

NUMERICAL NOTATION ON GREEK VASES

(PLATES 1-6)

MANY of the vases of Greek times found in the Athenian Agora¹ carry numerical notations, ordinarily incised, which seem to indicate capacity, price or weight. The methods of counting, calculating and measuring exemplified in these notations are various and may often reflect not only individual differences among the Athenians themselves but sometimes non-Attic usages, where a slave or resident-alien made the notation, or where an imported pot was marked before its arrival in Athens.² In spite of its informal nature, and partly because of it, this material makes a valuable supplement to the mass of evidence on numerical notation presented in the admirable articles of M. N. Tod.³

The Agora material is here divided into three main categories: A. indications of capacity (1-61); B. price marks (62-70); C. indications of tare and net weight (71-78). Such a division will, it is hoped, make for some clarity amid the variety of notational methods, despite the attendant disadvantages: in some cases where a pot has two different types of inscription it must occur in two of the categories; in other cases the inscription may be too fragmentary or indefinite to allow of certain assignment to a particular category. Such examples are placed together with the certain ones which they most resemble. Still another type of material, numerical notations made not on complete pots but on sherds (79-95), is treated in a separate section, which is followed by several examples not immediately susceptible of elucidation (96-103).

Because the interpretation will often seem arbitrary in a specific case, it is perhaps desirable to outline the process of thought followed with various types of inscriptions. That any of the inscriptions which have repeated symbols is a number is immediately obvious. When that number is carefully recorded on the neck or shoulder of a jar in a place where it is immediately visible, there is a strong presumption that the number

¹ This study was undertaken during the tenure of a fellowship under the John Simon Guggenheim Memorial Foundation, which made work in Athens possible. Thanks are due also to the American School of Classical Studies, and in particular to the field director and staff of the excavations of the Athenian Agora, both for publication permission and for assistance and facilities of all sorts.

² Marks made by scratching, however, because of their informal nature, may most often be attributed to the owner, and perhaps sometimes to a middleman like the retail seller. The manufacturer of the jar is more likely to guarantee his goods with marks that are less casual and admit of less tampering, i. e. marks made before firing, by stamps, incision, or by painting.

³ Cf. *B.S.A.*, XLV, 1950, pp. 126 ff., where references to earlier articles will be found.

is related in some way to the jar or its contents. If the jar is complete and it can be shown that the number actually does express the capacity, for instance, in terms of an ancient unit known to have been used for that type of vessel, there is a strong probability that other similar numbers, similarly located, even on small fragments of similar vessels, have a similar significance. This probability is strengthened when the number uses as its unit the initial of a unit of capacity. That is, Π may be five of anything, but just as ΠTT is seven drachmae and $\Pi\Sigma\Sigma$ is seven staters, so (at least when they appear on a jar) it is highly likely that ΠXX is seven choes and ΠKK is seven kotylai. There is naturally an element of uncertainty in the interpretation of all inscriptions where the complete pot is not preserved to bear it out, but it has seemed best to make the interpretations on the basis of similarities, wherever possible, and leave for the last category of inexplicables only those pieces which do not tie in with the regular practice.

Most of the material included here belongs to the 5th and 4th centuries B.C. and may be so dated by shape and fabric even when found in an irrelevant context. One piece (1) is of the 7th century B.C. and one (96) is of the early Roman period; ten (24, 25, 31, 35, 38, 39, 40, 53, 75, 83) are certainly of the Hellenistic period; four (20, 28, 73, 81) may be Hellenistic or earlier. All acrophonic numerals recognizable as such are included, except (1) single letters which most often can not be identified with certainty as numerals, and (2) a small group of 'shopping lists' with numbers of items. These latter add nothing to our knowledge of numerals and belong to a separate undertaking. Not all of the inscriptions are illustrated; it may be assumed, however, that where the illustration is not included the inscription presents no difficulties of reading. That is, the illustrated inscriptions are those which present some problems in reading or those which seem to be representative or illustrative of a type.

A. INDICATIONS OF CAPACITY.

The majority of the following examples are plain unglazed storage amphorae or fragments of such jars. Wherever possible the capacity of the jar itself or, in the case of fragments that preserve sufficient indication of shape, of a closely similar jar has been measured as a rough check on the interpretation of the notations. Since, for the most part, the possible variations in the size of the standard units will not affect this rough check, the generally accepted metrical equivalents of Hultsch⁴ are used:

$$\begin{array}{rcl} \text{oxybaphon} & = & .0684 \text{ liters} \\ \text{kotyle (4 oxybapha)} & = & .2736 \text{ "} \end{array}$$

⁴ *Griechische und römische Metrologie*, 1882, p. 703. These measures are liquid measures except for the kotyle, which is the unit of both wet and dry, and the choinix, which may also have been used for liquids under another name. See below, under 60. In the Roman period the large liquid measure was the amphora, which held eight choes and was equal to a Roman cubic foot.

choinix (4 kotylai)	=	1.094	“
chous (12 kotylai)	=	3.283	“
metretes (12 choes)	=	39.390	“

Complete justification is not always given for interpreting notations as indications of capacity. The decision was sometimes based on general likelihood, sometimes on the greater frequency of capacity notations and on the use of less ambiguous symbols for price and weight. What may seem in some cases to be an arbitrary interpretation of meaningless scratches is based on the close comparison of the doubtful case with meaningful examples, with regard to the type of jar, location of the graffito on the jar and details of context. The various methods of notation are presented in order of increasing complication. This is, of course, not the same as chronological order, as will be seen by comparing the brief note of context date accompanying all examples where the circumstances of finding are relevant for the dating of the piece.

In the simplest of these methods only strokes are used, without further indication of the unit employed than is implicit in the size of the jar. Presumably, each time the unit-measure was emptied into the jar a stroke was made, so that the total number of strokes represents the total number of unit-measures which the jar would hold.

1. Neck of a large decorated amphora. Pl. 1.


P 17356. 7th century B.C.

Incised:] III

Without either the complete jar or the complete inscription there can be no consideration of units, but this is indubitably a number of the tallying sort and so probably an indication of capacity.

2. Neck of Chian amphora.


P 11068. Early 5th century B.C.

Incised on handle: 

Similar complete Chian amphorae of a somewhat later time hold seven Athenian choes.⁵ Despite the evidence which makes the twelve-chous metretes the large liquid unit, the ordinary amphora of Greek as well as Roman times is more likely to hold eight choes.⁶ This fact combines with the 7:8 ratio of Chian and Athenian coins to persuade us that the Chian standard chous also stood in a 7:8 ratio with the Athenian chous. These jars would then hold eight Chian, or seven Athenian, choes. On this pot the informal indication of capacity would then be the work of the Athenian purchaser, probably for a re-use of the jar.

3. Semi-glazed krater.

P 21930. Mid 5th century B.C.; *Hesperia*, XXII, 1953, p. 88, no. 86, pl. 32.

Incised under the base: 

The capacity is eight choinikes. This vessel may have been used as a mixing bowl for some combination of dry foods that were measured by the choinix. It was marked, perhaps, by the cook

⁵ V. Grace, *Hesperia*, III, 1934, p. 296; *Hesperia*, Suppl. VIII, p. 182.

⁶ This generalization is based on as yet unpublished measurements of jars in the Agora.

so that as it sat upside down on the shelf he could tell by a quick glance if it was big enough for a particular recipe.

4. Pithos shoulder and rim fragment.

P 13869. Early 5th century B.C.

Incised on neck: IIIII

Although no comparable pithoi are preserved complete, so that their capacity may be measured, we must assume as unit either the large liquid measure (eight or twelve choes) or the large dry measure (48 choinikes).

Two other fragments on which the inscriptions are incomplete may use this same method:

5. Amphora neck fragment.

P 9242. 5th century B.C., last quarter.

Incised:] IIII i. e. four or more choes.

6. Amphora neck fragment.

P 9245. 5th century B.C., last quarter.

Incised:] IIIII i. e. five or more choes.

A slight variation of the simple stroke method is required by the introduction of fractions:

7. Small fragmentary amphora. Pl. 1.

P 4873. 5th century B.C., second half.

Incised on neck:] IIIIC

This is not, however, a certain example of the simple stroke method, since it is a small jar and probably held only one or two choes with four or more and one-half kotylai, so that it may have read, for example, X IIIIC. For this type of notation, see below. But the presence of two units, one large and one small, was sometimes indicated by another slight variation on the simple stroke method; see No. 8.

8. Chian amphora, restored complete. Pl. 1.

SS 1840. 5th century B.C., third quarter.

