almost impassable." State Papers Domestic, Chas. II.

In 1739 an Act was passed for canalising the Medway up to Tonbridge, and we find Fuller shipping guns of Brand Bridge (near Yalding) in 1744. The Rother was made navigable at a very early period by means of "shuts," probably a primitive form of lock, remains of which have been found at Appledore. The Robertsbridge works were able to ship iron from Bodiam Bridge in 1541, and from Udiam Bridge by smaller barges in 1553, transhipping to sea-going vessels at Rye. Holloway's "Rye," p. 52.

In 1635 the Mayor and Jurats of Rye, in a controversy on a proposed diversion of the Rother, stated that the iron from Robertsbridge, Echingham and Hawkhurst would cost £100 per annum more if sent by road, besides spoiling the highways. E.P.D., Charles I, Vol. 307.

The Brede at Brede Bridge served that furnace in similar fashion. At Udiam, Brede Bridge, and Winchelsea, there were "Iron Houses" for storage pending shipment.

At Hastings, as early as 1575, a due of 4*d.* per ton was authorised to be levied on iron shipped, and up to the late 18th century a good deal of the Ashburnham product was sent there, although the greater part went viâ Maidstone.

The liberty of this Cinque Port extended as far as Pevensey Sluice, and disputes as to the Hastings dues on the shipment of iron arose in 1607. The eastward drift of the shingle varied from time to time the outlet of the drainage from Pevensey Level; the haven at the town of Pevensey was at times open. The Pelham accounts mention both Pevensey and The Sluice, and in either case the iron was stored to await a vessel. The iron was brought down the marsh channels in the winter time; Lord Dacre of Hurstmonceux hired out his boats to convey it. A likely spot at which the barges may have been loaded is Chilthurst Bridge on the Nunningham Stream. Colonel D. MacLeod has found here brick abutments which possibly belonged to a hatch for raising the water-level, with remains of camp-shedding, and there is a raised causeway containing iron slag, which leads to Bodle Street Green.

As evidence of the great importance attached to water carriage, the deed by which Sir John Ashburnham repurchased Kitchenham Forge in 1667 may be cited. This deed, in very elaborate fashion, conveyed the right of carrying iron in boats, down what is now but little more than a ditch, from the forge to Boreham Bridge, through other owners' property, including the power to cleanse and scour and cast the slub, mud, etc., on the banks, also to set up bayes and pens to stay the water.

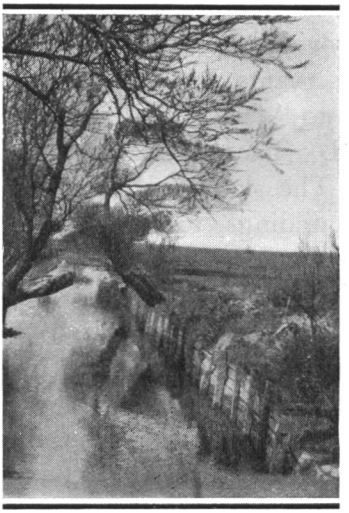
Close Roll, 4215.

The Ouse, both at Lewes and at Newhaven, formerly called Meeching, was only second to the Medway as an outlet for the ironworks. Owing to the risk of capture, the export of guns from here was often prohibited or discouraged, but much of the illicit trade went through these ports. In Commonwealth times, during the Dutch War, the Navy provided convoys for the vessels carrying iron to Hull for the northern counties.

There is a section of the Ouse above Lewes, near Isfield, called the Iron River; although the Ouse was not

canalised until 1790 it was doubtless navigable for a considerable distance.

The Wey was canalised as far as Godalming about 1760, and iron from the forge at Thursley was sent to London by water in 1768.



Pevensey Sluice.

CHAPTER TWENTY-ONE

FINANCE

THE furnace and forge, with their bays and ponds, were usually provided by the landowner, and sometimes worked by his servants, but the more usual practice was to let them out to "farmers," with or without the right to ore and wood. These leases were frequently for quite short terms. The landlord provided the furnaces, hammers and buildings, together with their equipment of tools, which the tenant was bound to keep in repair and to surrender in good condition on the termination of the lease. He was also required to keep the bays, water-courses and water-wheels in good order. The conception of the waste of capital by depreciation and obsolescence did not enter into the minds of our forefathers any more than it does to-day in Inland Revenue matters or in railway accounts. When a pond had so silted up as to be ineffective, or a bay had been destroyed by a flood, the cost of reinstatement was frequently so onerous as to cause the closing down of the works.

The leasehold system gave no inducement to progress, as any improvement inured to the landowner's benefit. The farmers were often men of small capital, which became exhausted in a period of bad trade. Bankruptcies were frequent.

A better state of affairs prevailed in the cases where the works were worked directly by the owners, such as Ashburnham, Waldron and Heathfield. It is noteworthy that the only records of "bridge houses" are at the two first-named. Owners of large estates were also able to construct supplementary feed ponds to provide a reserve supply of water for use in dry periods.

There are very few accounts available, and owing to the changing value of money, the absence or imperfection of stock valuations, and the mixture of extraneous matters, it is very difficult to extract any clear statement or to compare one with another.

The only set of the bloomery period are those of Tudeley Forge, deciphered by Mr. M. S. Guiseppi, F.S.A. The forge belonged to Elizabeth de Burgh, the Lady of Clare, to whom the accounts were rendered by her officers. They are for periods during which the forge was worked by the estate and not by lessees, are not consecutive, and need various adjustments for comparative purposes. The two periods are between 1330 and 1334 and from 1350 to 1354. Between these dates the first pestilence, the Black Death of 1349, occurred, and the figures show its effect in doubling costs and prices. The second pestilence of 1360–61 seems to have caused the permanent closing of the works. When let the rentals were one mark in 1334 and twenty marks in 1354, but the latter sum included rights to fuel and ore, so they are probably not comparable.

Archæologia, Vol. LXIV., p. 145.

In addition to an unstated number of woodcutters, colliers and carriers, the establishment consisted of four smiths, or "foreblowers," slightly graduated in rank and pay.

The building was of timber, wattle and daub.

The miners were paid according to the number of blooms produced, an ingenious method of keeping up the quality of the mine.

The colliers and coal carriers were paid by the decena—probably ten loads—in the first period, and by the duodena of fourteen loads in the second. The mine was burnt with "elyngwode" (from the Saxon œlan, "to burn"). The smiths were paid a price per bloom. In 1330 this was $5\frac{1}{2}d.$, in the other years of the first period $2\frac{1}{4}d.$, in addition to which they received each

seventh bloom. They also had a small fee called "gersuma," and beer money, which in the second period amounted to 1*d.* per week divided amongst four men.

The production seems to have been roughly one bloom per day. Unfortunately we have no clue to the weight of the bloom, but Thorold Rogers gives the general weight as 108 lbs., and the average price for eighty years up to 1349 as 4*s.* 1*d.*, in 1351–60 7*s.* 5¾*d.* This would seem to indicate that the Tudeley bloom weighed only about 50 lbs.

"History of Agriculture and Prices," Vol. I. p. 170.

The cost of superintendence was not charged in the first period, but a small sum for this and livery was included in the second. After adjustments for stock, blooms given as wages, and free wood from the estate, the figures are as follows :—

	1330–34.	% of Cost.	1350–54.	% of Cost.
	£ *s.* *d.*		£ *s.* *d.*	
Digging, burning and carrying mine	9 8 6¾	17	9 7 3¼	12½
Coaling and carriage of coals	26 1 3	49½	39 12 10½	50½
Smiths	17 10 9¾	33	21 14 3¾	27
Repairs and expenses	0 6 7	½	3 15 3¾	5
Salaries and liveries	—	—	3 15 0	5
TOTAL COSTS	53 7 2½		78 4 9¼	
PROFIT	16 13 5	31	18 15 9¾	23

Sales and value of blooms	£70 0*s.* 7½*d.*	£97 0*s.* 7*d.*
Days worked	Not stated.	608
Blooms made	761	572
Approximate cost per bloom.	1/4.33*d.*	2/9.66*d.*
Approximate sale price per bloom	1/10*d.*	3/4.5*d.*
Cost of mine per bloom	3.00*d.*	3.94*d.*
Cost of coal per bloom	8.24*d.*	16.63*d.*

Coming to the blast-furnace period, we have five almost contemporary sources about the close of the reign of Henry VIII.

(1) An estimate of the possible output and costs at Newbridge in Ashdown Forest, furnaces and forge, approximate date 1539. The figures are evidently "round," and unless the load was unusually small the consumption at the furnace was too heavy. They are per ton of bar iron produced, and seem to assume that 2 tons of sows were required to make 1 ton of bars. This agrees fairly well with later practice. A royalty was paid for the mine: if anything was charged for the wood it was included in the cost of the coals. Ministers' Accounts, Bundle 445, No. 7185.

Per ton of bar iron = 2 tons of sows.

	£	s.	d.
Licence: 14 loads at 1*d.*	0	1	2
Digging mine: 14 loads at 8*d.*	0	9	4
Carrying mine to furnace: 14 loads at 4*d.*	0	4	8
Coals, delivered at furnace: 11 loads at 3*s.*	1	13	0
Casting	0	3	4
Carrying sows to forge	0	0	10
Coals delivered at forge: 5 loads at 3*s.*	0	15	0
Forging	0	6	8
Fining	0	6	8
Repairs, £2 per annum	0	1	0
	£4	1	8

Sold for £5 or £6 at forge, profit "oone with another, at leeste" £1.

	s.	d.
Carriage to London	6	8

See p. 362.

(2) Harry Westall's Book of Panningridge.

This is a very clear and exact account of the costs of the furnace in the calendar year 1546. I am describing it fully in S.A.C., Vol. LXXII, but append here the summary of the expenditure. As the entire production was sent to the owner's (Sir Henry Sidney's) forge at Robertsbridge, there is no sales account, and the weight of the sows is not given, nor is there any account of the stock. This prevents any comparison with the others.

SUMMARY OF COSTS

Men Employed.	£ s. d.	£ s. d.	£ s. d.
53 Woodcutters. 3,343 cords at 3*d.* (26 at 4d.)		41 17 11	
2 Colliers. 1,317 loads at 1/10*d.*	120 14 6		
Less 3,342½ cords at 3*d.*	41 15 7½		
		78 18 10½	
2 Cole carriers. 1,351 loads at 4*d.* to 6*d.*		24 11 6½	
TOTAL FUEL			145 8 4
7 Miners. 1,562 loads at 7½*d.* (12 bushels by the load)		48 15 11½	
1 Mine carrier. 1,253 loads at 1¼*d.* to 1½*d.* (15 bushels by the load)		6 17 4½	
TOTAL ORE			55 13 3¾
2 Furnacemen. 52½ found-days at 14/–		36 9 2	
Furnace repair		1 9 4	
TOTAL AT FURNACE.			37 18 6

SUMMARY OF COSTS—*continued*

Men employed.			
			£ s. d.
7 Sow-carriers. 287 loads at 1/4*d.* = 574 sows.			19 2 8
Rent, tithe and way-leaves . . .			21 19 0
Spicer, for oak . .			4 13 4
Making colehouse .			9 8 5½
Repairs and sundries .			2 17 11
			£297 1 6½

The portion of the accounts shown in facsimile on the following page relates to a carpenter who built the new colehouse and in some way failed in his contract. Transliterated, it reads :—

p̄d to Martyn for his expenc in w^t his horse in goyng to 2 bayles w^t 2 warrants for [illegible] . . . . . 18*d.*

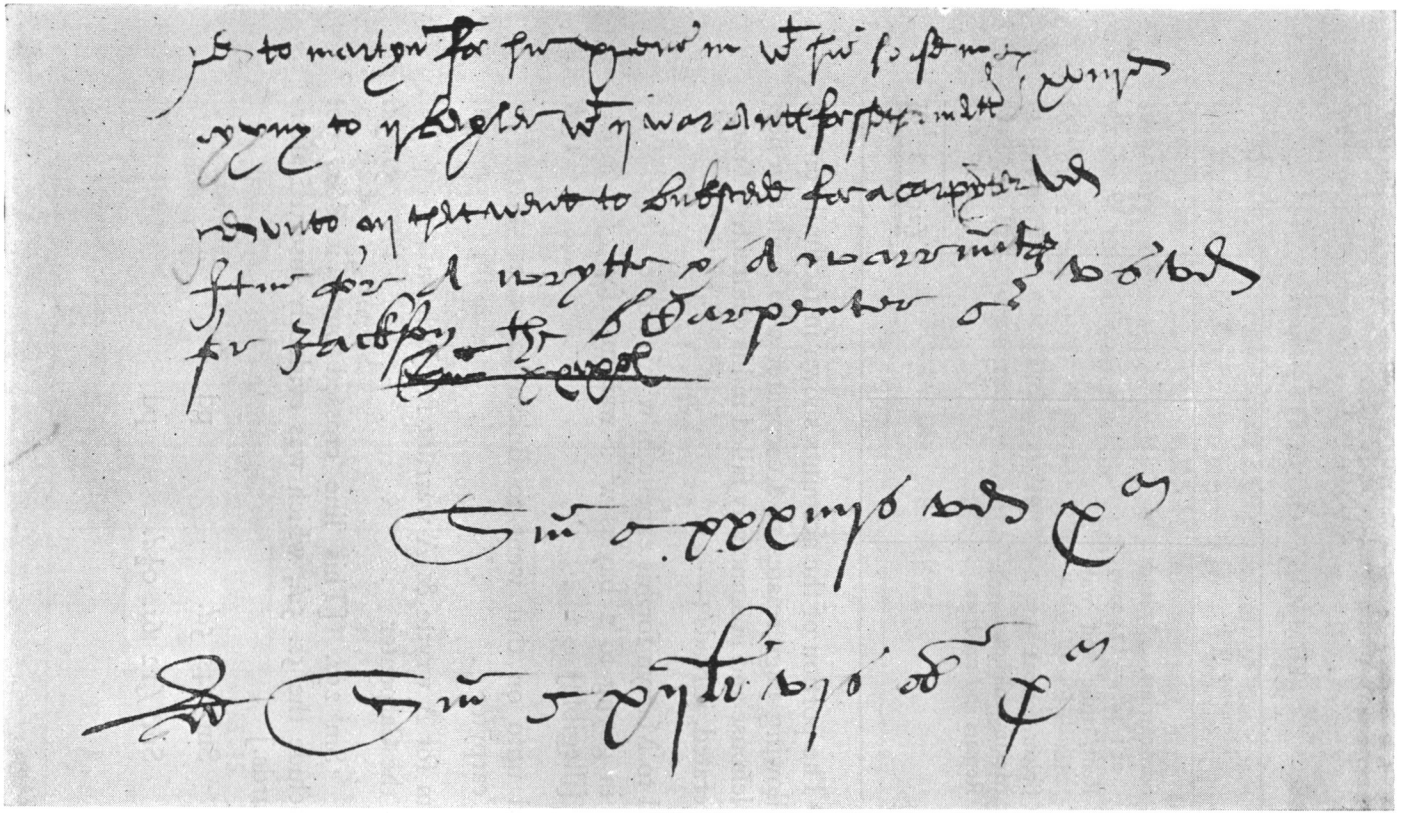
p̄d unto on that went to Bukstede for a carpȳter . . . . . 5*d.*

Itm for A wrytte & A warrūnt for Jackson the Carpenter . . . . . 5*s.* 5*d.*

Sm^a 29*s.* [This line crossed out; it does not include the 5*s.* 5*d.*, which was evidently inserted afterwards.]

Sm^a 34*s.* 5*d.* pd

Sm^a £12 6*s.* 0½*d.* pd



A Portion of Harry Westall's Book of Panningridge.
(Actual Size.)

(3) Prices at Robertsbridge Forge 1544–51. R.H.M.S. Reports, Lord de Lisle and Dudley, V. I.,

(4) Sheffield Furnace and Forge accounts, producing wrought iron, together with

(5) Worth Furnace accounts, producing sows and guns.

These latter are the accounts rendered by Sir John Shreve, priest, for rather more than two years, from October 31st, 1546, to January 17th, 1549; the three establishments are not clearly distinguishable, and no definite account can be made up from them, although several prices can be extracted. Arch. Journal, Vol. LXIX., p. 276.

Of later date we have, in addition to Ray's figures of production, three sources of information :—

(6) The Pelham Accounts of Waldron Furnace, Brightling and Bibleham Forges, ranging from 1639 to 1678, and 1692 to 1715. They are very voluminous, and contain a good deal of information, but no idea of profit or loss can be obtained from them, as the costs contain items that do not pertain to the ironworks, and the cash for the sales for the most part was apparently paid direct to the reigning Pelham. Add. MS., 33154–6.

(7) The Fuller accounts for Heathfield Furnace, which was almost entirely devoted to gun-founding (in the possession of Mr. W. A. Raper of Battle). Many extracts from these were published by the late Herbert Blackman, giving much useful information. A summary for the year 1746 is given below, and although many of the items are evidently estimated round figures, the profit shown is considerable. S. A. C., LXVII., pp. 25–54.

Heathfield Summary, 1746.

	£	s.	d.
Mine	385	9	0
Fuel	1,625	17	6
Founders and casting	132	9	4
Gun moulding: labour and materials	338	12	2
Carriage to Woolwich	348	6	0
Furnace wear and tear	50	0	0
Incidentals	50	0	0
Interest on £2,500 at 4 per cent.	100	0	0
Agency on £5,111	255	10	0
Total Costs	£3,286	4	0
Profit	2,179	16	0
	£5,466	0	0

Sales.

	£	s.	d.
265 tons received at Woolwich at £19 per ton	5,111	0	0
20 tons refused at £10 per ton	200	0	0
25 tons of gunheads at £5 per ton	125	0	0
Hammers, anvils, etc., myself and others.	20	0	0
Plates and andirons at my house	10	0	0
Total Sales	£5,466	0	0

(8) Ashburnham accounts.

These consist of two rough day books relating to the furnace, ranging from 1757 to 1792, and a ledger without details from 1798 to 1812, apparently for the whole establishment of furnace and forge. The entries in the day books are not in such a form as to enable any account to be made out, but yield the cost of certain items. The most interesting record is that of the blowings, for periods ending at irregular dates, which show the number of weeks the furnace was in operation, and during which the head founder was paid full wages (£2 3*s.* 9*d.* per week). During the time, when the furnace was out of blast, which towards the end was from one to three years at a time, he was only paid a small retaining wage.

The ledger shows very clearly the collapse of the industry. During the ten years 1798 to 1807, the turnover averaged £1,990 per annum, with a profit in every year except 1802, when some extraordinary expense occurred. The average profit for the ten years was £280 per annum. In the last five years, 1808 to 1812, the average turnover had dropped to less than £1,500, with an average loss of £307. Although the stock figures are very incomplete and erratic, they probably average out fairly over these periods.

The costs and prices as shown in the above accounts, so far as they can be extracted, are as follows, although it is by no means certain that the units of measurement were uniform at the different dates; the change in the value of money is also an uncertain factor.

	Wood Bought Standing per Cord.	Wood Cutting per Cord.	Coaling per Load.	Own Mine per Load Delivered at Furnace.	Mine Bought.
Panningridge, 1546 .	—	3*d.*	1/2½	9*d.*	—
Sheffield, 1547 and 8 .	—	3*d.*	1/–	1/4½	—
Worth, 1547 and 8 .	—	3*d.*	—	1/2 to 2/2	—
Waldron, etc., 1639–1715 . . .	—	1/1	2/6	—	5/8½
Heathfield, 1703–1755 . . .	6/–	1/6	2/6 to 2/8¾	—	6/6
Ashburnham, 1757–1792 . . .	10/6 to 13/8	1/3 to 2/1	2/6 to 2/8	—	6/– and 7/–

The wages paid at the furnace and hammer do not appear to have advanced in proportion to money values. I can only trace the undermentioned :—

FURNACE WAGES PER FOUNDAY OF 6 DAYS.

	Founder.	Filler.	Total.	Per Ton of Sows.
Newbridge, 1539 . .	—	—	say 10/– to 13/4 (2 men).	1/8*d.*
Panningridge, 1546 .	8/–	6/–	14/– (2 men).	
Robertsbridge, 1546 .	8/–	4/– and 2/6	14/6 (3 men).	
Sheffield, 1747–8 . .	8/–	6/–	14/– (2 men).	
Glamorgan, 1564–6–8 .	1 at 9/6 2 at 8/–	6/–	? number working.	
Waldron, 1639–1715 .	—	—	27/– to 28/11 (3 men).	say 4/7
Fuller, 1746 . . .	10/–	8/– and 7/–	25/– (3 men).	

FORGE WAGES PER TON OF BARS—PIECEWORK.

	Hammerman.		Finer.		Total.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
Newbridge, 1539 . .	6	8	6	8	13	4
Robertsbridge, 1546 .	6	8	6	8	13	4
Sheffield, 1547 and 8 .	—		—		13	4
Bibleham, 1639 . .	7	0	8	6	15	6
Brightling, 1639 . .	7	6	9	0	16	6

The costs, stock value, or sale price of cast iron in sows extracted from these accounts is as follows :—

		Per Ton.					
		£	*s.*	*d.*	£	*s.*	*d.*
Newbridge, 1539 .	Cost of production .	1	6	2			
Robertsbridge, 1541.	Bought for . .	1	8	7			
Sheffield, 1547 .	Stock valued at . .	1	10	0	and 2	0	0
Sheffield, 1547 .	Bought for . .	1	13	4	to 2	2	2
Worth, 1547 . .	Stock valued at . .	2	0	0			
Waldron, 1634 .	Sold at . . .	5	0	0	to 5	5	0
Waldron, 1656–59 .	Sold at . . .	5	15	0	to 6	0	0
Waldron, 1700 .	Cost of production .	4	7	11			
Heathfield, 1725 .	Sold for . . .	7	0	0			

For wrought iron in bars, as being an important article of commerce, we have, beside the prices contained in these accounts, a valuable series of quotations given in Professor Thorold Rogers' "History of Agriculture and Prices." The Spanish and Swedish iron, being of better quality than the English, usually commanded a higher price :

WROUGHT PER TON OF BARS

		English.				Foreign.			
		£	s.	d.		£	s.	d.	
Pieter Roberd, Hartfield	1493	3	0	0					
In Henry VII's reign	1495					3	14	10	&
						4	0	0	
In Henry VIII's reign	1519					4	0	0	
Newbridge, at forge	1539	5	0	0	to				
		6	0	0					
Robertsbridge, sale price	1542	5	15	0	&				
		6	0	0					
Robertsbridge, stock value	1546	4	18	0					
Sheffield and Worth, at forge	1547	5	16	0	to				
		8	1	0					
Sheffield and Worth, at Southwark	1547	9	0	0	to				
		9	6	8					
"Forest," *i.e.*, Wealden (Rogers)	1569	10	0	0					
Forest and Spanish (Rogers)	1554 to 1571	10	0	0		11	10	0	to
						14	0	0	
Swedish (Rogers)	1554 to 1571					14	0	0	
Spanish (Rogers)	1600					12	0	0	
English and Swedish (Rogers)	1620–23	13	10	0	to	14	10	0	to
		15	5	0		15	10	0	
English (Rogers)	1630	17	18	0					
Bibleham output fetched in (Perhaps including special forgings.)	1655	18	2	9					
Brightling output fetched in	1655	16	10	0					
About this time foreign iron fetched						16	10	0	to
						17	0	0	
Spanish (Rogers)	1709					12	10	0	to
						14	0	0	
Swedish (Rogers)	1709					14	10	0	to
						16	0	0	
Brightling sold to country smiths	1710	16	0	0					

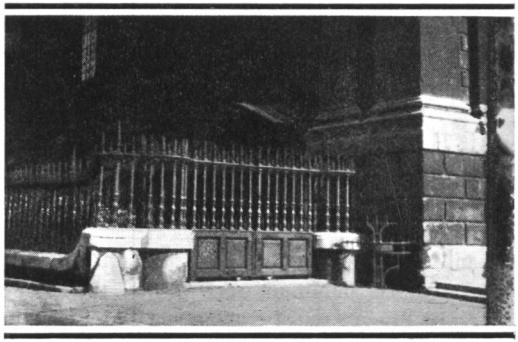
WROUGHT PER TON OF BARS—*continued.*

		English.	Foreign.
			£ s. d.
Foreign	1718		15 10 0 to 16 10 0
Spanish	1731		14 10 0 to 16 10 0
Spanish	1762		17 0 0
Swedish	1762		17 0 0 to 22 0 0

We have but scanty information as to the prices obtained for guns and shot, but can glean the following :—

GUNS.		Per Ton.
		£ s. d.
Hogge's price about	1546	10 0 0
Worth	1547	10 0 0
Rogers	1570	10 0 0
Rogers	1572	12 0 0
Spanish agents in Holland, in preparation for the Armada, offered : for large guns	1588	22 0 0
For small guns	1588	19 0 0
John Browne contracted to supply merchants at not more than	1620	13 0 0
It was proposed to fix the minimum price at	1621	13 0 0
A complaint against Browne stated that he sold to merchants at	1630	11 0 0
while his price to the King was		13 0 0
Prices realised at Heathfield :		
Navy guns	1727	16 0 0
Navy guns	1746	19 0 0
For the Irish Government	1746	20 0 0
For Sardinia	1752	16 0 0
For Naples and Sicily	1754	16 0 0 & 16 12 0
Navy	1757	18 0 0 to 20 0 0

SHOT.		Per Ton.
		£ s. d.
Worth	1547	4 0 0 to
		5 0 0
Hogge's price about	1574	8 0 0
but he stated others sold for . . .		12 0 0 to
		13 0 0
Rogers	1627	15 0 0
Various Sussex founders for the war with the Dutch	1652	13 0 0 to
		14 0 0
Rogers	1654	11 0 0 to
		12 0 0



St. Paul's Railings.

ST. PAUL'S RAILINGS

Sir Christopher Wren's accounts, preserved at St. Paul's, give the following details and prices:—

From 29 June, 1714, to 31 December—

To Richard Jones, smith, for the large iron ffence round the church, viz:

For gates	12
Large balasters	149
Small ditto	2,516
Scrowles	157
Rails	314
Spikes	5,051
Baces for ditto	2,422
Stubs and braces	8
Plates for scrowles	146
Slabs and steps for the gates to hang on and shutt against	31
Bolts for the breaks and piers	194
Steeled punches	6

Small plates, pins, and wedges.

	Tons.	Cwts.	Qrs.	Lbs.	At 6*d.* Per Lb.
Total weight	207	5	3	09	£11,608 06 06
Deducted for several parcels returned	7	5	0	12	£406 06 00
Rem. forward	200	0	2	25	£11,202 00 06

At *6d.* Per Lb.

Patterns for the rail	£50 0 0
Putting up the gates	£50 0 0

To Richard Jones—

For 50 cast iron banisters, being part of those that remained to him after his finishing the outward iron fence. Weight . 38 cwt. 0 09 at 3½*d.* per lb. £62 3 11½

By order of the Commissioners.

For carriage of the iron from waterside to church John Slyford

For cranage, wharfage and carriage of 207¼ tons of iron to St. Pauls from 13 Sep. 1710 to 10 June 1714 inclusive at 2/6 per ton £25 18 0.

OUTPUT

THE output of the works was very variable, being dependent on the water available and the supply of mine and coals. The figures to be gleaned from the accounts are unreliable owing to the variation of stocks. Although Ray states that each ton of sows produced a ton of bars, this is obviously wrong. The Newbridge estimate is 10 cwt. from each ton of sows, and the Bibleham and Brightling figures do not seem to indicate much more than 11 cwt.

At Robertsbridge Forge from 1541 to 1573 the average weight of bars produced (from two furnaces) was 113 tons.

The Fuller accounts show an average production over six years of about 290 tons, mostly guns.

During the first half of the 18th century there were several lists printed showing the outputs of furnaces and forges for the whole kingdom, which have been ably tabulated by Mr. E. W. Hulme. The figures relating to the Wealden works are given under their description in the topographical section.

PART II. SURVEY

PART II. SURVEY

TOPOGRAPHICAL AND DESCRIPTIVE

In the arrangement of this part of the volume, in order to obtain convenient sections, I have taken the river basins as the main divisions, subdividing them where necessary according to their tributaries. The county and parochial boundaries have no real relation to the siting of the water-power ironworks. The bloomeries are placed near the later works, of which no doubt in many cases they were the precursors. The parochial index on p. 469 will enable the reader to turn to the sites in any particular parish. The parishes are the old civil parishes, modern ecclesiastical divisions have been ignored. Where the county is not specified the sites are in Sussex, and similarly, to avoid repetition, are on the Hastings beds unless marked otherwise.

The dominant feature in the topography of the Hastings beds, on which the major portion of the sites is situated, is the Forest Ridge running from Horsham eastwards through St. Leonards, Tilgate, Worth and Ashdown Forests into Kent.

To the east of East Grinstead this divides into several subsidiary ridges; still keeping the east and west direction.

Near Rotherfield is a parting between the basins of the Ouse and the Rother, which connects at Cross-in-Hand

with the high Brightling, Mountfield and Beckley ridges, that separate the Rother basin from the small rivers running southwards into the Channel.

We have thus to the north the basins of the Wey and the Mole, flowing into the Thames, between them the North River, an affluent of the Arun, and then the Medway, comprising its upper waters, the northern and eastern slopes of Ashdown Forest, the Kent Water, the Eden and lower Medway, and the Teise. In the south-west the Arun drains the clay country, then come the Adur and the Ouse, divided into Western Ouse, Maresfield and Uckfield streams. The Rother basin is so large that I have divided it arbitrarily at Witherenden and Robertsbridge. The southern streams are the Cuckmere, the Ashburn, the Asten, the Brede, and Tillingham.

The descriptions of the water-power sites are from personal inspection; for those of some of the bloomeries I am indebted to Colonel D. MacLeod. The late Mr. Herbert Blackman, whose collection of slags is now at the Barbican House Museum, Lewes, furnished me with several notes on sites.

There are many other suspected bloomery sites, in which, owing to the land being under pasture or built over, no positive evidence is to be obtained; these are only inserted exceptionally.

Beside the place-names mentioned there are very many denoting the minepits, such as Minepit Wood, Minepit Field, Minedraws, etc. Unless obviously attached to a particular site these have not been inserted, as the furnaces in some cases drew their supplies from places away from their immediate vicinity.

In the majority of cases the ponds are drained; those still containing water are so described.

The position of the sites is given in reference to fixed points, such as parish church or railway station, with the approximate distance and direction, and also by the

latitude and longitude, which can be checked on any good map.

The type of cinder collected at each site is indicated by a reference letter corresponding to the classification in the chapter on Cinders and Slags, with the specific gravity, where tested. See p. 89.

The lines on the maps showing the average rainfall for the thirty-five years 1868 to 1902 were very kindly copied by Mr. I. D. Margary by permission of the Meteorological Office, Air Ministry, from the original map prepared by the British Rainfall Organisation in 1910.

I. EDEN

This large tributary of the Medway drains the Weald Clay belt from about Godstone and Horne to the eastward, and gets a certain amount of water from the northern slopes of the forests in Worth parish, joining the Medway at Penshurst. Various streams from the high ground round Tunbridge Wells, running into the combined river in the vicinity of Tonbridge, are for convenience included in this section.

Map. p. 224.

Warren Furnace

Furnace

Par. Worth. 51° 8′ 10″ N. 0° 4′ 20″ W.

1 m. N. of Grange Road Station. K

P.N. Furnace Wood, Furnace Fields.

In 1574 John Thorpe of Hedgecourt worked for John Gage a hammer and a furnace variously described in the lists as "about Copthorne and Lingfield" and "Hedgecourt." (Losely, "Heldcourt.") Thorpe himself was summoned at Hedgecourt, but signed the bond as of East Grinstead. He lived at Gibshaven, near Warren Furnace. The probable explanation is, that of the three great ponds in this chain, the upper served Warren Furnace, the lower Woodcock Hammer (q.v.), for which the middle, and largest, Hedgecourt, served as a pen-pond, as it did within my own memory in the early eighties of last century, when the corn-mills were still working.

In Robert Knight's Carrier's Accounts from 1761 to 1769 there are many entries of guns and shot carried to London for the owners, Messrs. Masters and Raby,

S. A. C., XLVI., p. 63.

Photo : E. Straker.

Warren Furnace, 1887.

latterly Raby and Rogers, coupled with small quantities of coal brought back. This was probably used for drying the moulds, not as stated in V. C. H. Surrey, Vol. II., for smelting. Traces of this coal are still to be found.

Weale MSS. In 1787 it was entirely down.

Copthorne, although now confined to the adjoining parish in Surrey, was the name of the district, and also of the house now called Little Frenches in Worth parish, Sussex, where a large mass of slag is preserved. Frenches may perhaps take its name from John French of Chiddingly, who was a partner of Thorpe.

The bay, originally clay, was heightened at different periods, and then faced with masonry. In Colonel Mudge's map of 1807, and in the Worth tithe map 1839–40, the pond is shown with water in it, and with buildings below the bay, of which a few stones remain. About 1865 the sluice burst and the pond became a swamp thickly covered with brushwood. The shattered brickwork is shown in the photographs taken by me in April, 1887. An attempt to mend the breach was made before the war, which failed. The present owner, Mr. Lionel Robinson, however, succeeded about 1919, and the pond is now restored. A massive oak sluice 30 feet long was found below the water-level opposite the remains of the buildings, and also portions of an earlier one at a lower level. There are minepits in the wood below.

S. N. and Q., V. I., p. 262. Hedgecourt mill is spoken of as a corn-mill as far back as the early days of Queen Elizabeth, and is so marked in Stent's map of 1680. When the demesne lands of the manor were let in 1656, the tenant undertook to carry down to Hedgecourt Mill pond yearly six loads of clay or "sinder" "to be spent about the reparations of the bay." A little of this slag is still to be seen.

Woodcock Hammer or Wire Mill — Forge

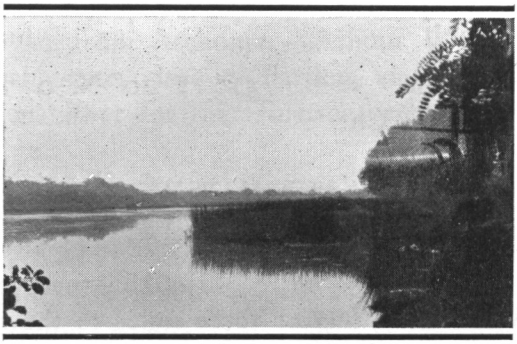
Par. Godstone (detached), Surrey.
51° 9′ 30″ N. 0° 2′ 30″ W

1¾m. S.W. of Lingfield Ch. I
P.N. None.
Weald Clay.

Worked by John Thorpe in 1574, in conjunction with Warren Furnace, (q.v).

There is a mention of "Godstone" in an undated Losely MSS. By tradition, nails for St. Paul's Cathedral were made here. "Old English Mills and Inns."

It was noted as working in 1663; it made 40 tons in 1718 and 1736. In the East Grinstead Carriers' Accounts there are several items in April and May, 1769, for bringing coals from the Brail, Lewes, to Woodcock Forge, but by 1788 it is mentioned by Weale as being now a Wire Mill. Weale MSS.



Wire Mill Pond.

The big pond is still in water, though fast silting up, and with the extensive beds of the great Club-rush, *Scirpus lacustris*, has a Fenland look quite unlike a Sussex hammer pond. There are large quantities of forge cinder in and about the bay.

Cinderhill, Blindley Heath — Bloomery

Par. Godstone, Surrey. 51° 11′ 45″ N. 0° 4′ 25″ W.
1¼m. S.W. by W. of Blindley Heath Ch. F—s. g. 2.78
P.N. Cinderhill, Little Cinderhill.

A very little cinder of ancient type, similar to that of Cinderhill, Blechingley, is to be found in the northern hedge of these fields, and there is a large pit near, which may have been the source of the ore.

Smith Hook — Bloomery

Par. Hever, Kent. 51° 10′ 20″ N. 0° 5′ 40″ E.
½m. S. of Hever Station. G
P.N. Smith Hook.

There is a very little cinder to be found in the ploughed field; it can only have been a very small bloomery.

Bough Beech — Furnace

Par. Hever, Kent. 51° 12′ 20″ N. 0° 7′ 10″ E.
1¾m. N. of Hever Ch. K
Weald Clay.
P.N. Furnace House—Furnace field—Furnace bank. Pond Mead.

There appears to be no record of this furnace. It is on the Weald Clay, two or three miles to the north of the nearest source of ore on the Hastings sands, but there are several large marlpits near it, which may have contained pockets of ferruginous stone. It is shown on Andrews' map, 1769, in a wrong position.

This is the most northerly of the Wealden furnaces; Ewood, the only other on the northern Weald Clay belt, being slightly more to the south.

Cinderhill, Penshurst — Bloomery

Par. Leigh, Kent. 51° 11′ 30″ N. 0° 11′ 35″ E.
1m. E by S. of Penshurst Station. F
P.N. Cinderhill, Cinderhill field.

In Penshurst Park, to the east of the road, is a very large pit, and several small ones in the fields west of the road. Round one of these latter a certain amount of bloomery cinder is to be found; probably this was the working place.

Barden — Furnace

Par. Tonbridge, Kent. 51° 9′ 35″ N. 0° 15′ 0″ E.
¾m. N.W. by N. of Speldhurst Ch. K—s.g. 2·77
P.N. Barden Furnace Farm, Old Furnace Lane, Gunfield.

At Michaelmas, 1577, David Willard bought 771 loads and 6 bushels of iron myne at 3*d.* the load, making £9 12*s.* 6*d.*, from Asshoure. Ashour Wood is on the Penshurst estate, close to Barden, and this myne may have been either for this furnace or the others nearer Tonbridge. H.M.S. Comm. Lord de Lisle and Dudley, V. 1, p. 249.

Otherwise the first mention is in 1653, when it was blowing. In 1717 the output was 100 tons per annum. In Weale's MSS. there is an entry which may be this: "Burnham, Mr. Butler's, entirely down (1787)." It is marked on Sellar's map, 1710. The pond was in water in 1841. Science Museum Library.

This was a good-sized and probably rather late furnace. The bay has formed the basis of the modern road, and has a well-made sluice-gate, which may be of later date. There is abundance of slag and many pieces of ancient stone. The flour mill that succeeded it is no longer working.

Tudeley — Bloomery

Par. Tonbridge, Kent. 51° 10′ 45″ N. 0° 19′ 16″ E.
⅜m. S. of Tudeley Ch. E—s.g. 2.43
P.N. Smithy Wood, Blacksmiths' Fields, Upper and Lower Ashpit fields, Ashpond field.

After several years' search I found this site in Devil's Gill on the Somerhill estate. It can only be visited by special permission, as it is in a game preserve. It is of exceeding interest, as it is the only bloomery in the Weald of which we have the accounts. They range from 1329 to 1361, and have been deciphered and printed by Mr. M. S. Giuseppi, F.S.A., in Archæologia, giving us a great deal of information as to ironworking in mediæval times. They are dealt with in a previous chapter.

Archæologia, LXIV., p. 145.

See p. 34.

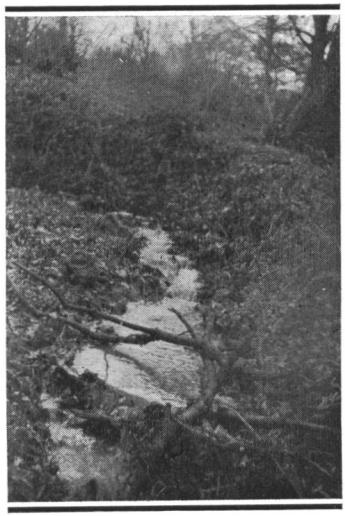
There is a good deal of unusually large cinder in the bed of a small tributary rill. A small rectangular depression near by may have had some connection with the forge. It is greatly to be hoped that this may be tested by excavation in the near future.

Newefrith — Bloomery

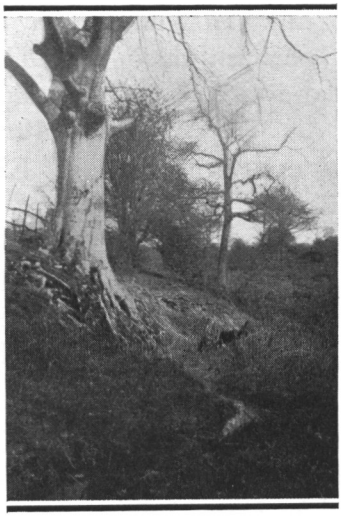
Par. Tonbridge, Kent. 52° 10′ 25″ N. 0° 17′ 30″ E.
1½m. S.E. of Station. F
P.N. None.

This small bloomery, close to Bournmill Farm, may conjecturally be identified with "Newefrith juxta Bournemelne" which is mentioned in the accounts of Southfrith chace of 1340 as being leased for a year at five marks (£3 6*s.* 8*d.*). The lessee was Robert Springet, presumably a brother or kinsman of the Tudeley lessee, Thomas Springet. Although little cinder remains, the site shows considerable signs of occupation, and there are several minepits near by.

M. S. Giuseppi, F.S.A., in Archæologia, LXIV., p. 148.



Site of Tudeley Forge.



Newefrith.

Vauxhall Furnace

Par. Tonbridge, Kent. 51° 10′ 20″ N. 0° 16′ 45″ E.
1¾m. S. of Ch., W. of Hastings line. K
P.N. Furnace field—Furnace shaw.

Old Forge, Southboro' Forge

Par. Tonbridge, Kent. 51° 10′ 20″ N. 0° 16′ 45″ E.
¾m. S. of Furnace, on same stream. I
P.N. Cinderfield, Forge Wood, Minepit field.

This pair of sites probably were recorded in 1574 as belonging to Sir Thomas Fane and worked by Davy Willard; although the number of furnaces is in some lists entered as one, in others as two, they all agree as to two forges, the second being probably that at Rats Castle, q.v. Possibly the other furnace was Barden.

The forge pond was later used for a powder mill, and then a corn mill. There is abundance of slag at the furnace.

Rats Castle Forge

Par. Tonbridge, Kent. 51° 11′ 45″ N. 0° 7′ 10″ E.
1½m. E. of Ch. I
P.N. Pond Mead, Hammer Stream.

See Vauxhall and Old Forge. There is no bay left, but the Pond Mead is swampy. The Hammer Stream is marked on the map much lower down the river, but can be said to flow from this site. All that remains is masses of forge cinder under the turf, which showed in a dry season by the grass perishing. This led to the cinder being uncovered.

II. KENT WATER AND CANSIRON STREAM

From the high ground at East Grinstead two streams run east to join the Medway, separated by a ridge. The more northern forms the boundary between Surrey and Kent, and Sussex. This section has not only three existing ponds, but also many evidences of ancient workings; especially in the neighbourhood of Cowden. Map, p. 224.

Cinder Mead, Basing Farm — Bloomery

Par. East Grinstead. 51° 8′ 10″ N. 0° 3′ 0″ E.
⅜m. W. of Hammerwood Ch. A.F.
P.N. Cinder Mead, Cinder Wood.

A small bloomery with scanty, but characteristic, cinder. There is much blackened earth in the wood, with burnt mine, which may have been in connection with Scarlets furnace.

Beeches Farm — Bloomery

Par. Lingfield, Surrey. 51° 9′ 10″ N. 0° 35′ 5″ E.
2¼m. E. of Dormans Station. F
P.N. None.

This site is just to the south of Dry Hill Camp (q.v.). There is a considerable quantity of cinder just under the surface adjoining a marlpit, one of several near the camp. There is also a bed of limestone. This cinder differs from that found in the camp itself, but that may have been selected from it.

Dry Hill Camp

Par. Lingfield, Surrey. 51° 9′ 20″ N. 0° 3′ 5″ E.
2½m. E. of Dormans Station. A.F.
P.N. Black Beech.

In that great corner bastion of Surrey, Dry Hill, or Lingfield Mark, Camp, a British fort, conjectured to have been later occupied by the Romans, I have found a little characteristic ancient cinder, accompanied by the usual Cyrenæ limestone and an unusually light-coloured slag; which may be blast furnace slag from Scarlets in the valley below.

One specimen of the cinder is much like that of Saxonbury Camp, another of the more usual form A.

It is a curious fact, not yet fully accounted for, that a small amount of cinder occurs in the Wealden camps of Dry Hill, Saxonbury, Castle Hill (Tonbridge) and Camp Hill, Ashdown Forest, also in Wolstonbury and other camps on the South Downs which overlook the Weald.

At Saxonbury it has been used in pottery.

Scarlets (formerly Scalehurst) Furnace and forge

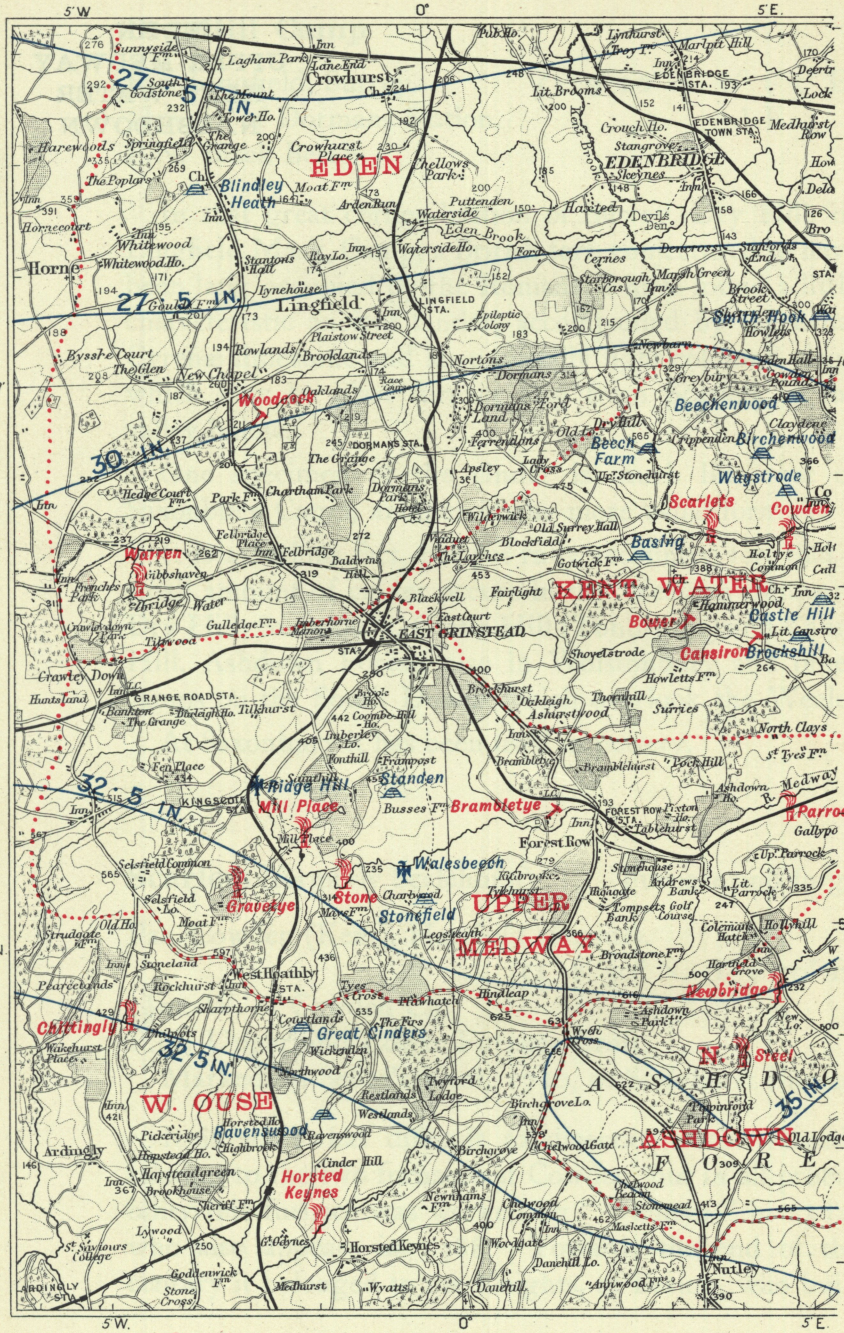
Par. Cowden (Kent), Hartfield (Sussex).
51° 8′ 30″ N. 0° 3′ 50″ E.
1½m. W. of Cowden Ch. K
P.N. Upper and Lower Furnace Croft.
Marked on Seller's Kent, 1710, as Scalehurst Furnis.

It is somewhat difficult to disentangle the records relating to the two furnaces at Cowden, but in all probability this furnace was worked by "Quintyn" in 1574, who also appears in 1588. Towards the end of the century it belonged to the Knights, of Basing, who built

EDEN
UPPER MEDWAY
KENT WATER
N. ASHDOWN

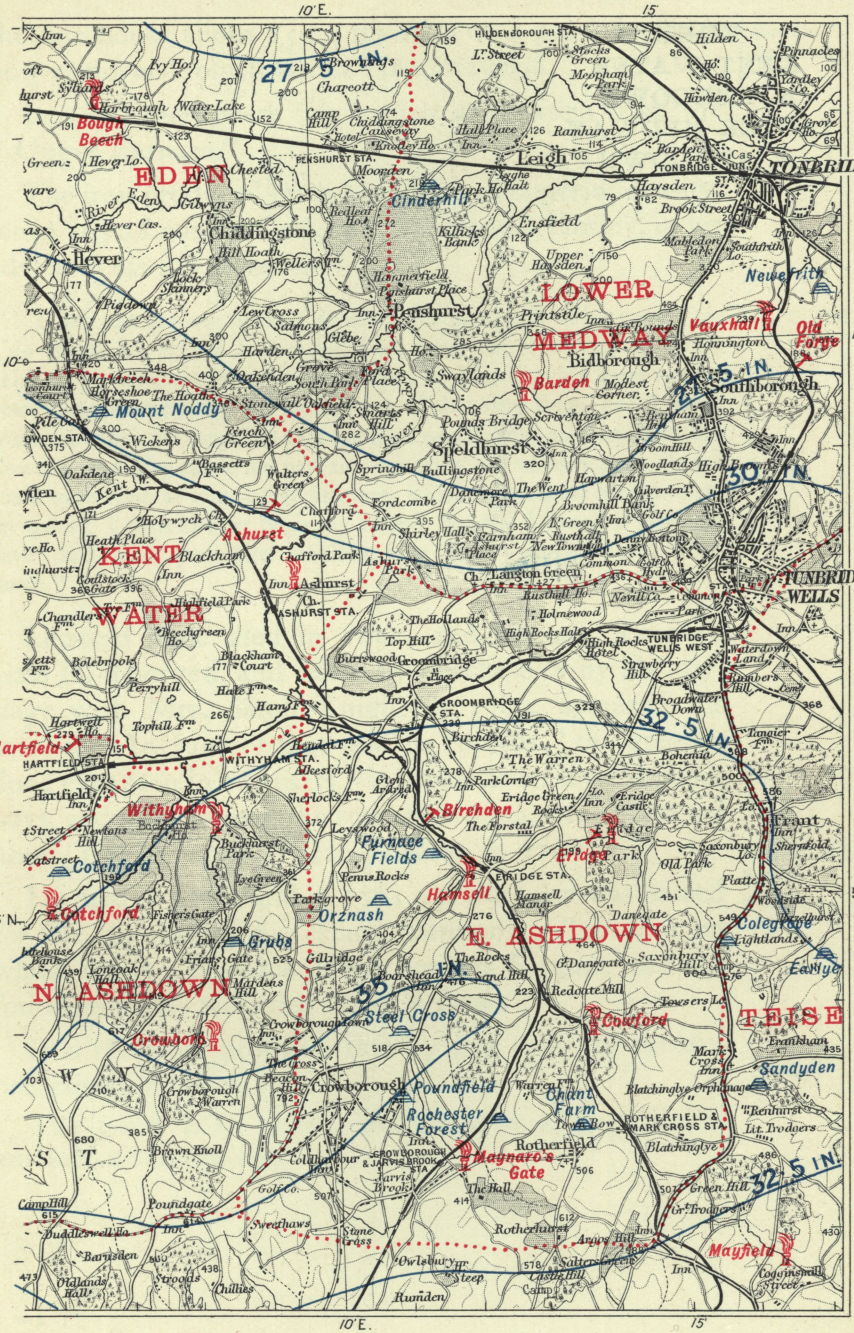
EDEN
UPPER MEDWAY

KENT WATER
N. ASHDOWN



"WEALDEN IRON"

EDEN
KENT WATER
N. ASHDOWN
LOWER MEDWAY
E. ASHDOWN



FURNACE FORGE BLOOMERY ROMAN BLOOMERY

EDEN
KENT WATER
N. ASHDOWN
LOWER MEDWAY
E. ASHDOWN

the fine house about 1597, the date on a good fire-back now removed from there to Hammerwood. "Cowden." Guy Ewing, p. 98.

In 1643 there were two burials at Cowden from the "Upper Furnace."

The iron produced must have been of superior quality, for in 1670 Leonard Gale, of Crabbett and Tinsley, in his advice to his son, says :—

"If you can get one of the Cowden furnaces, it will be very well, for I do assure you that if I were but forty years old, I would, by God's help, get a good estate by this employment, for I have within these twenty years cleared near £300 per annum out of that very forge, and I never would have left my forge but that my men would work no other sows but Cowden, and they made me pay 20s. for every ton of sows more than I could have them at some other furnaces, which was a great hindrance to my gains; I therefore let them my forge: besides, I feared if I should have died, and you but children, the forge would have fallen down." S. A. C., XII., p. 51.

Leonard Gale died in 1690, and his son, Leonard Gale II, inherited, and either by purchase or by his marriage with Mrs. Sarah Knight in 1703, acquired the furnace. In June of that year he records "the greatest flood ever seen in our parts; it broke down several pond-bays, and mine among the rest at Cowden, which cost me near £100 to repair." He paid tax in 1707. S. A. C., XX., p. 118.

He died in 1750, and in 1761 a private Act was passed for the division of his estate, mentioning "ground on which stood a Furnace called Scarlets Furnace and the founders house with the site of a forge." "Cowden," p. 111.

It is therefore probable that by that time the furnace had ceased to work.

The pond is in water, and there is a considerable amount of furnace slag.

Cowden—the lower Furnace. Furnace

Par. Cowden (Kent), Hartfield (Sussex).

51° 8′ 20″ N. 0° 4′ 50″ E.

¾m. S.W. by S. of Ch. K

P.N. Furnace Pond, Furnace Mill.

Old Furnace (Greame's map, 1799).

I take this furnace to have been the one worked by Michaell Weston of Lye in 1574; he did not appear. He rented a furnace from Sir Henry Sidney in 1576 at £200 per annum, but this may have been Robertsbridge. His name is also down for Cowden in Losely, 1588.

R.H.M.S. Report. Lord de Lisle and Dudley. V. 1, p. 249.

The late Mr. Guy Ewing thought that he may have only managed the furnace during the minority of Richard Tichborne, the son of John Tichborne.

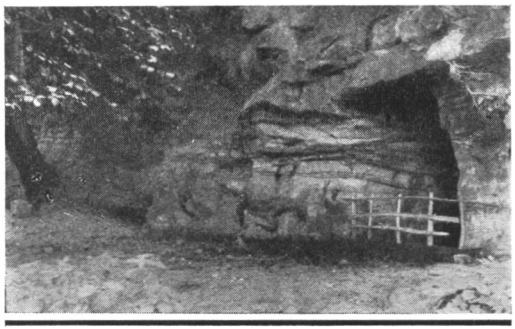
According to Somers Cocks and Boyson, I do not know upon what authority, the furnace was established by John Tichborne, whose will was proved in 1556.

"Edenbridge," p. 56.

Richard Tichborne built the fine old manor-house at Crippenden in 1607. Here may be seen the celebrated "Cowden Gun," an evident failure that must have been rejected for the faulty casting, full of air cavities. This was dug up at Furnace Mill about 1850. He must also have brought up much slag for paving purposes, which still remains there.

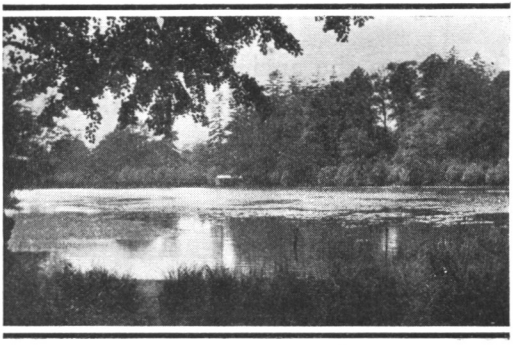
This branch of the Hampshire Tichbornes were strong Parliamentarians; one of them, Robert, was one of King Charles' judges, and signed his death warrant. A local tradition says that this furnace was very active in producing ordnance for the Commonwealth. It was probably controlled by John Browne during the Civil War, as he gave £1 to the poor of Cowden in 1645.

The 1664 lists read: "Cowden the Lower; Ruined before 1664, and so remains." Many cannon balls have



The Cave at Cowden.

been dug up, and there was a " bear," or mass of iron, but this has now been removed. The garden is full of slag, and near by is a cave from which the sandstone for the furnace was quarried. The pond covers 30 acres, much grown up at the upper end, and is very picturesque. A curious fact about the old mill, long turned into a quaint dwelling-house, was that although the mill was in Kent, the mill-wheel was in Sussex !



Cowden Furnace Pond.

Beechenwood Bloomeries

P.N. Burnt House Mead. Further and Great Smith field. 51° 9′ 40″ N. 0° 4′ 40″ E.

Birchenwood

P.N. None. 51° 9′ 6″ N. 0° 5′ 10″ E.

Waystrode

P.N. Stony Croft, Stony Croft shaw.
51° 8′ 46″ N. 0° 5′ 10″ E.
Par. Cowden, Kent. A.F.
1½m. N.W. by N., ¾m. N.W. and ½m. W. of Ch. respectively.

These three sites are in the valley of the little stream that runs into the Kent Water at Kitford Bridge. Although the fields are under grass there is clear evidence of bloomery cinder at Beechenwood. The Birchenwood site was dug in the autumn of 1928, but proved to be quite shallow, although large lumps of cinder had been taken from it. In one piece that I had previously found there are distinct marks of a crowbar or similar tool. The oxidisation of the cinder had cemented the sand into a hard but thin pavement, below which was the natural soil.

There is another deposit a little higher up the stream (I. D. Margary).

At Stony Croft, close to the ancient manor-house of Waystrode, there is a large deposit in both banks of the stream, some 5 or 6 feet below the meadow surface. The cinder had probably been dumped into the bed of the stream, which cut through it at a later period.

Spood Lane, to the east, no doubt takes its name from the Latin *Spodium*, slag, with which it had been made up. Some years ago a large lump was dug up by the lane, on the late Mr. Guy Ewing's property.

