IV.

NOTES ON TWO CHISELS OR PUNCHES OF BRONZE-LIKE METAL, FROM SUTHERLANDSHIRE AND DUMFRIES.

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I take this opportunity of putting on record two examples of a variety of implement which is of somewhat rare occurrence, in Scotland at least.[1]

The first (fig. 1) is a chisel-like or punch-like implement of bronze $3\frac{3}{4}$ inches in length and half-an-inch square in the cross section at the upper end, tapering gradually to a rather blunt chisel-point of nearly the full width of the implement. It is exhibited by Dr J. H. W. Laing, F.S.A. Scot., Dundee, who sends the following account of its discovery :—

Fig. 1. Chisel or Punch of Bronze, found in Sutherland, $3\frac{3}{4}$ inches in length.

"The bronze chisel, which I send you for exhibition, was found in 1880, near the north end of Loch Laoghal, which lies between the parishes of Tongue and Farr in Sutherlandshire. The spot where it was found is about half a mile from the loch, and close by the place where it lay is a boulder stone about 3 feet across, and 18 inches thick, bearing three deeply cut depressions on its upper surface. The largest of these is central in position and ring-like in form, the ring being $5\frac{1}{2}$ inches in total diameter, $1\frac{1}{2}$ inches in breadth, and $1\frac{1}{2}$ inches deep; the other two are almost rectangular in shape, the larger being 3 inches in length, by about 2 inches in breadth, and 3 inches deep, the smaller about $2\frac{1}{2}$ inches in length, by $1\frac{1}{4}$ inches in breadth, and $1\frac{1}{2}$ inches in depth. Of course the adjacency of the stone to the chisel does not prove that the one has any more intimate connexion with the other than that of mere proximity."

[1] Sir John Evans has tabulated about twenty chisels of bronze, found in England. On the Continent they are far from common. Among sixty-seven bronze hoards found in France and Switzerland, the number of chisels was only twenty-seven. Solid bronze chisels of square section are very rare, though Sir John Evans has figured one from Plymstock, Devonshire, nearly of this form. Others have been cited from Troy and in Egypt.

The second implement (fig. 2), which was brought under my notice by Mr Alexander Curle of Morriston, F.S.A. Scot., and is now exhibited by its possessor, Mr J. Gillon Ferguson of Isle, was found not long ago in an excavation in Dumfries. It differs from the Sutherlandshire specimen both in shape and size, being cylindrical towards the butt end, and tapering from near the middle of its length to a bluntly flattened edge of nearly the full width of the implement, which measures $6\frac{1}{4}$ inches in length and fully $\frac{3}{4}$ inch in diameter. It has thus a general resemblance to a flat-pointed mason's chisel, or a cold cutting chisel, except that it is not sharp. It presents evidence of use as the result of hammering, both in the turned over edges of the butt end, and the blunted and flattened edge of the opposite end.

Fig. 2. Chisel or Punch of Bronze, found in Dumfries, $6\frac{1}{4}$ inches in length.

I am indebted to Mr W. Ivison Macadam, F.S.A. Scot., for the following analyses of the two implements :—

Analyses of Two Chisels received from Dr Joseph Anderson, National Museum of Antiquities—

	No. 1. Loch Loyal, Sutherland. Dr J. H. W. Laing.	No. 2. Dumfries. Mr J. G. Ferguson.
Copper, . .	91·81 per cent.	86·86 per cent.
Tin, . . .	7·81 „	2·95 „
Zinc, . .	0·22 „	10·07 „
Iron, . .	0·16 „	0·12 „
	100·00	100·00

W. Ivison Macadam, F.R.S.E., F.I.C., F.C.S., &c.

It will be observed that while No. 1 presents little more than a trace of zinc and nearly the usual proportions of copper and tin, No. 2 has but a small percentage of tin and a large admixture of zinc, so that it is really more of a brass than a bronze.

