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OBSERVATIONS ON THE IRON CINDERS FOUND
IN THE FOREST OF DEAN AND ITS
NEIGHBOURHOOD.¹

By GEORGE WYRALL, of Bicknor Court, Esq.

Communicated by SIR JOHN MACLEAN, 24th January, 1878.

INTRODUCTION.

THE following observations were thrown together in the year 1780, at the request of Mr. Isaac Taylor, of Ross, in answer to the under-written Queries, proposed by Doctor Nash, who was then compiling his History of Worcestershire. Having no acquaintance with the Doctor, nor ever read his History, since published, we know not what use he made of these Remarks, nor whether he made any. They were given to Mr. Taylor in a short time after he communicated the Queries.

I.—Of what æra do you think the Iron Cinders were? Are they British, Roman, or Saxon?

II.—Do you find mixed with them Coins, Implements, or anything else that can denote their date?

III.—Is it true that the Cinders yield more or better Iron than the native Ore, dug fresh from the Mines.

IV.—In how large a tract of country do they find them; and how far distant from any of the Mines now worked?

THE Cinders which have been found in large quantities in many parts of the country about the Forest of Dean, are well known

¹ The Rev. H. G. Nicholls has access to this MS., which he describes as "valuable," and several times quotes it in his interesting history of "Iron Making in the Olden Times," having special reference to the Forest of Dean.—ED.

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to be the scoria of Iron. So are the shining, glass like Cinders of which great heaps, or mounts, are to be seen at every Iron Furnace now in use, as well as at the sites of those which are gone to decay. But these are distinguished by the name of Scruff; that of Cinders having been applied to the former long before any of the latter were ever seen.

Scruff is the scoria which rises upon the surface of the metal by the present method of melting the Ore in large Furnaces. But the Cinders were produced and left for us by the works of our forefathers, before the use of the Furnaces were known. The Scruff is a mere Scoria quite destitute of metal, and consisting of a vitreous substance more or less mixed with the impurities carried off with it in its fluid state. The best of it is used as an ingredient in the making of common green glass, for which purpose it is pick'd out and reduced to a fine powder by pounding with large stamping Engines, and at the same time washing away the lighter substances by a stream of water. The refuse of this Scruff is of no other use but to mend the highways—for which it is an excellent covering.¹

There are also found amongst the Scruff, on stamping, considerable quantities of granulated Iron, and also of ragged lumps, which are called Shot and Scrap Iron. These, in the clearing of the Furnaces, are thrown off with the grosser and less fluid Scoria, and, after being separated by the Stampers, are taken to the Forges and worked up with Pig Iron.

But the Cinders are very different, being not at all vitreous, nor having any transparency like the Scruff; but containing a large quantity of Iron, for the sake of which, since the modern improvements of the Iron-trade, they have been used as a principal material in working the Furnaces of this country. As we have not any works going on in our own times which produce these Cinders, the common opinion is undoubtedly well founded that they were made by the Works called Blomaries, or Blomary Forges.

¹ We must protest against this opinion, the word ought to have been written "excrabie."—ED.

This was a very tedious and elaborate process by which the ancients wrought the metal through many repeated operations, both of fire and the hammer, from the ore as it was raised out of the earth, into the state of Bar-Iron.

Their Bellows were only such as could be blown by the strength of men; and their Hammers no other than Sledges worked by men's arms. For we know that the beds of Cinders are generally found in places where no stream of water could ever be led to turn a wheel, and the quantity of Iron we find in them shews that their blast was not strong enough to extract from the Ores more than a small proportion of the metal they contained.

The work of our Finery-Forges, which perform the first operation on the Pig-Iron after it comes from the Furnaces, appears to have some resemblance to that of the Blomaries; only that our Bellows and Hammers, being driven by water, are larger and more powerful; and these bring the Pig-Iron into a state of malleability as the others did the Ore.

The Cinders, too, which are run from the Fineries, tho' different, are somewhat resembling those of the Blomaries; and, like them, not without unextracted metal.