Bower

Forge

Par. East Grinstead. 51° 7′ 40″ N. 0° 3′ 30″ E.
¾m. S. of Hammerwood Ch. I
P.N. Bower Farm, Hammerwood, Forge Meadow, Weir Meadow, Pond Field, Little Pond Field.

There is no mention of this forge in the 1574 lists, unless it appears under the name of Cansiron (q.v.). In 1664 it was "ruined," having been working in 1653.

The long narrow pond is still in water; the arrangement is peculiar, as the stone spillway, of which part remains, is at the upstream end. There is very scanty hammer-cinder.

Bower—the Spillway.

Cansiron

Forge — ? Furnace

Par. Hartfield. 51° 7′ 25″ N. 0° 4′ 35″ E.
⅝m. S. by W. of Holtye Ch. I.K.
P.N. Great and Little Forge Fields.

Weston—*sans* Christian name—had this in 1574 and 1588, as Cansorne or Causterne, probably the Michaell Weston of Cowden and Robertsbridge. The manor belonged at that time to William Bowyer, of Hoo, Hants, the elder brother of Sir Henry Bowyer, of Cuckfield. By his will of July 7th, 1578, he left Canserne to his daughter. In 1613 it passed to Sackville Turnor, who, in 1627, sold the "Iron-mylle" to Courthope of Whiligh.

Mr. Dunkin's notes.

Close Roll 3188. In 1637 the latter's executors resold it. It again changed hands in 1639, when Benjamin Tichbourne and John Maynard acquired the "manor of Canserne" together with "mines, marl, metalls, Iron ore, forges of Iron," and in 1641 they resold "all that forge or ironwork called Canserne Forge." The forge is at Little Cansiron. Cansiron Farm is about equidistant from this site and Bower; both are in the 1664 lists as ruined then, but working in 1653. The valley is shallow, and the bay rather a long one, largely made up with slag. The cinder appears to be both furnace and forge slag, but the former may have been brought from Cowden to help the forging.

This is one of the very few place-names in which "iron" appears, but perhaps the spelling is a variation of the older form after the forge was established.

Black Field, Beeches Farm Bloomery

Par. Hartfield. 51° 7′ 25″ N. 0° 5′ 5″ E.
⅝m. S. of Holtye Ch. F.G.
P.N. As above.

The place-names are significant—the field is now pasture, but there is a little ancient cinder to be found.

Castle Hill, Holtye Bloomery

Par. Hartfield. 51° 7′ 50″ N. 0° 5′ 30″ E.
½m. S.E. of Holtye Church. A.C.F.
P.N. None.

Mr. I. D. Margary has discovered here an ancient road running north and south, over the western slope of Castle Hill. This road is made up with heavy cinder of ancient type, probably from some bloomery near by, which has as yet not been located.

Blowers Hill or **Mount Noddy** Bloomery

Par. Cowden, Kent. 51° 9′ 25″ N. 0° 6′ 40″ E.
At Cowden Station. A.B.F.
P.N. Penstock field, Blowers field, Blowers Hill, Long Noddy, Noddy Mead, Noddy Pasture, Mount Noddy.

There are very large minepits in the Noddy fields—a name for slag—and traces of ore. The small bloomery was probably cut up by the railway, as there is vermiform cinder in the little gill, extending for a few yards on both sides of the line and goods-yard.

Ashurst Furnace

Par. Ashurst, Kent. 51° 8′ 0″ N. 0° 9′ 30″ E.
¼m. N.W. of Ch., on Medway. K
P.N. Pondfield.

Ashurst Forge

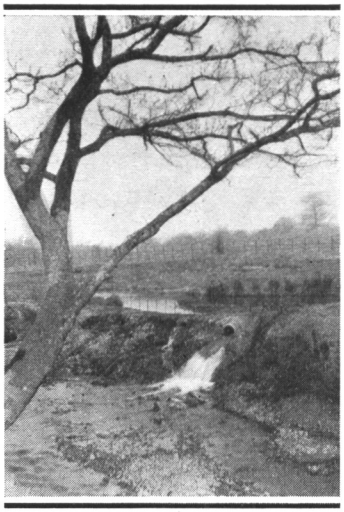
Par. Ashurst and Chiddingstone, Kent.
51° 8′ 30″ N. 0° 9′ 20″ E.
⅞m. N. of Ch., on Kent Water. I
P.N. Forge fields (one in each parish), Hammer field.

John (or Thomas) Stacie had, in 1574 and in 1588, a forge and a furnace in Ashehurst. In 1609/10 Thomas Browne, of Ashurst, co. Kent, gunfounder, deposed that he had delivered to divers persons since 1591 about 463 tons of Iron Ordnance. He was the father of the prominent Stuart gunfounder, John Browne. Exchequer Special Commission, 7 J. I. No. 4143.

The furnace was situated on the Medway, a little way below the corn-mill, which is still at work. At the furnace the bay has entirely disappeared, and the pond silted up to the general level of the flat water-meadows,

but no doubt the furnace was somewhere near the present mill-race. There is a little slag in the banks and gateways and larger pieces have been dug.

The bay at the forge, although now much reduced in height, is still visible, but there is no clue as to which side of the stream the building was placed, and only very little cinder.



Ridge Hill.

III. UPPER MEDWAY

The main stream of the Upper Medway, rising near Turner's Hill, and flowing by Forest Row, Hartfield and Ashurst to Tonbridge, has several interesting sites along its course, among them, as has recently been discovered, two Roman bloomeries.

The highest average rainfall is 32½ inches. Map, p. 224.

Ridge Hill — Roman and pre-Roman Bloomery

Par. East Grinstead. 51° 6′ 10″ N. 0° 2′ 40″ W.
¼m. E. of Kingscote Station. A.B.F.G.—s.g. of G. 3·27.
P.N. Cinder Mead.

This field, on the property of the late Mr. Edgar Crookshank, is a rough and swampy pasture sloping down to the infant Medway from a bold outcropping ridge of Tunbridge Wells sand, the soil near the river being a somewhat sandy alluvium deposited by periodic flooding and probably overlying Wadhurst clay.

At a point marked "Ford" on the 6-inch map, cattle in crossing the stream had worn away the grass, revealing a depth of 2 or 3 feet of bloomery cinder of early type. On the exposed surface were three small fragments of pottery, determined by Mr. S. E. Winbolt and others to be of the Roman period, one being Samian. Later in the year Mr. Crookshank very kindly agreed to excavation. Needing road material, he had an exploratory trench cut across the low mound, now made visible by the clearing of trees and scrub. The digging showed that the extent of the slag-heap is about 150 by 60 yards. It is almost entirely composed of heavy slag with a high iron content, some with the vermiform surface so characteristic of this period, but the bulk amorphous, with a fracture varying from blue to black.

The foundation of the smelting heap, as disclosed by the practically perfect uppermost layer, was formed of lumps of sandstone bedded in and supplemented by sand, both being burnt a bright red. The surface was level, without any concavity to receive the bloom, and had a very slight dip to the north-west.

This hearth is circular, roughly, 8½ to 9 feet in diameter, and is only the top one of a series of as yet unascertained depth, as shown by the alternate layers of red burnt sand, charcoal dust with some unconsumed pieces, and slag. The residue remaining after each smelting was not cleared away, but a fresh surface was prepared on top of it. The layers are horizontal, as was the case, so far as could be seen, at the Roman site near Sedlescombe, found by me in 1924, and partly excavated by the Sussex Archæological Society.

They thus differ from the conical heaps in Beauport Park, as described by Mr. James Rock in S.A.C., Vol. XXIX. The latter were apparently similar to those in Siegerland, Westphalia, which had a centre cone of clay, with a gutter-like depression round it to receive the melted iron.

There are traces of several other hearths at various levels.

There have been recovered about 30 pieces of pottery, some of which are described in Mr. Winbolt's note. There was also a square-headed nail about 6 inches long, unfortunately lost by the workmen. Mr. Crookshank gave every possible facility.

The geographical position of this site is of great interest. It is the most northern Roman iron-working yet found in Sussex, being, as the crow flies, about 9 miles north-west of the well-known Maresfield site, 21 miles from Shoreham, 26 miles from Pevensey, and but 28 miles to London Bridge. The outlet or port of shipment may well have been London, as a course

directly north would, in a few miles, join, without a bend, the ancient track from East Grinstead to London, which, with the exception of a five-mile traverse of the Weald clay, runs on hard ground.

NOTE ON POTTERY

"HORSHAM,

19th December, 1927.

"I have before me fourteen pieces of undoubted Roman pottery found on the Ridge Hill site, and Mr. Crookshank has about as many more. I saw several pieces extracted from within 2 or 3 inches from the top of the topmost layer of slag, and the rest came from the same layer. The position of the pottery seems to show that the site has not been in use since Roman times. But there is a clear interval of at least two centuries between the earliest fragment and the latest. (Dr. Felix Oswald has kindly confirmed my dating of the Samian pieces.) The earliest datable fragment of Samian is of form 18, with very good glaze and slightly swollen side, and belongs to the end of the first century. Another fragment, much worn, is probably the rim of a 37. Corroborating the first century date are four pieces of browny-grey, soft, soapy, coarse-grained ware which is generally assigned to the first century; and one piece of the same material with red slip inside, and applied studs outside—rusticated ware of about the same date. There is a good foot-rim of a hard grey pot which is probably of the early second century. Then come some pieces of quite indeterminate date. Finally, there is one fragment of imitation Samian belonging to the end of the third or beginning of the fourth century. This is a flange of a form 38, with no downward curve to the edge of the flange, and with remains of white painted bars on the upper edge of the flange. From the pottery fragments forthcoming to date it would be a safe and conservative estimate to infer a range of at least 100 A.D. to 300 A.D.

"S. E. WINBOLT."

At a greater depth pottery was subsequently found, which was dated by Mr. Reginald A. Smith, F.S.A., as pre-Roman.

The site has been carefully preserved and railed in.

Gravetye — Furnace

Par. West Hoathly. 51° 5′ 25″ N. 0° 3′ 0″ W.
1m. N. of Ch. K
P.N. Furnace Mead, Furnace Plot, Furnace Nine Acres.

John Blacket of Hodly was warned in 1574, but neither appeared nor was bound. We do not hear of it again until the years 1761 to 1769, when considerable quantities of guns were carried to London, from 32-pounders downwards, also 13-inch and 10-inch "Bum Shells." (Robert Knight's Carrier's Accounts.) There was also mine taken there from Boyles (south of East Grinstead) iron from Warren Furnace, and from London, and powder for proving the guns.

The payments for this carriage were made by Messrs. Clutton up to August, 1762, then by Eade and Wilton; in 1768 Raby and Rogers apparently worked it in conWeale MSS. junction with Warren Furnace (q.v.). In 1787 it was entirely down.

There is no pond shown in the tithe map of 1841 or the 6-inch of 1870; the present large pond is probably a resuscitation of the iron pond. A considerable amount of slag has been dug for the estate roads, but traces are left, and there are the remains of foundations and water-channels, with a curious sump-hole and culvert to carry away the water. A cast-lead pipe of early type, perhaps 17th century, was among the débris.

Mill Place — Furnace

Par. East Grinstead. 51° 5′ 50″ N. 0° 2′ 20″ W.
½m. S.E. of Kingscote Station. K
P.N. Mill mead, Furnace field, Hammer croft.

This was an important furnace, and had a long, though not unbroken, existence. In 1574 it was worked by Robert Reynolds, of Grynstede, who was summoned and signed the bond. It was discontinued before 1664, but " repair'd and stock'd upon account of the warre and future encouragement." It does not appear in the 1717 lists, but in February, 1763, Robert Knight carried about 100 " Swevil Guns " up to London to Seemans Warfe, for Messrs. Ralph Clutton and Durrant, the then owners. These were the smallest guns cast, weighing about 1 cwt., and were used on ships' bulwarks and in boats.

Great quantities of slag have been dug; a few years ago there was a very large lump, now gone. It is on the main stream of the Medway. Neither bay nor trace of buildings remain. The stream for nearly a mile below shows the lighter cinder that has been washed down in floods. There is a fine old house, now the farm, which doubtless was the ironmaster's. The old road to it, now completely foundered, was made up not only with the furnace slag, but also with the ancient cinder from the Ridge Hill bloomery, which lies a couple of hundred yards below it.

Mill Place.

Stone, East Grinstead — Furnace

Par. East Grinstead. 51° 5′ 30″ N. 0° 1′ 30″ W.
1¼ m. S.E. of Kingscote Station. K
P.N. Cinderbank field, Cinderbank Shaw.

This may be the furnace "in the pishe of Grinsted" (Grimsteed or Grynsted) of the 1574 lists worked by John Duffield, who signed the bond. The forge coupled with it has not yet been traced. In two of the lists Payne and Duffield are entered, Payne being probably the owner.

"History of East Grinstead," W. H. Hills, p. 142.

"This Mr. Payne was John Payne, a burgess of the town at that time, who, in his will dated December 12th, 1579, gave to his cousin, Roger Hayte, his tenement and 'Smythes fforge now in the occupacon of Joseph Duffield and John Larke scytuat in East Greensted.' From the fact of its being styled 'le fforge in Burge de Est Greensted,' in an inquisition held in 1580, on the death of its owner John Payne, it would seem to have been the only forge within the limits of the borough, which were by no means co-terminous with the parish."

P. 117.

"John Payne died seized of a field called Conclappers, held of John Duffeld Jnr. as of his manor of Hakenden. This manor is also named Placeland, Harkenden and Stone Rocks."

John Duffield the elder, in his will of December 8th, 1575, dated from Neylonde, the farm on the other side of the river, had left his son John the manor of Hakenden and Stone Rocks.

The Payne family was a prominent one in East Grinstead for several centuries, but this site was just outside their land in 1776.

The bay is situated on a crook of the Medway, where the stream is diverted by a bed of rock. There is furnace slag. Close by is a triangular excavation from which the mine may have been dug.

Standen Bloomery

Par. East Grinstead. 51° 5′ 50″ N. 0° 0′ 45″ W.

1¾m. S. by W. of Ch. B.F.

P.N. Cinderbanks.

This is a fairly extensive bloomery, partly in a wood and partly in a field now grass.

Walesbeech Roman bloomery

Par. East Grinstead. 51° 5′ 30″ N. 0° 0′ 30″ W.

2¼m. S. of Ch. A.B.F.

P.N. Cinderbank mead, Sindry Bank, Great and Little Sindrymeads.

This name is frequently spelt Whalesbeech and Walesbergh. The H is clearly a corruption. The first element is the same as that of Walhill, a little to the eastward, now called Ashurst Wood. The two forms of the second element, " beech " and " bergh," no doubt both derived from the cinderheap, which must at one time have been a considerable mound. " Beech " or " Beechy " is very frequent in Sussex field names, in the sense of stony, or sometimes, as here, having iron cinder. Cinderburg (Echingham) and Cinderbury (in several places) no doubt indicated mounds of cinder.

Photo: I. D. Margary.

The Mound at Walesbeech.

The manor is mentioned in Domesday as Waslebie, and Richard de Walesbergh appears in a taxation roll of 1333. At one time this must have been a large mound, and although it has been much dug away the outline is still quite visible. Having found some fragments of pottery in the spring of 1928, advantage was taken of the dry weather in the autumn of that year to do some excavation, with the able assistance of Mr. I. D. Margary. Permission was kindly granted by Mrs. Larnach-Neville, the owner. The pottery found was determined by Mr. Reginald A. Smith as a neck of a flagon, middle 2nd century, a piece of Samian ware of Lezoux, Central Gaul, probably 2nd century, fragments of a flagon and a bowl in pink ware, late 1st or early 2nd century, and a piece of tile.

See p. 32.

It is highly probable that this is the "ferraria" in

Photo: I. D. Margary.

Site of a Hearth, Walesbeech.

East Grinstead mentioned in Domesday Book, as discussed in a previous chapter.

Stonefield Bloomery or burning site

Par. East Grinstead. 51° 5′ 20″ N. 0° 0′ 20″ W.

2½m. S. of Ch. F

P.N. Great Cinderbanks.

This field, on the slope above Walesbeech, is now under grass, and but little cinder is to be found.

Brambletye — Forge

Par. East Grinstead. 51° 5′ 50″ N. 0° 1′ 25″ E.
½m. W. of Forest Row Ch. I
P.N. Forge Mill Mead.

The mill here, one of the few Wealden mills recorded in Domesday, close to the site of Old Brambletye, and to the picturesque ruins of Brambletye House, is placed on a stretch of the Medway which has been slightly widened, but cannot be termed a pond. Robert Reynolds who had the furnace at Mill Place (q.v.) had a forge here in 1574, but nothing now shows. Some cinder has been dug, and there is a little in the road, clearly forge refuse.

Parrock — Furnace and Forge

Par. Hartfield. 51° 6′ 5″ N. 0° 4′ 55″ E.
1⅜ m. W. of Ch. I.K.
P.N. Great and Little Hammer field, Upper and Lower Pond Mead.

This was one of the very early Hartfield forges. Frenchmen were employed, as three were made denizens in 1544. One of these was named John Lambert, and probably Pounsley was another. Huguenot Society Publications, Vol. VIII.

In 1513 Robert Scorer was the lessee. His very interesting will, made on the 9th of November in that year, left to his brother Richard the guardianship of his children, and also "all and asmany gunstones of iron as be now redy made aswell at London as at my fferme of Parok or any other place in Sussex, which I will shall be delivered to him by myn executrix. Immediately after my decease also I give and bequeth to the said Richard my brother the Indenture and lease w[t] the yeres

of my fferme of Parok called Parokforge." The date of proving the will is left blank, but we have a record that Robert supplied the King with nine tons of gunstones in 1513, and £6 13*s.* 4*d.* worth for the ship *Mary and John* in 1515. In the reign of Henry VII., *i.e.*, before April, 1509, among the suppliers of gunstones was John Warner, perhaps from here, as in 1518 Richard Warner mortgaged or leased the manor of Parrock to John Carill, including "a parcel of land called the Weke with a myll builded upon the same grounde called an yron myll, and all the yronworks builded upon the same p'cell of land; that is to say, a ffurnes, a fyner and a hamer with all man^r of instrumentes thereunto belongyng." It still belonged to Warner in 1525. His descendant, William Warner, had complicated money transactions with one William Saunders, and, according to Saunders, sold him the manor, including all lands and tenements called the Weke, with an iron mill, in 1547. Long after the death of William Warner his son Simon entered an action in Chancery, claiming possession, alleging that the sale was not absolute, and that on payment of certain sums should become void. The Court, however, decided in favour of Saunders.

Navy Record Society, Vol. 8, p. xxxiii.

Dunkin 39488.

Chancery Decree Roll, c. 78, No. 19.

Meanwhile the Warners had leased the forty acres of land and the iron mill or iron forge and a furnace for making of iron, and all ponds and water, for ten years to Denise Bowyer, widow of the John Bowyer of Hartfield who had supplied Henry VIII. in 1514 with "gunstones for great bambardys," and mother of Henry (afterwards Sir Henry) Bowyer, a prominent iron-founder in Elizabeth's reign.

Star Chamber Proceedings, Henry VIII.

From the suit in the Star Chamber we have a vivid picture of the happenings soon after.

In her evidence Denise stated she had "enjoyed the premises until about five years last past, when William Saunders purchased, and thereby intending and minding to expel and avoid her, broke up the said ponds and waters so that she could not use the forge," and on March 31st (the year is uncertain) Saunders and his men came "with force and arms, to wit with swords, bucklers, staves and other warlike weapons, with sculls upon their heads, in manner of war arrayed, and would then and there letten the water out of the ponds of the said furnace so that the furnace or iron mill could not in any wise be set on work. And after the said misdemeaning persons of their frowardness and malice carrying with them a cart and oxen did then and there riotously and forcibly enter into the mill or forge, and assault and evil entreat Denise's workmen," "did strike with swords Christopher Tryndall upon the head and gave him many evil wounds, so that he was in great danger of his life, and cut off another man's finger," "did pluck up the bellows and broke the frame in which they stood and by force carried them away in the said cart, and will in nowise permit Denise to have them again."

She, however, rallied her forces, and, with eighteen men armed with staves, bills, and bows and arrows, made a counter-attack. According to Saunders, "after they were departed from the mill almost to his own house, being in God's peace and the King's, Haywood and others suddenly without any word struck him upon his head and with a halberd brake his buckler and put him in jeopardy of his life, or had slain him. Denise, with a staff she had in her hands struck the oxen over the muzzles, and would have turned them out of the way, and cried out with a loud voice Down with Greybeard, Down with Greybeard, and Shoot at Greybeard." She would not avoid the way till Saunders took her in his arms

and bore her out of the way till the oxen were entered. Denise denied this, and said, "she had but a small stick in her hands which a lame and impotent woman used to walk withall to stay her." Unfortunately it is not on record how the suit was decided.

In 1564 William Saunders, Knight, was in peaceable possession, and in 1570 left the iron mill to his son Nicholas. In 1574 the furnace and forge were worked by George Bullen, of Hartfield, for Lord Buckhurst, probably leased from the Saunders family. In 1590 the works were sold to another Nicholas, who again sold them in 1593 to William Garway. They passed to John Garway in 1600.

It was not mentioned in 1664.

The site being in the river meadows by the Medway, which are very subject to floods, the ground has been much silted up—the long bay is but little above the present level and the banks of the ponds do not show. There is, however, plenty of cinder to be seen in the bay.

Hartfield ?

Par. Hartfield. 51° 6′ 25″ N. 0° 6′ 30″ E.
½m. N.E. of Ch.

P.N. Pond field, Pondfield Wood, Pondfield Shaw, Mill Mead.

Close to the Medway near Chartness Farm is a large mound of very red earth, with a copious spring of very ferruginous water. We may perhaps have here an instance of iron bacteria depositing iron from the water that wells out from ore beds. There is a little forge cinder and the vestiges of a leat are visible in the next meadow up river. On an estate map of 1593, preserved at Old Buckhurst, the meadow in which the mound

stands is called Mill Mead. The pond names are some distance above, and do not now show any bays or banks.

This may possibly be the site of the forge mentioned in the will of Thomas Wildgose, of Hertfeld, made Monday next after Passion Sunday 1496. After many charitable bequests he left " to the sufficient repaçon and amending the King's Highway lying thoroughly between my forge which John Stile occupieth and the churchyard gate of Hertefeld lying against the parsonage gate there." The ancient parsonage and gate still remain and the course of the highway can be traced past the above-mentioned mound. It is " amended " with forge cinder.

We have several instances of iron " gunstones " being supplied by Hartfield men in the early part of Henry VIII.'s reign. Robert Scorer supplied 9 tons in 1513 and in 1515, for the ship *Mary and John*, £6 3*s.* 4*d.* worth. John Bower or Bowyer—elsewhere Bowley—supplied in 1513 not only gunstones, but " dies of iron." He died in 1536, his widow Denise was the Amazonian lady of Parrock, and his son was the Henry Bowyer of Newbridge in Elizabeth's time.

Letters and Papers of Henry VIII.

See Parrock.

As a proof of the newness of the industry at that date, at the same time actual stone shot were being purchased in Kent, and iron shot on the Continent.

Although the exact locations are not stated, doubtless the furnaces mentioned were the scene of their labours.

Map, p. 224.

IV. NORTH ASHDOWN

There are two considerable affluents of the Medway on the northern slopes of Ashdown Forest, where the rainfall averages 35 inches, the one rising near Chelwood Gate and flowing by Steel Forge, Newbridge and Cotchford, the other near Camp Hill, running by Crowborough Common and Buckhurst Park. They meet near Withyham, just before entering the main stream.

Map, p. 224.

The three sites on the first named, and also Parrock on the Medway itself, are in Hartfield parish and were, together with Buxted, the earliest in England to work the new process, in the first place by Frenchmen. Mr. Rhys Jenkins has pointed out that "the blast furnace, together with the finery process for converting the cast iron into malleable, had been introduced into England before the year 1500, the method being borrowed from France. This view is supported by the terms used in the trade—founder, finery, chafery—all of which occur in the same or in a closely similar form in the French."

In 1493 Pieter Robert alias Graunt Pierre, yernefounder, dwelling in Hertfield, and having an iron mill in the Forest of Ashdown, had entered into partnership with Harry Mayer, alias Harry Fyner of Southwark, goldsmith, and had sent him 52 tons 7½ cwt. of iron at £3 0*s.* 0*d.* per ton, and had also done various repairs to the mill, but the said Harry had caused him to be arrested and "fetyred with grete yernes" on an action for debt for £20 0*s.* 0*d.*, and also taken away all the goods and stuff in Pieter's house. This Henry Fyner was commissioned on December 18th, 1496, to take artificers, founders, and labourers for the making of iron for the ordnance.

Star Chamber Proceedings 1493–1500.

Calendar of Patent Rolls Henry VII.

Steel, Pippingford Furnace and Forge

Par. Hartfield. 51° 4′ 0″ N. 0° 4′ 10″ E.

2m. E. of Wych Cross. K

P.N. Furnace Farm, New Furnace. Budgen's map, 1724, and Kelway's map, 1747.

In 1523 John Glande held a tenement called a "Forge of Steele" in Ashdown Forest. In 1525 this came into the hands of John Bowley (? Bowyer), who still held it in 1548. A fragment of Forest Proceedings in the Record Office, supposed to date from 1539, refers to it as follows:

"Ther is another myll called the Stylford Mill and xiiij acres of ground val p acre iiij^{s} viiij^{d}, molend nil qz prostrat" and on another leaf "Yf the Stylford were up she wolde make yerely XL or L Tonne. Sm^{a} clare XL^{li} or L^{li}." Min. Accts. Bundle 445 No. 7185. £1 profit per ton.

In July, 1545, Henry VIII. granted Ashdown Forest to Sir John Gage, who, however, retransferred it to Queen Mary on February 3rd, 1555, including, inter alia, "all that my smithy (fabricum) and my hereditament called the Stele-forge and the Iron Forge in the Forest of Aysshedowne aforesaid. And all that my furnace called the Stumblett otherwise the Stublett with the appurtenances in the said Forest, and all those my iron mills with the appurtenances in the said Forest." "The Stumblett" may refer to Newbridge, but cannot at present be definitely identified. The place-name is a very frequent one in the Weald. Close Roll 504. See "Place-names of Sussex," Vol. VII., p. 375.

This may have been "the forge and furnace in Ashdowne in the hands of Harrie Bowyer" in 1574, but the reference is too vague to be certain.

In the 1653 lists no Ashdown places are mentioned, but in the Parliamentary Survey of the Forest dated November 19th, 1658, Steel forge and Steel forge river S. A. C., XXIII. p. 269, etc.

are thrice quoted as boundary marks; by that time the works were derelict and they do not appear in the 1664 lists.

There is a fine sheet of water surrounded by woods, with a steep fall below the bay. A good deal of charcoal remains, in one place a large beech has been blown down, having grown on top of pure charcoal without a tap-root. The cinder is distinctly furnace slag, with some unburnt ore, but in such an overgrown spot forge cinder could easily be missed.

Newbridge

Furnace

Par. Hartfield. 51° 4′ 30″ N. 0° 4′ 45″ E.
2½ m. S.W. of Ch. K
P.N. None.

"English Industries of the Middle Ages," pp. 30–111.

This is supposed by Mr. Salzman to have been the place where the "great water hammer" was working in 1496, the first date we have in the Weald for power applied to ironworking. As Newbridge, however, was clearly a furnace, I think the hammer was more likely at either Steel or Cotchford forge. In 1497 Simon Ballarde was casting large quantities of iron shot here.

In 1523 the steward of the Duchy of Lancaster reported that £14 3*s.* 4*d.* was not received because no one would take the iron mills in Ashdown Forest until Lord Wiltshire took them. This refers to Newbridge, as may be seen from the report that follows.

In the Forest Proceedings, 1539 (Henry VIII.), mentioned under Steel Forge, there is a series of memoranda relating to Newbridge which give us the

earliest accounts of a blast furnace and its forges. The arrangement is somewhat disjointed, and it looks like a draft for a report. As these give considerable information as to processes and costs I print them in full. The quaint spelling and laborious calculations of the scribe are quite interesting. The apparent error of a shilling in the cast is perhaps to provide for the repairs. It reads thus :—

"The yron mylles called Newebridge in the Nether ende of the fforest of Ashdowne. Oone Nysell hath assignement of this mill of my lord Wiltesh^{r} and yeris yet to come vij or thereabouts.

The Myll well repaired in all thyngs.

Md. that to melt the Sowes in ij forges or ffynories ther must be iiij p̄sones, And at the forge to melt the blomes ther must be ij p̄sones. So ar ther at every forge ij p̄sones whereof the oone holdeth the worke at the hamo^{r} and the second kepeth the work hote.

Md. that oone man cannot kepe the hamor bicause the work must be kept in such hote that they may not shift hands.

They are paied for ev'y tonnes hamoryng — vj^{s} viij^{d}
viz., to the hamor man and his man.

For every Tonnes drawing into Barres — vj^{s} viij^{d}
the said forgemen or fynors.

Sm^{a} xiij^{s} iiij^{d}

Md. that they paie to the lord of the Soill for licence to dyg or myne for oore for every loode i^{d}.

xiiij lood of oore or myne will make j tonne of yron.

Sm^{a} of the orre — xiiij^{d}

The dygging of every Tonne after viij^{d} the Tonne dothe amount to ix^{s} iiij^{d}.

Sm^{a} ix^{s} iiij^{d}.

The raising of every lood to the furnace iiij^{d}. amount in the Tonne iiij^{s} viij^{d}.

Sm^{a}. iiij^{s} viij^{d}.

For cariage of a Tonne of Sowes to the forge x^{d}.

Sm^{a}. x^{d}.

Note : The forge must have been some distance from the furnace.

For xj lood of Cole deliv'ed at the furnace to make the tonne of Yron into Sowes, for every lood iij^{s}.

Sm^{a}. xxxiij^{s}.

For v lood deliv'ed at the forges to melt sowes and at the hamor to make a Tonne of Yron up every lood iij^{s}.

Sm^{a}. xv^{s}.

The casting of every Tonne at the furnace into Sowes iij^{s} iiij^{d}.

Sm^{a}. iij^{s} iiij^{d}.

Sm^{a} — iiij^{li}. xx^{d}.

Perhaps this accounts for the extra shilling in the cast.

Re̅pac̄ons omnibus annis in Bellowes, hamors, Andvills, romars, lynks, sundry great Spynsars and skopes XL^{s} or more, after as the workmen ar so ar the newe instruments s'ved.

Md. this myll will make yerely if she be well stored and applied every yere iiij^{xx} tonne at leest.

Md. she is well watered and well repaired.

To this myll lieth adjoyning xvj acres of ground every acre val iiij^{d}.

A newe furnace p̄teyning therto in this Kyngs Comon called the Stomlett.

Md. if the yron be caried to London it cost vj^{s} viij^{d} the loode cariage.

Sm^{a}. vj^{s}. viij^{d}.

Sm^{a}. omnis — iiij^{li}. viij^{s}. iiij^{d}.

Yf the tonne be solde at forge it is comenly solde for v^{li} sometyme vj^{li}, So comenly clere of the Tonne oone with another at leeste xx^{s}. And clere by the yere at lest xx^{li} or at lest XL marks.

Md. They say Iron is fallen in price by reason of no utterance.

Md. This yf it be not well followed cannot prevail.

This myll will spende at fynories and furnaces xij^{c} loods of Cole at lest, or xv^{c}."

80 tons at 16 loads per ton = 1,280 loads.

We next hear of Newbridge in 1574, when Henry Bowyer of Tinsley held a double furnace there, apparently his private possession, although he acted for Queen Elizabeth elsewhere in the Forest.

By 1650 the works had been abandoned; the Parliamentary Survey of June 5th in that year says that the Earl of Dorcett claimed, inter alia, "the ffish ponds and all the wast ground whereon the forges and ffurnaces and workmens howses were seated." They are not in the 1664 lists.

There are portions of a large bay, much cut about, and a spill-way which may belong to a later period. The site has been much altered, the tithe map of 1842 shows the strong stream that serves the mill in a different course to its present one along the road. The field below the bay was at one time covered with slag, but only a little furnace slag is now visible.

Cotchford Forge Furnace and Forge

Par. Hartfield. 51° 5′ 55″ N. 0° 5′ 55″ E.
1¾m. S.S.W. of Ch. I.K.
P.N. Little and Great Forgefields, Hammer Mead.

In 1574 John Eversfield, whose name is spelt in many different ways, held a furnace and a forge at Cruckford. He was of Grinsted, and signed his bond on February 26th.

He had also furnaces in Moore Forest and at Shillinglee, and must have been a very wealthy man, for he contributed £100 for the defence of the country in 1588, which was as much as the most important landowners subscribed.

Losely, 1588, reports Erfield as having a furnace at Crookfould.

In the bounds of Faulkenhurst, 1579, the forge and bay are mentioned, and in 1656 there was a Parliamentary survey, it being State property. The forge was then in the occupation of Jas. King and Richard Jones, who farmed it from Mr. Pickering of Lewes, and it was valued at £35 per annum, so it must have been working. Burrell Col. 5681, 340/189 and 519/290.

In 1627 Sir John Shurley, of Ifield, conveyed, for £2,500, to Nicholas Smith, of London, "the forge, hammer-pond, houses in occupation of the forgemen and fyners," and much land, at the nominal rent of one penny during the term of life of Dame Dorothy, late wife of Sir Henry Bowyer of Cuckfield. Close Roll, 2,715.

There is a bay, and both forge cinder and furnace slag.

Hammer Mead, Cotchford

Bloomery, or burning site

Par. Hartfield. 51° 5′ 20″ N. 0° 6′ 5″ E.
1⅛m. S.S.W. of Ch. F
P.N. Hammer Mead.

About a quarter of a mile from the bay to the N.N.E. is a field so named, now a poultry run. There is a little cinder in the bordering ditch.

It may have been a burning site in connection with the furnace.

Crowborough Warren

Furnace

Par. Withyham. 51° 4′ 0″ N. 0° 8′ 0″ E.
½ m. W. of St. John's Ch.
P.N. Furnace Wood, Old Furnace.

Unless this is the hammer and furnace in Ashdown, in the hands of Henry Bowyer, this is not recorded in 1574. In the Parliamentary Survey of March 20th, 1657, it is referred to in respect of a boundary as "the old furnace."

S. A. C., XXIII., p. 25.

The pond, at the lower end of Crowborough Common, is still in water, and the high bay has been very substantially built up in stone, no doubt at the time the large mill buildings, now semi-ruinous, were put up. They have the appearance of being 18th or early 19th century. There is no visible slag. There are three supply ponds higher up the gill, one of which served Old Mill.

It is marked as "Old Furnace" on a map by Kelton, 1747, which is inset in a survey of Ashdown Forest of 1693; the original map is missing in the British Museum copy, but another copy is at the Record Office.

Grubs Farm Bloomery

Par. Withyham. 51° 4′ 30″ N. 0° 8′ 25″ E.
¾m. N.W. of St. John's Ch. F.G., s.g. (of G.) 2·04
P.N. None known.

This small bloomery, nearly a mile lower down the stream than Old Furnace, is known by tradition. There is a very little cinder of ancient type along the stream.

Withyham or **Stonelands** Furnace and Forge

Par. Withyham. 51° 5′ 50″ N. 0° 8′ 20″ E.
In Buckhurst Park, ½m. S.E. of Ch.
P.N. None.

Both in 1574 and 1588 John Baker had a furnace and a forge in Withiham. The Baker family, who had possessions here as early as the time of Henry VIII., were owners of Stonelands in the 17th century. S. A. C. II., p. 220.

In 1676 in a lease by the Earl of Dorset to Mrs. Marchant there was a covenant to maintain and uphold the bays, floodgates, and woodwork belonging to the mills, but by that date it may have been converted into a grist mill.

The large pond is the ornamental lake of Buckhurst Park; landscape gardening operations have covered all relics.

Camp Hill Roman Road

Par. Maresfield.
¼ to ½m. N.E. by N. of Camp Hill Clump. A.B.
P.N. None.

In April, 1931, Mr. I. D. Margary traced a further portion of the N. to S. Roman road over Ashdown Forest. The agger in this section for at least 600 yards is gravelled with cinder of the same type as, and probably brought from, the Oldlands site, 1½ miles below. To the east of this, near Crow's Nest, is a deposit of quite different character, type D, that seems to have no connection with the road.

V. EAST ASHDOWN

From the slopes of Crowborough Beacon and Castle Hill, Rotherfield, run several small streams which join near Crowborough Station and flow through a beautiful forest valley to the Medway near Ashurst. Several tributaries, notably one from Eridge Park, add to its waters.

Map, p. 224.

Poundfield, Crowborough

Bloomery or burning site

Par. Rotherfield. 51° 3′ 20″ N. 0° 11′ 20″ E.
¾m. N. of Crowborough Station. AF

A very restricted site, but typical cinder. It may be only an ore roasting site.

Maynard's Gate

Furnace

Par. Rotherfield. 51° 2′ 50″ N. 0° 11′ 50″ E.
At Crowborough Waterworks. K
P.N. Furnace Mead.

Maynard's Gate takes its name from a family which had several branches in the parish, who gave their name to a gate in the ancient park mentioned in Domesday Book, now called Rochester Forest.

"Rotherfield," C. Pullein, p. 43.

Arthur Middleton had a furnace in Rotherfield in 1574, under Lord Buckhurst, which was among those "imployed to none other use but to the makeing of ordinance and shott," and in one of the lists this is specifically named Maynard's Gate. In Miss Catherine Pullein's able and exhaustive "Rotherfield" we learn that in 1568 he married the widow of Anthony Fowle, a brother of Nicholas Fowle of Riverhall. The following curious indenture is also recorded by Miss Pullein. It

"Rotherfield," p. 135.

was made on December 6th, 1576, between "Edward ffyltness of Rotherfield and Thomas Johnson of Cowdenn and Combe in Kent, gunsfounder.

"Edward ffyltness selleth to Thomas Johnson 200 loads of coles accomptinge 12 quarters to every load, to be well filled at the pytt, each load to be well 11 quarters when they shall come to the furnace and be unloaden. Edward acknowledgeth to be delivered by Edward ffyltness before the feast of St. James the Apostle next, at the furnace of Arthur Myddleton, gentleman, which he now occupythe in Rotherfield called Maynard's gate Furnace paying to the said Edward £35 which cometh to 3s. 6d. the load."

Below this is an indenture of the same date in which Edward ffyltness acknowledges to have received the full payment of £35, and a third in which Thos. Johnson acknowledges he has received in full satisfaction £12 10s. as agreed between the parties.

I cannot trace Thos. Johnson at Cowden, but Combe is near Woolwich and Johnson was Her Majesty's gunfounder a few years later. The transaction probably indicates that Filtness received ready money for the coles, for which Middleton paid a high price, and Johnson's £12 10s. was partly a hidden commission and partly in the nature of discount on a long-term bill.

There are very scanty signs of a bay behind the waterworks, with a little furnace slag. There is also another small bay to the east, at Browngate, which may have been a pen-pond.

See also p. 256, under Cowford.

Rochester Forest

Burning site

Par. Rotherfield. 51° 3′ 0″ N. 0° 12′ 20″ E.
⅝m. N.W. by W. of Ch. A
P.N. None.

There is a large mound of soil containing much charcoal dust and a good deal of drops of cinder, probably a burning site for Maynard's Gate.

This was first found by Mr. Taylor of Uckfield.

The vegetation chiefly consists of bluebells, with dense beds of nettles, betraying human occupation.

Chant Farm, Rotherfield — Bloomery

Par. Rotherfield. 51° 3′ 5″ N. 0° 13′ 25″ E.
½m. N.E. by N. of Ch. AF
P.N. Cinderbank.

This is a small bloomery, with cinder along a little rill.

Cowford — Furnace

Par. Rotherfield. 51° 3′ 57″ N. 0° 13′ 35″ E.
1½m. N. of Ch. K
P.N. Cowford, Tinkard Croft.

"Rotherfield," p. 278.

The only record of this furnace is contained in a Note of 1603, transcribed by Miss C. Pullein from the Abergavenny muniments, as follows:

"Iron Works of former times builded in Waterdowne. { One furnace in Rotherfield Walk at Cowford. / One furness side the pale of the same walk near Knights Place. } { This excused my lo: for selling of the woods in Waterdowne, viz., the Olde Woods of Oake and Beech."

The second furnace mentioned above was probably Maynard's Gate.

There is a long and high bay, and furnace slag.

Orznash — Bloomeries

Par. Rotherfield. 51° 4′ 50″ N. 0°10′20″ E.
1½m. S.W. of Eridge Station. 51° 5′ 0″ N. 0° 10′ 40″ E.
P.N. Minepit Wood. AF., s.g. 2·28

In this wood are two bloomery sites. The more southerly one has been mostly dug out, the cinder remaining only under the copse stools; the northern one is a very large dump on the slope of a bank, consisting of pure cinder of ancient type with scarcely any earth or charcoal. There are plenty of mine-pits in the wood.

Eridge — I. Eridge Furnace. II. Eridge Forge

Par. Rotherfield-Frant. In Eridge Park.
I. ½m. S.E. of Ch. 51° 5′ 35″ N. 0° 14′ 0″ E.
II. ⅜m. S.S.E. of Ch. 51° 5′ 35″ N. 0° 13′ 40″ E.
P.N. Forge Wood, Old Forge. K I

The Lords Abergavenny, or Burgavenny as it was formerly written, have held this estate, with other extensive lands in Sussex, since the Conquest, and figure as the overlords of several furnace sites.

The district was called Waterdowne Forest, and is so noted in 1574, when Lord Abergavenny had a forge and a furnace there.

In 1603 a Note was written

" concerning the felling and Sale and Expenditure of the woods in Water down Forest by my lo: Bergaveny before my lo: was possessed thereof." " Rotherfield," p. 278.

It continues:

" Iron works builded by my lo: Berg: and wood by himself a long time to the great expence of Woods.

One furness in Eridg Park
One gunnery below Eridg Green.
One gunnery at Hughes Hale.

Known to be all hees dwellings."

It is added that the most part of the woods were felled after the marriage of Sir Thos. Fane (of Frant) about 1576. He had two furnaces in Tonbridge in 1574. This is the only instance known to me of the term "gunnery" being used; it may mean a range for trial of guns, a usual adjunct to a gun-casting furnace.

Hughes Hale cannot now be identified.

In 1667 the furnace is not mentioned, the forge is continued in hope. It was marked by Budgen, 1724.

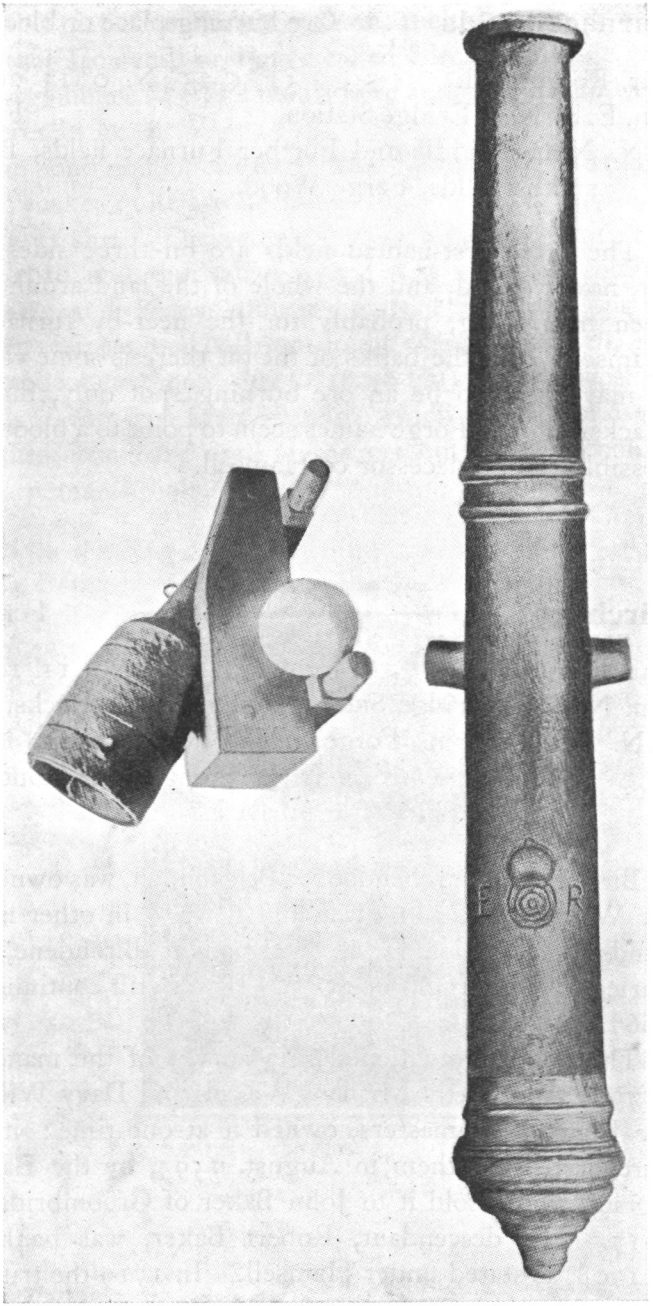
The Eridge gun which is figured in "Archæologia," X., p. 472, and reproduced in S.A.C., II., p. 217, was formerly on Eridge Green. It was of the same construction as the Bodiam Castle Mortar.

"Archæologia," Vol. X., p. 372.

The article in Archæologia, under the date of June 17th, 1790, says: "It has always been understood that the *mortar* engraved, was the first that was made in England, and that the first guns were made at *Buxted* furnace about ten miles from Lewes. This mortar now lies at Eridge Green, and has served for many years past for the amusement of the people on a holiday or fair day, when they collect money to buy gunpowder to throw the shell to a hill about a mile distant. The weight of the shell sinks it so deep in the earth that it costs no little pains to dig it out after each discharge, which is repeated as long as the money lasts. The chamber of the gun is cast iron, the other part, as is evident, wrought."

The furnace pond, now called The Lake, in Eridge Park, is a very large one, and has a long chain of pen-ponds above it. The site of the furnace was just below the bay and the dykes are still visible. Some slag remains, though much has been dug.

The forge pond, now drained, was just below; the footpath through the park runs over the bay, below is a good deal of forge refuse.



The Bodiam Castle Mortar.

The Pevensey Castle Gun.
Cast Iron, with Cipher and Badge of Queen Elizabeth.

C. Dawson, F.S.A. Photo. *From S.A.C., XLVI.*

Furnace Fields Ore burning place or bloomery

Par. Rotherfield. 51° 5′ 25″ N. 0° 11′ 20″ E.
¾m. E. by N. of Eridge Station. F
P.N. Near, Middle and Further Furnace fields, Blacksmith's fields, Forge Wood.

The three first-named fields are on three sides of a pit, now wooded, and the whole of the land around has been much dug, probably for the near-by furnace at Hamsell. On the banks of the pit there is some cinder. It may prove to be an ore burning spot only, but the Blacksmith and Forge names seem to point to a bloomery, possibly the predecessor of Hamsell.

Birchden Forge

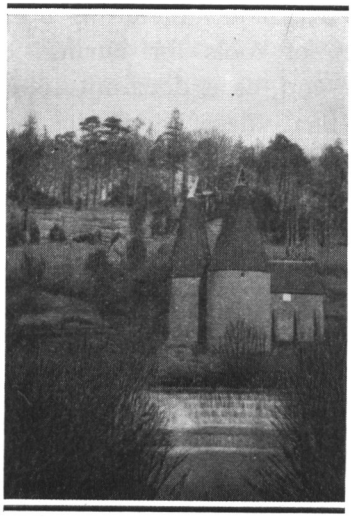
Par. Rotherfield. 51° 5′ 45″ N. 0° 11′ 10″ E.
⅞m. N.W. of Eridge Station, at Harrison's Rocks.
P.N. Forge Farm, Forge Island, Cinderbank, Forge Pond, Forge Green, Forge Hopgarden. Budgen, 1724, names it "Old Furnace."

Birchenden, Barchenden, or Brickenden, was owned by Sir Walter Waller in 1574, but it was "in other men's hands." Tompion, a hammerman at Birchdene, was buried at Rotherfield in 1587. It was still continued in 1667.

The pond is mentioned in a survey of the manor of 1579. Apparently Michael Weston and Davy Willard, the Kentish ironmasters, owned it at one time; it was purchased from them in August, 1595, by the Earl of Dorset, who resold it to John Baker of Groombridge in 1617. His descendant, Robert Baker, was bankrupt in 1708, as stated under Hamsell. In 1719 the trustees

sold the manor to Anthony Benn, including, inter alia, "all that Iron mill or Forge called Birchden Forge and the forge house." The ponds here and at Hamsell were 20 acres in extent. Burrell Col., 568, f. 805.

The pond no longer exists, the spill-way on the streams, which makes quite a waterfall in times of flood, no doubt marks its site. The water flows in a culvert under the farm road and the dairy, where it is used for cooling purposes, and there is some old masonry further along its course. A cannon ball, no doubt cast at Hamsell, has been shown me there. At Orznash Farm, on the western hill, is a cast-iron water-trough which is very like the "boshes" that are used at the present day for cooling the forgeman's tools.



Birchden.

Hamsell Furnace

Par. Rotherfield. 51° 5′ 15″ N. 0° 11′ 50″ E.
¼m. W. of Eridge Station. K
P.N. Pondfield, Furnace field, Cinder lane.

The Fermors of Walsh Manor were a very ancient and important family in the parish. There are several records in Miss Pullein's "Rotherfield" of Alexander Fermor, who was married in 1540, built a new manor house in 1551, and was buried in 1582. In the 1574 list he is mentioned as owning a furnace, in one list only identified as Hamsell. In 1664 it was working, and had made guns and shot. It passed into the possession of the Bakers, of the Groombridge branch of the Mayfield Bakers, together with its associated forge at Birchden. In 1708 Robert Baker was made bankrupt, and a very complete inventory of the effects is to be found in Miss Bell-Irving's "Mayfield," including 69 guns in London and a quantity of tools for boring, etc. This was, apparently, the end, as it does not appear in the list of 1717. In the final sale of the manor in 1719 the ponds and waters appertaining to the furnace and houses called the Furnace Houses, near the Furnace Pond, are mentioned. William Rabbett, an employe of Baker, was rated for the furnace in 1723, but this does not prove that it was then at work. The furnace pond, in the grounds of Lake House, is still in water, although the bay has been much altered, and there is some furnace slag in the plantation below.

"Mayfield," Bell-Irving, p. 177.
"Rotherfield," p. 280.

Steel Cross, Crowborough Bloomery

Par. Rotherfield. 51° 3′ 55″ N. 0° 11′ 0″ E.
1¼m. N.E. by N. of Crowborough Station. F
P.N. Cinderbank.

The main road from Tunbridge Wells to Crowborough makes an abrupt turn to the west here. This is to get round a large area of excavation, some 12 or 15 acres, in which the ground has been left in irregular mounds interspersed with wet and boggy places. Considerable light has been thrown on this by entries in the Rotherfield Court Rolls. On October 14th, 1617, Symon Vincent alias Fynche paid a fine for 350 cartloads of marl dug on his land here, and in 1619 for 1,000 loads, and in the next year 450 loads. This marl was Wadhurst clay, the lower strata of which contains much iron mine for the furnaces, the upper being used to enrich the fields. The licence to dig the marl included the right to sell the mine. Here we have a clear example of the practice which has resulted in so many excavations and pits in the Weald. There is a smaller pit on the east side of the road. The mounds contain a considerable quantity of ancient cinder, rich burnt ore, and burnt Cyrenæ limestone, but there is no definite heap, it having doubtless been disturbed by the later diggings and perhaps also for road metal. Some slight digging yielded a small fragment of a glass bottle, determined by Mr. Reginald Smith as probably Roman, so we perhaps have here a Roman site that future excavations may prove.

"Rotherfield," p. 112.

The name, and that of Steel Bridge, near Eridge, is from a Richard le Stile who held land here in 1296, not from the metal.

"Rotherfield," p. 277.

VI. TEISE

The Teise is a considerable affluent of the Medway, rising in Waterdown Forest, south of Tunbridge Wells. At Frant the hill rises to 695 feet, and the rainfall to 32½ inches. The Beult and other streams running from the high ground about Wadhurst and Cranbrook join it before it turns north into the flat Kentish plain.

This stream and a tributary rising on the eastern slopes of Saxonbury Hill supplied the power for no fewer than twelve works in an area of about four miles square. The researches of Mr. H. M. S. Malden, of Frant, in which parish or its borders they are mainly situated, into the manor rolls and parish register throw much light on their early history. Between 1565 and 1578 there are a number of entries relating to Frenchmen and their children.

Map, p. 272.

Benhall Forge

Par. Frant. 51° 6′ 50″ N. 0° 17′ 50″ E.
⅞m. S.E. of Hawkenbury Ch. (Tunbridge Wells). I

Melhill (?) Forge

Par. Pembury, Kent. 51° 7′ 10″ N. 0° 18′ 30″ E.
¾m. to the E. of Benhall. I

Breecher's Forge or **Marriott's Croft** Forge

Par. Frant. 51° 7′ 20″ N. 0° 19′ 30″ E.
1⅝m. to the E. of Benhall. I

There are no place-names now extant, except Benhall Mill.

The Teise has a good flow of water quite near its source, and is first dammed at Benhall. The pond there has only become dry in the last few years, and the swamp on its former site is quite extensive. From Benhall it runs a little to the north of east to Dundle (q.v.), then See p. 267. bending south and east to Bayham Abbey and Lamberhurst, forming the old boundary between Kent and Sussex, which, however, has now been altered at both ends. To serve the needs of the forges a straighter course See p. 271. was cut, both at Lamberhurst Forge and in Brown's Wood, where complaint was made of this ditch early in the 17th century. This is now the course of the river; the old bed, although still the county boundary, is merely a slight depression in the meadow.

The three forges named above are all in the two-mile stretch from Benhall to Dundle. From the manor rolls of Frant and Sunninglye, from which Mr. H. M. S. Malden, of Frant, has very kindly made me copious extracts, a good deal of their history may be gathered, although, owing to the non-survival of the place-names, the identifications are somewhat conjectural.

It is very probable that in their early history they produced the bar-iron direct from the ore, although later on Benhall was a conversion forge.

The first name we have in connection with them is Roger Breecher. In 1557 Roger Breecher became tenant of Marriott's Croft and in 1562 of land near Benhall and Melhill. In 1567 Breecher surrendered the lands to John Saunders, excepting "Le Forge, measons lez forgerers do inhabit, lez coleplaces et lez wast parcells pour lez cinder, lez shoppes et pur carriageis la auters cha'ers necessaries" and reserving the right to take sand, clay and earth, but one half of the forge went to Saunders. This may refer to either Benhall or Melhill. Breecher died in 1567. In 1568 Saunders surrendered

to Richard Leeche, of Fletching. Leeche in 1573 acquired rights from Elizabeth Fane in the pond called Beanehall and all other ponds, waterleys and watercourses in such manner as he or his assigns heretofore have done. It was also agreed that on giving up the tenancy he was to " ley the lands without water as it was before the making of his worke at Beanhalle, and to leave the baye and penstock of the upper pond in as good and ample manner as it is at the making thereof." Robert Woody, who apparently worked the forges for Leeche, had overflowed two acres of land—probably at Melhill, the " upper pond " being Benhall. John Wybarne, a Pembury landowner, became a tenant of the manor for Marriott's Croft in 1573. In the 1574 lists Mr. Wybarne and Mr. Leeche are recorded as holding " Breechers, two forges in Frant," and Robert Woody " a forge called Benehall in Frant." He is also mentioned in the Losely list as " Robert Woodheie of Benhal in Cranley " !! He died in 1615.

By 1576 Galfridus May held the forge at Marriott's Croft, but the ownership was still in Wybarne's hands, as an inquiry was held in 1593 to determine whether his son William or Roger Breecher's heirs were the real tenants of the iron mill and land. By 1614 Hugh Muddle held the forge, and in 1618 his son John, but by 1634 John held the land " on which an ironmill lately stood," so that by this date Breecher's Forge had stopped.

Robert Leeche, the owner of Benhall and of Melhill, died in 1596; his brother and next heir, William Leeche, succeeded, but transferred the forge to his nephew Richard Fogge in farm during William's lifetime; after William's death the property was to devolve as to one half to Richard Fogge and the other half to John Smyth, another nephew. Smyth, in 1605, surrendered his

moiety to Fogge. The latter died in 1630, leaving "one moledinum ferreum Anglice a forge and land called Turner's land" to his son Whittingham Fogge, who surrendered it in 1633 to William Dyke, cleric; the latter in 1652 leased it for three years to Thomas Foley and George Browne at the rent of £20 per annum. They were the executors of John Browne, the Government gunfounder, and at this period were contractors to the Commonwealth. The lease and inventory are given in full in the Sussex Archæological Collections. S. A. C., XXXII., p. 26.

The above transactions apparently refer to Benhall, which, under the name of Budhall, was working in 1653, but in 1667 was "laid aside and not used, only Budhall is sometimes used."

There is forge cinder by the old flour mill which succeeded the Benhall Forge, and much more at Melhill; at Breechers there is only a very little in the bed of the stream.

Dorndale, Durnedale—now **Dundle** Forge

Par. Pembury, Kent. 51° 7′ 20″ N. 0° 19′ 40″ E.
On Sussex border line, 1⅜m. S. of Pembury Ch. I
P.N. None.

The only mention of this forge is in the 1574 lists, when it was worked by Thomas Dyke or Dicke, of Horsmonden, who had also Chingley Furnace. The bay formed the foundation of the present road from Rushlye Down to Kippings Cross, and the dry autumn of 1928 revealed several large lumps of hammer cinder beneath the bridge. The hammer was probably in the present orchard.

Tollslye, Bayham Park. Furnace

Par. Lamberhurst, Kent, and Frant, Sussex.
51° 6′ 30″ N. 0° 19′ 50″ E.
1m. W. of the mansion. K
P.N. Cinderbanks, Furnace Wood, Furnace field.

There is no record of this furnace, although it must have been a considerable one, as there is a good bay and a great quantity of black glassy slag. It may have been included in Bayham, the corresponding forge.

Bayham Forge

Par. Lamberhurst, Kent, and Frant, Sussex.
51° 6′ 20″ N. 0° 20′ 50″ E.
Close to the mansion, at the head of the large pond in the park.
P.N. Forge Wood, Little Forge Wood, Forge field wood, Little Forge field, Forge Nick, Forge Nick Shaw.

This was worked in 1574 by John Porter of Battell for Lord Montague, to whom the Abbey lands were granted by Elizabeth, although it is variously named Frant, Boxham and Bayham—he still held it in 1588 as Baytham.

