THE ABACUS AND THE CALENDAR

(PLATES 25–27)

AN effort to understand the ancient Athenian calculation of interest and the extent to which it differs from ours must begin with an examination of examples where principal, number of days, and interest are all preserved or restored with virtual certainty: [1]

I.G., I², 324	*Principal*	*Days*	*Interest on Stone*	*Interest by Decimal System*	*Difference*
line 103	766T 1095/5	1464	37T 2338/2½	37T 2338/1¾ (.28)	0/¾
line 85	1T 1748	17	4/2½	4/2½ (.39)	——
line 86	521	17	0/1¾	0/1¾ (.29)	——
line 87	80	17	0/½	0/¼ (.045)	0/¼
line 88	3418/1	17	1/5½	1/5½ (.93)	——

Of the two examples which show a difference between the interest as preserved on the stone and that calculated by the decimal system, the one in line 87 represents not a difference in calculation, since no system which recognized quarter obols could give a solution of ½ obol, but a feeling that where the total amount of interest was so small the benefit of the fraction must go to the god. The difference in the example in line 103, however, represents a real difference in calculation, although an extremely small one. Such a slight variation from the decimal result can not, as Meritt [2] shows (p. 36), be achieved by either one of his tables (except by approximation), and suggests a system of calculation which is both more accurate and more like our decimal system. So slight a variation, moreover, with such large numbers casts doubt on the far larger variations for considerably smaller factors which Meritt accepted for calculations of which we do not have all three terms. For example, Meritt's 28T 3610/3½ for 1349 days, if calculated by the decimal system, gives interest of 1T 1716/4¼, which is smaller by 2/3¾ than the interest on the stone. Although Meritt can get the interest on the stone from his restored principal by means of his tables, the variation from the result given by decimal calculation is twenty-one times the variation between the

[1] Here, and throughout the paper, drachmas and obols are separated by the slanting bar, thus: 23/2. In the interest by decimal calculation the decimal remainder (in parentheses) is translated into the nearest quarter obol. Meritt, *Cl. Quart.*, XL, 1946, pp. 60 and 62, has restored a principal less by one obol in line 103. This difference is of no importance in the calculations, which are here made with his original figure.

[2] Except where noted, all references to Meritt are to *The Athenian Calendar in the Fifth Century*, 1928. Needless to say, this paper could not have been undertaken without benefit of Meritt's fundamental work and shining example. I am also indebted to him for reading this paper and making useful suggestions for the new text; see below, pp. 161-164.

decimal-calculated interest and the preserved interest in lines 103 ff., where both principal and days are far larger (2/3¾ is 21 × 0/¾). Since 766T 1095/5 is the largest principal we have to deal with, and 1464 the largest number of days, no smaller principal and number of days ought to give by Greek calculation a greater variation from the decimally calculated interest than 0/¾. Even if overall largeness is not the critical factor, but rather the size of the number which remains after dividing by five talents, there is still no justification for so large a variation. That is, the remainder from 766T 1095/5 is 1T 1095/5, or 24% of 5T, and the remainder of 28T 3610/3½ is 3T 3610/3½, or 70% of 5T. So that if a variation of 0/¾ is allowable for the former, the allowable variation for the latter must be less than three times that, i.e. 0/2¼.

The following table shows the extent to which Meritt's calculations vary from results obtained by the decimal system. All the payments for the four years (from Athena Polias) are included except those which are multiples of 5T and so not affected by the form of the calculation.

Year and payment	*Principal*	*Days*	*Meritt Interest*	*Decimal System Interest*	*Difference*
1, 3	28T 3610/3½	1349	1T 1719/2	1T 1716/4¼	2/3¾
1, 4	44T 3000	1202	1T 4701/1	1T 4697/5	3/2
1, 6	18T 3000	1128	4172/4	4173/3½	0/5½
3, 1	33T 550	705	4665/5	4665/5½	0/½
3, 2	23T 4250	645	3057/5	3058/1¾	0/2¾
3, 3	6T 1200	510	632/1½	632/2½	0/1
4, 1	59T 4720	355	4244/4½	4244/5	0/½
4, 2	2T 5500	281	163/5½	163/5½	——
4, 3	11T 3300	252	582/1	582/¾	0/¼
4, 5	18T 122/2½	34	122/2½	122/3½	0/1

What is wanted is a method of calculating interest which can have been used in the 5th century B.C. and which gives but slight variation from the results obtained by the decimal system. And since the abacus, both as preserved in Greece and used in Roman and later times, has a built-in decimal system, it should provide acceptable means of calculating interest. If we find a method which gives the exact interest preserved on the stone when both principal and number of days are known, this method can be used also where the interest is not preserved; and where only interest and number of days are preserved, it will necessarily be more accurately reversible than any system which employs approximated fractions, thus answering the complaint of Pritchett-Neugebauer [3] and so making possible a more certain restoration of the calendar.

[3] *The Calendars of Athens*, 1947, pp. 99-100. But of course Meritt (*The Athenian Year*, 1961, p. 67, note 16) rightly points out that "once a restoration has been made which involves principal

The method of abacus-calculation may be derived from the system used where the principal is a multiple of 5T. In this case the principal is divided by 5 to give the number of drachmas which will be the interest for one day. This quotient is then multiplied by the number of days to give the total interest. For a principal which is less than a multiple of 5T (as well as the remainder of any principal which is more than a multiple of 5T) the interest for one day will be less than one drachma. Such a principal, being expressed in drachmas, should be divided not by 5T but by 30,000 drachmas. Being less than 5T, such a principal is not divisible by 30,000. But if 30,000 is thought of as 3 myriads (or five positions),[4] the principal may be divided by 3 to give a quotient in thousands or less (four positions or fewer). which will represent the part of a drachma which is the principal's interest for one day, since after division by 3 myriads only myriads will represent drachmas, and anything less will represent part of a drachma. Then this quotient, multiplied by the number of days, will give myriads (i.e., drachmas) as the interest for the whole period, with a remainder in thousands or less (four positions or fewer) to be converted into obols.

Let us take, for example, the principal in lines 103 ff., which may be worked out on an abacus like that found on Salamis (*I.G.*, II², *2777*), but adapted for larger numbers, as follows: ⅛ and ¼ obol signs removed; ΔΓΤ𐅇 added to West and North rows of figures; 𐅅Η𐅄ΔΓ added to the beginning of the South row of figures. The board is set up as follows, with principal along the South row of figures and the number of days in the separate four-position area at the East (see Plate 25, Fig. 1). The talents which are a multiple of 5 can easily be seen from the Greek system of notation. Step 1 takes these (765) from the South row up to the calculating area (Plate 25, Fig. 2). Step 2 will be division by 5. Position rule:[5] three minus one plus one equals three; thus the quotient will have three positions and may be put at the far left of the board, with a pebble to mark its last position, to leave room at the operating right of the board for the product of quotient and days. Figure 3 (Plate 25) shows the result of the following calculation: $7(00) \div 5 = 1(00)$, with a remainder of $2(00)$; $26(0) \div 5 = 5(0)$, with a remainder of $1(0)$; $15 \div 5 = 3$; quotient is 153.

Step 3: multiplication of 1464 (days) by 153. The multiplicand is placed at the right end of the board and will gradually be replaced by the product. Position-rule for multiplication is: the sum of the number of positions in multiplier and multiplicand minus 1.

and interest, it is obvious that the only test of its validity is the reckoning from principal to interest, not *vice versa*."

[4] On the abacus everything depends on position (Diog. Laert., I, 59). So that 3, 30, 300, 3000, 30000 all involve three pebbles, but 30000 is represented by three pebbles in the fifth (counting from the right) position, 3000 is represented by three pebbles in the fourth position, etc.