Incised on neck: ≡IIIIII

The capacity is such that this must be read as seven choes, three kotyles, and two of some smaller unit, either kyathoi or, more probably, oxybapha. The fact that a Chian jar was supposed to hold exactly seven choes (eight Chian choes) need not invalidate either this inscription or this interpretation. As one might expect, there is considerable variation of capacity among amphorae with the same stamped guarantee. And if, as seems to me likely, the jars were manufactured in accordance with minimum specifications of dimensions,⁷ they must often have held more than the minimum, so that when actually measured, as this was, the total capacity would be something over seven choes.

⁷ Cf. my article in *B.C.H.*, LXXVI, 1952, pp. 18 ff. I hope shortly to publish such minimum specifications in connection with jars from the Athenian Agora.

9. Amphora neck fragment. Pl. 1.

P 9247. 5th century B.C., last quarter.

Incised:] \equiv IIIII

If we may judge from the capacities of similar amphorae, we must read this as six choes and six kotylai.

The simple stroke method may also apparently be used with an accompanying summation:

10. Chian amphora, restored complete.

P 2371. 5th century B.C., third quarter; *Hesperia*, IV, 1935, p. 516, fig. 28, b.

Incised: Γ $\overline{\Gamma}$ IIIIIII^H

The capacity of the amphora is seven Athenian choes. As noted above, however, the 7:8 ratio of Chian-Athenian coinage suggests a similar ratio in capacities. Whatever the first marks may mean, it is fairly certain that the eight strokes followed by "8" refer to the Chian chous capacity.

A refinement on the simple stroke method with summation may be seen in three fragments from one well group and one other fragment from a slightly later and different context. Although there is no way of knowing the capacities of the pots to which these various fragments belonged, the notations speak so clearly that we can be sure that they were made as the pots were measured.

11. Fragment of unglazed pot.

P 2364. 5th century B.C., third quarter; *Hesperia*, IV, 1935, p. 516, fig. 28, d.

Incised: CIIIIII

12. Amphora handle fragment.

P 11386. 5th century B.C., third quarter.

Incised: IIIIIII^H

13. Cooking pot fragment.

P 11387. 5th century B.C., third quarter.

Incised: EIIII

14. Amphora handle.

P 9340. Late 5th-4th centuries B.C.

Incised: HIIIIII

In the measuring process, after each unit-measure was emptied into the pot, a stroke was scratched on the jar. When the last unit filled the pot, the measurer substituted for the final stroke the total number, so that the jar which held six units shows five strokes and a "6," that which held eight units shows seven strokes and an "8," and so on. The fourth fragment may have some completely different signification, or it may illustrate this same type of counting in a rather different way, in that the last unit was recorded by a simple cross stroke which joined the last two strokes and thus makes an "8" out of strokes "6" and "7." The use of alphabetic numerals in the third quarter of the 5th century is not unprecedented in Athens.⁸ These examples of a private and informal use

⁸ I. G., I², 760; Tod, *op. cit.*, p. 137; Häckl, *Merkantil Inschriften*, Nördlingen, 1906, *passim*.

of alphabetic numerals centuries before they appear regularly in official documents recall the private and informal use of the Ionic letters long before the law of 403 B.C.

The usual numbers in the 5th century are the so-called acrophonic numerals, which use the initial of the number. Except in money matters the simple stroke may serve as the unit in this system, so that there are some capacity graffiti in which the simple stroke method combines with an acrophonic numeral.

15. Chian amphora. Pl. 6.

SS 1839. 5th century B.C., third quarter; *Hesperia*, III, 1934, pp. 296, 306.

Incised on neck: $\Gamma \equiv$

Compare No. 8 above. The capacity of this amphora gives us the interpretation seven choes, three kotylai.

16. Amphora fragment.

P 21965. Mid 5th century B.C.; *Hesperia*, XXII, 1953, p. 100, no. 140, fig. 4.

Incised: $\Delta \begin{smallmatrix} \text{||||} \\ \text{||||} \end{smallmatrix} [$

This may be 18, but since amphorae do not ordinarily hold more than 12 choes (one metretres) that would not be a likely capacity. It would be an unusual price inscription with either unresolved obols or drachmae expressed by the usual obol sign. It may then perhaps best be interpreted as ten choes and eight kotylai.

17. Upper half of Chian amphora. Pl. 1.

P 18989. 5th century B.C., second half.

Incised on lower neck: $\Gamma \equiv$

||||

Neither No. 16 nor No. 17 shows the pure acrophonic system in which not more than four simple strokes occur, the "5" being expressed by Γ . But the pure acrophonic system was not always completely adaptable to the recording of capacity, since the measurer could not be sure beforehand how many units it would take to fill the vessel. In the case of No. 17 a break between the Γ and the single strokes makes the reading uncertain; it may be either $\Gamma \equiv \begin{smallmatrix} \text{||||} \\ \text{||||} \end{smallmatrix}$ or $\Gamma \equiv \begin{smallmatrix} \text{||||} \\ \text{||||} \end{smallmatrix}$. In the former case we shall see the lower line of strokes as the tally on which the five choes of the Γ were counted up as they were poured in. The total contents would then be eight choes. In the latter case the contents of a five-choos measure were first poured in, then two choes, one after the other; there was still a small amount of space left. The measurer could not know that it would hold five kotylai, so he poured in one kotyle after another, marking each with a single stroke. The total contents then appears as seven choes and five kotylai. Complete Chian jars, as was seen above, hold somewhat more than seven Athenian choes.

18. Amphora fragment.

P 9243. 5th century B.C., last quarter.

Inscribed: $\begin{smallmatrix} \text{|||} \\ \Gamma \end{smallmatrix} [$

This appears to be eight choes, but it is not complete.

- 19.** Knidian amphora. Pls. 1 and 6.
 SS 6602. Late 2nd-early 1st centuries B.C.⁹
 Incised on neck: ΠΙΙΙ

The capacity of this jar is 33.625 liters. If this is a capacity notation, as seems likely, there are two possible interpretations. We may assume that the unit is $\frac{1}{8}$ of the total capacity, i. e. 4.203, and ask if there is evidence for such a Knidian chous. There is none. Knidian jars of this general period vary in capacity from 27 to 34 liters, and yet the stamps on their handles seem to guarantee that they are standard in size and hold an equal amount. The only amount they can all hold is something less than the capacity of the least capacious. That this happens to be eight choes (26.208 liters) makes it likely that the graffito on this jar records not what it can hold but what it did hold when filled, sold or delivered. The fact that it is an even number of choes suggests that it is not the actual measured capacity but a note made by the filler (saying how much he had put in), by the seller (saying how much he was selling) or by the user.

- 20.** Pithos rim fragment.
 P 11543.
 Incised: ΔΔΠ[

Using Heron's¹⁰ formula for the capacity of pithoi we might assume that with an average diameter of three feet and a height of four feet this pithos would hold 28 cubic feet or amphorae (the Roman amphora is equal to one cubic foot). An average diameter of three feet would mean a mouth diameter of less than that. The estimated diameter of this mouth is something over two feet.

In the pure acrophonic system, the unit may be represented by the initial letter of the unit,¹¹ i. e. X for χοῦς or K for κοτύλη. Where two units were used, it was apparently possible to use the single stroke for one and the initial for the other, as in the following examples:

- 21.** Amphora handle fragment. Pl. 1.
 P 9239. 5th century B.C., last quarter.
 Incised:] ΙΙΙ Κ [

See photograph on Plate 1 for details of the symbols.

- 22.** Amphora neck and shoulder fragment.
 P 9240. 5th century B.C., last quarter.
 Incised:] ΙΙΙ Κ

The jars of Nos. **21** and **22** held some number of choes greater than three and beyond that, kotylai to the number of four and three.

For completeness' sake, we may add:

⁹ Since this, like the other dates given in this catalogue, is a context date, it provides only a general terminus ante quem for the jar. The exact date of the jar itself, based on evidence from the stamps, is not material to the present argument and will more properly appear in Miss Virginia Grace's publication of the Knidian jars of the Athenian Agora.

¹⁰ *Metrologicorum Scriptorum Reliquiae* (ed. F. Hultsch), Leipzig, 1864, I, pp. 202 ff.

¹¹ Tod, *B.S.A.*, XVIII, 1911-12, p. 132.

- 23.** Small amphora fragment.
 P 9246. 5th century B.C., last quarter.
 Incised:] K[

That there was no consistent practice in the use of simple strokes and acrophonic signs for large and small units is shown by the following:

- 24.** Shoulder piece of small jar.
 P 879.
 Incised: XIII [

The size of the fragment suggests a pot which must have been not much larger than a chous; X may be interpreted as one chous; the three (or more) kotylai are represented by simple strokes.