In 1607 Lord Montague sold the manor, including "all buildings forges ironworks utensils and implements," to Stephen Barnham. In 1654 it was bought by Walter Covert and Samuel Gott, both well-known ironfounders. In 1665 it passed to George Browne of Buckland, with the manor and 1,000 acres of woodland, and a private Act was obtained in 1714 enabling his successor to sell to Mr. Pratt, the ancestor of the present owner, Lord Camden. In 1667 it was still "continued in hope."

As the site is now part of the gardens there are no visible remains.

Lamberhurst or Gloucester Furnace

Furnace—was a forge

Par. Lamberhurst, Kent 51° 6′ 15″ N. 0° 22′ 25″ E.
Formerly part in Wadhurst. 1m. W. of village.
P.N. Furnace Wood, Furnace Farm, Furnace Orchard, Furnace Field, Colepan field, Counting House mead, all south of river.

On north bank are Floodgate, Shaw, Forge field, Forge Nick.

H (s.g. 3.52) K

Marked on Budgen's map, 1724.

This is one of the most noted sites. Its history begins in 1548, when Thomas Darell complained as follows :—

From Hist. MSS. Commission. Hatfield MSS. XIII (by permission of the Controller of the Stationery Office).

"The information of the hurts by mean of a hammer begun to be made at Lamberhurst, which is 16 miles from the seaside.

Alexander Collyn hath begun to make a hammer for iron making in the parish of Lamberhurst in Sussex, for the which he hath obtained grant of Sir John Gresham, knight, owner of the waste ground and common wood in and nigh Corselewood in Wadhurst, and hath cut down the most part of all the oaks standing in the same wood and ground and beginneth to cut down the beeches standing and being in the same; by mean whereof in short time the same woods if that hammer do there continue will be utterly wasted and destroyed, to the utter undoing of a great number of the inhabitants and tenants in that part. And that there be in the parishes of Lamberhurst and Wadhurst three hammers and four furnaces which will spend much woods, and that the hammer if it be thoroughly occupied will spend about 400 loads of coals, and to every load of coal is required 3 wain loads of wood. And moreover for the conveyance of water for the maintaining of the same hammer the same Alexander Collyn hath caused a great ditch to be made by estimation in length 3 or 4 furlongs, which he hath made cross a highway there nigh a place called Hotheby* and by the same ditch intendeth to turn the water of a common stream or river there which doth divide the King's Majesty's shires of Kent and Sussex, and also the lordships and lands of divers of the King's subjects, whereby hereafter may ensue much trouble and business in that part and great hurt and charges to the inhabitants there if speedy remedy be not had for the premisses."

*A misprint for Hothely.

This " great ditch " is a remarkable piece of engineering for its period; the only parallel to it is the cut at Robertsbridge. It cut a straight course across a bend of the Teise, through a slight rise in the ground. The length is about 1,300 yards, and as the stream in its course round the bend falls considerably, a good head of water was obtained without a high bay. There is only a slight widening of the cut, hardly to be termed a pond. The upper portion of the cut forms the present bed of the river, the old bed, which was then the boundary between Kent and Sussex, is a slight depression winding through the meadows. At a weir about half-way down the cut, the stream has again cut across to its old bed, leaving the ditch, which here is both wide and deep, dry, though it carried water to work the corn mill within living memory.

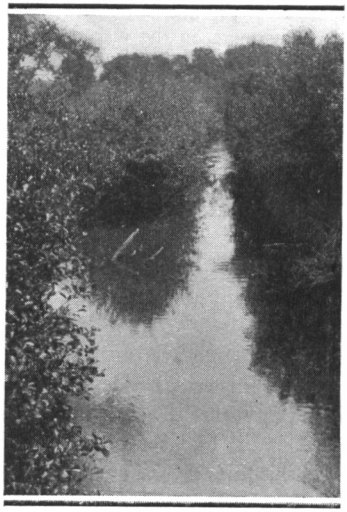
From a post-mortem inquisition in the Bodleian Library we learn that this Alexander Collyn died February 14th, 1550, and his son was Stephanus Collyn, inheriting in " Kancia et Sussex—Manerium de Hothleigh," and, inter alia, " unum molendinum fferreum vocatum an Iron Mill alias dictum a hammer mill."

Stephen was in possession in 1574, and signed the bond. The forge, place-names and forge cinder that is to be found must belong to this era. I believe it to have been a water-power bloomery.

" Hoadley Forge " was mentioned in 1629 as converting sows, but it seems to have fallen into decay, as it is not mentioned in the 1653 lists.

S. A. C., II., p. 213.

It is stated by Lower that it was worked by the Barhams, but I cannot trace his authority. It is clear that William Benge, who married a sister-in-law of John Barham of Shoesmiths, bought Faircrouch in 1692, and rebuilt the works as a furnace in 1695, making them the most extensive of any in the Weald. Swedenborg, the



The "Great Ditch" at Hoathly (Lamberhurst).

great Swedish philosopher and mystic, gave in his work "De Ferro," 1724, a rough sketch, which is the only engraving we have of a Wealden furnace :— See p. 78.

"Just at the time of their completion, they were honoured with a visit from the Princess (afterwards Queen) Anne and the Duke of Gloucester, who were sojourning at Tunbridge Wells; from which circumstance the name was derived. The undertaking was not successful. Mr. Benge had no sooner brought it to perfection than he failed. The property then passed into the hands of Mr. Gott, and was let to Messrs. Legas and Harrison, who carried on the works with great vigour and success. Cannon were cast here for the service of the navy. Mr. Legas amassed a fortune to the amount, it is said, of £30,000, and died in 1752. He was succeeded by Mr. Richard Tapsell, who had married his niece. This gentleman sunk the money acquired by his uncle, became a bankrupt in 1765, and died in indigence about twelve years after. He was the last ironfounder connected with Wadhurst. The foundations of the furnace are still traceable, and near them is the proof-bank. The soil, for some distance round, abounds with cinders. S. A. C., II., p. 213.

If we may credit the general report of the parish, the cannon cast at Gloucester Furnace were not always employed for the use of the British

navy, but were conveyed by smugglers to the coast, and there shipped for the service of French privateers, in the war then waged against England. This villainy was detected, and the parties engaged it in were fined to a large amount. The government contracts were of course withdrawn; and from this period we may date the decline of the works."

The foundations are no longer visible.

Hasted's Kent, V. II., p. 387.

In 1782 Hasted mentions Lamberhurst as being the only foundry then in Kent, and, apparently speaking of the industry in general, says :—

"Great quantities of cannon as well for the use of Government as the merchants are cast at these furnaces, besides backs for stoves and such like, as well as bars from the best sort of the ore, after having been worked in the forges for that purpose. . . . The iron rails round St. Paul's Churchyard in London were cast at this furnace. They compose the most magnificent balustrade perhaps in the universe, being of the height of five feet six inches, in which there are at intervals seven iron gates of beautiful workmanship, which together with the rails weigh 200 tons 81 lbs, the whole of which cost 6*d*. per lb and with other charges amounted to the sum of £11,202 0 6*d*."

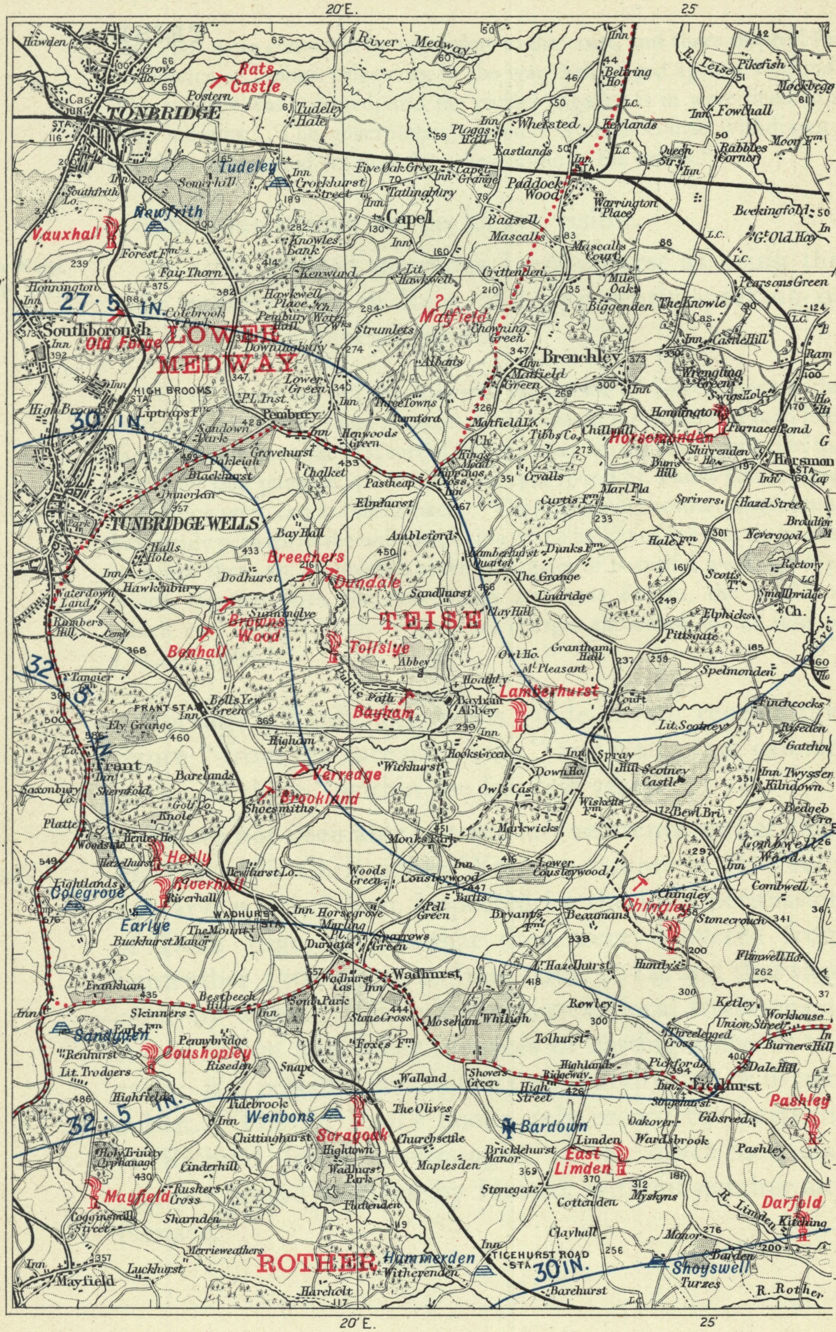
Sprange's Tunbridge Wells guide, 1797, repeats this figure "from the furnace books," and states that cannon were cast there "within the last few years."

See p. 207.

I have not been able to trace any reference earlier than Hasted. Sir Christopher Wren's accounts in St. Paul's Library, which I have inspected by the kind permission of Dean Inge, record that they were delivered from September 13th, 1710, to June 10th, 1714, and that they came by water. There are persistent local traditions at Ashburnham and other furnaces of casting some of the rails; it is possible the contract was subdivided or in part sublet. The St. Paul's books only record the payment to Richard Jones, ironmonger, of the exact sum and rate per pound as given by Hasted, without naming any furnace.

TEISE

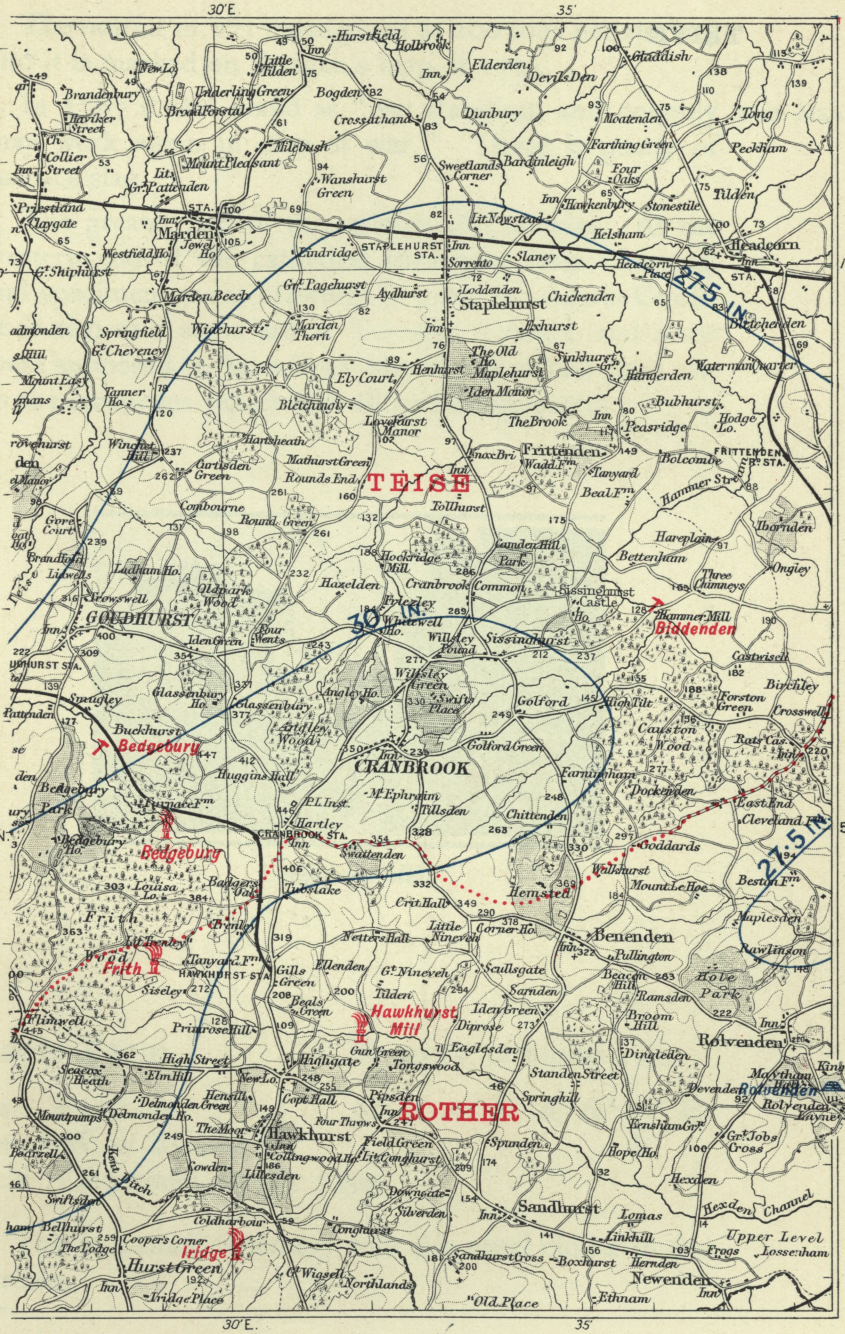
TEISE



FURNACE   FORGE   BLOOMERY   ROMAN BLOOMERY

Scale 2 Miles to an Inch
0 1 2 3 4 Miles

TEISE



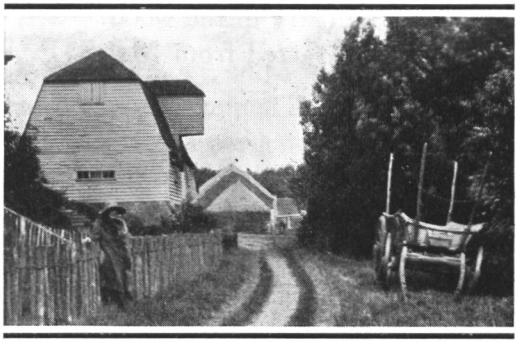
FURNACE FORGE BLOOMERY ROMAN BLOOMERY

TEISE

The output in 1717 was given as 200 tons per annum, and it is marked on Budgen's map of 1724.

In 1787 it was noted as "yet standing, and possibly may work again in case of war." There is plenty of furnace slag. Weale MSS.

The greater part of the railings still remains. At the western end of the cathedral they have been removed, and specimens are at Hastings (a gate) and Lewes Castle. It is also said some are at Toronto, Canada, and some were supposed to have been lost at sea, which gave rise to the erroneous report that all had disappeared.



Lamberhurst Mill.

Early Farm Bloomery, or burning site

Par. Wadhurst. 51° 4′ 10″ N. 0° 16′ 55″ E.
1m. S.W. of Riverhall. I
P.N. Cinderfield, Cinder shaw.

This is a small bloomery with the usual cinder in the stream.

W.I. T

Colegrove Wood Bloomery

Par. Rotherfield—Frant. 51° 4′ 30″ N. 0° 16′ 0″ E.
⅝m. N.E. by N. of Saxonbury Camp. A
P.N. None.

During the excavations at Saxonbury Camp in the spring of 1929, Mr. I. D. Margary, who was assisting Mr. S. E. Winbolt in the digging, came on some ancient cinder. On searching the gill in Colegrove Wood, to the east of the camp, I found cinder very similar to that at Sandyden, 1½ miles south. These two sites, with probably others yet to be discovered in the neighbouring gills, no doubt provided the cinder of the camp referred to below. There is clear evidence that charcoal burning has been a regular industry in the wood.

The following is extracted from Mr. S. E. Winbolt's account of the excavations :—

"The inner area produced flint flakes, some of which are obvious, but indeterminate artifacts : numerous sherds of pottery of La Tene III date i.e., the work of British Celts between 100 B.C. and 43 A.D., and extending also well into the Roman epoch. . . . Along with the pottery and confined to the inner area, was found a fair amount of British iron slag, specimens of which I found in the stream in Colegrove Wood . . . with the pottery was found in many places in the inner area iron slag, the latter being definitely dated by the former. It is nearly always rusty in appearance, and in shape made up of horned protuberances, contrasting markedly with the smooth, glassy surfaced lumps of Tudor iron slag. The slag was beyond doubt powdered to grit some of the pottery."

Specimens of these cinders are at the Municipal Museum, Tunbridge Wells (s.g. 3.83).

Henly (Bunklaw or Brinklaw)

Furnace ? Forge

Par. Frant. 51° 4′ 50″ N. 0° 17′ 7″ E.
In Great Wood, 1½m. S.E. of Ch. K
P.N. None.

On a small tributary of the Riverhall stream, running in on the N.W. or Frant side, are two bays that probably are the site of John Carpenter's works, mentioned in only one of the 1574 lists. He was summoned to appear, and gave his bond. Mr. H. M. S. Malden has traced in the Frant Manor Rolls that he inherited the land, including this site, in 1547, although the name Bunklaw does not appear. It is not given in the 1653 lists, so had probably ceased by then.

There is a little cinder, and I found a small fragment of pottery which was determined by Mr. Reginald A. Smith as being Roman, New Forest ware, probably 3rd century.

Riverhall Furnace and forge

Par. Wadhurst, borders of Frant.
Furnace, 51° 4′ 45″ N. 0° 17′ 10″ E.
Forge, 51° 4′ 40″ N. 0° 17′ 30″ E.
1¼m. N.W. by W. of Wadhurst Station. K. I
P.N. Furnace Wood–shaw–field (Frant side); Furnace bottom–field–Furnace field Wood, Furnace field shaw, Forge field, Upper Forge field (Wadhurst side).

In 1574 these works belonged to Nicholas Fowle of Mayfield, and it is recorded in two lists that it was "employed to none other use but to the makeing of ordinance and shott," although the parish is corrupted

in one to " Garderste in Sussex," and further to " Gowdherst " in the Stowe list. He was a prosperous man, and contributed £40 towards the Armada defences. Originally of Lightlands, on the Frant side, he built the Riverhall mansion in 1591. He died in 1634. By 1664, however, both furnace and forge are described as ruined, although the family remained there well into the 18th century. Budgen's map, 1724, shows their arms, but not the works. The furnace bay is some way above the house. I am informed by Mr. H. M. S. Malden that thirty years ago the bricks of the buildings were to be seen in plenty. There is a smaller bay higher up. The forge pond is in two divisions, the upper of which was in water about five years ago. The lower part has still water in it, and had a large oak shoot at its bottom end which poured the water to an overshot wheel—the corn mill was still in existence some forty or fifty years ago.

S. A. C., I., p. 35; II., p. 218.

Cinder and slag still remain at both sites.

Chingley or **Shingley Furnace** Furnace

Par. Goudhurst, Kent. 51° 4′ 7″ N. 0° 24′ 20″ E.
1¾m. N. of Ticehurst Ch. K—s.g. 2.02
P.N. Furnace field, Hops in Furnace field, Furnace Pit shaw (on Ticehurst side of river).

In the 1574 lists this is given under Kent, as belonging to Thomas Darell (of Scotney) and worked by Thomas Dyke of Horsemonden, who gave his bond. In 1565–6 this furnace supplied 7*s.* 4*d.* worth of " plates " for Sir Henry Sidney's steel works near Robertsbridge. There is no later record. It must always have been quite small; there are remains of a bay and a very little furnace slag.

Chingley or **Shingley Forge** Forge

Par. Goudhurst, Kent. 51° 4′ 30″ N. 0° 24′ 10″ E.
1¾m. S. of Lamberhurst Ch. I
P.N. Old Forge Farm.

In January, 1628, Alexander Thomas was indicted at Lewes for having carried 20 tons of sows from Snape to Chingley Forge without having laid down cinders according to the law. Comm. R. Garraway-Rice.

In 1589 Henry Darrell, of Scotney, the brother of Christopher Darrell, sold the manor to Sir Edward Culpepper, who resold it about 1626 to James Fletcher, of Priesthawes, and Edward Pelham, of Catsfield, including "the fforge or yronworke called Chingley fforge." "Wakehurst," G. W. Loder, p. 52.

This forge was not in the 1653 lists, but in 1717 its output was given, under Kent, as 40 tons per annum. It is marked on Budgen's map, 1724.

E. W. Hussey, Esq., of Scotney Castle, has kindly informed me that he has a rental showing that in 1726 there was a tenement and forge and several pieces of land in the occupation of John Legas. Legas was then working Gloucester Furnace. Mr. Hussey also states that about ninety years ago a quantity of cinder was dug. There is still some showing at a spot where a hammer-dyke commences, although all traces of the bay and the connecting leat from the river have disappeared.

Brookland Forge 1¾m.
Verredge Forge 2m. } E. by S. of Frant Ch.

Forges

51° 5′ 25″ N. 0° 18′ 30″ E.
51° 5′ 35″ N. 0° 19′ 15″ E. I. I
Par. Frant and Wadhurst.
P.N. Upper and Lower Pond field, Brookland Pond.

S. A. C., LVI., pp. 138 *et seq.*

These two forges belonged to the well-known family of Barham, of Wadhurst. (See Scragoak.) John Barham of Woodland and Butts, "Iern man," bought them, together with Bartley Mill, from Humphrey Lewknor, February 10th, 1521; he was assessed for them in 1543. He died in 1555, leaving them to his second son, John Barham, of Faircrouch, who in 1574 had "2 forges in Frant, in other man's hands." He died in 1583, leaving Brookland, with its tools and implements, and Bartley Mill, to his son, John Barham, of Maidstone, then a minor, but his executor was to have "my fforge called Veredge Forge" for "ffyve years next ensueing."

This Barham died in 1591, and among his possessions were "stock of Iron, Coale and sowes"—his son, John Barham, of Shoesmiths, is recorded in the Frant Manor Rolls as holding Brookland, Verredge, and Barkley Mill in 1635, extending to Griggs Wood (adjoining Upper Pond field), and there was an inquiry as to encroachment on Griggs Wood, caused by digging for mine, on October 13th, 1634. This Barham and others were indicted at Lewes Quarter Sessions in January, 1629, for having brought sows from Snape and Coushopley to Brooklands and Verredge. He died in 1640, leaving, inter alia, "Brooklands, Verredge Ironworks" to his son, John Barham (the second), of Shoesmiths, who did fealty for

Comm. R. Garraway-Rice.

them May 15th, 1641. In neither his will nor the Manor Rolls is Brooklands then called a forge. This Barham died in 1648, and his very fine armorial graveslab, dated December 5th, 1648, in Wadhurst Church is perhaps the most elaborate one existing. His son, the third of Shoesmiths, inherited and was admitted as tenant in 1653, and is again recorded in 1655, 1660 and 1669. He died without issue, and owing to the undue influence of his wife, Lucy, "a very subtle ill-tempered woman," left his estates to her, away from his own family. At her death they went to her nephew, George Egles, of Uckfield. Egles squandered his patrimony, and there is a deed at Lewes in the Ingram Collection, No. 147, dated October 6th, 1743, concerning (inter alia) "four pieces of land where a Forge lately stood called Brookland Forge, two of which pieces containing 3 acres were formerly covered with water." (Kindly extracted by Rev. W. Budgen.) It is probable, however, that the forge had ceased before the 18th century, and that the deed is dealing with past history. Neither Brooklands nor Verredge is mentioned in the 1664 lists.

S. A. C., LVI., p. 160.

The ponds of both have disappeared and no traces of the bays remain. Brooklands Pond was partly under the Hastings railway line, and no doubt the heavy embankment works destroyed the evidence. However, a little below the culvert there are fragments of stone and ancient bricks in the stream, and yet further down an accumulation of large masses of forge cinder in the water and in the banks, covered with 3 or 4 feet of silt. There was found here recently a liard (French copper coin) dated 1655.

Brooklands.

Verredge Forge was rather more than half a mile below Brooklands, close to Little Shoesmiths. The stream here has been diverted at some time between

Verredge.

1840 and 1870; the southern portion of the field south of the homestead is still in Wadhurst parish. There is a little forge cinder and an admixture of charcoal dust in the soil. The hammerdyke ran apparently from the oasts to the former Barkley Mill pond, which is mentioned in the Barham wills, but probably became silted up, and was superseded by the present leat. The portion of its site in Wadhurst is called Old Pond Mead in the tithe apportionment. The mill was seemingly always a corn mill.

Horsmonden — Furnace

Par. Horsmonden and Brenchley, Kent.

51° 8′ 35″ N. 0° 25′ 20″ E.

½m. N.E. of Horsmonden Heath. K

P.N. Furnace Pond field, Little Furnace field.

Thomas Bartle, or Bartell, owned this furnace in 1574, but it was worked by Mr. Ashburnham. From the itinerary of Pedley's journey it is evident that he expected Mr. Ashburnham to be at Horsmonden, for being at Frant on March 4th he made the only divergence from his well-arranged route by riding south to Ashburnham on the 5th, and returning to Tonbridge on the 6th of March.

In the reign of James I it belonged to John Browne, and by 1613 he had established a very extensive trade in guns both for the State, for which he had the monopoly, and for export. His career and the important part that he played during the Civil War are more fully dealt with in the chapter on The Later Gunfounders.

See p. 162.

The predominance of this furnace was doubtless due to its comparative nearness to the Medway, which gave an easy route to the Thames and London, free from the risk of interference by the enemy which attached to the Channel ports, especially during the war with the Dutch, at which time vessels from Rye, Pevensey and Newhaven had to sail under convoy.

It was flourishing in 1669, and described by Edward Browne, apparently no relative to the gun-founding family; but it was not among the Kent furnaces in 1717 and was probably disused before then. The pond, a fine sheet of water, is still in existence. Below the long and high bay is a great accumulation of slag, and a "bear." The elaborate spillway is perhaps of a later date.

See p. 79.

Matfield ?

Par. Brenchley, Kent. 51° 9′ 45″ N. 0° 21′ 30″ E.
2¼m. N.W. by W. of Ch.
P.N. Cinderfield, Cinderhill Wood (these are probably not connected).

There is a large bay across the valley here, with no visible slag or charcoal. Below the bay are contorted masses, having the appearance of the roots of large trees, of a rusty iron colour. These are composed of coarse sand, held together with iron oxide. The soil of the bay and fields is clay without sand. It is considered by Alderman J. H. Every, of Lewes, a practical iron-founder, to be spent moulding sand.

This site may possibly have been an adjunct to John Browne's foundry at Horsmonden.

Bedgebury Furnace Furnace

Par. Cranbrook, Kent. 51° 5′ 10″ N. 0° 29′ 5″ E.

1m. W. of Cranbrook Station, along railway. K

P.N. Furnace Farm, Furnace field, Minepit field and shaw.

Bedgebury Forge Forge

Par. Goudhurst, Kent. 51° 5′ 40″ N. 0° 28′ 5″ E.

2m. W. of Cranbrook Station, along railway.

P.N. Forge Farm, Pond field, Forge Mead, Forge Hop garden, Little Forge field.

In 1574 Sir Alexander Culpepper had " one furnace in Gaudherste a†s Badbridge furnace in Cranbrooke pishe " —in another list spelt Badbury. He was living in Lord Montague's house in London when he was warned to appear, but apparently did not sign a bond. The formality seems to have been sometimes waived for people of high degree.

In 1664 the furnace was " discontinued before 1664, but repair'd stock'd upon account of the warre."

The forge was not mentioned at either date, but may have been considered to have been the same establishment.

Both sites are large hop farms; the furnace bay remains and some slag, but all traces of the forge have disappeared.

Hammer Mill, Biddenden Forge

Par. Biddenden, Kent. 51° 6′ 50″ N. 0° 36′ 10″ E.

1½m. E. of Sissinghurst Ch. I

P.N. Hammer Mill, Hammer Wood, Hammer Stream.

I cannot trace this in the 1574 lists, but it is probably " Horsfield in Cissingherst," continued in hope in 1667.

The hammer-pond—the most easterly one of the Weald—has been a very large one; it is now an orchard. In 1802 a report was made by Alexander Sutherland, engineer, on a proposed canal from the Medway at

Yalding to the Rother near Tenterden, and so to Rye. The pond, then 30 acres, noted as "a bog generally," was to be embanked and made the head reservoir. He mentioned the former importance of the Wealden iron-works, and suggested that the canal might serve to revive them by bringing coal cheaply.

There was to be a branch to Lamberhurst.

The bay is high, and there are still some piles in the stream where the sluice stood. The present small mill-pond is of much later date, although the deep cutting that carried off the water may have been the old hammer-dyke. There is a little cinder.

Hempsted Roman Road.

Par. Benenden, Kent.

1½m. N.E. of Ch. A.B.C.

P.N. None.

Although the cinderbed has not yet been discovered, this must be put on record owing to the great amount of cinder that has been used in its construction.

From the ancient road running south from Maidstone through Staplehurst to tidewater at Bodiam, there branches off at Hempsted at right angles a straightly aligned track running eastward towards Tenterden and Lympne. Both east and west of Goddards Green, where it runs through woodlands, the agger is high and well preserved, and shows on its surface for a very considerable distance great quantities of cinder of pre-Roman type. While surveying this with me, Mr. I. D. Margary found a fragment of hand-made pottery, probably La Téne III. The bloomery, yet to be discovered, that furnished the many tons of cinder used in the road, must have been a very considerable one. Mr. O. G. S. Crawford found here a lump of cinder of exactly the same type as that dug at Saxonbury Camp.

VII. THE EASTERN ROTHER

This important river rises at Rotherfield, and flows eastward in a deep valley between the Wadhurst and Brightling ridges, which have an average rainfall of 32½ inches. There are numerous affluents on both north and south sides which furnished valuable water power. The Wadhurst clay, the main iron-bearing formation, practically forms the sides of this valley. The number and density of the ironworks sites is therefore naturally great. For convenience I have divided this area into three.

Upper Rother.—The Mayfield district above Witherenden Mill.

Middle Rother.—The portion between Witherenden and Robertsbridge, including the Limden on the north and the Dudwell on the south.

Lower Rother.—The main stream, together with the Kent Ditch and Hexden Channel. From Udiam Bridge, just below Robertsbridge, the river was navigable to the great Camber estuary, and the important ports of Rye and Winchelsea, until their decay through silting, were the seat of a considerable trade in shipping iron and ordnance.

Maps, pp. 288, 400.

Argos Hill Bloomery

Par. Mayfield. 51° 1′ 30″ N. 0° 13′ 55″ E.
1⅜m. W. of Ch. F
P.N. Cinderfield Wood, Cinderpit field.

There is ancient type cinder in the bed of the infant Rother here; the fields are in pasture.

Meeres Farm Bloomery

Par. Mayfield. 51° 0′ 0″ N. 0° 14′ 10″ E.
2m. S.W. of Ch. AF
P.N. Cinderfield.

The cinder here, of type very similar to Hore Beech, is from 10 to 12 inches below the turf, and is only exposed in rabbit holes and by the watering-place on the brook. It must be very ancient.

Old Mill Furnace

Par. Mayfield. 50° 59′ 50″ N. 0° 15′ 50″ E.
1⅝m. S. of Ch. K
P.N. Great Furnace, Furnace Wood, Butlets, Pinstop.

This site is not mentioned in 1574; it was most likely founded later. In 1617 John Baker bought lands and the rectory at Mayfield. The following, kindly communicated by Colonel D. MacLeod, throws much light on its history.

"Mayfield," Miss Bell-Irving, pp. 142–161.

Extract from Calendar of Deeds in Drake Collection. No. 131. 16 Dec. 16 Jas. I. (1618).

Deed of acknowledgment by John Baker of Mayfeild gent. to Thomas Aynscombe of Mayfeild esq. that a way which John Fuller gent. Richard Maynard deceased and others farmers and occupiers of the Furnace of the said John Baker called Olde Myll in Mayfeild have used to carry ride and goe with Oxen horses, courtes, waynes and other carryages both for coles myne and other things to and from the said furnace and lands of the said John Baker called Isenhurst and Old Myll lands through lands of the said Thomas Aynscombe called Cockeshult and Homan Grove in Mayfeild adjoining the lands of the said John Baker is in no way as of right but only by leave and goodwill of the said Thomas Aynscombe.

Witnesses Thomas Houghton, Thomas Bordeman, Thomas Mepham.

Colonel MacLeod informs me that the farmhouse was the furnace house; the pond covered the field which lies south of the house, so that the existing road, it seems, must have been the dam, or part of it. There is much smelting refuse behind the old farmhouse, lying about on the surface. He was told also that the old way for waggons used to be along the bed of the stream south of the present road, which rather points to the fact that when the stream bed was used as a high road the existing road was unfit for wheeled traffic, *i.e.*, was too narrow on top, as a furnace dam would be.

Moat Mill — Forge

Par. Mayfield. 51° 0′ 10″ N. 0° 16′ 15″ E.
1¼m. S. by E. of Ch. I
P.N. Forge field, Forge and Toll field.

Near the junction with the Rother of a rill running down from Mayfield there are many lumps of Tudor forge cinder, only visible when the water is low. There seems to be no record to fit this site, but it could well have been the conversion forge of Old Mill, half a mile away.

Colonel D. MacLeod reports:

"Traces of pre-Tudor slag are to be found in the fields around Moat Farm (not Moat Mill). I am informed that the fields here are full of it, but being now all under grass I failed to locate the bed nor could anyone tell me where the bed or beds are. The traces which I found were in the ditches."

Bungehurst — Furnace

Par. Heathfield. 50° 59′ 20″ N. 0° 16′ 55″ E.
2¼m. S. by E. of Mayfield Ch. K
P.N. Furnace field, Furnace Shaw, Pond field.

Miss Bell-Irving says this was worked by the Baker family. This would be some time during the 17th century, but it does not appear in any list. They held the manor from the Pelhams from 1587 to 1777. "Mayfield," p. 176.

Colonel D. MacLeod describes this as follows:

"This is situated on the boundary between the parishes of Mayfield and Heathfield, half a mile S. by E. of Bungehurst (otherwise Walwyns Farm) at the N. end of Newick Wood, on the tributary of the Rother which joins that river at Scotsford Bridge (6″ O.S xxix SW.). The footpath from Bungehurst to Street End Lane passes some yards N. of the lower bay. There are two bays some 220 yards apart, whose dimensions are much the same, viz.: 12′ to 14′ above the level of the stream and some 50 yards across. Sussex N.&Q., Vol. I., p. 224.

The ground below the lower bay is black with charcoal, and there is a large quantity of scoriæ of Tudor or later type on the surface. Traces of the furnace buildings, including some scorched brickwork, remain on the site."

Broadhurst — Furnace

Par. Heathfield—Burwash. 50° 59′ 37″ N. 0° 19′ 31″ E.
2⅝m. S.E. of Mayfield Ch. K
P.N. Furnace field, Furnace shaw.

I can trace no record of this small furnace, unless it was the Morley furnace mentioned by Lower under Hawksden, which is quite near. There are three rather high bays, now broken, across the narrow gill, and blast furnace slag of the usual type. Found by Colonel D. MacLeod.

Sandyden Gill

Bloomery

Par. Wadhurst—Mayfield. 51° 3′ 25″ N. 0° 15′ 45″ E.
2⅜m. N. of Mayfield Ch. AFG
P.N. None.

Mr. H. M. S. Malden, of Frant, discovered this site in 1929. The extremely deep and rocky gill descends rapidly in a series of steps, and cinder of an ancient type occurs in the stream for perhaps half a mile. The actual site of the bloomery cannot now be traced; very possibly it has been washed away. The stream lower down supplied Coushopley Furnace.

Coushopley—Coushossley—Cushaplea

Furnace

Par. Mayfield—Wadhurst. 51° 2′ 50″ N. 0° 17′ 20″ E.
2¼m. N.E. of Mayfield Ch. K
P.N. (M) Furnace Bottom, Cinder Mead.
(W) Furnace Roughet, Furnace Wood.

S. A. C., II., p. 215.

This does not occur in the 1574 lists. Lower states it belonged to the Penkhurst family, and afterwards to the Dykes. It was working in 1664, when it had made guns and shot, and also in 1707. Marked in Budgen's map, 1724. The bay, a large one, is largely composed of slag, which has been much dug recently.

Wenbons

Bloomery

Par. Wadhurst. 51° 2′ 30″ N. 0° 19′ 50″ E.
1½m. S. by W. of Ch. ABF
P.N. Cinderfield, Cinder Wood, Sunderham (on 6-inch).

The field is pasture, but there is bloomery cinder in the path leading down to it from the farm, mixed with blast furnace slag, probably from the neighbouring Scrag Oak Furnace, which at one time belonged to the Maunsers, who also owned Wenbons.

"Story of Wadhurst," pp. 62, 63.

ROTHER

"WEALDEN IRON"
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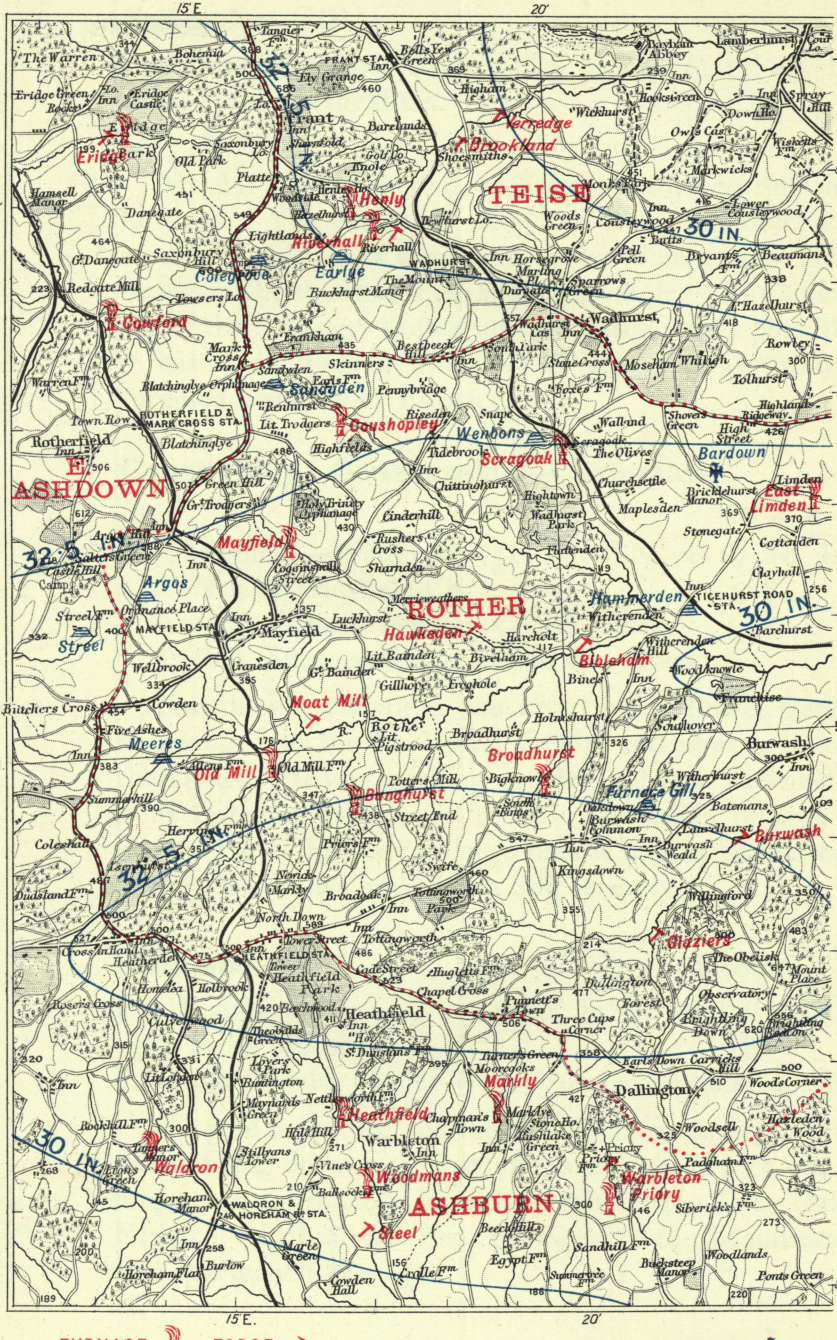
ROTHER



ROTHER

"WEALDEN IRON"

FURNACE FORGE BLOOMERY ROMAN BLOOMERY

ROTHER

Scrag Oak.

Scrag Oak or **Snape** Furnace

Par. Wadhurst. 51° 2′ 35″ N. 0° 20′ 10″ E.
1¾m. S. by W. of Ch. K
P.N. Furnace Plat, Furnace Orchard, Furnace Shaw, Furnace Rakes, Upper and Lower Furnace Fields.

This furnace is not in the 1574 lists, so is probably later. The John Barham of that time only held Brooklands and Verredge forges. It was originally the property of the Maunser family in the early part of the 17th century, but it came later into the hands of John Barham of Shoesmiths (b. 1617, d. 1648), who left it to his son John (b. 1642, d. 1724). The date on the fine old house is 1678, but part is probably older. The first-named is commemorated by one of the finest iron grave-slabs in Wadhurst Church, figured by Lower in S. A. C., Vol. II., p. 200. At Lewes Quarter Sessions on January 15th, 1629, several defendants were indicted for having failed to lay down cinders on the roads, having carried cole and mine to Snape, and sows from there to Chingley, Hoadly, Brookland and Verredge forges.

"Story of Wadhurst," p. 62.

Comm. R. Garraway-Rice.

In the 1664 lists "Snape" appears. I believe this to be Scrag Oak as I can trace no other furnace in the valley, although Lower treats it as a separate entity.

It was said to be ruined before 1653, and it does not appear in Fuller's list of 1717.

The bay has been dug away in living memory, and a great quantity of cinder has been taken for the roads, but there is still a big deposit of charcoal dust with slag in it.

SNAPE MINE

A short distance to the north of Scrag Oak in Snape Wood there is an interesting abandoned mine, the last attempt at exploiting Sussex ore. Topley gives the following account, as collected by Dr. C. Le Neve Foster:

Topley's "Geology of the Weald," p. 337.

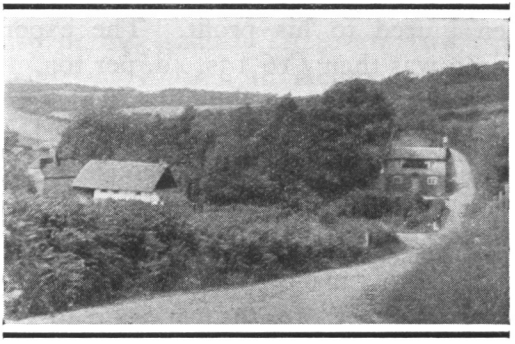
"The mine was commenced in August 1857, and abandoned in September, 1858; the ore was sent into Staffordshire. The ironstone was worked on both sides of the railway, just west of the 53rd milestone, by levels and cross-cuts. On the north side of the railway only one bed was worked, this was 1 foot 9 in. thick, underlain by a hard sandstone. The roof is sometimes bad and required timbering. On the south side of the railway two beds were worked, only one of which could be examined, as the level contained much water; this bed was two feet thick. In this level the ground was softer and required more timber.

The beds of ironstone were very irregular, but were found to be better on the south than on the north side; in both cases, however, the beds died out suddenly and re-appeared at intervals. Several shafts have been sunk from the higher ground.

The ore, a clay-ironstone, was sometimes calcined on the spot. A great deal of raw ore still lies by the side of the railway."

Entrance to Snape Mine.

The main gallery is about 150 yards in length. This gallery is 4 feet 6 inches wide and varies in height from 6 to 8 feet. Parallel galleries are connected with this by shorter ones at right angles. Wrought iron trolley rails about $\frac{3}{8}$ inch by $1\frac{1}{2}$ inch still remain. Parts of the gallery have fallen in, it is little below the surface of the ground. As the mine is alongside the Hastings railway, transport of the ore would have been easy. The little inn below, the "Miner's Arms," preserves the memory of this transient enterprise.



The Miner's Arms, Snape.

Mayfield — Furnace

Par. Mayfield. 51° 1′ 50″ N. 0° 16′ 20″ E.
¾m. N.E. by N. of Ch. K
P.N. Furnace (2).

In 1574 this furnace was owned by Sir Thomas Gresham, the great Elizabethan financial magnate, and was noted as being "employed to no other use but to the makeinge of Ordnance and Shott." Gresham had acquired this manor, which before the Dissolution belonged to the See of Canterbury, before 1570, about the same time as he built the first London Royal Exchange. Mayfield Palace seems to have surpassed his other houses in point of splendour, and contained magnificent furniture, which was valued at £7,553, a large valuation for those days. In 1573 he entertained here Queen Elizabeth. It is said that Sir Thomas built an especial staircase leading to the Queen's apartments that she might not use one in common with anyone else. About this time he was exporting cannon, perhaps cast at Mayfield, and there is a letter extant of October 15th, 1578, that shows how his position as financial agent of the Queen inured to his profit. The export tax on wrought iron was then £16 13s. 4d. per ton. Gresham claimed to pay but £11 on the guns, which was agreed to by the officer as he "was no common merchant." He was summoned to appear "at his house at Austerley," but in common with other important personages, neither appeared nor signed the bond. Gresham died in 1579, and the value of his manors of Mayfield and Wadhurst, with the parsonages there, the park and forges, or iron smithies, etc., were valued at £240 per annum. Miss Bell-Irving states that these were considerable works at a very early period. Here were, in all probability, made

"Mayfield," E.M. Bell-Irving, p. 148.

Hatfield MSS., V.I., Pt. 2, p. 216.

"Mayfield," pp. 175, 176.

the copings of Rochester Bridge, presented to that city early in the 16th century by Archbishop Warham. In an old map of the estate the three ponds for the use of the ironworks measured, two of them over 3 acres and another over 1 acre. In later years they were worked by the Baker family. The old furnace cottage, where their foreman of the works is said to have lived, has only recently been pulled down. The furnace stream close by retains its name, and on the left of the new bridge over it are the remains of one of the huge slag heaps, which was laid open not long since for use in road making. Below this the great hammer pond must have filled the hollow which lies along the course of the stream until it terminates on the further side of the old Tunbridge Wells road, close to the bridge. It was drained off finally when the bridge was built. The cannon at the convent was dug out of one of the cinder beds in these woods about the year 1824, and was placed on top of the porch of the palace, then in ruins. (This gun is now in the convent with St. Dunstan's hammer and tongs.) In 1598 the manor was sold to Thomas May of Burwash, an ironmaster, and in 1617 it became the property of the Bakers, also in the trade. There are two iron grave-slabs in Mayfield Church to members of this family, dated 1669 and 1671. Mayfield furnace was working in 1653, had been discontinued before 1664, but had been "repaired and stocked upon account of the warre" when it "had made gunns and shott for supply of his Maj[ties] stores." There is an entry in the Pelham accounts for Waldron furnace in 1712, of "veins bought from Mr. Baker of Mayfield, from near his old furnace," which shows it was out at that date. The ponds are drained, and the bays gone, but there is still slag.

"Mayfield," p. 77.

The Bay, Hawksden.

Hawksden

Forge

Par. Mayfield. 51° 1′ 0″ N. 0° 18′ 40″ E.
2¼m. E. of Ch. I
P.N. Forge Pond, Old Forge.

S. A. C., II., p. 214.

Lower states that this forge belonged to Thomas Morley of Glynde, who died in 1558, and worked an iron mill and a furnace, from which his daughter's jointure was levied. His great-grandson, Colonel Herbert Morley, the Parliamentary commander, died possessed of these works, which descended to his sons, who parted with it in 1662. Morley perhaps was owner only, as this name does not appear in the 1574 lists, which mention two Mayfield forges worked by Isted and by Richard Greene. Hawksden may be one of these. It was working in 1667, probably by Thomas Sands, whose iron grave-slab is in Mayfield Church, dated 1668, together with a more elaborate one of another Thomas Sands of London, who died 1708. In the Fuller list of 1717 is the entry of " Mayfield sands " as a forge of the capacity of 40 tons per annum. It appears

Dunkin.

on Budgen's map, 1724, but it is not in the list dated 1736. There is a good bay. The pond above, now a hop-field, was quite a large one.

Bibleham — Forge

Par. Mayfield. 50° 55′ 0″ N. 0° 20′ 20″ E.
$3\frac{1}{4}$m. E. of Ch. I
P.N. Forge Farm, Forge Plat, Pond Mead.

Thomas Ellys or Ellis had Bibleham Forge in 1574 and in 1588. At a later date it became Pelham property, and was worked, as was also Brightling Forge, as a conversion forge for Waldron Furnace. There are voluminous accounts of these three works in the British Museum, from 1628 to 1716. The output for this period is dealt with under Brightling. It is mentioned as continuing in 1667, and was worked till 1778. The output is given as 50 tons in the 1717 list, and 40 tons in 1736. According to the Weale MSS., Mr. Collins made about 30 tons yearly in 1788.

Waldron, see p. 381.
Brightling, see p. 301.
"Mayfield," p. 176.
Weale MSS.

There is a bay, but the pond does not appear to have been a large one. It was fed by a long leat from the main stream of the Rother. There is much charcoal dust, but little cinder—one large piece in stream.

It is marked in Budgen's map, 1724, but there is no pond shown in the 1813 1-inch.

Bardown Roman bloomery

Par. Ticehurst. 51° 2′ 20″ N. 0° 20′ 20″ E.

1⅛m. N. of Ticehurst Road Station. B.C.F., s.g. 3.50

P.N. The Burgh (local and doubtful).

This is a very extensive bloomery in a deep gill, the sides of which are largely composed of ashes and cinder. It was discovered in February, 1909, by Mrs. Odell and Mr. Eden Dickson.

"Ticehurst," Mrs. Odell, p. 27.

The thick ashbeds contain many pottery fragments, which were submitted by Mr. Garnet Wolseley to Mr. Reginald A. Smith, who pronounced some of them to be La Tene II and III (150 to 300 B.C.). The majority are of the Roman period and were described in detail by the late Professor Haverfield in S. A. C., Vol. LVIII., p. 195, who dated them as belonging to the second half of the second century A.D.

At the farm is preserved a beautiful specimen—a tiny clay lamp, perhaps a child's toy, apparently made of the local clay. At Messrs. Barham's forge at Stonegate, near by, is a beakless anvil of very ancient type, which has been there for over a century, and is said to have been discovered in the cinder heap.

East Lymden Furnace

Par. Ticehurst. 51° 2′ 10″ N. 0° 23′ 35″ E.

1m. S.W. of Ch. K

P.N. Furnace Shaw, Furnace Shaw field, Upper Pond shaw. Also on estate map, Pond field, Furnace field.

There does not appear to be any record that can be connected with this furnace. Although the bay is a large and high one, the amount of slag is quite small, suggesting that its life was a short one.

Hammerden Bloomery

Par. Ticehurst. 51° 0′ 10″ N. 0° 21′ 50″ E.
At Ticehurst Road Station. B.C.F.
P.N. Cinderbanks, Cinderbank Shaw.

There is much cinder in the little gill below the station, and Colonel D. MacLeod has also found some to the east of Hammerden Farm.

Shoyswell Bloomery

Par. Echingham–Ticehurst. 50° 56′ 8″ N. 0° 8′ 58″ E.
1⅞m. W. by N. of Echingham Ch. A.B.
P.N. None.

There is vermiform cinder, but the bed is not located (Colonel D. MacLeod.)

Darfold (Echingham Furnace) Furnace

Par. Echingham. 51° 1′ 35″ N. 0° 25′ 35″ E.
1⅜m. N.W. of Ch. K
P.N. Great and Little Furnace field, Furnace field shaw, Cinderbanks.

In two of the 1574 lists Darfold Furnace is bracketed with Echingham Forge as being worked by Thomas Glide, as also in Losely, 1588. It is not mentioned in 1653. The record has sometimes been identified in error with Durfold, Surrey.

This is on the little River Limden, at Burgham Farm. The bay is high, and the pond must have been a large one. There is slag, and two large masses in the stream, which has cut deeper through the bay in recent years.

Echingham Forge Forge

Par. Echingham. 51° 0′ 45″ N. 0° 25′ 25″ E.
¾m. N.W. by W. of Ch. I
P.N. Forge lane, Forge brook, Forge wood, Forge house, Forge ponds, Forge Hop garden.

This is one of the iron mills complained of by the portsmen in 1549—the Commission placed it "within five miles of the salt water," which is fairly correct, as the Rother was then navigable to Udiam Bridge.

The owner of this forge in 1574 was Sir Robert Tyrwhitt, or Tirwright. It was worked by Thomas Glide (Glyde, Glede, Glode) of Burwash, who alone signed the bond. It seems to have been laid aside in 1667, but this must have been only temporary, for its output in 1717 was 50 tons, as high as any Sussex forge. It drops out, however, in the lists of 1736 and 1750, although marked by Budgen in his 1724 map.

This is a river forge, drawing its water from much higher up the river by a long leat which has been traced by Mr. J. E. Ray. The bay has been levelled, but there are several large lumps of forge cinder near the cottages.

The hammer and anvil are preserved at Boarzell, the seat of the late Sir Frederic Fison, having been removed from a farmhouse on his property.

Pashley Furnace

Par. Ticehurst. 51° 2′ 25″ N. 0° 26′ 20″ E.
1⅜m. E. by S. of Ch. K
P.N. The Ponds, Pondfield Shaw, Mill Wood, Mill field, Upper and Lower Brickhouse fields.

In 1543, Sir James Boleyn, the uncle of Anne Boleyn, sold Pasheleygh to Thomas May the father and Thomas May the son, including "one furnace." Thomas May seems to have leased the estate previous to the sale. "Ticehurst," Mrs. Odell, pp. 134–174.

In 1574 Thomas Maye of Ticehurst appears as holding a furnace (in one list called a forge) at Echingham, which probably refers to Pashley, part of the estate being in Echingham parish. Perhaps Forge Brook and Forge Field piece in Echingham, where the same stream joins the Limden, may mark the site of a forge in connection.

From a Pashley MS. noted by Mrs. Odell, we know that Anthony May owned two iron mills and eight acres covered with water in 1614, but the entry of 1689, "the Brickhouse field, now divided into two closes, adjoyning and lying East from the place where the Furnace stood, and North from Boarzell Wood," shows that it had then been abandoned. It is not in the 1653 lists.

The bay is a very long and high one, in dense woodland, and there is abundance of furnace slag.

Cinderburgh, Echingham — Bloomery

Par. Echingham. 51° 1′ 20″ N. 0° 27′ 15″ E.
1¼m. N.E. by N. of Ch. F
P.N. Little and Great Cinderburgh, Forge field Pit, Forge Brook.

This ancient bloomery is now an apple orchard on Bellhurst Farm, cinder has been found in planting the apple trees, and there is some in the little brook at the lower end of the fields.

Bugsell — Forge

Par. Salehurst. 51° 0′ 15″ N. 0° 27′ 25″ E.
¾m. S.E. of Echingham Ch. I
P.N. Buggs Hill Forge Farm, Forge field, Forge Brook.

This is probably the only instance in which the 1574 lists are duplicated in error. One entry, with the master's name left blank is "—— Buggsell, one fordge in Salehurst" (the correct parish), the other, "George Maye, a forge called Budgells in Burrish pshe."

Losely, 1588, makes Maye's forge "Brodgell in Burrush parishe." It is not far from the Burwash boundary. George May was warned at and signed as of Burwash. It was working in 1653, but ruined before 1664.

The present corn mill was not built till 1777, by J. S. (Snepp), according to the date cut on the wall. It is on the main stream of the Rother. There is forge cinder in the garden ground around.

Furnace Gill, Burwash — Bloomery

Par. Burwash. 50° 59′ 23″ N. 0° 20′ 46″ E.
2¼m. S.W. Burwash Ch. A
P.N. Great and Little Furnace fields, Furnace wood, Furnace Shaw, Mill pond field.

S. A. C., II., p. 208.

This is the "air furnace on Goadsoal Farm" mentioned by Lower.

Colonel D. MacLeod reports that there are several sites on either bank of the stream running through Bough Wood and this gill, also one or more ore-burning sites, which may or may not have been used for hop drying. No Tudor slag has been found, bloomery cinder only.

Brightling or Glaziers Forge

Furnace and forge

Par. Brightling—Burwash. 50° 58′ 0″ N. 0° 21′ 0″ E.
2⅛m. W. of Brightling Ch. K. I
P.N. Glaziers Forge, Forge Meadow, Forge House.

In 1574 this was worked by Thomas Stollyan for Sir John Pelham; at a later date it was worked by the Pelhams in conjunction with Waldron Furnace and Bibleham Forge. From the Pelham accounts we gather much information regarding it. The name is usually Brightling, but occasionally the clerk writes Glaziers. John Glazier for many years up to 1652 was paid a rent of £1 per annum for the water-course across his land, and presumably his name was colloquially attached to the forge. The sows were brought from Waldron, but there were occasional purchases from Rushlake, Mr. Fowle, and Mr. Baker. The iron made was usually bars, but a good many "short broads" were made, and there is an entry in 1666 of 6½ tons of "anconeys" made for Richard Messenger. The wood was, as a rule, from the Pelham woods, but some was bought from John Glazier and from Mr. Thankful Heepden of Burwash in 1652—an example of the Puritan nomenclature of that period. In 1713 there is an entry, "some mistake in carrying, the marks were not very plain on the last sowes." Perhaps the discovery, a few years ago, of one of the sows on the down between the forge and the high road has some connection with the discrepancy. It is thought to have been "scrounged" in transit, and used in constructing a lime kiln. It is now fixed to the wall of Mr. J. H. Every's office in Lewes, and has been sawn through, showing the good quality of the iron.

