ON THE TRACK OF THE "OLD MEN," DARTMOOR.

BY ROBERT BURNARD.

(Read 22nd March, 1888.)

A CASUAL observer on Dartmoor cannot fail to notice the disturbed state of the surfaces of the valleys; for mile after mile the evidence of tin-streaming operations, consisting of mounds and old surface mining excavations, is plainly visible. A more careful examination discloses the remains of rude smelting huts, or blowing houses, containing stones with curious circular cavities, and ingot moulds hewn out of granite blocks, together with remains of furnaces, ancient watercourses, and wheel pits. Ask the moormen who made these things, and they will tell you that they are the "old men's workings," of a time so long since that none of them can give any clue as to the period when such remarkable evidence of centuries of work was accumulated.

It is popularly supposed that the Cassiterides included not only the Scilly Islands, but all the tin-producing portions of Devon and Cornwall; and local writers, from Risdon downward, assert that the Phœnicians traded here for tin at a very early period. The principal authorities quoted in support of this statement are Strabo, the Greek geographer, Diodorus Siculus, and Velleius Paterculus, historians, who are all supposed to have flourished about two thousand years since. The story of the discovery of tin in this country is given as follows: The Phœnicians are stated to have had very early possession of tin mines in the south of Spain, near the Straits of Gibraltar, and also in what now constitutes the kingdom of Portugal. The colony of Gades —the modern Cadiz—is said to have been settled by them about 600 B.C. Extending around the coasts, the Phœnicians, on the exhaustion of the Spanish mines, discovered the metallic riches

of Devon and Cornwall, Risdon conjectures about the days of King David, and perhaps some centuries sooner. They are supposed to have kept the secret of the position of the Cassiterides to themselves for some two or three centuries, until the Romans, perfecting themselves in navigation, broke up the monopoly—Strabo says by dogging the Phœnician ships, and thus discovering the islands.

As these ancient writers narrated events which must have taken place some six hundred years before their time, the value of such statements is often questioned, especially as no single article of undoubted Phœnician manufacture has ever been discovered in this country. If Phœnicians ever came here they have left no tangible traces of their presence, and grave doubts are raised in some quarters as to whether they ever traded here at all. Professor Rhys is one of the doubters, and he places the tin islands in Vigo Bay, on the coast of Spain.

What is probably one of the most ancient blocks of tin in the world, is now in the Museum of the Royal Institution of Cornwall at Truro. It was dredged up about sixty-five years since near St. Mawes, at the entrance to Falmouth Harbour. An exhaustive description of this relic, by Colonel Sir Henry James, appears in the *Forty-fifth Annual Report of the Royal Institution of Cornwall.* This block is two feet eleven inches long, eleven inches wide, and three inches thick at the centre; perfectly flat on one side, but curved on the other, and having four prolongations at the corners, each one foot long. Diodorus describes the early tin ingots as being in the form of "astragali," and Professor Owen is quoted as the authority for the statement that this peculiar block is in the form of an astragalus, or knuckle bone. Sir Henry James very ingeniously accounts for the adoption of this shape by claiming for it a peculiar adaptability for stowage purposes in the bottom of a boat, and on a pack-saddle for land transport. No moulds of this form have as yet been discovered.

Camden says the Greeks traded with Britain, and fixes the period at one hundred and sixty years before Cæsar's invasion. Risdon is not so precise, but says no one doubts that they did trade here some time before the arrival of Julius Cæsar. In Cornwall, at any rate, there is no doubt that Roman influence was extended toward tin-mining; for, at Castle Zen, in the parish of

Veryan, a block of tin of a singular form was discovered with a Roman inscription on it. Borlase mentions Roman coins found in ancient stream workings at Wendron and Karn Brê; and from Fowey westward in all directions large quantities have from time to time been discovered.

The largest find mentioned is that of twenty-four gallons of Roman bronze coins, found during the spring of 1735, close to the Helford River.

We are informed that during the Saxon period the production of tin was neglected, but that the Romans worked the deposits to their great advantage. Lysons note that there is no mention of the Devonshire tin mines in *Domesday*. But this, as Rowe points out, can hardly be wondered at; for a tract of land like Dartmoor was, under no circumstances, likely to find its way into the *Domesday* enumeration; as the land intended to be included, and to which alone the description of *hides* and *carucates* can strictly apply, was land under tillage, or some other form of profitable management, yielding an annual revenue to its owner, and therefore the fit subject of a land-tax. Tin streams and mines appear to have been outside the *Domesday* scope. They contributed their share to the revenue of the king by means of rentals paid by the individuals who farmed them. In the Pipe Roll 8 Richard I. (1197), it is recorded that Master Philip de Haukechirche and Harveius de Helion render account of £100 from the farm of the Stannary of Devonshire, and of 100 marks (£66 13s. 4d.) from the farm of the Stannary of Cornwall for this year.

In 1250, King Henry III. granted a charter of protection to the tinners of Devon, commanding all knights and others, *of whom the tinners of Dartmoor* held, that they should not exact from them other customs and services than they ought, and had been accustomed to do, nor to vex them contrary to the liberties they had before enjoyed under charters of the king's predecessors, but maintain in the same liberties.

Matthew Paris says that this monarch extorted money from the Jews, and sold them in return for money advanced him by his brother Richard, Earl of Cornwall. The term "Jew's house," by which ancient smelting-houses are known in Cornwall, but not in Devon, has been supposed to indicate that the Jews were sent as slaves by Richard to work in the western mines; but, as Max Müller points out, there is no evidence in support of this, Jew's

house, like Marazion and "attall Saracen" being but a corruption of Cornish words.[1]

Until the twelfth or thirteenth century European tin, unless any came from the East, must have been very largely and almost solely derived from this country, but about this period tin mines were discovered in Bohemia and Saxony. They do not appear to have seriously competed with the English mines; for between 1332 and 1345 it is recorded, in the accounts of the commercial industry of Florence, that the Italian merchants imported tin from Cornwall, from whence it was regularly conveyed in Italian vessels. It was exported from Cornwall in large slabs of a long square form, weighing about 200 lbs.

