

NOTES ON COPPER IMPLEMENTS FROM MEXICO.

BY F. W. PUTNAM.

THERE is no doubt that at the time of the conquest copper and tin, as well as gold and silver, were extensively used by the Mexicans. Cortez not only mentions the fact in his letters, but states that with the assistance of the Mexicans he was enabled to secure of the two former metals enough to cast several bronze cannon, and he and Bernal Diez both give us to understand that the Mexicans were already acquainted with bronze. Cortez also includes lead in the list of articles which he saw for sale or exchange. Dr. Valentini has entered at considerable length upon a discussion of the evidence in support of these statements, and I can not do better than refer to his valuable article in the Proceedings of this Society for April, 1879, for a critical review of that part of the subject. He has however made the suggestion that the *laton* of the Mexicans was a natural mixture; but as this is stated to have been a copper alloy containing a mixture of either tin, silver or gold, it must be regarded as an artificial combination. The rare ore, sulphuret of tin, which is a natural combination of sulphur 30, tin 27, copper 30 and iron 13, according to Dana, occurs only in Cornwall; and, in this connection, we must remember that the bronze chisel, of which an analysis is given in the *Anales del Museo de Mexico*, Vol. 2, p. 117 (as quoted by Evans, *Ancient Bronze Implements*, p. 166), contained 97.87 parts of copper and 2.13 of tin.

In relation to the methods by which the Mexicans obtained their copper I can find nothing of importance, and, in fact, even very little about the character and distribution of the ores in the country. Whitney states that copper is found scattered through Mexico to a considerable extent, consisting of vitreous and red oxide ores, with native copper in a limited quantity; but as there can be no doubt in relation to the knowledge which the Mexicans had of tin, which they must have obtained by smelting the ore, there is no reason why they should not also have smelted copper.

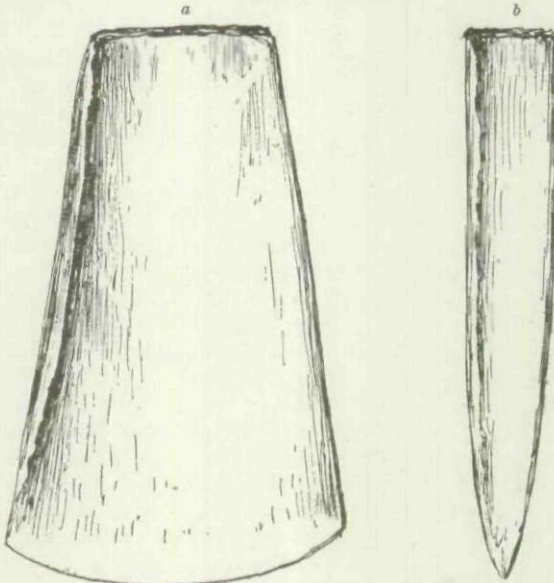
Notwithstanding the former abundance of copper implements and ornaments, and the discovery of many large deposits since the time of the conquest, their present rarity in collections, both in and out of Mexico, shows how few have escaped the melting pot, to which so many important works in the finer metals have been consigned during the past three and a half centuries. It is therefore of importance that descriptions should be given of all that come to notice, and as Dr. Valentini regretted that he had not seen a single specimen of a copper or bronze implement from Mexico at the time he wrote his article, the following abstract from an extended account¹ of copper implements and ornaments from North and South America may prove of interest to the members of this Society.

¹ Fifteenth Report of the Peabody Museum, Cambridge, 1882.

The first copper implement from Mexico of which I had personal knowledge, was obtained by Dr. Edward Palmer in 1878 while making explorations for the Peabody Museum. In a small tumulus, about three miles from Venis Melcis in the state of San Luis Potosi, which was evidently the site of an ancient dwelling, Dr. Palmer found a small copper axe associated with several terra-cotta images, ornaments and spindle-whorls so common throughout the country, three vessels of pottery, a stone ornament, a number of obsidian flakes, a crystal of quartz, two grinding stones and a stone mortar.