See pp. 381, 295

See p. 124.

The production of bar iron at the two forges may be summarised as follows :—

Period.	Average Tonnage per Annum.	
	Brightling.	Bibleham.
6 years, 1639–45 . .	119½	73½
10 „ 1646–55 . .	87½	62
10 „ 1656–65 . .	57¼	56
13 „ 1666–78 . .	52½	49
A break in the accounts occurs here.		
6 years, 1692–97 . .	28	33
11 „ 1698–1708 . .	41	50
The Fuller list of 1715 gives .	40	50
and that of 1750 . .	not included	40

S. A. C., XXXVII., p. 69.

On July 30th, 1715, the son of Sir Thomas Pelham, deceased, mortgaged a great part of his lands, including Glaziers Forge.

The forge is situated in a deep valley in Dallington Forest, from which much of the fuel was obtained. It is not on the main Dudwell stream, but on a tributary. There were two ponds, of which the bays remain. When the ancient farmhouse was renovated in 1927, very large deposits of charcoal and cinder were exposed. Much of the cinder is furnace slag, which seems to point out that after 1715 a furnace existed. This is borne out by the presence of a half of a cannon shot mould. It is marked as a forge in Budgen's map of 1724. The marking on the 1813 1-inch is not sufficiently clear to show if the pond was then in water, but it was dry in 1839. This is the only site actually on the small area of Purbeck beds, in Sussex, but unless these beds were used for flux in the conjectural late furnace, the fact has no particular interest.

Burwash Forge Forge

Par. Burwash. 50° 59′ 13″ N. 0° 22′ 12″ E.
1⅜m. S.W. of Ch. I
P.N. Forge, Forge Wood, Forge field, Hither, Mid, and Farther Furnace fields.

Shown on Budgen's, 1724, and Colonel Mudge's, 1807, without a pond.

This is called in one of the 1574 lists, "the nether forge in Burrishe," held by John Collins, who was described as "an old man of 80 years and not able to travell." Although warned he did not appear or sign. The "nether forge" would have been so called in distinction from Brightling Forge, higher up the river on the parish boundary. I think Mr. Trower is in error in identifying Collin's forge with the latter. S. A. C., XXI., p. 112.

Mr. Trower relates :— P. 113.

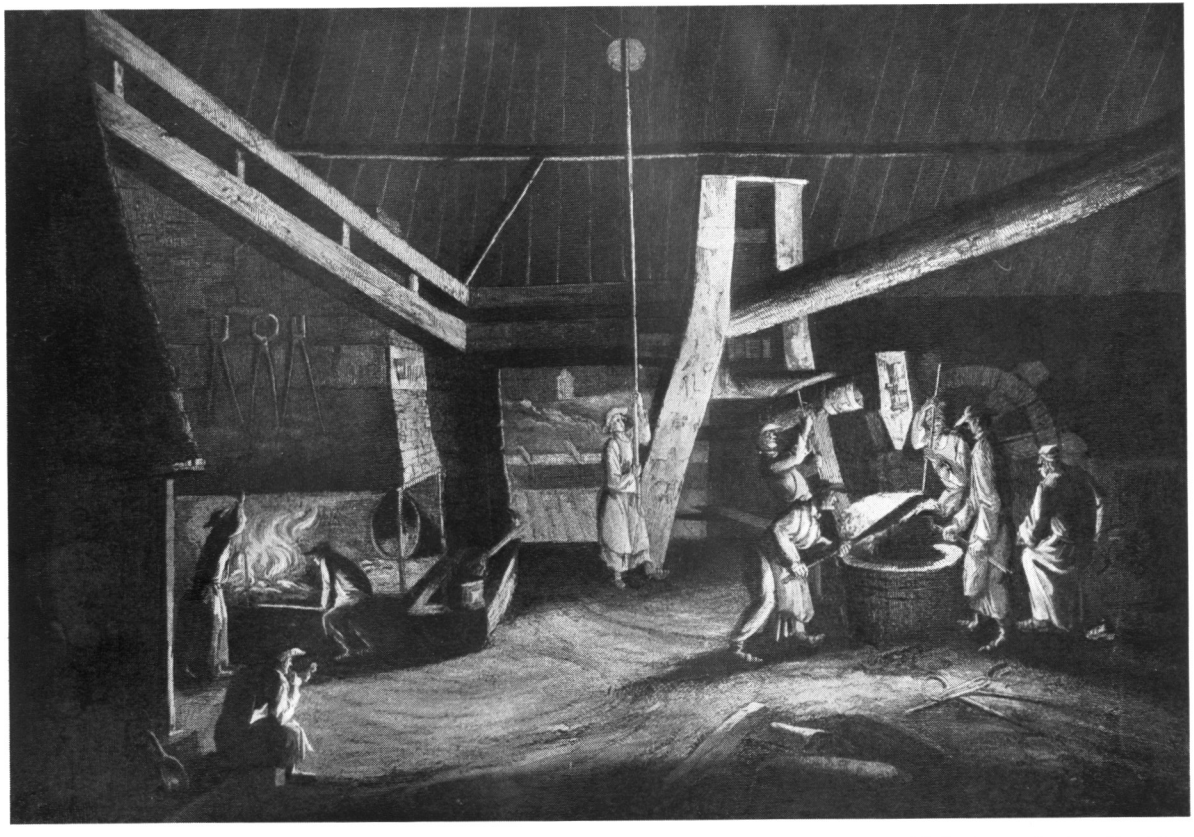
I have examined the records of a curious Chancery suit in 1592, between Robert Cruttenden and Thomas Hepden, names which have ever since been known names here, for the performance of an agreement by the former to purchase of the latter an "iron forge or ironworks, known as Burgherst forge, the inheritance of one Henry Colley, and of a certain stock of coal lying at the same forge containing the number of 300 loads, being very necessary and beneficial for such persons as should occupy the said iron forge."

The forge continued in 1667; in 1717 its output was 40 tons, and the same in 1736.

We have an interesting account of it in the poem "The Village Curate," first published in 1788, by the Rev. James Hurdis, the friend and imitator of Cowper, who was curate of Burwash from 1785 to 1791, as follows :—

". . . . mark the diſtant forge
Deep in the valley, jutting its low roof
Againſt the ſtream, cloſe by the trickling floodgate,
And thither turn their ſteps. I love to ſee
How hardly ſome their frugal morſel earn;
It gives my own a zeſt, and ſerves to damp
The longing appetite of diſcontent.

See, pale and hollow-ey'd, in his blue ſhirt,
Before the ſcorching furnace, reeking ſtands
The weary ſmith. A thund'ring water-wheel
Alternately uplifts his pond'rous pair
Of roaring bellows. He torments the coal
And ſtirs the melting ore, till all reſolv'd
Into a perfect lump; then ſeizes faſt
With his ſtrong forceps the unwieldy maſs,
And drags it glowing to the anvil. Eye
Can ſcarce attend it, ſo intenſe the heat.
He bears it all, and with one arm lets looſe
Th'impatient ſtream. The heavy wheel moves round,
And ever and again lets fall the loud
And awful hammer, that confounds the ear,
And makes the firm earth ſhake. He turns the maſs,
And works it into ſhape; till cooler grown,
He ſtops his wheel, and once again provokes
The dying cinders, and his half-done work
Buries in fire. Again he drags it forth,
And once more lifts it to the ſturdy anvil.
There beaten long, and often turn'd, at length
'Tis done. He bears it hiſsing to the light,



A Hammer Forge in Gothland about 1790.

From a Painting by J. F. Martin.

An iron bar. Behold it well. What is't,
But a juſt emblem of the lot of virtue.
For in this naughty world ſhe cannot live,
Nor ruſt contract, nor mingle with alloy.
So the great Judge, to make her worthy heav'n,
Submits her to the furnace and the anvil;
'Till molten, bruis'd, and batter'd, ſhe becomes
Spotleſs and pure, and leaves her droſs behind.

And who ſhall grieve, and think his lot ſevere
Who well conſiders this? The ſlaving ſmith,
That wipes his flowing brow ſo faſt, his bread
Earns at the bitter coſt, expence of health.
In ſummer's hotteſt day he feeds his forge,
And ſtands expoſ'd to the diſtreſsful fire
That almoſt broils him dead. Yet what complaint
Makes he at fortune? He is well content
To toil at his infernal work, and breathe
A torrid atmoſphere, ſo he may earn
A ſcant ſubſiſtence in this pinching world."

At this time it was worked by John Fuller, to the average extent of 30 tons per annum. Weale MSS.

The ruins of the forge house, with the relics of its garden, submerged in a dense growth of bracken, are about a mile above the fine old house of "Batemans," the home of Mr. Rudyard Kipling, which is said to have been an ironmaster's dwelling. There is a bay and forge cinder.

There is no trace of any furnace slag on the three furnace fields.

Socknersh Furnace

Par. Brightling. 50° 59′ 0″ N. 0° 25′ 10″ E.
2m. S. by W. of Echingham Ch.
K.—s.g. of a blue form, 2.69
P.N. Furnace field, Furnace Wood.

In 1574 Thomas Collins, of Brightling, had Stokenes Furnace and signed the bond.

Mr. Dunkin's notes.

This furnace belonged to Alexander Collins, of the Lamberhurst Forge; in his will he left to his wife the Manor of Socknesse in the parish of Brightling, with ffurnes, woodes, etc.

Recovery Roll, Hilary, 27 Eliz.

In 1585 it was sold to Robert Filmer, including "one mill or officio ferres vocat a furnace."

In 1588 Losely spells it "Stokmes."

In the 1664 list it appears as Sackness, and had been discontinued, but repair'd and stock'd upon account of the warre and future encouragement.

The Collins family owned Burwash Forge (q.v.), but it would seem more likely that the celebrated graveslab in Burwash Church was cast here. This is the earliest known example of a cast-iron graveslab, with an inscription in Lombardic characters. Beck states "from the style of the cross and the inscription Lower concludes in error that the casting is fourteenth century." Lower's account is as follows :—

"Geschichte Des Eisens.," V. II., p. 317.

S. A. C., II., p. 178.

"A curious specimen of the iron manufacture of the fourteenth century, and, as far as my own observation extends, the oldest existing article produced by our foundries, occurs in Burwash church. It is a cast-iron slab, with an ornamental cross, and an inscription in relief. In the opinion of several eminent antiquaries, it may be regarded as unique for the style and period. The inscription is much injured by long exposure to the attrition of human feet. The letters are Longobardic, and the legend appears, on a careful examination, to be :—

ORATE P. ANNEMA JHONE COLINE (or COLINS).

"Pray for the soul of Joan Collins."

"Of the identity of the individual thus commemorated I have been unable to glean any particulars. In all probability she was a member of the ancient Sussex family of Collins, subsequently seated at Socknersh, in the adjacent parish of Brightling, where, in common with many of the neighbouring gentry, they carried on the manufacture of iron, at a place still known as Socknersh Furnace."

The letters are not unlike those on church bells, but Mr. A. A. Hughes, of Messrs. Mears and Stainbank, the well-known church-bell founders, states that they are not bellfounders' stamps.

The Burwash Slab.

Among Mr. Dunkin's notes is the following:—

Socknersh furnace for smelting of iron ore and casting utensils of any sort with ye metal was set up (as Mr. Hayley supposes) and used by the first Thomas Collins. From Michaelmas 1673 to Michaelmas 1676 it was occupied by Mr. Farnden and Mr. Roberts and perhaps the second Thomas Collins worked it himself. It has been down many years.

The bay has been destroyed, but there are some large pieces of slag left. It is marked on Budgen's map of 1724.

Darvel — Furnace

Par. Mountfield. 50° 57′ 35″ N. 0° 26′ 0″ E.
1½m. W. of Ch. K
P.N. Furnace field, Old Furnace pond, Boathouse Shaw, Forge Mead, Burnt House Croft, Darvel Furnace field.

See Ashburnham.

This was probably founded by the Rev. John Gyles about 1649, as on February 20th in that year he obtained from the Earl of Winchelsea and others rights of way and licence to take earth for making and repairing bays. On his death it passed to Benjamin Scarlett, and there is a recognisance, dated October 19th, 1667, reciting the above licence, between the sons of Benjamin Scarlett (nephew of Gyles), that deals with the "streams of water, overflowing of water, Bayes, penns, penstocks, floodgates and ponds, furnace house, coleplaces and mineplaces in Netherfield in Battle parish."

Close Roll, 4216, and Ashburnham Muniments, 863.

Rhys-Jenkins.

The advertisement in the *London Gazette* of November 26th–29th, 1694, when it was offered for sale with the manor of Mountfield as "lately built," must have referred to a rebuilding of an older furnace on account of wear and tear.

The bay is wide and high, the bed of the large pond does not appear to have silted to any great depth, and forms a level meadow surrounded by its banks. It is shown in water by Colonel Mudge, 1807. There is a large bed of cinder at the south-east end of the bay. I found there a portion of the iron rack of the penstock. Many small cannon balls have been dug up.

Mr. Dunkin's notes.

In 1711 John Nicoll, of Hendon Place, mentioned in his will the manor of Mountfield and his iron furnace and forge, with stock of mine, coal and utensils.

The output was rated in 1717 as 150 tons per annum. Marked in Budgen's map, 1724, and mentioned by Fuller in 1737.

In a letter of Mr. Hayley to Sir W. Burrell of April 29th, 1777, he says :—

"Darvel Wood is said to be 800 or 1,000 acres. In later times it has supplied with fuel a Furnace for casting iron, established on its skirts, which was occupied by the owner and his tenants till the last peace with France and Spain. It is now in decay and it is feared that the manufactory at Carron will prevent its revival."

This would seem to indicate its survival till 1763. It was entirely down in 1787, belonging to Mr. Bourne, of Robertsbridge, but Colonel Mudge's map of 1807 shows the pond in water. Weale MSS.

Robertsbridge Abbey Furnace Furnace

Par. Salehurst—Ewhurst. 50° 58′ 50″ N. 0° 29′ 50″ E.
¾m. S. of Salehurst Ch., at Park Farm. K
P.N. Furnace Pit, Furnace Cottage.

The furnace is marked in Budgen's map, 1724, and the pond shown in water in the 1813 1-inch ordnance map.

Robertsbridge Abbey Forge Forge

Par. Salehurst. 50° 59′ 5″ N. 0° 30′ 10″ E.
⅝m. S.E. of Ch., near the Abbey ruins. I
P.N. Pondfield, Forge Crooks, Lower Forge Brook (at Udiam).

The history of these connected, but distinct, sites must be combined. These works were in the first rank from the earliest period of the blast-furnace, and we have almost continuous records until nearly the end of the industry in Sussex.

S. A. C., VIII., p. 171.

The rich Cistercian Abbey of Robertsbridge, founded in 1176, which held much land in Sussex, was surrendered to the King on April 6th, 1539, and in the following year the site of the Abbey, with other lands, was granted to Sir William Sidney and his wife Agnes, in exchange for the manor of Kingston-upon-Hull and various lands in Yorkshire. Sir William Sidney was the grandfather of Sir Philip Sidney. The accounts of the ironworking venture, which he lost no time in starting, have fortunately been preserved at Penshurst, and a great many extracts from them have been recently published by the Royal Historical Manuscripts Commission. It is to be hoped that the second volume will contain further information.

R.H.MS. Commission, Lord de Lisle and Dudley, V. I.

Sir John Horrocke, priest, vicar of Salehurst (who was steward of the household), commenced the making of a forge, and also a furnace on February 2nd, 1541. The

capital expenditure in that year was £83, and in 1542 £170. The dykes and bays were made and mining began. The furnace produced no sows in 1541, 42 tons being purchased from Woddy, whom we trace afterwards as a forgemaster in Frant, and from one Saxberge. In 1542 they made the hammer-pond and the furnace bay, scoured the dyke, and work commenced in earnest. A "beme" for weighing the iron was brought from London to Hastings.

The outputs at the forge were, in round tons, as follows: 1541, 6 tons; 1542, 130 tons; 1543, 140 tons; 1544, 134 tons; 1546, 131 tons; 1549, 100 tons; and an average up to 1573 of 115 tons, the highest being 202 tons in 1562.

These works were the first named in the portsmen's complaint of 1549, and apparently they acted up to the maxim "Breve regis non curret in Portus," by taking drastic action, for in that year we have the following entries:

"27th June.—Paid to Blacknell for his expenses at Robertsbridge at the fyrst comyng of the Rude company that were gathered together to put down the forge—1s.

"30th June.—To my expenses in ryding towards London to my master after that his forge was pulled down—1s.

This perhaps accounts for the drop in output for 1549. However, the damage was soon repaired and the works in full operation again.

Although this establishment is not named in the denization lists, Frenchmen were employed both here and at Panningridge, the subsidiary furnace, as there are several entries of meat and other food "sold to the Frenchmen." The names of the hammermen and finers—Adryan, Carde, and Gwylliam—are non-Sussex.

See p. 362.

The bar iron, which at that time was the only saleable

product, was at first sent to Rye from Bodiam Bridge. By 1553 they were able to ship at "the Oke," now Udiam, where at a later period an ironhouse or store was erected, although the larger barges could not get beyond Bodiam. Lower says there were put into the river "shuts," a contrivance somewhat of the nature of locks. When the bed of the Rother from Rye to Bodiam was cleansed several of the remains of these "shuts" were brought to light and removed. Budgen's map of 1724 shows the end of the navigation at Bodiam.

S. A. C., II., p. 216. Holloway's "Rye."

Mr. Rhys Jenkins gives the following account of a further venture in steel-making, one of the first instances of the production of steel from finery iron in England:—

Newcomen Society, Transactions, V. III., 1922–23.

"At the death of Sir William Sidney the property passed to his son. In 1564, an agent of Sir Henry engaged at Antwerp certain 'Duchmen,' Frolycke and Bowde (or Budde), to come over to England and start the manufacture of steel at Robertsbridge.

"In March, 1565, they came over to England, and after spending about a month here, possibly examining the product of the blast furnaces and viewing sites for the works, they returned to the Continent to procure men and appliances. It would seem that they were not satisfied that the Sussex iron was suitable for steel-making, for upon Bowde's second coming to England, towards the end of June, he and three other men, 'myners and Bergeknighten,' proceeded direct from London to Bristol for Wales. At the end of July, Bowde is back again from Wales 'with the myne' and proceeds to Antwerp. In the course of September the accounts show charges for 'postage of letters out of Duchlande to Andwarpe,' money given to Bowde 'to paie unto Gervaise the Mr. of the works for anvells, formes & elles provided by them in Duchland,' and 'at his goinge out of the hye countrie with the Duchmen,' other payments to Frolycke and Bowde, and payments for clothing for them and other Germans. On October 3rd Bowde goes to Utrecht for the forms and other necessaries provided in Germany and no doubt brought down by the Rhine. On the 4th there is a payment for bringing over certain 'Duchmen' to Rye, and on the 9th Gervaise and his company arrive, travelling by Canterbury. The company appears to have comprised seventeen persons. Bowde is still on the Continent, and on the 19th he proceeds to Cologne in search of more masters and men to take over to England. His efforts were not

very successful, for he left Antwerp for England on December 24th with two or three men only. However, during the year 1566 there are many references to new men coming over, also to others who went back to their own country, including four who decamped.

"Apparently these men were not satisfied that the local iron was suitable for the purpose, and a furnace was taken in Glamorganshire, near Cardiff. John Bowde and three other Dutchmen were sent there in June, 1565, and in December of the same year 20 tons of 'plats' were shipped from Cardiff to Rye. Before September of the next year 74 firkins of steel had been shipped to London and to Wales.

"These Dutchmen were no doubt Germans from somewhere in the neighbourhood of Cologne, and the process followed would be the finery process, for which the iron from the blast furnace, instead of being cast into sows or pigs, was cast into thin flat bars here called 'plats.' The steel was sold in firkins. To produce 57 firkins required 27½ tons of plats. It would seem that one Edmund Roberts, of Hawkhurst, was associated with Sir Henry Sidney in this enterprise.

"One judges that the Dutchmen were not altogether liked in the neighbourhood of Robertsbridge, for we find that in March, 1567, the Lords of the Privy Council caused a letter to be sent to certain Justices of the Peace for the County of Sussex, stating that complaint had been made that 'John Sharpe, of Robertsbridge or nere thereabouts, naming himself a master of fence, hath of late not only beaten diverse Duchemen which hath been employed in that county by the procurement of Sir Henry Sydney, Knight of Th' order (*i.e.*, of the Garter) and Lord Deputye of the realme of Ireland, for the making of steale, but also hath used suche unfitting wordes against them as is not to be suffered.' The Justices are required to take the matter up and see that 'the said Duchemen may have no further juste cause of complainte.' . . ."

"Another point may be mentioned about Sir Henry Sidney: In 1566 he was applying in Parliament for an Act for 'making steel and plates for armour within the realme.' His Bill got through the House of Commons, but did not pass the House of Lords; its provisions have not come down to us."

From the details now published it would seem that the steel works were at first not at the Abbey. The partners in the enterprise were Sir Henry Sidney, Edmund Roberts of Hawkhurst, gentleman, and Jone Knight of London, widow and administratrix of Raffe Knight (who had been General-Receiver to Sir Henry).

R.H.MS. Comm., Lord de Lisle and Dudley, V. I., pp. 316–318.

It is clearly stated that the works were in Kent and that the Dutchmen were brought to Hawkhurst. The works-house was at Saxhurst (? Sandhurst). The outlay was great for those times, viz.: £1,960 11*s.* 3*d.* for 1565–66, Frolyke and Budde receiving each 2,000 " dollers " (of five shillings), and the tools being all imported.

The first plates, *i.e.*, iron hammered thin for conversion into steel, were brought from " Chinglye forness." In 1574 Sir Henry Sidney was warned at Penshurst for his works at Robertsbridge, but did not appear or sign the bond.

About 1574 to 1578, the accounts show a payment of £200 per annum from Michael Weston in respect of the ironworks, reduced by £30 allowed in 1576 for the building of the furnace. Weston, who lived at Leigh, near Penshurst, had Cowden furnace at this time, and it is not clear if this entry really refers to Robertsbridge.

S. A. C., VIII., p. 169.

Soon after this the Rev. G. M. Cooper, quoting from an MS. account of the estate, gives a clue to the size of the ponds :—

" The Lorde of the saide manor holdith in his owne handes The Yron fforge with certein of the demeanes called the ffurnace ponds conteyning xiiij acres overflowed, the fforge-pond conteyning ix acres overflowed, with the profytt and ffelling of all the wood lyable to same."

In 1609 John Hawes farmed the estate, and carried on steelmaking at the Abbey. He cannot have been the man of the same name who was in control for Sir William Sidney in 1541, but was very likely his son or grandson.

Burrell Col., 5680.

There was " a capital mansion and in the Abbey lodging for the steelmakers. In the great gatehouse called the West Gate are two rooms used for the steel forges, a room used for placing of roles for the steelworke and the Brewhouse now used for making of steel wherein are 8 steel forges. The East Gate wherein James Lamye,

alias Barden, Hammerman for the ironwork now lodgeth, with a low room underneath as a storehouse for iron, at a rent of £4 per annum."

"There is no mention whatsoever of a waterwheel, so it must be taken that the bellows were worked by men, also that the hammers were hand sledges." Rhys Jenkins.

In 1623 John Culpepper and Henry English were tenants of Udiam ironhouse with power to dig for iron. "History of Salehurst," L. J. Hodson.

In 1664 and 1667 both furnace and forge were at work.

In 1680 John Roberts held them for the Earl of Leicester, and in 1707 Thomas Snepp, senior and junior. In 1711 there was a gunfounder of Salehurst, one Farrett Holloway, who made an agreement with Lord Montague for the purchase of wood, doubtless for Robertsbridge. Catalogue of Battle Muniments.

The furnace output in 1717 was 120 tons, the forge is not mentioned.

Sir Thomas Webster bought the estate in 1721, and from 1724 to 1734 carried on the furnace and forge himself. In the latter year he leased the furnace to Harrison, Jukes and Company of London, and granted another lease to William and George Jukes, their successors, for seven years on December 10th, 1746. Harrison was a London merchant controlling five furnaces. About this period John Fuller II. of Heathfield made arrangements with Jukes for co-operation in the Government contracts for guns, as Robertsbridge had a more constant supply of water, and could ship the guns all the year round. In October, 1740, Fuller ordered forty-eight four-pounders, and lent him the tackle; an exchange was agreed in December, 1741, Jukes to make small, and Fuller large guns, but in May, 1742, Fuller's water was dried up. The drought continued in 1743, and even at Robertsbridge they had Fuller MS., Herbert Blackman.

to "tread the wheel," *i.e.*, use the waterwheel as a treadmill for man-power.

"British Floods and Droughts," Brooks and Glasspool, p. 145.

This drought was the culminating point of a series of dry years from 1700 to 1750, which are partly recorded by the earliest meteorologists. The period 1741–50 had only 87 per cent. of the normal rainfall. The worst spell came in 1740–43, only 73 per cent. of the normal being registered. Fuller writes: "If the weather continueth, want of water will blow out all the Furnaces in the County." By 1748 relations between John Fuller III. (who had succeeded his father in 1745) and Jukes had become strained, and in the following year entirely broken, as is shown by the following letter:

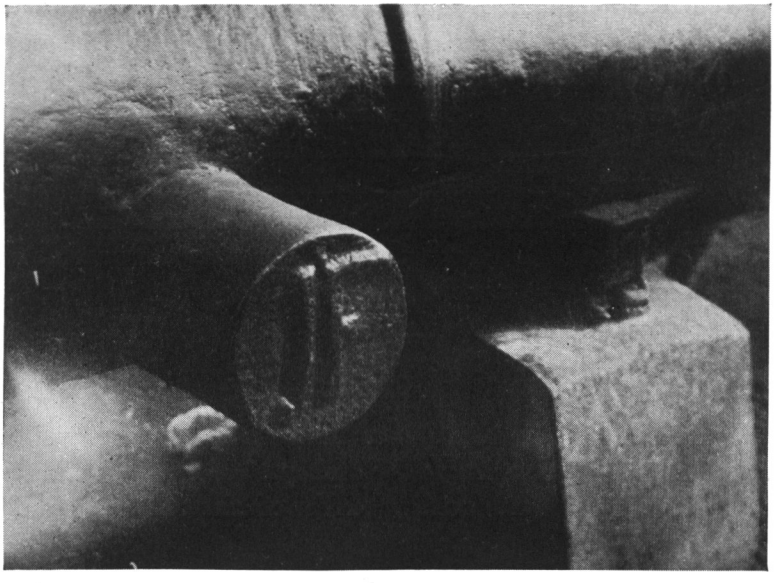
"ROSEHILL, 19th June, 1749. To Mr. Jukes.

"Sir, This day I sent two servants down to Robertsbridge Furnace to see if what I heard was true—viz.—that you were there making ½ pdrs. to offer at a proof for me, and had set my mark J F on the trunnions. I find it to be true; this you never did before and therefore is infamous if not treacherous, and to draw me into the censure of the Board of Officers at least you must have some private reasons for it, you never had my leave to do it, or have you ever done it before.

I therefore from hence forward disclaim any sort of dealings with you, and desire you and Mr. Remnant would immediately make up the account between us, and if you presume to offer any guns with my mark to be proved I will send to the Office directly that it is an imposition upon them and your humble servant. JOHN FULLER."

Jukes' lease was not renewed, the furnace was taken in March, 1754, by John Churchill of Hints, Co. Stafford, for a term of seven years. By this date the smelting of iron with coke had been successfully accomplished in the Midlands, and Churchill is said to have used coke, or sea-coal, at Robertsbridge as a substitute for charcoal in an air furnace, constructed so as to work without bellows, but apparently it was not a commercial

Sprange's "Tunbridge Wells Guide," 1797.



"My Mark J.F. on the Trunnions."
Irish Gun on Tower Wharf.

proposition, as in 1768 the furnace, ironworks, forge, etc., were leased to William Polhill of Hastings, David Guy of Rye, and James Bourne of Salehurst, Ironmasters. Bourne alone had it in 1785. It was yet standing in 1787, ready to work in case of war, and could produce about 50 tons per annum. The last rating was in 1793, and in 1801 the forge was sold in bankruptcy. Weale MSS.

This chequered record of 260 years is the longest we have of any Wealden ironworks. The furnace pond is shown in water on Colonel Mudge's map of 1807, and the large bay with some of the brickwork at the sluice remains, together with slag below the bay.

The forge pond bay has quite gone, and there is no vestige of the pond except the field name, but a very remarkable piece of engineering for such an early date can be seen in the form of a large and deep cutting through a piece of rising ground to the site of the forge. For some reason Parson Horrocke wished to vary the natural course of the water, which flowed into the Rother west of the Abbey. He therefore ran the hammerdyk well south of the Abbey buildings and into the Rother at Udiam, a mile and a half below the pond to the eastward, and placed the forge where the cutting merges into the water-meadows. This plan certainly avoided interference with the causeway from Robertsbridge to the Abbey and very likely prevented the backing-up at the hammer of flood-water at spring tides. At that time the tide would probably run up as far as the Abbey. The dykers' wages came to £49 0*s.* 10*d.*, a fifth of the entire capital expenditure.

There is a great deal of forge cinder at the site, which quite spoils the gardens of the present cottages. In the Abbey house garden is a small gun, several cannon balls, a pike, shovel, and small hammerhead, and also a curious forging which I take to be one of the cams, or, rather, tappets, for lifting the hammer or bellows.

New Pond (1-inch Ordnance.) Bloomery

Par. Ewhurst. 50° 58′ 20″ N. 0° 30′ 5″ E.
1¾m. S.W. of Junction Road Station. B.C.F.
P.N. Great and Little Floodgate field, Great Pond field, Forge Wood (6-inch Ordnance).

The first three field names and the farm name apparently refer to a supply pond for Robertsbridge furnace, a mile or so down the valley, and part of the

same great apple farm. There is what looks like a bay, but it is so effectively fenced off that no examination can be made. The last name, however, indicates the bloomery, some slag of which, of very ancient type, is to be found in the little rill.

Shoreham Farm

Bloomery

Par. Ewhurst. 50° 59′ 10″ N. 0° 33′ 0″ E.
¾m. S.W. of Ch. F.
P.N. None.

Here the junction of the Wadhurst clay and Ashdown sand is at a steep angle, very similar to that at Scoria Lane, Framfield (q.v.), and the clay has been excavated for a considerable distance along it. Two of the pits are full of water, but a long range is fairly dry in summer, though swampy. On the upper edge, on the sand, but well below the surface, there is a deposit of cinder. Mr. H. H. Hore, the owner of the farm, who kindly drew my attention to the site, found difficulty in sinking posts through it.

Colliers Green

Bloomery

Par. Ewhurst. 50° 58′ 45″ N. 0° 33′ 20″ E.
1m. S. of Ch. E.
P.N. Cinderbanks, Cinderbanks Mead.

This bloomery is situated between Flettice and Whiches Woods, near the junction of two rills, extending a short distance up both branches. The soil is darkened by charcoal, and the cinder is in large lumps reminiscent of that at Tudeley, which is 14th century.

Ewhurst or **Northiam** Furnace

Par. Northiam. 50° 59′ 20″ N. 0° 35′ 30″ E.
¾m. W. of Ch. K.
P.N. Furnace Wood, Furnace Shaw, Furnace field.

S. A. C., XXXII., p. 21.

The only record of this little furnace is in the 1664 lists, "Ewhurst at Norjam" (Parsons). Lower makes it into two, Ewhurst—Norsham, no doubt an error. It had then been discontinued before, but repair'd and stocked and had supplied guns (?) and shot for the late war.

The pond is not shown on any map; it appears to have been recently restored and has water in it. There is a bay and some cinder.

Iridge Furnace

Par. Salehurst. 51° 1′ 15″ N. 0° 29′ 40″ E.
1m. E. of Hurst Green Ch. K.
P.N. Furnace fields, Furnace field shaw.

Marked by Sellars, 1710, and Bowen, 1751, on their maps.

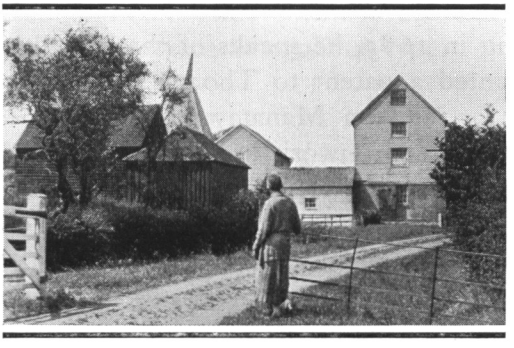
I know of no record of this little furnace. The stream is small and the bay very slight, but there is some blast-furnace cinder.

There are in Salehurst Church six cast-iron grave-slabs of the Peckham family of Iridge, ranging from 1679 to 1713, that may either have been cast here or at Robertsbridge furnace.

Frith Furnace

Par. Hawkhurst, Kent. 51° 3′ 55″ N. 0° 28′ 40″ E.
1½m. N. by E. of Flimwell Ch. K.
P.N. Furnace field, Furnace field shaw, Pond field, Pond field shaw.

Of this furnace, situated on the eastern edge of the great Frith Wood, I have been unable to trace any record. There is a good bay, and the site of the pond above is clearly defined. Below the bay is a quantity of slag, and a small circular mound composed of broken brick, tile and cinder which looks much like the débris of the actual furnace. As the farm is derelict and the district practically uninhabited, I was unable to get any local information.



Hawkhurst Furnace Mill.

Hawkhurst Furnace Mill — Furnace

Par. Hawkhurst. 51° 3′ 10″ N. 0° 31′ 50″ E.
1¾m. N.E. of Highgate Ch. K.
P.N. Furnace Mill, Furnace fields (2), Gun Green.

Sir Richard Baker of Sissinghurst had this in 1574, and was warned at his house at Coleman Street in London. In one list it is stated he did not appear, but this is an error, for he signed a bond for £200 only (unless this is another clerical error) on March 16th.

It had been discontinued before 1664, but was then repaired and stocked. William Penn, the great Quaker, after his imprisonment for his principles in 1671, retired to Warminghurst in Sussex, and in 1672 married "Guli," the daughter of Sir William Springett of Ringmer. The Springett family had intermarried with the Porters of Bayham and probably with other iron-master families, so Penn, a rich man, naturally invested in Sussex furnaces, among them being Hawkhurst. Penn, now restored to Court favour, obtained from Charles II. in 1681 in exchange for a heavy claim against the Crown, a grant of the territory now forming the State of Pennsylvania.

Smiles' Industrial Biographies.

Writing in 1685, he speaks of the iron there, and in 1715 granted a patent to Thomas Rutter, an English Quaker, for land on Manatawny Creek, where Rutter erected the first ironwork in Pennsylvania. This was, like most of the early American works, a bloomery—the ancient method being perhaps better suited to the conditions and needs of an undeveloped country. This was not the earliest works in the States, as Lynn, Massachusetts, had started in 1645. Thus we may regard this quiet Kentish mill as the ancestor of the great modern industry of Pittsburgh.

Swank, "Iron in all Ages," pp. 163–166.

See Brede, p. 342.

The flour mill was working up to 1914. The small pond must have been much silted up, as its bottom, now hops, is little below the top of the high bay. The wheel was parallel to the bay. A great quantity of very good bricks, without frogs, have recently been re-used in buildings, although they may not be as old as the time of the furnace. At the farmhouse a half-mould for cannon balls is preserved; and about 1794 three cannon balls were found. The furnace must have survived to a late period, as Dr. C. Le Neve Foster, in 1861, met with an old man at Hawkhurst who, when a boy, was in the habit of playing truant to see the guns tried at Gun Green.

Arch. Cant., V. IX., p. 264.

Topley's "Geology of the Weald," p. 332.

There is little cinder, but some Cyrenæ limestone, which was used as flux. The two Furnace fields are rather puzzling as they are some 300 or 400 yards from the mill, but contain a good deal of blast-furnace slag.

Rolvenden Layne Bloomery

Par. Rolvenden, Kent. 51° 2′ 40″ N. 0° 38′ 50″ E.
¾m. S.E. by N. of Ch. F.
P.N. Cinderbank.

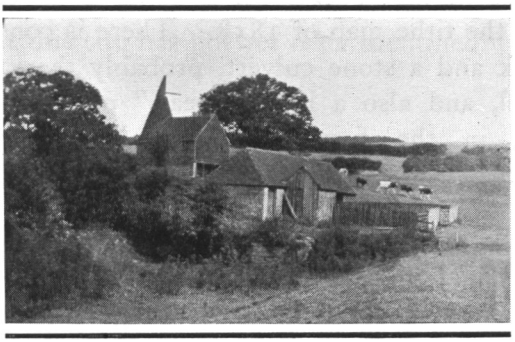
The field, now pasture, has beds of cinder beneath the turf, which are so compact as to prevent posts being driven through them. The cinder which shows in the gateways is of an ancient amorphous type.

X. BREDE AND TILLINGHAM

RISING in the high ground about Netherfield, the River Brede takes a course almost due east to the marsh at Winchelsea, in ancient times forming in its lower reaches a large inlet of the Camber, that great tidal lake on which Winchelsea and Rye were situated. The southern boundary of this watershed is the high Baldslow ridge, just north of Hastings, which reaches the sea at Fairlight Cliffs. On the north, separated only by a narrow ridge of high ground which formed the western approach to Rye, the little River Tillingham has its parallel course, debouching at Rye and forming the western defence of the peninsula on which that town was built.

The basins of these two rivers, although not containing a large extent of Wadhurst clay, were from the earliest times a great centre of iron production. Access was easy both from the port of Hastings, then possessing a harbour, and from the Camber. The Romans had at least four large bloomeries, viz., Beauport Park, Oaklands Park, Chitcombe and Footlands, and possibly other bloomeries in the district were worked by or for them. The blast-furnace period began early in the district and lasted at Brede till 1766.

Map, p. 352.



At Beech Mill.

Beech Furnace

Par. Battle. 50° 55′ 20″ N. 0° 27′ 20″ E.
1¾m. W.N.W. of Ch.—At Beech Mill. K
P.N. Millpond only. The name itself is suggestive.

In 1574, Thomas Haye, of Hastings, owned a furnace at Netherfield (not now a parish). As Beech is within a mile of the village, this site is probably indicated. In 1664 it had been working and making shot during the late war, and continued in hope of encouragement. In 1717 it was producing the fairly high quantity of 120 tons per annum, and on August 10th, 1724, Richard Hay, of Battle (perhaps a descendant of the Thomas Haye of 1574), leased for nine years to Lord Ashburnham and Sir Thomas Webster, "the Furnace or Iron Work, commonly called Beach Furnace," and on October 1st he sold to the lessees certain furnace bellows and other instruments. The lease was extended in 1731 for the term of Hay's natural life. After his death his daughters sold the property to Earl Ashburnham on April 18th, 1758.

Battle Abbey Charters.

Close Roll, 6020.

There is a big bay, largely composed of furnace slag,

which has been much dug. The pond which supplied the grist mill that succeeded the furnace is shown in water on the tithe map of 1858. There is considerable stonework and a stone culvert, probably the race from the wheel, and also a large "bear" or mass of iron solidified in the furnace. Some little way lower down the stream, on Lower Beech Farm, is Floodgate field and Furnace field, and a slight indication of a bay, but no visible slag. Marked on Budgen's map of 1724.

See illustration, p. 91.

Mountfield

Furnace ? Forge

Par. Mountfield. 50° 57′ 0″ N. 0° 29′ 30″ E.
¼m. E. by S. of Mountfield Halt. I K
P.N. Furnace fields, Cinderberry Shaw.

This was an early works, as it was among those inquired into in 1548, "within 4 miles of the salt water" (sic !).

See p. 114.

Richard Wykes of Battayle held this at "Munfield" in 1574, and appears in Losely, 1588, as Richard Wilkes at Minfield ! But it was not in the 1664 lists.

In John Gyles' will of 1654, and in deeds of 1668, 1669 and 1676, it is referred to as "an old furnace," and "furnace lands," the wood being sold for Ashburnham.

Ashburnham Muniments, Nos. 870, 886 and 951.

There is a large bay with big trees growing on it and some furnace slag and forge cinder. By the entrance drive to Rushton Park are some very large blocks of cinder, said to have come either from here or Robertsbridge.

Netherfield (see Beech)

The same Richard Wykes had a furnace in Netherfield, but this site has not yet been identified.

Footlands Roman bloomery

Par. Sedlescombe. 50° 57′ 10″ N. 0° 31′ 30″ E.
¾m. N.E. by N. of Ch. A, B, C, F, s.g. of C, 3.72
P.N. Cinderbury Hop Garden, Cinderbury, Stonehams, Cinderbanks, Cinderbank Shaw.

I discovered this site in July, 1924, and found considerable fragments of a small Roman olla. In September, 1925, some excavation was done under the auspices of the Sussex Archæological Society, by the kind permission of Lord Ashton, the owner. The cinders extend over a considerable area on both sides of the little stream, into which they seem to have been dumped. Along the course of the stream Mr. J. E. Ray and his sons found a good many fragments of pottery, which have been determined by Mr. Thomas May. Of Samian or Terræ Sigillata there are examples of forms 29, Modesti (A.D. 50–70), 58a, 82b, Vitalis (A.D. 65–80), 37 (A.D. 81–117). There are also Belgic ware and local fabric manufactured under Roman influence in the early period of occupation, circa A.D. 80 to 120, and others ranging from A.D. 190 to 260 and A.D. 250 to 400.

These show a long-continued working at the site, which is borne out by the extent and size of the cinder deposits.

A coin of Domitian, about A.D. 80, has been found here.

The trench dug showed evidences that the hearths had been formed at various levels, one above the other, as at Beauport. There is a great deal of burnt clay, charcoal and black ash, together with burnt Cyrenæ limestone.

Below a rather thick layer of cinder is a bed of blue limestone.

When the ground is newly ploughed an area of three or four acres is so strongly impregnated with charcoal and black ash as to be plainly visible from the high road, a quarter of a mile away.

We have here an example of the ignoring in the monastic records of what must have been a very important establishment in Roman times. About 1180 Rainald de Meiniers and Matilda his wife, who held "Fodilande" of the Earl of Eu, gave it, with other lands, to Robertsbridge Abbey. This grant was confirmed by King Richard I in 1198, and it passed to Sir Henry Sidney at the Dissolution. Although some very minute accounts of the Reeve are extant, towards the close of the 14th century, no mention whatever is made of the iron-workings.

R. H. MS. Comm. Reports. Lord de Lisle and Dudley, V. I., pp. 36, 50, 162.

Hodesdale — Forge

Par. Mountfield. 50° 56′ 12″ N. 0° 29′ 20″ E.
1½m. N. of Battle Ch. I
P.N. Cinderbank Wood, Pond Wood, Minepit field, Minepit brook.

This site is situated at the junction of the two main sources of the Brede. The bay is a large and high one, the pond can have hardly been more than an extension of the two streams. There is abundance of cinder, and an iron plate in the stream.

It is probable that this is the forge in Netherfield "or thereabouts" owned by Mr. Finche in 1574.

Somewhere about 1650 the manor of Ittington or Woodsdale—to which spelling it had been corrupted by the common pronunciation of wood as 'ood—was purchased by John Gyles, the clerical owner of Ash-

"Place Names of Sussex," Vol. VII., p. 476.

burnham Furnace, from the Earl of Winchelsea, and after his death it appears in some of the Ashburnham muniments. In 1668 his widow, Joane Busbridge, demised her moiety to Sir Thomas Dyke, and in 1669, in conjunction with him, sold the wood near "Whodsell Forge" to Thomas Westerne, who was then the lessee of Ashburnham Furnace. It had perhaps stopped by then, as it appears in the 1664 list, by the name of Hoodsdall, as working in 1653, but ruined before 1664.

Ashburnham Muniments, Nos. 870, 886.

In 1678 Sir Thomas Dyke sold Woodsdale als Hoodsdale to William Ashburnham.

Ashburnham Muniments, No. 1027.

Oaklands Park, near Sedlescombe

Roman bloomery

Par. Westfield. 50° 55′ 45″ N. 0° 32′ 30″ E.
1m. S.E. of Sedlescombe Ch. A, B, C, F
P.N. Cinderbanks, Stone Heaped field, Minepit field.

This heap, formerly 30 feet high, was known to Lower, who speaks of Roman coins, much corroded and some burnt, having been found there. Mr. Byner, mentioned under Beauport, dug away this heap for the roads before attacking Beauport, and had at one time six coins of Hadrian (A.D. 117–138) and also pottery. Thousands of tons of cinder from this site were used when the new road from the Harrow Inn to Whatlington was made in 1838–40. The site is close to the River Brede, on the south side of the drive, a short distance from the entrance. The cinder, of which little is left, extends some way along the drive. A little way to the south-east is a considerable excavation, near Minepit field, which most likely was the source of the ore. Amongst the cinder are a few bricks, with a greenish vitrification on the surfaces, apparently caused purposely in the making, and not by the smelting fires, together with fragments of tile.

S. A. C., II., p. 174.

Beauport Park Roman bloomery

Par. Westfield and Battle. 50° 54′ 10″ N. 0° 32′ 30″ E.
2½m. S.E. by E. from Battle Ch. A B
P.N. None.

S. A. C., XXI., p. 138.

This large cinderbank does not appear to have been known to Lower. It was first recorded by the Rev. S. Arnott, of Hollington, in 1862, and there is a very good account of it written about 1879 by Mr. James Rock, which is of great interest, as the mound has now been entirely destroyed. Mr. Byner, of Sedlescombe, the highway surveyor, after exhausting the bed at Oaklands Park, commenced digging here about 1870 and used up from 2,000 to 3,000 cubic yards per annum. When the cinder was exhausted, he is locally reputed to have bought and demolished several martello towers for road-making. Mr. Rock says :—

S. A. C., XXIX., p. 168.

"Some large mounds of scoriæ in Beauport Park, the property of Sir Archibald Lamb, Bart., in the low lying part of it towards Battle, and in that parish, have been worked, and these in their turn are rapidly disappearing. Another year or two will probably see them exhausted, and unless one or two other deposits, difficult of access, be utilised, or others, at present unknown, should be discovered, the use of iron 'cinders' as a roadmaking material will become extinct in this part of England.

The large mound in Beauport Park was, until opened as a quarry, a wooded knoll, with heavy timber upon it, presenting but little to indicate that it was the handiwork of man. It then covered a space of two acres or more, and at the highest part had an elevation of about 50 feet above the surrounding land. At the present time only one end of the knoll, which was originally of an oblong form, remains. It forms at one side a cliff about 30 feet high, and on the other a grassy slope with a few trees upon it. Seen from below, the mound rises higher than the cliff by about 10 feet. The whole mass now remaining covers about a third of an acre, but as it rests on the slope of the hill which rises behind it, the quantity of cinders contained in it is probably not so great as it appears.

At the time of my visits, men were working very carefully on the face of the 'cliff,' which crumbled so readily at every stroke of the pick, that

From S.A.C., XXIX.

The Cinderheaps in Beauport Park in 1878.

they had some difficulty in keeping their footing. Occasionally a piece of pottery is found, but rolling down with the cinders it is usually broken very small ere it reaches the bottom of the bank. More than one earthen vessel has been found entire or nearly so, but the workmen seeing no value in what they called ' an old pot,' took no pains to preserve them.

I have, however, a few fragments of Samian and other ware, which have been preserved, and I hope that my enquiries and injunctions may lead to the preservation of any further discoveries. It is to be regretted that attention has not been earlier directed to this locality, which I am inclined to think has not been worked for iron since the time of the Roman occupation. Mr. Lower makes no mention of it either in his article in the ' Sussex Archæological Collections,' or in his ' History of Sussex.' The works, which he mentions as being in the parish of Battle, are near Netherfield, at the opposite end of the parish. My reason for believing this deposit to be exclusively of Roman origin will appear later in this article, in describing another site in the parish of Brede.

The formation, or structure of the Beauport mound, is interesting as affording some clue to the method of smelting used by the old iron workers. The mound is made up of a series of layers, each layer being about 10 inches thick ; the mound being conical in its section, the layers follow each other

in the same form, like the coats of an onion when cut through. This stratified formation will be readily seen on reference to the illustration below, which represents the state of the mound in September, 1878. For this sketch I am indebted to Mr. Edward Farncomb, of Ferndale, Hollington, who takes a warm interest in the subject, and has accompanied me in my explorations both at Beauport and at Brede, rendering valuable assistance.

It has been said above that the mound at Beauport is formed of a series of layers about ten inches thick; it should be further explained, that those layers are each formed of a series of thinner layers. These thinner layers are usually four in number; the lower one of charcoal, some of which is still perfect, not having been consumed; then, burnt earth; then, iron scoriæ; then comes burnt clay; then, charcoal again, and so on through the whole heap. The burnt earth immediately above the charcoal is probably a residuum from the burnt ore. The process of ironmaking used here seems to have been simply to form a mound of earth, then to cover it with charcoal; upon this to place the ironstone or ore, and to cover the whole with clay, probably with some arrangement for the passage of air, to secure the combustion of the charcoal when ignited; the molten iron running off from the ore to the bottom of the mound.

The men employed in quarrying the cinders stated that they occasionally find vertical holes of small diameter, as if they had been pierced in the heap with an iron rod. These may have communicated with horizontal passages to secure a draught of air, though none such have been discovered; more probably, they only penetrated the layer for the time burning; the air entering by them, and, by passing through the interstices of the loosely piled charcoal, keeping it in a state of active combustion.

Thus the process resembled that of 'coaling,' or charcoal burning, or that of burning bricks in clamps. That it was very imperfect, is proved by the large amount of metal left in the slag or scoriæ, which is often more dense than the ore from which it was made.

It should be mentioned, that the upper or outer layers of 'cinders' in the mound at Beauport are more perfect and harder, than those which are nearer to the middle of the heap; these, having been subjected to repeated heating, have become reduced in some parts almost to dust.

There is no appearance of masonry in the neighbourhood of these works, so far as I have explored it; neither have I discovered any dam across the bed of the small stream, which runs by the side of the mound; it therefore appears that no forge existed at this spot, and that its crude products were manufactured elsewhere. It is possible that a dam may exist in the woods lower down, for although the mound of cinders is at a spot which is low, relatively to the Beauport of Baldslow ridge, it is still at a considerable elevation above the water level at Westfield, towards which the stream runs.

But now for proof, that the ironworks I have been describing are really Roman.

In the entire absence of any object of mediæval or modern origin, and in the presence of articles of Roman origin, discovered in the body of the heap of scoriæ, we have, I think, indisputable evidence that the heap itself is the work of Roman hands, or, what is probably nearer the truth, of native British hands under Roman direction. Besides the fragments of pottery which I have already mentioned, I have in my possession two coins of bronze, which were also found among the cinders—one of Trajan, the other of Hadrian. Both are in good preservation, especially the latter. These would seem to fix the date of the cinder-heap at a somewhat early period of the Roman occupation, because although such coins might have been in circulation long subsequently to the reigns of the Emperors whose image and superscription they bear, yet, as the coins show scarcely any signs of wear—that of Hadrian being as fresh as one of our present English bronze coins of the earlier issues—we may conclude that these Roman coins found their resting place in the Beauport heap somewhere about 140 A.D.

If we take the period included between the date of Trajan's accession to the Imperial throne at A.D. 98, and that of the death of Hadrian, A.D. 138, we might venture to assign even an earlier date than A.D. 140 as that of the operations of the Roman iron masters in the woods of Beauport and Battle.

The coins discovered at Maresfield have a much wider range of dates, namely, from Nero to Diocletian (A.D. 54 to A.D. 286), but they do not include any of Trajan or Hadrian.

I will now briefly describe the coins and pottery found in the Beauport cinder-beds.

1. A bronze coin of Trajan, nearly 1¼ inch in diameter, and one-eighth of an inch in thickness. On the obverse, the bust of the Emperor, very perfect and in high relief; the circumscription is obliterated at the beginning and ending, but the following letters are very distinct:—

TRAIANO AVG GER DAC PM.

On the reverse, is a draped female figure, standing, between the letters S.C.

The inscription is illegible, at least by me.

2. A bronze coin of Hadrian, quite perfect, except that it is not absolutely circular; it appears to have been hammered on the

edge in two places. It is somewhat larger than the coin of Trajan, being nearly an inch and three-eighths in diameter, and a full eighth of an inch in thickness. On the obverse, is the bust of the Emperor, surrounded by the inscription :—

IMP CAESAR TRAIANVS HADRIANVS AVG.

On the reverse, a helmeted and draped female figure, seated, apparently, on a shield like that of Britannia on some English coins, holding an erect spear with the left hand, the arm raised above the shoulder, and the right hand supporting on its palm a small winged figure.

The inscription is, as far as I can make it out—

PONT MAX TRP OT COS III S.C.

The two last letters are placed beneath the seated figure.

3. A bronze ring, quite plain, three quarters of an inch in diameter.

4. A bronze ligula, about 4½ inches long, well preserved, and having an elegantly shaped bowl, very thin and elastic, resembling in form a very narrow fire-shovel, rather than the bowl of a spoon. This was found at the bottom of the cinder-heap.

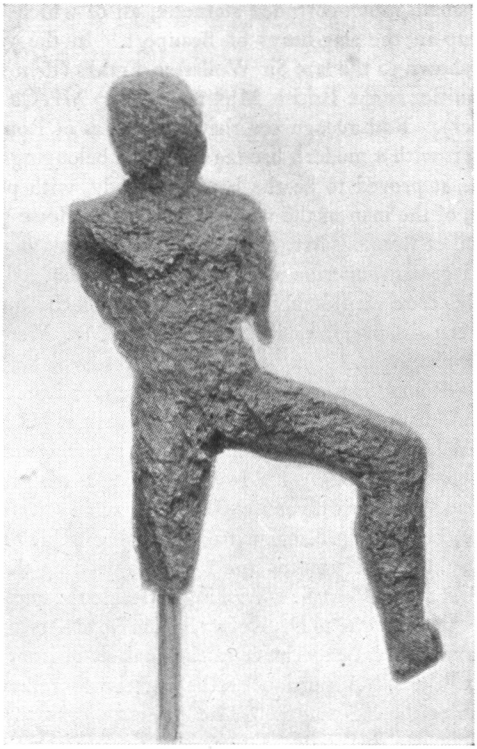
Among the fragments of pottery, which are numerous and of various kinds, are a few specimens of black and red Samian ware. On one of these, the base of a patera, is the potter's mark ALBVCIANI. Another, also part of a patera, has figures in relief on the outside. Another is a considerable fragment of a bowl, of figured red ware, part of the design being a hunting scene, of which, however, only a hare running, followed by a dog, has been preserved. Another is the base and part of the bowl of a patera, in fine red Samian ware ; with the same potter's mark as above.

The largest piece in my possession is in thin black ware, not much more than an eighth of an inch in thickness. It is marked with a trellis pattern, formed simply by crossed lines, roughly traced by the hand before the vessel was burned. These lines are slightly depressed, and shine as if they had been recently made with a black lead pencil. I have many fragments of this kind of ware. The one I am describing is part of a vessel, probably seven or eight inches high, two inches and a half in diameter, at the base and five inches at the largest part ; it has no foot or ring at the base, which is flat and thinner than the other parts. The fragment possesses half the base, and one-third of the entire diameter at the largest part, and is four inches high.

There are at Beauport many fragments of large vessels, of a rough character, of light colour, and unglazed.

From the fact that none other than Roman coins have been found in this locality, and these associated with fragments of Roman pottery, it may be fairly concluded that in Beauport Park we find clear proof of Roman occupation, and Roman iron manufacture, in a district which has hitherto supplied but little evidence of this kind, and is but little known."

The most interesting object found here is a small iron statuette, now in the Hastings Museum. The late Charles Dawson gives the following account of it :—



C. Dawson, F.S.A. Photo.

Statuette from Beauport Park.
(Actual Size.)

S A. C., XLVI., p. 4.

"If the Greeks were acquainted with the *casting* of iron, at all events the Romans have hitherto not been credited with such a practice. If we may speculate upon the discovery of one isolated specimen, it would seem that the Romans, or Romano-British, who smelted the iron at Beauport, near Hastings, had already attained the art of casting iron to a great degree of perfection. The specimen referred to was found by one of the workmen employed in digging the iron slag for road-metal about the year 1877. His name is William Merritt, and he lives at Kent Street, Sedlescombe Road, Westfield. All the workmen engaged in digging were in the habit of picking up any of the more important specimens, such as bastard Samian ware, coins, etc., such as Mr. Rock describes, and keeping them for certain people who were interested in the discoveries at the time. The work extended over many years, and the principal slag-heaps were disposed of. The author, who had been recommended in the year 1883 to see Mr. Merritt about some geological specimens, procured from him, with other specimens, a small, much-corroded statuette, all of which he stated that he had dug up in the slag-heaps of Beauport. In the year 1893 the statuette was shown to the late Sir Wollaston Franks (then Keeper of the Roman Antiquities at the British Museum) and to Mr. C. H. Read (the present Keeper). Both recognized the specimen as of Roman form, and on comparing it with a modern bronze specimen belonging to Mr. A. H. Smith, F.S.A., it proved to be the head and body, with portions of the arms and legs, of the man in the well-known Marly Horse-group in front of the Quirinal at Rome. Mr. Read considered the statuette beautifully modelled, and greatly superior to the bronze specimen. The author, as far as possible, took considerable trouble to settle the question of the *bona-fides* of the discovery, and received from Mr. Merritt a written account authenticating it. The question then arose whether the specimen, considered as a Roman work, could be of *cast*-iron, and the late Sir W. C. Roberts-Austen, of the Mint, examined it, and gave as his opinion that it was of steel-like iron, such as was manufactured in early times by a direct-reduction process from iron-ores. It was afterwards examined by several different experts with great diversity of opinion, some stating that it could not be Roman, because the Romans had no tools capable of producing it in wrought-iron, others dismissing the matter by stating that if it was of cast-iron it could not be Roman. Wishing to decide the question definitely the author sent the statuette to Dr. Kelner, of the Royal Arsenal, Woolwich, who has, of course, great experience in the analysis of iron, for his determination on analysis. A portion of the metal was removed from the interior of one of the leg-stumps. The Arsenal workman who bored it stated that it cut like cast-iron. Dr. Kelner reported that there was not the slightest doubt as to its being of *cast*-iron. Under these circumstances

and in the absence of further evidence, the author is disposed to claim that this little statuette is Roman, or Anglo-Roman, and the earliest known example of cast-iron, in Europe at least."

