There are few parts of England more interesting than the portion of Gloucestershire called the Forest of Dean, and certainly, none of its antiquarian or existing characteristics are so important as the past and present features of its iron works. We have indisputable proof of their existence in remote ages, and that the metal they then produced possessed those first-rate qualities which distinguish that here obtained at the present time.

The precise locality in which these iron works occur may be described as situated from twelve to sixteen miles west of Gloucester, indicated by the range of hills extending south of May Hill towards the Severn—not that these hills are confined to a single ridge, for they form a circle upwards of six miles in diameter. Within these elevations, exclusively, the iron mine occurs, hence all the excavations, whether old or new, are confined to them, whilst the after operation of separating the metal from the ore was, and continues to be, carried on at various distances around.

It will be my endeavour first to describe the cavities in the iron-mine lime-stone rocks, which testify to the labours of the early miner; then to specify the nature and position of the metallic cinders yet found in and about this mining district; and, lastly, to offer as complete an account as I am able, of the History of the Dean Forest Iron Works from the earliest to the present time.

With regard to the character of the old mine-holes, they either resemble deep and tortuous stone quarries, open to the sky (as at Bream), or spacious caverns, penetrating under-
ground for long distances, and of most capricious and uncertain direction and shape. Thus, sometimes, after proceeding a considerable distance—perhaps not more than a yard or more in height or width—they suddenly open out into spacious vaults, fifteen feet across, the site, probably, of some valuable “pochet” or “churn” of ore; and then, again, where the supply was less abundant, narrowing into a width hardly sufficient to admit the human body. Occasionally, the passage divides, and unites again, or abruptly stops, turning off at a sharp angle, or changing its level, where rude steps cut in the rock show the mode by which the old miners ascended or descended, whilst sometimes wooden ladders have been found, semi-carbonised by age. These excavations abound on every side of the Forest, wherever the iron ore makes its appearance, giving the name of “meand” or mine to such places. Such is the present aspect of these caverns, and a hundred years ago they exhibited the same appearance, for, in 1780 Mr. Wyrrall writes as follows:—

“There are, deep in the earth, vast caverns scooped out by men’s hands, and large as the isles of churches, and on its surface are extensive labyrinths worked among the rocks, and now long since overgrown with woods; which whosoever traces them must see with astonishment, and incline to think them to have been the work of armies rather than of private labourers. They certainly were the toil 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 near the surface.”

The distinction which Mr. Wyrrall makes in the depth of these diggings, and which is plainly exhibited in the shallower workings on that side of the Forest nearest the Severn, as compared with those bordering on the Wye and Herefordshire, seems to indicate a higher antiquity for the former, as being nearer to water communication, and more convenient of access. For, as to the excavations themselves, owing to

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A curious ladder formed of a single slab of oak or chestnut, with six square holes to serve as steps, was found lately in the Westbury Brook mine, the property of the Dowlais Company, and also a wooden shovel. These objects, described as found at a depth of about 100 yards at the junction of ancient (supposed Roman) workings, and the modern, were exhibited by Mr. John Irving, in the Temporary Museum formed during the Meeting of the Institute in Gloucester, and they are described in the Catalogue of that collection published by Mr. Lea, Gloucester. The remote antiquity of these relics may appear questionable.
the total absence of relics, coins, &c., none of which have, I believe, ever been found in them, we are only able to infer their date from their dimensions or character, or from the nature of the remains of iron works which derived supplies of ore from them. The astonishing extent of these mine-holes, certainly supports Mr. Wyrrall's remark, that "they were the toil of many centuries." For, although they were extensively excavated during the Middle Ages, some of them, at least, may have existed, as popular tradition suggests, at a much earlier period. An ancient mine-hole on the Great Doward, north of the Forest district, is mentioned by Camden as the spot where a gigantic skeleton was found, the name given to the cave being "King Arthur's Hall." It may also be observed that, in the time of the Rebellion, the terrified inhabitants of the neighbourhood are said to have fled to these subterranean passages for safety, when pursued by the hostile soldiery of either party who frequented these parts.