The present method of melting the Ore in large Iron-Furnaces and running it into massy ingots of what is called Pig-Iron, is a new improvement in the trade; and, as it seems to appear, not of a very remote date. We are at no loss to know how many of these Furnaces have ever been in this country from the heaps of Scruff which still remain to point out their precise situations, nor is it, perhaps, impossible now to discover, pretty nearly, the time of their first erection; and we conceive them to have been some of the first that ever were in England.

The Iron-Works in the Forest of Dean, both before and subsequent to the erection of Furnaces there, belonged to the King, and were work'd for his use; and the inhabitants of the country were always employ'd to raise the Ore for supplying them.

There had also been, for a series of ages, in many places at different distances from the Mines, other works besides the King's, carried on in the blomary way ; and afterwards several Furnaces made by private persons : all which were supplied with Ores from the Mines of the Forest.

By an Inquest of the Gentleman Regarders of our Forest, return'd at a Justice-Seat holden as long since as 10°. Edward I., it appears that certain wages, "either in money or in Iron Ore," were settled to be pay'd to these Miners who supplied the King's Works with Ore. What Ore they got more than this supply, or was allowed as Wages, we are, therefore, to conclude was sold by them to other Works.

In process of time the King's works were let out to Farmers, who pay'd an annual Rent to Government for them.

In the 9th year of King James the First, 1612, the King, by Letters patent under the Great Seal, demised to William, Earl of Pembroke, then Constable of the Castle of St. Briavels and Warden of the Forest of Dean, at the yearly rent of £2433 6s. 8d., "all the Iron-Ore, Coal, Wood to make Charcoal, &c., in the said Forest."

The following year an Information was filed in the Exchequer on behalf of the said Earl, against several Miners, for digging and carrying away these materials to other Works. And an Order of the Court was made consequent thereupon ; in which it was considered "that His Majesty's Farmer of the Iron Works, paying a great Rent, would not be furnished with materials to keep the said Forges at work if the said Ore and Cinders should be carried away," and it was ordered "that the Parties and others accustomed to dig, etc., should, of charity and grace, etc., be permitted to continue digging and getting the said Ore and Cinders so that they carry, or cause the same to be carried, to His Majesty's Iron-Works and Forges."

Cinders, it is well known, have not been made use of as a material for any other Iron-Works besides Furnaces, and as by this

Order of Court it appears that as long ago as the tenth year of King James Cinders were then considered as a necessary article for the carrying on of these Iron-Works, it follows that Iron-Furnaces were then in use here. The word "Furnace," indeed, is not mentioned in that record: yet this might well be in the early days of the works. Even now, amongst persons little conversant with Iron-Works, we frequently hear them often spoken of, generally, by the name of "Forges," without attending to the necessary distinction to be made between Furnaces and Forges. The word "Forge," therefore, as used in that place, must necessarily be so understood.

But another record has cleared this up. The same King Anno 19^o (1622) demised to Harris and Chaloner "All the Iron-works, with Furnaces, Forges, &c., and agreed that the Miners should furnish them with Ore for the Furnaces at the same prices as they were obliged to serve the King when they were worked on his account." 1617, In the return of Sir William Coke, and others, to a Commission issued out of the Exchequer to enquire concerning the Forest of Dean, it is expressly said that "his Majesty, since the erection of the Iron-works, had received a greater Revenue than formerly." I have in my hands an old Survey, dated in 1635,¹ and by the character evidently written at that time, of all the King's works in this Forest, being then in the occupation of Farmers, who appear to have then had them as much as six Years. How much longer we know not; nor are their names mentioned; but it is probable that they were the same Harris and Chaloner, who, if so, had then about eight years to come of their term.

This manuscript gives a particular account of all the King's Works, of their buildings, dimensions, troughs, machinery, and of even the utensils, with the state of repair everything was in at the time.