Dr. Beck, in his monumental work "Das Geschichte des Eisens," however, states definitely that the Greek and Roman iron statues were not cast but wrought iron.

Notwithstanding Mr. Dawson's belief in the authenticity of this find, there are some doubts on the matter. The sale of the objects found was a valuable source of income to the diggers, and it is possible that deception may have been practised. From the context it is evident that similar bronze figures have been produced, and a replica in modern cast iron would not be difficult to cast and to corrode by burial.

The late Mr. Herbert Blackman found much Roman pottery here, and fragments are still very abundant.

Photo: Miss Blackman.

Messrs. F. Grinsted and Herbert Blackman Excavating at Beauport.

Baldslow Place

Bloomery

Par. Westfield. 50° 53′ 50″ N. 0° 33′ 30″ E.
¾m. N.W. by N. of Baldslow Ch. B. C.—s.g. of B, 3.47
P.N. Cinderbank field, Cinderbank Shaw.

When the present mansion was built, about thirty years ago, nearly all the cinder was dug and used for making the drives and paths; a little, however, remains in the rill. Possibly this was a branch of Beauport Park bloomery, which is quite near.

Platnix

Bloomery

Par. Westfield. 50° 55′ 20″ N. 0° 33′ 45″ E.
1⅛m. N.W. of Ch. A.B.F.
P.N. Cinderbank Brook.

There is much ancient cinder in a hop-garden; the actual bed is under the soil and not visible.

Westfield Forge

Par. Westfield. 50° 55′ 30″ N. 0° 35′ 0″ E.
¾m. W. of Brede Bridge. I
P.N. Forge brook, Forge wood, Forge fields, Forge house, Forge pond.

This forge was probably erected subsequent to 1574; it is not in the lists at that date. On January 26th, 1580, the Mayor and Jurats of Rye complained to the other members of the Cinque Ports that "There is an iron hammer in the parish of Westfylde, which hammer is very hurtful to the haven, for by cutting a gate the water is turned from its accustomed course to the channel, and

so runs to the mill of the said iron hammer." This complaint would seem to have had very little justification. Mr. A. I. Jenkins has very kindly planned the levels here, and has concluded that there was no possibility of any tide water being impounded, and writes as follows: "The Forge stream, draining about 4–3/7 square miles, should have an average rate of flow of at least 1,700,000 gallons per day, about a quarter of the Brede above the junction of the two streams. This being the case, the effect of the dam in impounding (more particularly) the water during a summer storm for future use during a dry period may have been sufficient to interfere with the scour in parts of Rye Harbour; also the utilization of the water would rob it of its head, and hence of its scouring power. May not the people of Rye have been objecting, mainly on principle, to a practice the extension of which on any large scale to their headwaters might have been a serious matter?"

In any case, the forge went on, as in 1664 it was being "continued in hope."

There is a large bay, broken in the centre, stretching across the narrow valley, and some cinder and charcoal. It is marked on Budgen's map of 1724.

Fairlight

Bloomery

Par. Fairlight. 50° 55′ 15″ N. 0° 38′ 50″ E.
¾m. N. of Ch. A F
P.N. Cinderbanks.

The field is now pasture, but there is a very small quantity of cinder, together with mine, in an adjacent field. Perhaps a burning site.

Coghurst — Bloomery

Par. Guestling. 50° 55′ 30″ N. 0° 36′ 50″ E.
1⅛m. W. of Ch. A
P.N. Cinderbank field, The Rocks.

A small bloomery or burning site on the west bank of stream. Very little cinder found.

North Wood, Guestling — Bloomery

Par. Guestling. 50° 54′ 50″ N. 0° 37′ 15″ E.
½m. S.E. of Doleham Halt. A B
P.N. Smith's Wood—to the east.

A small bloomery with characteristic cinder. Mr. J. E. Ray, who discovered this site, found worked flints in an adjoining field, and a very interesting cast of an ox bone. This was at first thought to be cast iron, but on analysis proved to be cinder, containing a large proportion of silica. I have given the detailed analysis *supra*. The ox bone may have been used to form a vent, and the hole thus formed afterwards filled up with cinder, forming a perfect cast. A sandstone slab in the brook had been coated with a thin layer of cinder, resembling tar.

See p. 94.

Icklesham—Telegraph Mill — Bloomery

Par. Icklesham. 50° 54′ 55″ N. 0° 39′ 15″ E.
1m. W. of Ch. A F
P.N. Sinderbanks.

Icklesham—Place Farm — Bloomery

Par. Icklesham. 50° 54′ 40″ N. 0° 39′ 30″ E.
1m. S.W. of Ch. A C
P.N. Sinderbanks.

These are two quite small bloomeries, although more evidence may be hidden beneath the turf of the fields, not now arable.

Loneham Farm — Bloomery

Par. Udimore (detached). 50° 57′ 10″ N. 0° 34′ 30″ E.
1⅜m. N.W. of Brede Ch. F
P.N. None.

Cinder in fair quantity, well below surface, shows up when ploughed.

Brede — Furnace

Par. Udimore (detached). At Powdermill Farm.
50° 56′ 40″ N. 0° 33′ 40″ E.
1¾m. N.W. by W. of Brede Ch. K
P.N. Cinder Plat, Pondfield.

This furnace does not seem to have been built in 1574, but on June 29th, 1578, the towns of Hastings, Rye and Winchelsea, ever concerned about their fuel exports, complained to the Privy Council of waste of wood caused by the "erection of a new ironworke in the parish of Brede by David Willard, Michael Weston and Robert Woddy, forgemasters." These were all Kentish men of the Tonbridge district, owning works at Tonbridge, Cowden and Frant respectively; no doubt the Sussex men resented the foreign invasion. At any rate nothing was done to stop them. Acts of the Privy Council.

There is a deed of November 24th, 1586, which recites that Robert Oxenbridge of Hurstborne Priors, Hants, "intendeth to make, erect, build or new sett upp . . . within the parish of Breade, one fornis or hammer for Close Roll, 1276—No. 29.

Iron, to be supplied with wood from his own proper soil," and farming it to Edmund Hawes of Robertsbridge, who was bound in a penalty of £300 to use no other wood, in order to comply with the Act of 1584, which only permitted the erection of new furnaces if the owner supplied the fuel from his own " proper wood, standing and growing in and upon their own proper soil or land being to hym or them in fee simple or for terms of life or lives without impeachment of waste." Although the parish is given as Brede in both the above entries, it is probable that they refer to this site, as no other is known. Another alternative is that the proposed furnace in Brede parish was never set up and that the Powdermill furnace was erected later. Mr. J. E. Ray has kindly searched the manor rolls of both manors, but they are silent.

S. A. C., XII., p. 270.

In 1605, Lawrence Lenard died while tenant, leaving three sons and three daughters, all minors. Richard, the eldest, succeeded. He has left us one of the few representations of a Wealden furnace, in the form of a spiritedly designed fire-back, dated 1636, which shows not only himself and his dog, but hammer, baskets, wheelbarrow, hook, weights and ladle. There are a good many examples of this back extant, of various sizes, some, no doubt, being reproductions.

The family was evidently of French origin, as in 1544 John Lyonarde was described in the denization lists as " French born, a finer, in England 30 years," i.e., 1514, and on the same date " James Lenard, born in Picardy, working at the King's forge at Newbridge."

" Annals of the Leonard Family," Fanny Leonard Koster, 1911.

It is interesting to note that this family were ironworkers at Bilston, Staffordshire, and at Pontypool, Monmouth, from which latter place James and Henry Leonard came to America about 1645 or 1650, and were employed in the newly established (1643) bloomeries in

From S.A.C., XLVI.

The Lenard Fire-back.

Massachusetts. They have grown and prospered, and it is a saying, " Where you will find good ironworks, there you will find a Leonard."

Some time in the 17th century Brede came into the possession of the Sackvilles, and by the time of the Civil War it had passed under the control of John Browne of Horsmonden. It was sold in 1693 to the Westerns of Essex.

Horsfield, V. I., p. 514.

It was blowing in 1664, and in 1717 the production was estimated to average 200 tons per annum. Marked on Budgen's map, 1724. In 1766 it ceased, and was converted into a powder mill, which began to work in 1770 and ceased in 1825, when the extensive ponds were drained and used as hop gardens, and the buildings and

furnace pulled down. There is a large bay and furnace slag.

Pickdick

Bloomery

Par. Brede. 50° 56′ 20″ N. 0° 37′ 30″ E.
1¼m. N.E. by N. of Ch. B C
P.N. Hardrups or Hardcups.

This site was found by Mr. J. E. Ray, who writes: "It is a grass field presenting nothing to the outward appearance, but over a considerable area cinders are found within nine inches of the surface and extend down to an unproved depth. They are accompanied by a considerable quantity of burnt clay. We found an ox bone runner, similar to that found in North Wood. The road to Pickdick is a sunk road; in the banks on each side we found cinders of the ancient type and a piece of iron. The field south of Weston's Wood is hummocky and evidently much disturbed, and these deposits must extend over many acres. The interesting fact to me is, that the ancient road to Pickdick having been worn through an apparently continuous deposit indicates that this deposit is much older than the road, which must date back to Saxon period at least."

See p. 340.

Ellenwhorne

Bloomery

Par. Ewhurst. 50° 57′ 50″ N. 0° 33′ 40″ E.
2m. S. of Ch.
P.N. Cinderbank field. A F G

This little bloomery is on the upper waters of the Tillingham; there is but little cinder to be seen, of ancient type, but I found also two pieces of typical veined blast-furnace slag, perhaps road metal.

Chitcombe — Roman bloomery

Par. Brede. 50° 57′ 40″ N. 0° 35′ 0″ E.
2m. N.W. of Brede Ch. A B
P.N. Cindrell field, Upper and Lower and Long Cindrells, Swindlefield (!), Cinderbank field (N. side of Tillingham).

This large bloomery, apparently not known by Lower, was well described by Mr. James Rock in 1879. He says :—

"Descending from Chitcombe House towards the north-east, about a third of a mile, we arrived at a series of fields on the slope of the hill, which terminates abruptly on the edge of a ravine, or 'gill,' as it is called in Sussex. At the bottom of this ravine runs the river Tillingham, here a narrow but rapid stream. We came upon this spot at a place looking down on a small dell, shut in on all sides by steep banks and woods. In this dell the small farmers of the neighbourhood used to conceal their teams and waggons, in war time, to prevent them from being 'requisitioned.' S. A. C., XXIX., p. 176.

Standing at some distance from the ravine, on the higher slope of the hill, the lower outline of the fields next the ravine appears to form a series of swelling headlands, with smooth intervening valleys; the undulation stretching along the course of the Tillingham. Seen from below, the headlands jut out, and form small cliffs, at the height of about fifty feet above the bed of the stream. There are five principal 'Headlands,' occupying, with their intervening valleys, about a quarter of a mile. These headlands are beds of iron cinders; the fields in which they lie are called the 'Cindrells,' probably an abbreviation of 'Cinderhills'; they were formerly rough ground, but the hillocks and holes were obliterated some years ago in forming hop gardens. At present the land is under grass, and there is not much on the surface to indicate the beds of scoriæ beneath. We dug several holes, varying in depth from one foot to five. On the upper ground there is no great depth of soil above the cinders, but at the lower part the earth, washed down from the slopes by rains, has accumulated to the depth of four or five feet.

Every one of the headlands proved to be 'cinderbeds': few, if any, cinders are to be found in the valleys; the conclusion which naturally follows is, that the headlands were spoil-banks, or tips, for the waste from iron furnaces established on the hills above them.

The quantity of material contained in these beds is immense; for the

valleys between them, as well as the opposite bank of the Tillingham, show that originally the land sloped down gradually to the stream, while now the headlands are at least forty to fifty feet high above it, although not always approaching the stream closely.

Between these tips and the stream, as well as higher up the stream, there are indications of a different system of working from that by which the tips were produced.

In describing the cinder heap in Beauport Park, I stated that my reason for believing it to be entirely Roman would appear in my account of other works in Brede. I referred to those which I am now describing, and especially to those indications of a different system of working which I have just mentioned.

Higher up on the stream than the tips I have described, is a very large heap, resembling that in Beauport Park. This heap, like that, is a distinct *mound*—not a 'tip,' or spoil bank. It now has large oak trees growing upon it, and it contains many thousand tons of scoriæ, which appear to be of the same hard quality as those of which the road already described was made. The hardness of the scoriæ, as compared with those known to be of comparatively recent origin, is one reason for concluding that they were made by a less perfect, and, presumably, an earlier process. At Beauport, apparently, there has been no working, except by the process of heaping the ore on a mound of earth upon a layer of charcoal, and covering it with clay.

At Chitcombe there are evidences of two systems of working. There are the tips of waste, probably the result of smelting the ore in furnaces, and there is also the mound system, which appears to have the same kind of stratification as that at Beauport.

Besides the large mound, our guides showed us the remains of another which they had quarried for road-making material, and these presented distinct traces of stratification.

Roman relics being found in the stratified heap at Beauport, I am inclined to consider the heaping system to have been the Roman method of smelting iron ore.

Our search for relics of the old iron manufacturers at Chitcomb was not very successful as to the quality of those we found, but the quantity was considerable for such a superficial examination as that which the time at our disposal alone permitted us to make. It mattered little where we dug; everywhere we found fragments of coarse pottery, pieces of well-made brick, two inches thick, tile about one and a quarter inch thick, and occasionally fragments of bright red tiles, nearly an inch thick, some marked with a pattern of a number of small wavy lines, and others with radial lines.

Under a bank upon which a hedge is growing, we discovered the foundation of a wall, which we traced for five or six feet. It is constructed of loose stones, laid upon, and filled in with a kind of concrete made of lime (apparently of limestone), in which are incorporated fragments of brick or tile, broken very small. This is the only indication of masonry at present visible.

We dug in one part of the field half way up the hill, where we were told that when it was cultivated, the plough could only enter to a small depth. Here, about twelve inches below the surface, we found a hard bed, and on uncoping it we laid bare a well-made road, the surface of which was formed by a layer of broken clinkers about six inches thick. The road ran parallel with the hill side and the stream, and was probably used by the workers who formed the tips.

In all our diggings, the earth was found black with charcoal, even where there were no cinders.

There is no appearance of any mill dam on the Tillingham at Chitcombe, nor is the bed of the stream adapted for mill ponds. About two miles lower down at Conster, in the parish of Beckley, there is now a watermill on the site of 'Beckley Furnace,' by which name the place is still known. Here the iron manufacture may have been carried on from the earliest times, until it ceased about the middle of the last century. There are modern cinder-beds between Chitcombe and Beckley.

With the exception of the stratified cinder-heaps, there is not much evidence of Roman work at Chitcombe, unless the striated tiles, which are similar to some shown as Roman at the British Museum, may be so considered. I was told, however, that some years ago a cinerary urn was found on the higher slope of the Cindrell fields.

I am not sufficiently experienced, as an antiquary, to pronounce judgment on the coarse pottery, nor on other things, which to the eye of an expert would proclaim the date of their origin. I hope, however, that this article may be the means of directing attention to the interesting locality which I have so imperfectly described."

In the period since Mr. Rock's visit much has been changed, and the pottery, tiles, etc., no doubt have been carted away with the cinder. Mr. J. E. Ray, however, has found some Samian and other pottery there, and there is no doubt of this being of the Roman period. The tips of waste are formed of what is clearly bloomery slag, and not from furnaces, as Mr. Rock suggests.

Conster Manor Farm

Bloomery

Par. Brede. 50° 57′ 30″ N. 0° 36′ 10″ E.
1¾m. N. of Ch. B F
P.N. Hammer field.

At this old farmhouse is a small farm pond, the bay of which was partly dug away some years ago. The bay consisted in great measure of heavy bloomery cinder, which may have come from the Hammer field (now called Doucegrove Brook), which is by the Tillingham stream.

Beckley Furnace—formerly Conster

Furnace and forge

Par. Brede and Beckley. 50°57′ 40″ N. 0° 36′ 50″ E.
2m. N.E. by N. of Brede Ch., on the Tillingham. K I
P.N. Furnace or Conster Farm, Furnace field, Furnace Brooks, Furnace Wood, Brays field, Forge field.

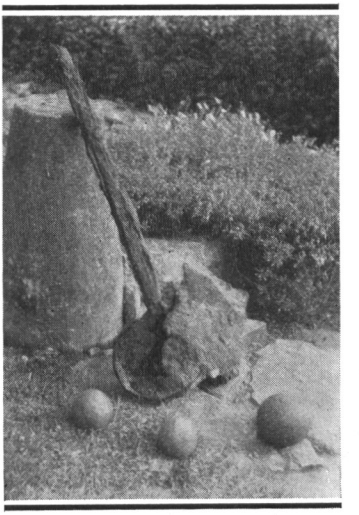
This was probably a Stuart period furnace. We find no mention of it before 1664, when "Conster furnace" was blowing in 1653 and remained at work, "Constance" Forge at work, but ruined by 1664. In 1717 the average output was 200 tons per annum. The Fuller MSS. show that it was still at work in 1741 and 1744, when, owing to the drought, they were "treading the wheel" there.

S. A. C., LXVII., p. 44.
Horsefield, V. I., p. 509.
Weale MSS.

Horsefield, writing in 1834, states that it was working in the memory of people then living. In 1787 it was yet standing, and might work again in case of war; owner, Miss Gott.

It is marked on Budgen's map of 1724, and the 1-inch Ordnance map of 1813 shows the pond; the bay is now levelled on the north side of the stream, showing only a

very slight bank, but exists on the south side. This was weighted with forge cinder, of which much has been taken out of the Forge field adjoining.



Ladle and Cannon Balls, Beckley Furnace.

Mr. Herbert Blackman noted that in the stream, 200 yards above the bay, was an oak post 15 inches square and 18 inches out of water, with other timber, and a little further down a large piece of oak, 11 to 12 feet long with mortises, perhaps part of a boring mill, as there is residue of borings, but more likely to be the remains of a trough for the forge wheel. The corn mill, only lately disused, was supplied by a long leat pond above the level of the iron pond. When the house was enlarged a few years ago cannon balls and a large ladle were dug up. There are also cannon balls and iron at Chitcombe House that were dug at Beckley Furnace.

Roughter Wood — Bloomery

Par. Brede. 50° 56′ 40″ N. 0° 39′ 0″ E.
½m. N.W. of Udimore Ch. A B
P.N. None.

A medium-sized bloomery, some 450 yards from the Tillingham stream, but having a good spring adjoining it. There is much cinder, and a little way to the east Mr. J. E. Ray found a lump of impure iron, clearly metallic in character.

Map, p. 352.

The little Asten has a small basin eastward of that of the Ashburn, of the same general character.

Blacklands, Hastings ? Bloomery

Par. Ore. About 50° 52′ 0″ N. 0° 35′ 0″ E.
P.N. Blacklands. Lost

S.A.C., XIV., p. xiii.

In 1861 J. Ross, Esq., the then mayor, exhibited at the Sussex Archæological Society's meeting at Hastings, inter alia, " Slag from the foundry on Blacklands Farm, Hastings, supposed to be Roman."

This site has long been built over, but it is quite a likely one.

Battle Park ? Furnace or forge

Par. Battle. 50° 54′ 15″ N. 0° 28′ 40″ E.
1m. S.W. of Ch.
P.N. None. Nil

In 1574 there is a kind of omnibus note stating that there were " divers " works at Battle conducted by " Wykes, Jefferys and others," but all we definitely know of this site is that so late as 1652 Lord Montague granted a lease to Robert Jarvis of the Mill in Battle, called the Park Mill, with the ironworks, and all implements, lands, waters, etc., whatsoever. In 1657 a lease of the adjacent copse was granted to John Jarvis, and in 1677 a further lease of the water mill to William Jarvis, the mill being no longer described as an iron mill. We may perhaps assume that it had by then been converted into a corn mill. Meanwhile, however, a powder mill had been erected at Peppering-eye, a little lower down the stream, and eventually the Park Mill became the chief establishment of a group of powder mills that produced the finest gunpowder perhaps in Europe. They con-

tinued till 1874. Owing to the long occupation of the powder mill, and the conversion of the ground below the bay of the pond, which is still in water, into a garden, no trace of slag remains.

Peppering-Eye Bloomery (? Roman)

Par. Battle. 50° 53′ 50″ N. 0° 29′ 0″ E.
1⅜m. S. by W. of Ch. A.B.
P.N. None.

Peppering-eye was among the earliest possessions of Battle Abbey, and is frequently referred to in their documents. In 1690 four acres here were leased to the first Battle powder-maker, William Hammond, and the bay and pond were made for the use of the powder mill.

In 1925 the late Mr. Herbert Blackman was supervising a new drainage system at the farm, and while digging for a cesspool cut through a solid bed of cinder about 3 feet in thickness, which was covered by 3 feet of garden soil. On subsequently visiting the spot, I found, embedded in a piece of brick vitrified on the surfaces, exactly similar to that occurring at Oaklands Park, a small fragment of Samian pottery. This would seem to indicate that it dates from the Roman period.

Forewood Bloomery

Par. Crowhurst. 50° 53′ 20″ N. 0° 29′ 40″ E.
⅝m. N.W. of Ch. A.F.
P.N. None.

This is an extensive bloomery of Roman type, but no pottery has yet been found. It is situated on the north side of a deep gill in this large wood.

Much cinder has been dug, but it still extends over a

considerable area. Among it I found a lump of impure iron, weighing about three pounds, and also very pure ore, with beds of clay suitable for tamping.

Crowhurst — Furnace and forge

Par. Crowhurst. 50° 52′ 55″ N. 0° 30′ 0″ E.
200 yds. S. of Ch. K.I.
P.N. Cinderbrook, Forge field.

John Relfe of Crowhurst held this as a forge in 1574 and 1588.

Burrell Col., 5679, f. 255.

In 1648 Sir J. Pelham was seised of the Manor of Crowhurst, including "all those Ironworks, forge and furnace, being of the clear yearly value of £200 above all charges." In 1664 the furnace was continued in repair, and made guns and shot in the late war, but the forge was laid aside and not used. Part of the bay remains. About 1898 a foundation of sandstone about 3 or 4 feet wide was found and also an iron pot, which was bought by Mr. Herbert Blackman, and is now in the Lewes Museum. There is plenty of both forge cinder and furnace slag, notably at the Furnace Tea Rooms.

Rackwell Gill, Crowhurst — ? Forge

Par. Crowhurst. 50° 53′ 0″ N. 0° 30′ 20″ E.
¼m. E. of Ch.
P.N. None.

There is no record of this, which seems to have been a subsidiary to Crowhurst.

There is a high bay at the foot of a deep and picturesque gill, where there are many bell-pits, but very little cinder, although there is a tradition of much being taken from there. Messrs. Blackman and Ade considered that the little found was forge cinder.

"WEALDEN IRON"
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ASHBURN

ASTEN

FURNACE FORGE BLOOMERY ROMAN BLOOMERY

Scale 2 Miles to an Inch

0 1 2 3 4 Miles

BREDE
TILLINGHAM

Crowhurst Park Bloomery (? Roman)

Par. Crowhurst. 50° 53′ 10″ N. 0° 31′ 30″ E.
1¼m. E. by N. of Ch. A.
P.N. Cinderbank.

This is a very considerable bloomery of Roman type. There is a large dump of cinder and ash in the bottom near a little rill, and the soil is blackened on an area of some four or five acres on the slope above. At the top of the field is a large excavation, now wooded, which no doubt provided the mine, out of which runs a deep and narrow cleft strongly reminiscent of the " Scowles " in the Forest of Dean, which were excavations for iron ore of the Roman period, but is probably mainly natural. There are several miles of roads in the park made up with the cinder.

The Cinderheap at Crowhurst Park.

Sidley — Bloomery

Par. Bexhill. 50° 51′ 30″ N. 0° 29′ 0″ E.
½m. N.E. of Sidley Station. A.F.
P.N. Cinderbanks.

This bloomery appears to have been under the railway line. A little cinder is to be found on the S.E. side of the line.

Potmans — Forge

Par. Catsfield. 50° 52′ 40″ N. 0° 27′ 0″ E.
1m. S. by W. of Ch. I.
P.N. Upper and Lower Pond fields, Mill Land.

Stent's map, 1680, shows a curious tadpole-like pond, which no doubt is Potmans, and it is marked as in water on Yeakell and Gardner's map, 1778–93, but not on the 1-inch Ordnance of 1813, when no doubt it had been drained by that date.

The Ashburnham muniments calendared by the Rev. W. Budgen enable us not only to trace the history of the power forge, but also many interesting facts. The name Potmans evidently derives from John Potman, holding in 1376 25 acres of copyhold land in Catsfield. He claimed to be a free man and a stranger, his grandfather, William Potman, being a free man of Burghershe (Burwash). Six witnesses from Burwash enabled him to prove his case and the claim was allowed.

Ashburnham Muniments, No. 4.

One of the earliest documents—undated (13th century)—is a grant of 3 acres of meadow lying between two brooks, called Hamerwyse. One of the witnesses to this deed is Martin Smith (Faber). Possibly this was a bloomery.

By the early years of the 16th century Potmans had come into the possession of the Estone or A'Neston family, and adjoining was 8 acres belonging to Thomas Clement, who sold them in 1547. After passing through several hands it was bought in 1579 by William Waters, who on March 10th, 1582, leased to Michael Marten an "Iyernewerke or Iyerne forge and foryers lately e'cted upon land called Clements in Catsfield, and certain lands" for ten years, rent £32 6*s.* 6*d.*

Ashburnham Muniments. No. 204. No. 279. No. 298.

William Waters had apparently tried, without success, to establish an ironworks elsewhere in the district, for commissioners were appointed on July 6th, 1573, to adjust "a difference betwixt one William Waters and the townes of Rie, Hastings, and Winchelsey for setting up of an iron milne, for such a sum of money as they shall think and award, and to take the like ordre for the rest of the wood there heretofore appointed for the service of the said milne."

Acts of the Privy Council, Vol. 8, new series.

In 1588 Waters sold to Thomas Alfraye, and the description in the deed refers to "molendinum ferrarium anglice called an Iron Fordge or Iron Myll, with buildings, offices, ponds . . . in and upon the premises called Clements and Southeponde." Alfraye contributed £30 towards the Armada defence—his brass is in Battle Church. In 1600 he bought the Manor of Catsfield from the unfortunate Sir John Ashburnham, and Potmans became the family seat. In 1636 Potmans pond belonged to Richard Alfraye, in the following year Thomas Lord and Emanuell Finche (perhaps trustees) leased to him for forty years "the forge or Ironworke in Cattesfield in the tenure of the said Richard Alfray and all ponds, etc., coleplaces, sinderplaces, workhouses, voyd places . . . belonging to the said forge or ironworke." The forge, however, must have ceased

No. 333. No. 394. See p. 366. No. 568. No. 573.

working before the expiration of the lease, as it is not mentioned in the list of 1653. The names of two woods, Reedwood and Southwood, which occur in these deeds, still survive, adjacent to the forge lands. There is a large bay, with forge cinder in evidence below it.

Buckholt Furnace and forge

Par. Bexhill. 50° 52′ 30″ N. 0° 29′ 0″ E.
2m. N. of Ch. K.I.
P.N. Old Forge, Forge Brook, Furnace Stream.

I am indebted to Mr. J. E. Ray of Hastings for much information as to this site. The manor of Buckholt was part of the possessions of Lord Dacre of the South, who is named in the 1574 lists as owner; the working being "in the hands of Jeffreys." Bartholomew Jeffrey was summoned to attend, and he signed the bond for one forge and one furnace in Buckholt. He belonged to the important family of Jefferay of Chiddingly. There was a petition in Chancery of John Stilian of Heyfield (Heathfield) reciting that Bartholomew Jeffery of Battell, ironmonger, had melted a ton of iron in bars that had been delivered to him. Stilian says that Jeffery is "a man well kinned, frended and alyed with the most part of the freeholders" and that "your oratator will be sure to fayle of justice on a trial at the Comon Law." Jeffrey was buried at Bexhill on March 9th, 1575, having by his will demised the furnace and forge to Thomas Alfrey for the payment of his debts. George May of Burwash, another ironmaster, was also an executor, and a long and verbose lease was granted to William Waters of Catsfield on April 20th, 1575, of "All that yron works called Buckholt ffurnas," together with "so much wood as will make 550 loode of cole evyyere," at the high rent of £220.

Waters had to deliver yearly " at feast of Birth of Christe, tenne tonnes of wrathe yron in Barres " at £8 per ton. The fishing in the ponds during June, July and August was reserved. Waters was a day late in tendering a half-year's rent, owing to his absence in Wales. The rent was then refused. This led to proceedings in the Court of Request; the result is not recorded.

We find Waters selling the near-by forge at Potmans See p. 354. to the same Thomas Alfrey in 1588.

In the 1664 lists " Buckhall is laid aside, only sometimes used."

It must soon after have entirely ceased. On an estate map of 1753 " Old Forge " is marked a field above the large bay. There are signs of a straight leat having existed, leading from higher up the stream to this spot, and there is a little forge cinder in the stream. Below the farm is a large and high bay, with abundance of forge cinder and charcoal, but very little furnace slag, which rather leads to the inference that when the bay was made, forming quite a large pond, the old forge at the pond-tail was removed to below the bay, and worked alongside the furnace.

Buckholt South Bloomery

Par. Bexhill. 50° 51′ 50″ N. 0° 28′ 50″ E.
$1\frac{3}{8}$m. N. of Ch. A.B.
P.N. Bloomery field.

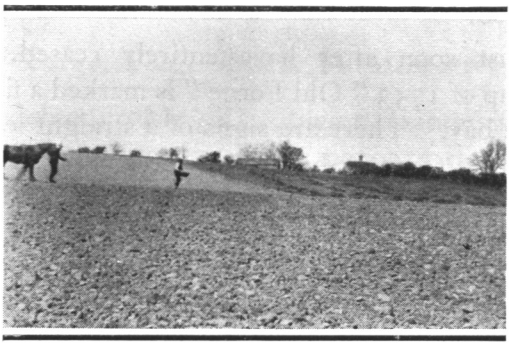
This is a large bloomery in Little Henniker Wood, of early, perhaps Roman, type.

A bank some 4 or 5 feet in height, at the base of which is a little rill, running from a swampy spot, shows that a great deal of cinder has been dug, but a considerable quantity remains.

Bynes Farm Bloomery

Par. Crowhurst. 50° 52′ 10″ N. 0° 29′ 30″ E.
1m. S. by W. of Ch. A.B.F.
P.N. Cinderbank.

A quite large bloomery in an arable field, typically situated near a stream. Ploughing has scattered the cinder over a large area, but the main bed is nowhere near enough to the surface to hinder cultivation to any great extent.



A Typical "Cinderfield," Bynes Farm, Crowhurst.

XII. ASHBURN

Ashburn

The little Ashburn drains the southern slopes of the Brightling Ridge, the average rainfall, though hardly exceeding 30 inches, sufficed for the supply of several important furnaces.

Maps, pp. 352, 400.

Warbleton Priory

Forge

S.E. of the Priory. 50° 54′ 30″ N. 0° 20′ 19″ E.

Furnace

½m. S.E. of the Priory. 50° 55′ 58″ N. 0° 20′ 21″ E.

Par. Warbleton. K

P.N. Penstalk (= Penstock) field, Furnace field.

Some time before the Dissolution the Priory, then called Hastings Priory, had a watermill of the yearly value of £1. After that event the buildings, etc., were sold to "divers persons" and the land passed to John Baker. In 1574 we find Thomas Stollion or Stolyan of Hefolde holding this, among others in the parish as a furnace; in Losely, 1588, Thomas Stollian the same group as a forge, and his name appears several times in the Pelham accounts in 1589, etc. This ironmaster appears to have succeeded Richard Woodman, and Great and Little Bayfields by Woodmans Furnace are noted as part of Stollion's Charity.

S.A.C., XIII., p. 176.

The Priory fishponds served as pen-ponds for the iron ponds below. The two bays are in very dense wood. There is a "bear" or block of iron below the furnace bay, and slag.

Summertree Farm Bloomery

Par. Warbleton. 50° 55′ 10″ N. 0° 19′ 40″ E.
1½m. N.W. of Bodle Street Green Ch.
P.N. Cinderbank field and shaw.

Traces, but very few ; no bed found. There are very large excavations here, perhaps iron mines, along the sides of the little stream (Colonel D. MacLeod).

Batsford Furnace Furnace and forge

Par. Hurstmonceux-Warbleton.
50° 54′ 49″ N. 0° 19′ 14″ E.
At Trulilows Bridge, ⅞m. N.E. of Cowbeech Windmill. K
P.N. Furnace field.

This is the furnace " called Battesford furnes " for which Simon Colman of Brightling was summoned in 1574. Batsford Farm lies a little to the N.E. In the Losely MSS., 1588, it is " Battesford furnace, called a forge."

There are two bays, slag has been dug and a large block found. My specimens are furnace slag only, but from the record it may be a combined site.

In July, 1930, Colonel D. MacLeod made the interesting discovery that the upper bay was in part weighted with bloomery cinder (types AB) which must have come from some near-by hearth. Perhaps this explains the forge name.

Herrings — Bloomery

Par. Dallington. 50° 56′ 22″ N. 0° 22′ 4″ E.
⅝m. S.E. of Ch. ABF—s.g. of A, 3.52
P.N. Cinderhill, Cinderhill Mead, Cinderhill Cottage.

This large bloomery has been known for many years, and extensively dug. The cinders are about a foot below the surface. Colonel D. MacLeod frequently examined the excavations in 1926 and 1927, and secured specimens of pre-Roman pottery (La Tene), but nothing Roman. There was also late mediæval.

The diggings are now filled in and the site tidied up. (Colonel D. MacLeod.)

Pagden Wood — Bloomery

Par. Warbleton–Ashburnham.
50° 55′ 40″ N. 0° 21′ 57″ E.
⅔m. S. of Cinderhill, Dallington. A
P.N. Blackland.

Colonel D. MacLeod has found here, together with curiously twisted cinder, a sandstone hammer and wedge, now in the possession of the Rev. Walter Budgen.

Peartree, Warbleton — Bloomery

Par. Warbleton. 50° 54′ 45″ N. 0° 21′ 28″ E.
¾m. N.N.E. of Bodle St. Ch. AB
P.N. None.

Colonel D. MacLeod writes in *Sussex Notes and Queries:* S. N. & Q., No. 7, p. 225.

"The cinderbed is found on the L. bank of a small stream, extending over about half an acre in the shaw through which the stream runs and over another half acre in the field above. Here also the cinders are of an ancient type, and are found some inches beneath the surface of the field, where they lie deeper than in the shaw."

Thorndale — Bloomery

Par. Ashburnham. 50° 55′ 40″ N. 0° 22′ 20″ E.
1½m. S.E. by S. of Dallington Ch.
P.N. None.

This small bloomery was found by Colonel D. MacLeod in 1930; he describes it as a mound a few yards across, full of cinder, charcoal and burned clay.

The cinder is much contorted, and takes weird shapes.

Panningridge — Furnace

Par. Penhurst and Ashburnham.
50° 56′ 0″ N. 0° 24′ 20″ E.
⅞m. N.N.W. Penhurst Ch. K—s.g. 2.40
P.N. Cinderbank Shaw (locally called Cinderhole), Pondbrook.

R.H.MS. Commission, Report 77. Lord de Lisle and Dudley, V. I., p. 307.

When Sir Henry Sidney came into the possession of Robertsbridge Abbey lands in 1541, he established a forge and a furnace there. In the following year he apparently leased land at Panningridge, as we have "The charges of the fornace edefyed at Panningridge made in the xxxiiij yere of King Harry the VIII" (1542). The probable reason for building this furnace some seven miles from the forge, notwithstanding the increased cost of carriage, was to take advantage of the close proximity of extensive woodlands, and so reserve the fuel supplies nearer the forge. The wall of the furnace cost £26, and there were many other payments. By 1543 it was in full work and sent 77 sows to the forge.

The accounts of Harry Westall, the clerk from 1542 to 1549, extracts from which are given in the Report, give both Robertsbridge and Panningridge, the combined produce being about 115 tons of bar iron, at a clear gain

of £270 per annum. Very full details for the calendar year 1546 are contained in "Harry Westall's booke of Pannyngrydge" which is preserved in the Huntingdon Library at San Marino, California, and of which I have been able to obtain a photostat copy by the courtesy of the directors. This is described at length in S.A.C., Vol. LXXII. The rent of £20 per annum was paid to Mr. Chancellor for the woodland, and £1 to the parson of Penhurst for the furnace pond, together with tithe. The fuel was cut in Panningridge, Olivers, and Asilden woods—the names of which survive.

See p. 198.

Full details are given of the cost of the various operations, the earliest account that we have of a Tudor blast-furnace. Of special interest are the names of the Frenchmen employed; several of these can be identified as having obtained letters of denization in 1544. In the muster rolls of 1539 it is specially noted that no fewer than 49 Frenchmen lived in Netherfield hundred, consisting of the parishes of Brightling, Netherfield, Mountfield and Penhurst.

By 1574 the furnace appears to have passed into the possession of John Ashburnham, under the spelling of Panning Reche, further corrupted in Losely, 1588, to Paning Rock. It is only about half a mile above his Ashburnham Furnace. It cannot have continued in work much later, for in an Ashburnham deed of 1611 one of the boundary marks is "a place where sometime was a furnace called Panningridge furnace."

There is a high bay, with much slag below it, and in the site of the pond, now arable, a hop-pole can be driven full length into the silt.

The track along which the sows were carried to Robertsbridge Forge can still be traced, although lost in part. It was very likely also used for Ashburnham. In order to take an easy gradient it descended the valley to

Ashburnham Furnace, and then climbed in a north-easterly direction. In one place it is cut in the rock. After crossing the modern road it continues as a green lane, at first quite overgrown, then widening out between hedges, by Homestead Farm and Darvel Beech through Limekiln Woods, where it is well marked, by Castle Farm, and up an avenue in the park of Mountfield Place. On the east of the Place it is bordered by an avenue of very ancient chestnuts, and reaches the main road at Vines Cross. From here to Poppinghole Lane the line is obscure, but it continues on the north side of the lane by a hollow way to Robertsbridge Furnace, and so to the Forge.

Ashburnham Furnace (or Dallington Furnace)

Par. Ashburnham (formerly Dallington)—Penshurst.
50° 55′ 40″ N. 0° 24′ 0″ E.
⅝m. N. W. of Penhurst Ch. K
P.N. Minepit field, Cinderbank Wood, Furnace field, Furnace Wood, Furnace Farm, Furnace Crook, Furnace Pond, Furnace Pond garden.

The ponds are still partly in water.

Marked on Budgen's map, 1724.

Ashburnham Forge (Called the Upper Forge, in contradistinction to Kitchenham).

Par. Ashburnham and Penhurst.
50° 55′ 10″ N. 0° 24′ 0″ E.
½m. S.W. of Penhurst Ch. I—s.g. 3.59
P.N. Forge Pond, Hammer Brook.

The large pond was in water in 1813, but drained before 1840.

These celebrated works, the premier in the Weald, were perhaps the largest, and certainly the latest to work.

The interesting sites are situated in a very beautiful wooded valley, above the furnace there is still water in two ponds, and the oak floodgates remain. There is a great accumulation of slag, although hundreds of tons have been removed and it is still being dug. Some large pieces about 4 or 5 feet long lie in the stream. There are also to be seen many fragments of the moulds, and considerable masonry, especially the wheel-pit. The cottage adjoining this is said to be part of the works. The forge pond is drained. It is shown in water on Yeakell and Gardner's map.

Previous to 1880 the house illustrated and half the wheel-race and wheel-pit were in a detached portion of Dallington parish, now annexed to Ashburnham. This accounts for the name used in the following extracts.

Over a thousand deeds relating to Ashburnham lands have been preserved at Ashburnham Place. They have been most painstakingly calendared by the Rev. W. Budgen, and throw much light not only on Ashburnham, but on other near-by works. A copy of the Calendar is at Barbican House, Lewes.

Lower tells us that: S.A.C., XXIV., p. 3.

"The Ashburnhams, without genealogical question, have held their estate uninterruptedly for between seven and eight centuries, with one slight interval of a very few years. Sir John Ashburnham, who died in 1620, was an improvident man, and alienated his ancient patrimony. There came to the rescue a gallant lady, named Frances Holland, wife of Sir John's eldest son, John Ashburnham, groom of the bedchamber to Charles I., who sold her own estate to repurchase Ashburnham, thus endowing her husband with the ancient possessions of his family. John Ashburnham's fidelity to his royal master is well known. He adhered to him in his adversities, and attended him in prison to the fatal scaffold at

Whitehall. There he took possession of some of the unhappy monarch's relics, including his shirt with stains of blood upon it, his silk drawers, and his watch. These objects were bequeathed by his descendant, Bertram Ashburnham, Esq., to the parish clerk for ever. Superstitious persons, even within my own time, have resorted to Ashburnham Church to touch the shirt for the cure of the 'King's Evil': and one scrofulous, but unscrupulous visitor, stole the outer case of the watch. Since that time the relics have been removed to the mansion, and still remain there."

S.A.C., XXXII., p. xviii.

The first part of the inscription on his monument in Ashburnham Church reads as follows :—

"Here lies in the vault beneath John Ashburnham Esq. of this place, son to the unfortunate person Sir John Ashburnham whose good nature and frank disposition towards two friends in being deeply engaged for them necessitated him to sell this place (in the family long before the Conquest) and all the estate he had elsewhere."

Westall's Book of Panningridge.

In 1542 we find Mr. Ashburnham selling mine to the Panningridge furnace. Ashburnham is not mentioned in the portsmen's complaint in 1549, but must have been established soon after, for in the Court Rolls of Ninian Burrell, lord of Penhurst (later of Holmsted), February 18th, 1563, the death of John Ashburnham is recorded, holding much land in the manor, including a meadow at Densforthbridge, "now made an Iron furnace, in Dallington and Penhurst." His son and heir was John Ashburnham, aged 19 years. In 1574 he held both Panningridge and the Ashburnham works.

Ashburnham Muniments, No. 243.

His grandson, the unfortunate Sir John, began to sell land to William Relfe, described as "ironmaster," in 1605, and in 1611, according to the following deed sold, him the ironworks :—

Ashburnham Muniments, No. 488.

"Feb. 1st, 1611. Conveyance by Sir John Ashburnham to William Relfe of Penhurst, gent., of (inter alia) the Iron works or forge called the Upper Forge and pond adjoining called the upper Forge pond and the workmen's houses near the same and all coleplaces, sinderplaces and waste grounds belonging containing 8½ acres, in the occupation of George

Littleboy, gent. . . . The Ironworke or furnace called Dallington Furnace, with the ponds, water, baies, sinderplaces and coleplaces in the occupation of the said William Relfe."

The price paid for the whole was £6,330, and much of this huge sum for those days was raised by Relfe from time to time by various mortgages. William Wimble, ironfounder, seems to have both advanced money and bought some of the land. On Relfe's death in 1638 his sons sold much of the land, and in 1640 we find the following deed :—

Ashburnham Muniments, No. 580.

Ashburnham Muniments, No. 607.

"Conveyance by John Relfe to John Gyles, clerk, and Benjamin Scarlett, gent., of the Ironworke Furnace called Dallington Furnace, with all the workmen's houses . . . and also the cinderplaces belonging abbutting on the Fludgate river there, and also the coleplaces, and mineplaces then rayled and payled in near the said furnace, which said Ironworke, workhouses, etc. abut to the River running from the Fludgate of the Forge east, a little brook of the said John Relfe which is at the lower side of the Cinder heape and to the rayles and payles of the Coleplace, south, and to the Barne and hedge of other lands of the said John Relfe at the outside of the Coleplace and Cinderplace, west, and to the one side of the myneplace and to the cinderplaces north. Endorsed with memo of attornment of John Hodson and Thomas Austin, tenants and farmers of the said Furnace and Forge."

John Gyles died in 1654, and left his half-share in the works and extensive estates to his wife Joane. This lady is remarkable as having married, in succession, four husbands who all owned ironworks. By the terms of Gyles' will, Anthony May, her son by her first husband, Anthony May, senior, of Pashley, had the option of purchasing, and Joane, having bought Benjamin Scarlett's share, put Anthony in possession about 1655.

Dunkin MSS., 39,500. Ashburnham Muniments, No. 740.

Perhaps owing to the effects of the Civil War, the times were not favourable to May. In the 1664 lists we find that both forge and furnace were ruined, although the latter had made guns and shot for the late war. In February of that year we find noted in the Close Rolls

Close Roll, 4,170.

that Anthony May was bankrupt—"Anthony May of Ashburnham Lodge, chapman, for several years past got his living by buying and selling iron and by the profession of maker of iron by the forge and furnace in the p'ishes of Dallington, Ashburnham and Penhurst, late in possession of George Browne and Alexander Courthope." Among the assets were 800 loads of mine, 20 bushels to the load, worth 4*s*. the bushel .. £160. The works now appear to have passed to Thomas Scarlett, son of Benjamin Scarlett, and grandnephew of John Gyles, perhaps by foreclosure, and in 1677 he leased them to Thomas Westerne of London, ironmonger, for five years at a rent of £60. In 1688, Thomas Westerne of Battle was proposed among the Justices of the Peace at the time of James II's attempt to repeal the Test Acts. There is an iron graveslab to his eldest daughter, Martha Gott, in Streat Church. The above lease is noteworthy, as it mentions "the boring place," which seems to show that gunboring was practised in England at least 36 years before the method was introduced in France. In 1680 the trustees of William Ashburnham's will acquired the works for John Ashburnham, and to clench their title entered a friendly suit against Westerne, having previously compromised a "pretence, claim or demand" of Sir Thomas Dyke, presumably as executor of John Gyles' will, to a moiety. The Ashburnhams thus again came into possession.

Chancery Proceedings, *Whittington* Bundle 201, No. 8.

Although a new lease was granted to Westerne in 1683 for six years, the works appear later to have been carried on for the direct benefit of the estate.

Ashburnham Muniments, No. 1,084.

In the 18th century they were again flourishing.

In 1717 the capacity of the furnace (the forge not being mentioned) was 350 tons per annum, nearly twice as much as any other in Sussex.

Cottage at Ashburnham Furnace.

The wages were paid through the little window above the gate.

The Wheelpit at Ashburnham Furnace.

By 1787 the output had dropped to 200 tons, and in 1796 to 173 tons, the smallest but one of any in Great Britain. There are considerable discrepancies in the dates given for the final closing down. Lady Dorothy Neville, in her "Under Five Reigns," says :— Weale MSS.

"Ashburnham was closed in 1809, the immediate cause of it being the failure of the furnace men, through intoxication, to mix chalk with the ore, by reason of which it ceased to flow, and the blasting finally ended."

The late Mr. Herbert Blackman, who had great local knowledge, puts the date for the furnace as 1813, and for the forge 1828. The account book ends December, 1812. William Hobday, the last surviving ironworker, died in the cottage shown in the plate in 1883. The little window to the right of the door is said to have been used for paying the wages.

Within living memory old people spoke of hearing the forge-hammer from a good distance.

There have been preserved at Ashburnham two Debtor day-books from 1756 to 1792, and a ledger, apparently

pertaining to the forge, 1798 to 1812. From these we can gather interesting particulars of the last period of Sussex ironworking.

The furnace was only worked for short periods after 1760, and from 1763 to 1778 every alternate year. For the next five years the " blasts," into which the accounts are divided, again took place each year, and increased in length of blowing, but the three following periods averaged only about 21 weeks in each, every three years. This is reflected in the iron exports from Hastings, which dropped from 152 tons in 1787 to nil in 1788, and three-quarters of a ton in 1789. The product was mainly guns, the greater part of which in the earlier years were sent viâ Maidstone and the smaller proportion viâ Hastings. The carriage was very costly, especially in winter, being 30s. per ton to Maidstone plus turnpike dues. The preference for Maidstone may have been due to the state of war with France, as after the peace of 1763 they were all sent to Hastings.

The wood and mine were collected over a large area, which made the cost of carriage heavy.

There was a boring-house at some distance from the furnace, and a " bridgehouse," as at Waldron. A considerable quantity of mill cases, i.e., shells, and gun-heads, were also sent to Hastings, which, together with purchases of wrought iron from other forges, would seem to show that the forge was not then working.

The ledger, 1798–1812, however, although there are no details, mentions a stock of scrap, probably for working up in the forge.

Although owing to the obscure method of accounting, and the absence of stock figures, it is somewhat difficult to see the financial position, it would appear that from 1808 onwards there was a steady and increasing loss.

See p. 201.

Kitchenham Forge (or Ashburnham Lower Forge)

Forge

Par. Ashburnham. 50° 53′ 50″ N. 0° 23′ 20″ E.
1m. S.W. of Ashburnham Ch. I
P.N. Hammer Wood, Hammer Hill, Hammer Mead, Hammer Brook, Forge Brook.

In 1574 John Lambard or Lambert, alias Gardner, who was the ironmaster for Lady Braye at Cranley, in Surrey, is also given in the Sussex part of the lists, and he signed the bond for Isabel Ashburnham, the grandmother of the unfortunate Sir John, although he was not "named in the book by the messenger," but we are left uncertain if this refers to this site.

The stream, after serving Panningridge and Ashburnham Furnace and Forge, flows through Ashburnham Park. Before crossing the road it was again held up by a bay, not now holding water, perhaps the site of a mill, and continued along the now flattened valley to the bay of Kitchenham. This is now a very slight one; below it there is a good deal of forge cinder and charcoal.

In 1611, at the time of the dispersal of Sir John Ashburnham's estates, a deed conveying from Sir John Ashburnham and Dame Elizabeth, his wife, to Edward Bromfeild and others the Manor of Ashbornham and certain lands included "lands called Kitchenham, with the Forge or Ironwork called Kitchenham Forge and 30 acres of land covered with water, which were used as a pond for the said forge, and 480 acres of roughland or woodland called Hoads Wood." (Ashburnham muniments, transcribed by the Rev. W. Budgen).

See Ashburnham Furnace.

Ashburnham Muniments, No. 489.

In 1634, Bromfeild, by then an alderman of London, and his partners sold to Laurence Somers, Roger Cobye and Nehemiah Panton for £409, Hammer Hill, alias the Forge field, Hammer Brook, Hammer Coppice, the pond of 25 acres, etc. It was then occupied by the

Ashburnham Muniments, No. 546.

Relfes, who worked Ashburnham Furnace and Forge. In 1640 it was again sold to John Fagge and William Hay, the pond being then described as of 10 acres only. No. 605.

It was working in 1653, but ruined before 1664 (called Ashburnham Minor).

In 1661 it formed part of a marriage settlement for William Hay's son, but in 1667 the lands and forge were repurchased by Sir John. The pond contained 10 acres, and there were six acres of brookland formerly part of the pond. Although the 1664 list stated the forge was ruined the deed recites all particulars as if it were at work, and especially guards in a very verbose fashion the rights of carrying the iron down the stream in boats to Boreham Bridge, a mile away. No. 776. Ashburnham Muniments, No. 853, and Close Roll 4,215.

Barnhorne

? Bloomery

Par. Bexhill. About 50° 50′ 30″ N. 0° 25′ 0″ E.
¾m. W. of Little Common crossroads.
P.N. Furniss Mead, Great and Little Furniss fields.

Mr. J. E. Ray has kindly shown me a copy of a customal of Barnehorne of 1306 which mentions Furnieys land. The marsh dyke near is called Cole stream and although no cinder has yet been found, the land now being under grass, it is so probable that this is an ancient bloomery site that I have put it on record.

XIII. CUCKMERE

Cuckmere

The little river Cuckmere has its sources in many small streams running from the high Heathfield ridge from about Blackboys to Punnetts Town, about seven miles from west to east. Although this ridge is in the main over the 500-foot line and reaches 597 feet at Tower Street, the collecting grounds are so small that the flow of water is scanty and intermittent. The rainfall does not exceed 32½ inches.

Such as it is, however, it served several important furnaces, of which we have interesting records, and there are many ancient bloomery sites. Map, p. 400.

Cross-in-Hand — Bloomery

Par. Waldron. 50° 58′ 5″ N. 0° 14′ 20″ E.
¼m. S.E. of Cross-in-Hand Ch. F
P.N. Cinderfield.

This is in pasture and roads have been made across it, but a typical piece of cinder was found.

Little London — Bloomery or burning site

Par. Waldron. 50° 57′ 40″ N. 0° 14′ 10″ E.
¾m. S. of Cross-in-Hand Ch. F
P.N. Stony field.

A certain amount of ancient cinder is scattered over the field, cinderbed not found. It may be only a burning site.

Browndown — Bloomery

Par. Heathfield. 50° 57′ 13″ N. 0° 16′ 58″ E.
⅜m. S.E. of Ch. AB (s.g. 3.16) F
P.N. Cinderfield (local), Fountain Field in Tithe Map.

Colonel D. MacLeod, in *Sussex Notes and Queries*, says :—

Sussex N. & Q., V. I., p. 225.

"This is an ancient site half a mile SSE. of Heathfield Church on the R. bank of the little stream which flows to Heathfield Furnace. (6′ O.S. xlii NW.). Over an area of at least half an acre in the field W. of the stream and in the shaw alongside it, is the cinderbed in which are found at all depths down to 2 feet the heavy blue black cinders, accompanied by burned soil, which seem to be typical of the ancient cinderbeds in the district."

Heathfield — Furnace

Par. Heathfield. 50° 56′ 45″ N. 0° 16′ 40″ E.
⅛m. S. of Nettlesworth Farm. K
P.N. Furnace Wood, Furnace Lane, Furnace Plot, Furnace field, Pond Mead, Pond field, Floodgate field, Boringhouse Farm.

In the 1574 lists Sir Richard Baker held two forges and two furnaces in Heathfield and Warbleton, but these are not likely to have included this furnace.

Herbert Blackman S.A.C., LXVII., p. 25.

The Fuller family, who lived at "Tanners," Waldron, established "the New Furnace" towards the close of the 17th century. The site chosen was by no means a good one from the point of view of water-power, as the watershed is very limited in area, although the high ridge to the north, reaching nearly to 600 feet, has a rainfall of 32½ inches. It was therefore found necessary to construct, probably at various periods, no fewer than eleven supplementary ponds. Most of these, and the main

furnace pond, are now dry, but several in Heathfield Park are still in water. These were the subject of a law-suit in 1797 between Francis Newbery, the owner of the park, and "Jolly Jack" Fuller; it was stated that the furnace had then ceased ten years before, and the covenants to maintain the ponds had become unnecessary. The lack of water in the dry period, 1700–1750, was a great handicap. A number of documents and accounts have been preserved, and the late Herbert Blackman published many of these in the Sussex Collections, and Mr. P. Lucas, in "Heathfield Memorials" gives considerable information.

Heathfield Memorials, Lucas.

S.A.C., LXVII., p. 25.

The first date on record is in a lease of Twissells Mill, on the stream above the furnace, dated April 8th, 1698, in which the tenants were to bear one-third of the cost of repairs to the furnace.

Heathfield Memorials, p. 74.

From 1703 to 1754 very large contracts for guns were carried out for the Government; at a later period, 1768 to 1770, the sows were sold to Mr. Molineux of Maresfield, 376 tons in all, as well as several tons of forge tackle. The furnace finally ceased about 1787.

The output in 1727 was 316 tons 8 cwt. 2 qrs., of the value of £3,442 3s., and the profit very considerable, but the Government demand was a fluctuating one. In 1748 John Fuller, Jnr., claimed that they had been contractors for "near two hundred years," but this is doubtful. About this period he supplied guns to Ireland in 1747, Sardinia in 1752, and Naples in 1754. The Irish guns were of a special pattern, and two of them were brought back in 1849, and, by request of Colonel Dundas, deposited at the Tower of London, where I found them on the wharf, wrongly labelled "Time of Henry VIII." They have the initials J.F. on the trunnions and have been mended as described in the following amusing letter:—

See illustrations, pp. 165, 167, 317.

"July 17, 1747. John Fuller to the Duke of Newcastle.

"If my dear Betsey continues mending, I shall attend the proof of my Irish guns on Wednesday at Woolwich. A Blott is no Blott till it is hitt, a little ornamental Ball at the end of each Gun no bigger than a Tennis Ball was knocked off from 6 of them, but so artfully putt on again with a screw that I hope there will be no occasion of making use of the enclos'd Advertisement.

Heathfield Memorials,

> Whereas some evil disposed malicious People did on the first Day of *May* last knock off the Balls of some large Guns, belonging to *John Fuller* Esq., which were laid on *Burwash Down* Whoever shall give such Information, so that one of them shall be convicted of the same Offence, shall receive the sum of Ten Guineas from
>
> J. FULLER."

In 1742 a new boring house was built a little below the furnace, on what is now Boring House Farm. There are large masses of the borings in the stream rusted together in solid blocks.

There are two other guns at the Rotunda Museum, Woolwich, with the mark J.F., and also another broken in the proof, the subject of bitter complaints from Fuller. Heathfield guns bore their part in the defence of Gibraltar during the famous siege, as witnessed by Sir John Elliott, the commander, who afterwards acquired Heathfield Park and was created Baron Heathfield.

The last Fuller, "Jolly Jack" of Rosehill, Brightling, was a member for Sussex for many years. He built the "Needle" and observatory at Brightling, and is buried in a curious pyramid in the churchyard there.

Although it was such an important furnace there is very little to be seen now. The pond is dry, the bay lowered, and the site generally confused and overgrown.

In Budgen's map of 1724 it is marked as New Furnace; three ponds are shown in water on Yeakell and Gardner's map of 1795.

Weale MSS. The output was computed as 100 tons in 1787, but it seems doubtful if it was then still at work.

Woodman's Furnace — Furnace

Par. Warbleton.
½m. S.W. of Ch. K (s.g. of causeway, 2.06)
P.N. Great and Little Bayfield.

A short distance below Heathfield Furnace, but in Warbleton parish, is a very large bay, by tradition the site of Woodman's furnace. It may possibly have been one of Sir Richard Baker's works in 1574 (see Heathfield). Richard Woodman, who also owned or worked Steel Forge and Markly Furnace in the same parish, was perhaps the most noteworthy of the Sussex martyrs who perished in the Marian persecutions. There is a very long account in Foxe's "Book of Martyrs," from which we gather that he was first arrested about 1553 or 1554, released for a period, and then recaptured. In the end he was burnt at Lewes, together with nine others of lesser note, on June 22nd, 1557, being then only thirty years of age. In his own spirited account of his second arrest we read that he was hidden in a secret chamber in his house (which was situated close to Warbleton Church). On being discovered by the sheriff's men, he broke out

"and leaped down, having no shoes on. So I took down a lane ful of sharp synders, and they came running after with a great cry, with their swords drawn, crying, Strike him! Strike him! which words made me look back, and there was never a one nigh me by an hundred feet; and all the rest were a greater way behind; and I turned about hastily to go my way, and stepped upon a sharpe sinder with one foot, and saving of it, I stepped into a great miry hole and fell down withal, only a stone cast from the plain ground, and before I could arise and get away, he was come up to me." — Foxe's Book of Martyrs, 1576.