[5] Position-rule for division: number of positions in dividend minus number of positions in divisor plus one equals number of positions in quotient; if first position of divisor will not go into first position of dividend, the number of positions in quotient wll be reduced by one.

$$\begin{array}{rlrr}
1(000) & \text{by} & 1(00) = & 1(00000) \\
 & \text{by} & 5(0) = & 5(0000) \\
 & \text{by} & 3 = & 3(000) \\
\hline
 & & & 153(000)
\end{array}$$

See Figure 4 (Plate 25),

where "pebbles" of the product are "white" to distinguish them from the black pebbles of the multiplicand.

$$\begin{array}{rlrr}
4(00) & \text{by} & 1(00) = & 4(0000) \\
 & \text{by} & 5(0) = & 20(000) \\
 & \text{by} & 3 = & 12(00) \\
\hline
 & & & 612(00)
\end{array}$$

See Figure 5 (Plate 25),

where the pebbles of the product, position 2, have simply been added on, making a total of 11 in that position, which must be resolved by removing 10 from position 2 and adding 1 to position 1.

$$\begin{array}{rlrr}
6(0) & \text{by} & 1(00) = & 6(000) \\
 & \text{by} & 5(0) = & 30(00) \\
 & \text{by} & 3 = & 18(0) \\
\hline
 & & & 918(0)
\end{array}$$

See Figure 6 (Plate 25),

where again pebbles were simply added on to make totals which must be resolved.

$$\begin{array}{rlrr}
4 & \text{by} & 1(00) = & 4(00) \\
 & \text{by} & 5(0) = & 20(0) \\
 & \text{by} & 3 = & 12 \\
\hline
 & & & 612
\end{array}$$

See Figure 7 (Plate 25),

for the unresolved product and Figure 8 (*ibid.*) for the resolution. It is clear that the interest in drachmas for 765T in 1464 days is 223,992.

Step 4: division by 6000 for reduction to talents. Position rule: $6 - 4 + 1 = 3$, but first position of divisor will not go into first position of dividend, so the quotient will have only two positions.

$$\begin{array}{rl}
22(0000) \div 6000 = 3(0), & \text{with a remainder of } 4(0000) \\
43(000) \div 6000 = 7, & \text{with a remainder of } 1992 \\
\hline
37 &
\end{array}$$

See Figure 9 (Plate 26).

Since a four-position number can not be divided into another four-position number of which the first position number is smaller, the answer is 37T 1992 drachmas. The talents (i.e., the quotient at the left of the board) and drachmas (i.e., the remainder at the right) can now be taken from the calculating area and recorded under the West row of figures as part of the interest (see Plate 26, Fig. 10). Then the remainder of the principal can be brought up from the South row of figures into the calculating area so that it can be processed.[6] Since the abacus is decimal by nature, there is no place for the five-sixths of a drachma which the five obols represent, so for the moment we shall leave them out of the picture.

Step 1: division by 3 myriads; with the understanding that only myriads will constitute drachmas in the answer, this division will be made simply with 3, and the quotient will be understood as thousands, hundreds, tens and units, most of which will be turned into myriads (i.e., drachmas) once they are multiplied by the days. Position rule for $7095 \div 3$ is: $4 - 1 + 1 = 4$. Quotient goes to the left, with a pebble to mark off four positions.

$7(000) \div 3 = 2(000)$, with a remainder of $1(000)$ (See Plate 26, Fig. 11).
$10(00) \div 3 = 3(00)$, with a remainder of $1(00)$ (See Plate 26, Fig. 12).
$19(0) \div 3 = 6(0)$, with a remainder of $1(0)$ (See Plate 26, Fig. 13).

Before we make the next move, the division of the remaining 15 by 3, we must remember that there were 5 obols of the principal which have not been brought into the calculating area. On the ground that the goddess must not be scanted of any interest and must be overpaid rather than underpaid, we must consider that those 5 obols will increase our remainder from 15 to 18 drachmas. For just as with the division by 5T we had to have a whole number to multiply with the days, so here too we must have a whole number and round off our principal to a multiple of three. And it will be just this slight increase which, when multiplied with the large number of days, will make the interest preserved on the stone three-quarters of an obol more than that calculated by our decimal system.

$$18 \div 3 = 6.$$

For the complete quotient (2366), see Figure 14 (Plate 26). This quotient must now be put up under the North row of figures, since there will not be room for both multiplicand and product in the calculating area.

Step 2: multiplication of 1464 days by 2366; as each number of the multiplier is used, it will be removed from the North row of figures.

[6] For the sake of convenience I have here taken up the whole number into the calculating area. But it is likely to have been taken up piecemeal, so that dividends and remainders should not become confused. See on Year 1, payment 3 below.

2(000) × 1464 = 2928(000). (Plate 26, Fig. 15)
3(00) × 1464 = 4392(00). (Plate 26, Fig. 16)

Resolve, and then

6(0) × 1464 = 8784(0). (Plate 27, Fig. 17)

Resolve, and then

6 × 1464 = 8784. (Plate 27, Fig. 18)

Resolve for the complete product (Plate 27, Fig. 19), which is 3463824. The myriads (346) represent drachmas and may immediately be added to the other interest in the West row of figures (Plate 27, Fig. 20). The remaining thousands, etc., represent some part of a drachma. If one myriad is one drachma, five thousands is three obols, two thousands and five hundreds is one and one-half obols, etc. So that either a table could be worked out or the thousands could be divided by 16 to get obols or by 8 to get half-obols. A system that seems reasonable and also conformable with all the calculations in this inscription is the following. We shall deal with only two places (thousands and hundreds) and first work up to 50, giving the number of examples from the inscription in parentheses at the right:

01-08 = ½ obol (1—line 87)
09-16 = 1 obol (1—year 4, payment 3)
17-25 = 1½ obols (1—year 3, payment 3)
26—33 = 2 obols
34-41 = 2½ obols (3—year 4, payment 5; line 85; lines 103 ff.)
42-50 = 3 obols

It is obvious that if this were continued, 93-99 would have to be six obols. But examples from the inscription from 99 down suggest the following:

99-93 = 5½ obols (1—line 88)
92-84 = 5 obols (4—year 3, payment 1; year 4, payments 1, 2; as here calculated, year 1, payment 3)
83-76 = 4½ obols (1—as here calculated, year 1, payment 4)
75-67 = 4 obols
66-59 = 3½ obols (2—year 1, payment 6; year 3, payment 2)
58-50 = 3 obols

The thousands which we have left on the board are 38(24), which will yield 2½ obols. These can be added to the West row of figures (resolved after the previous addition) to give the complete interest for 766T 1095/5 outstanding for 1464 days 37T 2338/2½ (Plate 27, Fig. 21).

The whole process is reversible, as follows: 37T 2338/2½ will be 224338 drachmas, to which can be added the equivalent of 2½ obols in thousands, hence 224338,4100. Divided by 1464 this yields 153 with a remainder of 346,4100. This divided by 1464 yields ,2366. If then 153 is multiplied by 5 it will give talents (765); if ,2366 is multiplied by 3 myriads, it will yield drachmas (7098). The total (766T 1098) must be within three drachmas of the original principal.