The axe is wedge-shaped, with a flat head which is three-eighths of an inch in thickness and seven-eighths in width, gradually becoming wider and thinner to its cutting edge, where it is an inch and three-quarters wide. It is, judging from its red color and softness, of pure copper. Over its whole surface are unmistakable signs that it was wrought by hammering, either from a mass of native copper or from a short bar of cast metal. In compactness and homogeneity it is like the other copper axes we have from Mexico, and decidedly different from those I have described from the United States. It is this fact which suggests that the implement was wrought from a block of the metal about two inches

FIG. 1.



Copper Axe; *a*, broad surface, *b*, edge, showing thickness. From a Tumulus in San Luis Potosi. (Peabody Museum, No. 18117.)

long which had been formed by casting. A small cavity and slight fracture on the head of the axe also have the appearance of a flaw in casting the metal. There is, however, no doubt that its present shape was produced by hammering. During this process the edges were expanded and have only been partially hammered down, as can be distinctly seen by the hammer marks on the still existing ridges. The cut-

ting edge is slightly rounded as shown in fig. 1, *a*, and was formed by working on both sides as shown in fig. 1, *b*. About a third of the edge is much battered by use, and taken altogether, this little wedge-shaped axe looks as if it had done considerable service for its former owner.

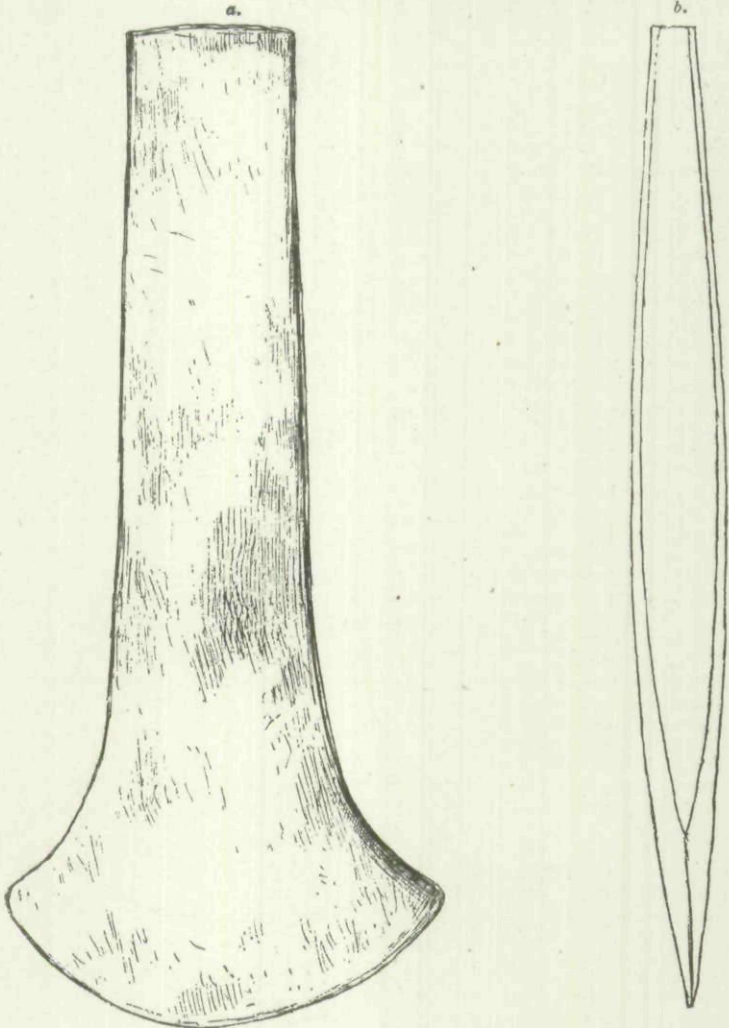
I can recall only two figures of Mexican axes of this shape:— the one on the left of the three axes from Yucatan, reproduced from the Dresden Codex, in cut 8 of Dr. Valentini's article, which is represented as set in a slightly curved handle; and fig. 58 of Mr. Squier's paper on American Copper Implements, in the Smithsonian Contributions, Vol. II., copied from a Mexican painting.

