

*An Enquiry into the Æra when Brass was used in purposes to which Iron is now applied, by the REV. JOHN HODGSON, Secretary.*

Having stated in a conversation at the meeting, at which the brazen sword from Ewart Park was presented to the Society, my opinion that arms of that kind were not in use among the Romans for a long time prior to the occupation of Britain by that people; I now, in compliance with the wish of some of the members of this body, endeavour not only to substantiate that opinion, but to shew from Hebrew, Greek, and Roman testimony, the æras in which brass was used in warlike instruments by these and some other nations of antiquity, and to draw some such general conclusions respecting the introduction of brazen arms into this country, as are deducible from the intercourse, generally allowed to exist, between the Britons and the people inhabiting the islands and the borders of the Mediterranean Sea, prior to the Roman invasion.

In the Mosaic, antediluvian age, Tubal Cain is said to have been the “instructor in every artificer of brass and iron”. I forbear any discussion on this text, from the apprehension of carrying myself into too wide a field of difficulty, thinking it sufficient to remark, that with respect to the present appearance of the surface of our globe, the Bible and the record left upon the face of the earth strongly illustrate each other.

The order of creation is exemplified by the organic remains discovered in the successive strata of rock from the lowest to the highest: and the alluvial soils found in all the mountains of the world, below the line of perpetual frost, are a record of the catastrophe that produced them. I think I am accurate in this distinction; because by assigning the organic remains found in the stratified minerals to the agency of Noah’s deluge, I could not account for the total disappearance of the bones of the antediluvians, and of their works of art. But I think, the vortiginous fury of that wave, which has thrown heaps of

gravel and rounded stones of great size upon the sides of mountains, as high as the sea can, by the ordinary laws of nature, flow without being arrested by frost; and which has covered the whole surface of the globe below that line with a stratum every way dissimilar to those below it, both with respect to form and materials; I think such a wave an agent of sufficient power to have obliterated all remains both of the people and the arts of the predecessors of Noah. At least I have heard of no remains of the human species, or of any works of art, discovered under circumstances that appear to justify their being attributed to antediluvian origin.

The Egyptians attributed the discovery of metals to their first kings\*, and the earliest account, we have of the use of brass, is connected with that people. In constructing the tabernacle, Moses “made the laver of brass, and the foot of it of brass; of the mirrors of the women assembling, who assembled at the door of the tabernacle of meeting”†. In the same year the Israelitish women were presented with “vessels of silver, and vessels of gold, and raiment” by the Egyptians‡. From both which passages it is evident, that the use of these metals at that time, 1491 years before Christ, was well understood. And a passage in Job§, affords a sort of explanation of the kind of brass, which was used in the mirrors of which the laver and its pedestal were made: “Hast thou with God spread out the strong airs like a molten mirror”. If the comparison lie here in the strength and similarity of brightness which are found in the sky and metal mirrors, the latter may well be supposed to have been of a very pale colour: and we accordingly find in Pliny, that there was a metal in high estimation for making mirrors in his time, called Egyptian silver, which was composed of three parts brass, and the rest sulphur and silver in equal proportions. He also says, that the Brundusian mirrors, which were in high repute, were made of copper and tin§. When the latter metal is about two to one

\* Phot. Bib. col. 1341.

† Exod. xxxviii. 8.

‡ Exod. xiii. 37.

§ Cap. xxxviii. 18.

§ Nat. Hist. xxxiii. 9. xxxiv. 17.

or nearly one-third of the alloy, the compound is of a very beautiful white, and takes a deep and exquisite polish. It is called *speculum-metal*, and is used in telescopes.

And as a further proof, that the Egyptians were acquainted with brass at an early period of their history, and at a time when their arts were in an infant state, we may add the testimony of Agatharcides, out of Photius. He says, that in a mountain in Upper-Egypt, not far from the Red Sea, there are ancient gold mines, “in which, even in our times, wedges of brass, *λαβωμιδες μὲν χαλκαι*, are found; because when these mines were wrought, men were no way acquainted with the use of iron”\*. The chain or torques of gold, which Pharaoh put about the neck of Joseph, was a badge of honour, which several ancient nations seem to have adopted from the Egyptians.

The wealth of Abraham consisted in “flocks and herds, and silver and gold, and men-servants and maid-servants, and camels and asses” †. Brass and iron had not then, as in the time of Joshua, been admitted into the catalogue of men’s wealth ‡. They, however, wrought gold into ear-rings, bracelets, and chains, for the neck, as in the instance of the jewels given to Rebecca §. And silver, at that time §, was so commonly used as the circulating medium among merchants, that the word, in the Hebrew, translated money, through all parts of the scripture, signifies silver.

The high antiquity of the book of Job is, I think, universally confessed. Authors of credit and great learning have placed him in the time of Jacob, about 1730 years before Christ; and he alludes to the art of fusing metals, as a thing generally known in his time. “Surely there is a vein for the silver, and a place for gold where they fine it. Iron is taken out of the earth, and brass is molten out of the stone.” ¶

\* Phot. Bibliotheca, col. 1344.

† Gen. xiii. 2. xxv. 35.

‡ Josh. vi. 19. xxii. 8.

§ Gen. xxiv. 22. 53.

¶ Gen. xvi. 12. 13. xx. 16. xxiii. 15. 16. xlii. 25. 35. xliii. 12. 15. 21, &c.

¶ Cap. xxviii. 1. 2.

He also alludes to an ancient method of writing upon lead with an iron style\*, and mentions a weapon of iron†; but has no allusion to tin.

BRASS was one of the metals used in the construction of the tabernacle, and of several of its utensils. The altar of burnt-offering, and all its vessels and implements were wholly of that metal‡. Moses made a serpent of brass, during the sojournment of the Israelites in the wilderness||; and after the conquest of the Midionites, we find directions given for the purification by fire, of every thing made of gold, silver, brass, iron, tin, or lead§. One of the excellencies of the Land of Promise was, that its stones were iron, and that brass might be dug out of its hills¶. This metal is also alluded to a few times in the Pentateuch, in a figurative sense\*\* ; but concerning its use in offensive armour, during the Mosaic age, I have not been able to discover the slightest hint. No warlike weapon, nor implement of domestic use has its name from it: for though the root, נחש, *a serpent*, or *to observe*, both as a verb and a substantive, is used in a variety of senses in the writings of Moses, and other parts of the Old Testament, yet there is no instance of its being metaphorically applied to any thing of the nature of an edge-tool.

It is, however, plain, that brass had its Hebrew name either from some supposed resemblance it bore to a serpent, or from its being commonly used in fabricating idols, resembling some animal of that genus. The kind of serpent, of which Moses bore the resemblance on his standard, was called *Seraph*, that is, *burning*; and the emblem itself נחש נחשת *nehesh neheshet*, the brazen serpent: and this continued in use unto the time of Hezekiah, who called it *Nehustan*; and destroyed it, because the Israelites in those days burned incense to

\* Cap. xix. 24

† Cap. xx. 24.

‡ Exod. xxxviii. 2. &c.

|| Numb. xxi. 8. 9.

§ Numb. xxxi. 22.

¶ Deut. viii. 9.

\*\* Levit. xxvi. 19. Deut. xxviii. 23. and xxxiii. 25.

it\*. The rod of Moses, so frequently mentioned in the book of Exodus, was a staff of brass, in the form of a serpent †.

Sampson had his eyes put out by the Philistines, and was condemned to grind corn in a prison in Gaza, bound in fetters of brass ‡. In this passage, the word in Hebrew, which is translated, fetters of brass ||, and in some other places fetters § and chains ¶, is the term for brass in that language, changed into the masculine plural, and might be rendered brasses, with as much propriety as we call chains and fetters, irons, from their being constructed of iron. Brass is also in one place put for a chain.

The most remarkable passage in the Bible, connected with the subject under inquiry, is that which contains the description of the armour of Goliath, the giant of Gath. “ His height was six cubits and a span. And he had a helmet of brass upon his head, and he was armed with a coat of mail; and the weight of the coat was five thousand shekels of brass. And he had greaves of brass upon his legs, and a target of brass between his shoulders. And the staff of his spear was like a weaver’s beam; and his spear’s head weighed six hundred shekels of iron: and one bearing a shield went before him.”\*\*

The combat between David and Goliath is generally dated 1063 years before Christ, in the time of Codrus, king of Athens, and of the first Peloponnesian war: and the account of it affords the first positive historical notice on record, of brass and iron being forged into armour.

I have quoted the description of the giant’s armour from the authorised version; but the sense of it may perhaps be better collected from a translation strictly literal.

His height was six cubits and a span. And a brazen helmet was upon his head, and he was clothed with chains like scales; and the

\* ii. Kings, xviii. 4.

† Exod. iv. 3.

‡ Judges, xvi. 21.

|| בנחשת, in brass; בנחשתים, in brasses; which the Septuagint translates εν πιδαις χαλκείαις. See also ii. Kings, xvii. 7.

§ ii. Chron. xxxvi. 6. Jer. xxxix. 7.

¶ Lament. iii. 7.

\*\* i. Sam. xvii. 4—7.

weight of the chain was five thousand shekels of brass ; and greaves of brass were upon his legs ; and a lance of brass between his shoulders ; and the staff of his spear like a weaver's beam ; and the flame (or blade) of his spear six hundred shekels of iron ; and one bearing a shield went before him.

The English translators following the authority of the Septuagint, the Vulgate, and several eminent critics have rendered the noon קִדָּן, a target ; but I think it will not be difficult to shew, that it ought to have been translated javelin. In Junius and Tremelius it is *humeralis*.

This word occurs in five\* other places in the Bible, in none of which it can, consistently with good sense, be rendered target, or made to mean any kind of defensive armour ; and in three of which it is spear, in the English version ; and in two of them in the Septuagint, γαισος, a heavy dart ; and in the third, ζεβυν, a boar spear. Junius and Tremelius have rendered it, in the four first of these places, *lancea* ; and in the fifth, *hasta*. The passage in Joshua determines its meaning at once, "Stretch forth the *spear* that is in thine hand towards Ai :— And Joshua stretched forth the *spear* that was in his hand towards Ai." And Diodati, on the passage in question, says, "Some understand the Hebrew word, *keedoon*, for a kind of pike, carried crossways upon the shoulders." And, besides the argument in favour of translating *keedoon*, a javelin, drawn from the meaning it bears in other parts of the Bible—whoever went to battle with a shield before him, and a target upon his back ? That it was some kind of offensive armour is evident from the words of David : "Thou comest to me with a sword and with a spear and with a *keedoon*, or dart" :—none of the defensive suit are here enumerated—neither the helmet, which covered his head ; nor the coat of chain armour, that clothed his body and his thighs ; nor the greaves of brass, which encased his legs and feet.

There are also proofs in Homer of the great antiquity of going out to battle armed with two spears :—

\* Joshua viii. 18, 19. Job. xxxix. 23. lxi. 29. Jer. vi. 23.

Now Alexander from the Trojan ranks  
 Advancing comes, god-like in form ; a leopard's skin,  
 His sword, and bow upon his shoulder slung ;  
 Two spears he vibrates, bright with brazen points,  
 And dares the bravest Grecians to the fight \*.

In the splendid description of Agamemnon arraying himself for battle, we are told that last of all,

Two mighty spears he seized, their heads of bronze  
 Keen-edged and strong, that dazzling brightness cast  
 O'er heaven †.

Two spears are enumerated among the arms of Nestor ‡. Hector also went out against the Grecians with two spears §; having, according to some ||, one of them in his right hand, and the other under his shield, in his left. Asteropæus was ambidexter, and threw both his spears at once at Achilles ¶. And Pallas, speaking to Telemachus about his father, pictures him thus \*\*:—

“ Could he now appear  
 There, at yon portal, armed with helmet, shield,  
 And grasping his two spears, such as when first  
 I saw him,” &c. ††

Ishbi-benob, another giant of the Philistines, carried a spear, “ the weight of which was three hundred shekels of brass in weight”. Mr. Parkhurst thinks that the word, קִיָּן, translated spear in this place, means a helmet: but originally it means any reed, cane, or hollow

\* Il. iii. 8.

† Il. xi. 43.

‡ Il. x. 76.

§ Il. xii. 294.

|| Schol. per Villoison. See also Montfaucon, vol. iv. plate 4, fig. 1.

¶ Il. xxi. 162.

\*\* Odys. i. 256, and these spears are mentioned in other parts of the Odyssy.

†† Cowper's Translation, 2d Edit.

stalk. Canes in ancient, as well as modern times, have been much used as shafts of spears and darts; and the Septuagint in this place has *δορυ* \*. About this period we also find mention of “bows of brass”, קשת—נחושה, which, in our translation, is rendered “a bow of steel” †.

The account of the large quantity of brass, used in many of the utensils and ornaments of the Temple of Solomon, affords decisive evidence of the high estimation in which that metal was held in the zenith of the Jewish Monarchy. Many of the vessels were of very extraordinary dimensions. For instance, the brazen altar was thirty feet in length and breadth, and fifteen feet high; the brazen sea forty-five feet in circumference, and supported by twelve oxen of brass; and there were two pillars, each twenty-seven feet high, and six feet in diameter, and having capitals of seven and a half feet in height. To mark the greatness of the quantity used, it is said that the “brass was in abundance, without weight” ‡.

IRON is not mentioned in the history of the Patriarchs, nor among the metals used in the construction of the tabernacle; but it occurs in the list of the six metals already quoted from the book of Numbers: and in the same book, “an instrument of iron,” such as might be used for committing murder, is mentioned. In the passage which relates to one man accidentally killing another, by the head of his axe flying off, the word, translated the head, means the iron, in the original §; and the same inaccuracy occurs in the second book of Kings: “as one man was felling a beam, the axe head”—*berzil*, the iron—“fell into the water” ||. Og’s bedstead was “of iron” ¶. Egypt, on account of its oppressive treatment of the Israelites, is compared to a

\* ii. Sam. xxi. 10.

† ii. Sam. xxii. 25. Job. xx. 24. Ps. xviii. 34.

‡ i. Kings vii. and ii. Chron. iv.

§ Numb. xxx. v. 16.

|| Deut. xix. 5. cap. vi. 5.

¶ Deut. iii. 11. The Lacedæmonians made beds, which they consecrated to Juno, of the iron and brass utensils which they found in the city of Plataeæ. Thucyd. lib. iii.



furnace of iron \*. Mines of iron are mentioned †; and altars on which no tool of iron had been laid ‡: and slavery is represented “by a yoke of iron upon the neck” §. All which expressions and allusions sufficiently shew that the Hebrews, in the time of Moses, were well acquainted not only with the method of smelting iron, but that it was then manufactured into masons’ and carpenters’ tools, and into different kinds of household furniture.

Immediately after the Mosaic age, we find frequent mention of chariots of iron used in war by the people of Canaan §. Goliath’s spear head weighed six hundred shekels of iron ¶. Saws, thrashing instruments, and axes of iron, are mentioned in the second book of Samuel \*\*. One hundred thousand talents of iron †† were prepared by “David, for the nails for the doors of the gate, and for the joinings” of the temple; but the stone of that edifice was “made ready before it was brought thither; so that there was neither hammer nor axe, nor any tool of iron heard in the house while it was building” ††. Jeremiah speaks of an iron style †††. In the book of Psalms, rods, fetters, and bars of iron are mentioned; and Isaiah tells of “cutting down thickets of the forest with iron”.

In the time of Ezekiel, Tarshish traded to Tyre in silver, iron, tin, and lead; Javan, Tubal, and Meshech, brought vessels of brass into its market; and Dan and Javan supplied it with bright iron §§.

In tracing the connexion between ancient implements of brass discovered in Britain, and the mercantile people along the shores of the Mediterranean Sea, it will be necessary to direct our attention to the information which the ancients have left us concerning their know-

\* Deut. iv. 20.

† Deut. xxvii. 5. and Joshua viii. 31.

§ Joshua xvii. 16, 18. Judges i. 19. iv. 3, 13.

¶ 1 Sam. xvii. 7.

†† 1 Chron. xxix. 7.

††† Cap. xvii. 1.

† Deut. viii. 9.

‡ Deut. xxviii. 48.

\*\* Cap. xii. 13.

†† 1 Kings, vi. 7.

§§ Ezek. xxxvii. 12—18.

ledge of TIN, which is by far the most common of all the alloys which they used with copper in making brass. In the Bible it is seldom mentioned. Moses enumerates it in the list of the six metals\*, and Ezekiel says it was brought from Tarshish to Tyre †. This Tarshish, I shall endeavour afterwards to shew, from ancient testimony, was situated at the mouth of the river Bœtis, in Spain. In the mean time it may be curious to know that tin has its Hebrew name בְּרִיחַ, *bedeel*, from the verb בָּרַח, which means, to divide or separate, probably in allusion to tin being used by the ancients in refining gold, in which process, Agatharcides tells us it was used by the Egyptians. After the ore, he says, was properly cleansed from impurities by pounding, grinding, and washing, it was weighed, measured, and mixed in earthen pots, *κατὰ λογόν*, with a piece of lead, grains of salt, a little tin, *κασσίτερον ἑραχτυ*, ‡ and barley meal. It was then poured into close crucibles, luted around, and put into a furnace for five successive days and nights; on the sixth day, after cooling, the gold was found quite pure, and with little loss ||.

I shall conclude this part of my enquiry with a few general remarks, connected with brass and iron, and the different kinds of armour mentioned in the religious books of the Hebrews.

When we consider how universally iron is diffused over the surface of the globe, we cannot but conclude that men were very indifferently acquainted with the methods of smelting and forging it, when they made the gates and bolts of their cities of brass, to which practice there are numerous allusions both in sacred and profane authors §.

We have seen that some of the nations, with whom the Israelites

\* Num. xxxi. 22.

† Cap. xxvii. 12.

‡ On this sentence the President de Gouguet observes, "There are tin mines in Africa," and gives the following authorities for the assertion:—*Voyage de V. le Blanc*, part 2, p. 80. *Hist. gen. des voyag.* t. 1, p. 25.

|| Agath. in *Phot. Bibliotheca*, col. 1341.

§ See 1 Kings, iv. 13. Ps. cvii. 13. Is. xlv. 2. Euseb. *Præp. Evang.* l. ix. 10.

had war, used chariots of iron; and spear heads both of brass and iron: But there is no positive evidence that the Hebrews themselves forged either brass or iron into any sort of offensive armour, excepting bows; for, the iron tool mentioned by Moses, by which a man might be murdered, was, I think, some sort of implement used in the arts; and the mention of an iron weapon, in the book of Job, is dubious proof in this case, inasmuch as the relation between that Patriarch and the Hebrews, as well as the æra in which he lived, and who his biographer was, are uncertain. But that they used brass in defensive armour is evident, from the helmet of Saul being made of that metal\*, and Rehoboam replacing the golden shields, which Solomon made, with shields of brass †.