From these proofs it appears that Furnaces and Forges, such as are now used for making Iron, tho' since much altered and

¹ Mr. Wyrall made a transcript of this Survey and compiled a glossary of the terms used therein, which Mr. Nicholls has printed in his work —ED.

improved, were in use early in the reign of James the First, and that the Cinders we are enquiring after were then used to be melted with the Ore in working them. But that such works were not known here very long before that time is also, we think, pretty clear from the concurrent tenour of these evidences.

By the record of 1617, these Iron-works, we see, were regarded as a great and a late improvement (for the Iron-works of the Kings, in the old way, had always been here from time immemorial), an improvement from which great advantage had accrued to the Revenue, and from which the highest expectations were entertained. For it must be allow'd that so large a sum as £2,433 6s. 8d. (which in 1612 was a prodigious yearly Rent for an Individual to pay) could only be undertaken to be payed from the inducement of the most sanguine expectations, raised by an extraordinary turn in the trade, unknown and unthought of in former ages.

The ancient Works, or Blomaries, have, in the old records and writings, the name of *Forgii* or *Forgiæ errantes*, as being capable of removal from one situation to another. The new names of *Furnaces* and *Forges*, and sometimes in those days, of *Iron-Mills*, distinguish'd the Works, the invention of which had so much encreased the Royal Income. And that they were *Furnaces* upon the same principle as ours, and *Forges* such as we call *Fineries* and *Chafferries*, and all work'd by water, is perfectly clear from the several particulars which are mentioned in this Survey.

That they had not been of long duration seems also pretty evident. It appears, indeed, that about the year 1630, those Works had been almost in ruins; but an attention to the circumstances will, we think, justify the opinion that this was not the effect of old age; but owing to their having been improperly placed and imperfectly constructed, particularly the *Furnaces*. One of them had been burnt down: an accident to which they must have been much exposed, as the buildings round them were almost entirely of wood. An other was taken down and rebuilt three feet higher, and, no doubt, of proportionally larger dimensions and stronger. And one more, which had been built but three years before, is said to be "very

much cracked." Most of the Workmen's Houses appear to have been built by these Farmers. The account says *built not rebuilt*. One of these was a Cot, raised by some labourers, which the Farmers now found it necessary to have for their men. Conveniences must be added as the want of them is discovered, and as Works are enlarged and improved. Everything, in short, appears at the time when this Survey was taken, to require both amending and improving.

It cannot be supposed that such powerful works were brought to their full perfection but by slow degrees and after considerable experience. The first projectors could not be expected to produce them otherwise than imperfect. They were not aware of the strength required to resist the force of the fire in these Furnaces. They were not adapted to the work by their strength or situation. It was not possible that they could work very long without great alteration.

The event has shewn this: they have been long silent, and have resigned the trade to others better placed and more improved. And the small mounts of Scruff to be seen at the places where they stood are a lasting evidence that they were not going on through many reigns.

There was printed in the year 1687 a small book entitled "Rules and Orders of the Court of St. Briavels, in the Forest of Dean," as being "Collected and ascertained by his Majesty's Tenants and Suitors of the said Court, by the direction and approbation of Sir Baynham Throckmorton, Knight, Deputy to the Right Hon. Henry, Lord Herbert of Raglan, his Majesty's Constable of the Manor and Hundred aforesaid," 11 Maij, 15^o Car. II., 1663. And along with this there is also printed an old "Account of the Laws and Customs of the Miners of the Forest, as digested and signed by forty-eight of these Miners,"¹ and there said to have been granted to them; but we are not told when and by whom; and no record of any such Grant has ever been produced.

¹ This has been printed, with annotations, by Mr. Nicholls in his work above cited, under the title of "The Miners' Lawes and Priviledges." 1 D.