The method of the use of these implements, involving the question of whether they were cutting-chisels or chisel-shaped punches, may

perhaps be inferred from an examination of their characteristics of form. Their most remarkable characteristic is their strength in proportion to their size. Excessive strength of form is not a necessary feature of a cutting chisel, though it is a necessary feature of a punch, especially if the material to be operated on be of considerable size and resistant strength. Cutting chisels of bronze, however, as shown by the example in the Museum from Glenluce (fig. 3), are generally of more slender mould than even the smaller of these two implements, and usually show more or less expansion of the cutting edge towards the side angles. These usually curve outwards to meet the curve of the cutting edge, which seems to have been sharpened in the same way as the bronze axes, by drawing down the edge with the hammer and finishing it with a whetstone. They were generally made to be used with a mounting of bone or wood for a handle, and were therefore furnished with a tang or a socket to receive the handle.[1] The use of such handled chisels must necessarily have been confined to work of a much lighter character than that for which the two very much stronger tools which have been previously described were evidently designed.

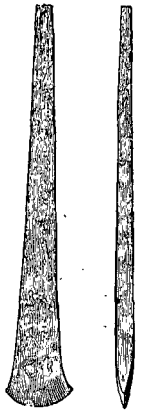

Fig. 3. Bronze Cutting Chisel from Glenluce, 4½ in. in length.

Whatever the work may have been for which these stronger tools were designed, it is evident that their efficiency must have depended to a large extent upon the size and weight of the hammer or mallet employed in conjunction with them. We have no hammers of the Bronze Age in Scotland, and the only variety known in Britain is that with a socket, like a socketed axe, weighing only a few ounces. But as a matter of convenience and adaptation, a hammer of any desired weight could always be obtained by selecting a water-worn pebble of suitable size and shape. At the present day in Peru and Bolivia, the masons,

[1] Among nearly one hundred chisels and fragments of chisels found in the great bronze hoard at Bologna, those that retained their upper parts were either tanged or socketed.

skilful in working hard stone with steel chisels, make use of no other mallet or hammer than a stone pebble held in the hand. Such a naturally formed mallet or hammer may have been used with chisels of bronze as readily as with chisels of steel, but when we come to the question of the hewing of stone with chisels of bronze, there is little to be said that is not of the nature of pure conjecture.

Even in ancient Egypt, where the use of bronze for the cutting tools of the ordinary industrial occupations appears to have come down to a time which is well within the historic period, the question of the use of chisels of bronze for stone-cutting has given rise to much speculation and even controversy. One reason for this uncertainty is, that although even the earliest architectural remains present evidence of the ability to deal with the most elaborate sculpturing, either incised or in relief, the tools with which it was done, or with which it could be supposed to have been done, have not been discovered. Carpenters' chisels of bronze in many varieties are common enough, but the tools of the mason and sculptor are so excessively rare that most authors who discuss the question are obliged to treat it as a question of probabilities.[1] Wilkinson, however, records the discovery by himself of one chisel of bronze, which was found lying among the chippings of the limestone rock of the tombs at Thebes, as if it had been accidentally left there by the workmen, when engaged in hewing the stone. The size of this

[1] Sharpe says on this subject :—"Though we have not now the tools themselves, we have the stones that were carved with them ; and the sharp deep lines of the hieroglyphics on the granite and basalt could have been cut with nothing softer than steel."—*History of Egypt*, vol. i. p. 17. Wilkinson also observes that—"The hieroglyphics on obelisks and other granitic monuments are sculptured with a minuteness and finish which, even if they used steel as highly tempered as our own, cannot fail to surprise the beholder, and to elicit from him the confession that our modern sculptors are unable to vie with them in this branch of art. Some are cut to the depth of more than two inches, the edges and all the most minute parts of the intaglio presenting the same sharpness and accuracy, and I have seen the figure of a king in high relief reposing on the lid of a granite coffin, which was raised to the height of nine inches above the level of the surface. What can be said if we deny to men who executed such works as these the aid of steel, and confine them to bronze instruments? In vain should we attempt to render copper, by the addition of certain alloys, sufficiently hard to sculpture granite, basalt, and stones of similar quality.—*Manners and Customs of the Ancient Egyptians*, vol. iii. p. 249.