The want, however, of positive evidence respecting the materials of which their spears and swords were made, is sufficiently supplied by the proofs of their being well acquainted with the use both of brass and iron in the arts, after the time of their coming out of Egypt; and of their neighbours' arming themselves with weapons of both these metals: for we cannot suppose, considering the long and bloody wars in which they were engaged, that they would arm themselves merely with slings and weapons of wood or stone, when they used brass and iron in the arts of peace, and went into the field against enemies, who were cased in mail and cuirass, and had swords and spears of bronze and steel.

The following parallel passages not only prove, that both the Hebrews and the Greeks used to fix their spears in the earth, while they were sleeping round their general; but afford a sort of indirect evidence, that the spears of the Hebrews, in the time of Saul, were made of some sort of polished metal, which could be seen, by its glancing, to a considerable distance:—"Saul lay sleeping within the trench, and his spear stuck in the ground at his bolster: but Abner and the people lay round about him" †.

\* 1 Sam. xvii. 5 and 38.

† 1 Kings, xiv. 27.

‡ 1 Sam. xxvi. 27.

To Diomed, Tydeus son, they went,  
 Him, circled by his sleeping friends, they found  
 Before his tent in arms: their heads reposed  
 Upon their shields. Their spears, in earth infix'd,  
 Erectly by their handle end, from heads  
 Of brass, shone far as Jove's own lightning gleams.  
 The hero also slept himself, out stretched  
 Upon a wild bull's hide, with tapestry broad  
 Of splendid workmanship beneath his head.\*

Ehud made himself a sword which had two edges, and was of a cubit (18 inches) in length. Its blade, in Hebrew, is called *leeb*, a word which is applied to the spear-head of Goliah, and occurs in the same sense in Nahum: in its primitive application it signifies flame or brightness:—"the shaft went in after the blade, *leeb*, and the fat closed upon the blade" †. It is also probable, that the sword of Goliah was something similar in size to that of Ehud, as David, a man of ordinary stature, used it in decolating Goliah; and, afterwards, when he was presented with it by Ahimelech ‡, he pronounced it a matchless one. If it had been large in proportion to the weight of the giant's other armour, it would have been useless to David.

Swords are frequently mentioned in the writings of Moses, under the same name that they bear in the other parts of the Bible, which name is from a term, *חרב*, *choreb*, which signifies, to consume or desolate: and, it is remarkable, that in the passage, where Moses is commanded not to build an altar of hewn stone—"for if thou lift up thy tool upon it, thou hast polluted it", the word translated tool, is *choreb* in the original, which might, with great propriety, have been rendered, thy sword. In Joshua, the sentence translated—"make thee sharp knives," is in the original, make thee *chorebuth jerim*, swords of stones. From this latter expression it would appear, that the Israelites, notwithstanding their knowledge of metals in the time

\* Hom. Il. x. 153.

† Judges, iii. 16—22.

‡ 1 Sam. xxi. 9.

of Moses, were not far removed from an age when their predecessors used weapons made of stone.

Under the Mosaic age, and in the time of the kings of Israel, mention occurs of axes with iron heads, used for hewing wood\*. In both the passages alluded to, the word translated head, as I have before noticed, means iron in the original; and, in the first, the sentence, "the head slipped from the helve", should have been—the iron slipped from the wood. Axes of this kind are also mentioned in other places †; and from 1 Kings, vi. 7, appear to have been used in hewing stone as well as wood.

The Philistines triumphed so completely over the Hebrews, in the time of Saul, as to carry away all the smiths out of the country, which was done, "lest the Hebrews make them swords and spears". They had even to go to their enemies to get their agricultural implements repaired. A similar catastrophe seems to have befallen them in the time of Deborah ‡.

The persons who were employed in the construction of the tabernacle were, a member of the tribe of Judah, who had the direction of the metallurgical department of the work, and one of the tribe of Dan, who excelled in the arts of engraving and weaving. When the temple was built, Hiram, king of Tyre, sent a man, whose mother was a Danite, and his father a Tyrian, and described him to Solomon as one "skilful to work in gold, and in silver, in brass, in iron, in stone, and in timber; in purple, in blue, and in fine linen and in crimson; also to grave any manner of graving, and to find out every device, which shall be put to him with thy cunning men, and with the cunning men of my lord David thy father."

The languages of the Phœnicians and the Hebrews are acknowledged to have been nearly alike: and the similarity between the names of the Hebrew and Greek letters, is a strong proof of the advantage which

\* Deut. xix. 5. 2 Kings, vi. 7. † 1 Kings, vi. 7. 2 Kings, vi. 5. Isa. x. 5.

‡ Judges, v. 8. 1 Sam. xiii. 19, &c.

the Greeks derived from their intercourse with the people of that part of Asia.

It is not necessary here to bring any arguments to show that great numbers of the inhabitants of Canaan, after the conquest of their country by the Israelites under <sup>Joshua</sup> Moses, settled in various parts of Greece; and that the Phœnicians, from time to time, established various colonies on the islands and shores of the Mediterranean Sea. It is sufficient for the purposes of this essay to shew, that the Phœnicians commonly traded into Greece in Homer's time; and that part of their traffic was in metals in a manufactured state. He calls them men skilled in nautical affairs, and sharpers, bringing cargoes of toys; among which were necklaces of gold, set with amber\*. Sidon is called "rich in brass", and one of the prizes at the funeral games of Patroclus, was a large silver bowl, made by an ingenious Sidonian, and carried to Lemnos by a Phœnician merchant †. Their females are described as skilled in elegant work, such as making beautiful apparel ‡.

From this manner of describing the Phœnicians, it is, I think, fair to infer, that they were civilized before the Greeks—that in Homer's time the Phœnicians dealt in the arts and luxuries of life, while the Greeks were employed in petty wars and pastoral pursuits. And from a survey of the uses to which brass and iron appear to have been applied in Greece, in the days of Homer, and in Palestine, in the time of Moses and Solomon, the inference in favour of the early superiority of the knowledge of the Hebrews and Phœnicians, over that of the Greeks, will be greatly strengthened.

That the art of manufacturing brass preceded that of iron, appears pretty evidently from some of the terms which belong to the metallurgical art. Homer calls the smith who made iron axes, *αὐτὸν χαλκεύς*, literally a *brasier*; a smithy, *χαλκείον* ||; the act of working metals in general, *χαλκευεῖν* §. The fire, too, in which metals were heated, was

\* Odys. iv. 288. xv. 314. 424. 459.

† Il. xxiii. 744.

‡ Odys. xv. 316. Il. vi. 290.

|| Odys. ix, 391.

§ Odys. viii, 273.

called *χοαρος*, a word which, in its literal sense, means a furnace, or a crucible, in which metals are *melted*\*. It is, however, evidently implied, in the account of Vulcan making ready to fabricate the shield of Achilles, that the metals he used were first heated and then hammered.

He said, and parting, to his bellows went :  
 These to the fire he placed, and said, " be worked".  
 On furnaces, full twenty bellows blew,  
 Blasts breathing out of all degrees of strength ;  
 Dispatch now suiting, now its counter part,  
 As Vulcan willed, and as his work required.  
 Brass indestructible, and tin he put,  
 And precious gold, and silver in the fire.  
 Then on its stock the anvil huge he placed :  
 One hand the hammer took, the fire-tongs one.

Though tongs are used for lifting crucibles out of furnaces, it is, however, evident from this passage, that the furnaces mentioned here were only the ordinary fires of a smith, otherwise for what purpose were the hammer and the anvil? In the third *Odyssey*, the same kind of tools are mentioned as used in the art of beating out gold, for gilding the horns of a bull, destined for sacrifice.

Then the brazier came,  
 His brazen armour bearing in his hand—  
 Anvil and hammer, fire-tongs neatly formed,  
 Tools of his art, with which the gold he worked.

From this description it is, I think, quite conclusive, that the Greeks, about this time, were very ill acquainted with the art of manufacturing iron; because it cannot be supposed that their hammers, anvils, and smith's tongs would have been made of so soft a metal as brass, if they could have easily procured iron for the same purposes.

\* *Il.* xviii. 470.

But that the proof that brazen implements preceded those of iron, both in mechanics and war, amongst the Greeks, does not rest on inferences and conclusions that may be doubted; it will be easy to shew, by inquiring into the several uses to which brass, iron, and tin, appear to have been applied in the time of Homer.

There are numerous references to hewing down trees, and carving wood with brass, in which no mention is made of the kinds of instruments used for that purpose\*. Other passages supply us with their names.

When Calypso dismissed Ulysses, "she gave him a large brazen axe, *πελεκυς*, fitted to the hands, sharp on both sides, and having a very beautiful helve of olive wood, skilfully carved". Then also she gave him a "well-polished adze", *σκεπαρρον ευξοον*. Having felled twenty trees, "he shaped them out with the brass, *πελεκκισεν δ' αρα χαλκω*, polished them skilfully, and adjusted them with a measure"†. At a former time she advised him "to hew beams of timber, and form with brass a broad bark" ‡.

On the word *σκεπαρρον*, the scholiast says: "wool, from its covering a lamb, but in this place some read a spear, or rather an axe sharp on both sides". That it was some sort of carpenter's tool is clear, from the above passage; and from the comparison between the hissing produced by burning out the eye of Polyphemus, and the noise arising from plunging hot iron into cold water||, it appears that this instrument and the *πελεκυς* were indifferently made of iron or of brass. The great value put upon them may be inferred from the skill employed in beautifying the handle of the one, and in polishing the head of the other.

Concerning the *πελεκυς* there is a variety of other incidental information in the Iliad and the Odyssey. The following simile occurs twice §:

\* Il. i. 236. xiii. 180. Odys. v. 152. xxiii. 196.

† Odys. v. 237.

‡ Odys. v. 162.

|| Odys. ix. 391, &c.

§ Il. xiii. 391. xvi. 484. See also Il. iii. 61, respecting its use by ship-carpenters.



“ He fell like an oak, or poplar, or lofty pine, which a carpenter fells for ship-timber, in the mountains, with new-whetted axes, *πελεκέσσι νεηκεσι*.” It is also stiled *υλοτομος* \*, wood-felling, in the account of the preparation for the funeral rites of Patroclus; where it is also said, that the wood for the fire was cut down with brass †. It was likewise used in close fighting ‡, and for killing oxen ||. There are a few scattered hints respecting its shape. Ten axes and ten half-axes comprised one of the prizes, at the games given by Achilles, at the funeral of Patroclus.

— ετιθει δεκα μεν πελεκεας, δεκα δ' ημιπελεκκα

By which I understand that the axe had two mouths, or, as it is expressed respecting the one given by Calypso to Ulysses, was *αμφοτερωθεν αναχμενον*, sharp on both sides; and that the half-axes had only one mouth.

The carved handle of the *πελεκυς* has been already noticed. The method of fixing it may be collected from the several references in the Odyssey, to the game of shooting an arrow through the helve-hole of twelve axes placed in a right line, and at stated distances from each other. These holes are expressly mentioned in the twenty-first Odyssey, line 486th; and the axes, which Ulysses kept in his treasury for that purpose, were made of iron.

The following Epigram, attributed both to Simmia of Rhodes, and to Bion, is called *πελεκυς*, and composed in lines, so arranged, as to represent the form of an axe and its handle.

\* Il. xxiii. 114.

† Il. xv. 711.

‡ Il. xxiii. 118.

|| Odys. iii. 449.



an olive-wood handle, long and well polished" \* : and the same weapon is mentioned next to the *πελεκυς*, in the description of the attack which the Trojans, under Hector, made upon the fleet of the Greeks.

Jav'lins now no more

Might serve them, or the arrow-starting bow,  
But close conflicting, and of one mind all,  
With bill and battle-axe †, with pond'rous swords,  
And with long lances, double-edged, they fought ;  
Many a black-hilted falchion, huge of haft,  
Fell to the ground, some from the grasp, and some  
From shoulders of embattled warriors hewn. ‡

The blade of the Homeric sword, *ξίφος* ||, was made of brass, and is called sharp §, and sharp on both sides ¶; under which latter term it is frequently joined with the spear called *εγχος* \*\*. This sword was suspended over the shoulder †† in a belt ‡‡, and hung by the thigh ||| in a sheath §§, which was sometimes made of ivory ¶¶, and at other times of a black substance \*<sup>3</sup>. The epithets applied to it are silver-studded †<sup>3</sup>, large ‡<sup>3</sup>, brazen ||<sup>3</sup>-hilted §<sup>3</sup>, and long-bladed ¶<sup>3</sup>. The hilt of it was sometimes made of silver \*<sup>4</sup>, near which the blade was apt to break †<sup>4</sup>. The sword of Menelaus was shivered into several pieces, on the helmet of Paris ‡<sup>4</sup>.

\* Il. xiii. 612.

‡ Cowper's Trans. p. 471, first Ed.

§ Il. iv. 530.

\*\* Il. xiii. 147. xiv. 26. xv. 278.

†† Il. v. 45. Odys. x. 261, &c.

||| Odys. ix. 300.

¶¶ Odys. viii. 404.

†<sup>3</sup> Il. ii. 45. iii. 334, &c.

||<sup>3</sup> Odys. x. 261.

¶<sup>3</sup> Odys. xxii. 443.

†<sup>4</sup> Il. xvi. 339.

† Οξείσι δὴ πελεκύσσι, καὶ ἀξίνοισι μαχόντο. Il. xv. 711.

|| Il. iii. 335. xvi. 136. Odys. x. 262, &c.

¶ Il. xxi. 118. Odys. xvi. 80. xxi. 336.

xvi. 637. Odys. xx. 526, &c.

‡‡ Il. vii. 305.

§§ Il. i. 194, &c.

\*<sup>3</sup> Il. xv. 715.

†<sup>3</sup> Il. i. 220.

§<sup>3</sup> Il. xvi. 332.

\*<sup>4</sup> Odys. viii. 403.

‡<sup>4</sup> Il. iii. 363.

Swords are also described under two other names, *αορ* and *φασγανον*, both of which appear to have been synonymous to *ξιφος*.

For the *αορ*, hung by the thigh\*, was brazen †, or all of brass †, long-bladed ‖, sharp §, and great; and with such a one Hector cut asunder the shaft of the spear of Ajax Telamon ¶.

The *αορ* which Euryalus gave to Ulysses was all of brass, its hilt of silver, and its sheath of new-carved ivory\*\*. The very same weapon is afterwards, under the name *ξιφος*, called silver-studded, and described as worn (in a belt thrown) over the shoulder ††.

The *φασγανον* was also made of brass, and was sharp on both sides ††. Among other epithets, it is styled silver-studded, beautiful, Thracian-made ‖‖, and black-sheathed and hilted §§. In the eleventh book of the *Odyssey*, the same weapon is in one place called *φασγανον οξυ* ¶¶, and in another *αργυροηλον* \*<sup>3</sup>; and Peneleus and Lycon, after their spears had both missed their aim, closed with their swords, *ξιφεσσι* †<sup>3</sup>. Lycon struck the horse hair cone of the helmet of Peneleus, and his sword *φασγανον*, broke at the hilt †<sup>3</sup>: in these two instances, the terms are evidently synonymous and mutable; but they seem to be applied to distinct kinds of weapons in the fifteenth *Iliad*, where the *πελεκυς*, *αξινη*, *ξιφος*, *εγχος*, and *φασγανον*, are classed together, as weapons used in close fighting ‖<sup>3</sup>.

The *μαχαιρα* seems to have been some sort of a brazen knife, which was worn in a sheath by the side of the sword. "Atreides, drawing with his hands the knife, *μαχαιραν*, that always by the sheath of his huge falchion hung, cut the hair from the forehead of the lamb." §<sup>3</sup> It occurs in the same sense in the nineteenth *Iliad* ¶<sup>3</sup>. The instrument with

\* Il. xvi. 493. xxi. 173. Odys. x. 439.

† Odys. viii. 403.

§ Il. xxi. 173.

\*\* Odys. viii. 403.

†† Odys. xxii. 79—90.

§§ Il. xv. 713.

\*<sup>3</sup> L. 96.

†<sup>3</sup> Id. 339. See also Il. xx. 469, &c.

‡<sup>3</sup> Il. iii. 271—292, and xix. 252.

† Odys. xix. 241.

‖ Il. xiv. 385: xvi. 473.

¶ Il. xvi. 115.

†† Id. l. 406—416.

‖‖ Il. xxiii. 807.

¶¶ L. 94.

†<sup>3</sup> Il. xvi. 335.

‖<sup>3</sup> L. 710, &c.

¶<sup>3</sup> L. 252.

which the broken arrow was extracted from the thigh of Eurypylus, has the same name \*: and the youths described in the picture of the Cretan dance, upon the shield of Achilles, had golden knives hanging in silver belts †. It was an instrument of this kind which Egeus hid under a large stone, and by which he afterwards discovered Theseus, while in the act of carving with it, to be his son ‡.

The *εγχος* had an ashen shaft, and was headed with brass ||, which is sometimes called sharp §, and sometimes two edged ¶. Its lower point, by which it was fixed in the earth at the bivouac of a general, was called *σαυρωτηρ* \*\*, and *εριαχος* ††. It is also often styled long, and that of Hector was eleven cubits in length, and its brazen head †† was encircled with a ring of gold. The same sort of spear is also called *δору* |||, a name which seems to be nearly equivalent to our word shaft, or pole §§, and under which the spear is frequently called brazen ¶¶, and has many of the same epithets applied to it which are applied to *εγχος*. *Μελια* \*<sup>3</sup>, so called on account of the shafts of spears being made of ash, and *ξυσος* †<sup>3</sup>, are also synonyma with *εγχος*, and had brazen heads †<sup>3</sup>.

Helmets, scale-armour, and cuirasses of brass, occur in almost every page of the Iliad. Brass constituted a part of the shields of Achilles, Hector, Ajax, and several of the other heroes. Nor does Homer forget to embellish his poem with descriptions of the brilliance of brazen armour; the flashes that proceeded from them as the troops changed their positions; and especially their dazzling splendour after being newly cleaned.

\* Il. xi. 843.

† Plut. vol. 1, p. 11.

§ Il. x. 135.

\*\* Il. x. 153.

†† Il. vi. 320. viii. 495.

§§ In Il. xv. 410, &c. ship timber is called *δору νηιον*. Il. xv. 410, &c. the wooden horse of Epeus was called *κοιλον δору*, from its being hollow and made of wood.

¶¶ Il. xiii. 247.

†<sup>3</sup> Il. x. 260 and 265.

‡<sup>3</sup> See for the first word Il. xxii. 225, 328, &c.; for the second, Il. iv. 469. xi. 260.

† Il. xviii. 597.

|| Il. v. 655. xxii. 328, &c.