There are two other less certain examples of this:

- 25.** Amphora fragment.
 P 3863.
 Incised:] IIHH [

As we shall see below, H ordinarily appears in those capacity numbers which are sandwiched in between the large and small units, and so must ordinarily be interpreted as 'hemi.' It is possible to read this as two or more choes and two half-choes. That is, when it was measured, first the choes were poured in; space seemed to be left for a half-chous, which was poured in and marked; but there seemed still enough space for another half-chous, so that this also was poured in and marked. Whether there were any kotylai after these half-choes we do not know. This seems to me the most probable interpretation, but the incompleteness of both fragment and inscription make it uncertain. It might, perhaps, be interpreted as a large sum of money like II]IIHH[X, but the large gap between hundreds of drachmae and obols seems odd, and the comparative infrequency of large sums of money on pots militates against this interpretation.

- 26.** Amphora neck. Pl. 1.
 P 11383. 5th century B.C., third quarter.
 Incised: H IIII
 Δ

This I would read as ten and a half choes and four kotylai, but aside from the general shape of the amphora neck and the comparison with other definite examples there is no proof.

- 27.** Amphora neck. Pl. 2.
 P 16444. 5th century B.C., second half.
 Incised: Δ ± II

The amphora seems to have been large enough for a capacity of ten choes and one-half and two kotylai.

More convincing again is the following use of acrophonic signs for large units and simple strokes for small:

- 28.** Small amphora neck.
 P 20367. Hellenistic (3rd-2nd centuries B.C.)
 Incised: XXXΠIII
 The size of the jar is suitable for three choes and eight kotylai.

29. Amphora neck. Pl. 2.

P 12657. Late 5th century B.C.

Incised:]XEIII[i. e. at least one chous, one-half chous and three kotylai.

The writer, being psilotic or an "h"-dropper, was probably not Athenian.

30. Chian amphora.P 2368. 5th century B.C., third quarter; *Hesperia*, IV, 1935, p. 516, fig. 28, f.

Incised: E II

The jar holds eight Chian choes, so this must be read as one-half metretes, two choes. The writer here is using both Chian standard and Chian psilos.

In the acrophonic system most often the initial of both large and small units is used, and perhaps also the initial for "half" as an intermediate stage between the two units.

31. Amphora neck fragment.

P 22869. 2nd century B.C.

Incised:]XΠΚ[i. e. at least one chous and six or more kotylai.

32. Amphora fragment. Pl. 2.

P 8432. Late 5th century B.C.

Incised: $\begin{smallmatrix} \text{XX} \\ \text{H} \text{K} \end{smallmatrix} \left[\right.$ i. e. at least two choes and one-half and at least one kotyle.**33.** Amphora neck fragment.

P 9250. 5th century B.C., last quarter.

Incised:]XXHΚ[i. e. at least two choes and one-half and at least one kotyle.

34. Upper part of amphora.

P 10690. 4th century B.C., second half.

Incised:]XXHKKKK i. e. at least two choes and one-half and four kotylai.

35. Small amphora neck fragment.

P 5841. Hellenistic (3rd-2nd centuries B.C.)

Incised:]XΚ i. e. at least one chous and one kotyle.

36. Amphora fragment.

P 12635. Late 5th century B.C.

Incised:]XXXX[i. e. at least four choes.

In one variation of the acrophonic system the abbreviation or initial of the unit precedes the number.

37. Neck of globular black-glazed lekythos. Pl. 2.P 12702. Mid 4th century B.C.; *Hesperia*, VIII, 1939, p. 280, note 38.

Incised: ΚΟΤΥ : ΠΙΤ i. e. kotylai: seven and one quarter.

A similar complete example (P 3992) holds almost eight kotylai.

38. Amphora neck fragment.

P 6733. Hellenistic (3rd-2nd centuries B.C.)

Incised: ΧΟ Ϟ Χ[i. e. six or more choes.

39. Amphora fragment.

P 7042.

Incised:]ΧΔΙΚ [i. e. 11 choes and one or more kotylai.

This is not at all certain, and might also be restored: *e. g.* ΓΧΧ]Χ δικ[αίως.**40.** Amphora fragment. Pl. 2.

P 19674.

Incised: Χ ΓΗΙ—

This is probably to be interpreted as choes: five and one-half; small unit (kotyle): one; smaller unit (kyathos): one. Measuring down to such detail seems rather fine-drawn and perhaps it is better to regard the horizontal line as merely a concluding dash (cf. 45).

Another variation allows the unit initial to combine with the acrophonic numeral.

41. Upper part of amphora.

P 4407. 4th century B.C., last quarter.

Incised: ϞϞ ΗΚΚC i. e. ten and one-half choes; two and one-half kotylai.

We must conclude that the measurer at first used a five-chous measure but did not trust his memory enough to wait till the amount reached ten choes. The use of two signs for one-half may be thought strange, but there can be no doubt that this is the case. It is worth noting that H is most often used for the half-chous and should probably be thought of as the initial of *ἡμίχουρ*, while C is taken over for half of the small unit from its customary use as one-half obol.

42. Amphora neck fragment.

P 9251. 5th century B.C., last quarter.

Incised: ϞϞ [i. e. ten choes or more.

43. Amphora neck fragment. Pl. 2.

P 9252. 5th century B.C., last quarter.

Incised:] ϞΗΙ[i. e. ten or five choes, one-half, and one or more kotylai.

44. Mendeian (?) amphora neck.

P 11382. 5th century B.C., third quarter.

Incised: on one side: ΔΚΚ i. e. ten choes, two kotylai.

on the other: Δ< i. e. ten staters.

The fact that the capacity is recorded in its final form, without showing intermediate stages of the measuring process, suggests that this might represent a more formal record than the usual owner's graffito. Such a conjecture would be supported by what must be a price inscription on the other side. See below, Section B.

45. Amphora.

P 11389. 5th century B.C., third quarter.

Incised: Ϟ+

+ i. e. seven choes.

—
The capacity is seven choes.

46. Amphora fragment. Pl. 2.

P 12962. Late 5th century B.C.

Incised: ΠΗΚΚ [

The interpretation of this piece is difficult, for although the presence of the *kappas* certifies it as a capacity inscription, the *etas* are used in an unprecedented fashion. As far as it is possible to tell from this small fragment the amphora was of ordinary amphora size (anywhere from six to twelve choes). So the H cannot stand for 100 and the whole be 602 kotylai. On the other hand, it seems unlikely that the hemichous would be used as a measure where the whole was considerably greater than a chous, or that five hemichoes would be used as a unit at all. On the basis of numerous parallels in which X appears in the same position as the H here it seems easier to believe that H is here used for X, perhaps by a slave from foreign parts who found little difference between the aspirate and the aspirated K. The alternative is to think that H stands for hydria, which was at least in some areas (Pontos) thought of as a measure.¹²

47. Small amphora, restored complete. Pls. 2 and 6.

P 18609. Late 5th-mid 4th centuries B.C.

Incised: ΠΚΚΗ

The capacity, measured with lentils, varies between 2.000 and 2.150 liters; seven and one-half kotylai of .273 give 2.0475 liters. Perhaps the H here is the initial of ἡμικοτύλιον.

48. Amphora fragment.

P 23414. 4th century B.C., second half.

Incised: Π[i. e. five choes or more.

49. Amphora fragment.

P 9244. Late 5th century B.C.

Incised: Π[i. e. five choes or more.

Another variation in the acrophonic system does not combine the unit-initial with the number.

50. Amphora neck fragment. Pl. 3.

P 2067. Late 5th-early 4th centuries B.C.

Incised: ΠΧΗΚΚ i. e. six and one-half choes, two kotylai.

51. Black-glazed oinochoe neck fragment.

P 2809. End of 5th century B.C.

Incised:]ΠΚ

The fragment is too small to indicate the exact size of the amphora, but it is most likely to have held less than two choes and more than six kotylai. We may most probably restore ΧΠΚ for one chous, six kotylai.

52. Amphora fragment. Pl. 3.

P 7922. 5th century B.C., last quarter.

Dipinto (red):]ΠΧΧΧ[

It is to be noted that this inscription was painted. It seems impossible to tell whether it was painted before or after firing. If it was before, it suggests that the capacity of the jar, eight or more

¹² *Metrol. Script. Rel.*, I, p. 264.

choes, was known before the jar was durable enough to be measured by filling with some substance. We might expect, therefore, that the capacity was known from the dimensions of the jar.¹³

53. Amphora fragment.

P 9050. Hellenistic (mixed 3rd and 2nd centuries B.C.)