It would be useless to labor the point by stretching out calculations for the other examples in lines 85 ff. for which all factors are known. Abacus calculations are quick and simple to make, but they are very cumbersome to describe. We should rather make use of this method of calculation to establish what is possible and what is impossible in the reconstruction of the calendar. It will readily be seen that calculation by the abacus makes very strict demands and allows none of the leeway which Meritt enjoys through approximated fractions and Pritchett-Neugebauer permit even with decimal calculation. Take, for example, the third payment of year 3 which must have been made on some epigraphically possible date in the sixth or seventh prytany (lines 31-32); the principal amount ended with two hundred,[7] and the interest is 632/1½. Both Meritt and Pritchett-Neugebauer restore the principal as 6T 1200 and the number of days outstanding as 510. Since the number of drachmas is divisible by three, both abacus and decimal calculation give an interest for this principal for this length of time of 632.4 drachmas, which could never have been taken as 632/1½, as we have seen in the interest calculation on 766T 1095/5 above, where .38 drachma was 2½ obols.

The strictness required by abacus-calculation makes restorations more difficult and therefore more certain because the remarkably little leeway allowed by the epigraphical requirements is sharply reduced when calculations must be accurate to the half-obol. In consequence, abacus-calculation should guarantee whatever prytany arrangement the various payments require, since there is literally no room for variation. To show that this is so, it will be best to go through the quadrennium employing

[7] Pritchett's new reading ("Ancient Athenian Calendars on Stone," *University of California Publications in Classical Archaeology*, IV, 4, 1963, pp. 271-273, 290, 304; the discussion is somewhat marred by the omission of 𐅈 in the text of line 32 on p. 304) here of [𐅈TXHH]Ḥ|̣|̣ overlooks the fact that only two of the 17 payments from Athena Polias end with obols (year 1, payment 3; year 4, payment 5) and both of these show an odd number of drachmas immediately before the obols. Therefore a payment in round hundreds plus two obols is highly unlikely. If the two uprights could be read as either H or ||, the weight of probability is on the side of H, but Meritt's complete explanation of the erosion (only partially quoted by Pritchett) makes it clear that the traces were once H; Pritchett's own photograph shows the less eroded island between the lower uprights which confirms Meritt's reading. It is interesting to note that Pritchett's new readings for Year 3 work out as follows on the abacus:

32T 5918/4 for 707 days = 4665/4½, instead of 4665/5;
23T 4718 for 647 days = 3077/5½, instead of 3077/5;
6T 1300/2 for 508 days = 631/3½, instead of 632/1½.

abacus-calculations and making the restorations that they, in combination with epigraphical necessities, demand.

For the first year of the quadrennium the principals which are multiples of 5T establish pretty clearly a skeleton of prytanies:

I	1464-1428	(37)				
II	1427-1391	(37)	4th day	(1424)	20T	[569]6
			[31st] day	(1397)	50T	2T 1970
III	1390-1354	(37)				
IV	1353-1317	(37)				
V	1316-1280	(37)				
VI	1279-1243	(37)				
VII	1242-1207	(36)				
VIII	1206-1171	(36)	[10th] day	(1197)	100T	3T 5940
IX	1170-1135	(36)				
X	1134-1099	(36)				

This skeleton is the regular one, which applies the 4th century B.C. system attested by Aristotle (*Ath. Pol.*, 43, 2:—4 × 36 days; 6 × 35 days) to the 5th century solar calendar. The regularity of this year is agreed upon by both Meritt and Pritchett-Neugebauer, so that it will serve as a neutral testing-ground for abacus calculations.

Apart from the three payments above, the first year is admittedly difficult; not only is Meritt obliged to make do with interests which diverge from the results obtained by decimal calculation much more than we have a right to expect from examples in which all three factors are preserved, but also he must assume a somewhat complex miswriting on the part of the auditors so that in the third payment 28T 5610/3½ is written in the inscription and added into the total, but interest is reckoned on only 28T 3610/3½, and that interest is added into the total. Some error must be assumed, but neither does the use of 3000 instead of 5000 in the calculation seem to be sufficiently motivated, nor does the admission of interests so out of line with our calculating evidence inspire complete confidence.

There can be no doubt about payments 1, 2, and 5 of 20T, 50T, and 100T respectively; and in each case the surviving interest or indication of the date is sufficiently secure so that we can subtract the total of these three payments and interests from what is known of the totals for the year.

Total principal	261T 5600 plus	Total interest	11T 199/1
Payments 1, 2, 5	170T	Interests 1, 2, 5	7T 1606
Payments 3, 4, 6	91T 5600 plus	Interests 3, 4, 6	3T 4593/1

Since interest for the sixth payment survives almost complete, and the date is quite certain, we may calculate in reverse, to find the following:

4172/3 is the interest for 1128 days on 18T 2970
4172/4 is the interest for 1128 days on 18T 2976
4172/5 is the interest for 1128 days on 18T 2982

It is obvious that such numbers can not be restored in line 13, where 18T 3000 fits to perfection. But 18T 3000 gives an interest for 1128 days of 4173/3½. That it was so calculated but wrongly recorded as 4172/4½ is rendered likely by the fact that both figures involve six upright strokes before the half-obol sign. As a further matter of fact, the spacing looks as if the stone-cutter first put down six verticals, of which the first three were spaced as drachmas, but then gave cross-bars only to the first two.[8] As a copyist's error this leaves the auditors' calculation untouched, as 4173/3½, which must be added into the total of interests for the first year. Thus the sixth payment, of 18T 3000, outstanding for 1128 days, gave 4173/3½ interest. We may subtract this principal and interest from the sums of principal and interest for payments 3, 4 and 6:

Payments 3, 4, 6	91T 5600 plus	Interests 3, 4, 6	3T 4593/1
Payment 6	18T 3000	Interest 6	4173/3½
Payments 3, 4	73T 2600 plus	Interests 3, 4	3T 419/3½

And now we are in a very peculiar position indeed, for if we subtract the surviving interest for the third payment (1T 1719/2 from 3T 419/3½ is 1T 4700/1½) we get an interest for the fourth payment which is larger by two drachmas and three obols than the preserved fourth payment will give in the only possible number of days (44T 3000 in 1202 days gives 1T 4697/4½). And if we subtract the known fourth payment (73T 2600 plus —44T 3000 = 28T 5600 plus), we get an approximate third payment which yields for the date given an interest far in excess of that recorded on the stone (28T 5600 yields 1T 1806/2 in 1349 days instead of 1T 1719/2). And yet the certain dates of the first and second payments require that the date of the third payment (Prytany IV, 5) should fall 1350 or 1349 days before the end of the period, no matter what the prytany schedule is. But even without considering the approximate amount of the third payment which we have derived by subtraction, we find no combination of Greek numbers which will fit the space for the principal in line 8 and give the interest on the stone, since for 1350 days 28T 3540 is needed, and for 1349 days 28T 3665 is needed; in both cases the number is too long by one figure, and does not provide the extra obols which will be necessary for the four-year and eleven-year totals.

That the third payment was written as 28T 5610/3½ is certain from several

[8] It is possible, however, that the stone-cutter's error was simply omission of the third drachma. This would leave somewhat more space on the stone for the obols and half-obol.

other indications besides the number of spaces:[9] the first year's total (line 15) requires that this figure be 28T 5600 plus something which will take only three spaces; the number of spaces available for the drachma part of the four-year total (line 49) is eight at most, into which must fit the sum of the drachma totals from the first and fourth years (years 2 and 3 have totals in talents only); the only three-space addition to 5600 which will fit with the fourth year's drachma total of 1642/2½ (line 47) in such a space must have 10 drachmas (to bring 42 up to 52) and 3½ obols (to make one drachma), thus

𐅆𐅅HΔ III(
X𐅅HΔΔΔΔͰͰII(
TXHH𐅄 ͰͰͰ

Any other filler for the three spaces of the first-year total will not add up with 1642/2½ to fit into fewer than 11 spaces.