The fact that these underground workings present no trace of the use of any machinery, either for raising the ore or water, or for their artificial ventilation, or of the employment of gunpowder, or, in short, the evidence of any mechanical skill, affords a further confirmation of their remote origin. But I am enabled to state that the age of the iron mines of the Forest of Dean need not be left altogether to inference. Although their date is not to be found inscribed on their walls, it has been approximately discovered in their debris, for Mr. Wyrrall states, in the MS. descriptive account of his investigations into the subject, that—"coins, fibulae, and other things known to be in use with that people (i.e., the Romans) have been frequently found in the beds of cinders at certain places. This has occurred particularly at the village of Whitchurch, between Ross and Monmouth, where large stacks 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. This writer had opportunities of seeing many of these coins and fibulae, &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 was surprisingly perfect, 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."

In addition to the above, I may advert to the numerous Roman vestiges on every side of the Forest. At no great distance from Whitchurch we have the site of Ariconium. At Lydney and at Alvington, discoveries of Roman relics have been made. At Lydbrook, on the Coppet Wood Hill, at Perry Grove, and Crabtree Hill, numerous coins of Philip, Gallienus, Victorinus, and of Claudius Gothicus have been brought to light. We possess indisputable testimony from Mr. Lower's researches in the old iron-making parts of Sussex, that the Romans there carried on metallurgical operations at an early period, and we may claim a like antiquity for our Dean Forest workings.

An examination of the cinder heaps that still occur, especially in the precincts of the Forest mines, reveals beyond doubt the antecedents of the mineral operations of the neighbourhood. In accordance with the extent of the caverns from whence the metallic relics were procured, they are remarkably abundant. At one time (about 200 years ago) they must have been so to a great amount, for although for most of that period they formed nearly the chief supply of the iron furnaces in this district, yet even now they occur almost everywhere. We meet with them in elevated situations, deep in the valleys, in fields, orchards, and gardens, and about the adjoining villages. Their character is peculiar, exhibiting by no means complete fusion, but rather semi-vitrification by roasting, the ore retaining not unfrequently a large measure of its metallic weight and original form. They cannot be mistaken for common cinders, nor do they resemble the slag of the smelting furnace; and I am not aware that anything like them is found elsewhere. Charcoal was the fuel invariably employed, and the large per-centage of metal left in them shows that the process then in use of extracting the iron was very imperfect. What that method

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3 See also the interesting essay by Mr. Wright, in the "Wanderings of an Antiquary," relating to the Roman Iron District of the Forest of Dean.
4 The History of the Ancient Iron Works of Sussex has been given by Mr. M. A. Lower, in the Sussex Archaeological Collections, vol. ii. p. 169.
was it is now difficult to determine. Some kind of blast
must have been created by means of the hand or feet, or
the fireplace must have been constructed on the plan of our
modern wind-furnace. Water power could not have been
employed, since in many instances no streams occur near the
works.

Such, then, is all that was certainly known, down to the
date of the earliest historical circumstance connected with
the Dean Forest Iron Works, or the first specific notice of
them to be found in existing records.—To this interesting
feature of the subject I have now to call attention.

In the time of Edward the Confessor, as we learn from
the Domesday Survey, the king was accustomed to demand of
the citizens of Gloucester thirty-six dicas of iron yearly
(each of which comprised ten bars), and a hundred iron rods
(virgas ferreas ductiles) for nails for the king's ships, where-
with to furnish his fleet with nails. Now, I would ask, from
what place did the Gloucester forgemen obtain their iron?
—It must have been from the works in the Forest, since
there was no other place of supply in the neighbourhood.
Indeed, we know that this was so, since Giraldus, in his
Itinerary through Wales, in 1188, speaks of the noble
forest of Dean, which amply supplied Gloucester with iron
and venison. We cannot now particularise what ironworks
in the Forest furnished Gloucester; but, in the reign of
Henry II., the recently founded Abbey at Flaxley was
endowed by that king with a grant of two oaks out of the
forest every seven days, for supplying their iron forges
with fuel, a fact which gives some notion of the extent of
the works.