This lane was a causeway raised in places above the ground level, and is still to be seen. The "sharpe sinders" are yet in evidence, although some 6 or 7 inches below the soil, and the field-names Great and Little Causeway field and Causeway Wood confirm the local tradition. These are mentioned in leases by Thomas Stolyon in 1675 and 1677.

Ashburnham Muniments, 1133–5.

Woodman must have been a considerable ironmaster, for in one of his examinations, pleading to be set at liberty, he said: "Let me go home, I pray you, to my wife and children to see them kept, and the poore folke that I would set aworke a 100 persons, ere this, all the yeare together."

There are no remains at the bay except some large masses in the stream at the east end, probably "bears" or semi-melted iron that caked in the furnace.

Steel Forge

Forge

Par. Warbleton. 50° 55′ 45″ N. 0° 17′ 0″ E.
¾m. S.W. by S. of Ch. I
P.N. Steel Forge field—shaw—wood.

A short distance below Woodman's Furnace is its forge, one of the few examples of the word "steel" appearing in a place-name. The situation of the wheel-pit is marked by a depression below the bay, and there is a small quantity of cinder visible.

This is reputed to have been Woodman's property.

Middle and Upper Forge Woods were leased by Thomas Stolyon in 1672, 1675 and 1677.

It would appear probable that Stolyon then owned Woodman's works, as Great and Little Bay field belong to Stolyon's Charity. He worked in co-operation with Sir John Pelham, who had the right to draw mine in Causey field.

Steel Forge, Warbleton.

Markly or Rushlake Green — Furnace

Par. Warbleton. 50° 56′ 22″ N. 0° 18′ 40″E.
1m. E. by N. of Warbleton Ch. K
P.N. Furnace field, Furnace Shaw, Floodgate field.

The 1574 references to Warbleton are not sufficiently definite to determine whether this furnace was then in existence, but it is traditionally reputed to have been worked by Woodman, i.e., before 1557.

In 1645 14½ tons were bought for Bibleham forge, and in 1655, 50 tons for Brightling forge.

No Warbleton sites are mentioned in 1664.

The high bay is placed diagonally in the deep wooded valley, and has been cut; the pond must have been a large one, and has a small pen-pond higher up. Below the bay there is much slag, and in the stream a block of cement, the aggregate of which is slag, in which are embedded old oak timbers—these have only been exposed within the last fifty years. They were perhaps water shoots, as when first uncovered they were covered with slabs, but seem more likely to have been the foundations of the wheel.

Cralle or Cowbeech Furnace and forge

Par. Warbleton and Wartling.
50° 54′ 42″ N. 0° 17′ 37″ E.
2m. S. of Warbleton Ch. K I
P.N. Furnace pond, Forge field, Lower, Middle and Upper Forge fields, Forge Field shaw, Hammer Lane.

There is a large bay, part of which has been destroyed, containing furnace slag and forge cinder.

The name does not appear either in the 1574 or 1653 lists.

Arch. Cambresis, 1863, p. 103.

At one time it belonged to the Cheneys of Cralle, a branch of the ancient Norman family that took its name from Cahanges in Calvados. The Cheinie of 1066 held under the Comte de Mortain, and fought at Hastings, receiving fiefs in the Rape of Pevensey after the Conquest. Their name appears in several counties as a place-name suffix, e.g., Horsted Keynes. In the 14th century Sir Richard Cheney married the heiress of Cralle, and that branch remained there well into the 16th century, and intermarried with ironworking families.

S.A.C., XXV., p. 110.

Dunkin.

John Manning died November 1st, 1633, seised of an iron forge called Crawle forge, alias Cobbeech forge.

Marked on Budgen's map, 1724.

Grove Hill, Hellingly Bloomery

Par. Hellingly. 50° 54′ 18″ N. 0° 16′ 51″ E.
1¾m. N.E. of Station. ABF
P.N. None.

Mr. J. T. Ade, then of Grove Hill Farm, found a considerable quantity of cinder in excavating for a drain, together with fragments of ancient pottery, perhaps pre-Roman.

Waldron — Furnace

Par. Waldron. 50° 56′ 25″ N. 0° 13′ 40″ E.
1¼m. S.E. of Ch. K
P.N. Furnace Wood, Furnace Farm, Furnace Plot, Furnace Brook, Furnace Hill field, Furnace Hop-garden.

In 1574 Sir John Pelham had a furnace in Waldron "in other men's hands;" in this case it was Thomas Stollyan who worked it for him, and he also is summoned, and signed the bond. As early as 1580 Pelham and Stollyan were exporting the iron at Pevensey, having brought it in barges down the marsh streams. S.A.C., LIII., p. 59.

There is a remarkable series of accounts for Waldron Furnace, together with Brightling and Bibleham forges, preserved in the British Museum in three considerable volumes ranging from 1639 to 1678, and then, after a break, from 1692 to 1715. During this long period the works were in Pelham hands. These voluminous accounts give very valuable information as to the costs and methods of iron-making at this time, and would require many months of labour and an entire volume to do justice to them. A careful analysis of the wood felled in certain years is summarized in the chapter on fuel. One of the noteworthy facts to be gleaned from them is the very slight effect of the Civil War in this part of Sussex, although there is a distinct decline in the latter half of the 17th century, followed by a revival in the early 18th century. Add. MS., 33,154–6. See p. 124.

Sir Thomas Pelham was a Parliament man, like most of the East Sussex landowners.

The constantly recurring cost of repairs to the buildings was a heavy burden. Among the buildings at Waldron was a " bridge house " such as was used in the Forest of

Dean. The only records of such an erection in the Weald are here and Ashburnham. The iron produced at Waldron was almost entirely sent to Brightling and Bibleham to be converted into bar-iron, although they sometimes made cannon and shot. The fuel was collected, as a rule, from woods on the vast Pelham estates, and only the cutting and coleing brought into the accounts. The long hauls of the sowes to the forges and the bars to the ports must have been a great handicap. Unfortunately the receipts are only very partially shown, viz., the cash actually paid to the clerk of the works. The bulk of the proceeds apparently was paid direct to the owner, so no profit and loss accounts can be extracted.

As it required roughly 2 tons of sows to produce 1 ton of bar-iron, the production of this furnace, judging from the bars made, must have approached 400 tons per annum about 1641, reduced to about 200 tons by 1705, but in the latter period something, no doubt, must be added for guns and shot made at the furnace itself.

In 1717 it was given as 150 tons only.

Weale MSS. In 1716 it came into the possession of the Fullers. It was marked on Budgen's map, 1724, but was entirely down by 1787.

There is a large bay and furnace slag. The pond, now a meadow, is marked on Yeakell and Gardner's map, and also on the 1-inch Ordnance of 1813.

Scallow Bridge — Bloomery

Par. East Hoathly. 50° 56′ 10″ N. 0° 11′ 25″ E.
1⅜m. N.E. of Ch. F
P.N. Cinderwood, Cinderford field.

There is a good deal of twisted cinder in a ditch at the side of a little wood, which is said to contain more. Cinderford was mentioned in a deed of 1614.

Knowle Wood Bloomery

Par. Chiddingly. 50° 55′ 30″ N. 0° 14′ 25″ E.
1⅛m. S.W. of Waldron Station. AG
P.N. None.

The soil of a large area on the east side of this wood, perhaps two to three acres, consists entirely of black ash, with a relatively small amount of ancient cinder in it. The deposit seems very deep, and is honeycombed with rabbit holes. Higher up the slope there are many depressions and minepits. It is difficult to account for the paucity of cinder, considering the size of the site, unless it has been sifted out for road purposes. The only comparable ash deposit is that at Bardown, which, however, is full of Roman potsherds, which seem entirely absent from Knowle Wood. It would therefore seem unlikely that this is the site recorded by Lower, where pottery seems to have been abundant.

Marle Green, Hore Beech Bloomery

Par. Heathfield. 50° 55′ 30″ N. 0° 15′ 20″ E.
⅔m. S.E. Horeham Road Station. ACF
P.N. Hore Beech field.

There is ancient cinder well below the surface, which is exposed by the little rill. This site was found by Colonel D. MacLeod.

Cindergill. S. of Maygarland Inn. Bloomery

Par. Hellingly. 50° 55′ 13″ N. 0° 14′ 24″ E.
2¼m. N. of Ch. FG
P.N. Cinderbanks.

A small bloomery with some cinder in the ditch and field. Found by Colonel D. MacLeod.

Chiddingly, Stream Furnace — Furnace and forge

Par. Chiddingly. 50° 55′ 4″ N. 0° 12′ 50″ E.
1m. N.E. of Ch. K
P.N. Smithland Wood, Smithland field, Cinder brook.

There is a large pond still in water, but choked with reeds, it having served a flour mill, now disused. Lower states that this is probably the site of the mill mentioned in Domesday, which was valued, *with the miller*, at four shillings per annum. The Victoria County History, however, considers the word translated above, " miller," to mean a subsidiary mill.

R.H. MSS. Commission. Hatfield MSS., XIII.

See p. 114.

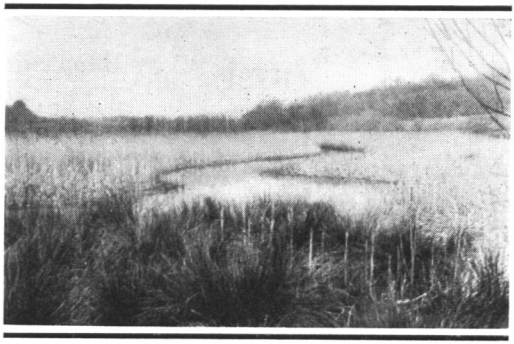
Chiddingly is specially mentioned in 1548 as follows : " The iron hammer of Chiddingly within four miles of salt water "—interlined—" beseeching your Grace to give commandment especially that it may go no longer." The distance is not such an exaggeration as it appears, as the shipping point at the Broyle would not be more than five or six miles distant.

S.A.C., II., p. 210.

In 1574 John French gave his bond, and it is also mentioned by Horsfield in Elizabeth's reign, and in Losely, 1558. In 1653 it was called a furnace, and remained in work in 1664. The cinder is furnace slag.

In 1650 it was leased by Sir Thomas Dyke and John Fuller, in partnership, from Stephen French, and the agreement between them as to the supply of mine and fuel is given in full in the Sussex Collections, showing that it was then both furnace and forge. Marked on Budgen's map, 1724.

S.A.C, XXXII., p. 30.



The Pond at Stream.

OUSE

The Ouse, the largest river of the Forest Ridge, has many sources, ranging from the south-eastern side of St. Leonards Forest to the southern slopes of Ashdown.

The rainfall is mainly 32½ inches, rising to 35 inches.

As this basin includes many iron sites, I have divided it as follows from east to west :—

I. The Uckfield river.
II. The Maresfield or centre district.
III. Western and main stream.

XIV. OUSE, UCKFIELD RIVER

The eastern sources of the Ouse, rising in the high ground of Crowborough and Rotherfield, are numerous, and as the average rainfall at their heads ranges from 32½ inches to over 35 inches, they have a good flow of water.

Map, p. 400.

Streele Farm (Twitts)

Bloomery

Par. Mayfield. 51° 1′ 15″ N. 0° 13′ 15″ E.
1¾m. W. of Ch. F
P.N. Cinder field.

" Mayfield," p. 177.

This is mentioned by Miss Bell-Irving under the name of Twitt's Farm. The field itself is in pasture, but there is plenty of twisted cinder in the little stream. The coincidence of the name with the Framfield Streele is curious, but I am unable to connect the word with ironworking. Professor Mawer derives it from O.E. Stræl, arrow.

" Place Names of Sussex," Vol. VI., p. 155.

Ordnance Place, near by, can never have been either a casting or trial site, the name must have some other origin.

Limney Farm — Bloomery

Par. Rotherfield. 51° 1′ 20″ N. 0° 12′ 0″ E.
1¾m. S.W. of Ch. F
P.N. Cinderbank (traditional).

There is a good deal of cinder scattered about here, and two large marlpits. On the banks of the eastern-most one I found a portion of the base of a pot, which has been determined by Mr. Reginald Smith as "Roman, perhaps New Forest ware, third century or later."

A little below the "Cinderbank" is a "Butletts" field. "Rotherfield," p. 279.

Huggetts Furnace — Furnace

Par. Mayfield. 51° 0′ 45″ N. 0° 11′ 0″ E.
1¼m. N. of Hadlow Down Ch. K—s.g. 2.35
P.N. Huggetts Furnace, Huggetts Furnace Mill, Furnace field.

This important furnace, according to Lower, is by tradition where the first iron guns were cast in 1543. He conjectures that the name of Hogge or Hoggé has been confounded with that of Huggett. There is a rhyme believed in the locality: S.A.C., V. II., p. 184. See p. 147

> "Master Huggett and his man John,
> They did cast the first Can-non."

See p. 394.

It is more probable, however, that the first guns were cast at Oldlands.

In the 1574 lists it is spelt Huggins, and belonged to Arthur Middleton of Rotherfield (see Maynard's Gate). It is also named in the enquiry *re* wood in Elizabeth's reign. It is not in the 1664 list.

The now drained millpond is too small and shallow, and the bay too low, for a furnace pond; perhaps the original pond became so silted up by the strong stream that a smaller pond had to be made above the silt for serving the mill. There is much slag.

Budgen's map does not show the furnace symbol, but gives the name.

Little Forge

Forge

Par. Buxted. 50° 0′ 45″ N. 0° 9′ 30″ E.
2½m. N.E. of Ch. I
P.N. Forge Brook, Forge Field.

This is mentioned in an enquiry as to wood in Elizabeth's reign (vide Horsfield) as Little Bucksted Hammer. In 1574 it belonged to Arthur Middleton. It is possibly the forge at Buxted continued in 1667, but the Buxted references are very uncertain.

The Rev. K. H. MacDermott informs me that Little Buxted was leased to John Sleach in 1611, and when the manor was conveyed to J. Marsham in 1652 mention was made of "one iron mill, one smiths forge, one furnace."

There is a bay higher up the stream (Mabb's Gill), illustrated in Maxwell's "Unknown Sussex," p. 181, but this may have been for a flour mill, as the field-name is Tibb's Mill Mead.

Morphews Bloomery

Par. Buxted. 51° 0′ 30″ N. 0° 9′ 0″ E.
$1\frac{3}{4}$m. N.E. of Station. AF
P.N. None.

This has been a very large bloomery, from which much cinder has been dug, and is the probable forerunner of Howbourne and Little Forges, quite a short distance away.

The lane to the north, between Wildings and Great Lodge Woods, leading to Burnt Oak, is practically paved with very hard cinder from this pit.

Howbourne Forge

Par. Buxted. 50° 0′ 15″ N. 0° 9′ 30″ E.
$2\frac{1}{4}$m. N.E. of Ch. I—s.g. 3.24
P.N. Old Pond Brook, Great Pond Brook, Hammer Meadow.

The Rev. K. H. MacDermott has found an early reference to this forge in Chancery Proceedings, 10 Eliz. (1568), John Relfe, plaintiff, Robert Olyffe, defendant, "to obtain recompense because divers parcels of iron were taken from an iron mill or forge called Owbourne Hammer, which the plaintiff and defendant were jointly possessed of."

John Paler of Rotherfield held this forge in 1574; both his name and that of the forge are spelt very variously, but Paler is that in the Rotherfield records, extending from 1576 to 1603. It was still at work in 1664. Lower, writing in 1848, says: "The hammer-post, an interesting relic, remains in situ, near the extremity of the now drained pond, which occupied many acres.

"Rotherfield," Miss C. Pullein, pp. 135, 240, 409.

S.A.C., II., p. 208.

It is a ponderous oak tree, in remarkably fine preservation, and, if not wantonly injured, may stand for many years longer. Its height about ground is 9½ feet."

Topley's "Geology of the Weald," p. 332.

This was standing in 1862, but has now disappeared, although its tradition remains.

There is a large bay and some forge cinder.

Howbourne

Bloomery

Par. Buxted. 50° 0′ 15″ N. 0° 9′ 30″ E.
2¼m. N.E. of Ch. A—s.g. 2·78
P.N. None.

At the rear of the farmhouse, in a little shaw, is a small but characteristic bloomery, perhaps the progenitor of the Tudor forge. There is much cinder along the little rill and in the adjoining field.

Buxted, Iron Plat

Furnace

Par. Buxted. 50° 59′ 50″ N. 0° 8′ 15″ E.
⅝m. N. of Station. K
P.N. Iron Plat, Huggetts Brook.

About a mile below Howbourne, along the stream, is a field with the above name. There are mounds looking like the vestiges of a bay, and furnace slag, which is also to be found further down, where it has been laid in gateways and boggy spots. The furnace cannot have been of sufficient size for gun casting, judging by the scanty remains.

There are two other fields near, on the other side of the river, called "Slags," but this is not a Sussex word, nor is any cinder visible.

Spood Farm Bloomery

Par. Mayfield. 50° 58′ 45″ N. 0° 11′ 50″ E.
1¼m. S.E. of Hadlow Down Ch. F
P.N. Spoods—Spood Mead.

This word occurs also at Cowden, and is a 17th-century Latinism for cinder.

Spood Mead, a pasture, is reputed to have cinder below the turf, and I found a trace in the stream.

Pounsley Furnace

Par. Framfield. 50° 58′ 30″ N. 0° 10′ 30″ E.
2m. N.E. by E. of Ch. K—s.g. 2·51
P.N. Gun Bank field.

South of the Hadlow Down ridge and north of Blackboys and Framfield, a stream runs to join the Uckfield river; on this Pounsley and Tickerage are situated.

In 1546, in the portsmen's complaint, the iron mill of Framfield was mentioned.

Robert Hodson of Framfield had Powley or Pounley in 1574, and signed the bond. In Losely, 1588, he appears as Robert Hodeshen for Poolie, and, according to Lower, the family still held it in the 17th century. It had been discontinued before 1664, but then "repair'd and stockt."

A little above the mill is the bay, around which a considerable amount of slag has been dug out. A heavy iron pot, slightly broken, was found here, and is now at the inn at Blackboys. It was used either for heating liquor in the ashes of a down hearth or as a mortar.

Marked on Budgen's map, 1724.

The pond is shown in water on Yeakell and Gardner's map.

Tickerage Furnace (?) and forge

Par. Framfield. 50° 58′ 10″ N. 0° 9′ 30″ E.
1½m. N.E. by E. of Ch. K
P.N. None.

This site should not be confounded with Tickerage Farm, near Kingscote Station, East Grinstead, where there is a good fireback. It does not appear in 1574, in 1653 it was working as a forge, but ruined before 1664. There is a small millpond, and the mill has only recently been stopped. The cinder is definitely furnace cinder, and there is also some slag, but this may have been brought from Pounsley for the road. Topley was told of a hammer-post which stood near the mill in the middle of the 19th century, which would prove this to be a forge.

"Geology of the Weald," p. 332.

Little Streele Bloomery

Par. Framfield. 50° 58′ 20″ N. 0° 8′ 30″ E.
¾m. N.E. by N. of Ch. F
P.N. Cinderfield.

S.A.C., II., p. 210.

This site is mentioned by Lower. It is on the brook running down from Pounsley and Tickerage.

The field has for several years been in pasture, but there is plenty of ancient cinder in the stream.

Framfield — Bloomery

Par. Framfield. 50° 51′ 55″ N. 0° 8′ 10″ E.
⅜m. N.E. of Ch. F
P.N. Scoria Lane (perhaps a modern name).

There are here two large marlpits, where a fault makes the junction between the Wadhurst clay and the Upper Tunbridge Wells sand almost vertical.

Mr. H. W. Keef of Framfield called my attention to a small deposit of very ancient type cinder on the face of the sand. His further searches have not as yet revealed the main hearth.

New Place, Framfield — Furnace

Par. Framfield. 50° 57′ 10″ N. 0° 9′ 0″ E.
1m. S.E. of Ch. K
P.N. None.

A site of which there is no record. New Place is now demolished, and the new house is named Thurston Hall. There is a fair pond in water here, around which there has been considerable alteration, but it has every appearance of an iron pond.

Large quantities of cinder were removed from a field close by the road due west, and some furnace cinder has been found recently by Mr. Keef, Jun. S.A.C., XIX., p. 206.

XV. OUSE—CENTRAL OR MARESFIELD

THE Maresfield district has two streams rising in Ashdown Forest, with a good supply of water, the average rainfall on the high ground being over 35 inches. The more westerly, rising near Nutley, runs by Boring-wheel Mill, Old Forge and Marshalls, the eastern from Duddleswell by Oldlands and Hendall, joining near Park Farm and flowing into the Ouse at Shortbridge. As the records only quote "Maresfield," it is a little uncertain to which of three sites they each refer, pending further discoveries of local records, but I have allotted them as it would appear most probable.

Map, p. 400.

Oldlands

Furnace

Par. Buxted. 51° 1′ 30″ N. 0° 6′ 20″ E.
⅝m. N.E. of Fairwarp Ch. K
P.N. Furnace field, Furnace shaw.

A little north of the old house of Oldlands are two ponds still in water, fed by the streams that run through Oldlands Park, and by a copious spring of highly ferruginous water. Below the bay is a hollow also full of water from which great quantities of blast-furnace slag have been dug. Mr. A. Nesbitt, a former proprietor, in a note in S.A.C., quotes Mr. Dunkin as considering that this was the site where Parson Levett, rector of Buxted, cast the first Sussex guns. As this, although on the extreme border, is in Buxted parish, this conjecture may be correct, as in Levett's will, dated March 6th, 1554, among very numerous legacies, he leaves "to Ralph Hoge my servant 4 li and vi tonnes of sowes, to

S.A.C., XXXIII, p. 268.

my nephew Francis Chalenor and Mary his wife my land called Oldlands and Appisfilde in the parish of Buxted, should they die without issue the said lands to go to Nicholas Pope. Reserving always to me and my executors all the wood being or growing upon the said landes for the space of 15 years." Of Hendall (q.v.).

Oldlands

Roman bloomery

Par. Maresfield. 51° 1′ 15″ N. 0° 6′ 15″ E.
⅝m. E. of Fairwarp Ch. A (s. g. 3.32), B
P.N. Cinderfield, Sinderhatche Gate (Survey of Ashdown Forest, 1564).

A little below the Tudor furnace is the classic site where Roman ironworks were first discovered in Sussex by the Rev. Edward Turner, the then rector of Maresfield:—

"In 1844, Mr. Turner observed, upon a heap of cinders, laid ready for use by the side of the London road, a small fragment of pottery, which on examination proved to be Roman. His curiosity having been excited by so unusual a circumstance, Mr. Turner ascertained, on inquiry, that the cinders had been dug upon Old Land Farm, in his own parish of Maresfield, and immediately contiguous to Buxted. He at once visited the spot, and found that the workmen engaged in the digging were exposing to view the undoubted remains of a Roman settlement. Lower, S.A.C., II, p. 171.

"The place in question is the site of one of the innumerable fields of iron scoriæ marking the localities of the extinct furnaces and forges of the Sussex weald. The bed was originally of great extent, no less than six or seven acres of it (varying in depth from two to ten feet) having been already removed for the useful purpose of repairing turnpike and other roads. A few days previously to Mr. Turner's visit, the labourers had opened, in the middle of this field, a kind of grave, about twelve feet in depth, at the bottom of which lay a considerable quantity of broken Roman pottery, evidently the remains of a regular funeral deposit. The superincumbent stratification was as follows: the ground had been excavated, first, through about one foot of earth, then through a layer of

cinders, two feet in thickness, and, lastly, through about eight or nine feet of earth. The cavity had been filled up entirely with cinders.

"The digging had been carried on many months previously to Mr. Turner's investigations. About two years before, the foundations of a building, measuring, according to the statement of the workmen, about 30 feet by 12, were uncovered. They were very rudely constructed of stone, and lay about six feet beneath the surface. A human skeleton, in a very perfect state, was discovered at the same time, but crumbled to dust on exposure to the air.

"Mr. Barrett, the surveyor, by whom the workmen are employed, informs me that he has seen several skeletons exhumed from the cinder-bed, in which the bodies had been interred as in ordinary soil. If these were Roman interments—which can scarcely be questioned—we are led to suppose that they were made long subsequently to the original deposit of scoriæ, since a *recently-formed* cinder-bed would have been a very unlikely spot to be selected for the burial of the dead. The fair inference from these considerations is, that the iron works at this place were carried on by the Romans during a long series of years.

"So extremely numerous are the remains of Roman pottery on the spot, that scarcely a barrow-load of cinders is driven out that does not contain several fragments of it. Hardly any of the vessels have been found entre, a circumstance not to be wondered at, when we consider the fragile nature of the articles, and the great weight of the superincumbent cinders.

"At the Society's annual meeting, held at Lewes in August last (1848), I had the pleasure of exhibiting a collection of the various articles discovered during the progress of the digging: it is hardly necessary to add that many others had been over-looked, while many more had been thrown away as useless by the labourers, or sold for a trifle to casual passers-by, previously to the examination of the spot by competent observers. The objects most worthy of attention which have been rescued from destruction are:—

"1. Coins, in first-brass, of Nero, Vespasian, and Tetricus, and a fragment, much oxidized, of one of Dioclesian. Some have undergone the action of fire, and cannot be identified. The Vespasian is of the most common occurrence.

"2. A brass fibula. Portions of other fibulæ, and of armillæ, were noticed by Mr. Turner.

"3. Fragments of coarse fictile vessels, principally domestic. The pottery of this kind is in great quantities, and of great variety as regards shape, colour, and fineness. Several fragments of the vessels known as *mortaria* have the potters' names boldly stamped upon them, particularly IVCVN (for Jucundus?) and EVAI.

"4. Fragments of fine red or Samian ware, both figures and plain. Several of these likewise bear potters' marks or stamps, particularly OF. (officina), MIRAVI, and IVAN or IVANI.

"5. Fragments of glass.

"6. Pieces of sheet-lead full of nail-holes, some of which had fragments of wood adhering to them. Much broken brick was also found.

"7. An implement of mixed metal, very hard; probably a stylus.

"In the absence of further evidence, I am unwilling to speculate largely upon the date of the commencement of these iron works; but, from the preponderance of the coins of Vespasian, we may hazard a conjecture that it took place during the reign of that emperor, or his successor, Titus, at a time when Agricola, then governor of Britain, was successfully introducing the arts of civilization into this island. That the works were still carried forward in Dioclesian's time is clear, from the coin of that monarch.

"It is worthy of remark that the Romans would appear, so far at least as the evidence of the discovery under notice goes, to have been but imperfectly acquainted with the art of smelting ores. The scoriæ at Maresfield retain a far greater proportion of the metal than the cinders of other beds in the neighbourhood, and are, on that account, much more valuable for the purpose of road-making."

The arable field is still strewn with pieces of cinder and cyrenæ limestone, and cannot be ploughed to any depth, owing to the cinder remaining.

Hendall

Furnace

Par. Maresfield–Buxted. 50° 0′ 40″ N. 0° 5′ 40″ E.
1⅜m. N. of Maresfield Ch. K
P.N. Furnace Wood, Furnace Banks.

Nicholas Pope owned this furnace in 1574 and 1588. He was warned and signed the bond. An inquiry as to wood in Elizabeth's reign, quoted by Horsfield, mentions two hammers here, but this may be an error, as the cinder is furnace slag. A high bay was disclosed by the cutting down of the dense copsewood in 1928. It is just below the ancient manor house of the Pope family.

Boringwheel Mill

Par. Maresfield. 51° 1′ 10″ N. 0° 4′ 40″ E.
1½m. N.W. of Ch.
P.N. Boringwheel Pond and Mill.

S.A.C., XXIV, pp. 191 and 206.

In the Parliamentary Surveys of Ashdown Forest of 1658, there are mentioned in the boundaries of the manor of Duddleswell and of the commoners of Maresfield the "Sluces and old watercourses to the west end of the bay of the boreingwheel pond" and "the North end of the boreingwheel pond and thence on the west side of the said pond." This would seem to confirm the local tradition that cannon were bored here. The pond is in water and the flour mill but lately disused, but it is not of ancient construction. I was unable to find any remains of borings, but it is by no means unlikely that the tradition is correct.

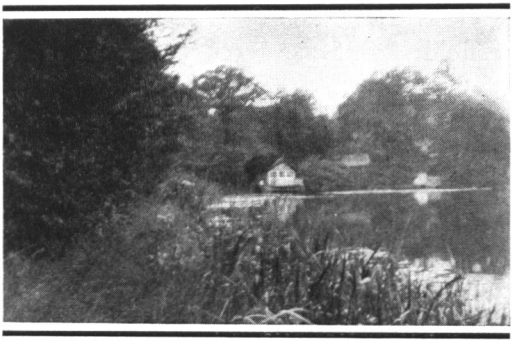
Old Forge

Furnace and forge

Par. Maresfield. 51° 0′ 45″ N. 0° 4′ 50″ E.
1¼m. N.W. by N. of Ch. K
P.N. Cinderbank, Bank field.

This is, I think, the furnace and forge called Marshalls in the 1574 lists. The manor house of Marshalls, about three-quarters of a mile distant, at that time belonged to Ralphe Hogge, who describes himself as "the quenes Maiesties gonnestone maker of yron for the office of her Ma^ties ordinnance w^hin her Ma^ties tower of London." He was duly warned, but is noted as not having appeated or having been bound, perhaps because of his official position. His name appears as a gentleman interested in the south ward of the forest in 1576. Hogge House at Buxted was built in 1581, according to the date on the celebrated "hog" rebus, This is a cast-iron slab with

S.A.C., XIV, p. 44.



Boringwheel Pond.

the figure of a hog and the date. In the MSS. of Sir J. Maryon Wilson is a deed of 30 Elizabeth (1588) conveying a house at Buxted from Thomas Hog of Buxtedd to James Burgess which bears the endorsement " In this house lived ralf Hog who at the then furnace at Buxted cast the first cannon that was cast in England." Hogge married, in 1580, Margaret Henslow, daughter of the master of the game in Ashdown. The parish registers have several French and Dutch names, including a hammerman and a founder. The Marisfield of the 1664 list " continued in hope " may have been either this or the Powder Mill site. The Rev. Edward Turner, writing in 1852, stated that the forge was worked within living memory, and Mr. Ridley, whose house is on the site, told Mr. Herbert Blackman that a very old woman who died about 1884 remembered the forge being worked by the Willis family, but if these statements are correct they can only be taken as the working up of old iron.

H.M. Comm. Report 5, App., p. 305.

S.A.C., XIV, p. 158.

The pond was ten acres in extent, and the silt is 9 feet in depth. Many tons of cinder have been dug, including a mass of about half a ton. Cannon balls and a mould have been found. There is still cinder and slag in evidence.

Lower Marshalls Forge

Par. Maresfield. 50° 59′ 50″ N. 0° 4′ 10″ E.
1m. W. of Ch. I
P.N. Little and Great Hammer Heads, Hammerpond Field, Forge Field, Forge Wood.

On the same stream as Old Forge, but half a mile south of Marshalls, we find the field-names quoted above. There is no bay left, and the stream has been altered, but in it there is cinder of the intermediate type. No records can be connected, unless it was a branch works of Old Forge.

Maresfield Powder Mills Furnace and forge

Par. Maresfield. 50° 59′ 5″ N. 0° 4′ 50″ E.
1m. S.W. of Ch., on Park Farm. H.I.K
P.N. Furnace Bank, Furnace Bank Wood, Forge Pond, Forge field, Forge Pit Wood, Upper Forge, Forge Lane.

I consider this site as being that held by John Faukenor of Waldern at Marsfield in 1574. Losely, in 1588, makes it Mayfield, no doubt an error. If this had been Hogge's works one would expect to find a road to it from Marshalls, but none such now exists. As mentioned under Old Forge, a forge was "continued in hope" either at the former site or here. In 1608 James I had silver ore brought from Scotland to be smelted; 20 tons of this were sent to Maresfield, according to a paper in S.A.C. by Mr. W. V. Crake. The experiment was a failure, but a furnace master from Sussex was sent to Scotland to continue it there.

S.A.C., LV, p. 278.

In 1620 Sir Sackville Crowe was granted a patent for iron guns for the merchant service, and seems to have controlled this furnace.

S.P.D., James I, V. 118, Nos. 48–49.

WEST OUSE
MARESFIELD OUSE
UCKFIELD

"WEALDEN IRON"
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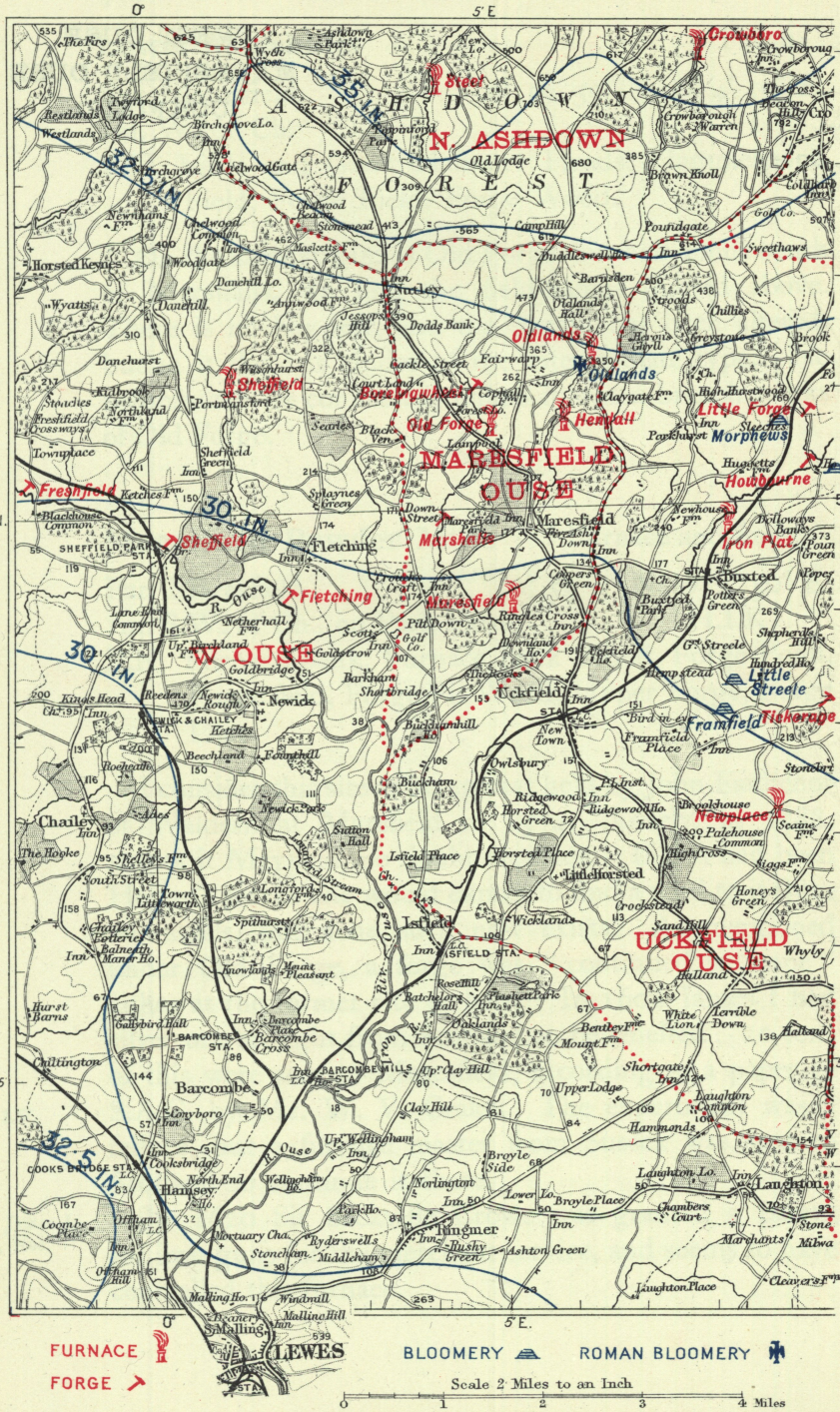
OUSE

WEST MARESFIELD UCKFIELD



UCKFIELD RIVER
CUCKMERE

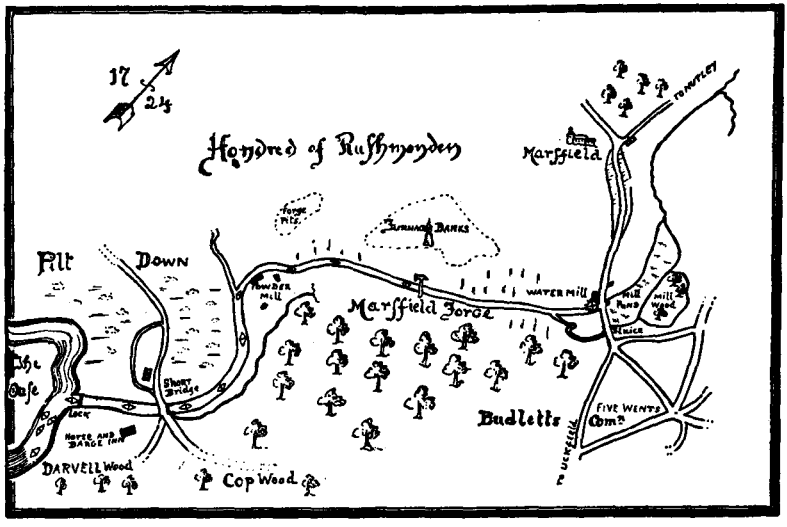
ROTHER
ASHBURN

"WEALDEN IRON"

UCKFIELD RIVER
CUCKMERE
ROTHER
ASHBURN

About 1627 Donevide, a Frenchman employed by Cardinal Richelieu, went to Maresfield to see the furnace or forge for making and boring of iron guns. He endeavoured to persuade a gunfounder to go to France, apparently with no success. Anthony Browne, by instructions of Crowe, accompanied him, and an inquiry was held. S.P.D., Chas. I, Vol. LXV.

The " boring " referred to above was most likely riming only.



COPY OF A MAP OF THE MARESFIELD FORGE IN 1724.

Made by C. Dawson, F.S.A.

From a curious map of 1724, copied by the late C. Dawson, F.S.A., which was printed to illustrate Mr. Crake's article, and is here reproduced, the powder mills that took the place of the furnace as at Battle and Brede, a little lower down the stream than the upper forge, were then in existence. They continued until about 1854, when an explosion caused their abandonment. There are several ranges of high banks, either bays or safety banks, and the ground has been considerably dug about,

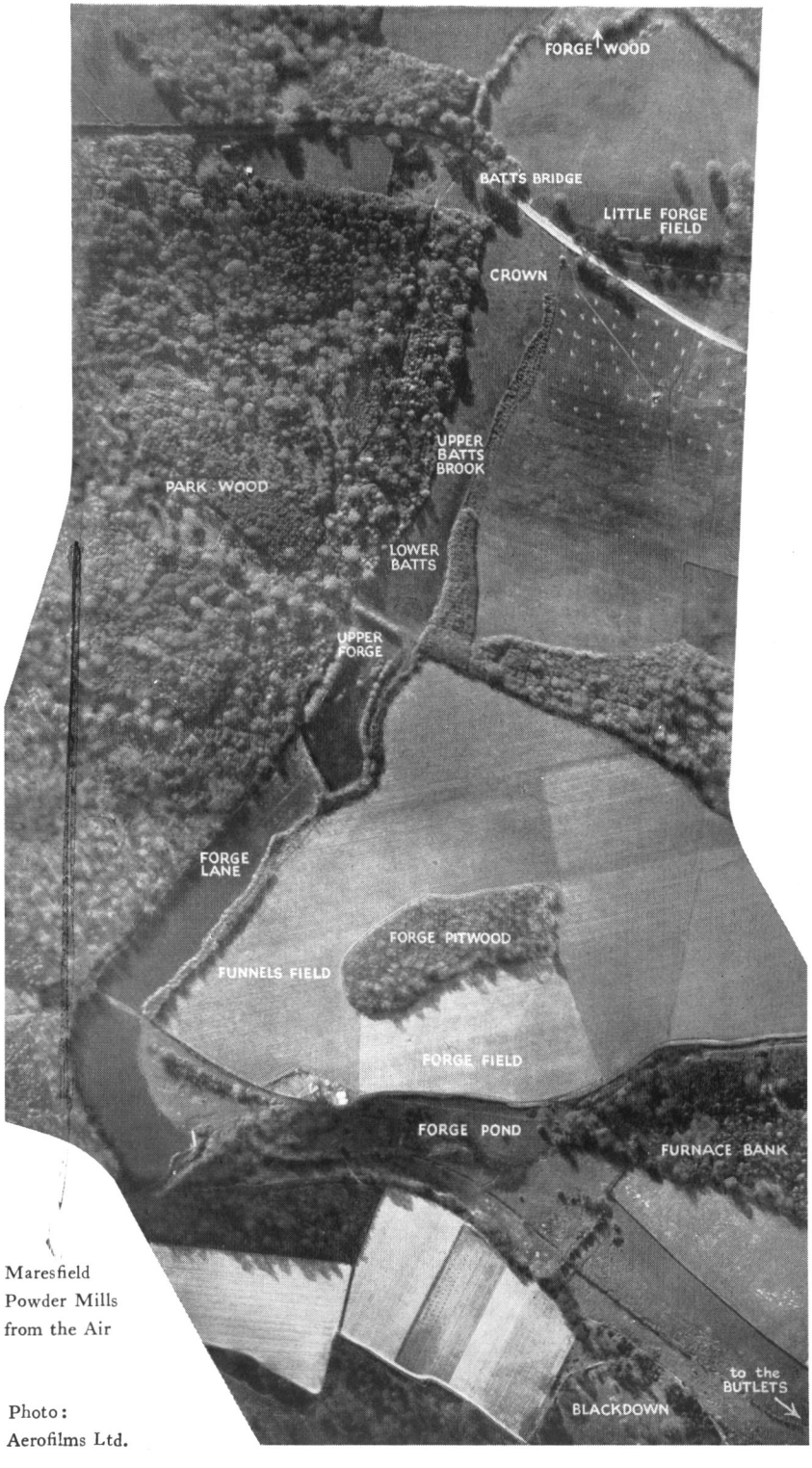
but much charcoal and iron slag is to be seen about where a zigzag line crosses the end of the side stream on the map, where there is clear evidence of the forge pond. On the field above lies one of the great mill-stones used for grinding the powder. The boats on the map would seem to indicate that the stream was then navigable. The forge was at work in 1736, when the annual production was given as 60 tons; in 1741 John Fuller sold to Messrs. Masters and Tidy 17 tons of sows, and from 1768 to 1770 he supplied no less than 376 tons besides forge tackle to Mr. Molineux. In 1788 the output, by Mr. Collins, was 30 tons only.

Heathfield Memorials.

Weale MSS.

The pond is shown on Stent's map of 1680, Budgen, 1724 (with a hammer sign), and Bowen's of 1749. The "uppermost pond" is mentioned in a survey of 1625.

We have here a very interesting example of resuscitation of the old water-system, admirably shown in the aerial photograph here reproduced. This was taken for Mr. I. D. Margary, who has very kindly allowed me to use it. The top of the plate, where Forge Wood is marked, is below Lower Marshalls, and the line of trees to the left of the word "Forge Wood" marks the course of the swift stream. After passing under Batts Bridge, the stream runs along the right-hand edge of Park Wood, where the trees show in the photograph as rounded bosses, the direction being approximately from N.E. to S.W. Prior to the summer of 1929 the whole of the old pond area was swampy ground covered with coarse grass and rushes. In that year the lowest bay, abutting on the dark wood at the lower end of the plate, was repaired by a concrete dam, and the ponds refilled as far as the cross bay marked Upper Forge. It is possible that in the days of the ironworks the higher basins marked Lower Batts, Upper Batts Brook, and Crown were also overflowed.



Maresfield
Powder Mills
from the Air

Photo:
Aerofilms Ltd.

Since the photograph was taken in 1930, the bay of the Forge Pond, below the cottages which show as white spots in the semicircular enclosure at the bottom of Funnels Field, which was in fair condition, although somewhat difficult to make watertight owing to the amount of cinder in it, has been made good and a penstock put in. In the middle of March, 1931, the whole of the field marked Forge Pond, as far as the hedgerow below the Furnace Bank Wood, and the light coloured fields, showing different stages of cultivation, towards Black Down, became again covered with water, forming a large and deep pond. The name Funnel Field probably derives from a chimney shaft of the powder works, which is marked on the 1870 6-inch Ordnance Map near its lower end. Above the wood marked Furnace Bank may be seen the wide and deep trackway up which the guns were hauled to the main road at Maresfield.

XVI. WESTERN OUSE

This division has a considerable drainage area from Slaugham to Nutley from the almost continuous forest land to the northward, and after receiving the Maresfield and Uckfield affluents becomes a considerable river.

From the earliest period much export trade in iron and ordnance was carried on from Lewes, and in the 18th century the river was canalised as far as Ardingly.

Map, p. 400.

Slaugham

Furnace

Par. Slaugham. 51° 2′ 15″ N. 0° 13′ 5″ W.
½m. W. of Ch. K
P.N. Furnace Pond.

This was worked in 1574 by Ninian Chaloner of Cuckfield and Mr. Covert of Slaugham Place, but does not seem to have survived in 1653.

The pond, still in water, is fairly large and there is another pond above. The large pond at Slaugham Place has no connection with the ironworks.

Below the bay is a little slag, and the water is very ferruginous.

Blackfold

Furnace

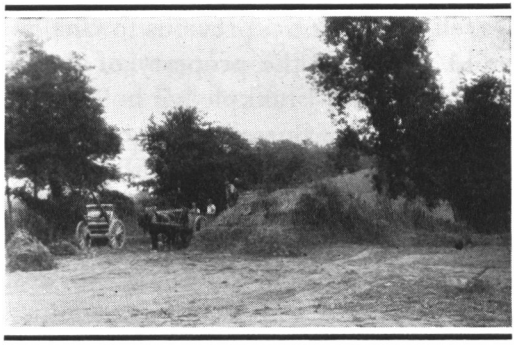
Par. Cuckfield. 51° 3′ 0″ N. 0° 10′ 50″ W.
¾m. N. by W. of Staplefield Ch. K
P.N. Furnace Green, Furnace Green Shaw.

In 1574, Ninian Chaloner (see p. 405) had a furnace at Blackfielde or Blackfolde—Losely, 1588, spells it Blackford. This seems to be the only record. It was in the manor of Saddlescombe, granted to Sir Anthony Browne at the Dissolution.

Sussex Notes and Queries, V. II., p. 65.

The small pond is shown dry on the tithe-map of 1843, but is now in water.

It is situated in Balcombe Forest, about a mile east of Handcross and 1¾ miles from its forge at Holmsted. There is some furnace slag.



Removing the Bay at Holmsted.

Holmsted or Gaston's Bridge — Forge

Par. Cuckfield. 51° 1′ 50″ N. 0° 10′ 20″ W.
½m. S.E. of Staplefield Ch. I
P.N. Hammerfield, Hammerhill, Forge Pond field, Forge Barn, Garston's Meadow, Little Garston's Meadow.

The farm on which this is situated is marked as Gaston Farm on the 1806 1-inch. This forge belonged in the 16th century to the Chaloners of Lindfield and Cuckfield. Ninian Chaloner, the grandson of John Chaloner of Holmsted, is in the 1574 lists as owning a furnace at Blackfield (q.v.) and a forge at Gaston's Bridge, which the Losely MSS. in 1588 corrupts to " Glastonbury " ! He signed the bond on March 4th, 1574, as Ninion Challyoner of Cokefield. He also probably was the partner of Mr. Covert in the Slaugham furnace (q.v.) at the same date. Neither of these two furnaces appears

S.A.C., XLIV., p. 130.

to have been of sufficient size to supply a forge by itself.

His unusual Christian name was frequent in the Burrell family, to which his mother belonged, and the Holmsted property came into the possession of a nephew, Ninian Burrell, about 1605, previous to Chaloner's death in 1609, and remained the property of the Burrells to 1833. At the view of Frankpledge holden at Cuckfield May 3rd, 1614, Ninian Burrell, armiger, was called upon to repair the bridge at the iron mill called Homsted hammer. In the Cuckfield parish registers we find the names of Thomas and John Forrod, who died in 1605 and 1606, and John Man in 1613, all described as forgemen.

S.A.C., XLIII., p. 9.

Ninian Burrell died in 1628, his son, Walter Burrell, became one of the chief ironmasters of Sussex, and it is his practice that was described by Ray.

See p. 44.

Between 1636 and 1656 the forge drew supplies from the Burrell furnace at Tilgate (q.v.) worked by Walter Burrell's brother or son, Thomas, the carriage costing 2*s.* 6*d.* per ton in summer and 3*s.* in winter. About 1643 a partnership with Leonard Gale of Tinsley forge was arranged, which probably diverted the sows from Holmsted. This lasted for about fifteen years. In the Horeham list the Holmsted forge is mentioned as working in 1653, but ruined in 1664.

Furley's "Weald of Kent," V. II., p. 578.

The large bay, which was slightly to the west of the Handcross-Cuckfield Road, was dug away in 1928, and used for making up road widenings by the County Council. The Sussex Archæological Society was consulted by the owner prior to his removing the bay, but there did not appear to be sufficient reason for retaining it.

Sussex Notes and Queries, V. II., p. 130.

There was plentiful hammer cinder. The pond, on the Ouse itself, must have been long silted up.

Strudgate — Furnace

Par. Balcombe—Ardingly. 51° 4′ 25″ N. 0° 6′ 10″ W.
2m. N.E. of Balcombe Ch. K
P.N. Fire Wood.

From an indenture in the Close Rolls this furnace appears to have belonged in 1584 to Lord Abergavenny, when he leased it to Ralphe Valey, who in his turn leased for the term of certain lives to Robert Orbell, alias Fuller, " Strudgate Park or Walk sometime parcel of the Forest of Worth," including, inter alia, " one ironwork or ironfurnace withall the cotage and building thereunto belonging, with such ponds, watercourses, bayes, heads, floodgates, sluices, gutts, dykes and other accessories as have been used to or with the same ironworks ; together with such mine etc. as now is or shall be upon the said premises," for £4 per annum. Close Roll 1308.

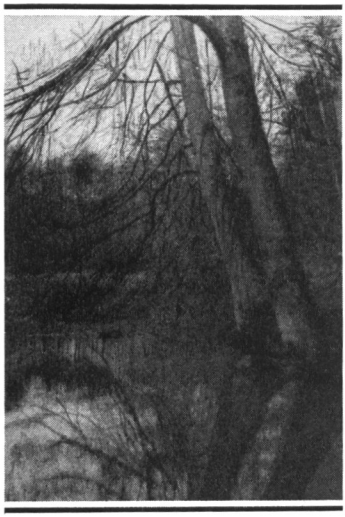
There are several entries in the Ardingly Parish registers from 1565 to 1591 relating to the furnace-men, the earliest ones being noted as " Frenchmen."

In an estate map of 1727, Old Pond occurs as a field-name, but Budgen does not show it in 1724. The pond bay was heightened by the late Lord Cowdray and the head of water is utilised to drive turbines that pump water from a spring to the mansion at Paddockhurst. The excavations for the pipes revealed much slag. About 1885 a broken fireback was found, with the not uncommon effigy of Charles II—this is preserved at Paddockhurst.

Chittingly Manor Farm — Furnace

Par. West Hoathly. 50° 4′ 20″ N. 0° 4′ 40″ W.
1½m. S.W. by W. of Ch. K
P.N. None.

Thomas Michell held this manor in 1536, and also (or perhaps a son of the same name) in 1570 and 1576. Doubtless he was the Michael who appears in the 1574 lists for Hoadlye or Hoodlea. In 1546 Sheffield forge bought 65 tons of iron from him, at the rather high price of 40*s.*; the cost of carriage from his furnace to the forge was about 2*s.* 2*d.* per ton, which is about in proportion, having regard to the respective mileages, to the cost of 9*s.* per ton Sheffield to London.



Chittingly Pond.

It is neither in Losely nor in the 1653 list.

The exquisite little pond, near the celebrated Great upon Little Rock, can never have yielded enough power for a furnace of any size, although the slag is in evidence.

Ardingly — Forge

Par. Ardingly. 51° 2′ 40″ N. 0° 4′ 40″ W.
⅝m. S.W. of Ardingly Ch. I
P.N. Hammer Wood, West and East Hammer Copse, Hammer fields.

In the 1574 list Mr. Challenor is noted for one forge in Ardinglye. Colonel F. W. T. Attree, in his Notes on the Chaloner family, thinks that this was Francis Chaloner of Kenwards. It was still at work in 1667. There are ten entries in the Ardingly Parish Register, ranging from 1568 to 1660, of hammermen and workers at the hammer. S.A.C., XLIV., p. 130.

There was a broken example of the Anne Forster grave-slab found here, used as a path stone, which is now in Ardingly Church. Miss Mary S. Holgate notes that Anne Forster was a descendant of Richard Wakehurst of Ardingly. Perhaps these slabs were cast at Little Strudgate; no doubt the broken one was brought to the forge to be worked up into bar iron. See Archæologia, V. X. S.A.C., LIX., p. 130.

There are some large blocks of cinder on the west side of the stream, but the bay has disappeared. The site was afterwards a fulling mill, which gave its name to the cottage; remnants of this mill remained in the stream in living memory.

Budgen's map of 1724 marks it as a mill only.

Cinderhill, Horsted Keynes — Bloomeries

Par. Horsted Keynes. 51° 3′ 15″ N. 0° 2′ 0″ W.
½m. to 2m. N.N.W. of Ch. F
P.N. Cinder hill field (2), Cinder bank, Cinders.

This hill, to the north of the Tudor furnace, is reputed to have cinders under most of the pasture. In the arable field called " Cinders " they are very abundant.

Par. Horsted Keynes and West Hoathly.
51° 4′ 5″ N. 0° 2′ 0″ W.
P.N. Cinders Wood, Great Cinders, Little Cinders.

Further north, on the parish border, there is a considerable deposit revealed by the clay digging for the brickworks. The cinders have to be sorted out of the clay if mixed with it.

Horsted Keynes

Furnace

Par. Horsted Keynes. 51° 2′ 25″ N. 0° 2′ 0″ W.
¼m. W. by N. of Ch. K
P.N. Furnace Field, Cinderbank.

The main bay and pond was situated a little below Horsted Keynes Mill, with another considerable pond about a quarter of a mile higher up, of which the bay remains. There were also two smaller ponds in the valley called the Slade, running up towards Broadhurst, which may have been additional storage ponds. The present lake, although named Furnace Pond in the 1839 tithe map, is supposed to have been formed at a later date. The mill, still at work, is supplied from this by a leat at a higher level.

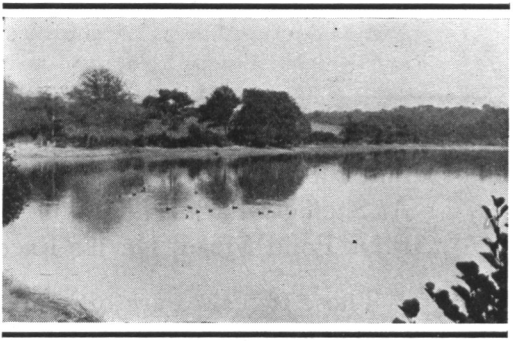
The 1574 bonds were given by Barrington and Anthony Morley.

S.A.C., XXXII., p. 21.

In 1653 the furnace " did blow " and made guns and shot, and continued in repair at the beginning of 1664.

The manor of Broadhurst, which includes Horsted Keynes, was for long the property of the Michelbornes. On the death of William Michelborne in 1656 it was sold to Edward Lightmaker, the elder, citizen and brewer of London, who, in his will of February 21st, 1658, bequeathed, inter alia, " my iron ffurnace called Horsted ffurnace, and the watermill near unto the same adjoyning, to my wife Saphirah." This lady was the daughter of the celebrated Dr. Leighton and sister to Archbishop Leighton, who made his home with her on his retirement. Her parsimony was the subject of a bitter complaint by

the rector, the Rev. Giles Moore, in his diary. He also recorded the purchase from Edward Cripp of a fireback for the parlour in 1658–9, with the Michelborne arms, and one for the kitchen, marked G.M.S., weighing 100¾ lbs., for 13*s.* 0*d.* with a 2*s.* 0*d.* gratuity to the founders, and on August 10th, 1667–8, he gave the men at the furnace 1*s.* 6*d.* S.A.C., I., p. 77.



Furnace Pond, Horsted Keynes.

There is a considerable amount of slag below the bay, with fragments of moulds for large cooking pots. Mr. R. Chalmers, the present occupier, has recently discovered what appears to be part of the foundation of the furnace.

Freshfield

Forge

Par. Horsted Keynes. 51° 0′ 10″ N. 0° 1′ 30″ W.
2¾m. S. of Ch., on the Ouse.
P.N. Forge Meadow.

This is perhaps the site of the forge belonging to Anthony Morley in 1574. It is mentioned in the 1664 list as working in 1653, but ruined in 1664. The field name is the only clue; perhaps the evidence was destroyed in the 18th century when the Ouse was canalised. The name of the Sloop Inn, at the bridges, seems out of place in such an inland scene, but people still living can remember the barges passing. No cinder remains.

Sheffield Furnace

Par. Fletching. 51° 0′ 50″ N. 0° 1′ 5″ E.
¾m. N.E. of Sheffield Green, at Sheffield Mill. K
P.N. Furners Gate.

Sheffield Forge

Par. Fletching. 50° 0′ 50″ N. 0° 0′ 0″.
At Sheffield Park Station. I—s.g. 3·41.
P.N. Pond Mead, Devil's Race.

These two sites are quite distinct, the furnace having a pond, still in water, fed from a stream running from Sheffield Forest, the forge being on the main stream of the Ouse, from which, no doubt, it was fed. The bay remains, but the railway has changed the character of the Pond Mead. There is a little cinder at each site.

The history of this pair shows that they were established very early in the blast-furnace period. The third Duke of Norfolk, to whom they belonged, had in his employ five or six Frenchmen, who were given letters of denization in 1544; one of these had been in England since 1530, but, of course, not necessarily working at Sheffield. The forge figured in the portsmen's complaint in 1548.