¶ Il. xiv. 26, &c. Odys. xvi. 474, &c.

†† Il. xiii. 444, &c.

||| See Il. v. lines 660—664.

\*<sup>3</sup> xx. 272 and 277. xxii. 326 and 328.

The spears long, ruthless, sharp, with horror filled  
 The battle. Brazen splendour in their eyes,  
 From glit'ring casques, and cuirass burnished fresh,  
 And shining shields, with dazzling splendour shone,  
 As the host thickened.

Arrows, with brazen heads, are frequently mentioned in connexion with shooting them out of bows. Under the name *οἰσος*, we have the epithets brass-headed\*, three pointed †, long pointed ‡; under *ισος*, the arrow is called heavy-with-brass||, and three-pointed §; and the practice of poisoning the brazen heads of arrows is alluded to ¶.

Chariots were ornamented with brass\*\*; the fellies and spokes of Juno's ††, and the axle of Neptune's were of brass ‡‡. Brass was also used by the Greeks in their leg armour, as they are called in the 7th Iliad (line 41), brazen-greaved, *καλλοκνημιδες*. Whether they shod their horses with any kind of metal is very doubtful; though the horses both of Jove ||| and Neptune §§ are called brazen-footed, which indeed may be only intended to mean strong hoofed, without reference to any practice of shoeing horses with brass in Homer's days.

The trade in brass amongst the Greeks, in Homer's time, was so common, that he alludes to it as a matter of common occurrence ¶¶. And when enumerating the articles of which the cargoes of ships consisted, brass, gold, well-wrought iron, and raiment, form the general catalogue of valuable commodities\*<sup>3</sup>. This metal is also very commonly found in the accounts of the wealth of his heroes, with gold, raiment, wrought-iron, and beautiful women †<sup>3</sup>. He also says, that it

\* Il. xiii. 650. 662.

† Il. viii. 297.

‡ Il. xi. 507.

\*\* Il. iv. 226. x. 322, &c.

†† Il. xiii. 30.

§§ xii. 23.

\*<sup>3</sup> Odys. xv. 324. xvi. 231.

†<sup>3</sup> Il. ii. 226. vi. 47. ix. 265. x. 379. xi. 133. Odys ii. 338, &c.

† Il. v. 393.

|| Il. xv. 465.

¶ Odys. i. 261.

†† Il. v. 725.

||| Il. viii. 41.

¶¶ Odys. v. 38. xiii. 136.

was carried to Greece from Temesa, a city of Cyprus\*; near which place, according to Strabo †, there were numerous mines of brass; and, in Pliny's time ‡, the Romans obtained much of their best copper out of that island, from which I apprehend the terms *cyprum*, *cyprius*, and *copper*, are derived.

Plutarch tells us why Homer calls brass *ευνρορα* and *ρωροπα*. The hunters, says he, when they have taken a boar or stag, and have to send it from a great distance to a town, thrust into it a spike of brass, as a remedy against putrefaction, which effect it would appear to have from its styptic properties; hence physicians use the rust of brass in cases of that nature. Persons too, affected with inflamed eyes, when employed in brass mines, grow better of their complaint; and such as have lost their eye-lashes, have the hair restored. For the fine dust, which arises from the ore of brass, falling imperceptibly upon the eye-lashes, so dries and braces them up, that they no longer emit rheum or tears. Hence Homer calls brass, *ευνρορα*. Aristotle, also relates, that wounds made by spears and knives of brass, are less painful, and heal sooner, than those made by iron weapons; because brass has in it a certain medicinal quality, which it communicates directly to the wounds ||.

One of the prizes at the funeral games of Patroclus was,

A mass, self-fused,  
Which erst Eëtion's mighty strength could hurl.  
\* \* \* \* \*  
How distant far, the winner's fertile lands,

\* Some critics have contended that this Temesa is the same as that mentioned by Livy, xxxiv. 45, which was a town of the Bruttii. See Eustath. and the Venet. Schol.

† Li. vi. and xiv.

‡ Nat. Hist. xxxiv. 2, &c.

|| Symph. iii. 10. Edit. Hen. Steph. an. 1572. vol. ii. p. 1169 and 1171. See also Macrobi. Saturnal. vii. 16. where this passage out of Plutarch is quoted. The passage alluded to in Aristotle, may be found in his Problems, sec. i. 35. vol. ii. p. 829. Ed. 1596.

It him shall serve in using full five years ;  
 For herd or plowman wanting iron none  
 Of his shall seek the town, but deal it out.

This self-fused mass was probably one of those balls of native iron, which are formed in the higher regions of the air, by the aggregation of gaseous atoms of iron and of some other metals, and hence have been called aerolites, and meteoric stones, the use of which, I conjecture, first suggested to mankind the idea of attempting to make ores of iron malleable by roasting. Be that, however, as it may, it is here intimated that shepherds and husbandmen, in the time of Homer, used iron, but in so sparing a manner, that a lump which one man could hurl further than all his competitors,

Far as a herdsman throws his tapering staff,  
 That whirling flies the herding beeves between,

was more than sufficient to serve all the purposes of a considerable estate for five years\*.

The next prize proposed was, ten double mouthed and ten single-mouthed axes, made of iron fit for arrows, which, I apprehend, was such as had been properly prepared for the purpose of being formed into edge-tools. †

In the description of Ulysses putting out the eye of Polyphemus with a burning stake of olive wood, the poet, as if it were by incident, throws into a simile a philosophical observation on the art of tempering iron :

As when a smith a hatchet or huge axe  
 Loud hissing, plunges into water cold,  
 In tempering (*thus the strength of iron comes*),  
 So hissed his eye around the olive stake ‡.

From this passage it is quite clear that the early Greeks were well

\* Il. xxvii. 125, &c.

† Id. 850.

‡ Odys. ix. 392, &c.



acquainted with the cause, which gives to iron its temper; but the term *φαρμασσων*, *healing*, which stands for the process, leads one to infer, that they imagined iron had some sort of an imperfection of the nature of a disease, before it was plunged into cold water. I have before noticed, that this comparison affords a sort of proof that the *πελεκυς* was indifferently made of brass, or iron; and I would here add my conviction, from the iron axes of Ulysses being laid up in his treasury with so much care, and the great regard with which the poet uniformly mentions this metal, that it was esteemed in his time as much more valuable than brass.

That it was not in general use in the Homeric age, there is abundant testimony. Excepting in the club of Areithous,\* and two notices, which induce the belief that it was used in arrow heads, † it does not appear to have been forged into any sort of warlike weapon. Juno's chariot wheels are, indeed, said to have been of iron, and where Ulysses instructs Telemachus how to apologize to his mother's suitors for removing the arms out of the hall, the concluding reason is:—because the sight of steel provokes men to use it: *αἷλος γὰρ ἐφελκεται ἀνδρα σιδηρος* ‡. Here *σιδηρος* has precisely the same import that *ferrum* frequently has in Latin authors, and means a sword or offensive weapons in general.

The passages in Homer, which afford proof that iron in his time was scarce, and reckoned among valuable commodities, are numerous. Adrastus, imploring life at the hand of Menelaus, told him that his father's house was well stored with brass and gold, and highly-wrought iron §. It is also, under the same epithet, classed among the riches in the treasury of Ulysses ||. Sometimes it is called *πολιος*, white or shining ¶; and with this denomination is enumerated by Achilles

With gold, red brass, and women trimly zoned \*\*.

\* Il. vii. 341, 344.

† Odys. xvi. 294. xix. 13.

|| Odys. xiv. 324. xxi. 10.

\*\* Il. ix. 365. xxiii. 261.

‡ Il. iv. 123. xxiii. 850.

§ Il. vi. 48. See also Il. x. 379, and Il. xi. 133

¶ Odys. xxi. 3 and 81. xxiv. 167.

The Greeks, at the siege of Troy, bought wine with brass, iron, oxen, hides, and captives, Iliad vii. 473; where it is αἰθωνοῦσι σιδῆρα with shining, or polished iron, as it also is in Iliad iv. 484, where it is spoken of, as quoted above, as used by coachmakers for felling poplars. The Taphian merchants sailed to Temessa, trading for brass with shining iron,\* which in one place is made an emblem of bravery †. Persons of obdurate dispositions are said to be possessed of “iron minds” ‡.

Apollo is introduced, Iliad iv. 510, exhorting the Trojans to battle, and telling them that the bodies of the Greeks were neither stone nor iron, that they could sustain the shock of their brazen weapons: and the sky is called σιδῆρεον ἄραρον, the iron heaven, probably from bearing some resemblance in colour to polished iron §.

TIN is mentioned several times in the Iliad; but never, as far as I have observed, in the Odyssey. Its Greek name, *κασσίτερος* has been variously derived. One author says it has it, *παρα το θασσον τειρεσθαι*, because it is more easily melted than other metals. But the root *κασσα*, a harlot, because tin appears to be silver and is not, is, perhaps, the most rational origin in the Greek language to which *κασσίτερος* can be traced. I have, however, an opinion that the Greeks derived their name for tin from the Phœnicians, who sold it to them for silver, which metal in Hebrew is called כסף; for we have the testimony of Homer, that the Phœnicians practised deceptions upon the simplicity of the early Greeks, by palming upon them toys and jewelry, for more valuable commodities; and Bochart has shewn that *κασσίτερος* must have been of Phœnician origin, “*quia Chaldæi et Arabes stannum appellant vocabulis huic simillimis. Hic Num. 31, 22. pro Hebræo ברזל, et Græco κασσίτερος, Jonathan habet קסטירא *kastira*, et Jerosolymitanus interpres קיסטרא *kistara*, et Arabs קודיר *kasdir*. Et in tractu Talmudico Sanhedrin קסטיטריון *kasterion* est Stannum.”*

\* Odys. i. 184.

‡ Odys. v. 191. xxiii. 172.

† Il. xx. 372.

§ Odys. xv. 328, and xvii. 665.

The corslet of Atrides was given to him by Cinyras, king of Cyprus, and was made of ten rods of cyanite, twelve of gold, and twenty of tin; and had three cærulean serpents on each side, entwined round its neck\*. The shield of the same hero had twelve orbs of brass, twenty bosses of white tin, and one boss in the centre of dark cyanite, upon which Gorgon, with Flight and Fear, were carved †.

In constructing the shield of Achilles, Vulcan is said to have made use of gold, silver, brass and tin ‡. This piece of armour had two folds of brass, the two interior ones of tin, and the innermost one of gold §. One of the devises upon it was a vineyard, the fences of which were made of tin ||; and in the picture of the beeves, half the herd were made of the same metal ¶. The greaves of Achilles were also made of “ductile tin\*\*”, newly-wrought” ††.

The corslet, which Achilles took from Asteropus and gave to Eumelus, was made of brass and edged round with shining tin †††; and the chariot of Diomedes was ornamented partly with gold, and partly with tin ||||.

There can be no question but the propriety of the names which Hesiod has given to the successive tribes of men, which he supposes have existed upon the earth, consists in the comparative estimate between the purity of morals, which each of these races of men possessed, and the relative value of each of the metals, to which the several ages are compared. As gold, silver, brass and iron, in Hesiod’s time, bore a regular decrement in value in the order they stand; so the successive generations of men sunk in value from the first; and, therefore, he styles them the golden, the silver, the brazen, and the iron age. But these names were also probably given with some allusion to the order in which

\* Il. xi. 20, &c.

† Il. xviii. 474.

|| Il. xviii. 565.

\*\* Il. xix. 612.

†† Il. xxiii. 561.

‡ Il. xi. 33, &c.

§ Il. xx. 271.

¶ Il. xviii. 574.

†† Il. xxi. 592.

|||| Il. xxiii. 503.

metals were discovered. For this poet tells us that, in the golden age, golden chains were worn round the body\* ; and amongst the brazen race,

Their arms were bronze, their houses bronze, the tools  
They worked with bronze : no iron black was then †.

Even in his own time, iron does not seem to have been in such abundance as to render it inferior in value to brass ; for in his description of the plough, then in use, he directs that the share be made of the wood of the ilex tree ‡. He speaks, indeed, about whetting iron §, and felling wood ¶ with it, and says, that “ Hercules put upon his shoulder iron, the aid of battle, but the quiver, which was full of arrows, he cast upon his back” ¶¶. We have seen from Homer, that, in the time of the Trojan war, the sword was suspended from the shoulder in a belt. Are we then, from this last passage, to conclude, that the *αρης αλκτης σιδηρος* was an iron sword, or a quiver full of iron-headed arrows ? I incline to the latter sense ; because in his description of the shield of Hercules, he mentions a sword of brass \*\* ; and because he expressly says, that the spears of Hercules, Cygnus, and Mars, were made of brass ††.

That iron had come into a certain degree of common use in edge-tools, in Hesiod’s time, there is, however, a remarkable proof in the lines which direct, that “ in the feast of the gods the withered part of a five-fingered branch should never be cut from the green part with sable iron” †††. Every one knows with how much care the guardians of religion, under the Greek and Roman mythology, laboured to preserve their ceremonies from every kind of innovation : and there are numerous allusions, in ancient authors, to the use of instruments of brass about the altar, after similar instruments intended for civil and

\* Op. et Di. 74.

‡ Id. 434.

§ Id. 418.

\*\* Id. 221.

†† Op. et Di. 741.

† Id. 149.

‖ Id. 385.

¶¶ Scut. Herc. 128.

†† Id. 135, 414.

military purposes had, for many centuries, been made of iron. The Scholiast, upon the following line in Theocritus,

*Α θεος εν τρισδοσι, το χαλκιον ως ταχος αχει,\**

Says, "that brass was much in use, in religious matters, amongst the ancients, especially in all expiations and purgations, as Apollodorus has shewn in his treatise concerning the gods." Plutarch also relates, that in the night before the great battle between P. Æmilius and Perseus, there was a total eclipse of the moon, during which the Romans, according to their usual custom, made a great noise upon vessels of brass, and held up burning faggots and torches till her light was restored. Similar accounts are also recorded by Livy and Tacitus, and Manlius says,

*Ultima ad Hesperios infectis volucris alis  
Seraque in extremis quatiuntur gentibus æra.*

Sophocles describes Medea cutting poisonous plants with a brazen hook, having her hands behind her back, lest she should be injured by their noxious smell; and pouring the juice of these herbs into brazen vessels: and Macrobius, after observing that Virgil unquestionably took the idea of his brazen falces from this passage in Sophocles, adds, "that brazen things were almost exclusively used in divine matters, there is abundant evidence: and they were chiefly used in those sacred rites, in expiations, in the consecrations, and in driving away any disease, which may be seen in the second book of that very curious and learned author Carminius, respecting Italy, where he says, "The Tuscans, as I find in their Tayetan mysteries, formerly used a brazen ploughshare when they intended to build a city; and amongst the Sabians, the priests were wont to be shaved with razors of brass."†

I am not able to point out the precise age, in which the use of brass in arms began to give way to that of iron: it was probably gradual:

\* Idyl. ii. 36.

† Saturn. lib. v. Ed. Zeunii, p. 552.

it certainly prevailed among the Greeks long after the time of Homer and Hesiod. The Carians and Ionians, people of Asia Minor, used brazen arms in the year 670 before Christ. During the joint reign of the twelve kings in Egypt, an oracle had declared, "that whoever of them should perform a libation, in the temple of Vulcan, from a brazen cup, should be sole monarch in Egypt." "Upon the last day of a certain festival of that God, when they were going to perform the libation, the chief priest reached to them the golden cups, which they were accustomed to use in that solemnity; but, mistaking their number, gave out only eleven instead of twelve. Psammitichus, who stood the last, not having a cup, took off his helmet, which was of brass, and from it poured his libation." His colleagues in office, fearing this circumstance might be taken for the fulfilment of the prediction of the oracle, abridged him of a considerable part of his power, and confined him to the marshy district. He resolved, however, to be revenged upon them for this ignominious treatment; and, therefore, "sent to the oracle of Latona, at Butos, upon the veracity of which the Egyptians place the greatest confidence, and received this answer:—'That revenge would rise from the sea in the appearance of brazen men.' This prediction he treated with the greatest incredulity. But not long after, certain Ionians and Carians, while engaged in a piratical voyage, were driven into Egypt. As they landed *armed in brass*, an Egyptian ran to inform Psammitichus, who was then residing in the marshes, (*for the man had never before seen men armed in brass*) that brazen men had risen from the sea, and were ravaging the country. The king perceiving the prediction of the oracle to be complete, formed an alliance with the Ionians and Carians, whom he gained over by splendid promises; these, with the Egyptians under him and other auxiliaries, overturned the kings; and he thus became sole monarch of Egypt." \*

Pindar, who flourished about 470 years before Christ, very frequently introduces his gods and heroes clad in brazen armour †.

\* Herod Euterpe 147, 151, 152.

† Olymp. Od. iv. Nem. Od. i, ix, xi.

He mentions brazen spears,\* and styles them brazen-cheeked †: calls Mars χαλκεος and χαλκασπις ‡: speaks of limbs wounded with shining brass §; of brazen axes ||; brazen shields ¶; and the brazen bows of the Amazons \*\*; and has numerous other references to the use of brass in warlike weapons. It is further remarkable that he mentions an anchor with brazen cheeks; and brazen implements as used in ploughing; but there are reasons to suspect that he often introduces brass more in allusion to the manners of the heroic age, and for poetical effect, than from any just ground of authority he had for embellishing his poetry with it, on account of its *general* use in his own time.

Sophocles, 450 years before Christ, in his tragedies, all of which that are extant are founded upon transactions connected with fabulous or heroic history, mentions the dedication of spoils all of brass to Jupiter Tropæus ††; axes all of brass ‡‡; and calls Mars brazen-voiced §§, probably from trumpets being made of brass.

The Massagetæ were a great and powerful nation, whose territory bordered upon Scythia, and stretched beyond the Araxes, a river that empties itself into the eastern side of the Caspian sea. It was in a battle with this people that the elder Cyrus was slain, 528 years before Christ; and Herodotus, after describing the circumstances attending that event, gives the following account of the Massagetæ:—"In their food and clothing they resemble the Scythians. Their forces consist of cavalry and infantry, both of which are powerful: they are divided into distinct companies of archers, spearmen, and axe or halbert-men. They use gold and brass in every thing. *For in such things as belong*

\* Olymp. Od. i. Nem. Od. x. Pyth. iv.

† Nem. Od. viii.

‡ Olymp. Od. x. Isth. Od. iii. vii. See also Nem. Od. i. and Olymp. Od. xiii.

§ Olymp. Od. i.

|| Id. v.

¶ Id. ix.

\*\* Nem. Od. iii.

†† Antig. 147.

‡‡ Elect. 198.

§§ Oedip. Col. 1101. and Ajax 17. Elect. 713.