In August, 1881, a number of copper axes, all of nearly the same size and of one pattern, were found near Tlacolula, Oaxaca, but the circumstances relating to the discovery I have been unable to learn. Soon after they were found, Mr. Frederick Ober was travelling in the country, and six of them were given to him by the owner, who prized them simply on account of their being pure copper, as he had discovered by slightly filing one side and cutting a small piece off the blade of each. Some of them had been cleaned of the green carbonate of copper with which they were covered, by scraping and filing, but others were fortunately left untouched, except, as above stated, on the edge of the blade. Four of the six specimens brought home by Mr. Ober were obtained for the Peabody Museum. A short time afterwards Mr. Alexander Agassiz was travelling in Mexico and met with two axes of the same lot, which are filed and cut in the same way as the Ober specimens, but are otherwise uninjured and are still covered with a coating of green carbonate and have a slight patina. These specimens Mr. Agassiz presented to the Museum with a number of other interesting objects which he obtained during his travels from Yucatan to the city of Mexico. Mr. Stephen Salisbury, jr., has also received three axes from the same lot, from Mr. L. H. Aymé, and has kindly let me have them for comparison with the others. I have, therefore, the opportunity of studying nine specimens of this important lot of axes which are of the shape most commonly represented in the ancient Mexican picture-writings, where they are shown as set in wooden handles which are usually curved. This method of mounting the implement in an eye near the end of the handle shows them to be axes beyond question. They are also represented without handles in the pictures illustrating the tribute of different towns to the controlling power. Both of these forms of representing axes can be seen in cuts 1 to 6 of Dr. Valentini's article to which I have several times referred. They also resemble the axe from Quilapan, figured by Du Paix, but are not quite as broad, and are a little longer.

As already stated, these nine axes are all of the same general pattern and nearly of the same size. The smallest of the lot is represented of full size in fig. 2, of which fig. *b* is a section. No two are of exactly the same dimensions, but when placed in a series the variations from one to the other are very slight. The largest is slightly less than five and three-quarters inches long and a little over two and a half inches wide, measured from point to point across the rounded blade. The smallest

is slightly more than five inches in length and is two and a quarter inches in width across the blade. The gradations between these two extremes are best illustrated by the series of outlines given in fig. 3. In width at the flat but-end, or head, there is still less variation, that being three-quarters of an inch in some, and not quite seven-eighths of

FIG. 2.

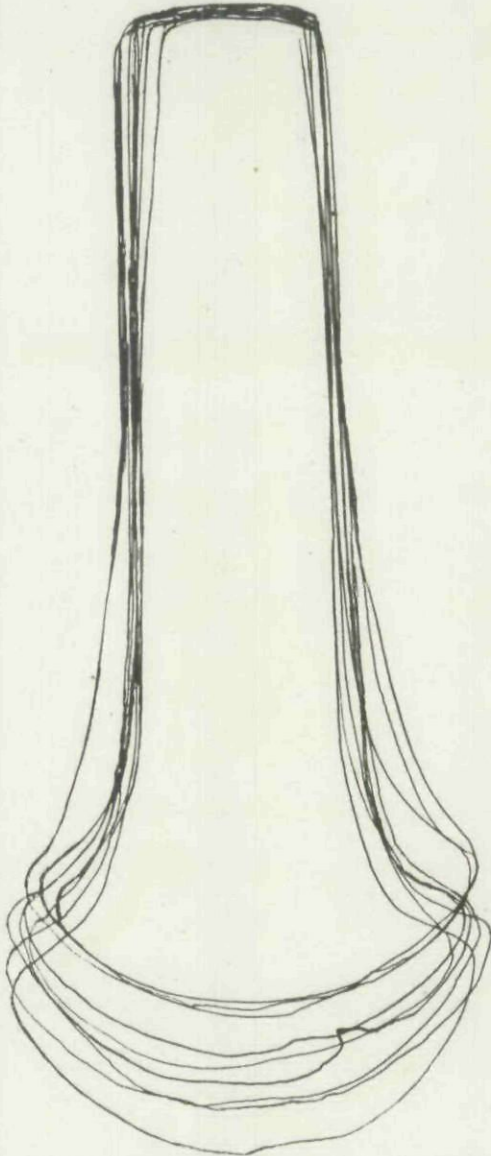


Copper Axe; *a*, broad surface, *b*, section. From Oaxaca.
(Peabody Museum. No. 26023.)

an inch in others. In thickness in the central part they vary from one-quarter to three-eighths of an inch.