The streaming operations on Dartmoor must have been very active, and of an extensive character, from the thirteenth to the sixteenth centuries. Indeed, so active were they that Parliament had to interfere; and an Act was passed in 1531, having for its object the preservation of the havens of Plymouth, Dartmouth, and Fowey. The streamers were compelled to erect suitable catch-pits, for the purpose of arresting the silt, but it is very questionable whether the law was stringently applied; for, a few years after, Leland says that the Torey Brook ran red with sand from the tin works, and this had accumulated to such an extent as to choke up the lower and first buildings of the court of the Priory of Plympton Mary. Referring to Dartmouth he says, "The River of Darte by Tynne Workes carieth much

[1] In Appendix B to De La Beche's *Geological Report of Devon and Cornwall and West Somerset*, in the Red Book letter written about 1205 from William de Wrotham and others to the Archbishop of Canterbury, there occurs, in the enumeration of persons liable for penalties inflicted for contravention of the king's rules and regulations for refining, weighing, and stamping tin, the following expression, "Also neither man nor woman, Christian nor Jew," &c. The special mention of the Jews may indicate that they dealt in the metal, but it does not follow that they raised it. The selling referred to by Matthew Paris means that he pawned to his brother the legitimate and illegitimate taxes that could be squeezed out of the Hebrews. In the account given by Paris, who was a contemporary historian, there does not occur a single word which indicates that the Jews were sent as slaves into Cornwall to work the tin mines; on the contrary, he says, the "Earl spared them." If Jews did work the Cornish tin mines, it is fair to assume they worked in Devon as well, and seeing that they are supposed by some writers to have left their impress on one county, in the designation of the smelting-houses, it is strange they have left no impression whatever as the result of their labours in the other.

sand to Totenes Bridge, and chokith the Depth of the River downward, and doth much hurt to Dertmouth Haven." It is a pity Leland did not visit Dartmoor. He dismisses this region with the remark that "it is of a very great Compace, and is suche a wild Morisch and Forest Ground as Exmoor is."

This activity must have continued, but probably to a diminishing extent, through the seventeenth down to the early part of the eighteenth century, when Devonshire mining appears to have sunk into insignificance; and at the time Chapple wrote his *Review of Risdon*, in 1770, it hardly had an existence.

The visible tin-streaming remains on Dartmoor are mainly covered therefore by a period extending back from the beginning of this century to the year 1197, when Philip de Haukechirche and Harveius de Helion rendered account of rentals of the farms of the Stannaries of Devon and Cornwall.

Beyond this period, although there is no doubt of much more remote antiquity, the remains are uncertain. No discoveries in them of coins indicating much greater antiquity have been reported;[2] the whole subject appears to have been neglected; and the Dartmoor of to-day, although one of the most interesting spots in the British Isles, is also one of the least known and appreciated.

Dr. Evans approximates the commencement of the bronze age in Britain at from 3000 to 4000 years since. However this may be, tin was necessary to alloy the copper and harden it; and its production is as old on Dartmoor as the above estimate, and perhaps much older still.[3]

[2] A coin of Tiberius Constaninus (581) was, however, found at Prince Town in 1885.

[3] An important discovery was made at Gittisham Hill, near Exeter, in 1869, which throws considerable light on the question of early bronze-founding in Britain. A barrow was opened before the members of the Devonshire Association, and in it were found four shapeless fragments of bronze, which appeared to have originally formed a portion of a cake of metal that had been melted in the saucer-shaped cavity of a stone, and which were obviously intended for casting purposes. They weighed respectively 10 ozs., 8½ ozs., 5½ ozs., and 1½ ozs. Near Chudleigh two mould stones of green micaceous schist for a rapier-like dagger were unearthed; and in various parts of England, Scotland, and Ireland many mould stones for bronze castings have been discovered, and are now in various museums. At Lenant heavy lumps of fine copper were found with broken socketed celts; at Kenidjack Cliff, with palstaves and socketed celts; and at St. Hilary (all in Cornwall) lumps, weighing 14 or 15 lbs. each, were said

The following account of the mining operations of 300 years ago is abridged from Carew, the best authority we have on the subject. The discovery of the tin lodes, he says, is made by certain tin stones lying on the face of the ground. These are termed "shoad," as shed from the main lode. They are somewhat round, and smoothed by water action. "Where the finding of these affordeth a tempting likelihood, the Tynners goe to worke, casting up trenches before them, in depth five or six foote more or lesse, and three or foure in breadth, gathering up such shoad, as this turning of the earth doth offer to their sight."