*belong to their spear heads, the points of their arrows, and their battle axes, they make use of brass: but their helmets, their belts, and their breast-plates they adorn with gold. In like manner they put cuirasses of brass upon the chests of their horses, while their reins, bits, and trappings are decked with gold. They neither use iron nor silver, for neither the one nor the other is found in their country; but of brass and gold there is abundance.”\**

There was, in the time of Herodotus, at Exampæus, a city of Scythia, between the Borysthenes and the Hypanis, “a vessel of brass, of the thickness of six digits. It was capable of holding, at the least, six hundred amphoræ; and the natives say that it was made out of the heads of arrows; for when their king Arantas wished to know the number of the Scythians, he commanded each person, upon pain of death, to bring him an arrow head. Thus a very great quantity of arrow heads were collected, and this vessel composed of them in memory of the transaction.”† This account, however, offers a remarkable contradiction to an assertion the author has made in a preceding chapter‡ of the same book: for he there asserts that the Scythians were acquainted with gold; but never used either silver or brass.

Herodotus also, in his account of the Æthiopians says, that “their prisoners are all bound in golden chains; because brass amongst them is, of all other metals, the rarest and most precious”§. Why he should thus introduce the fact of the scarcity of brass in Æthiopia, I do not conceive, unless he intended it to be inferred that chains were made of that metal amongst the Greeks in his time. The Athenians, however, in the age preceding that of Herodotus, with the tenth part of the ransom of certain prisoners, purchased a chariot of brass for four horses, and placed it at the entrance into the citadel, with an inscription upon it, which mentions a chain of iron, “*δεσμος σιδηρεος*”||.

\* Clio c. 215.

† The 71st.

|| Herod. Terps. c. 77.

† Herod. Melp. c. 81.

§ Thalia cap. 23.



In the time of the elder Cyrus there were in the circuit of the walls of Babylon one hundred ancient massy gates, which, with their hinges and frames, were wholly made of brass\*; besides several smaller ones, which led through the walls to the river †. The brazen gate of the temple of Belus too, remained there in the time of Herodotus ‡. But it would be endless to enumerate the various objects of brass, connected with the temples of the ancient heathen nations.

Perhaps the saying of Cleomenes to Crius of Ægina: “Come tip your horns with brass, that you may be prepared to meet a great calamity,” was intended as a threat, and had allusion to fighting with weapons of brass ||.

Several of the nations, who composed the army of Xerxes, 478 years before Christ, had helmets of brass; but no mention is made of their carrying any kind of offensive armour of that metal, though iron spears are particularised. The Sagartii, however, it is said, “are not accustomed to carry any sort of arms, *πλατα*, either of brass or iron, except daggers,” § a mode of expression which seems to favour the supposition, that it was not uncommon for the soldiers, which Herodotus had been accustomed to see, to wear weapons both of brass and iron.

Hippocrates, who flourished 410 years before Christ, says, that “the Amazons burnt off the right breast: for while the girls are yet infants, their mothers apply to it a brazen instrument, with which it is seared.”

The passage in Aristotle which relates, “that wounds made by spears and knives of brass are less painful, and heal sooner, than those made by iron edge-tools,” seems to imply, that edge-tools of brass were still in use in his time. Indeed Strabo gives the same account of the armour of the Massagetæ ¶ as Herodotus had done, four hundred years before his time; and also asserts, that some of the people of Lusitania pointed their spears with brass: “*τινες δε και δραμι χρωται, επιδραμιδες δε*

\* Herod. Cli. c. 179.

† Id. c. 181.

§ Herod. Polym. c. 85.

† Id. c. 180.

|| Herod. Erato. c. 50.

¶ Lib. xv. c. ii. p. 352.

χαλλαι \* : but I have met with no authority in any Greek or Roman author to justify me in supposing that any kind of edge-tools of brass were in use, excepting in religious matters, either in *Egypt, Greece, or Italy, or any other civilised nation within the Roman Empire*, for the space, at least, of two centuries before Christ. I shall, therefore, close this part of the enquiry with a remark of an eminent philosopher of the present age, which, though not immediately connected with my subject, is, nevertheless, allied to the history of ancient brass.

Theophrastus, in speaking of the manufacture of glass, states, as a report, that “χαλλαι was used to give it a fine colour; and it is extremely probable, that the Greeks took cobalt for χαλλαι. I have examined some Ægyptian pastes, which are all tinged blue and green with copper; but though I have made experiments on nine different specimens of ancient Greek and Roman transparent blue glass, I have not found copper in any, but cobalt in all of them.”†

Gold, silver, and copper have been discovered, in various parts of the world, in a malleable state ‡. Of iron, capable of yielding to the hammer in its native state, we are, I think, unacquainted with any well authenticated examples, excepting in the form of meteoric stones. We have seen that there was a time when the Egyptians worked their mines with tools of brass, and, consequently, when they were destitute of iron; but that its use was extensively known, both to them and to the Hebrews, in the time of Moses. It was not used in the tabernacle, probably for the same reason that it was excluded from the religious ceremonies of the Heathens.

While the speculative and commercial people of Egypt and Phœnicia, however, enjoyed the numerous advantages, which iron affords to society, we have seen sufficient proof from the writings of Homer and other Greek authors, that its use in arms was either altogether

\* Lib. iii. p. 106.

† Sir H. Davy in Philos. Trans. for 1815, p. 109.

‡ Goguet's Origin of Laws, bk. ii. chap. iv.

unknown, or extremely confined, in the Grecian states, for more than five centuries after the death of Moses. The Egyptians attributed the invention of iron arms to Vulcan, and the Phœnicians to two of their most ancient heroes, who were brothers\*. According to the Arundelian Marbles †, iron was discovered 186 years before the Trojan war, which account is also given by Strabo and other authors ‡, who assert that the burning of the wood upon Mount Ida, 73 years after Deucalion's flood, or 1438 years before Christ, lead to its discovery. This Mount Ida according to some was in Crete, but others say it was in Phrygia and inhabited by the people called Dactyli Idæi, who, as Diodorus Siculus writes, "not only found out the use of fire, and of brass and iron, but the art of working in these metals, in a place called Berecynthus." || The same author, in his Historic Library §, attributes to them only the art of forging iron, and adds, that they received it from the mother of the Gods: Pliny gives Hesiod as his authority for attributing this invention to the same people: He also asserts, that the Cyclops were the first who wrought in iron:—"fabricum ferrarium invenere Cyclopes" ¶. Other authors give the merit of this invention to the Chalybes, a people who lived upon the southern side of the Euxine Sea; and from whom iron, prepared for the purpose of edge-tools, was called *Chalybs*. Arrian, in his History of Alexander the Great, says "it has been accounted a crime to the Chalybians that they were the first who forged iron". Callimachus, 540 years before Christ, had made an allusion to the same fact \*\* ; and Catullus in his ode, *De Coma Berenices*, has imitated him in the following lines:—

" Chalybon omne genus pereat :  
Et qui principio sub terra quærere venas  
Institit, et ferri frangere duritiem."

\* See Goguet Orig. of Laws, &c. Vol. I. p. 160.

† Ep. x.

‡ Strabo Lib. x. and xiv. Apollonius the Scholiast. Natales Comes, Lib. ix. Seneca Ep. 90. Clem. Alex. Stromb. line i. Virg. Æn. 609—620.

|| Re. Antiq. Lib. v.

§ Lib. xvii.

¶ Lib. vii. cap. 56.

\*\* See Apollon. Schol. l. 2. Eusth. in Dionys.

This country is mentioned as producing iron in the last chorus of the *Alcestes* of Euripides; and Ammianus Marcellinus also expressly ascribes this art to them in these words:—"Chalybes per quos erutum et domitum est primitus ferrum"\*. Zenophon, who passed through their country 400 years before Christ, says, "they subsisted chiefly by the manufactory of iron" †; and, 200 years before that time, the Prophet Jeremiah, where he asks—"shall iron break the northern iron and the brass," ‡ probably alludes to the iron of the Chalybes, and the brass of their neighbours the Tibareni and Moschi, who, under the name of Tubal and Meshech, are described by Ezekiel, as trading in the markets of Tyre, in vessels of brass ||. Virgil calls them "Chalybes nudi," who dealt in iron §. Eudoxus says, their country affords iron celebrated for the excellency of its temper; and Daimachus<sup>ed</sup> Poliorceticon contains the following remarkable passage:—"Different sorts of steel are produced amongst the Chalybes, in Sinope, Lydia, and Laconia. That of Sinope and the Chalybians is used in smiths' and carpenter's tools; that of Laconia in files, drills for iron, stamps, and mason's tools; and the Lydian sort is manufactured into files, sabres, razors, and knives." ¶

Lycurgus had recourse to a remarkable expedient to counteract the luxury and avarice of the Lacedæmonians. "He abolished the use of gold and silver money, and ordered that iron money only should pass, giving to a great weight and bulk of it only a small value; so that a sum of the value of ten minæ, would occupy a large apartment, and take a yolk of oxen to remove it. By this severe measure, many sorts of vices were banished from Lacedæmon. For who would steal, or be bribed, or cheat, or rob, when the object of his avarice could neither be hid nor make him happy in its possession, nor be applied to any useful purpose? For it is said, that by slaking hot iron in vinegar, it is deprived of its useful properties and strength, and rendered unfit to work with and to be worked."

\* Lib. xxii. c. 8. ed. Bipont. Vol. I. p. 300. † Retreat. v. p. 542.

‡ Chap. xv. 12.

§ Geor. i. 58.

|| Chap. xxvii. 15.

¶ See Bochart's Phaleg. p. 208.

This sort of iron money continued in use till the time of Lysander, about 400 years before Christ, when, according to Plutarch, that general sent a large sum of gold and silver money to Lacedæmon, which greatly offended the Spartans. A party of them, therefore, but unsuccessfully, endeavoured to get it decreed, “that no gold nor silver money should be received into the city; but that that of the country should continue to pass. This was of iron, but before it was issued it was dipped, while hot, into vinegar, by which means it could not be forged, for by the dipping it became unfit for edge-tools and brittle. Perhaps of old all the money was of this kind, the brass and iron being formed into obelisks, whence it continues to this day, that much of the small money in circulation is called *oboli*, six of which make a drachma, a term which means as many as the hand can grasp.”\*

The pier of the Piræus at Athens, in the time of Themistocles, was constructed of stones cramped together with iron and lead †: and we are told that Nitocris, queen of Babylon, and a person whose chronology is very doubtful, built a bridge in that city, the stones of which were similarly compacted ‡. Iron was also one of the articles among the stores sent to the siege of Nisæa ||: and bricks and iron are enumerated among the materials collected for the purpose of circumvallating Syracuse, before Christ, 415 years §.

Herodotus says, that it was written, in Egyptian letters, upon one of the Pyramids, how much money was laid out in the progress of the work in radishes, onions, and garlic for the workmen; and which his interpreter, if he rightly remembered, said amounted to one thousand six hundred talents. If this was true, it would be scarcely credible if one were told how much more was expended in iron necessary to carry on the work, &c. in food and clothing for the workmen ¶. This account proves, at least, that Herodotus considered that iron was necessary in the work tools and machinery employed in carrying on

\* Plut. Life of Lysander.

† Herod. Clio sec. 186.

§ Id. lib. vi.

† Thucyd. lib. i.

|| Thucyd. lib. iv.

¶ Euterpe, sec. 125.

any great building, and consequently, that it was used in such things in his time.

Alyates, a king of Lydia, who died 562 years before Christ, made an offering at Delphi of "a silver cup, with a stand for it, made of iron welded\* together. It was as worthy of observation as any of the things at Delphi. It was the work of Glaucus the Chian, who first of all found out the method of welding iron." † "The joinings of this stand were not made with clasps or rivets, but welding was the only fastening. In form it nearly resembles a tower rising from a broader base, into a narrow top. Its sides are not wholly continuous, but consist of transverse zones of iron, like the steps in a ladder. Straight and ductile plates of iron, diverge from the top of each bar, to the extremity." ‡ This stand was the only offering, made by the Lydian kings, which remained at Delphi in the time of Pausanias.

The phantom which appeared to Xerxes and Artabanus, urging the expedition against Greece, seemed to threaten to burn out the eyes of Artabanus with a hot iron. And about 540 years before Christ, the Phocæans, in their way to Cynus, "bound themselves by horrid curses never to forsake each other; they further threw a mass of red hot iron into the sea, and swore they would never return to Phocæa till it should appear again" ||.

Pausanias tells us, that there was at Delphi a Hercules and the hydra made of iron, the work of Tisagoras, and observes, that "to make statues of iron is one of the most difficult and laborious things imaginable; but this performance of Tisagoras, whoever he was, is really

\* I am not sure that *καλλασειν*, when applied to joining two pieces of iron together, always signifies "to weld;" for I have been told that the Chinese have a method of *soldering iron with iron*, and even of repairing cast iron vessels, by filling up holes and cracks with iron solder. I am further inclined to this belief, from the supposition that the several white heats required for the numerous joinings of this stand would have destroyed the quality of the iron; and from *καλλα*, when it refers to other metals, being equivalent to our word *solder*, and meaning the substance applied in a liquid state to joining two pieces of metal together.

† Herod. Clio. 25.

‡ Paus. Phoc. c. xvi. sec. 1.

|| Herod. Polym. sec. 18. Id. Clio. sec. 156.

worthy of admiration. There are also in Pergamus iron heads of a lion and a boar, of admirable workmanship”\*.

Aristotle had heard, “that the iron of the Chalybes and Mysiceans, was collected out of the sand beds of rivers,” and says, “that some report, that after simply washing it, it is smelted in furnaces; and others, that after frequent washings the residuum is cast into the fire, and purified by adding to it a portion of the stone called pyrimachus †, which abounds in that country. This kind of iron is much brighter than others, and though it has only been once purified in the furnace, it gets a silver-like appearance: it is the only pure sort.”

There is an edict of Paulus Æmilius, which forbids either gold or silver to be wrought in Macedonia; but gives permission for working iron and copper ‡. Dionysius Periegetes has a line ||, which mentions the fine edge of Aonian or Bœotic iron. And Strabo speaks of vast mines of brass and iron in Eubœa in former ages §.

These observations only refer to what is said respecting the discovery of iron among the Greeks, and its general use among them. I shall now draw together a few notices respecting its particular application to arms.

In the time of Crœsus king of Lydia, Lichas a Spartan, was on a visit at Tegea, a city of Arcadia; and during his stay there, happening to step into a smithy, he observed them forging iron, and was in admiration with the sight of the process ¶. This city, in after ages, according to Virgil, was famous for its manufacture of swords.

“Tum lateri atque humeris Tegeæum subligat ensem”\*\*.

It would be too much to infer from these authorities, that it was

\* Phocids, cap. xviii. sec. 5.

† See Theophrastus de Lap. and De Laet’s note on *pyrimachus*, from which it appears, that that stone was employed as a flux.

‡ Livy, lib. l. v.

§ Lib. x.

\*\* Virg. viii. 459.

|| The 476th.

¶ Herod. Clio, 28.

the art of making swords which Lichas so much admired at Tegea, but it is plain enough that there was something either in the process, or in the excellency of the workmanship, which he had not been accustomed to see at Sparta.

Plutarch and Stobæus have preserved a beautiful fragment of a poem of Bacchylides on the praise of peace, from which the following lines are nearly a literal translation :—

“ O'er shields, with iron circles bound, the webs  
Of sable spiders hang. The metal-pointed lance,  
And double-edged sword with rust consume.  
No more the brazen trumpet's voice is heard ;  
Nor honey-bearing sleep, that soothes the heart,  
Is from the eyelids driven.”

If the poet drew his descriptions from objects that he had really seen, it is fair to conjecture that, in an age when iron made a part of the ornament and strength of a shield, it would be forged into offensive weapons, on account of its being better adapted for that purpose, when smelted and forged with charcoal, than brass ; and his mention of the points of spears and the blades of swords, being corroded by the action of rust, is satisfactory evidence of his allusion to spears and swords of iron and steel.

Anacreon, A. C. 530, mentions iron in conjunction with fire, in the proverbial way that we say, “ by fire and sword ;” and says that the arrows of Love were pointed with iron. And Pindar, A. C. 470, describes an abundant country as overwhelmed in calamity by the destructive force of fire and iron\* : he also calls the spear which Achilles, when young, used in hunting, “ βραχυσιδαρον ακοντα,” a short-ironed dart †. In another place he uses the expression “ iron war” ‡. The iron throne, upon which he used to sit and sing the hymns, which he composed in honour of Apollo, was in existence, in the temple of that god, at Delphi, in the time of Pausanias §.

\* Olymp. od. x.      † Nem. od. iii.      ‡ Id. v.      § Phoc. xxiv. sec. 4, p. 234.



Atys, son of Cræsus, was unintentionally killed by a boar spear, having an iron point, by which event a dream of his father was fulfilled. In the account of this part of the history of Cræsus, the words, “ ὑπο ἀίχμης σιδηρῆς,” occur three times\*.

In the description of the forces which composed the army of Xerxes, 478 years before Christ, Herodotus has the following notices of iron armour. The Persians wore tunics on which iron scales were sewed, so as to resemble those of fish †; the helmets of their horsemen were ornamented with plates of brass and iron. The Indians had arrows made of reeds, and pointed with iron ‡. The Assyrians carried clubs headed with iron ||. And the Arabians had short arrows, made of reeds, and pointed with sharp stones, such as seals are cut with, *instead of iron* §. I have before noticed from Herodotus, that the Sagartii used no kind of weapons *either of iron or of brass*; which seems to imply that both iron and brass were in use in arms in his time: by a similar inference, from his noticing that the arrows of the Arabians were pointed with stone *instead of iron*, one would be led to conclude, that iron was exclusively used among the Greeks, in his time, in arrow heads.

“ There was a house of king Cyrus, in Cyprus, which was built of white and black stones, bound with gold, and in which were innumerable *iron lances*, windows of silver, and on its roof tyles of green-stone.” ¶

The Thracian soldiers, who fought under Perseus, at Pydna, in the year 166 before Christ, “ were men of terrific countenance, and exceedingly tall; their shields were white and glistening; their legs were armed with greaves; they wore sable vests, and as they marched, *their long pikes, which had heavy heads of iron* (‘ ὀρθὰς δὲ ῥόμφαιας βαρυσιδηρῆς’) shook upon their right shoulders.” In the place from which I have quoted this account, Plutarch is describing the order in

\* Herod. Clio. sec. 34, 38, 39.

† Polym. sec. 61, 85.

‡ Id. sec. 64.

|| Id. sec. 69.

§ Id. sec. 69.