The principal variation in thickness is at the extreme end or head of the axe, which in one of the two presented by Mr. Agassiz, and also one of Mr. Salisbury's specimens, is a full quarter of an inch in thickness, while all the others are about two-thirds as thick. In all, this end is considerably thinner than the central portion as will be seen by looking at the section given in fig. 2, *b*. In all but the Agassiz specimen with the thickest end, which has the lateral edges slightly rounded off, the edges and the broad surfaces are flat and smooth. From these remarks it will be seen that while the variations between the nine specimens are so slight that they can be said to be all of one pattern and of about the same size, they are yet sufficient to show that they were not all made in one and the same mould. To exemplify this I have introduced fig. 3, which shows the outlines of the nine specimens placed one over the other. They might, however, have been rough cast in two or three moulds of nearly the same size and then finished with the hammer, as were the ancient bronze implements of Europe; but it seems more likely that if any casting was done it was simply in the form of bars about five inches long, three-quarters of an inch wide and a quarter of an inch thick, and that

FIG. 3.



Outlines of nine Copper Axes from Oaxaca, to show the individual variations produced by hammering.

from such bars the axes were wrought entirely by the aid of the hammer. That they were hammered there is not the slightest doubt, as the foldings of the copper where it expanded along the edges can be traced here and there on all the specimens, although such expansions have been carefully hammered down. In one of Mr. Salisbury's specimens which has a thinner blade than any of the others, there are fractures at the two points of the blade which were unquestionably caused by the great expansion of the metal while making the thin blade with a hammer. Another of Mr. Salisbury's specimens has the but-end considerably battered as if from long use.

An analysis made for me by Prof. S. P. Sharples, has proved that one specimen was of pure copper, and as the color and hardness of the others are the same as the one analyzed, there can be little doubt that they are all of pure metal, and we must either believe that they were made from rough cast bars or from compact masses of native copper. The smooth compact surface of these specimens is entirely unlike the laminated and granulated surface of the copper axes from the United States of which I have given figures and descriptions in the Report of the Peabody Museum.

Captain Du Paix gives a figure of natural size (Kingsborough, Vol. iv., Pl. 1., 25, fig. 75,) of a copper implement four and a quarter inches long, by five and three-quarters in width, from point to point of rounded blade. Of this he makes the following statement (Kingsb., Vol. VI., p. 446). "In Zochs, a town in the vicinity of Oaxaca, I was shown a copper implement, in the house of an Indian laborer named Pasqual Bartolano, who a short time before my arrival [1806] discovered, when ploughing his field, twenty-three dozen of these tools, contained in two large earthen pots, in very good preservation; they are all of cast metal, and of similar form; they only differ from each other a little in length but appear to be of equal thickness." He then states that the use of these instruments was unknown. Afterwards he was led from a picture which he saw at Mitla to believe they were the blades of hoes.¹

The T-shaped pieces of copper mentioned by several early writers as native coins were very likely such copper blades, and Mr. Bancroft, in his *Native Races of the Pacific States*, Vol. iv., p. 383, alluding to the specimens described by Du Paix, considers them as used for money, and further adds that he has a precisely similar article from one of the Mexican ruins. As regular articles of tribute or as implements in constant demand, these implements would unquestionably have a standard