Upon the Patent Rolls of Henry III. an entry occurs in
the year 1237—"De forgiis levandis in Foresta de Deane," and,
according to the record of a judicial inquiry held in
Gloucester Castle, A.D. 1282, we find that upwards of
"72 forgeae errantes" were at work in the Forest; that
the sum which the Crown charged for licensing them was
at the rate of 7s. a year, viz. 3s. 6d. for six months, or 1s. 9d.
a quarter; that a miner received one penny, or the worth of
it in ore for each load of mine brought to any of the king's
iron-works; but, if conveyed out of the forest, the penny
was paid to the Crown; and that, in those cases where a

forge was farmed, forty-six shillings were charged. I wish that I were able to offer any suggestions as to the construction, form, or capacity of these forges, but as this is beyond my power, I must content myself with inquiring if from the terms—*levandis and errantes*—applied to these forges, we are to conclude that they were limited in size, and portable? The question also suggests itself, of what material were they made? It could hardly have been of stone, nor yet of brick, neither wholly at least of iron. These iron furnaces or forges were not confined to the Forest or its precincts. The ancient Book of the Miners of the Forest of Dean informs us, that at Caerleon, Newport, Berkeley, Monmouth, and Trelleck, the manufacture of iron was carried on by smithsmen, who were connected with smith-holders living in the Forest, and supplying the ore; it is remarkable that at each of those places iron cinders have been found. But whatever may have been the apparatus used, it is obvious from the character of the cinders remaining, that the process of smelting was very imperfectly accomplished, that the fuel was never sufficiently heated to liquify the ore or the rock, and that the measure of success attained depended more upon the great richness of the ore—upwards of 80 or 90 per cent.—than on the skill brought to bear on its reduction into metal.

And here, having brought my subject to the point where an interval occurs between the old method of operating on the Forest iron and the present mode, it may not be out of place to introduce some account of the operatives themselves, the ancestors of the present “Free Miners of the Forest of Dean,” who continue in the possession of many of their privileges and customs, and must long have been, as they still are, a very peculiar people. The origin of their liberties has not been clearly ascertained, but they appear to have been granted as a reward for their services at some period in the reigns of the first three Edwards. The worthy poetess of the Forest, Kitty Drew, has expressed the tradition thus—

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I am told that many ages back  
A foreign army did our land invade,  
And blood and carnage then was all the trade;  
They pitched their tents, and then, without delay,  
They waited anxious for the coming fray.  
But our bold miners underneath did get,  
And many tons of powder there did set;```
So up they blew the unsuspecting foe,
Their shattered limbs came rattling down below.
Our land thus cleared, our liberty thus saved,
Our noble miners dug the caitiffs' grave.
The King with honour did them so regard,
Made them Free Miners as a just reward,
The Forest Charter to them granted was,
And firm and sure were made the Forest laws.

The book of the miners' laws and privileges, which they call "Dennis," and consider as their Magna Charta, seems to belong to the beginning of the fourteenth century, and it is indeed a curious composition. It specifies, first of all, the franchises of the mine, meaning its liberties or privileges, as not to be trespassed against, and consisting apparently in this, that every man who possessed it might, with the approval of the King's Gaveller, dig for iron ore or coal where he pleased, and have right of way for the carrying of it, although in certain cases, "forbids" to sell might be declared. A third part of the profits of the undertaking belonged to the King, whose gaveller called at the works every Tuesday, "between matins and masse," and received one penny from each miner, the fellowship supplying the Crown forges with twelve charges of ore per week at 12d., or three charges of coal at 1d. Timber was allowed for the use of the works above and below ground. Only such persons as had been born and were abiding in the Forest were to "visit" the mines, in working which the distance of a stone's throw was always to be observed, and property in them might be bequeathed. The miners' clothes and light are mentioned, and the standard measure, called "bellis," to the exclusion of carts and waynes. Allusion is made to "the Court of the Wood," at the speech before the Verderers, and to the mine-court, as regulated by the constable, clerk, and gaveller, and the miners' jury of 12, 24, or 48, where all causes relating to the miners were heard. "Three hands," or three witnesses, were required in evidence; the oath was taken with a stick of holly held in the hand, and touching a copy of the Holy Gospels, the witness wearing his miner's cap.