The preparation of the ore is also completely described by this writer, both for lode and stream tin. In the former case, the largest stones were broken first with hammers, and then carried, either in waggons or on pack-horses, to a stamping-mill. This kind of mill is supposed to have been introduced about this period from Germany. It is described "as of great logges of timber, bound at the ends with yron, and lifted up and down by a wheele, driven with water." From the stamps it passed to the crazing-mill, consisting of two grinding-stones working one over the other, turned also with a water-wheel. The stamping-mill, as formerly introduced and used in connection with the crazing-mill, was evidently worked dry; for Carew says, "Of *late times* they mostly use wet stampers, and so have no need of the crazing mils for their best stuffe, but only for the crust of their tayles" (*i.e.* the coarser stuff in which the ore remained in the matrix—the "rows" of the modern miner). In stream works the stamps may have been unnecessary, as a crazing-mill would probably have been sufficient to break down the larger

to have been found with spear-heads. In a barrow on Mardon Hill, near Moretonhampstead, a spear-head of copper was found a few years since. (Spence Bate, "On Grimspound." *Trans. Plym. Inst.*, 1873.) Although there are no proofs of early copper-mining in Cornwall or Devon, there is good evidence that the Romans worked the Parys Mountain, Anglesea, for this metal, and it is likely that they followed in the footsteps of previous miners. If early copper-raising in Britain be disputed, the suggestion that tin was exchanged for copper cannot fairly be objected to. The earliest smelters of copper ran the metal into circular cakes, convex below and flat above, corresponding with the bronze cakes found near Exeter; whilst the castings found in Anglesea, with inscriptions in Roman characters, were of nearly even thickness, but with the edge inclined, as if they had been cast in a small frying-pan. The evidence gradually accumulating is strongly in favour of bronze-making in Celtic Britain before the advent of the Romans.

pebbles of tin stone met with in the stream work. After leaving the grinding machinery the stream of water was allowed to descend on a series of clods of turf, about three or four feet square, and one foot thick. On these the tinner spread a little of the ground ore, gently stirring it with his spade, so that the running water carried off the light earthy substances, leaving the heavier tin stuff on the turf. For further purification this was placed in a wooden dish or tub, described as broad, flat, and round, and about two feet in diameter, and having handles at the side. The tinner, sitting down, carefully rocked this vessel between his knees, gently pouring off from time to time the remnant of the lighter impurities. The residue was black tin.

In Carew's time two pounds of this smelted in the furnaces of the period yielded one pound of white or metallic tin. This was carried on in what were known as blowing-houses. The black tin, mixed with wood or peat charcoal, was reduced in a furnace, the heat of which was excited by means of bellows moved by a water-wheel. The tin was cast into ingots of about 250 or 300 lbs., which were slung over pack-horses, and taken at certain times to the nearest coinage town. There "the blocks or pieces of tin are brought into a great room ordained for that purpose, and there first peized or weighed, then tasted, that is proved whether they be soft tin or hard, and after marked with Her Majesty's stamp (Elizabeth). To the hard (less worth by 50 shillings in the thousand than the soft) the letter H is added ere it comes from the blowing-house. Each thousand must answer 40 shillings to the Queen, which with the other incident fees being satisfied, then, and not before, it is lawful for the owner to alienate and distract the same." The stamping and coining of the ingot rendered it saleable, heavy penalties being inflicted if tin was sold prior to coinage. The origin of this quality test is very ancient.[4]

The letter from William de Wrotham and others to the Archbishop of Canterbury, previously mentioned, exhibits the regulations in force respecting the tin coinage in Devon and Cornwall at the end of the twelfth or commencement of the thirteenth century. Reference is made to the admeasurement of the weights of the first and second smeltings, the stamping, and the disposition of the available profit of the king's tin.

It is difficult to understand what is meant by first and second

[4] *Op. cit.* De la Beche. Appendix B.

smeltings. When an ore is reduced to the metallic condition the operation is complete, and when conducted in a rude furnace contained doubtless a good deal of dirt and foreign matter. This impure ingot was weighed and stamped in the presence of the keepers and clerk on behalf of the king, and no one in or out of the Stannaries could have possession of any tin of the first *smelting* beyond a fortnight, unless this first stamping was complied with.

The ingots of this first stamping could not be kept beyond thirteen weeks without being taken to the nearest Stannary town appointed for the purpose, and there *melted* and refined (not smelted), freed from impurities, and receiving the stamp which certified as to its purity and fitness for sale.

The translation of this document in De la Beche constantly refers to the second *smelting*, but this second process obviously means *melting* and refining; for it is impossible to reconcile the very stringent rules and regulations of the first stamping, &c., with a crude mass of charcoal, unreduced black tin, and metal. It is stated that the refining of the tin shall be by weight of the city of Exeter; that is, as eight is to nine.

In other words, for every nine pounds of crude tin of the first stamping presented to the stannary refiner, eight pounds of pure tin, capable of taking the second stamp, must be returned to the owner.

In the Museum of this Institution there is an ancient tin ingot, holed for pack-saddle purposes, fourteen inches long, eight inches at the widest end, and seven inches at narrowest, and weighing fifty-two pounds. It does not correspond with the weight or shape of the ingots referred to as being exported to Italy in the earlier portion of the fourteenth century, and is possibly an ingot of early type lost or stolen on its way to the coinage town. It was found, with another precisely similar to it, whilst digging a drain at Slade, near Cornwood. These ingots may have been stolen or lost whilst on their way to Plympton, which was made a stannary town as early as 1328.

The laws guiding the tinners were comprehensive and, being framed by their own Parliament, were just and strictly administered in the interests of all concerned. The first Parliament of which we have any account met on Crockern Tor in 1494. The next of which we have details met in 1510. In Pearce's *Laws and*

Customs of the Stannaries in Devon, the names of the twenty-four "jurates," or delegates, attending this Parliament from each of the Stannary Courts of Chagford, Ashburton, Plympton, and Tavistock, are given. "Which said Jurates being sworn and try'd by the Assent and Consent of all the Tinners in the County aforesaid, enact, ordain, and constitute, That every Statute of the Tinners, afore this time then made, to be void, broken, and of none effect; and those done anew to be in this Court affirmed as hereafter followeth." The matter done anew consisted of thirty-seven clauses regulating the tinners' conduct, protecting their interests, and providing for punishment in Lydford gaol.