It is equally certain that the recorded 1T 1719/2 (line 9) is not the interest on 28T 5610/3½ for either of the two possible numbers of days (1349 or 1350), which give interests of either 1T 1806/2 or 1T 1812/3. An error in calculation not only must be assumed but can even be traced to the abacus. After the interest on the multiple of 5T had been figured (25T ÷ 5 = 5; 5 × 1349 days = 6745), the next step would ordinarily have been to take up to the board all the rest of the principal in drachmas to be divided by 3 myriads, but the auditor this time decided that it would be well first to process the 3T (18,000 drachmas) and the 3000 drachmas because of their easy divisibility: 21,000 ÷ 3 myriads = ,7000; ,7000 × 1349 days = 944/2. But having removed the pebble against the 𐅆, he neglected to add two pebbles against the X and so having dropped 2000 drachmas out of the principal he went on to figure interest on 610/3½ (610/3½ ÷ 3 myriads = ,0204; ,0204 × 1349 days = 27/3). Total interest is:

6745	(25T)
944/2	(3½T)
27/3	(610/3½)
7716/5	

This should have been written TX𐅅HHΔΓͰIIIII. It can hardly be coincidence that the recorded interest uses exactly the same upright strokes and differs only in the

[9] Because the third payment is the only one of this year which ends less roundly than 3000 drachmas, its final symbols will appear again in the principal total for the year in line 15. There, the number of spaces available after the thousands is only six, of which at least one must have been left vacant, as elsewhere before the interest total. Since the number of spaces after the thousands in line 8 is six, all of which should be used, the number which will fit in both places must employ at least two obols, which are the only signs which can be doubled up.

addition of three crossbars: TX𐅅HHΔΓ⊢⊢⊢I. Although we have seen one example of stone-cutters' carelessness in the matter of crossbars, this error seems to stem rather from the abacus, since the incorrect interest was used by the auditor for the total, and, as we shall see below, the auditors themselves seem to have assumed responsibility for the error. The error must have occurred at the last stage of the calculation when the interest of 27/3 (on 610/3½) was taken from the calculating area over to the West row of figures, when the three obol-pebbles were put mistakenly under the drachma sign, thus:

	T	𐅆	X	𐅅	H	𐅄	Δ	Γ	⊢	I
before 27/3	o		o	o	o	o	o o o	o	o o o o	o o
add 20 and resolve	o		o	o	o o			o	o o o o	o o
add 7 and resolve	o		o	o	o o		o	o	o	o o
add 3 obols as drachmas	o		o	o	o o		o	o	o o o o	o o

Still more interesting is the fact that the resultant excess of 2 drachmas 3 obols is exactly the same as the recorded excess on the fourth payment's interest, where the interest on 44T 3000 for 1202 days must have been recorded as 1T 4700/½ (to make up the year's total) but was most certainly calculated as 1T 4697/4½. What we have here is surely an attempt to retrieve an error of 2/3 which became muddled and ended by compounding the error, so that the excess of 2/3 on the third payment's interest was not subtracted from the fourth payment's interest but added to it.

For this first year of the quadrennium we have been obliged to assume a stone-cutter's neglect of one crossbar, an auditor's neglect of 2000 drachmas in calculating interest, and a confused effort to retrieve the effect of three errant pebbles. But we have a completely consistent use of an abacus system of calculation, which even dictates the kinds of mistakes which may be made.

No other one of the four years is restored with a regular prytany arrangement by Meritt. All of the four are so restored by Pritchett-Neugebauer. The fourth year may be easily checked.

I	366-330	(37)	[I,12]	355	59T 4720	[4244/5]
II	329-293	(37)				
III	292-256	(37)	[III,12]	281	2T 5500	163/[5]
IV	255-219	(37)	IV,4	252	[11T 3300]	582/1
V	218-182	(37)				
VI	181-145	(37)				
VII	144-109	(36)				
VIII	108- 83	(36)	[VIII],2[4]	85	100T	1[700]
IX	82- 37	(36)				
X	36- 1	(36)	X,[3]	34	[18T 122/2½]	122/2½
					[19]2T 1642/2½	1T 813/1½

All of these calculations are correct by the abacus [10] except that in the fifth payment. There, 18T gives an interest of 122/2½ in 34 days; 18T 122/2½ gives an interest of 122/3. Meritt (p. 66) has suggested the possibility of parablepsis on the part of the scribe. But because it does not seem likely that the scribe could have added the interest into the total of the year's payments, 122/2½ must have been a part of the payment.[11] So we must assume an auditors' mistake, but a mistake of a very special category which can easily be traced. The auditors, having on the board a remnant (122/2½) of the principal, simply forgot to calculate the interest on it. They did not catch their mistake when they came to clear the board for the next calculation because of the almost incredible coincidence that both the uncalculated remnant and the interest on 18T were 122/2½, and so they unthinkingly assumed they were clearing away the interest. See Plate 27, Figs. 22-24.[12] For a similar confusion of remainder and solution, see " Herodotus and the Abacus," *Hesperia,* XXVI, 1957, p. 285.

The second year, with only two simple payments, calculation of which can not

[10] In the first payment the principal was increased by one drachma to allow complete division by three myriads; this must have been fresh in the minds of the auditors when they figured the interest on the second payment, where instead of adding two drachmas to allow complete division by three myriads they dropped one.

[11] In *The Athenian Year,* p. 70, Meritt shows that the space where the 122/2½ part of the principal is here assumed can be filled instead with the longer interest formula (τόκος τούτοι ἐγένετο). But this does not explain how the interest was added into the total payments for the year. See below, p. 163.

[12] Figs. 22-24 illustrate stages in the calculation of this interest. At far right are the days outstanding (34); in the center position of Fig. 23 is the ,6000 resulting from division of 3T by 3 myriads. At far left is the growing interest: Fig. 22 shows 102 as the interest on 15T for 34 days; Fig. 24 shows added thereto the interest on 3T for 34 days (20/2½); the total is 122/2½ which matches the remnant of principal at the South row of figures. If, as is likely with more than one person at work, the various rows of figures were not always used for the same purpose, it would be easy to think that the pebbles in the South row represented the same figure as that in the calculating area.

be in doubt, can also be arranged on a regular prytany calendar, always providing that the number of days for which the second payment was outstanding gives an amount of interest which will combine with those restored in the third year to make up (with the preserved totals of the first and fourth years) the four-year total. So it is the third year which is most crucial. The third year is also the one which requires the most restoration, with only two interests and parts of two payments preserved. And since neither the total principal nor the total interest for the year is preserved, this year can be restored only by means of the four-year total and the totals of the other years. There is, however, very little scope for variety in restoration, since the preserved dates and the totals of principal and interest made necessary by those of the other three years are very restrictive. And of course calculation by the abacus makes for still greater strictness.

If a regular prytany calendar is assumed, the first payment, made on the twenty-sixth day of what can only be the first prytany (707 days outstanding) and giving interest of 4665/5, must be within three drachmas of 32T 5985. Since the third payment, made in the sixth or seventh prytany, was an amount ending in two hundreds (see note 7 above) and giving an interest of 632/1½, the only possible principal outstanding for an epigraphically possible number of days is 5T 4800 for 545 days.[13] These two payments plus the fourth, which has been convincingly shown by Meritt to be 100T, add up to 138T 4785, which being subtracted from the year's total of 163T [14] leaves 24T 1215 (within three drachmas) for the second payment. This second payment was made on the twelfth day of the second, third, or fourth prytany and hence was outstanding for 684, 647, or 610 days with interests respectively of 3310/5½, 3131/5 or 2952/4½. This range of possibles can be narrowed down by adding the known interests for this third year and subtracting them from the total interest for the year. But this total interest for the third year must first be discovered by adding up the known totals of the first and fourth years plus the two possibilities for the second year.