Incised:]HKK[

The fragment is from a large storage amphora which must have held some number of choes in addition to this half-chous and two or more kotylai.

54. Amphora fragment. Pl. 3.

P 9249. 5th century B.C., last quarter.

Incised: Π + Η.[i. e. six and one-half choes and ?

55. Amphora neck fragment.

P 11375. Late 5th-early 4th century B.C.

Incised (before firing): ΔX[

At least 11 and perhaps 12 choes, recorded before firing and so presumably in accordance with specified dimensions for one metretres.

56. Amphora handle fragment.

P 20333. 4th century B.C., first half.

Incised: ΠXXX[i. e. eight or more choes.

57. Mendeian amphora neck.

P 17010. Late 5th century B.C.

Incised: ΠXXXXT
TE

In addition to the eight choes there was presumably a fraction. The T in the first line may stand for *τρίτον*, in which case a third of a chous was perhaps not sufficient to fill the jar so that one-fourth chous (TE) was added. But the T may have been meant as one-fourth, and was so explained in the second line.

A few other inscriptions indicate capacity but present anomalies of one sort or another.

58. Chian amphora, complete.

P 2366. 5th century B.C., third quarter; *Hesperia*, IV, 1935, p. 496, fig. 17, no. 86.

Incised: ΠΕΕΧΔΕΚΑΤΕΞΑΡΕΞ¹⁴

The measured capacity is seven Attic choes, so that it is not merely tempting but almost necessary to take ΠΕΕΧ as π(έντε), ε(ἑς) ε(ἑς) χ(όες) i. e. seven choes. This would mean that the unit must also have had, at least in the minds of some individuals, an acrophonic sign. That this particular individual was psilotic and so non-Athenian need not make any difference since the presence of price (*δεκατέσσαρες*) as well as capacity suggests that the inscriber was seller or merchant rather than owner.

¹³ Cf. note 7.

¹⁴ Reading published by L. Talcott in *Hesperia*, IV, 1935, pp. 515-516, fig. 28, a.

59. Amphóra neck fragment. Pl. 3.

P 9241. 5th century B.C., last quarter.

Incised: J|||H OOO

Traces to the left of the two simple strokes may be two more simple strokes, a N, or a retrograde K and another stroke. The greatest likelihood is for the simple strokes, since the H standing between simple strokes and what I think must be taken as a smaller unit initial must stand for "hemi." If this inscription had read |||HKKK, it would be comparable to Nos. 20 following above and there would be no question about its interpretation: four and one-half choes, three kotylai. Here only the smaller unit is different, and since there is a small capacity unit whose initial symbol must be O (oxybaphon), it seems best to read: more than four choes, one-half chous, three oxybapha. Three oxybapha make three-quarters of a kotyle, and if after pouring in the choes and the half there still looked to be room for a kotyle, the measurer might have tried to put it in and discovered that only three-quarters would fit. Greek notation makes three-quarters of a unit of which one has not been recorded very difficult, so the easiest thing was to record three oxybapha.

The other graffiti appear to be indications of capacity, but because of their unusual nature interpretation can be only tentative.

60. Black-glazed oinochoe base. Pl. 3.P 21401. Mid 5th century B.C.; *Hesperia*, XXII, 1953, p. 100, no. 139, fig. 4.Incised under base: P P ||

See Plate 3 for the form of the symbol. If it is the initial of a capacity unit, it must represent one tryblion. In *Metrologicorum Scriptorum Reliquiae* tryblion appears as another name both for the kotyle (I. 208, 222) and for the oxybaphon (I. 236, 327). But also there is the statement that "among the Athenians the choinix is called tryblion." (I. 233). The choice must be made on the basis of the capacity of an oinochoe (P 21871) with a similar base from the same well group: something over 2.200 liters. Both kotylai and oxybapha are too small to be the two tryblia here noted. But two choinikes will be 2.184 liters, so that these tryblia must be choinikes, whatever the two smaller units represented by the simple strokes may be. The fact that the choinix is a dry measure may explain why it is here called by another name. And its use as a liquid measure may perhaps be explained by the occasional need for some intermediate measure between .273 and 3.282 liters.

61. Amphora neck.

P 15053. 5th century B.C., fourth quarter.

Incised: P |||||

This is a small amphora, but there is no way of knowing if it is small enough to hold only nine tryblia of the choinix variety (i. e. three choes).

B. PRICE MARKS.

Very few certain examples have been found in the Agora. We have already seen two examples (44 and 58) on which two drachmae (or one stater)¹⁵ per chous was the standard price for wine.¹⁶ Still another example from the same well group confirms this impression:

¹⁵ The stater in both Chios and Mende, where these amphorae appear to originate, is a didrachm.

¹⁶ Because Chian wine was famous and Chian jars were presumably made to export Chian wine, it is assumed that the contents were wine.

62. Chian amphora, complete.

P 2372. 5th century B.C., third quarter; *Hesperia*, IV, 1935, p. 516, fig. 28, e.

Incised: ΠΙΙΞ i. e. seven staters.

The jar holds seven choes, so that the price is again one stater or two drachmae per chous. Literary evidence on the price of wine is scanty for this period; in connection with his publication of the Attic Stelai, Pritchett¹⁷ has collected it for this and succeeding centuries. Apparently a chous of ordinary wine, unnamed, might cost any price from two to ten obols, but Plutarch (*de tranquill. an.* 470F) tells of an expensive Chian wine which cost 50 obols for a chous in the time of Socrates. At the same time, one interpretation of the text in Stele VI, lines 60 ff. of the Profaners of the Mysteries, gives a price of four obols a chous for the Attic wine sold at auction.¹⁸ The wine which filled our jars (at two drachmae or 12 obols per chous) appears to have been rather better and more expensive (perhaps largely because it was imported) than the ordinary local or unnamed wines but not nearly so costly as that mentioned by Plutarch.

63. Chian amphora neck.

P 2367. 5th century B.C., third quarter.

Incised: ΙΙΙΙ  i. e. 14.¹⁹

The amphora belongs to the series which holds seven choes, so that the 14 is most easily interpreted as price.

Because our other apparent indications of price are much less readily comprehensible, it is good to have some notions of the approximate prices both of possible contents and of the containers themselves. The one other commodity which was likely to be sold by the amphora is oil; again the evidence for prices is scanty. Pritchett's collection²⁰ suggests usual prices varying from one to three drachmae for a chous. Oil and wine will belong to much the same category of prices for our purposes, giving a possible range of numbers up to 36 drachmae for a jar holding one metretes.

Much smaller numbers may indicate the price of the vessel itself. Evidence collected by Häckl²¹ shows that six large painted kraters cost four drachmae, i. e. four obols each. Twenty oxybapha cost one drachma or 50 cost three drachmae, giving a

¹⁷ W. K. Pritchett, "The Attic Stelai, Part I," *Hesperia*, XXII, 1953, pp. 225 ff. I am indebted to Professor Pritchett for the opportunity to consult his manuscript of the Commentary to the Attic Stelai, in which the evidence on prices is collected. This Commentary is scheduled for publication in *Hesperia*, as "The Attic Stelai, Part II."

¹⁸ The price of 104 seven-chous jars (lines 64 f.) must be restored as 520 drachmae. If the seven-chous jars sell for five drachmae each, then the three-chous jar (lines 60 f.) should go for three-sevenths of five drachmae, or just about two drachmae (i. e. four obols a chous). Such a price is made probable when the number of such three-chous amphorae (590) is multiplied by two drachmae and gives the number 1180, which agrees with the last five numbers of the total price (...ΗΡΔΔΔ). Since the alignment is not regular at this part of the stele (cf. Pritchett's note hereon, p. 277), it is not necessary to fill both places at the front.

¹⁹ Reading by L. Talcott, *Hesperia*, IV, 1935, pp. 515-516, fig. 28, c.

²⁰ Cf. note 17.

²¹ *Op. cit.*, p. 98.

price for one of about one-third obol. As Häckl points out, this ties in neatly with Aristophanes' statement (*Frogs*, line 1262) that a very fine lekythos costs one obol. Further study of Häckl's material and some new material by Amyx²² and Jongkees²³ has not materially altered the picture for our present purpose. Evidence from the Attic Stelai may now be added: II, 41 ff., empty but presumably decorated Panathenaic amphorae are going for prices ranging from a little less than two and one-half to a little more than three and one-half obols; II, 240, empty amphorae, presumably unglazed and for re-use, are being sold in a lot of 21 for three obols, making the individual price one-seventh obol or a little over one chalkous; VII, 52 ff., three phidaknes are being sold at four or four and one-half drachmae a piece; but two others, which must be larger, are going for nine and eleven drachmae respectively. These phidaknes are giant pithoi, some of which are recorded in the Attic Stelai (II, 251) as holding 12 amphorae each.