¶ Luc. Ampelius’ Liber Memorialis, edited at Leyden, by Salmasius, at the end of Elziver’s Florus, in 1738.

which the soldiers of Perseus marched out to battle. The last which quitted the camp was a Macedonian regiment, called from their brazen shields, *chalcaspides*: when these came out, “the field was filled with the *splendour of steel and the shining of brass*, and the mountains with the shouts and the tumult of the men cheering one another”. At the first onset of the battle, neither the shields nor the cuirasses of the Romans could withstand the force of the Macedonian pikes. Plutarch quotes a History of Perseus, written by one Posidonus, in which “a dart wholly made of iron (*παλτοιν εμπειειν ολοσιδερον*)” is stated “to have fallen upon Perseus. The point, indeed, did not touch him; but glancing obliquely past his left thigh, in the track of its descent, it pierced his garment, and blackened his flesh with a bruise, the mark of which remained for a long time.” From these accounts it is plain, that not only the offensive arms both of the Greeks and Romans were, at that time, made of iron; but that the heads of the Macedonian pikes were of an excellent temper. The metal of which their swords were made, is not, indeed, mentioned: it is merely stated, that the short swords of the Macedonians were of no avail against the long shields of the Romans, while the weight and stroke of the Roman sword pierced through all the armour of the Macedonians to their bodies. It must, however, be inferred, from the pikes being of iron, that the swords were also of that metal; and this deduction is, I think, strengthened by the account which Plutarch gives of the Macedonian armour, in his beautiful description of the triumph granted to Æmilius for this victory: “On the second day came the most beautiful and highly finished of the Macedonian armour, carried in many waggons. These were refulgent *with brass and iron*, newly cleaned: and though they were arranged with the greatest art and taste, they yet appeared to have been thrown together carelessly and as chance directed; helmets upon shields, cuirasses on greaves, C. . . targets, Thracian bucklers and quivers, mixed with the bits of bridles; and the blades of naked swords bristling up amongst them and taller than these the Macedonian pike; all too having such due liberty to play in, that, as they were drawn along, their

united clank was so harsh and terrible, that, though they were the spoils of the vanquished, they were looked upon with fear." The brass that glittered was the body armour; the steel was the swords and pikes.

"The helmet of Alexander the Great was of iron, the work of Theophilus, but it shone like pure silver. To this was joined a collar also of iron, set with gems. The sword, which he commonly wore in battle, was admirable for its *temper*, 'εαφη', and lightness; the gift of the king of the Citieans. The Rhodians honoured him with the belt which he used in engagements; it was the workmanship of old Helicon, and more superb than any of his other armour."\* The metal of which this sword was made is not mentioned; but the word "βαφη," which in its primitive sense, signifies a *dipping* or *immersion*, and here, in a figurative way, *the temper*, is a sufficient proof, that the blade was composed of steel: for, if it had been of brass, Plutarch would have described its temper, by the word κρασις or μιξις, which are employed to signify that kind of temper or degree of hardness, which is obtained from mixing one metal with another; and implements of brass derived their temper from alloying copper with different proportions of tin or lead.

When Tyre was besieged by Alexander, its inhabitants distributed arms among the youth, and filled the workshops with artificers, with which their city abounded: but when they put the iron into the forge and were blowing up the fire, a sort of red stream rose under the flame, which resembled blood, and which they interpreted as a bad omen to the Macedonians. This account is from Q. Curtius †: the following relation is from Diodorus Siculus:—The soldiers of Alexander, during the siege, were annoyed from the walls by showers of sand, made red hot in shields of iron and brass. Large red hot plates of iron were, also, thrown upon them out of machines, and their artillery were broken, and their men killed, by *gunning* irons and crows‡.

The reason which Agatharcides assigns for brazen tools being used in

\* Plutarch's Life of Alexander.

† Lib. iv. c. 2.

‡ Diqd. Sic. lib. xvi. 2. Curt. lib. iv. c. 3.

gold mines in Egypt, in the time of the first kings of that country, namely, because iron was then scarce, is a conclusive proof, that iron, in his time, was plentiful and commonly used in mining tools, and that brass was not then applied to that purpose.

I think I have now sufficiently proved, from Hebrew and Greek writers, some of them contemporary with the use of brass in arms and edge tools, that, in very ancient times, several of the nations, whose territories border upon the Mediterranean Sea, formed a great variety of implements of brass, which they afterwards made of iron. My next object shall be to shew, that when any of these ancient brazen implements fell under the notice of the learned Greeks of succeeding ages, they attributed them to an æra in which iron was scarce, and to a date either prior, or very little posterior, to the wars of Troy.

Diodorus says, that the Egyptians had among them a tradition that the art of forging copper and gold was discovered at Thebes; and that they were first made into arms to extirpate wild beasts, and afterwards employed in agriculture\*. This testimony is corroborated by that of Agatharcides, already noticed in different parts of this essay: "There are found, even in our days, in the old workings of gold mines, in Upper Egypt, stone-chissels of brass, (which were used in these ages on account of the scarcity of iron) and incredible quantities of human bones, which show too clearly that great numbers of persons perished in these loose and extensive excavations." This author flourished about 180 years before Christ †.

Plutarch relates, that "the Athenians were directed by the oracle of Apollo to take up the bones of Theseus, which were buried in the isle of Scyros, and to deposit them honourably among themselves.

\* Lib. i. p. 9.

† Tacitus mentions a dispute between the Lacedæmonians and Messenians, respecting the right each party claimed in the temple of Diana at Limnæ, which was referred to Augustus; and in which the Messenians appealed to the testimony of records on stone and ancient brass—"Ære prisca".—Annal. iv. 43. Elz. p. 174. See Pausan Lacon chap. ii.

But it was difficult either to discover his tomb, or take up his remains on account of the inhospitable and fierce disposition of the barbarous inhabitants. Cimon, however, having conquered the island, felt a desire to find the bones; and seeing an eagle, on a certain elevated spot, beating the ground with her beak, and scratching it up with her claws, a sort of divine impulse directed him to open the place, where he found the coffin of a large body, and a spear head of brass, and a sword lying by it." This oracle was delivered while Phædon was archon, before Christ, 470; and Cimon died A. C. 449. This same story is related by Pausanias, and a similar one respecting the bones of Orestes, which the Spartans had, by a certain oracle, been commanded to seek\*. "Lichas, coming to Tegea, collected them as if they were deposited in the work-shop of a copper-smith. The manner of collecting them was thus:—as many things as he found in the brazier's shop, he took them for the Delphic riddle, *προς το εκ Δελφῶν μαντευμα*—likening the bellows of the brazier to the winds, because they emit a violent blast; the blow, was the hammer; the thing beaten, the anvil; and the emblem of man's destruction was *iron* †; because it *now began* to be used in war: for if the god had delivered this with respect to those called heroes, the destruction of man would have been brass; for, that all the arms of the heroes were of brass, Homer is my authority, where he speaks of the axe of Pisander, and the spear of Merion. My reasoning is further confirmed by the spear of Achilles, laid up in the temple of Minerva at Phæseus, and the sword of Memnon, in the temple of Esculapius; for the head and pike, ' *ἡ αἰχμη και ὁ σαρωτηρ,*' of the spear and the whole of the sword were made of brass: and these things we know to be so."

Pausanias derived this account from Herodotus, who relates it in the following manner:—"At this time a commercial relation existed between the Tegeans and the Spartans; and Lichas, while at Tegea, coming into a brazier's shop, ' *εἰς χαλκῆιον,*' and seeing him beating

\* Laconics. cap. iii. sec. 6. Edit. Fac. v. 1, p. 341.

† For the words of this oracle, see Herod. i. sec. 68.

out iron, was greatly struck with the sight of the process. The smith, ‘χαλκεις,’ perceiving his astonishment, paused from his work and said: ‘Since you so much admire the method of working iron, you would, O stranger of Sparta, be surprised, were I to inform you of a circumstance with which I am acquainted: for as I was making a well in this building, in digging, I fell upon a coffin seven cubits long; and, because I could never believe that men were formerly larger than they are at present, I opened it, and found a body of the same length as the coffin, which, after I had measured it, I reburied.’ From this account Lichas was induced to believe that he had met with the fulfilment of the oracle respecting the body of Orestes: for he thought that the pair of bellows which he saw, might be the two winds; the anvil and the hammer, form opposing form; and the act of beating out iron, mischief heaped on mischief; founding his conjecture on this, *that iron was discovered to the injury of man.*” This transaction is supposed to have occurred about 560 years before Christ, and Herodotus flourished about a century afterwards.

Some hints and inferences may be collected out of Pausanias, respecting the state of metallurgy in the time of the Trojan war, and the process employed in forging the arms of the heroes; for he informs us that the first statues of brass consisted of numerous pieces joined together with nails, in such a manner that they had the appearance of a woven garment. The oldest of this kind was one of Jupiter, in Sparta, said to have been made by Learchus, of Rhegium, who, according to some, was the scholar of Dipœnus and Scyllis; but according to others, of Dædalus\*. This method continued till long after the fall of Troy, for our author, speaking of a statue of Minerva, said to have been found among the spoils of that city, says, he could not be brought into the belief of the account, because the Samians, Rhœcus and Theodorus, were the inventors of the art of casting brass†; and, in another place he professes to believe, “that the sceptre or spear of Agamemnon, which, in his time, was preserved at Chæronea, was the

\* Paus. vol. i. p. 406. ii. 392.

† Id. vol. ii. 301.

only work of Vulcan, that the poets had sung upon, or had descended to posterity with the praise of other men, that was deserving of credit as genuine. For though the Lycians, in the temple of Apollo at Pataræ, have a brazen cup, which they exhibit as a work of Vulcan; yet they are not aware that Theodorus and Rhæcus were the first who wrought in melted brass." We have, therefore, in these passages, the authority of Pausanias, for the conclusion that the warlike weapons used in the time of the Trojan war, were made of hammered brass\*; which strengthens the inferences I have already drawn from Homer's description of implements used in making the shield of Achilles †: but the testimony of Pausanias respecting the discoverers of the art of casting brass, is applicable only to the Greeks: for many of the implements of the tabernacle of the Hebrews were founded in brass and silver ‡, 300 years before the Trojan war.

Pliny says, that "Cinyra, the son of Agriopa, both invented tyles and discovered mines of brass in the island of Cyprus; and that Aristotle supposed that Lydus, a Scythian, found out the art of smelting and tempering brass; though Theophrastus attributes these discoveries to one Dela, a Phrygian. Some attribute the trade in brazen utensils to the Chalybians, some to the Cyclopians." ||

The evidence I have been able to collect respecting the use of brass in edge-tools among the Romans, is neither so full nor so decided, as that I have advanced respecting its similar application among the Greeks. It began to be disused in Italy long prior to the age of the most ancient Latin authors, whose works have descended to us. We have, however, both the testimony of history and the remains of antiquity to prove, that there once existed in Italy a state of society somewhat resembling that of the heroic age amongst the Greeks, with respect to the use of that metal.

I have already shewn that the Sabines and Etruscans used implements

\* Id. vol. iii. 134 and 301.

† See p. 31.

‡ Exod. xxx. 27, 28.

|| Nat. Hist. vi. 56.

of brass in their religious ceremonies. It was the same in Rome. The high priest of Jupiter cut off his beard with brazen scissors\*. Romulus, about 750 years before Christ, marked out the boundaries of Rome, in a circle round the tomb of his brother Remus, with a plough upon which he put a brazen share, “ὁ δ’ οἰκιστὴς ἐμβάλων ἀροτῶν χαλκῆν ὕννιν, &c.” † This ceremony was performed by Etruscans, who had an ancient ritual, which they always used in founding cities, temples, altars, walls, and gates, as may be seen in Festus, and in the authority already cited from Macrobius. Among the spoils which Romulus carried from the city of Cameria, was a brazen chariot, which he consecrated in the temple of Vulcan.

Plutarch enumerates only eight of the trades, which Numa incorporated in Rome, the only two of which connected with metallurgy, were goldsmiths and braziers ‡, the college of the latter of which, according to Pliny, was the third in the order of institution: “collegio tertio ærarium fabrorum instituto” ||. It is, however, probable, that the ‘χαλκιοὶ,’ mentioned by Plutarch, included *black-smiths*, as the Greeks expressed under that term such as wrought in iron as well as brass.

It has been asserted, on the authority of Livy and Dionysius Halicarnassus, that copper, amongst the Romans, supplied the place of iron for many ages, in arms and all kinds of tools and utensils §. Livy says, that Servius Tullius, when he instituted the census at Rome, divided the people into classes and centuries, and ordained that the first class should have “a helmet, shield, greaves, and coat of mail, all of brass, as a covering for the body; the offensive armour should be darts, a spear, and a sword”. ¶ The words of Halicarnassus are, “he commanded them to bear Argive shields, spears, helmets of brass, breast plates, greaves, and swords”. \*\* But the evidence here, that the spears and swords were of brass, is, at best, of a negative kind.

\* Serv. on Ænid. i. 448.

† In his Life of Numa.

§ Goguet Orig. of Laws, vol. i. p. 157.

\*\* Oxford Edit. 1704. vol. i. p. 212.

† Plut. Life of Rom.

|| Nat. Hist. xxxiv. 1.

¶ Lib. i. chap. 43.



Indeed, I think, that it amounts to a sort of proof that they were of iron; for if they were not, and Livy did not intend to convey such an idea to a Roman ear, why does he tell us that the defensive armour was of brass; but not particularize the sort of metal of which the offensive armour was made? There can be no dispute but that shields, helmets, and the like, were indifferently made of skins, cloth, and various sorts of metals: most commonly of leather, brass, or iron. He, therefore, to record a direct historical fact, mentions the particular substance of which the "tegmenta corporis" were made; but that of the "tela in hoste, hastaque, et gladius," is not mentioned, because every person in his time would naturally infer that they were made of iron.

That the inhabitants of Italy did, however, in some period of their history use brazen arms, is confirmed beyond all question, by the great numbers of all sorts of warlike weapons which have, from time to time, been dug up in that country.

"We may assuredly say," says a celebrated antiquary, "that of old, even after the use of iron was known, they made use of brass for arms, and other things, which at this day are all made of iron. A heap of brazen arrows was found at Rome, the number of which was so great, that several boats were loaded with them. They also made use of brass nails in boats, of so hard a temper, that they could drive them as well as iron ones: of this kind I myself brought one from Italy, taken from the ruins of Porto."\* Two-edged tools, of the kind called celts, were found in Herculaneum.

The same observation is also applicable to other countries. Brazen swords, spear heads, chissels, and augers, of various shapes, have been discovered all over Europe, as well in parts which were once comprised within the Roman dominions, as in those to which it never extended. Count Caylus says, that fourteen celts were found under a stone twelve leagues from Paris, on the road from Versailles to

\* Montfaucon's *Antiq. Expl.* vol. iv. p. 37. See also *Le Recueil d'Antiq.* par M. le C. de Caylus, vol. i. p. 237, 238, 261, and 262, as quoted by Goguet, vol. i. p. 157.

Houdan, and that some of the number appeared as if they had never been used. Many have also been found near Lyons\*. Others on a mountain in Spain, between Lamas del Mauro and Carcalai, about twelve miles from Oviedo, in 1760 †. I could also bring numerous authorities for their having been found in Norway, Sweden, Denmark, and in various parts of Germany and Russia; but the fact is too well known to stand in need of proof.

But I know of no account in any ancient author, of any of these nations using brazen armour. Strabo does, indeed say, in his description of the armour of the *Lusitanians*, that “some of that people used spears, headed with brass” ‡; and that the *Massagetæ* used “battle axes of brass” ||. But, I conceive, that he gives the latter account on the authority of Herodotus, and not from any knowledge he had, that the *Massagetæ*, in his time, continued to arm themselves as they had done 450 years before. As to “some of the *Lusitani* using spears with brazen heads,” there is no such account in the continuation to Cæsar’s Commentaries, or in any other ancient author, with which I am acquainted. And Diodorus Siculus, after describing their shields, expressly affirms, that “they use bearded iron darts,” and “have helmets and swords like those of the *Celtiberians*,” who “wore brazen helmets, having plumes of a hand breadth in height, and two-edged swords, the blades of which were made of the very best steel” §.

Any difficulty that would arise in this part of the inquiry respecting the brazen falces, mentioned in the fourth *Æneid*, as used for cutting herbs with for incantations, has been sufficiently removed by shewing out of Macrobius, that Virgil borrowed his notions on that subject from Sophocles. Indeed, there could have been no need of illustrating that passage, if brazen implements for cutting with had been used in the time of Macrobius, or had commonly occurred as such

\* Archæol. v. p. 117.

† Lib. iii. p. 106.

§ Rer. Antiq. l. v. c. ix.

† Id. p. 118.

|| Id. p. 352.

in Latin authors; but there was a mystery in it, and the commentator could clear it up only by advancing a sort of parallel custom out of the tragedies of Sophocles and the ancient books of the Tuscan and Sabine priests. Ovid also introduces Medea using brazen falces in incantations\*.

But this was not the only thing in which the ingenuity of Virgil applied his knowledge of the ancient use of brass to the purpose of embellishing his poetry. He was not content that the steel armour of his time should gleam alone through the *Æneid*; but he sometimes introduced the corruscations of the brazen swords of Homer, as in this verse:—

“*Æratæ micant peltæ, micat æreus ensis*” †.

But the poet probably used the word “*æreus*” here entirely for the sake of quantity; for I cannot discover any other place in the *Æneid* where either swords, spears, or arrows of brass are mentioned. The shields and body armour are commonly of brass, the swords and spears of iron. In the following lines,

“*Vestibulum ante ipsum primoque in limine Pyrrhus  
Exultat, telis et luce coruscus ahenâ.*” ‡

The “*lux ahenâ*,” I think, was given from the defensive armour only. But in the account of the Amazon Camilla and her attendants, one of the heroines is introduced armed with a battle axe of brass:

“*— Æratam quatiens Tarpeia securim*” ||.

Here, then, are three instances produced from Virgil, of his mentioning implements, intended for cutting with, as being formed of brass: one of them used in incantations; the second a sword, where it is probable that Virgil wrote “*æreus*” instead of *ferreus* for the sake of quantity; and the third, the battle axe of a race of heroines, who, perhaps,

\* *Metam.* vii. 223.

† *Æn.* vii. 743.

‡ *Id.* ii. 470.

|| *Æn.* xi. 656.

never had any other existence, than that which poetry and fable have given to them.

This is the only information I have met with, respecting the use of brass in arms and mechanical implements among the Romans, before their conquest of Britain. It contains no authority for the conclusion that they used brass in edge tools, in the Augustan age. It indeed appears to me, that there is no decisive evidence respecting the æra in which they applied it to such purposes. The notice of the brazen plough share, used in the Tuscan ceremonies at the foundation of Rome, affords no proof that brass, in that age, was employed in agriculture; on the contrary, I think, Plutarch, by particularising the metal of which the share was made, and connecting it with the religious rites of a people celebrated in antiquity for the use of such mysteries, meant to convey an opposite idea. But the great quantity of arrow heads of brass discovered in Rome either proves that brass was employed in arms after the foundation of that city, or that it had been the scite of some ancient town or fortress before the time of Romulus. Again, brass was certainly out of use when "Porsenna, in his treaty with the Romans, after the banishment of their kings, expressly forbade them the use of iron, except in agriculture:" for the prohibition of it in every other thing but agriculture, implies the previous use of it in other things. I have already noticed two similar occurrences in the history of the Hebrews\*.