Twenty-three years later there is an account of another Parliament, held for the purpose of confirming the rules and regulations of the previous one, and for passing new laws, consisting of sixteen clauses, the most important of which dealt with the fouling of the rivers, and consequent silting up of the havens of Dartmouth and Plymouth. This action was doubtless forced on the tinners by the Act of Parliament passed two years before, to which reference has already been made. Courts were also held on the Tor in 1534, 1553, and in 1576.

The latter, held on the 6th of August in the sixteenth year of Elizabeth, was presided over by the Earl of Bedford, the Lord Warden of the Stannaries, and the first seven clauses of the thirty-eight enacted referred to the silting up of the havens. The penalties for carrying silt into the "main or great fresh rivers" were increased to forty marks (£26 13s. 4d.) or in default "to be committed to the prison of Lidforde, there to have the Imprisonment of one whole year, without Bail or Mainprise." No one was allowed to dig or work for tin within sixty feet of the rivers Teign, Dart, Plym, Tavy, Walkham, or Tamar. It was enacted that tinners should have the right to carry their silt into any "hatches, tye-pitts, moory places, or *grounds which have been of ancient times wrought.*"

This convenient permit has doubtless buried up many an archæological treasure; for the earliest stream works have been covered by the later.

How long these open-air Parliaments had been held it is impossible to say. There is every indication that they were in existence long before 1494. The only records that would throw light on this and other interesting matters affecting Dartmoor, are concealed

from the enquiring mind at the Stannary Office. Applications for searching the documents stored there are refused.

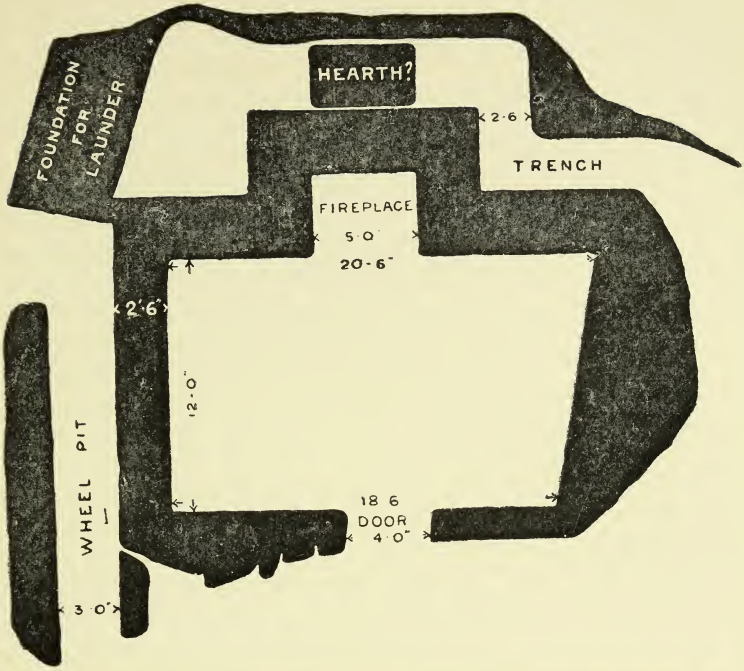
The examination of the ruins of the blowing-houses on Dartmoor is a most interesting study. Some appear to be similar in type, whilst others again are quite unlike. It is possible that the examination of a number of these ruins and their contents may throw considerable light on their probable age.

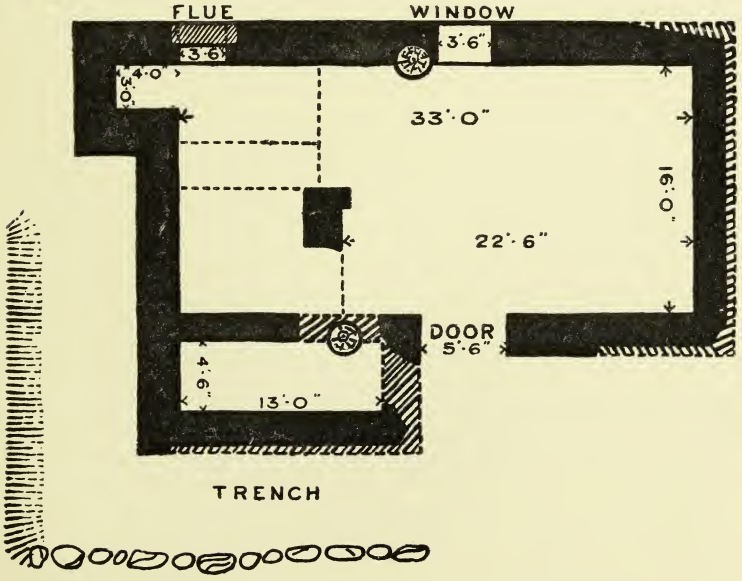
At present, my investigations extend over a few only of these remains, and this paper must be considered to be but of an introductory character to a large and important subject. No attempt will be made to come to hasty conclusions, but it is to be hoped that patient investigation will ultimately result in very much increasing our knowlege of these workings of the "old men."

With the exception of two short papers by Mr. Thomas Kelly and Mr. Amery, and a few allusions by Mr. Spence Bate, no literature appears to exist on this subject, notwithstanding diligent search in quarters likely to contain the same.

I propose at first to describe two sets of ruins, one situated at Week Ford, Huccaby, and the other near Har Tor, Princetown. They are similar in construction. Each consists of two ruins; the blowing-house proper, and a habitation and possible storehouse, with a pit for an overshot water-wheel running the length of one side of this building. The water-wheel worked the bellows for the furnace, and might possibly have turned a crazing-mill, or worked rude stamps, but not to any great extent, as the wheels must have been of small size and power. The low and massive doorways are the same, and both have stones mixed up with the *débris*, containing curious circular or oval-shaped cavities, which may have been moulds, mortars, the bottom stones of primitive stamps, or the cavities formed by crazing-mill spindles, and answering to the same description as the foot-brass of the modern mill.