This code of their Laws is regarded as the Magna Charta of our Miners and Colliers. Unluckily the date does not appear, so we are left to take our opinion as to the age of the compilation from what we see in the contents. The time of the King's Officer, called the "Gaveller," coming to visit the Mines is mentioned (Sect. 18) to be between "Matins and Masse." It was, therefore, before the Reformation had taken place in England. On the other hand, the language tho' quite in the vulgar dialect of the Forest, shews, we think, that it could not have been written at a much earlier period. But it clearly appears through the whole that at the time when it was written, the Blomaries were in full work round about them, and that no such thing as an Iron Furnace was then known or thought of. Will it, then, upon the whole of these facts, be deemed too bold a conjecture to suppose that the first erections of our modern Furnaces in England were about the middle or end of the 16th century, or during the reign of Elizabeth, under whom every art and manufacture was cherished and promoted? Perhaps it may here be asked: "But where was the cannon found before that time, if there was no Cast Iron?" This, then, requires some consideration.¹

The use of Artillery, we admit, was known before that period. Some historians have said that it was employed by the English at the battle of Cressy, in 1346. But if any was there it must have been very insignificant and comparatively defective and disregarded: of which we may be assured from the disuse of it which

¹ Cannon, made of iron bars, or staves, bound together with hoops of the same metal, were of early date, and continued long in use. We have a remarkable example of this kind of ordnance in Mons Meg, preserved in Edinburgh Castle, the loading of which, it is said, required a peck of powder and a granite ball. This gun was used at the siege of Dumbarton in 1489, but it was probably in existence long before. A careful drawing to scale is given of it in the "Archæological Journal, Vol. x., 125." The famous ship, the *Mary Rose*, which heeled over and sank at Portsmouth, in 1544, when the captain and 700 men were drowned in the presence of the King, Henry viij., was armed with ordnance of the same description, several pieces of which have been recovered and may be seen in the Tower of London and at Woolwich. One specimen is described and illustrated by the late Sir Charles Lemon in the "Report of the Royal Institution of Cornwall," in 1844.

succeeded for more than a century afterwards. In the details of all the great battles which were then fought—in those of Poitiers (but ten years after that of Cressy), of Agincourt, of Bosworth field, and all the other many bloody engagements between the Houses of York and Lancaster, we see nothing about Cannon : we only read of feats perform'd by showers of Arrows, of Pikes, of Battle-axes, and Scymetars. And as to all the naval engagements of those times, (as well as of one fought but six years before the battle of Cressy) the descriptions relate only to the shooting with Arrows, the grappling of Ships, and fighting hand to hand.

This long silence with respect to Artillery, then quite a new discovery of such great importance, and which afterwards effected so entire a change in the whole art of war, we think not easy to account for if there was any made use of in those engagements. Pretty early, however, in the sixteenth century, or in the reign of Henry the Eighth, it does appear that some Artillery was known and brought into use in the armies and fleets of Europe. And afterwards, in 1588, the Spanish Armada is said to have carried with it an ordnance of two thousand six hundred and thirty great Guns. And we must not suppose that the fleets of the English Queen were not duly prepared to meet them in the same manner. But what were these great guns? Not made of Iron, for we are expressly told they were made of Brass. And as to their size, if they could now be seen they would only discover a proportion, with respect to the Cannon of our days, such as their ships which carried them and which then appeared so terrific, would now exhibit if placed against our First-rates.

After the discovery of gunpowder became known and its wonderful efficacy, the next invention was that of applying it to the destructive purpose of forcing instruments of death through metal tubes. This was more effectual than Bows and Arrows. But to bring the art to perfection was what necessarily required length of time. And men proceeded slowly from age to age to enlarge and improve their Guns, till at length they were used as Ordnance on board their Ships of War ; first of Brass and Wrought Iron, and

afterwards of Cast Iron, from the Furnaces and Iron-foundries, And before the erection of these, we think it may be presumed that there neither was, nor could be made, by any methods then known, any Iron Ordnance such as is now in use.

To what æra, then, is the question, do the Blomary Cinders belong? I do not conceive that they belong exclusively to any particular age or people: but that they have been the work of a very long series of ages.

There has been somewhat of a tradition in the country that they were left in it by the Danes. But this could be no other than mere conjecture, taken, perhaps, from the similarity of the names of those towns amongst us with that of those people, as Michel Dean, Little Dean, and Ruardean, in which places large quantities of these Cinders have been, and still continue to be, found.