Pliny, too, as far as I could discover, in an attentive perusal of his Natural History, has no allusion to brazen implements, though he has several on the methods of making brass, and the purposes to which it was applied in his time; for it was a great article of luxury in the height of Imperial Rome, being then made into candelabra, capitals and pedestals of columns, the feet of tables, couches, and beds: also into the doors, statues, and various ornaments of temples. Perhaps the objection to Camillus having brazen doors to his house was of a religious kind, because it was considered an act of impiety to

\* See p. 29.

emulate the splendour of the temples in the ornaments of private houses\*.

I have already given my reasons for supposing that the Romans made their arms of iron before the time of Porsenna, above 500 years before Christ. The words of Pliny are, "In fœdere, quod, expulsis regibus, populo Romano dedit Porsenna, nominatim comprehensum invenimus, ne ferro nisi in agricultura uterentur. Et stilo inscribere intutum est, ut vetustissimi autores prodiderunt." I know of no other Latin author who has noticed these facts: they were probably concealed because they sounded harshly on a Roman ear. Pliny, however, was a native of Verona, which city was founded by the Tuscans; he was, therefore, perhaps glad of an opportunity of shewing that Tuscany was once in a state to dictate terms to Rome. But these are not the inferences which apply to my present purpose. The humiliation of the Romans was so complete, that they were forbidden the use of iron even in the style; it was then unsafe to use it. Nothing, therefore, can be more plain than that iron styles were then in use as well as iron armour: indeed Valerius Maximus tells us that Mutius, when he entered the camp of Porsenna, was "ferro cinctus," and the conditions of the treaty confirm the probability of his assertion.

It were easy to collect out of Latin historians and poets, the most irrefragable testimony that the people of Rome, through all the ages of their authentic history, were in the habit of forging iron into all kinds of tools and implements. The word *ferrum* was synonymous to *arma*, and meant any weapon or tool made of iron. But I shall omit all evidence of this kind, and content myself with bringing a few proofs from Pliny, and other authors, respecting its general use, and the places in which it was procured in Italy, and in the countries of Europe most contiguous to Britain.

\* Pliny xxxiv. 3. Tac. Anal. iii. Ed. Gron. i. 231. Cic. Ep. ad Attic. Lib. ii. Ep. 1. Tac. Hist. ii. where he mentions brass and lead as being used in cramping large stones together. There are cramps of brass in Trajan's column.

“Iron,” says Pliny, “is both the best and the worst article of human life: for with it we till the ground, we plant shrubberies, we set fruit trees, and by cutting away their decayed parts, force the vines into a sort of perpetual youth. With this we build houses, we hew stone; we apply iron to all other uses. But it is the instrument of wars, and slaughter, and depredation; not being used hand in hand only, but in a missile way and feathered; now shot from engines, now thrown from the arm, now winged: which I esteem the most execrable artifice of human ingenuity. For that death may come more quickly to man we fledge it, and give wings to arrows. But the blame cannot be laid upon nature: numerous experiments have proved, that the physical properties of iron are innocent.”

“Mines of iron are found almost every where, inasmuch as even Elba, an Italian island, produces it. They are discernable without the smallest difficulty, being distinguishable by the colour of the earth. But the same means are used in smelting all sorts of ores. In Capadocia only there is a question whether it be more allied to water or to earth, since the earth, washed in a certain river, without any other preparation, gives iron from the furnace.

“The different sorts of iron are numerous: the first consists in the kind of soil or climate that produces it: some yield a metal that is quite soft and akin to lead: some a brittle and brassy sort, to be particularly avoided in the use of wheels and in nails, to which the former sort is suitable. Another kind only answers in small things, such as nails and the studs of greaves; another is more readily susceptible of rust; and all these are called *stricturæ*, a word applied *a stringendo acie*, of which other metals are not capable. And there is a great difference in furnaces: for in these, the best of the iron (*nucleus ferri*) is refined for edge-tools, and by a different process is solidified for anvils, and the heads of hammers: but the greatest difference is in the water into which it is dipped while hot; this being in some parts more useful than others, has rendered certain places famous for the excellency of their iron, as Bibilis and Turioso in Spain, and

Como in Italy, though there are no iron mines near them. But the palm of excellence is due to the Chinese iron before all other kinds: they send it with their garments and furs. The second in excellency is the Parthian: no other kinds of iron but these are formed of pure steel: in the rest it is mixed. That in our part of the world welds more kindly. In some places the ore gives this goodness, as in Norica: in some the mode of manufacturing; as by the waters of Sulmo: for there is even a difference between whetstones for oil and those for water in sharpening, the edge becoming finer with oil. It is also strange that, when the ore is smelted, the iron becomes liquid like water, but, after cooling into sponge-like masses, is brittle. The practice is to temper the lighter sorts of iron tools in oil, lest, if dipped in water, they be hardened to brittleness."

"Iron heated in the fire, unless hardened by blows, is spoiled. It is not fit to be hammered while it is red, not before it begins to grow white. Besmeared with vinegar or alum, it gets the appearance of brass. It is defended from rust by ceruse, and gypsum, and liquid pitch. This is the mixture which the Greeks call *Antipatheia*. Some, indeed, say that this may be effected by a sort of religious charm, and that there exists in the town called Zeugma, on the Euphrates, an iron chain, with which Alexander the Great had fastened a bridge, the rings of which, that have been since repaired, are infected with rust, of which the original ones are free."

Aristotle, speaking of Elba, says: "It is an island belonging to the Tuscans, which they now call *Æthalia*, and in which there are mines of brass, of the kinds of which their brazen vessels are at present manufactured; but they have failed, and produce nothing at present. In the lapse of time, these same mines have, however, yielded, not indeed brass as formerly; but iron of that sort, which the Tuscans use, and which they call Poplianian," \* probably from its having been manufactured into different sorts of implements at Populonia, a town in Tuscany.

\* Arist. Op. vol. i. p. 1094.

Virgil, in enumerating the forces of Æneas, has the following notice of Elba and its mines, in conjunction with Populonia:—

“ Sexcentos illi dederat Populonia mater  
 Expertos belli juvenes: ast Ilva trecentos,  
 Insula inexhaustis Chalybum generosa metallis.”\*

Diodorus Siculus says, that “ Æthalia is in the Tyrrhenian Sea, opposite the city of Populonia, and about one hundred stadia from the continent. It had its name from a general called Æthalia, who governed it. In it the stone, out of which iron is forged, is dug; for they quarry that sort of mines, with which the island abounds. The iron melted from these stones, in furnaces, is divided into pieces resembling large sponges, in which shape the merchants bring it to market. Of this iron, artificers make the various kinds of implements suitable for agriculture and the different arts.” †

Pliny only says of this island, that it is called Æthalia by the Greeks, and that it has iron mines ‡; and in another place, that iron is found in almost every place, for even Elba, an island of Italy, produces it. §

Norica, a country at present included within the Austrian dominions, was, in ancient times, celebrated for its iron. Clemens Alexandrinus attributes the discovery of making iron malleable to its inhabitants ||. Its iron was of excellent quality ¶, and the swords made of it were in great repute, as appears from the following lines of Horace and Ovid:—

——— “ quas neque Noricus  
 Deterret ensis, nec,” &c. \*\*  
 “ Modo ense pectus Norico recludere.” ††  
 “ Durior et ferro, quod Noricus excoquit ignis.” ††

\* Æn. lib. x. l. 173.

† Lib. v. c. 5.

‡ Lib. iii. c. 6.

§ Lib. xxxiv. c. 14.

|| Strom. l. i. p. 365.

¶ Plin. l. xxxiv. 14.

\*\* Hor. Od. lib. i. od. 16.

†† Hor. Epod. xviii. 19.

†† Ov. Metam. lib. xiv. l. 712. See also Zonar. En. v. iii. p. 125, l. 58, respecting Ferrea.



The Celtic tribes, who inhabited Spain, “ used shields of the length of a man, and ornamented according to the fancy of the owner. Some had them embossed with the figures of animals, in brass, slightly raised, as well for ornament as for defence. The head they protected with low brazen helmets, on which horns were stamped, or the figures of birds or beasts were carved. Their trumpets, after the manner of savages, were made to give a shrill and alarming sound. They use *iron cuirasses*. Some, to whom nature only has given arms, fight naked. Instead of swords they wear *longish iron knives*, hanging from their right shoulders in chains of brass. Some over their vests have belts of gold or silver. They also fight with darts, which they call *lances*, and which have *iron heads* of about a foot and a half in length, and something less than two hands broad. Their swords are not shorter than the boar spears of other countries; and their boar spears are broader at the point than swords; these they sometimes make straight, sometimes curved, so that they either strike or stab their adversaries.”

“ Some of the Celtiberians have light bucklers, others have round targets, of the size of shields. They twist greaves, made of hair, round their legs. They wear brazen helmets, with plumes. Their swords are two edged, and have blades of the very best iron, and with these they carry daggers, about a span long, which they use in close fight. They prepare iron for arms after a manner of their own; for they put thin iron plates into the earth, where they let them remain till the weakest part is consumed by rust; the stronger part remains, and of this the most excellent swords, as well as other sorts of arms necessary in war, are made. No shield, helmet, or other sort of defensive armour is proof against weapons which have been fabricated by this process.”\* Plutarch, in his treatise on Primitive Cold says, that “ smiths throw marble and the chippings of stone upon iron that is hot and ready to melt, thereby preventing over much flux, and causing it to cool.” I

\* Did. Sic. Rer. Antiq. lib. v. c. 9.

suspect that this process, by supplying the iron with carbon, assisted in forming it into steel.\*

“The Lusitanians use small bucklers made of sinews. These they use with so much quickness, that they both ward off blows and arrows with them. Their darts are of iron and barbed. They wear a helmet and a sword, after the manner of the Celtiberians. They throw their darts to a great distance, and with exquisite skill.” †

That the Gauls were well acquainted with the use of iron, is sufficiently evident from their using inch bolts of it in their ships, and iron chains instead of cables, in Cæsar’s time ‡, who also informs us that the Bituriges, a people of Berry, “drove mines under the mount, which his soldiers raised against their city,” and that “they were the better skilled in that art, because they had large iron mines amongst them; and had the knowledge and use of all sorts of drifts”. § A sort of stakes, with hooked iron heads, were used by the Romans at the siege of Alesia, and these they called Stimuli. || “The people of Marseilles had a sword which they had preserved from the foundation of their city, and with which they executed criminals. It was indeed eaten with rust, and scarcely fit for its office: but it serves to show that even in the least matters, all the vigour of an ancient custom is to be preserved.” ¶

Plutarch, in his life of Caius Marius says, that “the Cimbrian cavalry wore helmets which represented ferocious wild beasts, with open jaws and of uncommon shapes: on these they fixed plumes of feathers to make them appear taller. They were also adorned with breast plates of iron, and their shields were white and glittering. Each had a double edged javelin, and in close fighting they used large and heavy swords.” \*\* These were the weapons of one of the German

\* *Morals*. Steph. ed. p. 1757. The same author also says, that iron is one of those things which, if dipped in water is made more solid and compact by the cold in proportion to its being hotter, p. 1743. See also the Cluet process of making steel in *Philos. Magazine*.

† *Diod. Sic. Rer. Antiq. lib. v. c. 9.*

‡ *De Bel. Gal. iii. 13.*

§ *Id. vii. 22.*

|| *Id. vii. 63.*

¶ *Val. Max. lib. ii. cap. vi. sec. 7.*

\*\* *P. 767.*

tribes, one hundred years before Christ. Let us see how it answers to the descriptions of other historians.

Tacitus filled an official situation under the Roman government in Germany ; we may, therefore, suppose him to have left us some account of the kind of metals which the Germans used in their offensive armour ; and accordingly we find him relating, in his account of the manners of that people, that “ iron did not abound among them, which he inferred from the kind of darts which they used. Swords and the greater lances were rare among them ; but they bore spears, which they called *frameæ*, having short and narrow iron heads, but so sharp and convenient, that, as circumstances required, they either closed with them or threw them at the enemy. Their cavalry were content with a spear and a target. Each of their infantry has several missile weapons, which they throw to an immense distance.” This he says of the Germans in general : there are a few other scattered hints in his enumeration of their several tribes.

“ The strength of the Catti consists of foot soldiers, whom they load not only with arms, but with iron tools and provisions—*quem super arma ferramentis quoque et copiis onerant*. The bravest of them, till they have slain an enemy, wear an iron ring, which they consider as an emblem of ignominy and slavery, and from which nothing but the blood of an enemy can absolve them.”

“ The tribes of the *Æstii* inhabit the right coast of the Baltic Sea. They speak a language somewhat resembling the British. Iron is rare among them, clubs being their chief weapons.”

These extracts are sufficient to prove, that in the time of Tacitus, brass weapons were not in use among the Germans. He has no allusion to them. But from Eccard and other German authors, it is evident that arms of brass were at one period common in that country, for several of them have been discovered in the Holsatian and other barrows, which also contain spear heads, hammers, and hatchets, all of stone ; and we know that the mode of burial which had prevailed when these implements were committed to tombs, was still common in the time of

Tacitus. "Their funerals," says he, "were without ostentation. They attend to nothing more than burning the bodies of distinguished persons with certain kinds of wood. Neither garments nor perfumes are thrown upon the pile; but the arms of every one, and sometimes his horse, are committed to the flames. Earth composes the tomb. The pomp and laborious honours of monuments they reject as oppressive to the dead."\*

Having seen that arms and implements of iron were in common use among the continental nations of Europe, both before and after the time of Cæsar, it remains that some enquiry be made into the trade carried on by the ancients with Britain, and into the history of the use of brass, iron, and tin amongst its inhabitants, prior to the invasion of their country by the Romans.

Great Britain and its adjacent isles received the name of *The Britanic Isles*, from two words *brët — ānāc*, which in the Phœnician language signify *The Land of Tin*: amongst the Greeks they were called *the Cassiterides* for the same reason, as is evident from these words of Mela, "quia plumbo † abundant, uno omnes nomine Cassiterides appellant;" and these of Pliny; "Cassiterides dictæ à Græcis à fertilitate plumbi."

In what æra the people who inhabited the shores of the Mediterra-

\* See Luc. Phars. lib. ix. l. 175. and the account of the tomb of Childeric, king of the Franks, in which his spear, sword, &c. were found.

† The ancients, and especially Pliny, seem to have supposed that tin and lead were of the same species of metals, at least that they were both produced from the same kind of ore; for in speaking of the metal which he calls black lead, he says "Plumbi nigri origo duplex est: aut enim sua provenit vena, nec quicquam aliud ex se parit: aut cum argento nascitur, mistisque venis conflatur: ejus qui primus fluit in fornacibus liquor, *stannum* appellatur: qui secundus, argentum; quod remansit in fornacibus, *galæna*, quæ portio est tertia addita venæ; hæc rursus conflata, dat, nigrum plumbum, deductis partibus duabis." From the same author it is, however, evident that by album plumbum, stannum, and candidum plumbum, tin was signified; for in another place, speaking of lead, he says, "it is of two kinds, the white and the black: the white (candidum) is the most valuable, and is called by the Greeks, *Cassiteron*:" and "the white (album) has got the superiority, and in the Trojan age, as Homer testifies, was called Cassiteron."—Nat. Hist. xxxiv. 16.

nean sea first visited Britain, is exceedingly uncertain. Pliny says, that "Midacritus was the first, who brought *plumbum* from the island, Cassiterides." And Bochart observes, that this name should be read *Melicartus* or *Melcarthus*, that is, according to Sanchoniathan, the Phœnician Hercules, to whom his countrymen attributed the first voyages to the western parts: \* for Midacritus is a Greek name, and the Greeks, as Herodotus ingenuously confesses, were unacquainted with the Cassiterides from whence the tin they used was derived. Many are of opinion that the Phœnician Hercules was a contemporary of Moses: Bochart thinks their first settlement in Spain was made in the time of Joshua. †

That the ancients derived their tin from Britain and the Scilly islands, may be satisfactorily proved. The only thing which Herodotus was able to speak decidedly upon with respect to the Cassiterides was, that they were situated in the ocean, on the western side of Europe, and that the tin and amber imported into Greece, came from these remote parts. Polybius, in the third book of his history, promises to give some account of the British islands, and the methods of preparing tin; and, that he performed that promise in some of his books that have perished, is evident from a passage in Strabo, in which he compares and criticises upon the opinions of Pytheas, Dicæarchus, and Eratosthenes, respecting the extent of Britain. Strabo himself calls Britain a country rich in tin and lead. Diodorus Siculus says, that it is dug up in the island of Britain in rocky ground, and after being smelted, is exported to Gaul; and Cæsar mentions "album plumbum" as a product of Britain.

\* An inscription discovered at Malta, on a piece of marble, and written in Phœnician and Greek characters, mentions the Phœnician Hercules, and is thus translated by the Abbè Barthelemy: The Phœnician:—"We Abdassar and Asseremor, the sons of Asseremor, the son of Abdassar, having made this vow to our Lord *Melcrat*, the tutelary divinity of Tyre: may he bless and guide us in our uncertain way." The Greek thus:—"Dionysius and Serapion to Hercules, surnamed Archegetes." See Boisgelin's Hist. of Malta, vol. i. p. 5.

† Phaleg, lib. iii. p. 189.

The fact that the ancients derived their tin exclusively from Britain and the Scilly islands, furnishes us with a proof that these countries were sometimes called the Hesperides and the Oestrymnides. Dionysius Periegetes has the following lines :

The stern Iberi's wealthy offspring dwell  
In isles, Hesperian called, where tin abounds.