chisel is $9\frac{1}{4}$ inches in length, its diameter at the summit 1 inch, the point end measuring $\frac{7}{10}$ of an inch in greatest width. The summit was turned over by the blows it had received from the mallet, while the point was intact as if it had been recently made. In its general form it resembles those now used by the masons of modern Europe, though considerably heavier, its weight being 1 lb. 12 ozs. Its analysis shows a smaller proportion of tin in the alloy [1] than usual:—

Analysis of Bronze Chisel from Thebes—

Copper, ...	94·
Tin, ...	5·9
Iron, ...	·1
	100·0

The latest writer on the subject of the Bronze Age in Egypt, Dr Montelius, in 1890, has no facts to adduce from more recent discoveries to help the settlement of the question. But he observes, with justice, that the common argument which attributes the Egyptian civilisation to an age of Iron, on the ground that it is impossible to suppose that their magnificent temples and obelisks, and vast constructions for sepulchral purposes, with their profusion of sculpture and their perfection of hewn and polished masonry executed in the very hardest and most intractable materials, such as granite and syenite, could have been constructed without the aid of steel tools, is directly contradicted by experience in other quarters of the world. Mexico and Central America show a series of edifices and monuments constructed of the hardest stone, and richly ornamented with sculptures in relief, although they are certainly anterior to the time of Columbus, and to the introduction of iron by the Spaniards. It has been ascertained that it is not necessary to be possessed of implements of metal of any kind to work stone as hard as Egyptian granite, for this can be done with implements of stone, though much more slowly and with greater expenditure of labour. Accordingly, after examining all the indications afforded by

[1] The addition of tin or other metals to harden it, if exceeding certain proportions, renders it too brittle for use.—*Manners and Customs of the Ancient Egyptians*, vol. iii. p. 252.

the most recent investigations, he comes to the conclusion that the Egyptians during the whole period of the Ancient Empire, and probably down to about 1500 years before the Christian era, were unacquainted with the use of iron, and employed bronze only, in the manufacture of all their arms and implements.

But the general character of the archaic sculpturings found on rocks and stones in Britain, is that they are picked out with a sharp-pointed implement, and not hewn with a driven tool or bruised with a flat-ended chisel. The use of zinc as an alloy in conjunction with copper and tin is not a Bronze Age characteristic,[1] but points to a date less remote than that of the true Bronze, in which zinc was never present even as an impurity. If we assume that the large cylindrical chisel from Dumfries was probably a mason's chisel, as its shape implies, we have to admit that there is no evidence of hewn or surface-dressed stone work for which such a tool might be required until the period of the Roman occupation, when it is also to be remembered that iron was in use. On the other hand, admitting that the presence of zinc in the alloy indicates a late date for both the implements, it is possible that they may have been used as punches in connection with the ornamentation of articles of bronze, whether in chased or *repoussé* work. Many of the earlier bronze implements, such as the flat and flanged axes, are ornamented by patterns of different kinds, chiefly of various combinations

[1] It is characteristic of the relics of the earlier Bronze Period that the alloy of which they are composed is one in which copper and tin are the principal ingredients. It is characteristic of the Iron Age, that much of the bronze-like metal that was then so abundantly used for decorative purposes is not the older alloy of copper and tin, but a new alloy in which copper and zinc form the principal ingredients. It is, in fact, not *bronze* but *brass*, though differing considerably in the proportions of its constituent elements from the brass of more modern times. This change in the composition of the metal from tin-bronze to zinc-bronze is a useful distinction to be noted in considering the age of relics which are of bronze-like metal. "Zinc," says Morlot, "is never present in the bronzes of the Bronze Age, even as an impurity." The researches of Göbel have also shown that zinc is absent even from the Greek bronzes, which are composed of copper, tin, and lead. Zinc only begins to appear as an ingredient in Roman alloys, and it is only towards the commencement of the Christian era that it begins to be present in them.—"Notes on Relics of the Viking Period," *Proceedings*, vol. x. p. 558.

of short straight lines indented in the metal. These patterns, which exhibit considerable variety of form and fertility of design, must necessarily have been produced by tools of bronze, and the punches employed for this purpose must have resembled stout, narrow, and blunted chisels. Some such implements as the smaller chisel from Sutherland must also have been employed to a large extent in producing the varied patterns in chased work and *repoussé* work, both in bronze and silver, of the Early Iron Age.