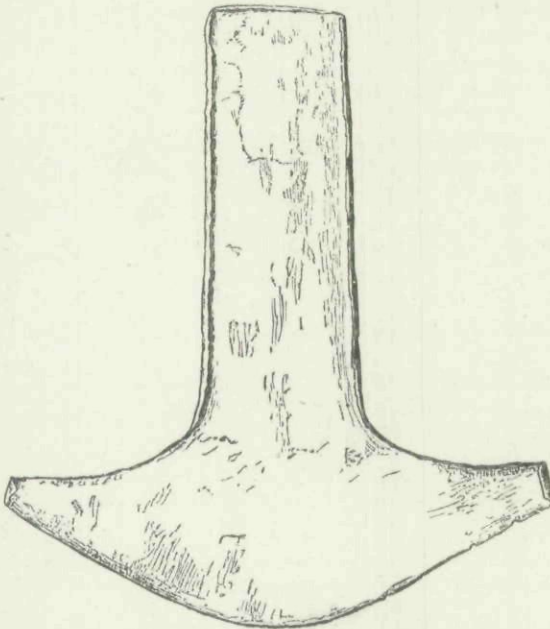
¹Du Paix also gives a figure of a round chisel flattened at its circular cutting edge, which he obtained near the city of Oaxaca. (Kingsb., Vol. iv., Pl. 1., 25, fig. 77, and text Vol. iv., p. 446). On the same plate he also represents a polished mass of copper pyrites which has had two holes bored into it as if for its attachment to some other object. This is interesting as indicating the kind of ore which may have been smelted and also from its resemblance to a similar ornament of sulphuret of iron in the Peabody Museum from Peru. Du Paix also mentions (p. 457) that while at Mitla he obtained several copper implements of various sizes and shapes.

value among a people so far advanced in the arts as the ancient Mexicans; but I fully agree with Dr. Valentini in his conclusion that objects of this character were not manufactured for the purpose of serving as coin.

Mr. Ober, while at Teotitlan del Valle, a town between Oaxaca and Mitla, in 1881, had a similar copper implement given to him, and was told that it was found, with many others like it, buried in a large earthen jar. This specimen I obtained for the Peabody Museum, and it is represented of one-quarter size (one-half diameter) in fig. 4.

It is six and a quarter inches long and five and three-quarters wide, from point to point of the circular blade. It was evidently cut from a sheet of copper about a sixteenth of an inch thick, and the blade has been made thinner by hammering, until a thin *but not a sharp cutting* edge was produced. That the implement was cut from a sheet of copper is shown by the slight irregularities or notches made by the cutting tool along the concave or upper margins of the blade, from each point inward. Above this part, for the whole length on both sides and across the top, the copper has been evenly hammered so as to form a considerable ridge bordering the flat surface of each side of the implement. This has resulted in widening the edge to about an eighth of an inch, around what may be called the shank. This part of the implement is one and

FIG. 4.



Copper "Hoe," $\frac{1}{4}$. From Teotitlan del Valle. (Peabody Museum, No. 26024.)

three-fourths inches wide where it merges into the blade, and one and three-eighths at its end.

Were it not that the semicircular edge of the blade is too blunt to answer for cutting purposes it would be natural to call the implement a knife, to be held in the hand. The figure given by Du Paix represents the borders of the shank turned over in the same manner as in our specimen, which is not the case in the copies of the figure given by Squier, and particularly so in the one given by Valentini, which represents this part as rounded. As already stated, Du Paix finally concluded that implements of this character were hoes, and possibly they may have been so used. They could easily have been fastened to the end of a pole, and in soft ground would serve very well as hoes. The circular edge in our specimen, if examined with a lens, shows many little abrasions and a high polish, as if from long use. It has also several notches, and the two points of the blade are folded over as if by rough usage, leading to the conclusion that Du Paix has probably correctly designated this implement as one for agricultural purposes. Another indication that the implement was fastened to a handle is a slight indentation of the central portion of the shank, as if there had been a strain at that point which has caused the copper to bend a little.

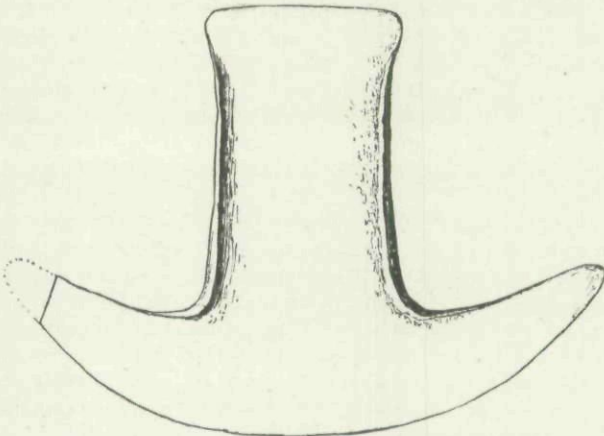
This blade is made of pure copper, so far as can be judged from its color and hardness, and it has the appearance of copper which had been cast in a thin sheet and then hammered. At one point there is a place where a portion of the metal has been hammered down, which has the appearance of a flaw in the casting, although if the implement were made from a mass of native copper a similar appearance would result from the compression of a ragged edge of the metal. When found this interesting copper implement was coated by a green carbonate which has been partly removed.