Supposing that these towns might have their names from those invaders of whom some settlers might fix there, and admitting that several such settlers might be manufacturers of Iron, and of course that some of the Cinders were left there by them; yet, as we know the length of time the Danes had possession of the country, we also assuredly know that but a small part of the Cinders found in and about those towns could have been made by them.

Cæsar says that the Britons had Iron when he was here, and Brass, but that the latter was imported. It therefore follows that they made the Iron themselves. We are sure that they have had the Ores. No iron could be made without producing some refuse or Scoria, and none has been found but these Cinders, some of which we may therefore believe had been laid here before Cæsar's time.

That large quantities of them were afterwards deposited by the Romans, comes within the certainty of a proof which will not be disputed, for Coins, Fibulæ, and other things known to be in use with that people, have frequently been found in the beds of Cinders at certain places.

This has occurred particularly at the village of Whitchurch, between Ross and Monmouth, where large states of

Cinders have been found, and some of them so deep in the earth (eight or ten feet under the surface) as to demonstrate, without other proof, that they must have lain there for a great number of ages. The present writer has had opportunities of seeing many of these Coins and Fibulæ, &c., which have been picked up by the Workmen in getting the Cinders at this place in his time ; but especially one coin of Trajan, which he remembers to be surprisingly perfect and fresh, considering the length of time it must have been in the ground. Another instance occurs to his recollection, of a little image of brass, about four inches long, which was then found in the Cinders at the same place, being a very elegant female figure in a dancing attitude, and evidently an antique by the drapery. If the Cinders of Whitchurch are Roman, there seems to be good reason to entertain the same opinion with respect to others which have been found, but in smaller quantities—at a place called Pitstow, or Peterstow, a few miles further off from the Mines, and by the road leading from Ross to Hereford. In both these places they are somewhat different from most of the other Cinders which we have known, having lost that smutty blackness which others generally retain, and acquired (till well scoured in a stream of running water) the loamy colour of the soil in which they are found buried, and, in a manner, incorporated. These cinders are peculiarly heavy and rich of metal.

At the times when these cinders were made, the country round there undoubtedly abounded with wood and timber. Perhaps it was then a part of the Forest. There is a hill near Whitchurch which it may be presumed was then covered with timber, though now quite bare, having still the name of Copped Wood. Their Ores were found in another hill called Doward, which overhangs the same village, and is now partly covered with wood. These ores I rank with those of the Forest, tho' this hill is not within its liberties, but is separated from it, and from the county of Gloucester, by the river Wye. On the highest point of this last mentioned hill are now to be seen the remains of a Roman Camp. There are also the traces of another Roman Camp, nearly opposite on the other side of the river, at a place now called Symon's Gate.

In the village of English Bicknor, near to the church, and about a mile from this camp, are the vestiges of a very ancient castle, now quite in ruins, of which we know not that an account has been anywhere given.

If we might be allowed here to offer a conjecture, it would be that for a considerable time after the Romans gained a footing in this country, our Forest might be one of the strongest holds of the unreduced Britons: that the invaders, finding Whitchurch to be an eligible situation for their manufacture of Iron, with the Ores and wood near at hand, and particularly having the river between them and their enemies, found it necessary to fortify one or both of these camps against the attempt of the Britons to disturb them, and if Bicknor Castle was then a place of strength it was of importance to that side which could have it.¹

If the probability of these thoughts should be admitted we may, perhaps, be indulged a little further in supposing that Whitchurch might have been already an Iron-work of the Britons, and that the Romans, finding it a good situation, dispossessed them, and afterwards continued their works there as long as they possessed the Island.

There are now, near the banks of the River Wye, on the Gloucestershire side, some remains of a very old Road, which has been supposed to be Roman. This certainly led to their Works at Whitchurch, and in as direct a line as they could go from their great Road between the Passage, which they then had over the Severn to their Stations at Caerwent and Caerleon.

If we are doubtful as to the Iron-works of the Romans, whether they were such as we have described, Virgil will introduce us into one of their forges, where we may see the Roman Blomary men at their work.