Knowing these prices we can interpret the following graffiti with somewhat more assurance. Numbers which are beyond the range of possibility as the price of either the particular pot or its contents may be interpreted in one of two ways: 1) as the price of a shipment of pots; ²⁴ 2) as casual jotting without relevance to the pot or its contents. The latter is perhaps less likely since the odd sherd would have been less cumbersome and more convenient for such a use. There may well be other explanations for some of these numbers, especially where it is not clear that the unit is one of money, but since none of them is susceptible of proof, they may perhaps best be mentioned only as a last resort in the individual case.

64. Amphora neck. Pl. 3.

P 6126. Late 5th century B.C.

Incised: ΔΓ ΙΙΙΙ ΔΓ

The four simple strokes are separated from, and more lightly incised than, the acrophonic numbers; the second ΔΓ is very uncertain. I would suggest that 15 drachmae was the price with four obols perhaps added as the price of the jar. The jar is too fragmentary to allow of a capacity estimate but appears to be of the Mendean type which range from eight to ten Athenian choes. Fifteen drachmae would be a reasonable price for the wine.

65. Amphora fragment. Pl. 3.

P 9248. 5th century B.C., last quarter.

Incised: ♦ ††

This I read as ΔΔ†† or 22 drachmae and assume that such was the price of the contents, of which it is likely there were up to twelve choes.

²² Amyx, D. A., "An Amphora with a Price Inscription," *University of California Publications in Classical Archaeology*, I, pp. 179 ff.

²³ Jongkees, J. H., "On Price Inscriptions on Greek Vases," *Mnemosyne*, IV, 1951, pp. 258 ff.

²⁴ Cf. Häckl, *op. cit.*, pl. 3, nos. 595 ff.

66. Amphora neck fragment.

P 18923. 5th century B.C., last quarter.

Incised: ΔΙΙΙΙ

The lower half of the inscription is broken away so that it is not certain whether the four strokes are plain or have the cross bar of the drachma sign. In either case, although the size of the amphora cannot be known, this may represent the price. It is of course also possible that it is like **16** in using the acrophonic symbol for the large unit and simple strokes for the small; so that it might indicate not price but a capacity of ten choes and four kotylai.

Another similar fragment presents the same problems:

67. Amphora neck fragment.

P 22473. 4th century B.C.

Incised: ΔΙΙΙ

A rather different sort of price appears on the following:

68. Small black-glazed ring-handled jug. Pls. 3 and 6.

P 3512. 4th century B.C.

Incised (underneath): $\begin{smallmatrix} \text{F}\Delta \\ \text{I} \end{smallmatrix}$

This may be either 61 drachmae or 60 for one drachma. The position of the numbers militates against the former. If the latter reading is accepted it must be a consignment price; 60 of something for one drachma would give an individual price of one-tenth obol. Whether the commodity was ring-handled jugs or something else on which this was hung as a tag, there is no way of telling.

69. Lower part of black-glazed skyphos. Pl. 4.

P 9177.

Incised (inside ring foot): Δ:Δ ΙΙΙ[

The unusual form of the *delta* may be seen on Plate 4. This might be interpreted as ten pots (perhaps skyphoi) for 13 obols.

These are all the pot-inscriptions which can reasonably be interpreted as price marks with any degree of conviction. One other which includes a drachma sign must be interpreted as money but is too big to be the price of a single pot or its contents and too precise to be a shipment price. It may be a simple jotting.

70. Amphora neck fragment.

P 8786. 4th century B.C.

Incised:]T-I HHH[i. e. 300 (or more) and one drachma plus one-fourth obol.

There are other cases where numbers are written on pots which are too large to be indicative of price and not suitable for capacity marks. It is to the next category that we must look for some explanation of these.

C. INDICATIONS OF TARE AND NET WEIGHT.

Many jars of the Roman period in the Agora excavations have scratched or painted inscriptions which tell the weight of the empty vessel. These have not yet been published, but the quotation here of two sample texts will give a general idea.

Graffito: P 9806. *δοσστράκου λι ιε*, i. e. (weight) of the jar: lbs. 15.

Dipinto: P 16079. *κούπου λι στ' ου γ*, i. e. (weight) of the empty: lbs. 6, oz. 3.

The weight of the pots, which are not perfectly complete, is a fair approach to the recorded amount. The advantage of having the tare (or empty weight) recorded on the vessel is immediately apparent: by weighing the vessel when it is full of a known substance you can know without measuring how much it holds. As we know from the *Metrologici Scriptores* the weights of specific measures of wine, oil and honey were well known, so that if a jar full of wine weighs 18 lbs. and the inscribed tare is eight lbs., the amount of wine must be a chous (i. e. ten lbs. of wine).

The fact that we have more metrological evidence for the Roman period has made the interpretation of these tare-inscriptions relatively obvious. Whether the same practice existed in Greek times was rather more difficult to determine. There was some evidence, as will be seen below, but nothing that was absolutely convincing till the spring of 1954 when part of an amphora emerged from a late 5th century B.C. well that almost certainly proved the use of tare in Greek times.

71. Upper part of amphora. Pl. 4.

P 23948. Late 5th century B.C.

Incised on one side of neck: $\Delta M \Delta M M$
M

on other side: $\Delta \Delta$
MM

Consult Plate 4 for the relationship of the *delta* to the *mu*. The reading must be $\acute{\alpha}\mu(\phi\omicron\rho\acute{\epsilon}\omega\varsigma)$ 12 minas; 20 minas; i. e. (weight) of the amphora: 12 minas; (weight of contents): 20 minas. Unfortunately, the amphora is incomplete, nor is there a comparable jar available for weighing and measuring. The inscription itself, however, is sufficiently explicit without such corroboration.

Emboldened by this certain example we can look at other material that is suggestive of tare.

72. Chian amphora.

SS 1841. 5th century B.C., third quarter.

Incised on neck: $\Delta \Delta$

If this is a tare-inscription, the amphora should weigh 20 minas (i. e. 8.720 kg.). It is somewhat incomplete and restored in plaster; its weight is 8.640 kg.

73. Amphora neck fragment.

P 9753. Hellenistic (3rd century B.C.)

Incised: $\Delta \Delta \text{|||||}$

This inscription does not seem suitable as a price mark, partly because the six straight strokes can properly be neither obols nor drachmae. Because it appears to be counting units toward the end, it should be either capacity or tare; in weighing as in measuring capacity one may start with large units but must end up by adding one after another enough small units to strike a balance. We cannot be sure exactly how the weighing was done, but many of the Roman jars with tare show cumulative counting by strokes. This amphora may have weighed 26 minas.

But often, if we may judge from the treasury inventory lists, weights were recorded in drachmae rather than minas, so that we might expect to find drachma notations that record the tare.

74. Krater rim fragment.

P 5165. 5th century B.C., second quarter.

Incised on top of rim:]HHΠ

This inscription might be restored as 250, 350, 450, 750, 850, 950 drachmae etc. That a similar complete krater (P 5160) from the same well group weighs 850 drachmae is perhaps not a sufficiently compelling reason to interpret this as a tare inscription, but it is difficult to imagine what else it might be.

The two following inscriptions (and also the vessels) are too fragmentary to tell us much. Only the size of the number suggests that it may be tare.

75. Amphora neck fragment.

P 5933. Hellenistic (3rd century B.C.)

Incised:]HΔΔΔ[

76. Amphora shoulder fragments.

P 7447. 4th century B.C.

Incised: ΓHHH[]ΔΔΓ[

A rather different problem is presented by the next.

77. Small black-glazed pyxis lid. Pl. 4.

P 9809.

Incised on top: ΔHHH

See the illustration on Plate 4 for the form of the symbols. Fourteen drachmae cannot be the price; it is far too large. The use of drachmae forces us to assume either a casual financial jotting or an expression of weight. It does not seem casual enough for the former and I would prefer to believe that the little box was used to hold some fairly expensive cosmetic or ointment which was sold by weight. When it needed refilling it was taken to the perfumer's shop where it was filled and weighed full. The number of drachmae over 14 would then be the contents and for these the buyer would pay. The lid itself weighs four drachmae; if the box was two and one-half times the lid in size the total would be 14. Unfortunately no complete examples of this sort of pyxis have been available for weighing.

78. Black-glazed bolsal.

P 7441. 4th century B.C.