Through the attainder of the Duke, and that of the next grantee, Thomas Seymour, Lord Admiral, as related fully under Worth Forest, they fell into the King's hands, and we have a similar inventory and accounts.

See p. 461.

THE MANNOR OF SHEFIELD, IN THE COUNTIE OF SUSSEX

S.A.C., XIII., p. 127.

AN INVENTORIE taken at the Manner Place ther, the xxjth daye of Jenuarye of the ij^{d} yere of the raigne of Kinge Edward the Sixte, by Sir Thomas Cawarden and Sir Willyam Gorynge, Knights, in vertue of a Commyssyon of Assistans, w^{t} a Memorandum of Instruccions for the same purpose, to them directed and delyvered by my Lord Protector his Grace, and others of the King's ma^{ties} most honorable Counsaill, the xviijth of Jenuarie last, of all suche gooddes, cattalls, and other store or flocks remaynynge there of the Lorde Admyrall, in the charge and custodie of Sir John Sherief, Clerke, saruante unto the said Lorde Admyrall, hereafter apperythe :—

Ffyrst, there remaynyth of fatte oxen, xxx^{ti}. Item, drawynge oxen, for thuse of the iron mylles there, xxij. Item, ther remayneth of haye, by est^{on}, for the fynding of the said laboryng oxen, xx^{ti} loodes. Item, ther ys within the said mannor a ffurnace to cast rawe iron, with all implements necessarie for the same :—Item, in coole, by est^{n}, ccc. loodes; Item, in sowes of rawe iron, xxxviij; Item, in myne or ower, by est^{n}, mm^{ti} loode; Item, in whode cutte for the sayd furnes, xij^{c} loode, that is to say, eu'y loode by measure, iiij. fote of highe and viij. of lenghe, wiche amounteth to more then of whode, xij^{c} loodes; Item, in myne drawen and not caryed, ccxix. lodes.

Item, a fforge or hammermylle, nere unto the said Mannor, withe all implements apperteynyng unto the same :—Item, in sowes of rawe iron, xxv.; Item, iron in barres, vj. tonne, whereof v. tonne are sold to a man of Devonshere, at viij^{li} xij^{s} le tonne, and the money paid unto the said S^{r} John Sherief; Item, in cole ther, in the colehous, ccc. loode; Item, in whode cut for the same, vj^{c} iiij^{xx} corde; Item, ther was delyvered to the Whithart, in Sothwerk, at Mydsomer, in anno secundo, C. sext, and remayneth ther as yet, xxiij. tonne, and x. c^{t}.

Item, ther was delyvered by my lorde Admyrall's comaundment, at Mydsomer, in anno primo, R.E. sext, unto one Cornelius Smithe, dwellynge at the Strande, viij. tonne Of Iron, the wiche is not paid for to the knowlege of the said Sir John Sherief.

Item, delyuerid by my Lord Admyral's commaundement, to one Smark-whode, in Bow Lane, at mydsomer last, also to his knowlegge, v. tonne of Iron.

The some or number of the workmen apperteyning unto the said fforge and ffurnace, xxiij^{ti}.: whereof, hammerman and seruaunts, ij.; ffyners, ij. seruaunts, ij.; a founder, j., and a fyller, j.; coleyars, ij.; sarvants, vj.; myners, ij.; servaunts, iiij. All these persons are hyred after a rate, by taske work.

Item, one man, hyred by the year, to attend upon the works and workmen, at all tyme, and wey the iron ffrom the workman to the merchaunte, and hath for his wages, by the years, iiij^{li}, a lyeurie or x^{s}, mete and drinke; Item, ij. wyenmen, hyred by the yere, for all careges, and their wages yerly, euery of them, xl^{s}, a lyu'ry, mete and drinke.

Arch. Journal, V. LXIX., p. 276.

From the accounts we learn that the furnace did not produce sufficient sows to supply the forge, as iron was brought from Relf (Heathfield or Cralle), 15¾ tons, Mychell (Chittingly), 65 tons, Geffrey (Chiddingly), 12 tons. Guns were not cast here, the production being converted into bar iron at the forge, this being borne out by the employment of so many Frenchmen, experts at fining.

In 1550 the walls and banks were in ruin and decay, but nevertheless the forge mylle, having four wheels, three pair of bellows, and five water gates called "le pole bay," together with "le Farneys mill," was leased to Thos. Hogan for 21 years at the rent of £73 5*s.* 10½*d.* On the accession of Mary in 1553 the attainder of the Duke of Norfolk was reversed, and his possessions restored. There are no papers among the Norfolk muniments referring to Sheffield, in one only of the 1574 lists "Shefild" is named as belonging to Lord Buckhurst. In 1623, one ironmill only is mentioned in a sale of the manor by the Earl of Dorset to Xpofer Nevil. In 1664, the forge, having been working in 1653, was laid aside and not used.

There was a "bear," or mass of iron clogged in the furnace, on Sheffield Green until recently. It is now in a garden at Fletching.

Fletching Forge

Par. Fletching 50° 59′ 15″ N. 0° 1′ 50″ E.
At Fletching Mill, ½m. S.W. of Ch. I
P.N. Upper and Lower Forge fields.

In 1574 this forge belonged to "the lord of Buckhurst," in one list it is stated to be worked by Leeche, in another by Rolfe. The latter is probably a mis-copy, as in the next entry, also for Lord Buckhurst, William Rolfe was working Heathfield furnace, and again in Losely, 1588. Rolfe was of Crawle, Warbleton. Richard Leeche, moreover, was of Fletching, and a fine monument to his memory is in the church there, with a tablet recording certain benefactions, inter alia :—

> HE GAVE TO THE POORE OF THIS HIS PARISH OF FLETCHINGE AND TO THE PARISH OF SMEETHE IN KENT WHERE HE WAS BORNE ONE HUNDRETH PONNDES A PECE TO BE BESTOWED BY HIS OVERSEERS FOR A PERPETWALL RELIEFE.

He contributed £40 for Armada defence in 1588, was high sheriff in 1595, and died in 1596.

He also held a forge in Frant. See p. 266.

There does not appear to be any later record.

The site was probably that of the present grist-mill, which is still working, as there are large pieces of forge cinder in the channel from the mill-wheel, and also some in the yards of neighbouring cottages.

XVII. ADUR

This sluggish river of Mid-Sussex has but few sites in its basin except where the Hastings beds occur in the southern borders of St. Leonards Forest and at Cuckfield. The rainfall does not exceed 30 inches, so the water supply is poor.

Map, p. 416.

Cuckfield Furnace and forge

Par. Cuckfield. 50° 59′ 50″ N. 0° 8′ 40″ W.
1m. S. of Ch. KI
P.N. Cinderbank Shaw, Furnace Wood, Furnace Cottage, Old Furnace Plat.

There is no direct documentary evidence to be identified with this site, but the 1574 lists give Ninian Burrell as owning a furnace, locality not mentioned. He had much land in Cuckfield, and at this date had not succeeded his uncle, Ninian Chaloner, at Holmsted (q.v.), so perhaps had this furnace. By 1576 Sir Walter Covert, who was in partnership with Chaloner at Slaugham, owned a furnace at Cuckfield, and supplied sows to Roger Gratwick for his St. Leonards forge, and in June, 1577, let the furnace and a moiety of a hammer to Gratwick for two years at the rent of £144. A dispute arose as to payment, which led to Chancery proceedings.

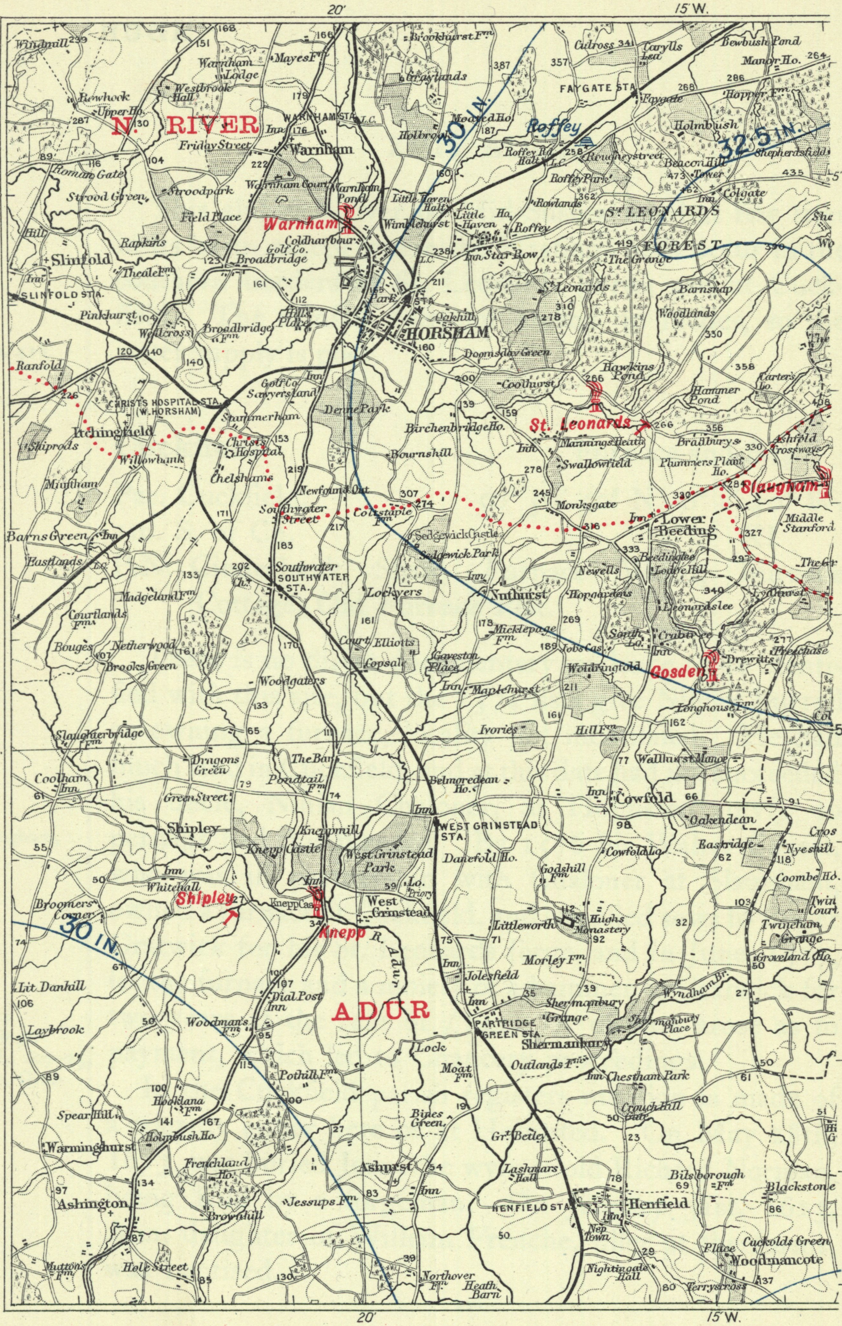
See Slaugham, p. 404.

Chancery Proceedings, Series II., 207–25, Covert *v.* Gratwick.

In the Cuckfield parish registers mention is made of a tragedy either here or at Holmsted. On May 28th, 1613, was buried Joan, the wyfe of old Richard Norman, being Kild by a forgeman. On January 31st, 1613, Ann, daughter of William Frenche, filler at the furnis, was baptised.

ADUR

ADUR



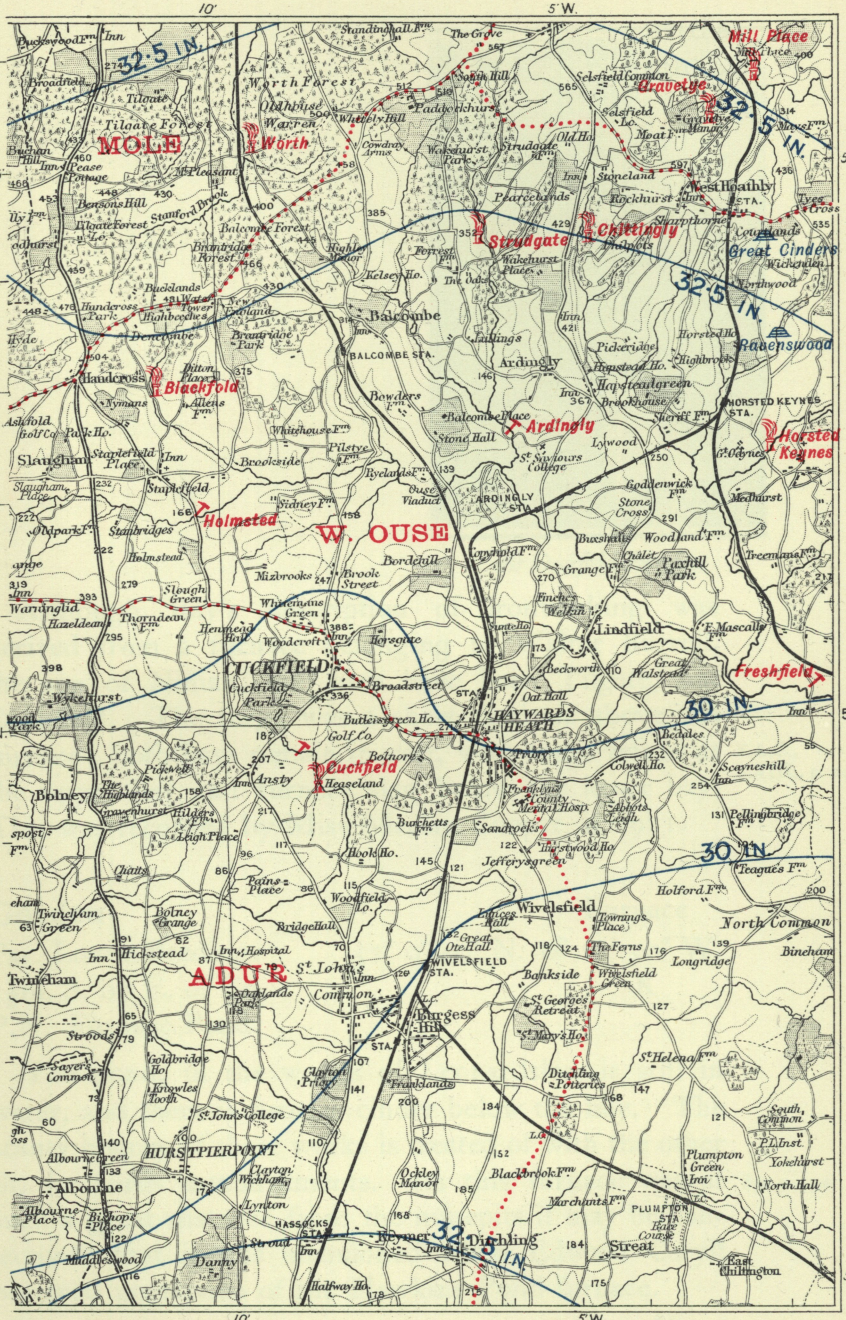
FURNACE FORGE BLOOMERY ROMAN BLOOMERY

Scale 2 Miles to an Inch

0 1 2 3 4 Miles

"WEALDEN IRON"

ADUR W. OUSE



FURNACE FORGE BLOOMERY ROMAN BLOOMERY

Scale 2 Miles to an Inch

0 1 2 3 4 Miles

ADUR
W. OUSE

At Cuckfield Furnace.

Although Ray's description of ironworking was derived from a furnace belonging to Walter Burrell, the son of Ninian, this may have been Tilgate, not Cuckfield. The forge was a short distance above the furnace; both bays remain in part, with forge refuse at the upper bay and furnace slag below the lower bay. This was recorded by Miss Marian Cooper in 1921. S.A.C., LXIII., p. 241.

Gosden

Furnace

Par. Lower Beeding. 51° 0′ 40″ N. 0° 14′ 50″ W.
1½m. S. by E. of Ch. K
P.N. Furnace Pond.

The pond, in the woods of Leonardslee, is still in water, and there is furnace cinder below the bay. The scanty history of these works is treated of with the other St. Leonards establishments. As this furnace was at such a great distance from the minepits it may be conjectured that it was abandoned when Edward Caryll obtained possession of the Hawkins Pond furnace. See p. 434

Knepp Furnace

Par. Shipley. 50° 58′ 40″ N. 0° 20′ 30″ W.
1¼m. S.E. by E. of Ch. K
P.N. Furnace Lodge, Furnace Lane, Furnace Gate, Floodgate Farm.
Marked " Old Furness " on Budgen's map, 1724.

Burrell MSS.

Burrell states that this furnace, then belonging to the Duke of Norfolk, was worked by Carylls from July, 1568, to April, 1604. The great pond is the largest piece of water in Sussex, with a long and high bay, but owing to the flat nature of the country, small catchment area and low rainfall, the waterflow cannot be great. Slag is scarce; a good deal, however, was exposed when the bridge on the main road was widened in 1928. This was kindly reported by Mr. S. E. Winbolt.

Shipley Forge

Par. Shipley. 50° 58′ 30″ N. 0° 21′ 50″ W.
¾m. S. by E. of Ch. I
P.N. Hammer Farm, Hammer Wood, Hammer field, Lower, Middle and Upper Hammer Pond Lags.

S.A.C., II., p. 217.

Lower says of this: " A large hammer-pond still remains at Bayntons in Shipley. The works here are presumed to have belonged to the Apsleys, of Apsley, in Thakeham. The initials I.A. (for John Apsley ?) occur upon many articles of Sussex manufacture. At Apsley House there was, a few years since, a massive pair of andirons so marked, and among the chimney-backs produced by the same eminent ironmaster are two very singular specimens, both dated 1582, one of which is at Misfield Farm, Worth, the other, which was brought from this locality, is now in the possession of Captain

Richardson, of Sutton Hurst. It is ornamented with the badge and supporters of Queen Elizabeth, and the legend, 'THES . IS . FOR . IAMES . HIDE . AND . ION . HIS . MIF . 1582.' It may perhaps have been a wedding present. These and many other examples of Sussex iron are stamped with the fleur-de-lis, which leads to the supposition that Frenchmen were much employed in our foundries."

The pond at Benton Place is now dry, but the bay still remains; it is shown on Budgen's map. The field-names only relate to the pond, and I have been unable to discover any cinder or evidence of a furnace or forge; or any reason for making this pond, as the stream from it does not run into the hammer-pond described below. However, about a mile to the N.N.W. is a bay and the above-mentioned field-names. There is hammer cinder, and by the roadside I found a sow of iron about 3 feet 10 inches long, of triangular section, $8\frac{3}{4}$ inches at base, $4\frac{1}{2}$ inches deep. This was apparently the only example remaining in situ, the other two being at Lewes Castle See p. 82. and in Mr. J. H. Every's museum there. (It is now in the museum at Littlehampton.)

The pond site, marked Hammer Pond on the 6-inch Ordnance map, is a long winding depression, and although probably much silted up, can never have held much water. Budgen does not mark this with a hammer sign, and there seems no record of this forge. It would appear probable that it was worked in conjunction with Knepp.

XVIII. ARUN AND WESTERN ROTHER

The basin of the main stream of Arun, and its tributary the Western Rother, is a large one, but its Wealden measures are Weald Clay only. The ironworks are mainly grouped in its western portion, under the high ground of the green-sand hills of Hindhead and Blackdown, the former having an average rainfall of 35 inches. The still higher average of 40 inches is attained on the highest points of the chalk downs, and the high ground east of Petworth with 32½ inches supplies Pallingham. On the level clay country the streams are sluggish and the sites are scanty. The industry seems to have been introduced into West Sussex at a much later date than in East Sussex, and the bloomeries are few.

Map, pp. 432, 448.

Imbhams (Weald Clay) Furnace

Par. Chiddingfold, Surrey. 51° 5′ 15″ N. 0° 40′ 10″ E.
2¼m. S.W. of Ch. K
P.N. Great and Little Furnace field, Furnace Meadow, Furnace Copse, Boremill Copse.

"Bygone Haslemere," p. 151.

This furnace was set up by Lord Montague about 1570, on land leased from Thomas Quennell of Lythe Hill. Upon the death of Thomas Quennell his brother Robert succeeded to the property; sometime subsequent to 1574 he took over the Imbhams furnace. Robert's eldest son, Peter, was a Royalist and made at Imbhams "gunns and shott for supply of his Majesties' stores" until his furnace "was stopped by force, and other ironmasters would have done so if they could, being Royalist." This was the Mr. Quennell who had the King's commis-

V.C.H., Surrey, V. I., p. 406.

sion, and tried to get a force together even before the raising of the King's Standard.

The preamble to the 1574 lists reads: "Item another new furnace sett up in Haselmeere by my L. Montague which as yet hathe never wrought, and whether they shall blow sowes for Iron or ordenance I know not." The actual list says: "The Ld. Montague one forge and one furnace in Haslemeere and thereabouts." (under Sussex). There was evidently some confusion in the information here, as Pophall, a forge, which could well have been worked in conjunction with Imbhams, is called a furnace.

It is mentioned as blowing in 1653, in Surrey— "Imbhams wh. Mr. Brown stocked to make Gunns and is aside," i.e., in 1664. From this reference it would appear that it came under John Browne's control during the war with the Dutch in Commonwealth times. S.A.C., XXXII., p. 22.

The pond at Imbhams Farm is almost a mile above the site, which is where the drive to Furnace Place has been carried over the bay. There is plenty of slag, specimens of which are in the Haslemere Museum. Another low bay is above, and still further up the stream some broken masonry and brickwork perhaps mark the site of the boring mill. A cannon ball has been found in making the garden.

West End (Weald Clay) Furnace

Par. Chiddingfold, Surrey. 51° 6′ 5″ N. 6° 39′ 30″ W.
1½m. S.W. of Ch. K
P.N. Furnace field.

No record can at present be connected with this furnace; it may have been a subsidiary of Imbhams, from which it is a mile distant on the same stream. There is a bay and furnace slag.

Burningfold Forge, also Furnace

Par. Dunsfold, Surrey. 51° 5′ 50″ N. 6° 54′ 0″ W.
1⅜m. S.S.E. of Ch. K

P.N. Great and Little Forge field, Furnace Hill, Furnace Bridge, Boarstocks Meadow and Croft, Lower Pond field.

The name Burningfold is much older than the ironworks, being first on record in 1229. About 1570 the land came into the possession of Richard Marshe of Farnham, who probably established the forge. In 1574 he was summoned, as was also Thomas Gratwick of Cherford, who actually worked it. There is a farm Cherfold not far away, or the name may be a reading of Kirdford, where the Gratwicks owned land. Marshe died in February, 1584, but he was still named as the owner in the Losely list, 1588. In Norden's description of Surrey, 1595, he states, "it yeldeth also Yron oore, which is both melted and forged within the Shire at Burningfold." About 1580 it was in the hands of Simon Bowyer and Edward Caryll in partnership. A lawsuit between the partners gives us the information that in three years 234 tons 3 qr. 14 lbs. of sows were supplied to the forge, which, according to the plaintiff, should have produced 164½ tons of bars (a gross overestimate). Only 61 tons were accounted for, and it was stated that Caryll misappropriated 14 tons of sows. In May, 1604, the works were sold by William Marshe, the son of Richard, to Geo. Duncombe, who in 1607 was in partnership with John Middleton of Horsham,

V.C.H., Surrey.

Richard Wyatt of London, and Thomas Burdett of Abinger. The works were mentioned in a deed of 1656, and in 1657 there were 40 acres under water. Aubrey mentions them in 1673, but it is doubtful if they were still at work as they do not occur in the 1667 list. By 1722 the 40 acres were heath and furze. The farm road passes over the bay and a good deal of slag and burnt flint is visible, the site of the pond being a level meadow.

Ebernoe (Weald Clay) Furnace

Par. Kirdford. 51° 2′ 25″ N. 0° 36′ 30″ W.
⅛m. S. of Ebernoe Ch. K
P.N. Furnace Croft.

There is no record that can be identified with this small furnace, but it is mentioned in Norden's Surveyors Dialogue as among those that "devoured many famous woods." The pond is still in water, and there is some furnace slag below it. It is not marked on Budgen's map.

Roundwick (Weald Clay) Furnace

Par. Kirdford. 51° 2′ 55″ N. 0° 35′ 5″ W.
2m N.W. of Ch. K
P.N. Old Pond Mead, Furnace field, Floodgate field.

Like several of these western sites, there is no record either in 1574 or 1653. It is mentioned in "The High Stream of Arundel," circa 1636–7, in the following passage :—

"High Stream of Arundel," Fowler, p. 40.

" Here frighted with their hideous noises, it fearfully goes to certain ironworks " (Mr. Fowler's note suggests Frith, Shillinglee and Ebernoe) . . . " Here wonder may it at those Swarthie Steropes, the sons of Vulcan, that toile continually in Fire to Forge some Mischief. Half dead with fear away he hyes, and prays the Winde to lend him Wings, who thus reply: when in the open Aire yourself you raise, our favours there never fail you, but whilst in Earth you lye, expect no Friendship, succour, or supply. So have I many seen, as Water doggs their drops shake off, cut off their Friends, in want, until themselves they can some Fortune raise. But to return from this digression. The Water Nimph, thus scared and comfortless, goes coldly on to Rudgwick Furnace, where she finds a Fire there rests, and warms."

Mr. Fowler says in his note: " Rudgewick is surely wrong here. Could it have been ' Roundwick ' in the original . . ." From the continuation this seems certain, as the next places mentioned are at Wisborough Green, and " Rudgeweeke " itself is mentioned in a previous passage in its proper place after Dedisham.

The large bay is unusually prominent, as it stands in open parkland and not in a wooded gill. Below it is a very large " bear," or metal clogged in the furnace, some 5 feet by 3 feet, partly composed of pure iron and slag. The stream is very insignificant, and is only a tributary, not on the main stream described in " High Stream," the writer of which had evidently a very imperfect knowledge of this part of the Arun basin.

Barkfold (Weald Clay) Furnace

Par. Kirdford. 51° 1′ 55″ N. 0° 31′ 55″ W.
⅞m. E. by N. of Ch. K

P.N. Great and Little Furnace field, Furnace Wood, Furnace Shaw, Upper and Lower Furnace plot, Old Pond.

Barkfold Forge

Par. Kirdford. 51° 1′ 20″ N. 0° 31′ 55″ W.
⅞m. E. by S. of Ch. I
P.N. Hammer patches, Hammer field, Colliers field.

Here again we have no record of this pair of sites save the place-names and the cinder, which is well in evidence. The furnace is in a wooded gill formed by a small tributary, the forge is on the main stream; the bay has been raised in recent years, but the pond can only have been a shallow one.

Pallingham (Weald Clay) Furnace

Par. Wisborough Green. 50° 40′ 0″ N. 0° 31′ 0″ E.
2⅛m. S.S.W. of Ch. K
P.N. Pondhead Lag, Pond tail, Furnace Pond, Furnace Croft, Furnace Barn, Furnace Pond Cottage.

From the depositions in a lawsuit of 1633 respecting the digging of mine in the parishes of West Chiltington and Nutbourne, we gather that this furnace was erected about 1586 or 1587 by Edward Caryll, and a good quantity of mine was carried from Nutbourne about 1593. In 1630 about 300 loads were dug at Gobles, in West Chiltington, for Walter Bartlet, and carried to Pallingham. It was still working in 1664, but not marked on Budgen's map of 1724.

The pond, now dry, must have been a large one, and was not far from the head of navigation on the Arun at Pallingham Quay.

Fernhurst or Northpark (Weald Clay) Furnace

Par. Fernhurst or Linchmere. 51° 2′ 45″ N. 0° 44′ 45″ W.
1¾m. W. of Fernhurst Ch.
P.N. Furnace pond, Furnace lane, Furnace Wood, Minepit Copse.

It is barely possible that this was the furnace worked by Blackwell in 1574 for the Earl of Northumberland in "Petworth Great Park," otherwise unidentified. In the 1664 list "Northparke" was mentioned as ruined. The pond was marked on Stent's map of 1680, but not on Budgen's, 1724. However, it was revived late in the 18th century.

S.A.C., II., p. 213.

Lower says of this furnace :—

"Linchmere—on the land of Hasler Hollist, Esq., in this parish, and about three miles south-west of Haslemere, there are considerable vestiges of iron works. There are several acres of slag or cinders, and an osier bed occupies the place of the head of water, by means of which the forges were worked. Some good masonry, by which the water was confined and directed, still remains. The works here were among the last in the western division which experienced the impossibility of competing with the coal-producing districts of the North, and were not abandoned until the year 1776."

"Bygone Haslemere," p. 152.

"John Butler (a farmer), quite inexperienced as he was, established a hammer furnace and cannon foundry at Fernhurst, and entered into contracts with the government during the American and Spanish Wars (*i.e.*, 1762–1783), and after many difficulties achieved at last a great success. The old skill in the industrial processes had died out in the neighbourhood, and the workmen imported from the north made much of their own importance and little of the interests of their master. But in time he replaced them with the native labour which had been gradually trained, and with the help of his faithful clerk, George Denyer, whose tombstone stands in the churchyard, did a large and prosperous trade."

This was the last ironworks in West Sussex; probably the transfer of the Government contracts to Carron caused it to close. The final date was 1776.

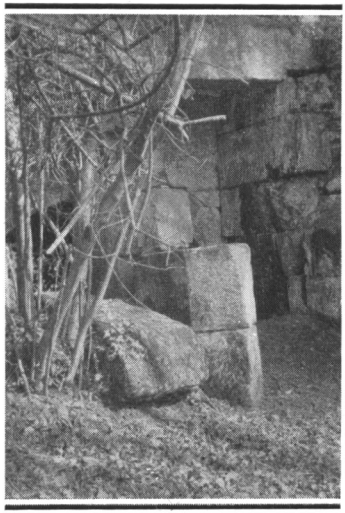
The pond is not marked as in water on the 1-inch map revised to 1903 or the 6-inch of 1870, but has recently been restored. The masonry of the spillway is rather elaborate.

The site is not far from the boundary of Lynch parish, (which actually includes part of Minepit Copse), where the Nonæ return of 1342 indicated the existence of ironworks; also that iron was at that time subject to tithes. The rector received ten shillings for the tithe of iron ore. Careful search would very likely reveal the bloomery site. The suggestive name "Iron Hill" is called in the tithe apportionment of 1848 "Higher Hill."

Dallaway's "Rape of Chichester," p. 300.

The part below the bay is in Linchmere parish.

I am informed by Mrs. Anthony Hollist that when the stream is low a good deal of the foundations of the works can be seen.



Stone Sluiceway at Fernhurst.

Frith (Weald Clay) Furnace

Par. Northchapel. 51° 4′ 5″ N. 0° 58′ 5″ W.
1m. N. by E. of Ch. K
P.N. Minepit field, Kiln field, Furnace field, Great Pond field, Pond field, Furnace Pond field.

In the 1574 lists and also in Losely, 1588, Mrs. Blackwell was named and summoned as having a forge and a furnace in Northchapel; Blackwell, her husband or son, is also mentioned as working a forge and a furnace in Petworth Great Park for the late Earl of Northumberland. The present ponds in Petworth Park have not sufficient flow of water, and there is no trace of cinder.

Burrell Col. 5701, p. 146. There is a note under Shillinglee in the Burrell MSS. of a survey in 1608 which would seem to imply that the "Great Park" extended over a large district:—

> "Md. There adjoyneth to this park" (i.e., Shillinglee) "in the East end thereof the Great Park of Petworth, the pale only dividing them, which park of Petworth is now in the occupation of one Blackwell, who lately hath demised there certain ironworks."

Mrs. Blackwell was an outwardly conforming but much suspected recusant, and her house in London at Blackfriars (which at a later period was purchased by Shakespeare as an investment) was a noted hiding place for priests. As it was closely watched, her successors there refused admission to the Gunpowder Plot conspirators.

In 1664 this furnace was still continued and in repair. It is marked on Budgen's map of 1724. The bay is a large one, and the pond, now dry, was of considerable extent. There is much slag.

Shillinglee (Weald Clay) Furnace

Par. Kirdford. 51° 4′ 0″ N. 0° 56′ 45″ W.
1½m. N.E. of Northchapel Ch.
P.N. None. K

Mitchellpark Farm (Weald Clay) Forge

Par. Northchapel. 51° 3′ 40″ N. 0° 56′ 50″ W.
1¼m. E. by N. of Ch. I
P.N. Hammer Croft, Hammer Plat, Hammer field, Upper and Lower Hammer Mead, Hammer Bridge, Hammer House.

The furnace was at the southern outlet of the large lake in Shillinglee Park at Park Farm. The bay has been preserved and improved, the water-power now being used to generate electricity for the mansion—there is slag and fragments of iron.

The preamble to the 1574 lists states: "There is a new furnace sett up in Sillinglee Park by one Smithe of Petworth and one Eversfield of Grensted," and in the list: "Thomas Smith of Petworthe one forge and one furnace in Shillinglee, also a double furnace neere North Chapple." The forge was probably Mitchellpark, about a mile below the furnace, on the same stream, and the double furnace may have been Mrs. Blackwell's at Frith, which is quite near. Smith was warned at Petworth.

There are no signs of the hammer save very scanty forge cinder in the bed of the stream, which is a very small one. The bay has disappeared.

Professor Mawer identifies Mitchellpark as "the great Park" (see Frith). "Sussex Place Names," Vol. VI., p. 114.

Chithurst (Hythe Beds) Forge

Par. Iping and Chithurst. 51° 0′ 20″ N. 0° 47′ 35″ W.
½m. N.E. of Chithurst Ch. I
P.N. Hamar Plat, Hammer field, Floodgate field, Tumbling bay field, Hammer Wood, Hammer Pond, Hammer stream, Hammer Cottages.

Like many of the works in West Sussex, this seems to have been a late one, and there is no record known to me. The pond, still in water, is very charmingly situated in a winding valley, with woods on either side. There are some large blocks of forge cinder.

Burton (Folkestone Beds) Forge

Par. Burton. 50° 57′ 10″ N. 0° 36′ 20″ W.
¾m. S.W. of Ch. I
P.N. Hammer Moor.

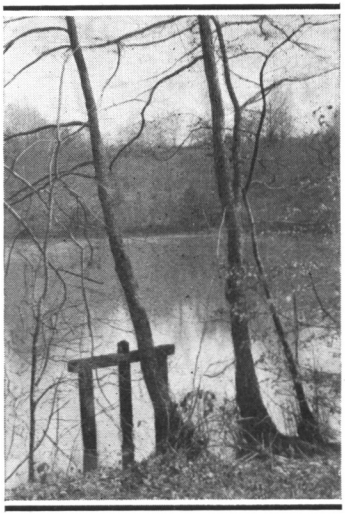
This forge is exceptionally situated on the Folkestone Beds below the large lake in Burton Park, receiving its supplies from springs below the South Downs, which there reach 837 feet above sea level and have the high average rainfall of 35 inches. It was no doubt owing to the good water supply that the forge was placed so far from any furnace.

S.A.C., XXXII., p. 22.

The only record we have is in the 1667 list, when it was working in hope of encouragement. The word "Bur" in the list of those ruined before 1664 is no doubt an error in copying, as it does not appear in Lower's list, nor is it counted in the total of nineteen. In Budgen's map of 1724 it is marked "Engine to raise water," so must have ceased before then.

S.A.C., XVIII., p. 15.

There is a good deal of forge cinder under the turf below the mill.



Chithurst Pond.

Lurgashall — Bloomery

Par. Lurgashall. 51° 1′ 30″ N. 0° 39′ 35″ W.
¾m. S. of Lurgashall Ch. BF
P.N. None.

This must have been a fairly extensive bloomery; it is situated near the north-eastern end of the bay of the large Lurgashall millpond, which does not seem to have been an iron-pond. It is an interesting speculation as to whether this was the illegal bloomery which William Yalden of Blackdown worked. He was pardoned for infringing the Wood Acts in 1640. "Bygone Haslemere."

The Yaldens, or Yawldyns, were ironmasters under Lord Montague, and owned much land in Lurgashall, another William being the chief freeholder in 1734. Possibly the first named was the M.P. for Midhurst in the 1659 Parliament.

Rogate (Folkestone Beds) Forge

Par. Rogate—Harting. 50° 59′ 40″ N. 0° 51′ 35″ W.
½m. N.W. of Rogate Station.
P.N. Pond field, Hammer Pond.

"Scenes of Rural Life in Hampshire," p. 169.

Canon Capes mentions in his " Scenes of Rural Life " an enquiry in 1591 concerning woods in Harting Combe and ironworks at Rogate, and a mill called Iron Hammer Mill, where Richard Michelborne had committed great spoil.

There is now nothing to be seen. A slight bank in dense scrub may possibly be a remnant of the bay. The railway may have destroyed some evidence and the forge cinder, as is frequently the case, be buried under the turf.

The flat valley above has several streams which converge at the site and two fair-sized artificial ponds, Harting and Blackrye, which could have served as supply ponds.

WEY
ARUN

"WEALDEN IRON"
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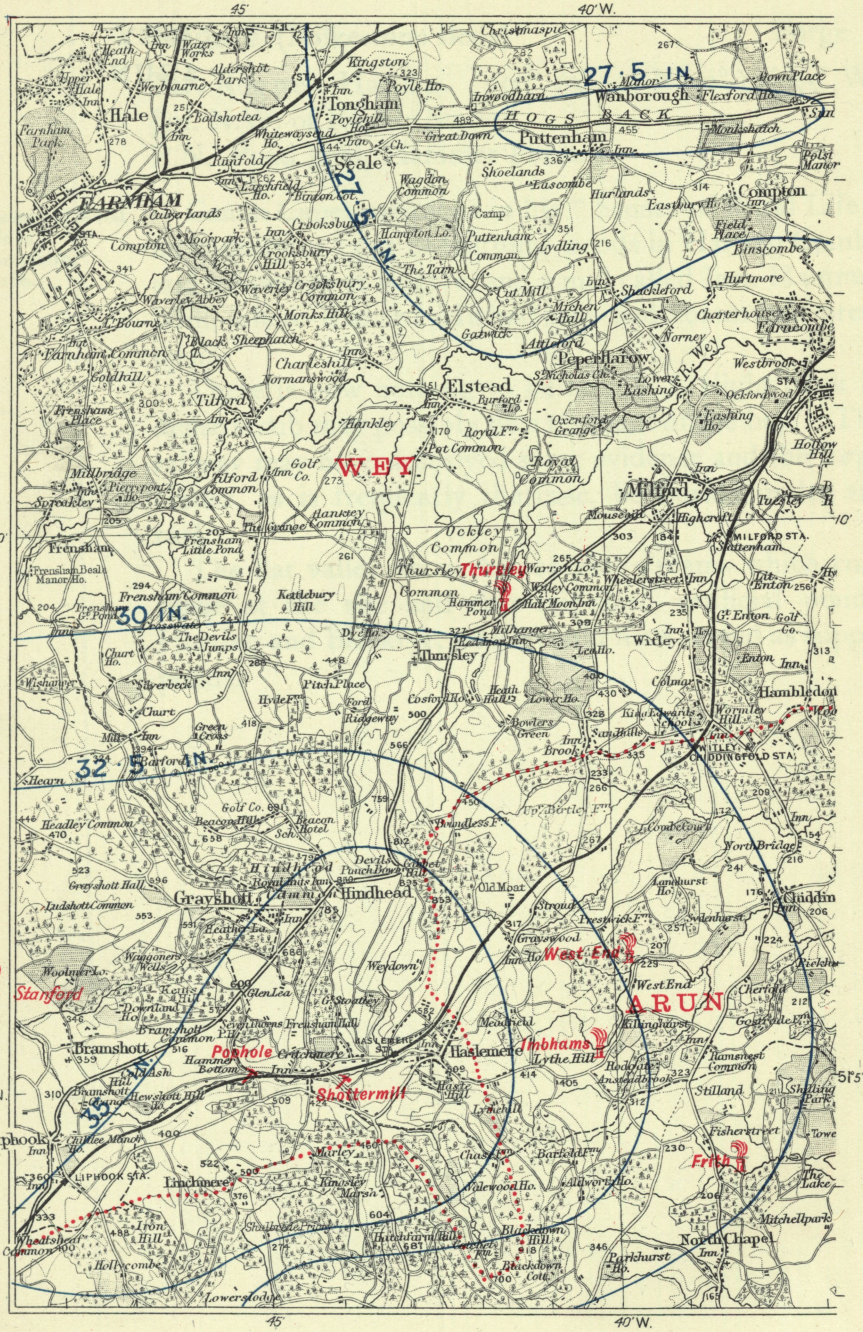
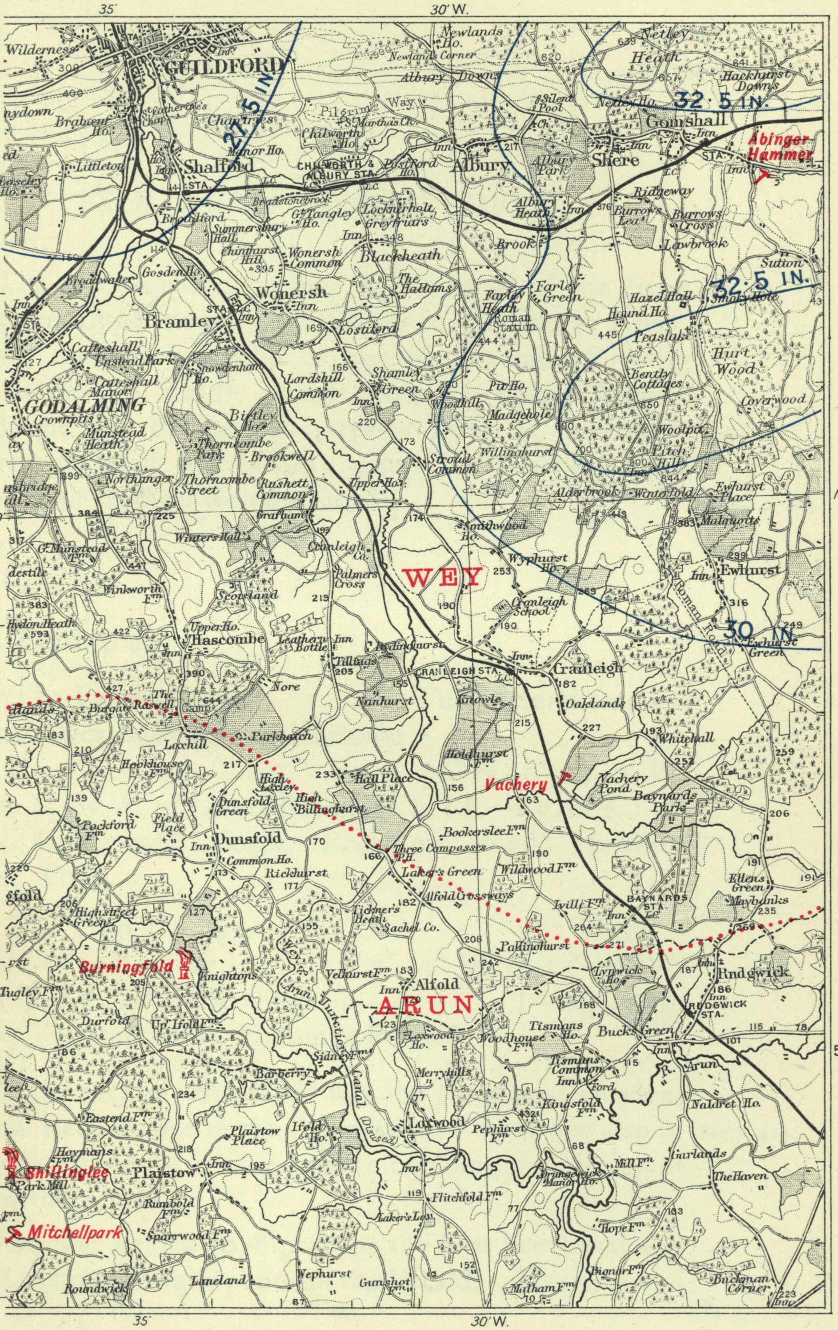
WEY ARUN



WEY ARUN



FURNACE FORGE BLOOMERY ROMAN BLOOMERY

Scale 2 Miles to an Inch

0 1 2 3 4 Miles

WEY
ARUN

XIX. ARUN—NORTH RIVER

The north-eastern portion of the basin of the Arun contains three considerable affluents: the North River, rising under Leith Hill in Surrey, the rainfall being 35 inches; a middle stream from the Surrey border, and one fed by copious streams from St. Leonards Forest (rainfall 32½ inches), where the Hastings beds have their furthest western outcrop. Map, p. 464.

St. Leonards

(*a*) The Lower Forge. Furnace and forge
Par. Lower Beeding and Nuthurst.
51° 2′ 50″ N. 0° 16′ 0″ W.
1¼m. N. by W. of Lower Beeding Ch. I K—s.g. of K 1·42
P.N. Cinderbank Copse, Roasthole Pond, Hawkins Pond.

(*b*) The Upper Forge. Forge
Par. Lower Beeding. 51° 2′ 45″ N. 0° 15′ 40″ W.
1m. N. of Lower Beeding Ch. I—s.g. 3·16.
P.N. Hammer Hill, Hammer Pond.

In connection with these was the furnace at Gosden, below Leonardslee in the Adur basin. This was also in the Forest, and it is necessary to combine the history of these three sites. See p. 417.

The first named have perhaps the best preserved and the most picturesque ponds in the Weald. Hawkins and

Hammer ponds are situated in two deep valleys in the Forest, having distinct watersheds, separated by a ridge that is not more than 300 or 400 yards wide at the pond heads. They are each some three-quarters of a mile in length. The narrow road is carried over the bays. The views up the winding lakes, with the trees coming down to the water's edge, are most charming. We read that:—

"The High Stream of Arundel," Fowler (c. 1637), p. 28.

"On the Head or bay of Hawkins Pond there stood sometimes an ancient Chapel, now naught but ruinous, dedicated to St. Leonard, whose festival is solemnized about the beginning of November, from whom this Forest took its name."

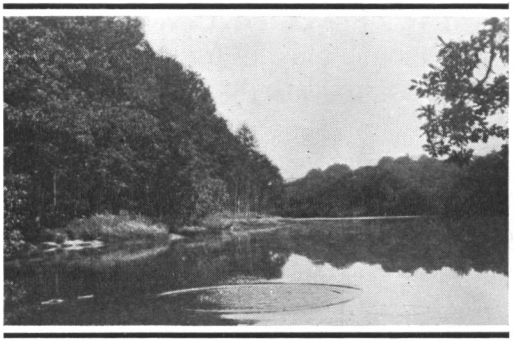
The two streams, of which the flow of water is good and constant even now, join by the Lower Forge. The mine was probably got from the very interesting series of minepits in the Forest near Colgate, where the deep craters, among noble beech trees, extend over many acres.

See p. 107.

During the reign of Elizabeth there was much litigation concerning these important works, and in spite of the contradictory evidence we are able to piece together from the pleadings and evidence much information.

The Forest of St. Leonards and the neighbouring manors belonged to the third Duke of Norfolk, who was one of the early exploiters of the blast-furnace, and owned the works at Sheffield and Worth. Although confiscated on his attainder in 1546, they were restored on the accession of Mary in 1553. Possibly the St. Leonards forges were established by then, as George Hall, a Horsham worthy, who held some of the land, deposed in 1588 "that he had known the Forest for the space of fifty years, and the ironworks he has known since the first erection and making thereof."

In 1561 the fourth Duke of Norfolk, being greatly indebted to Queen Elizabeth, offered her the manors of Chesworth and Sedgewick, together with adjoining lands,



Hawkins Pond, St. Leonards.

the Forest of St. Leonards and the ironworks, in exchange for his debt and land elsewhere. He stated that the ironworks had been leased until 1568. The offer was not accepted: in 1572 the Duke was attainted and executed. On June 24th, 1573, the Queen granted the whole property to John Blennerhasset and William Dix, who were of the late Duke's household, for 21 years. Included in this grant was "the iron mill and forge in the Forest of St. Leonard, with stones and ore and other necessaries for making iron," together with all the implements and utensils. The full inventory of these tools is given, indicating that it was a forge. The rent was £36 13*s.* 4*d.* per annum, payable half-yearly, and it was provided that if it was in arrear for 40 days, the lease was to be void.

Patent Roll, 15 Eliz., part 10.

The ironmaster who held the underlease, which had probably been renewed, was Roger Gratwick of Sullington, who, in his will made just before his death in 1570, left to his son Roger the lease of the two forges, together with that at Ifield. Roger Gratwick the younger appears in the 1574 lists as holding two forges and also working one for the Queen. On February 19th, 1574, he was warned at Horsham, and signed the bond for £2,000 on

March 1st, as of Sullington. In 1576 we find that he bargained with Walter Covert, the builder of Slaugham Place, for sows from the furnace at Cuckfield. Dispute arose over the payment, and a lawsuit ensued.

The Forest itself, as distinct from the ironworks and the rights to cut wood and dig ore, was leased to Gratwick and Covert; it is not clear whether it was held in common or the "moyeties" were actually delimited.

Chancery Depositions, 30 Eliz., Easter Nos. 8 and 17.

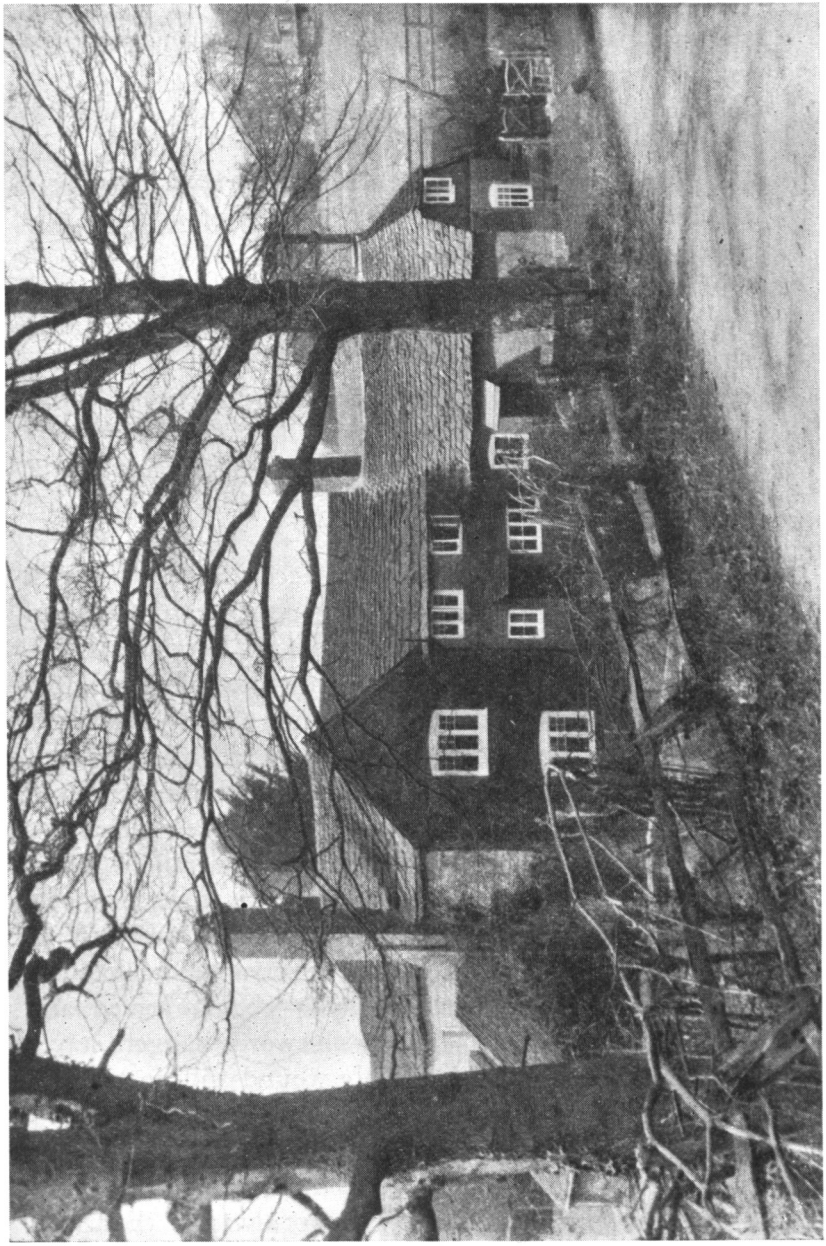
Originally there were only the two forges; about 1580 Gosden furnace was erected by Gratwick, but the furnace at the Lower Forge below Hawkins pond was not built until about 1584, according to the depositions of several witnesses.

By 1586 the Gosden furnace had passed into the hands of Edward Caryll of Shipley. Caryll, Covert and Gratwick were all wealthy men, each contributing £100 for Armada defence, a figure not exceeded by any landowner in Sussex.

The requirements of the two furnaces were now causing considerable competition for the somewhat limited ore deposits, and bad blood ensued between Caryll and Gratwick, with Covert on Caryll's side. According to Gratwick's pleadings, "Walter Covert, being a man of great living and power in Sussex, presuming on his power and friends and thinking to overbear Gratwick, or that Gratwick was too mean a man to be partner with him in the said forest challenged the whole interest in the same and wrongfully expelled him." It was, however, decided in the Court of Exchequer that Gratwick was entitled to his moiety.

Star Chamber Proceedings, 30 Eliz. 3, 26.

The fishing in the great ponds was at that time much prized. Caryll, coming to fish them in August, 1587, found that Gratwick had already done so, and took great offence.



The House at St. Leonards Hammer Pond.

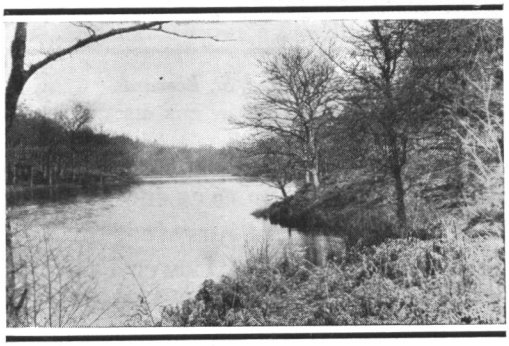
A loose arrangement as to payment of the rent gave the opportunity. "Dix finding it was rather troblesum and no profit to receive the same rent, and pay it over to her Highness, did agree that Gratwick should pay direct during the time of his lease and gave him an authority in writing so to do and so Gratwick has paid to Her Majesty's receiver." The same arrangement was made with other tenants.

The rent due at Lady Day, 1587, was demanded and not paid, as it was claimed to have been already paid to the Queen's receiver. There was much hard swearing on both sides, but, apparently, the decision was in Caryll's favour, as on July 4th, 1587, fresh letters patent were granted to him for 21 years on the same terms and for the same lands as those of Blennerhasset and Dix, a fine being paid.

A state of war now ensued. According to Gratwick and his witnesses, "Covert and one Edward Caryll of Shipley, John Mitchell and Henry Bercholde conferated together to deprive me of my title and term in the said ironworks intending thereby not only to take away the ironworks, but also by force and might all my wealth and substance"—"the stock of mine and iron employed about the same works, being of great value." This was assessed by one witness at £4,000. Considerable fighting took place. "Giles Moore and others, twenty or more, a company of most dissolute, disordered, quarrelsome and riotous persons, his (Caryll's) servants and hangers on, have committed great riot"—"being armed and apparelled in warlike manner with swords daggers staves and other weapons, did forcibly wound and beat (Gratwick's) servants labouring about the ironworks and digging and drawing stone, and have violently taken great quantities of ore and carried it to the works of Caryll."

In these frays the honours were not always to the armed Caryll men. In one of them the rearmost ox-wain of

a train carrying ore to Gratwick's furnace being attacked, the other drivers " came running in with their goads and beat and wounded Henry Wood "—afterwards "fearing the danger of his wounds, they cut off a piece of the lower part of his shirt and laid it on his wounds, lest he should die of the same, and they took from him his sword, for which he would not have taken twenty shillings."



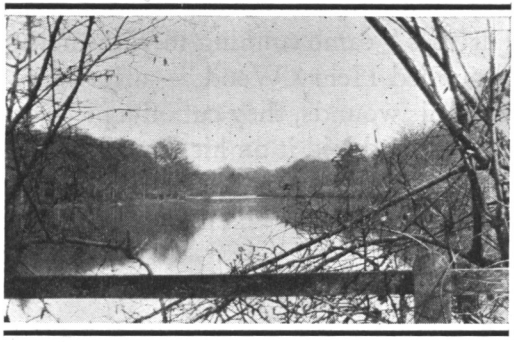
Hammer Pond. St. Leonards.

Richard Harding, a leading Caryll man, came to the minepits and " struck Edward Grame with a mattock, and threw him into a pit, and then he took a great stone and came to the minepit side and offered to throw the stone upon the said Grame, and swore by an oath that he cared not if he had killed the knave."

The war was carried on beyond the forest as Thomas Marsh assaulted Richard Whitebread " with his dagger drawn, in Horsham town as he was going to church, and chased him into the house of Thomas Champion."

Although there is no record of the upshot of these proceedings, it would seem that Gratwick was dispossessed, as his will of 1596 does not mention the ironworks. S.A.C., LX., p. 43.

In 1601 they were again granted by letters patent to Sir John Caryll, nephew of Edward, for sixty years, and they are referred to in the " High Stream of Arundel," " High Stream," p. 28.



Hammer Pond, St. Leonards.

c. 1637, although the geography is confused. They were working in 1653. In 1655 the Royal possessions in and about the forest were surveyed, the Upper Forge being valued at £27 and the Lower Forge at £32 per annum. The latter was claimed by Walter Pawley, who had bought the lease, but the claim was not admitted by the Commissioners, as it stood on the Forest. They also reported that the furnace was " decayed and downe aboute fortye yeares past," i.e., 1615.

Parliamentary Surveys, 317, p. 35.

By 1664 the forges were stopped. In 1675 Sir Edward Greaves, King's physician, who had bought the rents of the Forest, petitioned to have the works granted to him, as he had lent £10,000 to Charles I and his pension was £1,200 in arrear. The trustees had refused to grant him a lease, and the works had fallen to the ground. The Lord High Treasurer also stated that the ironworks were decayed and disused. The result is not recorded.

Burrell MSS., 5705, p. 21.

There were some remains of buildings to be seen within living memory. Much slag and charcoal dust has recently been dug for use on the adjoining golf links and burnt stone exposed, which may have been portions of hearths.

Warnham (Weald Clay) Furnace

Par. Warnham—Horsham. 51° 4′ 35″ N. 0° 19′ 50″ W.
1¼m. N. of Horsham Ch. K
P.N. None.