The first payment of the second year yielded 5910; the second payment could have been made on either the fifteenth or eighteenth day of the ninth prytany. It was therefore outstanding for 790 or 787 days, yielding 2T 3800 or 2T 3740 and making the year's interest either 3T 3710 or 3T 3650.

Year 1 interest total:	11T 199/1	11T 199/1
Year 4 interest total:	1T 813/1½	1T 813/1½
Year 2 interests:	3T 3710	3T 3650
	15T 4722/2½	15T 4662/2½

[13] Other amounts will give this interest but only for dates in the third decades of the prytanies, which will not fit on the stone.

[14] For detailed proof of the 163T see Meritt, pp. 38-47.

The preserved total interest for the quadrennium is 18T 3935 plus (up to five drachmas). Subtracting the two possible sums for the three years we find that the two possible totals for the third year interest are 2T 5212/3½ plus (up to five drachmas) or 2T 5272/3½ plus (up to five drachmas). Finally, we may subtract from these two alternatives the sum of the preserved interests on the third year's first and third payments (4665/5 + 632/1½ = 5298/½). The results are two possible sums of the interests on the second and fourth payments of the third year: 1T 5914/3 plus and 1T 5974/3 plus. Since the fourth payment was of 100T and made on the thirtieth day of the seventh, eighth, ninth, or tenth prytany and so was outstanding for 481, 445, 409, or 374 days, the possible interests are 1T 3620, 1T 2900, 1T 2180, 1T 1460. Going back now to the possible interests for the second payment (3310/5½, 3131/5, 2952/4½), we see that the seventh prytany date for the fourth payment gives an interest too large for even the smallest second payment's interest and that the ninth and tenth prytany dates give interests too small to be combined with even the largest second payment's interest. The fourth payment must belong to the eighth prytany, and the interest (1T 2900) should combine with one of the second payment's interest possibilities to make the sum of 1T 5914/3 plus or 1T 5974/3 plus. But

1T 2900	1T 2900	1T 2900
3310/5½	3131/5	2954/4½
2T 210/5½	2T 31/5	1T 5852/4½

This is proof then that the regular prytany skeleton can not be restored in the third year, and perhaps not even in the second year of the quadrennium.

Once prytany irregularity becomes a possibility, the scope widens, but I have found only one consistent solution for the whole quadrennium which is at the same time epigraphically satisfactory and arithmetically correct by the abacus.[15] The steps by which it was arrived at are too complicated to repeat here, but the chart follows:

Year 1

I	1464-1428	(37)				
II	1427-1391	(37)	II.4	1424	20T	[569]6
			II.[31]	1397	50T	2T 1970
III	1390-1354	(37)				
IV	1353-1317	(37)	IV.5	1349	[28T 5610/3½]	1T 1719/2
V	1316-1280	(37)				
VI	1279-1243	(37)				
VII	1242-1207	(36)				

[15] That is, the reconstruction allows for no errors except those which occur on the stone.

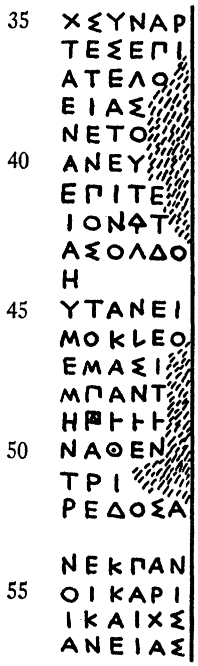
VIII	1206-1171	(36)	VIII.5	1202	4[4]T 3000	[1T 4700/1½]
			VIII.[10]	1197	100T	3T 5940
IX	1170-1135	(36)				
X	1134-1099	(36)	X.7	1128	1[8T 3000]	417<3>/3½
					261T 56[10/3½]	[11T 1]99/1
Year 2						
I	1098-1062	(37)				
II	1061-1025	(37)				
III	1024- 988	(37)				
IV	987- 951	(37)	IV.3	985	30T	5910
V	950- 914	(37)				
VI	913- 877	(37)				
VII	876- 841	(36)				
VIII	840- 805	(36)				
IX	804- 769	(36)	IX.1[5]	790	100T	[2T 3800]
X	768- 733	(36)				
					1[30]T	[3T 3710]
Year 3						
I	732- 696	(37)	[I].26	707	[32T 5983]	4665/5
II	695- 659	(37)				
III	658- 623	(36)				
IV	622- 587	(36)	[IV].12	611	2[4T 1217]	[2957/3½]
V	586- 551	(36)				
VI	550- 515	(36)	[VI.6]	545	[5T 48]00	632/1½
VII	514- 478	(37)				
VIII	477- 441	(37)	[VIII].30	445	[100T]	[1T 2960]
IX	440- 404	(37)				
X	403- 367	(37)				
					[163T]	[2T 5215/4]
Year 4						
I	366- 330	(37)	[I.12]	355	59T 4720	[4244/5]
II	329- 293	(37)				

III	292- 256	(37)	[III.12]	281	2T 5500	163/[5]
IV	255- 219	(37)	IV.4	252	[11T 3300]	582/1
V	218- 182	(37)				
VI	181- 145	(37)				
VII	144- 109	(36)				
VIII	108- 73	(36)	[VIII].2[4]	85	100T	1[700]
IX	72- 37	(36)				
X	36- 1	(36)	X.[3]	34	[18T 122/2½]	122/2½
					[19]2T 1642/2½	1T 813/1½

	Principals	Interests
Year 1	261T 56[10/3½]	[11T 1]99/1
Year 2	130T	[3T 3710]
Year 3	[163T]	[2T 5215/4]
Year 4	[19]2T 1642/2½	1T 813/1½
	[7]47T 1[253]	[1]8T 393[8/½]
lines 99 f.	4001T 4522	
line 144	4748T 5[775]	

That then is the case for an abacus-calculated quadrennium in which only preserved mistakes are allowed. It will be seen that all four years of the quadrennium are of the same length but that the variation of prytany lengths between 36 and 37 does not always follow a consistent pattern. The pattern as presented here appears more consistent than it need have been, so for instance in the first year either V or VI could have had 36 days instead of VII; in the second year both V and VI could have changed lengths with VII and VIII, and so forth. If the length of the year was fixed, there was no more reason for the length of individual prytanies to follow a fixed sequence than there was for the prytanizing phylai to do so.

The restorations which the abacus-calculated quadrennium requires appear in the text below; as is both obvious and necessary, the basic text is Meritt's. I have adopted here also two suggestions made by Meritt in correspondence: (1) that in line 10 the iota of ἐσελελυθυίας was omitted, so that two letters need not be crowded into one space (see Meisterhans, p. 59, #17, 1, and Oguse, *B.C.H.*, LIX, 1935, pp. 416-420, for this habit in the feminine perfect active participle); (2) that the extremely localized irregularity of line-endings in lines 37-42 and 47-51 resulted from damage to the stone on its right edge:



Assumed Damage at Right Edge of *I.G.*, I², 324, lines 35-57

The assumed damage seems to me a neat, economical, and almost inevitable solution, since it is not possible, without introducing unfortunate anomalies, to explain the uninscribed spaces at the ends of some of these lines as the result of a preference (both sudden and short-lived) for syllabic division. That is, if Wade-Gery's attractive restoration [16] of [ἐπὶ Ἰονίας (or ἐς Σκιόνεν) Εὐρυμέδοντι] is accepted, line 37 must end [στρατεγο|ῖς]. Line 41 must break [ἐπὶ τε̂|ς] since the prytany at the beginning of line 42 can not have 11 letters because the two prytanies of this length appear on the stone as first and third of this year (lines 38, 40). In lines 42-43 the number must be divided [ΔT|XXXHHH] in order to avoid an anomalous uninscribed space before the interest formula in line 43. The division between lines 48 and 49 must be χσ[ύμπαντ|ος]. Finally, in line 51 it seems to me likely that the break penetrated far enough in to make possible the restoration [τρί▨▨▨|τες] so that the eleven-letter third prytany can be restored in the eleven spaces here. If so extensive a break is unacceptable, the only reasonable alternative is to assume damage of one space within line 51 so that a ten-letter prytany can stand in eleven spaces, thus:

ἐ[πὶ τε̂ς ▨ Κεκροπίδο]ς πρυτανείας [τετάρ ▨ | τες].