Although, with the change of circumstances, the free miner's exclusive position is qualified, yet even now all the workings are commenced under his auspices, and he continues to receive preliminary possession as follows:—The gaveller goes to the spot selected for the new undertaking with the free miner who
makes the application, and gives him possession with the following ceremonies: the gaveller cuts a stick, and asking the party how many "verns" or partners he has, cuts a notch for every partner and one for the King. A turf is then cut, and the stick forked down by two other sticks, the turf put over it, and the party "galing" the work is then considered to be put in full possession. An heraldic crest upon a helm with lambrequins, &c., part of the accessories of a sepulchral brass, still to be found in the Clearwell chapel at Newland church, Gloucestershire, gives a curious representation of the iron miner equipped for his work. It represents him as wearing a cap, holding a candle-stick between his teeth, handling a small pick or mattock with which to loosen, as occasion required, the fine mineral lodged in the cavity within which he worked, or to detach the metallic incrustations lining its sides, bearing a light wooden mine-hod on his back, suspended by a shoulder-strap, and clothed in a jacket, and short breeches tied with thongs below the knee. In this representation the lower extremities below the knees are concealed: numerous marks, however, still visible on the moist beds of some of the old excavations prove that the feet were well protected from being injured by the rough rocks in the workings. Several heads of mattocks, resembling that which the miner is here represented as holding, have also been discovered; and to enable us, as it were, to supply every particular, small oak shovels for collecting the ore and putting it into the hod, have also been found.

But we may now turn to the comparatively modern and most important change introduced into the mode of reducing the metal from the ore, by using larger fire-places, urging the fuel with a strong and continuous blast, and so melting down the whole of the unvolatile contents of the furnace, or making, in short, cast-iron. I believe the inquiry still remains open as to the where and by whom this improvement was brought about. It seems, I think, that no pieces of casting

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6 A representation of this curious plate is given in the Account of the Forest of Dean, by the Author of this Memoir, London, 1858, p. 217. The date of the Memorial, according to the information of the Rev. H. Haines, is 1450-60. A mutilated figure in armour still exists, apparently of that period.

7 This appears to be stick, to one extremity of which, either perforated or provided with some other contrivance for the purpose, the candle is fixed. A similar mode of carrying their candles between their teeth is still in use among the miners of the district, as shown from the life, in the frontispiece to the Account of the Forest of Dean (before cited) by the Author of this Memoir.
have been found of an earlier date than Queen Mary I., and of course some years elapsed ere such improvement would be generally introduced. The earliest intimation of any such change in the mode of manufacturing the Forest iron, occurs in the terms of a “bargayne,” made by the crown on the 14th of June, 1611, demising “libertye to erect all manner of workes, iron or other, by lande or water, excepting wyer workes, and the same to pull down, remove, and alter att pleasure, with libertye to take myne oare and synders, either to be used att the workes or otherwise,” &c. By “synders” is meant the refuse of the old forges, but which by the new process could be made to yield a profitable per centage of metal, which the former method had failed to extract. In the year following a similar “bargayne” was made with William, Earl of Pembroke, at the enormous rental of 2433l. A third and corresponding “bargayne” was agreed to on the 3rd of May, 1615, with Sir Basil Brook, there being reserved in rent forty tons of iron per month, or a total by the year of 4000l. In 1621 Messrs. Chaloner and Harris appear to have succeeded to the works under a rent of 2000l.; and we may presume that they cast the 610 guns ordered by the crown on behalf of the States General of Holland, in 1629. The spot where they were made was subsequently called Guns Mills.