Incised under foot: ΔΔΔΓ

The number might have almost any significance but the fact that about one-third of the cup is missing and the remainder weighs 24 drachmae makes it at least possible that 36 drachmae was the weight of the whole.

NUMERICAL NOTATIONS ON SHERDS.

Where numbers were written on a potsherd rather than on a pot, most of the possible interpretations used in the category above are no longer valid since neither weight nor capacity is relevant. The number may still be a price mark—now in the form of a detachable price tag—and other interpretations also become possible. The number may be jotting either for calculation or memory. It may also be for keeping count (e. g. when measuring a pot that must not be marked up) or keeping score in games. Simple counting might be done by this stroke-marking; more complicated counting and simple arithmetic could be done better with a counting board or abacus.

Of these latter we have two examples. These are not the formal stone counting-tables like that found in Salamis (*I.G.*, II², 2777) or those in the Amphiareion ('Αρχ. Έφ. 1925-6, pp. 44-45), but the roof tile fragments which have been converted into informal counting boards by having the numbers scratched on them so that the pebbles could be added or subtracted from any particular number. An example of this sort was found in Eleusis (*I.G.*, II², 2780). One can imagine the sort of situation in which one of these might be made and used: a man involved in some kind of business transaction which requires arithmetic beyond what he can do in his head or on his fingers (ἀπὸ χειρός Aristophanes, *Wasps*, 656) takes up a large fragment of tile, scratches the numbers (ΧϞΗϞΔΠϞICTX) in a row and picks up a handful of pebbles to serve as counters. Then by adding or taking away pebbles he can perform most arithmetical functions with ease and dispatch.

79. Roof tile fragment. Pl. 4.

P 12317. Late 5th century B.C. (disturbed context).

Incised:]ΠICT

80. Roof tile fragment.

A 782. End of 5th century B.C.

Incised:]ϞΗϞ[

We have one example of what must be a price tag, since it has a hole chipped in its center so that it may be tied onto the object priced.

81. Base of black-glazed bowl or plate. Pl. 4.

P 6876. Late Hellenistic.

Incised on floor: ΔΠΗΗ

The numbers were incised with relation to the broken edge and so show that the inscription was made on the sherd.

Another price tag or perhaps bill of lading:

82. Black-glazed rim and handle fragment. Pl. 4.

P 16981. Late 5th century B.C.

Incised around edge of sherd: κέρāμος ΔΔΔΔΠ[

The handle (not visible in the illustration) again makes for convenient attachment. The closeness of the Γ to the edge suggests that part of the original sherd has been broken off so that the original number may have been anything from 45 to 49. That *κεράμους* is accusative plural seems likely, and this suggests that the number is not a price but a record of the shipment; perhaps a lot price followed. What may be another example of a tag seems to have been re-used as an ostrakon. It is a kylix foot (P 2734, *Hesperia*, XV, 1946, p. 272, no. 8) on which are inscribed both the number '50' and the name of Kallixenos, son of Aristonymos. Since there is no parallel for a number on an ostrakon, the number should belong to a previous use either of the sherd or of the kylix. It is difficult to imagine why so large a number should be written on the kylix; but once the foot was broken off, the resulting hole would have made it an admirable tag to be attached to a shipment comprising fifty objects or to something priced at fifty drachmae.

Counting may be seen in another inscription which was written with relation to the edge of the sherd.

83. Unglazed amphora fragment. Pl. 4.
P 7404.

Incised: HHHHHHHH $\Delta\Delta\Delta\Delta$
 Δ II

The listing of hundreds and tens without making use of the signs for 500 and 50 makes this appear to be counting; the use of the simple stroke rather than the drachma sign suggests that it was not money which was being counted.

84. Base fragment of black-glazed skyphos.
P 14847. Late 5th century B.C. (disturbed)

Incised:]IIIIIIIIII
]IIII
]Γ[

Some sort of counting seems to be involved, but the piece is too fragmentary to interpret further.

85. Black-glazed sherd.
P 916.

Incised on what was inside of pot:]XXXX[
X

Although it is possible that the numbers were written on the sherd rather than the pot (because they are inside and seem to follow the edges of the sherd) it is not certain that we have the whole of the original sherd. This looks like counting and might well be the tallying of choes being poured into a jar.

A good example of a sherd which has been used merely to record a number is the following, where it is immediately apparent that the inscription was made on the sherd.

86. Wall fragment from large semi-glazed krater. Pl. 5.
P 12214. 6th to late 5th century B.C.

Incised on inside: $\overline{\Gamma}$ ++++
 $\overline{\Gamma}$ HHHH
 $\overline{\Gamma}$ $\Delta\Delta\Gamma$

Consult Plate 5 for the forms of the symbols. What this large number (9975) may refer to we can not even guess.

Several other small sherds preserve inscribed numbers, but whether the inscription was made on the sherd or on the pot is not certain. Without that information it is almost impossible to decide among possible interpretations. The lamps (93-95) are especially puzzling, since one can imagine no possible reason to record such numbers on the underside of a lamp, at least while it was in use.

87. Small black-glazed sherd.

P 250.

Inscribed on outside:]ΔΔ[

88. Black-glazed sherd.

P 5979.

Incised on outside:]ΗϞΔΔΔΠ†[

89. Tile fragment.

P 7285. 5th century B.C., second half.

Incised: ϞΔΔΠ

90. Saucer fragment.

P 17285. 4th century B.C.

Incised:]HHHH[

91. Plate fragment.

P 17539. 4th century B.C.

Incised on floor:]ΔΔΔ

92. Black-glazed skyphos base. Pl. 5.

P 23733.

Incised underneath:]ΤΗΗΔΔΔΔ
]ΛΗΔΔΔ
]ϞΔΔΔΔ

93. Greek lamp fragment. Pl. 5.

L 3068.

Incised on underside of foot: ΔΠΙΙ ΔΗ

This lamp will be published as No. 280, pl. 23 in R. H. Howland, *Athenian Agora*, IV, *Greek Lamps*.

94. Greek lamp base.

L 3496. 5th-mid 4th century B.C.

Incised underneath:]Η ϞΔΔΔ

This will be published as No. 219, pl. 22 in R. H. Howland, *Athenian Agora*, IV, *Greek Lamps*.

95. Greek lamp base.

L 4133.

Incised underneath: ϞΗϞΔΔΔΔΠ

This will be published as No. 300, pl. 23 in R. H. Howland, *Athenian Agora*, IV, *Greek Lamps*.

For the sake of completeness it seems good to include here eight other vase-inscriptions which make use of numerical notation, even though little or no explanation can be offered.

96. Shoulder fragment of an unglazed pot.

P 3771. Early Roman.

Incised:]*apwv* ΔΓ

This is 15 of something in the genitive plural, but whether it is price, contents or weight is difficult to tell.

97. Amphora handle fragment.

P 10416. 4th century B.C., second half.

Incised: $\frac{o}{\equiv}$

Two possibilities may be suggested: 1) in a system in which *o* was ten and the stroke one, it might be read as a price of 14 drachmae; 2) where *o* stands for obol it might be four drachmae and one obol. The first requires that an Argive have written it; the second, though possible for an Athenian, seems too low a price for the contents of an amphora and too high a price for the amphora itself.

98. Amphora neck fragment.

P 7444. 4th century B.C.

Painted in red: EY
ΔΔΓ[

EY must be an abbreviation, perhaps of a name, perhaps of contents. The number is more difficult to interpret because it is painted rather than incised. It may, however, be comparable to tare graffiti such as Nos. **72-73**.

99. Small shoulder fragment of coarse pot. Pl. 5.

P 14576. Mid 4th century B.C.

Incised:]ΙΦΗ[

Here even the reading is difficult, and the fragmentary nature of pot and inscription seem to make interpretation impossible.

100. Small stemmed bowl. Pls. 5 and 6.P 14973. Early 5th century B.C.; *Hesperia*, IX, 1940, p. 274, fig. 9.

Incised under foot: ΦΚΚΚ

This inscription, if found on a larger vessel, would be a capacity notation of five choes and three kotylai. Here the meaning is not at all clear unless it is to be regarded as the jotting of some other vessel's capacity.

101. Large wide-mouthed jar. Pls. 5 and 6.

P 23681. 5th century B.C., second half.

Incised on shoulder: H
on other side: ΓΗΗ

These numbers, although they appear to say something about the jar, do not fit in with any of our categories, mostly because the jar itself is so different.

102. Base fragment of black-glazed bolsal. Pl. 5.

P 17013. Late 5th century B.C.

Incised around under foot:]ΗΔΓΧ[

The first three letters are certainly 111 drachmae. The next symbol to the right may perhaps be read as three simple strokes joined together at their base, i. e. three obols. The X, being on a larger scale, may begin the inscription or may be completely extraneous.