¹ We do not consider the earthworks either at Symond's Yat or at Bicknor to be Roman. They were more likely British defences against their enemies, according to Mr. Wyrall's theory, on the other side of the river. The Romans, undoubtedly, had a station on the Copped Hill on the Herefordshire side of the river, opposite to Symond's Yat.—ED.

Non aliter lentis Cyclopes fulmina massis
 Dum properant, alii taurinis follibus auras
 Accipiunt, redduntque alii stridentia tingunt
 Æra lacu ; gemit impositis incudibus Ætna ;
 Illi inter se magnâ vi brachia tollunt
 In numerum, versantque tenaci forcipe ferrum.¹

GEORG. IV.

As I have not, nor have seen, Dryden's translation of this passage, I will venture humbly to try whether I cannot, from it, in our own language, give some idea of the old English Smithymen, who left us the Cinders.

So Vulcan's journeymen the thunder frame :
 Some quench the hissing metal in the stream ;
 Some urge the blast from roaring bellows driven,
 With timeful strokes by brawny Cyclops given,
 In Ætna's forge resounds the vaulted dome,
 While swift with grasping tongs these twist the sputtering bloom.

If we have not been so fortunate as to meet with Coins or Implements among the Cinders of other places to identify the particular works of other ages or people, there are yet some considerations which appear sufficient to place it beyond a doubt that the Blomaries continued working and making them thro' all the succeeding ages until the use of the Furnaces was known. The tradition we noticed may, perhaps, be entitled to some degree of credit, so far as to induce us to suppose that a part of our Cinders might be made by the Danes, while they were in this country. Both they and the Saxons (as well as the Romans) had too much use for Iron and Steel to allow of the idea that they fetch'd this metal out of other countreys of which they found here all the materials for making it in plenty, and Iron works carried on in the ages before them. With regard to the English, both before and after the conquest, we have the clearest certainty that they were carried on by them in every age. The Code of Forest Laws we have mentioned makes this very clear. The works we there see were called Smith-works, the men employed in working them, Smith men, or

¹ The reading in the Delphin Edition is somewhat different.—ED.

Smithy men, and the masters who employed them, Smith holders¹—terms which are not applicable to works of the present times, their workmen, or conductors.

We are there informed that these Smith-works or Blomary works had been in use here from time immemorial, and were then working not only within the bounds and liberties of the Forest, but at many other places at considerable distances, as Monmouth, Caerleon, Newport, Trelleck, and Berkley; at every one of which places we have known Cinders to be raised, and at the three first-mentioned places in very large quantities.

From the same information we learn that these works were all supplied with ores from the Mines of this Forest, some of them of necessity by water carriage, and others, as those of Monmouth and Trelleck, by land, from the hills near the village of Clowerwall. Of which we have had this further evidence that in bringing the Cinders back to be melted a second time in our furnaces we have frequently found pieces of our own Ores unmelted or half melted among them. But in the Book of the Forest Laws it is to be noted that there is no mention of any ore taken to, nor of any Works or Smith men being at Whitchurch or Pitstow, which we think to be a concurring proof that the Cinders found in those places are of greater antiquity.

Our forefathers knew of no Fuel but Wood-charcoal for the making of Iron. The use of Pit-coal for this purpose is of late discovery: nor has it ever yet succeeded in well melting the Ores of this Forest. The vicinity of Woods in plenty was therefore indispensably requisite in fixing the seats of the ancient Iron-works, and this even preferably to that of the Ores, as the Charcoals were a more bulky material and received more injury from long carriage, especially by water. It may, therefore, be taken for a certain rule that wherever large quantities of Blomary Cinders have been found,

¹ There is now raised in our Mines a rich and valuable Ore, being a fine dark-coloured gravel, when wash'd by the rains, which still has the name of Smithy Ore among the miners, and which we doubt not had its name from these Smithy-works as being well adapted to their manner of working, and much valued by those people.

there, undoubtedly, were in the neighbourhood of those places, at the times when the Cinders were made, either very large tracts of land covered with wood and timber so as to support a great manufactory capable of producing those Cinders before the woods were clear'd away, or else that the Works there were less numerous but of very long continuance, and furnish'd with the Charcoals from the Coppice-woods, regularly cut at certain periods. This latter we conceive to have been the case particularly at Monmouth, where some of the last Blomaries appear to have been working ; and where we must be at loss to apprehend that woods could be found sufficient to produce the very large banks of Cinders which have been raised there, without supposing these Works to be carried back very far into past ages ; and that they were served with Charcoals from Coppice-Woods of periodical fallage.