A curious inventory, dated 1635, of the buildings and machinery referred to in the forenamed “bargaynes” has been preserved, from which it appears that the stone body of the furnace adopted at that period was usually about 22 feet square, the blast being kept up by a water-wheel not less than 22 feet in diameter, acting upon two pairs of bellows measuring 18 feet by 4, and kept in blast for several months together. Such structures existed at Cannope, Park End, Sowdley, and Lydbrook. Besides these there were forges, comprising chafferies and fineries, at Park End, Whitecroft, Bradley, Sowdley, and Lydbrook. Messrs. Harris and Chaloner, &c., as farmers to the crown, held all of them on lease, and made the cannon and shot for the sieges of Bristol, Gloucester, Goodrich, &c. Hence, no doubt, when quietness was at last restored, it was found expedient to demolish these means of warfare. How far the parliamentary mandate of 1650 to that effect was carried out does not appear, but ere the year 1674 a general decay seems to have fallen on the
Forest works; yet iron-mine continued to be delivered at St. Wonnarth's furnace, Whitchurch, Linton, Bishop's Wood, Longhope, Flaxley, Guns Mills, Blakeney, Lydney, Redbrook, Tintern, Brockweare, Redbrook Passage, Gunpill, and was shipped for Ireland on the Severn. Most of these localities exhibit traces of iron manufacture having been carried on up to the commencement of the last century; but, at the time here meant, the works on the west and south-west sides of the Forest, as at Newland and Noxon Park, were the principal sources of supply. That the manufactures of this district were then appreciated, the following novel suggestions of Andrew Yarranton, printed in 1677, clearly show. "And first," he says, "I will begin in Monmouthshire, and go through the Forest of Dean, and there take notice what infinite quantities of raw iron is there made, with bar-iron and wire, and consider the infinite number of men, horses, and carriages which are to supply these works, and also digging of iron-stone, providing of cinders, carrying to the works, making it into sows and bars, cutting of wood and converting it into charcoal. If these advantages were not there, it would be little less than a howling wilderness. Moreover, there is yet a most great benefit to the kingdom in general by the sow-iron made of the iron-stone and Roman cinders in the Forest of Dean, for that metal is of a most gentle, pliable, soft nature, easily and quickly to be wrought into manufacture, over what any other iron is, and it is the best in the known world; and the greatest part of this sow-iron is sent up Severne to the forges into Worcester, Shropshire, Staffordshire, Warwickshire, and Cheshire, and there it's made into bar-iron; and because of its kind and gentle nature to work, it is now at Sturbridge, Dudley, Wolverhampton, Sedgley, Wasall, and Burminham, and there bent, wrought, and manufactured into all small commodities, and diffused all England over, and thereby a great trade made of it; and when manufactured, into most parts of the world. And I can very easily make it appear that in the Forest of Dean and thereabouts, and about the material that comes from thence, there are employed, and have their subsistence therefrom no less than 60,000 persons." This author further writes: "In the Forest of Dean and thereabouts the iron is made at this day of cinders, being the rough and offal thrown by in the Romans’
time; they then having only foot blasts to melt the iron stone; but now, by the force of a great wheel that drives a pair of bellows twenty feet long, all that iron is extracted out of the cinders, which could not be forced from it by the Roman foot blast. And in the Forest of Dean and thereabouts, and as high as Worcester, there are great and infinite quantities of these cinders, some in vast mounts above ground, some under ground, which will supply the iron works some hundreds of years; and these cinders are they which make the prime and best iron, and with much less charcoal than doth the iron-stone. Let there be one ton of this bar-iron made of Forest iron-stone, and 20l. will be given for it."