These Iberi were the Silures, a people who, according to Tacitus, resembled the Spaniards. And Festus Avienus evidently alludes to Britain and its islands, where he says, that " the Oestrymnides stretch far out into the sea, and are rich in mines of tin and lead". \*

I am, however, aware that both Diodorus Siculus and Pliny were of opinion that Spain produced tin. The words of Diodorus are " Tin is found in many places in Spain, not accidentally, as some authors assert; but the report is, that it is mined and smelted in the same manner as silver and gold. For over against Lusitania, very much tin is dug up in islands of the ocean, not far distant from Spain, which from their tin are denominated the Cassiterides: much, however, is

\* Concerning the island called Atlantis, which Homer describes as a sort of terrestrial paradise, and which was afterwards largely written upon by Solon, though there are many fabulous things related concerning it in the writings of the ancients, yet it is certain that it was situated in the Atlantic ocean, and on the coast of Africa. The Greeks derived their accounts of it from the Egyptians; for Solon, according to Plutarch, heard its history from Psenophis and Senchis, two Egyptian priests. Aristotle says, that it was discovered by the Carthagenians, and that it was many days sail from Cadiz. Plato makes it of greater extent than Asia and Africa; but that it was swallowed up by the sea in one night and a day; and Diodorus Siculus says, that it was discovered by certain Phœnicians, who, after being many days tossed about by a tempest that overtook them on the coast of Africa, were at length driven to this island. Plutarch, in his life of Sestorius says, they are two in number, separated by a narrow frith of 10,000 furlongs from the coast of Africa. They call them the Fortunate Islands. He gives a large description of them, and says that they are the same as Homer has described in the fourth book of the Odyssey. Perhaps all the accounts of them are more or less mixed with fable; but they shew clearly enough, that the Egyptians and Phœnicians at an early period were accustomed to make voyages in the Atlantic ocean at early periods of their history.

taken from the island of Britain to the opposite shores of Gaul." What is to be inferred from this account? Not that tin was really produced in the peninsula of Spain; but in the Cassiterides, which he supposed to be islands of that country. Pliny's account is, that "tin was called by the Greeks Cassiteron, and was fabulously\* reported to be found in certain islands of the Atlantic ocean, from which it was transported in wicker boats, covered with hides. It is now certain that it is produced in Lusitania and Gallacia." What he here asserts cannot be positively denied†; but if he had no better authority for saying that tin was found in Portugal and Gallacia in his time, than he had for pronouncing the report, that tin was found in islands of the Atlantic ocean, to be fabulous, his assertion is unworthy of credit.

I have already noticed that the brazen mirrors, of which the laver and its foot were made‡, were probably formed of a composition of

\* Pliny probably aimed this censure at Timæus, for in his account of Britain he says, on the authority of that author, that "within six days sail from Britain there is an island, called Mictis, in which tin abounds. To it the Britains sail in osier boats, covered with leather." Diodorus' account, which was also probably derived from Timæus, but more correctly stated, is, "that after the tin was dug out of the rocks and smelted, it was carried, when the tide was out, in carts into the island, Ictis, whence it was taken in ships to Gaul, and thence on horses, thirty days journey, to the source of the Po; also to the markets of Narbonne and Marseilles." I take both this Ictis and the Mictis of Pliny to be the same as the Vectis of other Roman authors, and which is now called the Isle of Wight. That there should be many contradictions in the early Greek and Roman writers, respecting the situation of the country from which tin was then derived, is not to be wondered at, when we learn from Strabo, that a Phœnician captain, wrecked his own ship on shallows, in order that the same fate might follow a Roman vessel, which followed him for the purpose of discovering the place from which that people derived their tin; for the Cassiterides were then known only to the Phœnicians.

† It is certain that tin is found in the White Ridge of the mountain Cresta di Gallo, about a league from Ronda; but both the mine and the manufactory for tinning iron plates have been for some time entirely decayed, on account of the plates costing more than they can be imported for into that country from England. The same ridge also contains almost every other metal except iron, which is found in great abundance in a limb of the same mountain, called the Red Ridge. See Jacob's Travels in the South of Spain, p. 330.

‡ P. 18.

copper and tin: and have shewn that tin is enumerated with gold, silver, brass, lead, and iron, as being in use 1452 years before Christ. Isaiah alludes to its being used in purifying the precious metals A. C. 760; and Ezekiel, 112 years after, says, it was brought from Tarshish into the markets of Tyre. From which I infer that the Egyptians, before the Hebrews left their country, were acquainted with tin, and consequently, that they imported it, by the way of Tarshish, from Britain, as the only country where it was to be found, in the same manner as the Tyrians did in the time of Ezekiel.

That the Tarshish or Tarsis of the Hebrews and Phœnicians, the Tartessus of the Greeks and Romans, and the Gadir or Gades of the Carthagenians, were all ancient names for the city at present called Cadiz, in Spain, there is no difficulty in proving. According to Ezekiel's account we have seen, that tin was brought from Tarshish to Tyre: if the ancients, therefore, had tin from no other country than Britain, Tarshish must have been either in Britain, or in some intermediate country between Britain and Tyre.

Polybius quotes certain treaties made between the Romans and Carthagenians, and which were existing in his time, on tables of brass, in the Ædile's chamber, in the capitol at Rome: in the first of these, which was made twenty-eight years before Xerxes invaded Greece, it was agreed, that neither the Romans nor their allies should sail beyond the Fair Promontory, which is a cape in Africa, a little to the west of Carthage. In another treaty, in which the Tyrians and Uticeans were included, it was agreed that "it should not be lawful for the Romans to pillage, or trade, or build cities beyond Mastia and Tarseius," which were cities of Spain, as appears from the same author, where he speaks of the Spanish troops that were sent into Africa, in the time of Hannibal: these were "the Thersitæ, the Mastians, and certain mountaineers of Spain, called Olcades".

Aristotle had heard, that the most ancient of the Phœnicians sailed to Tartessus; and Strabo tells us that where the mouth of the river Bœtis, in Spain, divides into two parts, it is said that in ancient times



there was a city, called from another name of that river, Tartessus\*. The same account is given by Pausanias, † who also mentions two bedchambers of Tartessian brass, as existing in his day, in the treasury of the Sicyonians, in Olympia. Appian says, that the temple of Hercules, which is at the columns, appears to me to have been built by Phœnicians, for Egyptian rites are used in it to this day; and the god of this people is not of Theban but of Tyrian origin. Diodorus Siculus relates that the Phœnicians, sailing in quest of wealth beyond the columns of Hercules, built a city, which they called Gadira: in it, among other edifices, they erected a temple to Hercules, which even to our time continued to be held in the highest veneration ‡. Arrian's account is that the Hercules which was worshipped at Tartessus was, in his opinion, the Tyrian Hercules: because Tartessus was founded by the Phœnicians, and the temple there is built in the Phœnician style. Pliny, from Timœus, says, "nostri Tartesson apellant, Pœni Gadir". || Velleius Paterculus thinks they built it about the time of Codrus, or 1080 years before Christ; and Philostratus and others "call it the ancient Gades".

Bochart has collected authorities out of Strabo, Diodorus Siculus, Mela, Pliny, and other authors, to shew that Spain, and especially Tartessus, were famous in ancient times for the metals, which Ezekiel says Tarsis sent to Tyre. In the time of Solomon we know that the Sidonians and Hebrews carried on a lucrative trade in gold, silver, and other articles, which were probably collected in trading voyages along the coast of Africa and Spain, and their cargoes being usually completed in the great emporium of wealth at Tartessus, it was, therefore, said that their ships went for these things to Tarsis, or as it is usually translated, to Tarshish.

Aristotle had heard that the most ancient of the Phœnicians when they sailed to Tartessus, purchased such large quantities of silver with

\* Lib. iii. p. 148.

† Post. Eliac. xix.

‡ Rer. Antiq. lib. v. c. 7.

|| Lib. v. c. 22. In lib. iii. c. 1. he says, "Carteia, Tartessos a Græcis dicta."

oil and other nautical trifles, that their ships were neither able to hold nor to carry it; they were, therefore, driven to the necessity of making their anchors, and such other tackling of their ship, as could be formed of metal, into silver, before they quitted the place.

Herodotus reports that the Phoceans were the first of the Greeks who made distant voyages, and that explored Iberia and Tartessus\*, about 540 years before Christ; and in another place says, that Coleus, a Samian, was accidentally driven beyond the columns of Hercules to Tartessus, a port at that time but imperfectly known †.

After Moses, Homer is the next author who mentions tin ‡; but no where, that I can recollect, with any reference to the country that produced it, or how the Greeks obtained it. Amber, however, occurs three times in the *Odyssey* ||, and in one of the places a Phœnician merchant is introduced as endeavouring to sell a chain of gold set with that fossil §. Tin and amber also occur in Hesiod ¶; and Herodotus, speaking on certain geographical matters, observes: "I have nothing which I can relate with certainty respecting those extreme parts of Europe, which lie to the west; nor can I assent to those who tell us of a river, which the barbarians call Eridanus, whence it is said amber comes, and which, running northward, empties itself into the sea. Neither have I any knowledge of the islands called Cassitrides, from whence tin comes to us, for the name Eridanus is evidently Greek, and not barbarous; it was probably given by some poet. But though I have diligently enquired into this matter, yet I have not been able to meet with any one, who, from his own observation, could describe to me the nature of the sea which lies on that side of Europe: tin and amber do, however, come from these extreme parts." \*\*

The Eridanus here mentioned, was probably the Rodaun, which, joining with the Motlau, falls into the Vistula near Dantzic, and on

\* *Clio*, sec. 169.

† See p. 43.

§ *Odys.* xv. 459.

\*\* *Thal.*, sec. 115.

† *Melp.* sec. 152.

|| *Odys.* iv. 73. xviii. 295.

¶ *Scut. Herc.* 142. 208.

the banks of which abundance of amber is frequently found. In the time of Diodorus Siculus and Pliny, many absurd notions prevailed about that river being the same as the Eridanus or Po, in Italy; and about the sisters of Phaeton having on its banks been changed into poplars, which annually shed tears that became amber; but they both ridicule these fables, and Diodorus affirms that "amber was got in an island called Basilia, which was situated in the ocean, in a part of Scythia, beyond Gaul. There amber is thrown up in abundance by tempests, and it is found in no other part of the world." Pliny, on the authority of Philemon, says "it is a fossil, and is produced in two parts of Scythia. Sotacus believed it flowed from certain trees in Britain, which he called *Electridæ*. Pytheas said, that there was an estuary of the ocean, called *Metonomon*, the borders of which were inhabited by the *Guttones*, a German tribe; and in which there was an island, distant from the land one day's sail, and called *Abalum*; thither the 'maris rejectamentum' was carried by the waves and hardened: the inhabitants used it for fuel instead of wood; and sold it to their neighbours, the *Teutones*. Timæus was of the same opinion, excepting that he calls the island *Baltia*." From these accounts it is plain, (1.) that from the days of Herodotus to those of Pliny the ancients believed that amber came out of a country on the north west side of Europe; and their descriptions answer to the islands and shores of the Baltic sea\*: (2.) that the Phœnicians traded into Greece with ornaments of amber before the time of Homer: (3.) and consequently that they had some sort of intercourse with certain people of Germany considerably to the north of that part of Britain which produces tin, one thousand years before the time of Christ.

That the Britons did not use edge-tools of brass in Cæsar's time, is, I think, clear, from the following considerations:—1. Their neighbours, the Germans and Gauls, were acquainted with the use of iron; and

\* See these deductions still farther confirmed in Tacitus' account of the *Estii*.

were in the habit of frequent intercourse with them. Many of the maritime parts of Britain were inhabited by Belgians. Divitiacus, in Cæsar's memory, was not only the most powerful prince in Gaul; but had possessions in Britain\*. Some of the Belgians, when in danger from the Romans, fled into this country†. And the Veneti, who lived on the shores of the Bay of Biscay, were expert seamen, and both traded to Britain and derived succour from thence in time of war‡. These and several other notices in Cæsar's Commentaries prove, that there was a regular intercourse between the Britons and Gauls, and consequently, that the arts of each nation were reciprocally known to each other, before Cæsar invaded Britain.

2. Cæsar says, "the Britons use brazen money and pieces of iron ||, adjusted to a certain weight, instead of money. The interior of the country produces tin, and iron is got on the sea coast, but in small quantities; the brass they use is imported." Iron, therefore, of their own produce and manufacture, was in use among the Britons: the brass they had was supplied by foreigners: both were used in money; and if their arms were not sticks and stones, we are forced into the conclusion that their swords and spears were made of iron; for it was better adapted for the purpose of arms, than brass, and cheaper, because obtained at home.

3. Herodian says, they wore iron rings around their bodies and necks by way of ornament, and as a mark of wealth. The German youths also wore iron rings till they had distinguished themselves in battle by killing an enemy. There are also several notices in Pliny respecting iron rings as used among the Romans§.

4. If the Britons in Cæsar's time had used weapons of brass, he could not have failed to notice it as a singular circumstance: but

\* De Bel. Gal. ii. 4.

† Id. ii. 14.

‡ Id. iii. 8, 9.

|| Scaliger reads *taleis ferreis*: some copies have *laminis ferreis*, and others *annulis ferreis*.

§ Vide Tac. de Mor. Germ. and Plin. Nat. Hist. lib. xxxiii. c. 1, and xxxvii. præcæm.

neither he nor Tacitus, though they frequently mention the spears and swords of the British, take any notice of the metal of which they were formed; and Tacitus married the daughter of Agricola, from whom he no doubt derived the accounts of Britain, which he has given in the life of that celebrated general. Herodian, Dio Nicæus, and other authors, in their accounts of the arms of the Britons, are also silent respecting the metals of which they were made: but Mela expressly says, that they were similar to those of the Gauls; from which I infer that they were of iron.

5. Inscriptions to Jupiter Dolichenus have been discovered in Northumberland and Monmouthshire, and that god, as may be seen in Reinesius, was worshipped "*ubi ferrum nascitur*". In several parts of the county of Durham there are large heaps of iron scoria, especially to the west of Lanchester, and in North Tindal; but whether these are the refuse of Roman or more modern furnaces, I have no evidence. Lanchester was, however, a celebrated station of the Romans.

6. All ancient historians agree, that the Silures or ancient inhabitants of Cornwall were of Celtic origin, from the strong resemblances in national character which existed between them and the ancient Spaniards; who perhaps settled there at an early period in the history of the world, for the purpose of working the tin mines, or were brought over by the Phœnicians for that purpose; and we have seen that the Celtiberians were well skilled in the manufacture of iron. Besides which, how could the Phœnicians trade to Britain for any length of time without the use they made of iron, and its being superior to brass in edge-tools, being observed by the persons with whom they traded?

We have seen from Cæsar that the Britons imported the brass they used; and this account is confirmed by Strabo, who says, that Britain "is a country rich in mines of tin and lead, and in hides, which commodities the inhabitants barter for salt, earthen-ware, and articles of

brass".\* From the first of these accounts we learn, that this imported brass was used as money: from the second, that it was brought into the county in a manufactured state, probably in kettles and other household utensils.

In Ziphilin's Epitome of Dion Cassius it is said, that the arms of the British infantry are a shield and a short spear, on the lower end of which is a ball of brass, to terrify the enemy by its sound when shaken. Much of the brass which the Britons imported in Cæsar's time, was probably in bars; for there are strong evidences that before his time they were acquainted with the art of casting it into implements of the kind called Celts, nearly one hundred of which were found on Earsley Common, twelve miles north west of York, "with a great quantity of cinders and several lumps of the same metal". Fourteen or fifteen of them, shewn to the Society of Antiquaries in 1750, were found in a pot, with pieces of metal which seemed to be the same as that of which the celts were made. Two masses of copper were also found with some celts in Norfolk. Ten pounds weight of them were found near Helsdon-hall, in the neighbourhood of Norwich, "with some pieces of copper, that appeared to have been broken off in casting." At Fifield, in Essex, in 1749, a large quantity of metal for casting these implements was found, and several of them, with fifty pounds of the metal, were sent by Earl Tinley to Mr. Lethieuller. †

It is further remarkable in the history of ancient brass, as connected with Britain, that the implements usually denominated Celts, and the spear heads, and swords, discovered in Britain, as well as the brass

\* Strabo also says, that when the Britons sued for peace and submitted to Augustus, duties were laid upon "such commodities as were exported and imported from Britain and Gaul: such as ivory, bridles, chains, vessels of amber and glass, and other like cheap and interchangeable wares".—*Gough's Camden*, vol. iv. p. 200.

† Arch. v. 114—116. *Gent. Mag.* for 1789, p. 799.

coins of the Greeks, Romans, and Gauls, were generally made of a composition of tin and copper.

M. Dizé, in 1796, published in the *Journal de Physique*, an account of an analysis of twenty-five grains of an ancient dagger, which contained tin and copper; and made several experiments on eight different sorts of coins, Greek, Roman, and Gallic, from which it appeared, that they contained from five-twelfths of a grain to twenty-four grains and a third of tin in 100 grains to each of the old metals, but no other metals but copper and tin.\*

Dr. George Pearson, in the same year, gave an account in the *Transactions of the Royal Society*, of certain experiments upon several ancient weapons and implements, one of which was a spear head, which contained nine parts of copper to one of tin, and a very small proportion of silver, which had probably been added accidentally. Three of the other instruments were Celts, one of them from Ireland and another from Cumberland, and each contained ten parts of copper and one of tin: the third had seven and a half of copper to one of tin.

“Copper, alloyed with certain proportions of tin, affords a metal sufficiently hard and strong for chopping tools for many useful purposes. Of such proportions, namely, about eight or nine parts of copper and one part of tin, there is very little doubt all the ancient nations, who were acquainted with the alloys of copper by tin, generally made their axes, hatchets, spades, chisels, anvils, hammers, &c. These metals united in these proportions, I believe, would afford the best substitute known at this day for the instruments just mentioned, now commonly made of iron. Accordingly, before the art of manufacturing malleable iron from cast iron was known at all, or at least practised extensively, that is, till within these last 4 or 500 years, the alloys of copper by tin must have been generally employed. Accordingly these Celts may be considered as specimens of the kind of metal tools in general use, before the art of manufacturing iron in the manner just mentioned was discovered. And it is no small confirmation of this opinion, that by analysis and synthesis we have found these

\* *Philos. Trans.* xviii. 57. *Journ. de Physique*, 1796, p. 272.

metals to contain, in perhaps, most instances, the proportions of tin which renders them most fit for the uses to which they were applied. This proportion being considered to be about one part of tin and nine parts of copper.”\*

Humboldt, speaking of the bronze implements used by the Mexicans, says “that several men of great learning, but unacquainted with chemical knowledge, have maintained that the Mexicans and Peruvians possessed a particular secret for tempering copper and converting it into steel. There is no doubt that the axes and other Mexican tools were almost as sharp as steel implements, but it was by a mixture of tin, and not by any tempering that they acquired their extreme hardness. What the first historians of the conquest call *hard* or *sharp copper*, resembled the χαλκος of the Greeks, and the æs of the Romans. The Mexican and Peruvian sculptors executed large works in the hardest green stone (grünstein) and basaltic porphyry. The jeweller cut and pierced the emerald, and other precious stones, by using at the same time a metal tool and a siliceous powder. I brought from Lima an ancient Peruvian chisel, in which M. Vauquelin found 0·94 of copper and 0·06 of tin. This mixture was so well forged, that by the closeness of the particles its specific weight was 8·815. While, according to the experiments of Briche †, the chemists never obtain this maximum of density but by a mixture of ten parts of tin with 100 parts of copper.” ‡

The same author further remarks, that it is a singular coincidence that tin, which is so little spread over the surface of the globe, should have been used by both continents in hardening copper; and that tin and copper are no way found in the mine naturally mixed, but at Wheal, in Cornwall, where they are in equal quantities. ||

\* Dr. G. Pearson in *Philos. Trans.* vol. xviii. p.