In Mr. SALISBURY'S collection there are two implements of this character which were lately sent him from Oaxaca by Mr. L. H. Aymé, and probably came from the same lot as the specimen in the Museum obtained by Mr. Ober. One of these varies but slightly from the one represented in fig. 4. It has a little shorter and broader shank and the curve of the blade is not quite as long. One of the tips of the blade was broken off, probably while in use, and the other was folded over and so nearly detached that it fell off during my examination and was taken to the Chemical Laboratory for analysis, which proved it to be pure copper. This specimen is five and three-quarters inches long and the same in width across the blade, allowing for the broken points, and is one and a half inches wide at the end of the shank. Its surface is pretty well covered by a green carbonate of copper in more or less extended blotches. Like the Museum specimen, both of Mr. Salisbury's exhibit the slight indentures on their shanks as if they had once been held fast in handles, and they also have evident signs of wear along their edges.

The other specimen belonging to Mr. Salisbury is of particular interest as it still more closely resembles the one figured by Du Paix.

It is only four and one-half inches long, and the blade, which is not nearly as deep as in the others, is six inches in width, allowing for the broken point on one side. The end of the shank is not hammered so as to form a ridge on both sides, as in the others, and is two inches in width; the hammered sides have edges three-sixteenths of an inch in width in the centre, formed by hammering the thin edge of the copper so that it projects on both sides. This widened edge extends slightly along the curve of the blade where it joins the shank, but does not continue to the end of the shank. The variation in these details from the Museum specimen can best be understood by comparing figures 4 and 5, representing the implements of one-half diameter.

FIG. 5.

Copper "Hoe" from Oaxaca, $\frac{1}{2}$. (Mr. Salisbury's Collection.)

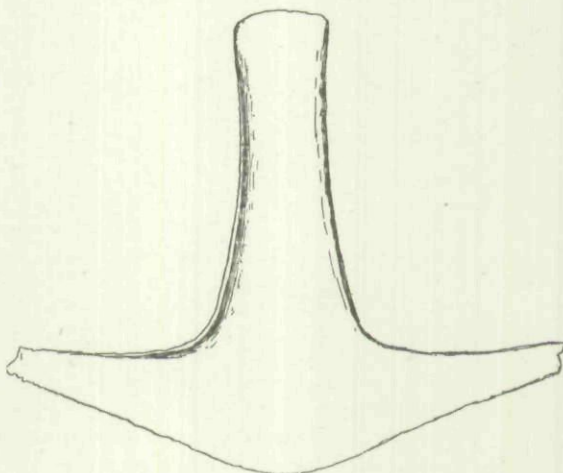
Nearly the whole surface of this specimen has been changed to a red oxide of copper, over which, particularly on the blade, is a coating of green carbonate which in several places has a decided patina. By reversing this figure so as to look at it with the curved blade uppermost, its resemblance to the letter T is very marked, and in that position the implement will answer for "the thin copper coins shaped like the Greek Tau," as stated by the old writers.

ADDITIONAL NOTE.

Since the above was communicated to the Society, I have had the opportunity of studying three more of the copper implements with semilunar blades. These were given to Dr. Valentini by Mr. Simon Stevens, of New York, to whom they had been sent by a friend in Mexico. Dr. Valentini has kindly given the smallest specimen of the lot to the Peabody Museum and has permitted me to study the others. As these three specimens vary considerably in size and shape from those already described, although they are of the same general character, I have thought it advisable to give figures of all three with a few words

of description. The surfaces of all are more or less changed to a red oxide, covered in places with green carbonate of copper. On the smallest there are many little granulations and irregularities, as though the carbonate of copper had formed over some substance with which the implement was in contact at the time of burial. On the largest, the outline of the blade of another in contact with it during the long time which has elapsed since they were buried can be distinctly traced. In shape these three specimens are very much alike, varying but little from each other except in size, but as will be seen by the figures they are not only smaller than those described above, but have proportionately narrower blades and shanks. The rounded "points" of the blades are also relatively longer, and they are in every respect more delicate implements. The figures represent them of one-quarter their full size, or one-half diameter, so they can be compared directly with the figures 4 and 5. The shank of each narrows slightly from bottom to top, and both edges have been hammered so as to make a slight rim or flange on both surfaces, as described in the larger specimens. This flange also extends along the back, or concave, portion of the blade, nearly to the points, thus adding to the strength of the thin and slender blade-portion.