As to the length of time the works above-named continued in operation, we have no data now to determine. The experienced Mr. Mushet considered that one hundred years was their duration, judging from the quantity of slag found near the site of one of them.

According to a paper examined by Mr. Mushet, and referring to the year 1720 or 1730, the iron-making district of the Forest of Dean then contained 10 blast furnaces, viz. 6 in Gloucestershire, 3 in Herefordshire, and 1 at Tintern, making their total number just equal to that of the then iron-making district of Sussex. In Taylor's Map of Gloucestershire, published in 1777, iron furnaces, forges, or engines are indicated at Bishopswood, Lydbrook, the New Wear, Upper Redbrook, Park End, Bradley, and Flaxley. Yet only a small portion of the mineral was obtained from the Dean Forest mines, if we may judge from the statement made by Mr. Hopkinson, in 1788, before the Parliamentary Commissioners, to the effect that "there is no regular iron mine-work now carried on in the said forest, but there are about twenty-two poor men, who at times when they had no other work-tools, employed themselves in searching for and getting iron mine or ore in the old holes and pits in the said forest, which have been worked out many years." Such a practice is still remembered by some of the aged miners. The chief part of the ore then used came by sea from Whitehaven. This was particularly the case at the Flaxley furnaces, whither also, in the remembrance of persons yet living, the ancient cinders and pickings of the old mine-holes were taken. Mr. Mushet states, that at Tintern the furnace charge for forge pig-iron was generally composed of a mixture of \( \frac{7}{8} \) of Lancashire iron
ore, and 1/3 part of a lean calcareous sparry iron ore from the Forest of Dean, called flax; the average yield of this mixture was 50 per cent. of iron.

The year 1795 marks the important era of the resumption of iron-making in the Forest, with this essential difference as compared with previous modes of operation—namely, that coke obtained from pit-coal was used instead of charcoal. Cinderford was selected as the best site for the furnaces, and it succeeded as to fact, pig-iron of good quality being produced there. As a speculation the effort failed, since twenty tons was the limit of the weekly make. The cokes were brought from Broadmoor in boats by a small canal, the embankment of which may be seen at the present day. The ore was carried down to the furnaces at Cinderford on mules' backs from Edge Hill and other mines. Renewed efforts to realise profits by smelting pig-iron were made by Mr. Mushet in 1820, and again in 1825, but not until 1835 with success; since that date, under Mr. Teague's and Mr. Broad's able supervision, iron has been made at Cinderford of quality and in quantity such as had never been anticipated. At this place there are now four blast furnaces, fed with hot and cold air. At Park End also, in spite of similar early disappointments, results hardly less satisfactory have been secured, and two blast furnaces are constantly at work. At Sowdlley, likewise, iron-making is advantageously prosecuted by Messrs. Gibbon, who have two furnaces in blast. So that eight blast furnaces are now at work in the Forest, and are making upwards of 25,000 tons of the best iron annually, much of which is sent to various parts of the kingdom to be mixed with iron produced in other localities, most iron-founders keeping a stock of pig-iron from the Forest for such purpose. Much, too, is used in the neighbourhood itself for the manufacture of wire and tin-plate.

The iron mines of the district exceed fifty in number, and yield every year no less than 100,000 tons of the richest haematite ore.

I have thus brought my narrative of these operations down to the present day, from their beginnings in remote antiquity, commencing with very imperfect results (as the state of the old cinders shows), but, nevertheless, carried on perseveringly until better modes were invented by the use of the blast furnace, at one time fed entirely with charcoal, but for the
last sixty years with coke, which has resulted in the growing development of the Dean Forest Iron Works, and the increasing demand for coal, the use of which has tended proportionably to the preservation of the timber. I need hardly add that the good people of this Forest are at this time doing well. They are steadily progressing and becoming more and more acquainted with the appliances, conveniences, and civilisation of life. Let us hope that their progress in moral and religious improvement may be alike conspicuous, and thus further their present and future happiness.