With the breaks at the edge we have line-endings from line 37 through line 51 which compare with those above and below in the chance occurrence of syllabic and

[16] *C.Q.*, XXIV, 1930, pp. 33-39.

non-syllabic division. Concerning this inscription Austin[17] wrote: "Accordingly no explanation can safely be based on the engraver's preference for any particular kind of line-ending. Probably no solution of the anomaly can be found." The solution seems to be that the engraver's preference, at least for the first 70 lines, was for lines which ended where the surface of the stone gave out unless he wished to indicate a new "paragraph." With one exception the only lines outside these breaks in which there were uninscribed spaces at the right are where the interest figure comes very near the end of the line and the next item is held over to the next line (lines 10, 22, 24, 44). The exception is line 17, where one blank must be assumed after *πρôτος* in [*πρôτος* ᵛ | *ἐγραμμ*]*άτευε*.

As far as the breaks at the edge are concerned, verisimilitude might be increased at the cost of simplicity by assuming that the damage on the right edge at lines 37-42 was matched by damage on the left edge at lines 47-51, or vice versa, suggesting bilateral means of lifting or transport. Certainly the location just above the middle of the stone is suitable for damage incurred for such a purpose.

It is interesting to note that the interest formula *τόκος τούτον*, certainly used in line 9 and almost as certainly in lines 7, 10, and 12 (hence for payments 2, 3, 4, and 5 of year 1), is always accompanied by an interest figure which is set off both before and after by a single uninscribed space. The same combination now appears in line 31, where *τόκος τούτον* has been restored with an abacus-calculated interest which leaves two uninscribed spaces, presumably before and after the number. No case of an uninscribed space before the interest occurs in association with the formula *τόκος τούτοις ἐγένετο*, which suggests that different auditors wrote up various parts of the accounts and brought different clerkly habits to the task.

The only other occurrence of *τόκος τούτον* is in the restored part of line 46, where there is not room for the uninscribed space before the interest. It may be that the combination of *τόκος τούτον* and the two uninscribed spaces is strict enough so that we should accept Meritt's new reading here (Δ̣𐅃TTT *τόκος τούτοι ἐγένετο* instead of Δ̣𐅃TTTHΔΔ⊢⊢I̯I(*τόκος τούτον*) even though the difficulty of the interest's having been added into the total of principals is so difficult to justify (see note 11).

At any rate the probability of a fourth interest formula having been used is likely, if only on grounds of symmetry:

(lines 7, 9, 10, 12, 31)		(lines 60 ff. *passim*)
τόκος τούτον	is to	*τόκος τούτο*
as *τόκος τούτοις ἐγένετο*	is to	*τόκος τούτοι ἐγένετο*
(lines 6, 14, 20, 22, 29, 32, 41, 43, 44)		(useful restoration in lines 33, 39)

Furthermore, as Meritt suggested to me in conversation, the use of both *τόκο κεφάλαιον τôι ἀργυρίοι τôι ἀναλοθέντι* (lines 15, 24, 35) and *κεφάλαιον τόκο τοῖς ἀναλοθêσι χρέμασι*

[17] *Stoichedon Style in Greek Inscriptions*, Oxford, 1938, p. 60.

(line 47) makes the variation between singular and plural in the interest formula perfectly regular.

A table of other uninscribed spaces may be useful for comparative purposes:

	Lines *on the stone*	*restored*	*Year*
one (or more) after interest	6, 7, 9, 12	10, 14	1
	20(2)	22(2)	2
	29, 32	31, 34	3
	43, 46	40, 41, 44(5 -end)	4
one before interest	9	7, 10, 12	1
		31	3
one after total principal		15	1
		23	2
		35	3
	47		4
one (or more) after total interest	16 (6)		1
		24 (4)	2
		36 (4)	3
	48 (1)		4

As far as the writing of obols and half-obols is concerned, the stone preserves examples of both single and double spacing, so that restorations of either kind must be acceptable.

The text adopted here for lines 28 ff. should be explained as follows: elsewhere on the stone only [ἐχς Ὀπισθ]οδόμο (lines 19-20) and [παρὰ] Σαμ[ίον] (line 42) come between the date and the amount of the payment; the fourteen spaces between πρυτανείας (line 28) and the payment in line 29 should therefore indicate the source of the 32T 5983; it might read παρά plus some ten-letter ally or ἐχς plus some other treasury than that in the Opisthodomos, for why should the Opisthodomos be specified in lines 19-20 if all the money came from there? I have therefore preferred to leave the source unrestored, but if it still seems desirable to restore ἐχς Ὀπισθοδόμ|ο (13 spaces), it will be necessary in order to leave no space uninscribed to change the payment in line 29 to 32T 5983/2. This will entail changing the payment in line 30 to 24T 1216/4 and then putting two obols of the interest in line 31 in one space. Both of these payments give by abacus-calculation the same interest as those used above. A possible advantage of 32T 5983/2 and 24T 1216/4 is that 83⅓ and 16⅔ drachmas are frequent numbers in the tribute lists. But this brings up the still unresolved problem of what determined the amount of each payment: was it an itemized account of needed funds submitted by the payee? or was it some lump sum or combination of lump sums which had been just paid into the treasury? The latter would explain payments ending in numbers like 83⅓ and 16⅔.

Only the first 53 lines of the accounts are given here. I hope that a second article dealing with the abacus-calculations and text of the second half will be ready soon.

I.G., I², 324 ΣΤΟΙΧ. 75

[τάδε ἐλογίσαν]το hoι λογιστα[ὶ ἐν τοῖς τέτ]ταρσιν ἔτεσιν ἐκ Παναθεναίον *ἐς* [Παναθέναια *ὀφελ*]

[όμενα· τάδε hο]ι ταμίαι παρέδοσ[αν Ἀνδρο]*κλε̂ς* Φλυεὺς *καὶ χσυνάρχοντες hελλ[ενοταμίαις . . . .]*

[. . . . . 10 . . . . .]*εῖ καὶ χσυνάρχοσι[ν στρατ]εγοῖς hιπποκράτει* Χολαργεῖ *καὶ χσυ[νάρχοσιν ἐπὶ τε̂ς]*

[Κεκροπίδο]*ς πρυτανείας δευτέ[ρας πρυ]τανευόσες τέτταρες ἑμέραι ἒσαν ἐσελ[ελυθυίαι ἐπὶ τε̂]*

[ς βολε̂ς hε̂ι] Μεγακλείδες *πρôτο[ς ἐγραμ]μάτευε ἐπὶ* Εὐθύνο *ἄρχοντος* 𐅉𐅉 *τόκος τ[ούτοις ἐγένετο]*