103. Wall fragment from an unglazed amphora.

P 17059. 5th-4th centuries B.C. (disturbed).

Incised:]Δ|OK[
]Π[

The *delta* is attached to the bottom of the left vertical stroke of the Π. The first line may be part of a name. The second must be a number, but how it is being used we do not know.

CONCLUSIONS:

There seems little point in detailing particular conclusions, partly because the material presented is so various and partly because it speaks for itself. But certain general remarks may be made (1) about the lack of standardization in numerical notation, (2) about the domestic and economic situation implied in the notations, and (3) about the chronological distribution of these acrophonic notations.

The apparent lack of any standard system indicates to me an actual lack of numerical standardization such as we would expect where there was no universal primary education and still considerable choice in so standard a matter as spelling. Monetary notation was standardized by virtue of being a subject of official importance. But notations of capacity were made unofficially in the home or the market place, two strongholds of rugged individualism. They were made by people with a variety of backgrounds, foreign or servile, native or free.

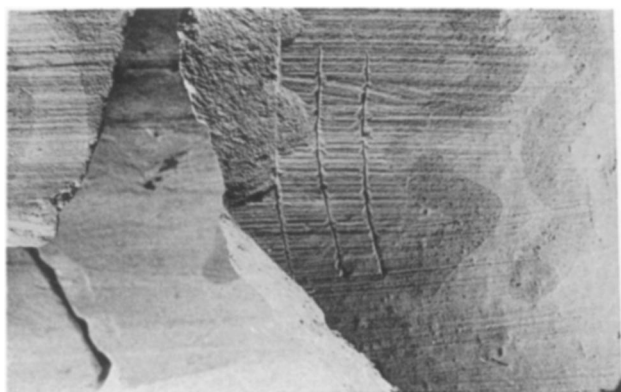
Just as the lack of standardization is what we might have expected with no specific evidence at all, so the information about commercial practices implied in the graffiti exactly coincides with what it would have been reasonable to suppose without it. We know that already in the 5th century amphorae were being made in standard sizes for the shipping of wine and perhaps oil. But it also seems likely that these containers could not be made so as to hold no more and no less than a guaranteed amount; all that could be asked for by the purchaser was a jar filled with the number of choes he was paying for. That is, the jar must be made to hold at least a certain amount; and what with calculations of diameters and shrinkage they must often have been made bigger to provide a margin for error. And so an Athenian bought a jar of Chian wine knowing that he was getting seven Attic choes of wine, but not knowing exactly how much more the jar would hold. But having finished the expensive Chian wine, he was perhaps obliged to economize and buy cheap wine—that the wine shop had in bulk, because it was not worth the expense of putting it into jars. And so, like a modern Athenian who buys cheap or local produce rather than imported or “brand names,” he would take his own jar. What better than the Chian jar which was as good as new and would serve as evidence to whom it might concern that he was buying cheap wine because he liked it and not because he could not afford Chian. But because he wanted to be sure how much wine he was getting from a wineshop keeper who was not transparently honest, he first measured the jar, either by weight or measure. Or even when there was no question of the shopkeeper’s honesty and the same Chian jar

was sent back to the shop every week to be filled, the jar may have been marked by both customer and merchant to save time and trouble.

Our hundred and three examples extend over seven centuries, but the vast majority of them belong to the 5th and 4th centuries. It is not surprising that the earlier period is comparatively unproductive of numerical notations, but the scarcity in later Greek times is sufficient to provoke comment. The explanation of this scarcity must lie in change from acrophonic numbers to alphabetic. Whether the alphabetic numbers increase during this period is difficult to know, mostly because it is virtually impossible in the case of single letters to distinguish between a letter as letter and a letter as number. The last use of the acrophonic which we have belongs to the early Roman period, by which time alphabetic numerals were being regularly used both in formal and informal inscriptions.

MABEL LANG

BRYN MAWR COLLEGE



No. 1



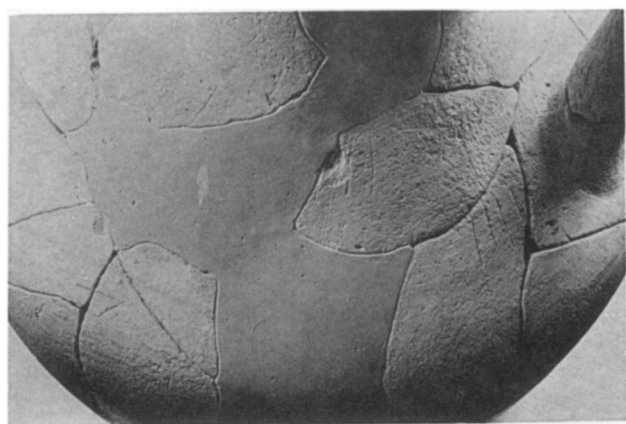
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No. 8



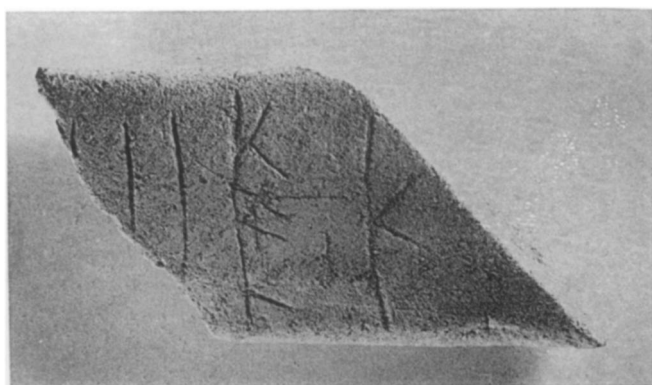
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No. 17



No. 19

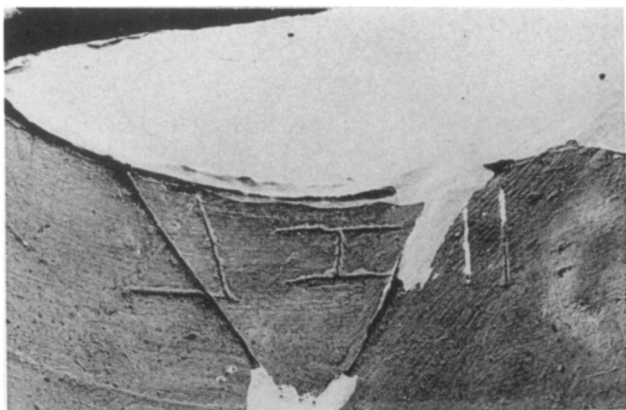


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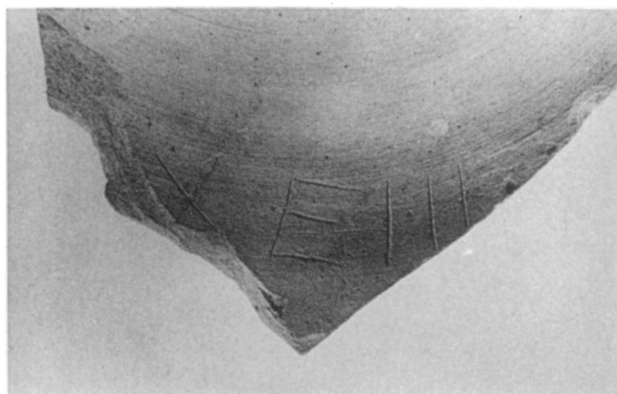


No. 26

PLATE 2



No. 27



No. 29



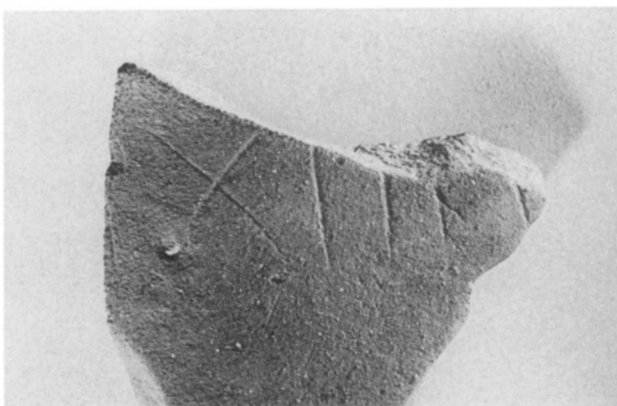
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No. 37