FIG. 6.



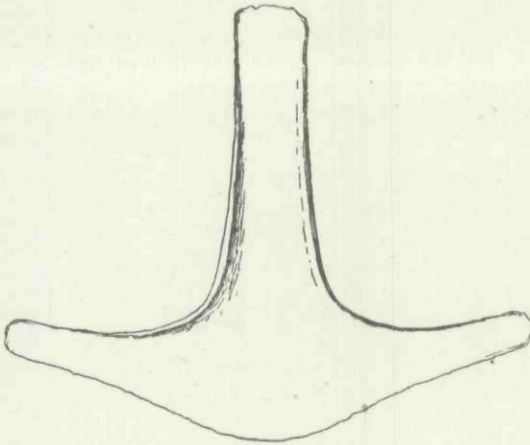
Copper "Scraper" from Mexico. $\frac{1}{2}$.
(Dr. Valentini's Collection.)

The specimen represented by Fig. 6 measures $4\frac{3}{4}$ inches from top of shank to edge of blade; and the blade from point to point, allowing for

the broken ends, is about 6 inches long. The same measurements taken on the specimen represented by fig. 7, are $4\frac{3}{8}$ and $5\frac{1}{4}$ inches; fig. 8, $4\frac{1}{8}$ and $5\frac{1}{4}$ inches.

The small size of these specimens and their slender blades with long points, are features which are opposed to the supposition of Du Paix that they were hoes, and also to my belief expressed on page 242 that they may have been agricultural implements of some sort. Dr. Valentini has pointed this out to me, and he gives several reasons in support of his view that they were the blades of knives which were to be sharpened on

FIG. 7.

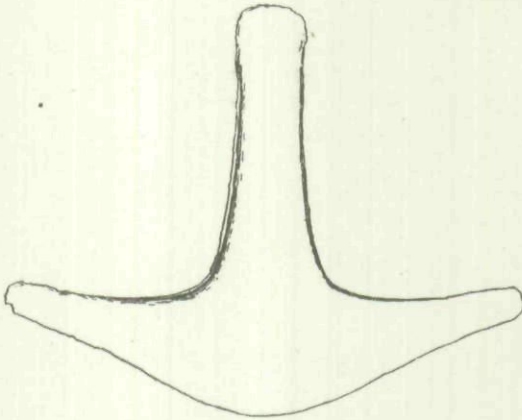
Copper "Scraper" from Mexico. $\frac{1}{2}$.

(Dr. Valentini's Collection.)

their semilunar edges and provided with wooden handles. Such knives he thinks the Mexicans must have been supplied with. In support of this theory I may state that there are several small *bronze* knives, with semilunar blades, of very nearly the same shape in the Peabody Museum, which came from Peru. In opposition to this, however, is the fact that all the Mexican specimens have been used for other purposes than cutting instruments. The semilunar edges of all are seen to be dull and rounded when examined with a lens, as if they had been used as scrapers, and they have many little indentations and irregularities, as shown in some of the figures, which are evidence of considerable and

rather rough service. From these facts it has occurred to me that they may possibly have been used in connection with pottery making, and

FIG. 8.



Copper "Scraper" from Mexico. $\frac{1}{2}$.
(Peabody Museum, No. 28885.)

may correspond to the copper implements called "trowels" found in Peru.¹ They would certainly answer admirably for scraping and smoothing the clay in manufacturing pottery, in the same way pieces of gourds and thin wooden implements are now used by many Indian tribes of North and South America, in scraping and fashioning pottery. That they were implements of some kind, and not coins, is evident, although we cannot as yet consider their exact character as determined.

¹One of these "trowels" is figured in the Fifteenth Report of the Peabody Museum, p. 143, fig. 41.

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