[𐅆𐅅Η𐅄ΔΔ]ΔΔΠ⊢⁝ v *δευτέρα δόσις ἐπ[ὶ τε̂ς* Κ]*εκροπίδος δευτέρας πρυτανευόσες λοι[παὶ ἒσαν hεπτὰ ἑ]*

[μέραι] τε̂ι πρυτανείαι 𐅊 *τόκος τ[ούτον* v] ΤΤΧ𐅅ΗΗΗΗ𐅄ΔΔ v *τρίτε δόσις ἐπὶ τε̂ς* Παν[διονίδος *πρυτα*]

[νείας] τετάρτες πρυ[τ]ανευόσες [ἐσελελ]υθυίας πέντε ἑμέρας τε̂ς πρυτανείας 𐅉[𐅉𐅈ΤΤΤ𐅆𐅅ΗΔIIIC *τ*]

[όκος τ]ούτον v ΤΧ𐅅ΗΗΔΠ⊢⊢⊢II v *τ[ετάρτ]ε δόσις ἐπὶ τε̂ς* Ἀκαμαντίδος *πρυτανεία[ς ὀγδόες πρυταν]*

[ευόσ]ες πέντε ἑμέρας ἐσελελυθ[ύας τε̂]ς πρυτανείας 𐅉𐅉𐅉𐅉[Τ]ΤΤΤΧΧΧ *τόκος τούτο[ν* v ΤΧΧΧΧ𐅅ΗΗΙC v]

[πέμπ]τε δόσις ἐπὶ τε̂ς Ἀκαμαν[τίδος *πρ]υτανείας ὀγδόες πρυτανευόσες ἐσελελ[υθυίας δέκα ἑμέ]*

[ρας τ]ε̂ς πρυτανείας ΗΗ *τόκος τ[ούτον* v] ΤΤΤ𐅆𐅅ΗΗΗΗΔΔΔΔ v *hέκτε δόσις ἐπὶ τε̂ς* Ἐρε[χθείδος *πρυταν*]

[είας] δεκάτες πρυτανευόσε[ς ἐσελελ]υθυίας hεπτὰ ἑμέρας τε̂ς πρυτανείας 𐅉𐅈Τ[ΤΤΧΧΧ *τόκος τού*]

[τοις] ἐγένετο ΧΧΧΧΗ𐅄ΔΔ⊢⊢⟨⊢⟩[IIIC v *κεφ]άλαιον τô ἀρχαίο ἀναλόματος ἐπὶ τε̂ς* Ἀνδρ[οκλέος *ἀρχε̂ς κα*]

[ὶ χσυ]ναρχόντον ΗΗ𐅄𐅉Τ𐅆𐅅Η[ΔIIIC v *τ]όκο κεφάλαιον τôι ἀργυρίοι τôι ἀναλοθέντ[ι ἐπὶ τε̂ς* Ἀνδροκ]

[λέος] ἀρχε̂ς καὶ χσυναρχόντο[ν 𐅉ΤΗ]𐅄ΔΔΔΔΠ⊢⊢⊢⊢ vvvvvv *τάδε παρέδοσαν hοι τα[μίαι* Φοκιάδες *ἑ*]

[χς Οἴ]ο καὶ χσυνάρχοντες ἐπὶ Σ[τρα]τοκλέος ἄρχοντος καὶ ἐπὶ
τε̂ς βολε̂ς hε̂ι Πλ[ειστίας προ̂τος ^{v}]
[ἐγραμμ]άτευε στρατεγοι̂ς περ[ὶ Πε]λοπόννεσον Δε[μ]οσθένει
Ἀλκισθένος Ἀφιδ[ναίοι ἐπὶ τε̂ς Αἰγ]
[είδος] πρυτανείας τετάρτες [πρυτα]νευόσες τρίτει ἐ[μέ]ραι τε̂ς
πρυτανείας ἐσ[ελελυθυίας ἐχς]
[Ὀπισθ]οδόμο ⍋⍋⍋ τόκος τούτο[ις ἐγέ]νετο 𐅆𐅅HHHHΔ ^{vv} hετέρα δόσις
στρατεγοι̂ς [Νικίαι Νικεράτ]
[ο Κυδα]ντίδει καὶ χσυνάρχο[σιν ἐπὶ] τε̂ς Πανδιονίδος πρυτανείας
ἐνάτες πρυτ[ανευόσες πέμπτ]
[ει καὶ] δεκάτει ἐμέραι τε̂ς π[ρυταν]είας ἐσελελυθυίας ⱵI τόκος
τούτοις ἐγένε[το TTXXX𐅅HHH ^{vv}]
[κεφάλ]αιον το̂ ἀρχαίο ἀναλόμ[ατος] ἐπὶ τε̂ς Φοκιάδο ἀρχε̂ς καὶ
χσυναρχόντον ⱵI[⍋⍋⍋ ^{v} τόκο κεφάλα]
[ιον το̂ι ἀ]ργυρίοι το̂ι ἀναλοθ[έντι] ἐπὶ τε̂ς Φοκιάδο ἀρχε̂ς καὶ
χσυναρχόντον T[TTXXX𐅅HHΔ ^{vvvvv}]
[τάδε παρέδ]οσαν hοι ταμίαι Θ[οκυ]δίδες Ἀχερδόσιος καὶ
χσυνάρχοντες ἐπὶ Ἰσ[άρχο ἄρχοντος κα]
[ὶ ἐπὶ τε̂ς βολε̂ς] ḥ[ε̂ι Ἐπί]λ[υ]κος [προ̂]τος ἐγραμμάτευε
hελλενοταμίαις hένοις Δ[. . . . . . .^{14}. . . . . . .]
[. . .^{6}. . . καὶ χσυνάρχοσι καὶ νέοις] Χαροπίδει Σκα[μβ]ονίδει καὶ
χσυνάρχοσιν [ἐπὶ τε̂ς hιπποθον]
[τίδος πρυτανείας πρότες πρυταν]ευόσες hέκτει καὶ εἰκοστε̂ι τε̂ς
πρυτανεί[ας . . . . . .^{12}. . . . . .]
[. . ⍋⍋⍋TT𐅆𐅅HHHH𐅄ΔΔΔ⊢⊢⊢ τόκος το]ύτοις ἐγένετο
XXXX𐅅H𐅄ΔΓIIII ^{v} δευτέρα δ[όσις ἐπὶ τε̂ς . . . .ί]
[δος πρυτανείας τετάρτες πρυταν]ευόσες δοδεκάτει τε̂ς πρυτανείας
⍋⍋TTT[TXHHΔΓ⊢⊢ τόκος το]
[ύτον ^{v} XX𐅅HHHH𐅄Γ⊢⊢IIC ^{v} τρίτε δ]όσις ἐπὶ τε̂ς Ἐρεχθείδος
πρυτανείας hέ[κτες πρυτανευόσες]
[hέκτει τε̂ς πρυτανείας 𐅃XXXX𐅅H]HH τόκος τούτοις ἐγένετο 𐅅HΔΔΔ⊢IC ^{v}
τε[τάρτε δόσις ἐπὶ τε̂ς]
[Ἀκαμαντίδος πρυτανείας ὀγδόες] πρυτανευόσες τριακοστε̂ι τε̂ς
πρυταν[είας ⱵI τόκος τούτοι ἐ]
[γένετο TXX𐅅HHHH𐅄Δ ^{v} κεφάλαιον] το̂ ἀρχαίο ἀναλόματος ἐπὶ τε̂ς
Θοκυδίδο [ἀρχε̂ς καὶ χσυναρχόν]
[τον ⱵI𐅆⍋TTT ^{v} κεφάλαιον τόκο το̂ι] ἀργυρίοι το̂ι ἀναλοθέντι ἐπὶ
τε̂ς Θοκυδ[ίδο ἀρχε̂ς καὶ χσυναρ]
[χόντον TT𐅆HHΔΓIIII ^{vvvv} τάδε παρ]έδοσαν hοι ταμίαι Τιμοκλε̂ς Εἰτεαι̂ος
κ[αὶ χσυνάρχοντες ἐπὶ]