But if Cinders should be found in places where no Coppice-Woods are near, and it could even be proved how long it is since the country round such spots has been cultivated, enclosed, and clear'd of timber and wood, we might, I think, in such case, venture to conclude that such Cinders are at least of great antiquity.

The Forest of Dean, which is, in all probability, as ancient as any other in the world, has furnished in all former times an abundant supply of wood, inexhaustible for ever by such works, though numerous. And the Cinders left by them have been found in different parts of the country, perhaps to almost as wide a circuit as the Forest is known to have formerly extended. But as the more distant parts were clear'd, the works were of consequence, from age to age, necessarily reduced within the narrower circle ; and those that were the nearest to the centre of the Forest (and which were also nearest to the Mines) continued to be worked the longest.¹ Agreeable to this we have seen very large states of Cinders in a great many places in and about the present Forest, and those which have been found at remote distances but inconsiderable.

¹ There is no Iron in the centre of the present Forest ; but, accepting the ancient boundaries, the statement would be more nearly accurate. —ED.

The works of Monmouth, Newport, and Caerleon, for the reasons already given, we account not to be of this class, as having their fuel supplied from their own Coppices, but their Ores from the Mines of the Forest. And from this fact we think that it must be inferr'd that the immense quantities of Ores and Iron-Stones, with which their mountains abound, were, in all those early times, either not known to, or not regarded by, the inhabitants.¹

Upon the whole, as to the Cinders found in those parts of the kingdom, tho' those of certain places may belong to particular æras and people, yet, generally speaking, we hope it has been made to appear that they are the work of a long series of ages, through every period of our own history, and from the time when the art of making iron was first known here, down to the time when the works which made them were superseded by others more effectual; that is, till the invention of Iron-Furnaces was discovered and brought into practice here. In short, that our Cinders are British, Roman, Saxon, Danish, and English.

Whoever may have been much among the Mines of this country will not need many arguments to be convinced of this truth. There are, deep in the earth, vast caverns scoop'd out by men's hands, and large as the aisles of churches, and on its surface are extensive labyrinths worked among the rocks, and now long since overgrown with woods, which, whoever traces them must see with astonishment, and incline to believe them to have been the work of armies rather than of private labourers. They certainly were the work of many centuries, and this, perhaps, before they thought of searching in the bowels of the earth for their Ore, whither, however, they at length naturally pursued the veins as they found them to be exhausted nearer the surface.

With respect to the quality and richness of the Cinders, it has not appear'd that they yield better than the native Ores, if these be well gotten and selected. Nor will it easily be supposed that

¹ There is not Iron-ore very near those places.—ED.

after having been already worked in the fire they can produce more in quantity. But there is a great difference in the goodness and value both of the one and the other.

The ores of our Forest are of great variety: some of them being much more rich, as well as capable of producing better Iron than others of them: and they are sometimes so ill gotten and adulterated by the Miners as to be of little value.

The Cinders, too, are very different, as they are found in different places, some being light and porous, and yielding little metal, and others heavy and abounding in metal; and of these latter some are more brittle, may be broken into small pieces by slight blows of a hammer, and are more easily brought into fusion; whereas others, but little if any richer in metal, are more obdurate, and require a greater strength of fire to melt them. It is observable that these differences in the banks of Cinders are commonly preserved through the whole of each; and that those which are found in the respective villages, or places, have a resemblance, so that whether it be owing to their being worked from the same particular Mines, or to some peculiar mode or process in the working of the Blomaries, the peculiarity seems to have continued the whole time in which the works were going on there.