No. 40



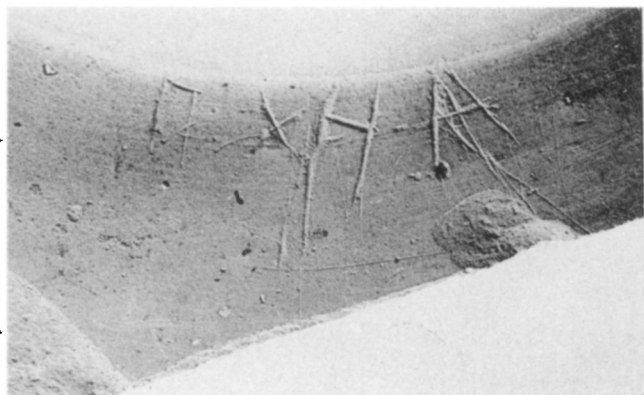
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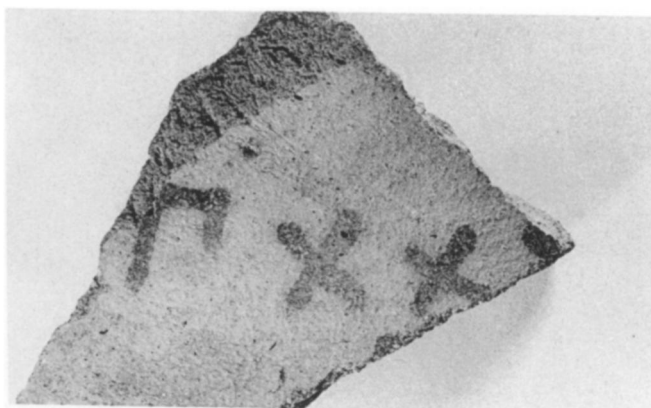
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No. 47



No. 50



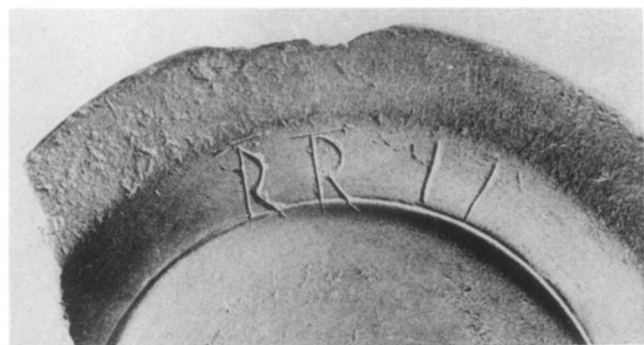
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No. 54



No. 59



No. 60



No. 64

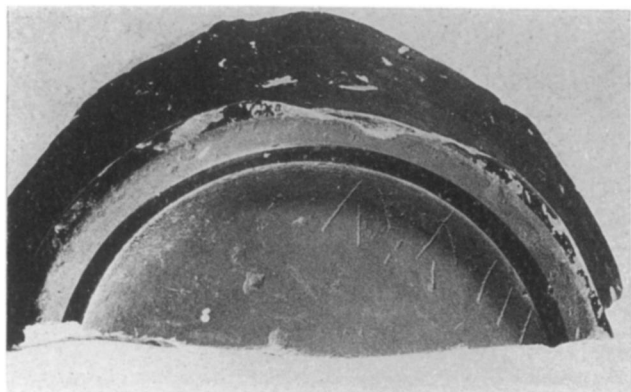


No. 65



No. 68

PLATE 4



No. 69



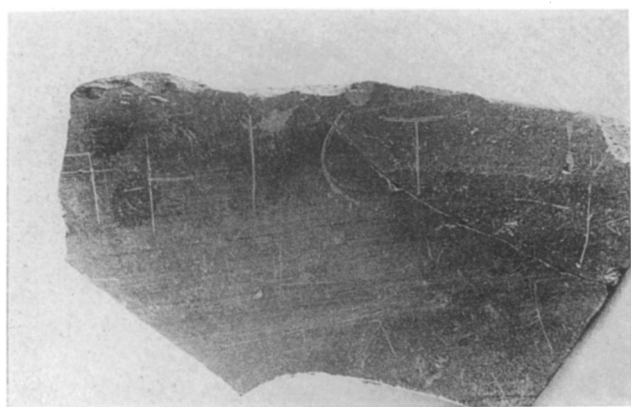
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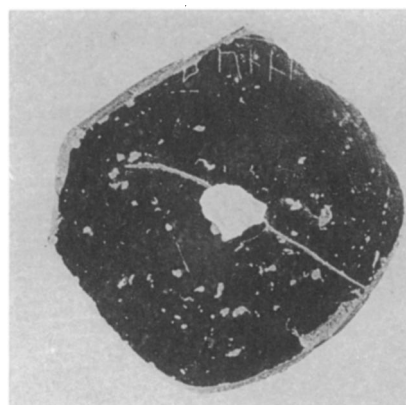
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No. 71b



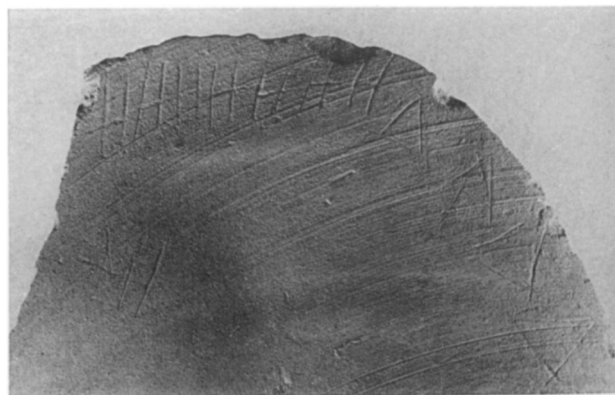
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No. 81



No. 82



No. 83



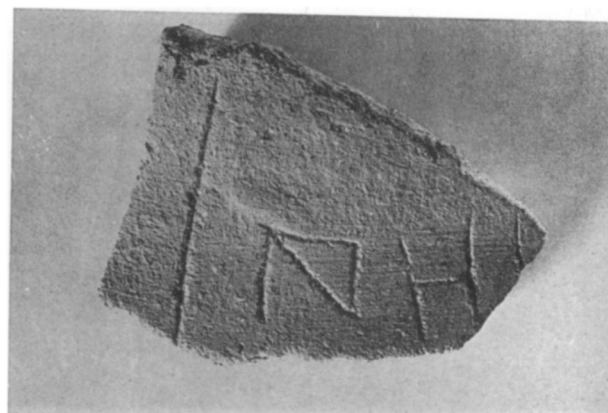
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No. 92



No. 93



No. 99



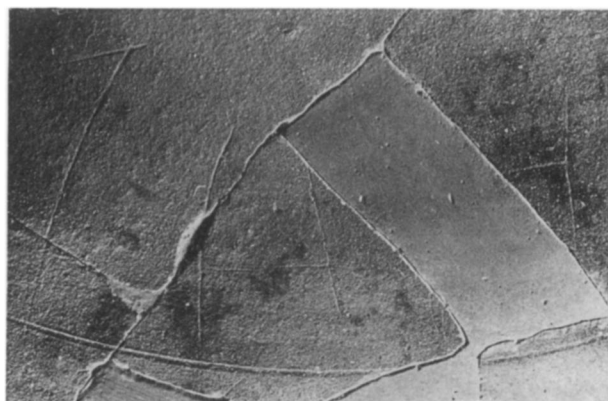
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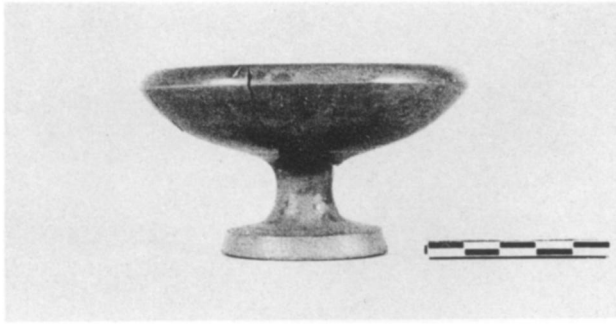
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No. 102



No. 101b



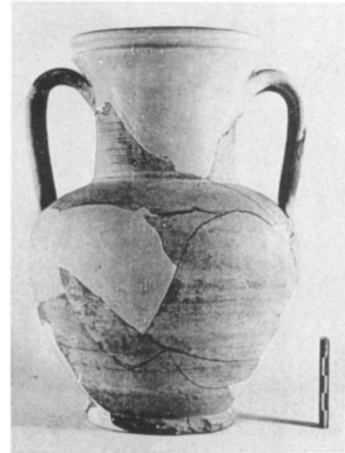
No. 100



No. 68



No. 101



No. 47



No. 15



No. 19