† *Journal des Mines*, an. 5. p. 881.

‡ *Polit. Essays*, iii. 115. Also his *Vues des Cordelières*, &c. p. 118, 121, 122.

|| *Polit. Essays*, iii. 116. Dr. Berger, in his account of the *Physical Structure of Cornwall and Devon* says, there are “thirteen mines producing tin and copper; of which there are four in Redruth, four in Gwennap, three in St. Agnes, and two in St. Neot.” See the *Transactions of the Geol. Soc.* vol. i.



It would, therefore, appear, that, to nations unacquainted with the use of iron, tin, on account of its property of giving hardness to copper, was much more valuable to the ancients than to the moderns. And if tin was used by the Romans in the sestertii and dupondarii, which were all either of brass or bronze (or of copper alloyed with some other metal than zinc or tin), while the ases were entirely of copper, it will follow, that, even among them, tin was of double the value of gold; for the Sestertium, which weighed an ounce, was worth four ases, each of which weighed half an ounce.\*

But the ancients were acquainted with other alloys for hardening or altering the colour or the properties of copper besides tin. Aristotle says, "they report that the brass of the Mossynæci is the brightest and the most white, not being mixed with tin, but with an earth produced in their country, with which it is smelted." Strabo also speaks of a "silver-like metal, found near Andrea, a town of Phrygia, which was mixed with copper to imitate orichalcum." "The best mirrors of our ancestors," says Pliny, "were made at Brundisium, and consisted of tin and copper: now those made with silver are preferred. Praxatiles was the first that made them, in the time of Pompey the Great. The most ductile copper, live sulphur, and silver, are mixed together to form these." † He also tells us, that old household brass was used with copper in casting statues; in other cases, given proportions of lead, and silver yielding lead, were used: for "lead added to copper, gives to the robes of statues a purple colour". ‡ Much may also be seen in the same author respecting cadmia and chalcitis, which were either compound ores, which produced brass, or certain minerals, used as alloys of copper.

\* See Pinkerton's Essay on Medals, vol. i. p. 132, &c. Respecting the metals of which the sestertium and the as were made, the words of Pliny are, "Summa gloria [æris] nunc in Marianum conversa, quod et Cordubense dicitur. Hoc à Liviano cadmiam maximè sorbet et orichalci bonitatem imitatur in sestertiis dupondariisque, cyprio suo assibus contentis."

† Nat. Hist. xxxiii. 9.

‡ But this author sometimes evidently confounds lead with tin and other metals.

The late Bishop of Llandaff in melting a Celt found, that “when in a state of fusion it emitted a blue flame, and a thick white smoke, which are esteemed certain marks of zinc.” In melting it a second time no flame or smoke appeared: “It was composed, I think, of copper, calamine, and tin.”\* But oxides of copper, with which these implements are usually coated, would give both flame and smoke in the manner described. †

Pliny expressly affirms that Aristonides made a statue of a mixture of copper and iron, which existed at Thebes in his time. Count Caylus also thought that the ancients employed iron in hardening their brazen implements ‡; and Humbolt says, “the Greeks made use of both tin and iron at the same time in hardening of copper”.§ This idea has been treated as absurd and impossible. But M. Vauquelin found, that implements not liable to break or yield, might be formed of 0·87 of copper, 0·03 iron, and 0·09 of tin. And there can be no question, but that iron added to copper in the proportion of about one to fifty, makes the copper less malleable, and gives it a reddish hue. The ancients probably used arsenic in making their pale-coloured brass.

As to the uses which the Celts were applied to, there are a great variety of opinions. Mr. Thorsby “supposes them to have been the heads of spears or walking staves of the civilised Britons.” Mr. Hearne thinks them “chisels used by the civilised Britons, for cutting and polishing the stones they used for their works in this island.” Dr. Borlase adopts Thorsby’s opinion, and takes them to have been “the heads of offensive weapons, originally, indeed, of British invention and fabric; but afterwards improved and used by the principal Romans and Britons.” Whitaker holds a middle opinion, and affirms them to have been the heads of light battle axes. Dr. Stukely thought they

\* Chem. Essays, vol. iv. p. 58.

† Abridg. of the Royal Trans. xviii. 50.

‡ Recueil d’ Antiq. Egypt. Etrusque, &c. tom i. 4to. 1761.

§ Polit. Essays, iii. 15.

had been used by the Druids, for cutting the mistletoe and branches of oak with.

“ The Celt,” says a learned writer \* in the Archæologia, “ has long been the *ignus fatuus* of antiquaries. Much has been written on its antiquity, form, material, and uses; probably we may obtain a clue respecting the latter, from a consideration of similar instruments, which have within these few years been brought into this country from the South Sea islands, many of which so much resemble our stone Celts, both in form and materials, that it is almost impossible to determine which is the ancient and which the modern. Our rude forefathers doubtless attached the Celt by thongs to the handle, in the same manner as modern savages do; and, like them, formed a most useful implement, and destructive weapon from these simple materials. If I might be allowed to hazard a conjecture, I should suppose that the metal Celts in our museums were fabricated by foreign artists, and exported to this country; just as we have sent to the South Sea islands an imitation in iron of their stone hatchet, which is now become so scarce as to be deemed an object of curiosity even to the natives of those countries.”

Speaking of Celts in general, Dr. George Pearson says, “ they were probably instruments used by the ancient Britons, Gauls, and Celtæ;” and respecting their use he adds, “ the most probable opinion is, that they were merely domestic tools. Many of the Celts are cast after the model of stone instruments, which are confessedly ancient British or Celtic chopping instruments.”

In the preceding remarks I have used the word brass in its most general acceptation, meaning a mixture of copper with tin, zinc, lead, or some other mineral, in the form of an alloy. In the following concluding observations, by brass, I mean a composition of copper with zinc; by bronze, copper with tin; and iron and steel are used in their proper acceptation.

\* Jos. Hartford, Esq. of Stapleton, Gloucester, vol. xiv. p. 98.

*General conclusions respecting iron.*

1. Meteoric stones, consisting principally of iron in a malleable state, probably led mankind to the discovery of iron from its ores. To this day large balls of iron stone found in certain parts of Sicily, are called thunderbolts, a name they have no doubt received from their similarity in substance and shape to the true aerolite.

2. The Egyptians, in the time of Moses, were well acquainted with the use of iron; and all the agricultural and mechanical implements of the Hebrews, from that age downwards, were of that metal. In the time of David they had it in the greatest plenty, as appears from the account of the immense quantity of it, which he provided for the temple, which his son built.

3. The Greeks supposed that iron was first discovered by the burning of wood upon Mount Ida, 1438 years before Christ. In the time of Homer and Hesiod it was scarce and valuable: but the account of the iron money of Lycurgus and the extracts, I have given from Herodotus and other authors, prove, that, for more than 400 years before the Christian æra, it was plentiful. The account derived from the *Poliorectica Commentaria* of Daimachus, and contained under Lacedæmon <sup>124</sup> ~~et~~ Stephanus, gives even the uses to which several kinds of iron were applied in edge tools.\*

4. When Cæsar landed in Britain, all the nations of Europe enjoyed the advantages which arise from the use of steel; and the Britons had iron works of their own. It is probable too that the Egyptians or Phœnicians had made mercantile voyages to their country, more than sixteen centuries before that time. That it was known to the Phœnicians in the time of Homer, his accounts of amber and tin are unquestionable evidence. And there can be no doubt, but that the

\* This passage is quoted at p. 52. Daimachus of Platæa, lived before the time of Strabo. Plutarch has copied a very interesting account of a meteor that threw down stones, from a treatise, which this author left concerning religion. He also wrote something respecting India. See Solon and Publicola compared; the Life of Lysander, &c.

Greeks and Romans frequented it commonly ever after the destruction of Carthage, if not sooner: Pliny indeed says, this country was in his time, “Clara Græcis nostrisque monumentis”, and he wrote before the Romans were extensively settled in the country.\* And besides their knowledge of iron, and their long intercourse with foreign and civilized nations, their old established tin trade is a proof that they had been accustomed to work in mines for numerous ages; and there is no account that implements of bronze are more abundantly found in the old mines and rubbish heaps of the tin districts, than in those parts of the country which are destitute of all sorts of mines.

5. If *καλλησις σιδηρευ* signify welding of iron, then we have a proof that malleable iron was in use in the time of Alyattes, king of Lydia. † Perhaps the different sorts of iron, which Pliny calls *Stricturæ*, received their name from their being malleable, “a stringendo acie”, from *binding the edge*, i. e. from having the property of welding, “quod non in aliis metallis”. The sentence, “mollior complexus (i. e. ferri) in nostro orbe,” probably alludes to the same property. But though two pieces of common iron, or a piece of iron and steel, by using siliceous sand, unite at a white heat more readily than two pieces of steel; yet very highly cemented steel may be readily and very perfectly welded by using finely powdered potter’s clay instead of sand: and the ancients were acquainted with this process, as appears from Pliny, for in describing the solders used for different sorts of metals he says, “argilla ferro”.

#### *Conclusions respecting bronze, brass, &c.*

1. Before the flood, Tubal-Cain (i. e. the possessor of the earth) was “an instructor of every artificer in brass and iron”. Does this passage, besides affording us a valuable notice in the history of the useful arts, lead us to some knowledge in antediluvian geography. After

\* Plautus, in A. D. 43, was the first of the Romans after Cæsar, who came into Britain an invader, and Pliny died 35 years after that time.

† See before at p. 54.

the flood, Tubal and Mesech, sons of Japhet, settled on the borders of the Euxine Sea: In Ezekiel's time, their descendants traded to Tyre in "vessels of brass"; and by the Greeks were called Tibareni and Moschi.

2. Because Moses mentions metal mirrors and tin, I infer, that the Egyptians, before his time, were acquainted with the use of tin in hardening copper for edge-tools: consequently, that their most ancient arms and mining tools were made of bronze.

3. χαλκος and gold among the Egyptians were first made use of at Thebes, in weapons for destroying wild beasts, and in agricultural implements.\* Hyginus, indeed, expressly affirms that Cadmus, the builder of Thebes, discovered *as* at that place; † and Pliny, that he found mines of gold on Mount Pangæus, and the method of smelting it. ‡ We have seen that under the first kings of Egypt, gold mines were worked with tools of χαλκος, on account of the scarcity of iron. In the table of Isis, some of the sceptres or spears have heads which very much resemble our bronze Celts in shape, § But bronze armour was *entirely* out of use in Egypt in the time of Psammitichus, 670 years before Christ.

4. Weapons of bronze were *partly* in use in Palæstine, in the time of David, as I have shewn in the account of the armour of Goliah, and of his descendant Ishbi-benob. In Greece, about the same age, they were general, as the extracts I have given out of Homer and Hesiod decidedly

\* Diod. Sic. Re. Antiq. i. 2.—In the early history of Egypt, gold appears to have been applied to the most common purposes. Many of their temples were almost wholly covered with it. A similar profusion of silver was found among the Spaniards, when the Phœnicians first visited Tartessus; and a state of society very much resembling that of the Egyptians, in the time of Isis and Osiris (i. e. about 1740 years before Christ) prevailed in Mexico and Peru, when they were first discovered, with respect to gold and silver, the use of bronze tools and weapons, the state of statuary, and especially in the use of hieroglyphics.

† Fab. 247.

‡ Lib. vii. 56.

§ See Pignorius' Mens. Isiacæ Expositio, fol. 11, &c. Ed. Venet. 1605.

prove. Even the rasp with which the cheese was grated into the cup of wine, which Nestor gave to Patroclus, was of that metal.\* Seven centuries before Christ, arms of bronze were worn by the Carians and Ionians; and when Herodotus wrote his history, the Massagetæ made their battle axes, and the heads of their spears and arrows of bronze: but all sorts of weapons and tools of that metal, were looked upon as antiquities in the days of Agatharcides and Pausanias; excepting in things which pertained to religious matters, in which bronze implements were employed in the heathen temples long after the Christian æra.

5. That the ancient inhabitants of Italy, in common with the people of Greece, Egypt, &c. did, at some period of their history, make their edge-tools of bronze, is sufficiently plain from the use they made of them in religious matters, and from their being frequently found in the ruins of their most ancient cities: but they were fallen into disuse in the reign of Porsenna, 500 years before Christ.† And it is probable that the nations on the western side of Europe, long before the commencement of the Christian æra, had begun to disuse brass in arms, because we know that in the time of Caius Marius, the Cimbrian cavalry wore steel cuirasses; and that the people of Gaul, Spain, and Britain, were acquainted with the art of manufacturing iron in Cæsar's time.

\* Il. xi. 639.

† Since this paper was written, I have found a reference to bronze weapons in Pliny. Speaking of the medicinal qualities of iron, he says:—"Est et rubigo ipsa in remediis: et sic Telephum proditur sanasse Achilles, sive id ærea, sive ferrea cuspidem fecit. Ita certe pingitur dicutiens eam gladio." He doubted whether this healing rust was scraped off a bronze or an iron sword, because he knew that in the heroic age, bronze was in use in weapons. He could have had no difficulty in concluding that it was not of bronze, from any use to which that metal was applied in arms in his time; for his own accounts of iron sufficiently refute such a notion; and in the chapter from which this extract is taken, he says:—"Medecina è ferro est et alia, quam secandi," from which it is plain that surgical instruments were made of it in his time.—*Nat. Hist.* xxxiv. 15. *Hygin.* 101. *Paus. Arc.* lxx. 4. *Ovid. Metam.* xiii. 172. *Trist.* v. 2, 15. *Remed. Am.* 47, &c.

6. The æra in which edge-tools of bronze were in use in Britain, cannot, perhaps, be ascertained with any degree of certainty. There can be no reason to suppose that iron was introduced here while bronze was used in Greece: or that the Germans should be acquainted with it before the Britons. But when iron became plentiful amongst the Greeks, as it unquestionably was in the time of Lycurgus, 900 years before Christ, it would certainly be cheaper amongst the Phœnicians than either copper or tin: if, therefore, they traded to Britain at that time, it would be their interest to barter steel for the goods they came for; and that of the Britons to receive it for edge-tools, in preference to copper. The disuse of bronze tools, and the introduction of iron ones into this country, was probably gradual. But from the above reasons, I would conclude that bronze began to give way to iron here, nearly as soon as it did in Greece; and, consequently, that all the Celts, spear-heads, swords, &c. found in our island, belong to an æra 500, or at least 400 years before the time of Christ, for iron then seems to have been general among all the people along the shores of the Mediterranean Sea.

7. The circumstance of implements similar to our Celts having been found in Herculaneum, merely proves that the scite of that city was once tenanted by men ignorant of the use of iron; and we know from Dionysius Halicarnassensis, that it was founded about thirty years before the Trojan war. Also the various culinary and kitchen implements of bronze that abound in its ruins, prove nothing more than that the ancients had discovered that in warm climates copper or bronze is better adapted for such purposes than iron. I apprehend too, that nothing more can be inferred from the fact, that both Celts and undoubted Roman antiquities have been met with at Ladbroke, in the middle of the town of Old Flint, than that the Britons had occupied that situation either as a fortress or a town before the Romans settled in it.

8. That the Celts were not imported into Britain is plain, from moulds for casting them in, and pieces of crude bronze being



found in places where, from the cinders that were with them, they appeared to have been cast. If the bronze of which they made them was imported, it is probable that the people, who supplied them with it, exchanged it for tin, one of the articles of which it was composed. But it cannot be supposed that a people, whose country abounded with copper, should be ignorant of the art of working and smelting it, at a time when they were mining and manufacturing tin, lead, and iron. The *æs*, which Cæsar says they imported, and the *χαλκομαλα*, which Strabo mentions, were probably nothing more than vessels of copper or bronze, which foreign merchants bartered among them for hides and metals.

9. It has been shown that the sceptre or rod of Moses, and many of the utensils of the tabernacle of the Hebrews, were of brass; but none of them of iron. The Greeks and Romans borrowed a great part of their religious worship out of Egypt, where it is probable bronze, as the first metal which assisted in the arts of civilized life, was held in religious veneration; and iron, as a more modern discovery, in religious abhorrence. We accordingly find in Hesiod, that iron was prohibited in certain religious rites; and Accennius, on the word “*ahenis*” in the following lines from the *Æneid*,

“*Falcibus et messæ ad lunam quæruntur ahenis*

“*Pubentes herbæ, nigri cum lacte veneni,*”

says: “*Quia nefas id ferreis facere.*” Does not this custom justify the supposition that the “*aurea falx*,” with which Pliny says the Druids, at certain seasons, cut the misletoe, is an error for “*ærea falx*?” and, consequently, that bronze implements were antiquated in his time in all common uses in Britain, and only employed in the religious rites of the Druids?

10. The extracts, I have given out of Homer and Aristotle, prove, that the Phœnicians were in the habit of bartering their toys and baubles for valuable commodities in Greece and Spain; I would, therefore, infer, that they exchanged trifles of that sort amongst the Britons

for tin ; and, consequently, that the articles of jewelry, found in our most ancient tombs, are of Phœnician manufacture.

11. Dr. G. Pearson's opinion respecting the uses to which the Celts were applied, is very natural and probable. The wedge-like shape of Figs. 7, 8, 9, and 10, Plate II. evidently points out the use they might be put to in splitting wood, for the wattled houses, and osier canoes of the ancient Britons ; and, with wooden hafts, they would answer the purpose of chisels in hollowing canoes from the trunks of trees, making wooden bowls, &c. ; the strength and shape of their edge being excellently adapted for such purposes. The implements Figures 11, 12, and 13, on the same plate, were unquestionably used as gouges ; and I found some, which I made of the same shape and materials, answer that office exceedingly well, even in old oak. The two broken pieces of bronze, Fig. 14, were probably bosses of a shield : they are thick in the middle, and thin at the edges. All the spear heads and other implements are of bronze, the tin being in the several proportions from one-sixth, to one-tenth of the copper, excepting in Number 13, which is of *pot metal*, i. e. copper alloyed with about one-third of its weight of lead.

12. The sword, Plate IV. Fig. 3. found in Ewart Park, is also of bronze. From the manner in which it was found \*, and the angular gashes in its edges, which appear to have been made by a weapon similar to itself, it would appear that it had been concealed immediately after an action ; for these traces of hacking might have been readily closed up with a hammer, if its owner had ever had the least leisure to repair it after they were made.

JOHN HODGSON.

\* See before at p. 12.