This was apparently a Stuart period furnace, it is not mentioned in 1574. On May 22nd, 1609, Sir John Caryll took a lease (now in the possession of Mr. William Albery, of Horsham) from John Middleton of Horsham

" of all that current, stream and watercourse running from the furnace ponds of the same Sir John Caryll, commonly called the Warneham ffurnace in the said county of Sussex towards a certain stone bridge called Farthinge Bridge, through lands called Furminges, Maunsells and Caldecotts . . . for 1,000 years at the rent of one peppercorn if demanded."

This would seem to give the date of its foundation.

In 1621 and 1645 the Horsham churchwardens borrowed the " beame " from the furnace to weigh their new-cast bells.

By 1664 it was ruined.

No doubt the furnace was about where the mill is at present, although the high bay holding up this fine sheet of water has probably been increased in height. The amount of water power is very considerable, as it takes the drainage of a large area up to and beyond the Surrey border. The watercourse of the lease leads from the spillway and is carried at a much higher level than the mill-stream, which it joins only three-quarters of a mile below the bay. In 1928, when the bridges were reconstructed, much slag was shown, and a large mass of iron, which was more than two men could lift, was found, but again covered up. There were also many massive oak timbers, blackened with age, probably pertaining to the bridge rather than to the furnace.

Roffey or Roughey (Weald Clay) Bloomery

Par. Horsham. 51° 5′ 10″ N. 0° 16′ 50″ W.
¼m. E. of Roffey Road Halt. AF
P.N. Crooked Cinder Lane, Wide Cinder Hams.

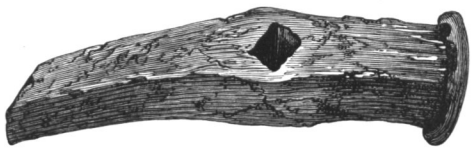
These are two arable fields between the main Crawley-Horsham road and the railway at Roffey Street, separated by a strip of damp rough named the Leg, or Lag, which shows signs of irregular digging. There is also a square pond to the east which could have provided clay. Both fields have abundance of cinder and no doubt are the site of the Roughey Forge from which 1000 horseshoes were sent to Shoreham in 1327, the Sheriff being paid £4 3*s*. 4*d*. for them, and an extra 5*s*. for carriage.

Delaney, p. 26.

This is of interest, as being one of the named sites of the bloomery period, of which we only have four definitely on record.

The ore may well have come from the minepits in the forest, described on p. 106. The late Thomas Honywood dug up a hammer-head and a pick at Roffey, now in the possession of Mr. C. J. Attree of Billingshurst.

S.A.C., XVIII., p. 195.



From S.A.C., 18.

Hammer Dug Up at the Roffey Bloomery.

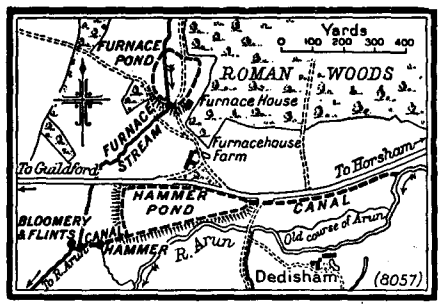
Dedisham or Rudgwick

(Weald Clay) Furnace and forge

Par. Rudgwick. 51° 5′ 15″ N. 0° 25′ 10″ W.
Furnace 1¼m. N.W. of Slinfold Ch.
51° 5′ 5″ N. 0° 25′ 20″ W.
Forge 1¼m. N.W. by W. of Slinfold Ch.
K (s.g. 2·65 and 2·02), H I G (?) s. g. 3·80.

P.N. Furnace, Furnace Farm, Furnace House, Furnace Wood, Furnace Pond, Hammer Pond, Great and Little Mill Closes, Hammer Plats (on S. side of Arun, Slinfold Parish).

This is not mentioned in 1574, or in the 1664 list. The hammer is referred to in a deed of May 9th, 1631, conveying certain land in the manor of Dedisham and parish of Rudgwick, including " the close or mead called the Mill meadow, and one other parcel of meadow ground . . . lying near the works or iron-mill called the hammer." Mill Close is so named in the Tithe Apportionment of 1840. Close Roll, 2892.



By permission of " The Times."

Mr. S. E. Winbolt's Plan of the Dedisham Sites.

The furnace bay is a very high one, and the pond, now dry, must have been of a considerable size. The flow of water is very small, and it is hard to understand how the furnace can have worked except in the rainy season. There is abundance of furnace slag.

The hammer was situated on the south side of the Horsham-Guildford road, where there is a very long but low bay extending nearly to the Dedisham bridge, giving a long shallow pond. This was fed not only from the weak furnace stream, but by a long ditch from the Arun itself, about three-eighths of a mile above the Dedisham bridge, now partly obscured by the road. The course of the Arun between these points has in part been diverted to form part of the Dedisham defences; the old bed is indicated by the parish boundary, a small area on the north side of the present stream opposite Dedisham being in Slinfold Parish.

A cut, perhaps for drainage purposes, not far from the eastern end of the bay, is by a mound full of large lumps of hammer-cinder, and there is much in the stream banks. The site of the forge was probably at the junction of the bay with the stream running down from the furnace; the arable field on the west side has a considerable area, some eighty yards by thirty, of black soil full of cinder, some of which has much the appearance of bloomery cinder. It is quite possible that a bloomery here preceded the Stuart works. On the surface and under it are flint-flakes, and neolithic flint implements have been found.

In 1930 Mr. S. E. Winbolt dug a patch some 36 feet square to a depth of 1½ to 2 feet, but found no hearths.

XX. WEY

The upper basin of the Wey derives its main supplies from the greensand hills, Vachery on the east from Hurtmoor, and the western part from Hindhead, having each an average of 35 inches. Only the fringe of this basin is within the Weald.

Map, pp. 432–448.

Abinger Hammer (formerly called Shere Hammer)
Lower Greensand. Forge

Par. Abinger, Surrey. 51° 13′ 42″ N. 0° 25′ 42″ W.
⅝m. S.E. by E. of Gomshall Station. I
Lower Greensand.
P.N. Hammer Meadow, Hammer mead, Hammer Marsh.

This is the most northerly forge, being situated on the little Tillingbourne, on the north side of the Lower Greensand range. Owing probably to the easy access to London, many mills for various industrial purposes were erected on this stream. The pig iron must have been drawn from further south.

In 1557 Owen Bray and his wife sold the iron-mill and pond to Elrington. Being within the area in which the use of wood for ironworking was prohibited, an information was lodged in Trinity term, 1566, against Elrington, alleging that he had cut 1,200 oak and beech trees. Whatever the upshot of this was a special licence, which is extant in the British Museum, was issued to Thomas Elrington Tate, of Willesdon, alias Thomas Elington, on May 5th, 1560, " during fiftene yeres next ensuing to cut and cole wood or other fewell for the makyng, burning, melting, tryeing, fyning, dressing and hamering of yron, of timber trees, of Oak, Beche or Ash, at or above 1 foot square at the stub, in Abingeworth als Abinger, Capel, Sutton als Wootton and Ocklo als Ockley."

In 1574 Edward Elrington, of Harlston, Middlesex, was summoned and signed his bond. The name is variously spelt Elderton, Ellington, and Elrington; he apparently acted for the Lady Braye (of Cranley), and the place is given as Sheere. Manning and Bray, in 1806, speak of "a hammer mill which was here till late years."

Manning and Bray, "History of Surrey," V. II., p. 136.

The pond, now watercress beds, was fairly large; there is some masonry for the sluice gates remaining, though perhaps of later date, and a little hammer-cinder.

Vachery (Weald Clay) Forge

Par. Cranleigh, Surrey. 51° 7′ 20″ N. 0° 28′ 55″ W.
1⅜m. S. of Ch. I
P.N. Hammer Farm, Hammer Lane, Little and Great Hammer, Hammer Mead, Hammer field.

Although the Brays had sold Abinger Hammer to Elrington in 1557, they retained this forge. In 1574 it was worked for Lady Braye by John Lambard, who also went by the name of John Gardener; the lists seem to give him the name of Lambard here, with Gardener as an alias. He was the first country ironmaster warned on Pedley's journey. He also worked a forge for Isabel Ashburnham, widow—probably this was Kitchenham—and signed the bond as for her.

In 1573 Lambard, together with Richard Weste of Rudgwick, was summoned for converting 837 oak and beech trees, and he was again in trouble for the same cause in 1581. As Vachery was within the area in which felling wood for ironworks was prohibited, and, unlike Abinger and Ewood, had no special exemption, very probably the 1581 Act for preservation of wood closed the works.

V.C.H., Surrey, p. 272.

It is not mentioned in the 1653 lists. Two ponds, apparently connected to the moat of the old house, which is still partly in water, are shown on Whitwell's map of 1604, and one is shown by Stent, 1680.

Aubrey, in a letter to John Evelyn of February, 1675, says the pond was 60 acres in extent, but this is probably a great exaggeration. The present pond, at a higher level, containing 50 acres, was constructed to feed the Wey and Arun Canal about 1760, and is a conspicuous landmark in any view from the hills to the north. There is a bay at Hammer Farm containing much forge cinder, and at the farmhouse a number of large lumps, which, together with stone, have formed part of the foundations of a building now demolished.

Thursley, Horsebane Hammer

Furnace and forge

Par. Thursley, Surrey. 51° 9′ 10″ N. 0° 41′ 30″ W.
1⅛m. N.E. of Thursley Ch. I K
P.N. Hammer Pond.

This is a very late forge. We are indebted to Mr. Guiseppi for a detailed account of its history in the 17th century. It commences in a lease of May 14th, 1610, as " lately erected and built," probably the last to be set up in Surrey. There is a mortgage of December 17th, 1617, and a deed of March 29th, 1623, in which Sir George More of Losely demises the mill to Henry Bell of Milford, and in 1641 a suit in Chancery, largely concerned with the fishing rights in the ponds.

Surrey A. C., XVIII., p. 27.

In 1666 the works were leased for two years, at £10 per annum, to William Yalden of Blackdown, a considerable ironmaster, with a very detailed inventory, which shows there was a furnace as well as the forge.

Roque's map of Surrey, 1762, shows the Portsmouth Road as running between the two large ponds with awkward bends. Apparently when the road was straightened, it was taken across another pond, not now in existence.

The works were mentioned in connection with traffic to the new canal at Godalming, the iron carriage being, however, small, and in 1768 wrought iron was sent to London by this canal. Later the mill became a silk mill. There is some old masonry, probably 17th century, and some large masses of slag, in the garden below the bay. There are also traces of carrstone, which may have been used, but the minepit names are all on the Weald Clay. It was noted in 1730 that there was enough iron in Witley Park (on the clay) for two forges.

A fireback at Rake House, probably cast here, bears Henry Bell's initials and the date of 1630.

Shottermill (Lower Greensand) Forge

Par. Haslemere and Thursley, Surrey.

51° 5′ 5″ N. 0° 43′ 55″ W.

⅛m. S.E. of Shottermill Ch. I

P.N. None.

Dallaway's "Sussex," V. I., p. 300.

According to Dallaway, Shotter Iron Mill was held from Shulbrede Priory by Shotters, but as there is no mention of it in 1574, it may then have been a corn-mill. It is shown as a hammer on Budgen's map, 1724. The pond is still in water, and the picturesque group of dilapidated mill buildings seems to have served for many uses.

"Scenes of Rural Life in Hampshire."

According to Canon Capes, the ironworks stopped in 1776.

There is some old masonry and a little hammer cinder.

WEY
ARUN

"WEALDEN IRON"
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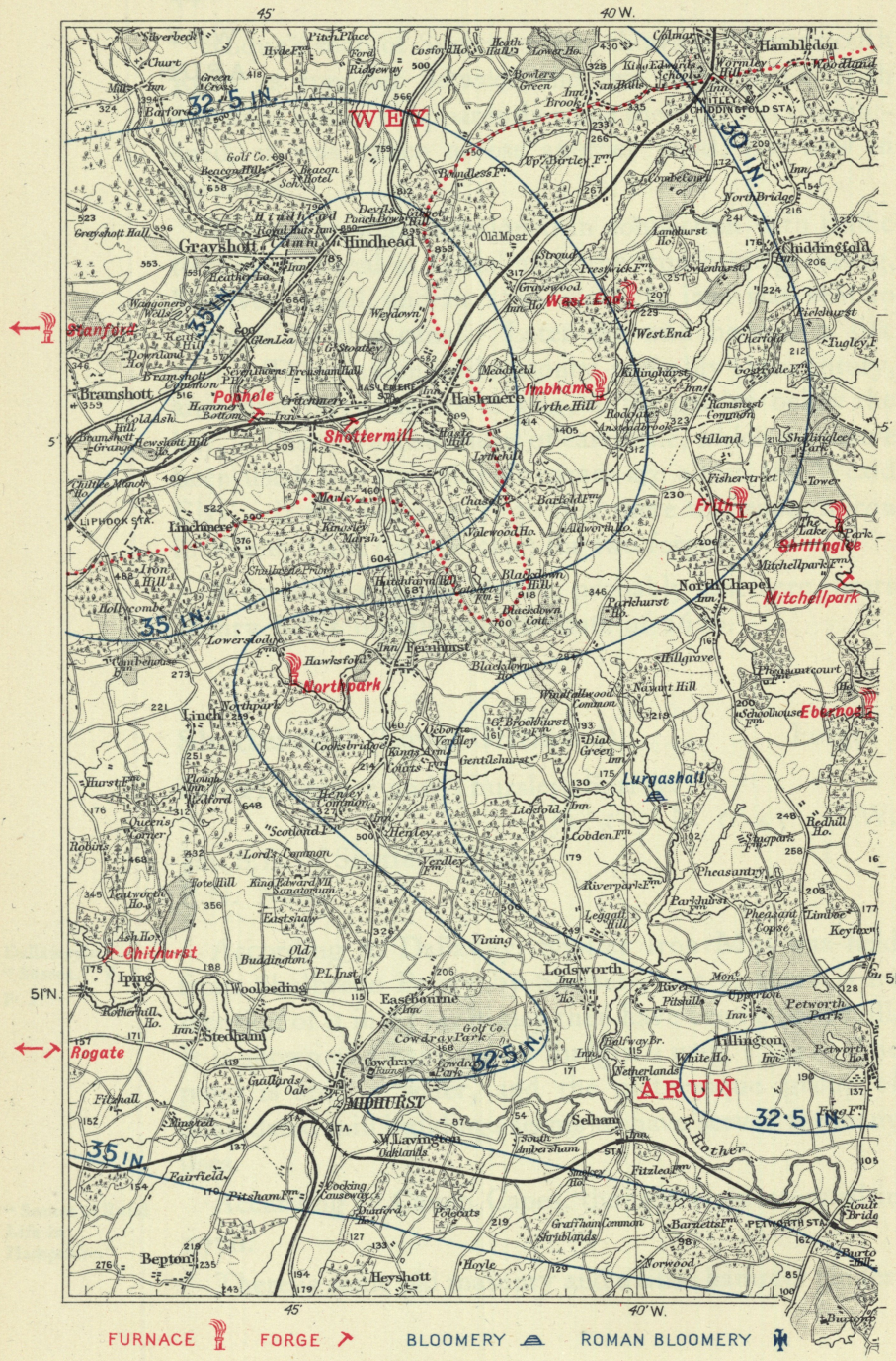
WEY ARUN



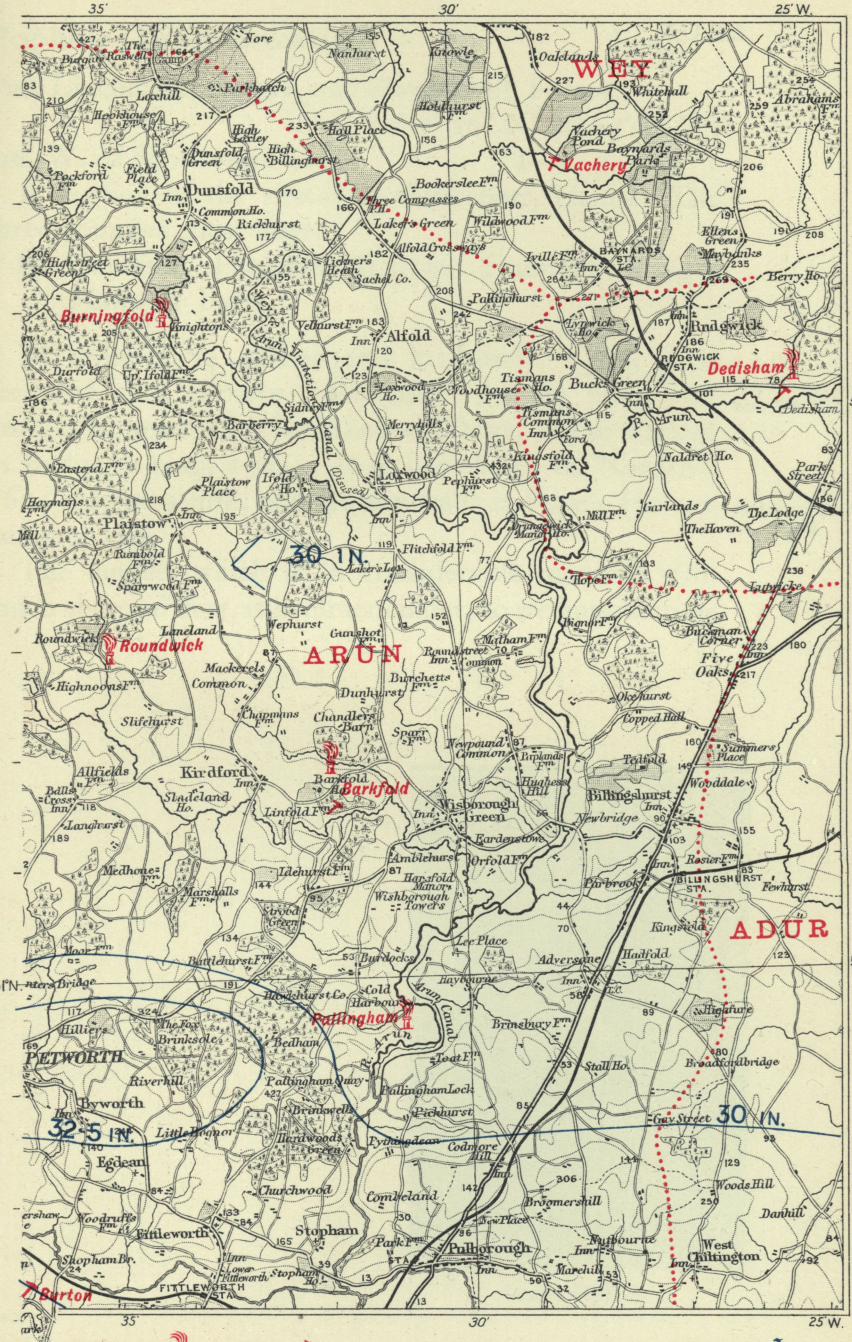
FURNACE FORGE BLOOMERY ROMAN BLOOMERY

Scale 2 Miles to an Inch

0 1 2 3 4 Miles

ARUN

"WEALDEN IRON"



FURNACE FORGE BLOOMERY ROMAN BLOOMERY

Scale 2 Miles to an Inch

0 1 2 3 4 Miles

ARUN

Pophole (Lower Greensand) Forge

Par. Linchmere, Sussex, and Shottermill, Surrey.

51° 5′ 10″ N. 0° 45′ 0″ W.

¾m. W. of Shottermill Ch. I—s. g. 3·52

A portion of the site is in Bramshott, Hants. The three counties meet here.

P.N. Hammer, Hammer Bottom, Hammer Rough, Hammer Farm.

In three 1574 entries and in Losely, 1588, it is recorded as a furnace "Pophall." In the 1664 and 1667 lists, however, it is ranked as a forge, and so marked in Budgen's map, 1724. It is also shown on Norden's 1604 map as a mill, and Aubrey calls it Pope's Hole, a hammer mill.

S.A.C., XVIII., p. 10, and XXXII., p. 21.

Aubrey's "Surrey," V. 3, p. 8.

The cinder, which is in considerable quantity with much charcoal dust, is hammer cinder, so we must assume

Sluice, Pophole.

that if it ever was a furnace it was later on used as a forge only.

The stream, having in its mile-long course from Shottermill, received considerable affluents from both north and south, is a very strong one, and the pond, now dry, was not large. Marked on Budgen's map, 1724.

The dressed stone framework for the hatches is in good preservation, and is similar to that at Fernhurst.

Canon W. W. Capes, "Scenes of Rural Life in Hampshire."

In the Bramshott parish registers one of the earliest names is "Henry at Cinderheap," and there are also recorded the baptism of "children of the Strangers at the Hammer."

Stanford (Lower Greensand) Furnace——? also forge

Par. Bramshott, Hants. 51° 6′ 10″ N. 0° 49′ 45″ W.
1¾m. N.W. of Ch. K
P.N. (in old deeds) Hammer Pond.

"Scenes of Rural Life in Hampshire," p. 169.

Canon Capes has put it on record that the Hookes carried on these works in Ludshot Manor, where the Hammer Iron Pond and the blacksmith's shop were rented by them. This site was later a paper mill, now disused.

The pond, on the Wey itself, is still in water, and there is furnace slag. By tradition the ore was obtained on Weavers Down (Folkestone beds), which seems unlikely. It is more probable that it was brought to the water power, where the wood was also available, from the Weald Clay.

XXI. MOLE

The northern slopes of St. Leonards, Pease-pottage, Tilgate and Worth Forests, from the vicinity of Fay Gate to the divide at Turner's Hill, although there is no great depth of watershed, provide a copious supply of water to several streams which form the headwaters of the Mole. Doubtless when the bogs were less drained it was more constant than at present, but the numerous supply ponds indicate that even then the Mole was a very variable river. The rainfall on the heights averages 32½ inches. Several of the ironworks served by these streams are on the Weald Clay, but within easy reach of the ore on the Hastings sands.

Map, p. 464.

Ewood (pronounced " Yew-wood ") Furnace
(Weald Clay)

Par. Newdigate, Surrey. 51° 11′ 20″ N. 0° 16′ 50″ W.
1⅝m. N. of Newdigate Ch. K
P.N. The Pond.

These works are perhaps the most interesting of the Weald Clay sites. We have, thanks to Mr. Giuseppi's researches, considerable documentary evidence.

Surrey A. C. XVII., p. 28.

The manor of Paddington Pembroke, which included the park of Iwode, was the property of the Earls of Warren, and descended from them to the Earls of Arundel (who to-day are again in possession), and then by marriage to the Nevills, Lords Abergavenny. This family, intimately connected with the iron industry in Sussex, no doubt founded the works, probably the earliest in Surrey. On March 24th, 1553, the then Lord Abergavenny sold the Park of Iwood, and also all the buildings, ironworks and offices within the same, to George and Christopher Darrell, belonging to the Scotney family, but London men who had taken an interest in the industry.

On June 18th, 1554, the brothers leased to John Stapley of Framfield and Gregory Newman, citizen and grocer of London, for the term of 99 years, Ewood Park, at a yearly rent of £66 13*s.* 6*d.*, and on July 4th, 1554, sold their respective freehold moieties to Antony Pelham of Buxted and Thomas Collet of London. On December 13th, 1567, Collet sold his share to John Heathe of King's Lynn, who on May 22nd, 1574, sold it to Christopher Darrell and Thomas Browne of Betchworth. Christopher in the same year repurchased the other moiety from Herbert Pelham, son and heir of Antony Pelham. He had probably previously leased the ironworks, as his name appears for Ewood in the list of owners made in February, 1574, and he signed the bond on April 4th, 1574.

The ironmaster in charge was Robert Reynolds of East Grinstead, who also worked Mill Place and Brambletye.

In February, 1574, a Commission from the Exchequer was appointed to survey the manor and to enquire into the rights and interests of Christopher Darrell of London, Merchant Taylor. They reported very fully on the 10th of May in that year, having made a very complete survey. Some of the field and wood names are still extant, certain holdings can be conjecturally identified, and the total acreage is fairly near the present area of the property.

We read after a recital of the mansion house, farmlands and woods in the occupation of Reynolds, that

" The same Robert Reynolds also holdeth the Iron mylle and woorkes a Furnesse a Forge and Hammer and all the buildings and edifices of the same called and knowen by the name or names of the Forge and Furness of Iwode otherwise Iwode Pke with divers tooles instrumentes ymplementes and necessaries incydent and belonging to the same workes, and also one great ponde containing by estimation iiij^{xx}x acres and all streames waters, watercourses and waterworkes thereunto belonging and apper-

teyning also one colehouse there and some cotages and howses with garden plot and y'des necessary and mete for the woorkemen to inhabytt in, together with the waste and void grounde about the foresaid workes, containing by est. vj acr. nedeful to lay the cole myne synders and other stoyage of the same worke. . . . "

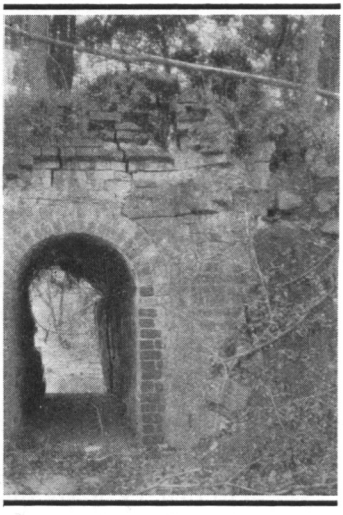
Christopher Darrell became indebted to the Crown and conveyed part of the estate to Sir T. Bromley and others, in trust for Queen Elizabeth, and later conveyed all his interest to the Crown. He died in 1581, in reduced circumstances, and in 1582 the Queen confirmed the lease of three-fourths of the land, including the iron-works, to Henry Darrell, of Scotney, in consideration of £500 paid by instalments.

Manning and Bray, Vol. 2, p. 174.

It would therefore appear that the Queen had a definite interest in the property, which perhaps had some bearing on the special exemption in the Act of 1581. The Losely list of 1588 gives in error Christopher Darrell as owning a forge and furnace at " Endware." Edmund Pelham, co-overseer of Christopher's will with Henry Darrell, undertook to pay off the debt, but failed to do so ;

See p. 122.

Patent Roll, Eliz., Part 13, No. 1222.



Culvert at Ewood.

the Crown remained in possession until 1604. It is quite probable that it then closed down, as it is not mentioned in the 1667 petition, which dealt mainly with Sussex.

Notwithstanding the lapse of time, the remains are considerable. The long bay was reinforced by masonry, which still remains. There is a spillway or rather brickwork framing for a wooden hatch, and two culverts through the bay. Although ruinous, the brickwork of these appears to be 18th century; they probably occupy the same position as those serving the "furnesse." One of these, usually dry, runs into a wheel-pit (locally reputed to be bottomless !) There is a quantity of furnace slag in the bed of the stream, the scour of which has recently revealed a clear section which shows the deposit of slag and broken tiles from 2 feet 6 inches to 1 foot 6 inches below the present surface, with other strata of refuse at a still lower level.

The valley is exceedingly shallow, and the need for power must have been great to induce the original venturers to dam it. The pond was the largest in Surrey and in all probability was only exceeded on the clay by Knepp pond. It forms a conspicuous feature on the old maps from 1605 to the 1-inch ordnance of 1813, but is not shown in Bryant's map of 1823. It was drained before 1840. The acreage recorded is very various. The 1575 survey gives 90 acres, Aubrey (as Eaglewood Pond) 20 to 30 acres, Bray 60 acres, and Edwards in 1800, 100 acres.

Aubrey's "Surrey," V. IV., p. 62.

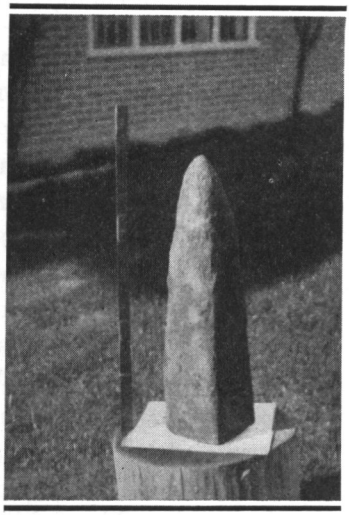
The level meadowland which now indicates the silt deposit is not more than 30 acres in extent, but traces of banks at a higher level enclose an area of double that size. The discrepancies probably arose from the liability of the nearly level ground round the pond proper to flooding, e.g., the 1575 survey took place between February 12th and May 10th, a time of year when heavy floodings frequently occur, as in 1927.

Leigh Hammer (Weald Clay) Forge

Par. Leigh, Surrey. 51° 12′ 5″ N. 0° 0′ 15″ W.
⅝m. S. by W. of Ch. I
P.N. Hammer Bridge, Burchetts Field, Grove Farm.

This was the forge attached to Ewood, though perhaps at first an independent works. The land belonged to Henry Lechford, who, as recited in a later deed, let eight acres of land known as Burghett and Grove Lands, to Richard Wheler and William Hawthorne in 1551. This lease had been transferred to George and Christopher Darrell. This was before Ewood came into their possession, and it would seem probable that Ewood also dates back to 1551, as the forge would hardly have been established without having near by a furnace to supply it with sows. The cinder is clearly conversion forge, not power bloomery, cinder. After the Darrells got possession of Ewood in 1554, the lease of Leigh Hammer passed with the furnace in its various changes of ownership. Burchetts field, now the plantation around the lodge of Mynthurst, is about three-eighths of a mile to the S.E., so cannot have been part of the eight acres, but the name may have been applied to several fields.

Close Roll, 506.



Cam found at Leigh Hammer.

The pond and bay are not now traceable; there has probably been a great amount of silting. There is a

depression on the lower side of the bridge which may have been a hammer-dyke. There is abundance of forge cinder and charcoal. In 1930 Mr. F. H. Edmunds of the Geological Survey found there a cast-iron slab, some 12 inches by 9 inches by 2 inches, now at the Jermyn Street Museum. On further investigation I was fortunate enough to discover one of the cams that lifted the hammer, the only one of its kind known. It is now in the museum of the Holmesdale Natural History Club at Reigate. Two other imperfect slabs were also found by Mr. Watt; their use is doubtful.

There is a field about three-quarters of a mile south-east called Furnace Corner, but several visits have revealed no traces.

Cinderfield, Horley (Weald Clay) Bloomery

Par. Horley, Surrey. 51° 11′ 50″ N. 0° 10′ 50″ W.
2m. N. by W. of Horley Ch.
P.N. Cinderfield, Cinderfield Farm, Cinderfield Cottage.

Although this is an unproved site—as excavation in the large pasture field in 1927 yielded no result—I have included it as being one of the very few having early records. It is probably the one recorded by Sir Henry Lambert in Surrey Archæological Collections from the Coram Rege Roll, 45 Edward III, 1371 (No. 443, 10, 15 Rex). John Neel and others were presented for digging up the highway in Horley on a certain waste forming part of the manor of Banstead; in which was a mine of iron (mina ferri). John Weeche admitted buying 200 loads of ore (carras fodini) for 50 shillings, but maintained it was no highway. Later he admitted that it was a highway, and had to repair it, and pay fines of 2*s.* and 1*s.* for his man. The field was a roadside common in 1846.

Surrey A. C., XXXIV., p. 105.

South Park, Blechingley (Weald Clay)

Bloomery

Par. Blechingley, Surrey. 51° 13′ 0″ N. 0° 5′ 40″ W.
1¾m. S. by E. of Blechingley Ch. AF
P.N. Cinderfield, Cinderhill.

This site was kindly shown me by the owner, the late Mr. Uvedale Lambert. It is the most northerly bloomery yet found, being very near the rise of the greensand hills. There is a deposit of Paludina limestone within a short distance, which may have provided the flux. A considerable amount of ancient cinder is spread over the field, and large lumps have been thrown up on the hedges. There are some marl-pits which probably yielded the ore. Sir Thomas Carwarden, who owned this estate in the reign of Edward VI, was the first-named of the commissioners who took over the estates of Admiral Seymour, on his attainder, including the iron-works at Sheffield and Worth (q.v.) in 1549, and also in the same year was head of the commission of enquiry as to iron furnaces and fuel. He apparently accumulated a store of ordnance, which was confiscated on January 25th, 1554, on suspicion of his complicity in Wyatt's rebellion. There were in all loads for seventeen wains, including "16 great peeces of ordinance of yron, whereof 2 are chamber peeces, double bases wrought, double bases cast, a cast robinett of yron, 200 lbs. in weight, 1¼ in. bore."

S.A.C., XIII., p. 129.

See p. 113.

"Blechingley," Uvedale Lambert. p. 265.

He was later cleared and restored to favour, but was only able to get back four wainloads in 1558. The cast pieces cannot have been made here, although it is possible that the bloomery was still in existence and supplied some of the smaller wrought-iron weapons.

Stumbleholm (Weald Clay) Bloomery

Par. Ifield. 51° 7′ 10″ N. 0° 14′ 40″ E.
1⅜m. W. by S. of Ch. AF
P.N. Little and Great Cinderplat, Cinderplat mead.

Cinder of a primitive type is spread over a considerable area, most of which is now under grass, but it shows up by the stream and in an arable field to the east of the farm. A great deal was found when digging the foundation of a barn; this may have been the site of the hearth, but is now covered up.

Bewbush (Weald Clay) Furnace

Par. Bewbush. 51° 6′ 20″ N. 0° 13′ 50″ W.
1m. S.W. of Ifield Halt. K
P.N. Furnace field.

This is the furnace that worked with Ifield Forge; it is a very short distance above the tail of that pond, and was called Ifield furnace in 1574, belonging to Roger Gratwick. At about the same time as the grant of the western part of St. Leonards Forest to Caryll, the eastern portion, including the parks of Bewbush and Shelley, was granted to Sir Thomas Sherley, who in his turn leased them to Arthur and John Middleton of Horsham and Stephen French of Chiddingly, ironmasters. In the Exchequer Accounts, Forests, it is noted that they cut during the seven years 1589 to 1596 56,000 cords of wood, worth £4,200. In addition they bought "the tymber of 80 dead, stub and pollard trees for the reparation of their houses and ironworks." At the time of the Commonwealth, Bewbush belonged to Thomas Middleton. He was Member for Horsham in the Long Parliament, and although a sequestrator for Sussex, was

See p. 439.

Bundle 151, No. 9.

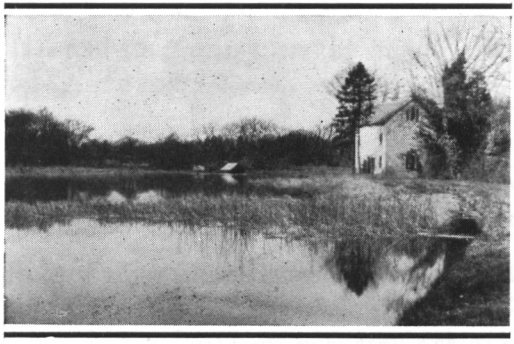
suspected of complicity in the Royalist rising at Horsham in 1648, and his estates sequestered. In the resulting Parliamentary survey, dated March 16th, 1649, the furnace pond is mentioned as a boundary to various farms and there is a note :—

"Furnace and Iron mine.—There is one old furnace standing at the lower end of the great furnace pond, and store of iron mine, but the aforesaid Mr. Thos. Middleton and his predecessors have so destroyed the woods and timber with more abounding upon the several parks of Shelley and Bewbush and neglected to follow the said furnace, that it hath stood emptie for about seven yeares last past. The said old furnace if it be repayred will be worth, with the benefit of the mine within Bewbush lands, £20 per annum."

This dates the closing down as about 1642. It was mentioned as ruined in the 1653 lists.

The succeeding mill has long gone, but the fine pond, larger than that of Ifield, is still extant, and the resort of numerous waterfowl.

There is a very little furnace slag.



Ifield Mill.

Ifield Mill (Weald Clay) Forge

Par. Ifield. 51° 6′ 50″ N. 0° 13′ 10″ W.
⅜m. S.W. of Ifield Halt. I
P.N. None.

This forge was worked, seemingly on his own account, by Roger Gratwick in 1574, in addition to the forges in St. Leonards Forest worked by him for Queen Elizabeth. He was warned at Horsham, and a daughter was buried at Warnham in 1577, but he signed as of Sullington. He must have been a substantial man, as in 1588 he contributed £100 towards the Armada defences. He died in 1596, and a brass to his memory is in Tortington Church. Waller's troop of horse burnt the forge, together with others in St. Leonards Forest, in 1643, and apparently it was never restored, the corn-mill being erected in 1683.

S.A.C., II., p. 211.

There is a large pond, now intersected by the railway and much grown up; in 1841 it covered 22 acres. Some forge refuse remains, also a curious mitre-shaped block of stone, with a round hole through it, perhaps a bellows counterpoise.

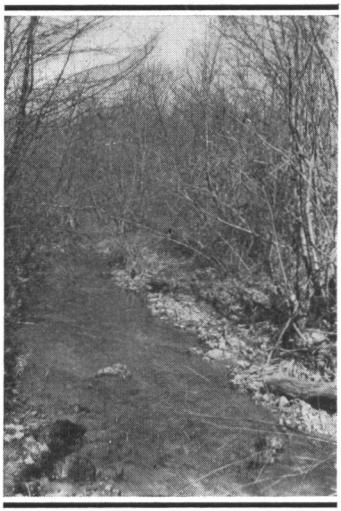
Worth Forest Furnace

Par. Worth. 51° 5′ 10″ N. 0° 9′ 30″ W.
1¾m. S.W. of Ch. K
P.N. Cinderbanks.

This was one of the earliest and most important iron-works in the Weald.

Although the first iron guns were only cast at Buxted in 1543, this furnace must have soon followed suit, as by 1547 a considerable number of guns were being produced here and at Sheffield. By a happy accident we get a very clear idea of the state of affairs during a period of a little

At Ifield Mill.
Perhaps a Bellows Counterbalance.



Slag along the Stream, Worth Furnace.

over two years. These furnaces had been the property of Thomas, third Duke of Norfolk. On his attainder in 1546 his vast estates in Sussex and other counties fell into the King's hands; and after the accession of Edward VI they were granted to Thomas Seymour, Lord Admiral. This ambitious man, a brother-in-law of Henry VIII, had sought in turn the hands of Elizabeth, Mary, and Anne of Cleves, and eventually married Henry's widow, Catherine Parr. He had been appointed master of ordnance in 1544, and later Lord Admiral. He quarrelled with his brother, the powerful Lord Protector Somerset, and after the accession of the young king, was accused of collusion with pirates, attainted, and executed in 1549, his estate being forfeited to the Crown. We have therefore in the State Records a complete inventory of the Worth and Sheffield furnaces, printed by Sir Henry Ellis in S.A.C., Vol. XIII., and full accounts for over two years, published by Mr. M. S. Giuseppi in the "Archæological Journal," Vol. 69.

As the inventory is very informative, I quote it here in full :—

S.A.C., XIII., p. 128.

THE FORESTE OF WOURTHE, IN THE SAID COUNTIE

An Inventorie taken ther the xxijth of Jenuarie, in Anno dicto, by the said Sir Thomas Cawarden, and Sir William Gorynge, Knights, by vertue of the Comyssyon before expressid, of all siche gooddes, cattells, and other store or flocks remayninynge ther, of the Lorde Admirall's, hereafter apperethe.

Ffyrste, a duble ffurnace to caste ordynaunce, shotte or rawe iron, w^{t} all implements and necessaries appertenyng unto the same : *Item*, there ys in sowes of rawe iron, cxij ; *Itm*, certen peces of ordynaunce, that is to say, culverens xiv. ; dim. culverens, xv. ; *Itm*, of shotte for the same, vj. tonne v. c^{t} ; *Itm*, ordynance caryed from thens to Southwark, and remanyth ther as foleth, sakers, xv. ; ffawkons, vj. ; mynnyons, ij. ; and dim. culverens, j. ; *Itm*, in shotte for the same delyvered at the h.st^{d}, xiij. tonne ; *Itm*, in myne or ower at the furnace, redye receved, xvj^{c}. lode ; *itm*, in myne, drawen and caried, Mix^{x}. lode ; *Item*, in whode, viij^{c}. corde.

Item, a forge ther w^{t} all implements necessary for the same :—ffyrste, in sowes ther of raw iron, and redy to worke, cxxx^{li} ; *Itm*, in barres of iron, viij. tonne ; *Itm*, iron caried from thens to the White Hart, in Sothwark, xvv. ^{tonne} vj.^{c} ; *itm*, in blomes at the forge, iiij^{tonne} dim. ; *itm*, in cole, iiij^{c}. lode ; *itm*, in whode, vij^{c}. corde.

The sum or number of the said workmen appertaining unto the said fforge and furnace, xxxiij^{ti}. whereof, a hammerman and a servant, j. ; finers and ij. seruants, ij. ; founder, j., ffyller, j. ; iij. coleyers, and ij. servants, v. ; myners and iij. seruants, iij. ; gonfounders and viij. seruants, x. All these persons are hyred after a rate by taske work.

Itm. One may hyred by the yere to attend uppon the work and workmen, weying the iron from the workmen to the merchants, and his fee or wages yerlye ys iiij^{ls}., a lyuerie, or x^{s}., meate and drynke.

Me^{d} That all the premisses, stock, and store w^{t}in receyted with th' order of the workmen are commytted and appoynted to the custody and charge of S^{r} John Sherief, Clerk, and for his better assystance Henry Foyce, Gent. The some or value of iron in barres remayning at the fyrnyces, forges, and hammer-mylls, within written, as also in London, as we are credably informed amounteth by estimation to cccciiij^{xx} xvij^{li} xv^{s}.

The some or value of th' ordynaunce remaynyng at the said places amountethe to vj^{c}xx^{li}.

The some or value of the shotte there lxvj^{li}.

The some or value of the sowes cclj^{li}.
The some or value of the whode xlij^{li}.
The some or value of the cole iiij^{xx} iiij^{li}.
The some or value of the myne ccclix^{li}.
The some or value of the blomes xxvij^{li}.
The value of the drawyng oxen xxiii^{li} vj^{s} viij^{d}.
The some or valew as well of the implements apperteynyng unto the said forges and furnaces, as also weyns and other siche like amounteth to x^{li}.
M^{d}. that P'son Levett owythe uppon a rekenyng for shott to hym delyuered in anno primo regis E sexti from the furnace of Wourthe by estimacion lxxvij^{li}.

Summa totall Mmixxvij vj^{s} viij^{d}.

Whereof to be allowed unto certan gonnefounders and other workmen in the said ffurnyces and fforges for ther wages nowe dewe by estimacon clx^{li}.
And so remaynethe m^{t} ix^{c} xvij^{li} vi^{s} viij^{d}.

Itm to be remembred to knowe what the gonnefounders shall do, whether they shall caste any more ordynaunce and shott or no and of what kynde.

M^{d} that S^{r} John Sherief, Clerk, confessethe, that he hath not made none accompt of the furnyce and mylles of Shefeild sync the feast of All Saincts in Anno xxxviij, Henr. viii, and hath not accompted for the ffurnyce and mylles in Wourthe syns the Na^{te} of our Lord in Anno dicto: and nowe desyrethe instantlye to come to his accompt.

Wyttnessys, T. Cawerden, Wyllyam Goryng, John Sheryf, clerke, Henri Foyce."

From the accounts, which are dealt with on p. 199, we learn that the product of the furnace from December 24th, 1549, was 156 tons of iron, 56 tons 1 cwt. of guns, and 52 tons 1 cwt. of shot. Total value, £1,973 3*s*. 1*d*. Arch. Journal, V. LXIX., p. 276.

Sir Thomas Seymour in December, 1546, had orders for a great number of cannon for the King's new fort at Newhaven, and on the same day Parson Levett, the King's gunfounder, had a commission to oversee the iron mines belonging to the Duke of Norfolk in Sussex. He figures in the accounts as owing for 33 tons. Acts of Privy Council, N.S. 1, 561.

Another parson, John Shreve or Sherief, kept the accounts of Sheffield and Worth.

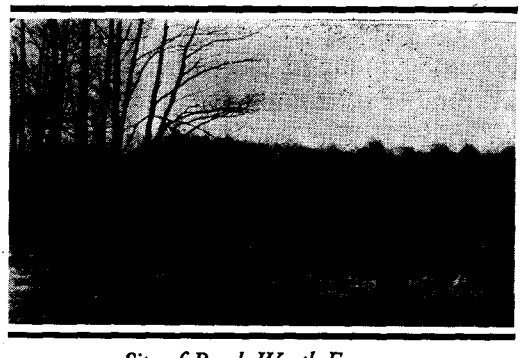
In 1550 the furnace was leased to Clement Throck-

merton for 21 years at the rent of £90, which could be paid in guns. On the accession of Mary in 1553 the Duke of Norfolk's attainder was reversed and his possessions restored, so passing out of the hands of the Crown.

In 1580 and 1582 there are entries in the Duke of Norfolk's rent rolls showing that John Eversfield had the farm of the forest, and paid £20 for wood taken to the ironworks. He paid a rent of £10 for the "opus ferrarii" in 1580, and the same amount in 1582, "et operax lez Iron Works in Forest de Woorthe." He appears in the 1574 lists as working two *forges* and a furnace in Wooreforeste for the Lord Abergavenny, and the Erles of Derby and Surrey. In one of the lists a furnace is also mentioned.

The discrepancy in the rents as compared with that paid by Clement Throckmerton in 1550 is hard to explain, unless the properties were different.

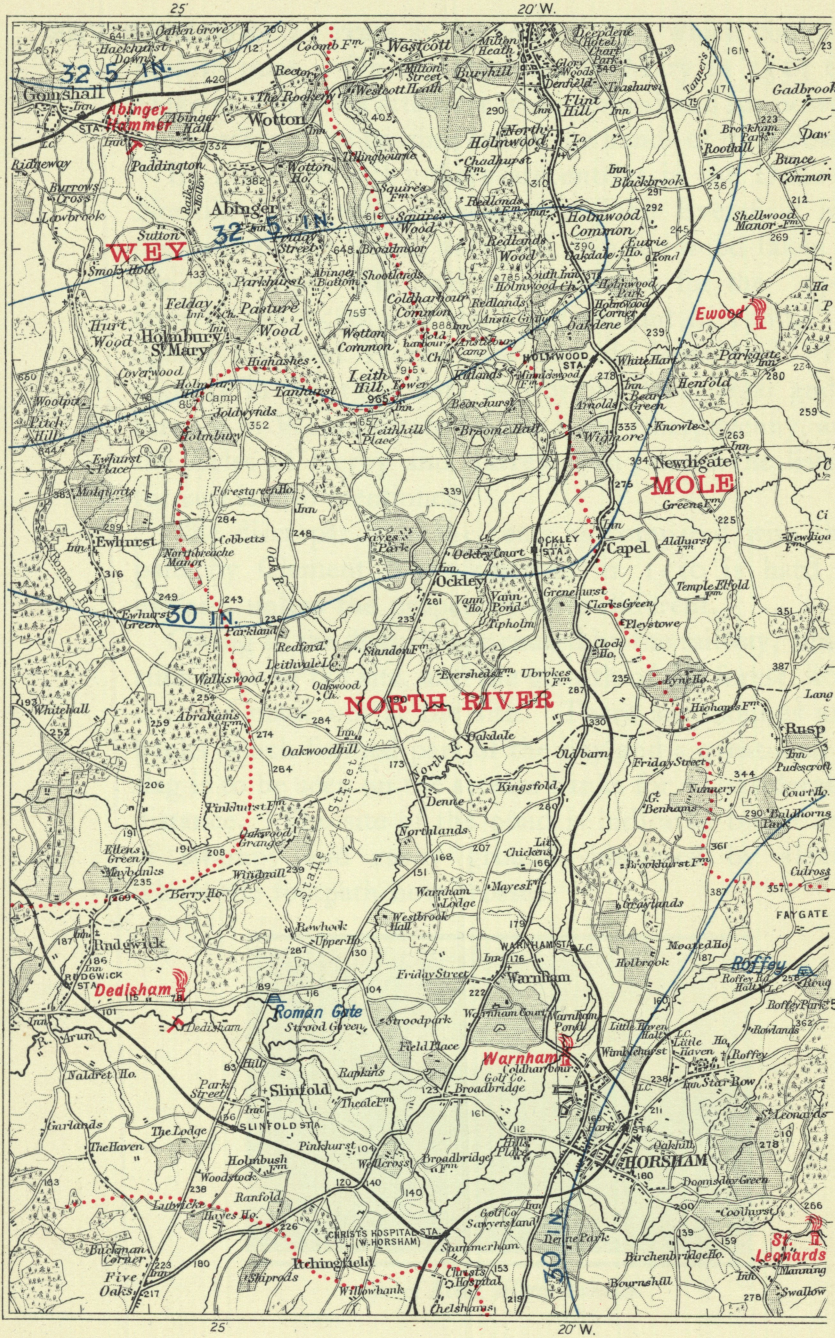
Owing to the disturbance caused by the railway, which runs close to the site, and the growth of the forest, little is to be made out at the site. There are mounds and banks which formed part of the bay and a great deal of slag is to be seen on the stream banks for a considerable distance. The site of the pond is indicated by an area of swampy and rushy ground, bordered by alders, which the footpath now crosses.



Site of Pond, Worth Furnace.

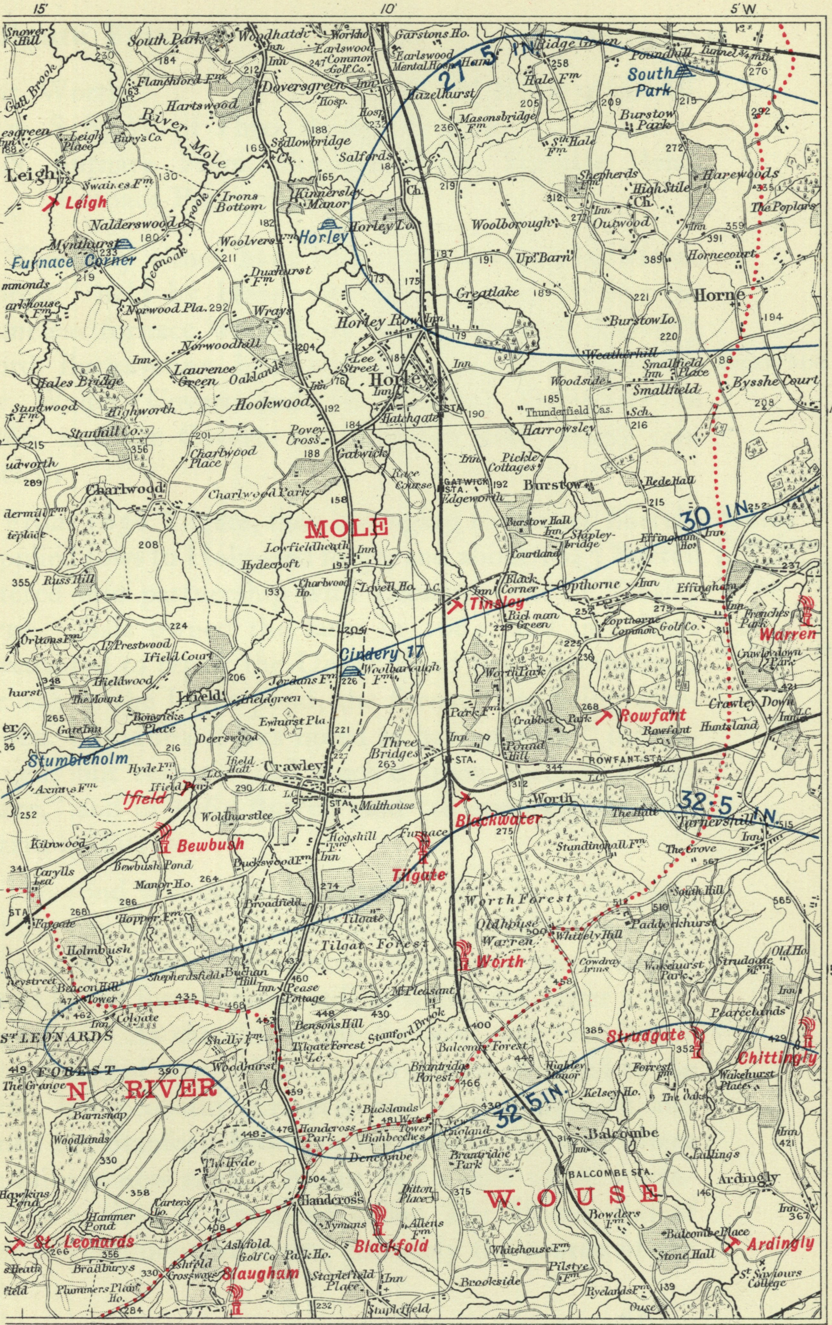
NORTH RIVER

NORTH RIVER



FURNACE FORGE BLOOMERY ROMAN BLOOMERY

MOLE



FURNACE FORGE BLOOMERY ROMAN BLOOMERY

Scale 2 Miles to an Inch

0 1 2 3 Miles

MOLE

Tilgate Furnace Furnace

Par. Worth. 51° 6′ 10″ N. 0° 9′ 50″ W.
1⅛m. S. by W. of Three Bridges Station. K
P.N. Furnace Farm, Furnace Plain, Furnace Pond, Furnace Pond plat.

This may either have been the "furnace in Moore Forest" held by Henry Bowyer in 1574, or else the nameless furnace worked by Ninian Burwell (Burrell). Lord Burgavenny had sold the Tilgate property to Sir Walter Covert and Sir Edward Culpepper in 1566, and the Coverts and Burrells were closely connected. Burrell MSS.

From 1636 Tilgate, then belonging to Walter Burrell, supplied sows to Holmsted forge, and about 1643 Burrell entered into partnership with Leonard Gale of Tinsley forge. Gale owned the farm in 1664, and in a lease covenanted to repair the Upper Pond bay, also reserved the fish in the lower pond, the furnace not being mentioned. In 1664 it was noted as having been "discontinued, but repair'd and stock'd upon account of the warre," and in 1665 Burrell paid tax upon a (domestic) hearth at Tilgate. Chancery Proceedings, Bridges, Bundle 79, No. 84. S.A.C., XLIII., p. 18.

The pond was shown in water in the 1842 tithe map, but the bay has been levelled and only a slight rise in the ground is visible. However, there are three supply ponds in the forest above, still in water, the lower a very large one. At the site of the furnace, now wooded, is a good deal of slag. The stream is now diverted to the north, but probably formerly ran to the eastward and joined the Stanford Brook below Worth furnace, where the railway now runs. About half a mile to the north-west is a piece of woodland called The Hoath, full of almost contiguous minepits, probably the source of the ore.

Blackwater Green (Weald Clay) Forge

Par. Worth. 51° 6′ 45″ N. 0° 9′ 20″ W.
½m. S.E. of Three Bridges Station. I
P.N. Great Pond Mead, Little Ponds.

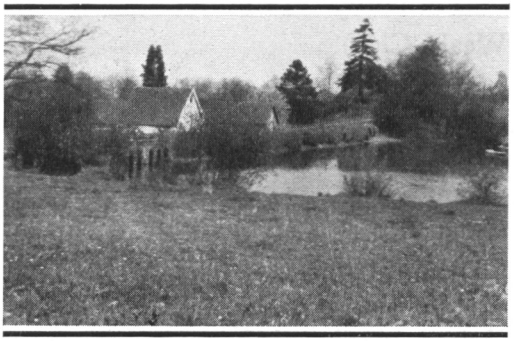
See p. 460.

This is perhaps the hammer attached to Worth furnace, as the forge mentioned in the accounts was not adjacent to the furnace; the carriage of sows to the hammer cost 8*d.* per ton. This compares fairly well with the cost at Newbridge for a similar distance. There is an item for the "new making of thre brydges upon the weyes betwene ye hamer at Worth and Crawley" which doubtless refers to the three bridges at Three Bridges Station. These are clearly shown on the tithe map of 1842, spanning the stream from Tilgate and Worth furnaces, now much diverted by the railway. It feeds the pond of Hazlewick Mill, which does not seem to have been ever an iron mill, although there is a large "bear" near the pond bay, and much cinder in the road, some of which, however, is bloomery cinder from Cindery Seventeen (q.v.).

Arch. Journal, V. LXIX., p. 276.

In 1574 it may have been one of the two hammers in Moore Forest (Worth Forest) belonging to Lord Abergavenny and the Earls of Derby and Surrey. The old road from Tilgate (Maidenbower Lane) crossed the stream here, and the forge was perhaps later in connection with Tilgate Furnace.

There is a bay, and much forge refuse.



Rowfant Mill and Caldmer Pond.

Rowfant Mill Forge

Par. Worth. 51° 7′ 20″ N. 0° 7′ 10″ W.
1⅜m. N.E. of Ch. H I (s.g. 3·57)
P.N. Hammer Wood, Hammer Mead.

Robert Whitfield of Worth (in some lists Roger) held Rowfraunt in 1574. He contributed £100 for Armada defence.

In 1664 it was laid aside.

The mill-pond, called Caldmer Pond, is a charming piece of water and the picturesque mill has only recently ceased working. There is abundance of forge cinder.

Rowfant Supra, mentioned in 1664, as being ruined before that date, may perhaps have been at Horse-pasture Pond, a little above Caldmer Pond, as I have found a little cinder there (s.g. 3·13). At any rate, it was a supply pond, together with other ponds higher up the stream by Rowfant House. The bay is now broken and the pond dry.

Tinsley—Tenceley—Tinsloe Forge
(Weald Clay)

Par. Worth. 51° 8′ 20″ N. 0° 9′ 15″ W.
1½m. N. of Three Bridges Station. I
P.N. Forge Farm, Forge Wood, Minepit Wood, Black mead, Black Corner.

Burrell MSS., 5683, 92–108. In 1574 this was owned by Henry Bowyer, Boyer or Bower, son of the militant lady of Parrock. He died September 8th, 1589, still in possession.

S.A.C., XII., p. 45. In 1664 "Tenceley" was still working, as in 1656 it was bought by Leonard Gale, a poor blacksmith from Sevenoaks, who soon afterwards was taken into partnership by Walter Burrell of Cuckfield, who supplied the sows from Tilgate Furnace. Gale afterwards became the sole proprietor; he died in 1690, his son Leonard inheriting what must have been a valuable property, as in 1696 he was able to buy the estate of Crabbett, near by, for £9,000. He later was able to secure the Cowden furnace, as his father had advised in a long memorandum, written three years before his death. The bay remains, and some forge cinder. The wedge-shaped field on the site of the pond is called "The Otter's Tail."

It was here that the "Sussex Forge" apple originated.

Cindery Seventeen (Weald Clay) Bloomery

Par. Worth. 51° 7′ 25″ N. 0° 10′ 30″ W.
On Woolborough Farm, 1m. N.W. of Three Bridges Station. AF
P.N. Farm name, Cindery Seventeen.

This is a large field now under grass, from which a good deal of cinder has been dug; some remains at north end of the field.

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