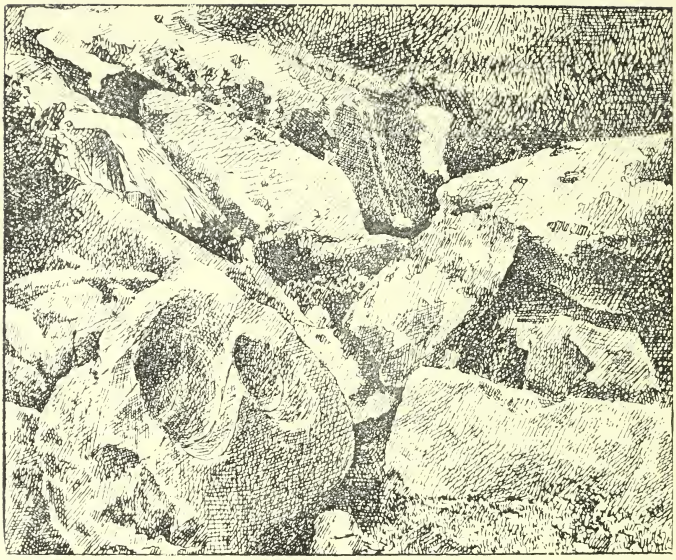
The Week Ford blowing-house, locally known as "Mill," is situated about fifty yards south-west of the junction of the West Dart with the Wobrook, or, as it was anciently called, the Okebrook, on the slope of the hill running up to Saddle Bridge. The ruin is in a most dilapidated condition, choked up with *débris* from the walls, and overgrown with vegetation. The



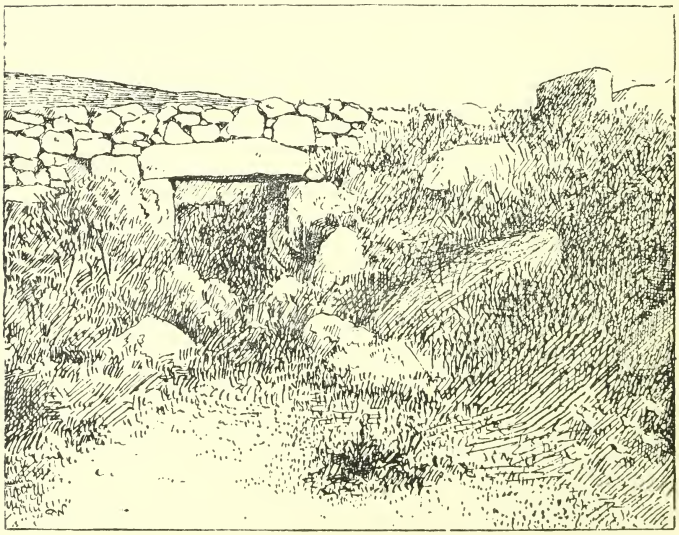


GROUND PLANS OF BLOWING-HOUSES AT WEEK FORD.

See page 104.



Stones with circular cavities on site of ruins of the western house at Har Tor.



Entrance to the eastern Har Tor Blowing-house.

See page 106.

blowing-house is thirty-three feet long, sixteen feet wide, and is surrounded with an outer enclosure, or dwarf rampart, which was evidently intended to prevent surface water from gaining access to the furnaces.

The doorway, five feet six inches wide, is on the eastern side, with the jambs fairly perfect, but no lintel. It appears to have been about five feet high. Almost choking this up are two large stones, one containing three oval-shaped cavities, and the other two. These cavities are about seven inches wide, and vary from five to six inches deep. Opposite this entrance, and on the western side, is either a doorway or window, three feet wide with perfect jambs. This does not appear to be an entrance from the exterior, but leads—if a doorway—from the interior of the main building to an outside compartment of some depth, the bottom of which looks like the remnants of flues.

At the south end the walls of roughly-placed stones, some squared, with no sign of mortar, are five to six feet high, and in the centre of the house is what appears to be one side of a furnace mouth, formed of a wedge-shaped stone.

The most striking features of this ruin are two oak-trees; one with a trunk circumference of five feet six inches, growing inside the house, near the entrance on the eastern side, and the other with three boles, not so large, growing inside the ruin on the western side. In the south-west angle is the flue exit from furnace. Both are large and flourishing trees for Dartmoor, and must indicate considerable age.

Forty feet south of the blowing-house, higher up the hill, is the other ruin, eighteen feet six inches long by twelve feet wide. The doorway facing north has the jamb perfect on the western side, imperfect on the other, and was originally from three to four feet wide. The jamb has a groove about two feet long, three and a half inches wide, and about an inch deep. The footstone is in place at entrance.

The fireplace recess, two feet deep and four feet wide, with a portion of the chimney back standing, is on the south side of the building. What appears to be the hearth-stone has been removed, and is now lying on the high ground close behind the chimney. The walls of this house are three to four feet wide, and a portion of the western gable, seven to eight feet high, is still standing.

The wheel-pit runs the whole length of the eastern end of the

house, has an internal width of four feet, and is about six feet high. The northern end of the wheel-pit is open, and partly blocking it is a stone with three more of the oval cavities. Scattered about are stones containing fourteen of these cavities, and more are concealed under the *débris*.

The foundation of the launder carrying the water to the overshot wheel is plainly visible, and here and there the leat supplying it can be traced up the valley to the river Wobrook.

About two hundred and fifty yards south of the ruins, and about fifty yards west of the Wobrook, is a hut circle twenty-seven feet in diameter. The foundations appear to be Celtic, but it has a comparatively-modern dry wall erection on it, some six to seven feet high, forming a rough gable, and was probably utilised as a residence by the tinners working at the stream works adjacent. Higher up the hill are ancient enclosures mapping out the slope in squares.