These ores, when judiciously chosen and used, I have had some reason to believe are capable of making better and more solid-bodied Iron when worked alone without any mixture of Cinders. But this has been found to be a matter of difficulty, so as to prevent many trials being made. Even the best of the Ores are hard to be work'd in the Furnaces by themselves, owing, probably, to the quantity of heterogeneous matter contain'd in them. They appear to require a certain proportion of other ingredients, exempt from those matters, to bring them into perfect fusion, without which the Scoria (which must be freely separated and drawn off) becomes not sufficiently fluid, and the labour to the men is exceedingly hard to keep the Furnaces clear. This work has, therefore, been attended with great toil and some hazard. Perhaps future experiments may find ways to

obviate this difficulty. The introduction, some years since, of Lancashire ore into the country to be used with ours, instead of cinders, on their becoming scarce, appears to have had a good effect, and to have caused much addition to the profits of the Furnaces.

It seems to be owing to the causes alluded to that no attempts have hitherto proved successful to blow our Furnaces with the pit-coal of the Forest, these coals abounding in sulphur, and not being, in their nature, sufficiently absorbent to reduce the ores which are so replete with noxious substances.¹

The adventurers who first erected Iron-Furnaces in this country appear, therefore, to have been singularly fortunate in finding, near at hand to the places they made choice of, not only the Mines for supplying the Ores, but also the two other materials for working them which only could, we doubt, then have rendered their endeavours successful : namely, that fuel which had ever been found the best, and, perhaps, the only one capable, from its absorbent nature, of working these Ores advantageously ; and also an ingredient ready prepared for them by their predecessors, from which the noxious substances had been discharged, and therefore well fitted to the intention of assisting to bring the Ores into fusion in their furnaces ; and also itself contributing a large proportion of metal. Had it not been for these coincident circumstances, our first Furnaces would not, we think, have been successful ; and the Iron trade would have been many years longer before it would have attained its present state of improvement and perfection.

Whether such Cinders as ours are found in distant parts of the kingdom, or what may have been produced from other Mines, are

¹ Great improvements have been made in the method of smelting the Iron Ores of the Forest within the present century. At first the use of the ancient Cinders and Lancashire Ore was superseded by mixing with the Forest Ores a certain proportion of lime-stone and coke, made from a Forest seam of coal called Lowery, or Low Delf. Since 1831, however, the quantity of lime used has gradually decreased, and it is now, it is believed, wholly discontinued ; the poor Calcareous Ores of West Dean being substituted for it. We are indebted to the kindness of Mr. W. HEANE, Surgeon, of Cinderford, who has long been a resident in the Forest, and has been closely connected with the Coal and Iron trade of East Dean, for this information.—ED.

questions which I am not prepared to answer : I can only speak as to these which are known to have been made from the Ores of our Forest and its vicinity, the principal beds of which have been found at moderate distances from the Mines, and no very large ones further off than at Monmouth, excepting those at Newport and Caerleon. The Cinders at Pitstow are five or six miles from the Mines at Doward, but the quantities there and at Berkley being not so great as at many other places, we conclude that those works were not of such long continuance.

The Blomaries of Michel Dean and Little Dean we apprehend to have been supplied with their Ore from a part of the Forest called Edgehills, being near to those places or towns. But the Mines there as well as those of Doward, have not been open'd for a very long time. There have been small quantities of Cinders found at some other places, as far as ten or twelve miles from any of our Mines which we know. These, for the reasons already given, we may suppose to have been laid there a great many centuries past, when the Forest extended to those distances.

Since the foregoing remarks were thrown together, I have been informed that a gentleman, not many years dead, once found in a remote part of Yorkshire an old man working at a Blomary Forge. And the gentleman, being himself a perfect master of the iron trade and works, stay'd with the man till he had inspected and informed himself of his mode of working ; and then wrought with his own hand, a piece of Iron from the Ore to the Bar. This anecdote was related to me by the son of that gentleman, Mr. James Cockshutt, late of Ponty Pool.

G. W.