The Har Tor blowing-house is about two miles south-west of Princetown, on the head waters of the Meavy, close to the line of dam which would have formed the proposed Har Tor reservoir. The two ruins are situated on either side of the stream.

That on the western side is sixteen feet long by twelve feet wide. The chimney is still standing to the extent of six feet in height. The breastwork rests on a massive lintel of granite, the aperture being four feet square. Two stones, with two circular cavities six to seven inches in diameter and three inches deep, are lying among the *débris*. The walls, mostly in ruins, are composed of rough moorstones, dry laid; some are, however, shaped.

About fifty feet across the stream is the other ruin, twenty-two feet long and sixteen feet wide, with an entrance doorway on the south side three feet three inches wide and five feet high to lintel. This entrance is perfectly complete and intact. A part of the wall resting on the lintel is in good condition. The door-jamb and lintel are grooved and holed for door.

The wheel-pit, with a width of ten feet, is on the eastern side of the house. It is deeper than the floor of the building, and has on the northern side an outlet for allowing the water after use to return to the stream a few feet below it. It is difficult to trace the ingress; but as the bed of the river a few yards away is

higher than the point of entrance, a stream could easily have been led to the required direction and level. The eastern wall of the wheel-pit is built of very large stones, one being six feet long, four feet wide, and three feet deep, which must weigh some six or seven tons.

Inside the house, on the western side, is a recess ten feet long and four feet wide. At the entrance to this recess, in the south wall, just inside the doorway, is a small aperture or niche. On the eastern side, against the wall dividing the house from the wheel-pit, is the remnant of a fireplace.

No mould stones or circular cavities are visible.

The walls are built of similar stones to the other ruin, but are in a better condition, and much more perfect.

Numerous hut circles are dotted about the slopes in the vicinity. Two with avenues leading to them from the river are particularly fine, and in good preservation.

The whole valley has been disturbed to a great extent, showing that at some period the streaming operations here were of a very active character. The name of a neighbouring moorland farm (Stanlake) or the "tin stream" is very suggestive of this.

Gobbett mine, near Hexworthy, is a very interesting spot; for here are examples of the modern deep shaft, the shallow workings and deep open cuttings of the earlier miners, and the stream-works of the "old men." This, like nearly all the Dartmoor mines, is now abandoned.

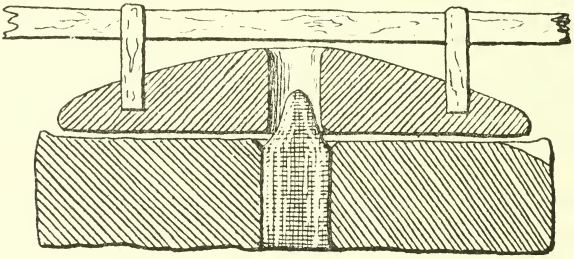
These remains of stream-works have been described by Mr. Amery in the *Transactions of the Devonshire Association* for 1870. Among them are the remains of a crazing-mill, consisting of the upper and the nether stone. The nether stone is three feet ten inches in diameter, and ten inches thick. The eye of the stone is circular, and has a diameter of six and a half inches. In the periphery is a groove, forming a lip, so that the ground material was readily discharged from the stone.

The upper stone is three feet in diameter on the flat grinding surface. The eye of this stone is five inches in diameter. The back is convex, roughly chipped and finished. The nether stone within the diameter of the upper is slightly worn by friction; but it is not concave, nor was the grinding surface of the upper stone the convex side, as described by Mr. Amery. The error of

this gentleman's description of the manner in which he supposed the stones worked is palpable on examination.

On the back, *i.e.* the convex side of the upper stone, are four holes, sunk from two to three inches, and about two inches in diameter, at equal distances from each other. Into these holes prongs were fitted which carried two bars, so that the stone was revolved by either horse- or man-power, similar to a capstan arrangement.

The hole or eye of the nether stone was for the purpose of receiving a conical plug, the apex of which penetrated partly up into the eye of the upper stone, and served the double purpose of keeping the runner stone in position, and distributing the feed equally on the grinding surfaces. To further assist this are four curved master furrows or grooves, radiating from the eye of the



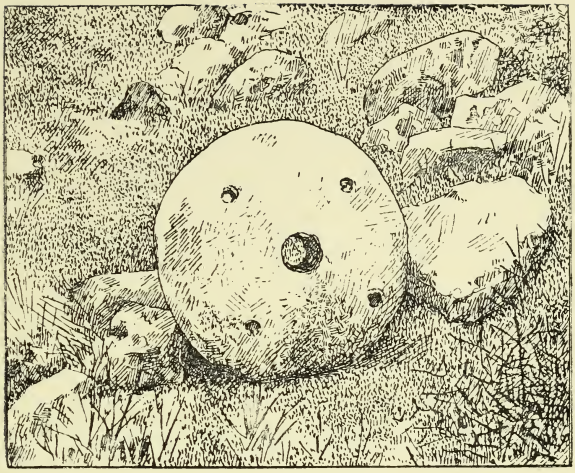
grinding-surface of the upper stone. The mill, worked by men or horses, was of slow speed, and water was introduced to assist the propulsion of the ground material towards the grooved lip in the periphery of the stone. This and the feed were of course introduced through the circular hole in the top stone.

The Roman hand-mill was of precisely similar type to this, only smaller, and worked by one perpendicular handle fixed in the runner.

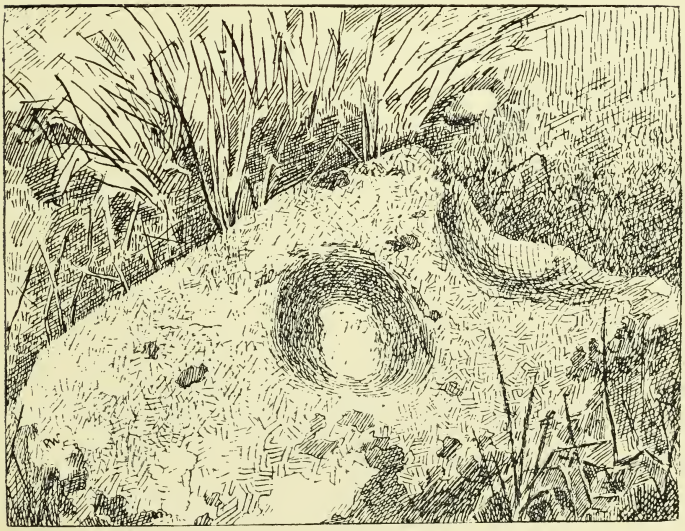
There are remains of two watercourses visible. One undoubtedly is modern, and the other may have been used by the streamers; but there are no traces of a wheel-pit, or anything to suggest water-power.

These remains of a crazing-mill are of the greatest interest, and of considerable antiquity. It is to be hoped that steps will soon be taken to ensure their safety.

On the site of what was evidently the blowing-house is a mould

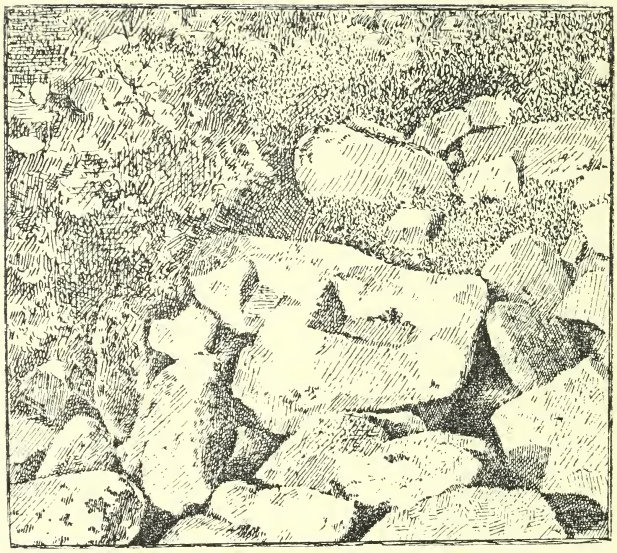


Back view of upper stone of remains of Crazing-mill at Gobbett.

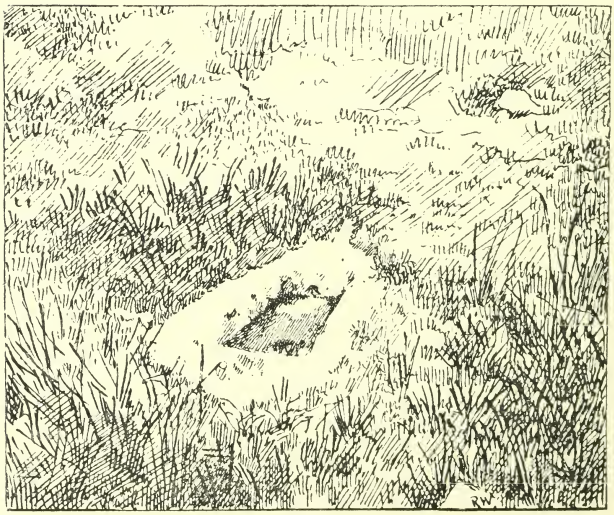


Oval-shaped cavities in stone at Gobbett.

See page 108.



Stone with bevelled moulds at the lower Blowing-house, Yealm Head.



Mould stone outside Blowing-house at Deep Swincombe.

See page 110.

stone, about four feet by three feet. The mould is fifteen inches long, by eleven inches wide at one end and ten inches at the other, and four to five inches deep. There are also two small cavities two inches long, three wide, and two deep, between the mould and the edge of the stone, perhaps for receiving samples of the bulk of the metal in the large mould. So far I have not met with similar cavities elsewhere.

Another stone, not described by Mr. Amery, contains another cavity, which has the appearance of a receptacle for molten metal. It is seventeen inches long, ten wide at the narrowest end, and fifteen inches long at the widest end. At the narrowest end it is seven to eight inches deep, whilst at the widest end the depth is only three to four inches. Both these measurements of depth are increased to nine and ten inches in the centre of the cavity.

Several stones lying about have cavities in them similar to those found in other ruins, only instead of being circular they are more oval in shape, about eleven to twelve inches long, by seven to eight wide, and five deep.

Heaps of furnace slag, covered with soil and vegetation, occur just outside the site of the blowing-house. Flint chips, flakes, and scrapers, are to be found on Gobbett Hill near by, and although the formation of field walls has doubtless destroyed much of the pre-historic remains, there is sufficient evidence left to show that there were early inhabitants on this portion of the Moor.

About one mile and a half above the last waterfall in Hawns and Dendles, and near Yealm Head, on the eastern bank of the river, is the ruin of a blowing-house. A short distance beyond, but on the west bank, is another. Mr. Francis Brent first drew my attention to these remains; and I find they have been briefly described by Mr. Kelly in 1866 in the *Transactions of the Devonshire Association*, and in the same year in the *Journal of the Royal Institution of Cornwall.*

The title of each paper is, "Celtic Remains on Dartmoor," and the description of the ruins of rectangular buildings is associated with that of hut circles and other pre-historic British remains. Mr. Thomas Kelly gives illustrations of the mould stones in both these blowing-houses; and it is to be noted with

regret that the mould stone in the lower house has been broken since Mr. Kelly's visit, and that only one of the two moulds in the same stone is now intact.

I have made a careful examination of the present condition of these ruins with the following result: The lower house, on the eastern side of the stream, is a mere heap of stones, with portions only of the original structure standing. This building must have been about twenty-five to twenty-six feet long, and sixteen to seventeen feet wide.

The entrance, facing the north, is fairly perfect, with a doorpost of unhewn moorstone six feet high. This entrance is higher than those of Week Ford or Har Tor. No wheel-pit is visible, but there are traces of a watercourse at a high level to the north-east of the ruin. Near the entrance is a stone with one perfect mould and another imperfect. This is the stone which has been broken since Mr. Kelly's visit, somewhere about twenty-two years since. Originally it was four feet three inches long, two feet six inches wide, and about fifteen inches deep.

The perfect mould is seventeen inches long at the top, eleven inches wide, and eight inches deep. It is bevelled, so that at the bottom of the mould the length is twelve inches, and from six to seven inches wide. The length of this mould runs parallel with the length of the stone; whilst at right angles to it, and running the width of the stone, is the broken mould, which was originally of the same dimensions as the other.

Another mould stone lying near an angle in the eastern wall of the house either escaped the notice of Mr. Kelly, or else was not visible at the time of his visits. It is very curious, and differs from any I have yet seen. The stone is three feet six inches long and three feet wide; the depth not ascertained, as it is buried up in *débris*. It has two moulds adjoining each other —one at a lower level than the other, and connected by a channel. The high-level cavity is fifteen inches long, eight inches wide, and three inches deep. At one end is a groove an inch deep, perpendicular, and running down the side of the mould three inches; that is, from top to bottom.

The low-level mould is seventeen inches long, twelve inches wide, and five inches deep. These cavities may have been used for the purification of the tin, for molten metal mixed with furnace impurities poured in on the high-level hollow would

flow in a purer condition into the low-level mould, which is almost of the identical size as the moulds previously described.

About a quarter of a mile further up the river, but on the western bank, is the other ruin, with an internal length of twenty-eight and a half feet by ten feet wide. The doorway, which is very imperfect, is on the eastern side, and is three feet nine inches wide. At the south extremity the wall is fairly perfect; and at this end is a recess six feet long by three feet wide, similar, but smaller, to the recess already described in one of the ruins near Har Tor. There is one stone visible (two feet eight inches long by two feet four inches wide), containing a mould seventeen inches long, twelve inches wide, and from four to five inches deep.

Mr. Thomas Kelly mentions another stone outside the hut with a similar mould, but so far I have been unable to find it. Close by is a British village with two large enclosures, and from forty to fifty hut circles. The foundations of some of these are in a fine state of preservation.

The whole of the valleys have been turned over in streaming; the usual mounds and heaps of *débris*, some neatly walled-up with dry work, abound.

Excepting the two blowing-houses and the hut circles, no traces of habitations exist. The tinners probably utilised the foundations of their British ancestors for their dwellings. This is borne out by the apparently comparative modern remains on the hut circle above Week Ford, and on another circle, mentioned hereafter, at Deep Swincombe.

The other blowing-house left for description within the scope of this paper is probably the most ancient and primitive of any of the rectangular ruins I have yet visited.

It is situated in a valley washed by a small tributary stream of the river Swincombe, running about south from Swincombe Farm. The valley is known as Deep Swincombe, and the whole of it has been extensively streamed for tin. The blowing-house, or what remains of it, is concealed in a mound. It is twenty feet long by thirteen feet wide, the internal dimensions narrowing somewhat toward the south-west. The walls are thick, and built of stones dry laid, some being roughly-shaped. At this end, concealed by vegetation, is a chamber, completely enclosed and covered, six feet long, four feet wide, and about the same in height. The

back of this chamber is built with fairly-placed hewn stones; the front wall is composed of smaller stones, more roughly placed together, whilst the roof is formed of hewn cover stones, buried in soil and vegetation. The bottom of this chamber is peat soil, with no paving. The internal stones appear to have been subject to the action of fire, and in the crevices between them I collected some fine dust, which still shows traces, on examination, of tin and lead. The black mould in the bottom has been thoroughly examined, but no trace of fused metal was discovered.

The western end of this chamber communicates through a flue, with a recess in this corner, and was evidently some portion of the furnace arrangement. No outlet is visible on the eastern side. There are no water-power remains.

On the eastern side of the house, and distant about six feet, is a curious mould, hollowed out of a rock which slightly protrudes above the surface. It is twenty-six inches long, and twelve inches wide by five inches deep at one end; whilst it is fifteen inches wide, and two inches deep, at the other. The rock in which this mould is cut inclines from the deeper to the shallower end, so that when filled with metal the ingot would start with being two inches thick at the wider end, decreasing in thickness until it reached the narrow, or upper end, when it would run out to a thin cake. I have hitherto seen no other mould of this shape and dimensions.

About two to three hundred yards north of this blowing-house, and on the slope of the hill facing the valley of the Swincombe, is a large hut-circle, twenty-four feet in diameter, having on it a wall rising to a height of four to five feet, similar to the hut circle above Week Ford.

Further up the gorge, beyond the blowing-house, is a large granite boulder, one end of which is resting on a sloping piece of ground, and the other on a dwarf wall, so that the height of the space covered and enclosed is two feet.

There is room for three or four men to crawl in and lie down, and thinking it may have been used as a sort of lair, I excavated about a foot of the floor, and carefully sifted the same. No traces of human habitation were found, and I therefore consider this curious primitive-looking cavity to be a *cache*, or hiding-place, either for metal or tools. A few lumps of turf would most effectually conceal the entrance and defy even a close search.