[Ἀμενίο ἄρχοντος καὶ ἐπὶ τε̂ς βολ]ε̂ς *hε̂ι* Δεμέτριος Κολλυτεὺς προ̂τος
ἐγρ[αμμάτευε στρατεγο]
[ι̂ς . . . .⁹. . . . Εὐρυμέδοντι Μυρρ]ινοσίοι καὶ χσυνάρχοσι ἐπὶ τε̂ς
Ἀκαμα[ντίδος πρυτανείας]
[πρότες πρυτανευόσες δοδεκάτε]ι τε̂ς πρυτανείας 𐅊𐅈TTTTXXXX𐅅HHΔΔ
τό[κος τούτοι ἐγένετο]
[XXXXHHΔΔΔΔ𐅂𐅂𐅂IIIII *v* δευτέρ]α δόσις ἐπὶ τε̂ς Πανδιονίδος πρυτανεί[ας
τρίτες πρυτανευ]
[όσες δοδεκάτει τε̂ς πρυτανείας] TT𐅆𐅅 τόκος τούτοις ἐγένετο
H𐅄Δ𐅂𐅂𐅂IIII[I *v* τρίτε δόσι]ς [ἐπὶ τε̂]
[ς . . .⁶. . . ίδος πρυτανείας τετά]ρτες πρυτανευόσες τετάρτει τε̂ς
πρυτα[νείας παρὰ] Σαμ[ίον 𐅉T]
[XXXHHH τόκος τούτοις ἐγένετο] 𐅅𐅄ΔΔΔ𐅂𐅂 *v* τετάρτε δόσις ἐπὶ τε̂ς
Αἰαντ[ίδος πρυτ]ανεί[ας ὀγδό]
[ες πρυτανευόσες τετάρτει καὶ] εἰκοστε̂ι τε̂ς πρυτανείας 𐅋 τόκος
τούτο[ις ἐγέν]ετο X𐅅H[H *vvvvv*]
[πέμπτε δόσις ἐπὶ τε̂ς Λεοντίδο]ς πρυτανείας δεκάτες πρυτανευόσες
τ[ε̂ι τρίτ]ει τε̂ς πρ[υτανεί]
[ας 𐅉𐅈TTTHΔΔ𐅂𐅂IIC τόκος τούτον] HΔΔ𐅂𐅂IIC *v* κεφάλαιον το̂ ἀρχαίο
ἀναλό[ματος] ἐπὶ τε̂ς Τι[μοκλέο]
[ς ἀρχε̂ς καὶ χσυναρχόντον 𐅋𐅊𐅉𐅉] 𐅉𐅉TTX𐅅HΔΔΔΔ𐅂𐅂IIC *v* κεφάλαιον
τόκο τ[οι̂ς ἀ]ναλοθε̂σι χρ[έμασι]
[ἐπὶ τε̂ς Τιμοκλέος ἀρχε̂ς καὶ χσυ]ναρχόντον T𐅅HHHΔ𐅂𐅂𐅂IC *v* κεφάλαι[ον
ἀν]αλόματος χσύ[μπαντ]
[ος Ἀθεν]αίας ἐν τοι̂[ς] τέ[τταρσιν ἔ]τεσιν ἐκ Παναθεναίον ἐς
Παναθέν[αια $\overbrace{𐅈}^{3}$] 𐅋𐅋𐅉𐅉𐅉𐅉𐅈TTX[HH𐅄𐅂𐅂𐅂]
[κεφά]λαιον τόκο χσύμπαν[τος Ἀθε]ναίας ἐν τοι̂ς τέτταρσιν ἔτεσιν
ἐ[κ Παν]αθεναίον ἐς Πα[ναθέν]
[αια 𐅉]𐅈TTTXXX𐅅HHHHΔΔΔΓ[𐅂𐅂C *v* τάδε] Ἀθεναίας Νίκες ἐ[πὶ τε̂ς
Πανδιονίδο]ς πρυτανείας [τρί]
[τες πρ]υτανευόσες τετάρτε[ι τε̂ς πρυτα]νείας Τιμοκ[λε̂ς Εἰτεαι̂ος καὶ
χσυ]νάρχοντες πα[ρεδοσα]
[ν 𐅈T τόκος] τούτοις ἐ[γ]ένετο H[HHΔΔΔΓIIIIC] *vacat*

MABEL LANG

BRYN MAWR COLLEGE

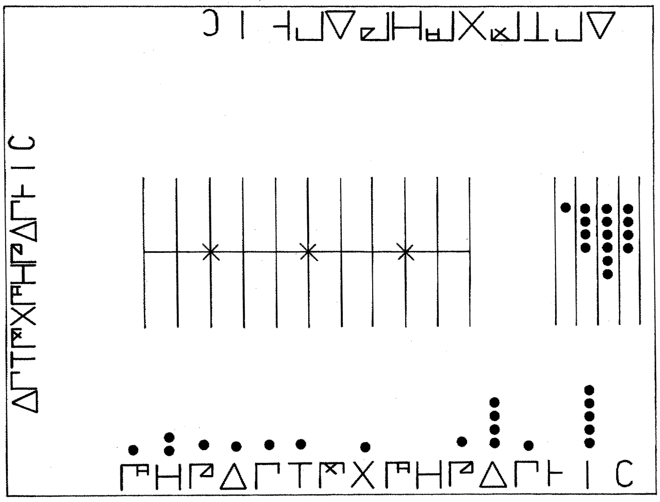


Fig. 1

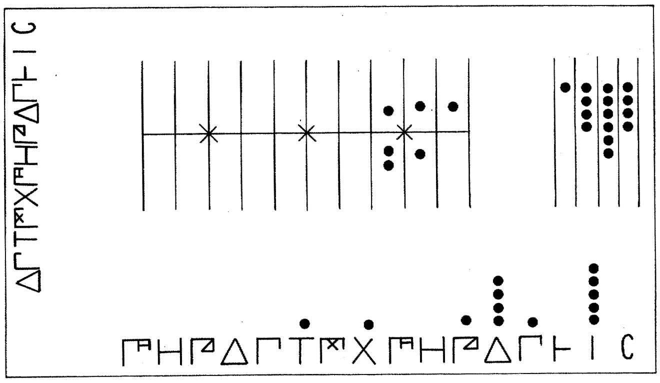


Fig. 2

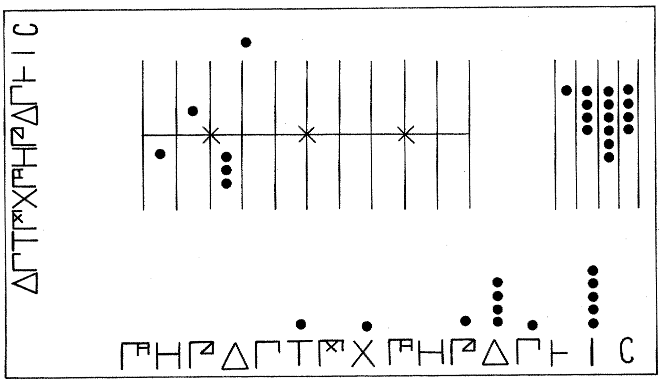


Fig. 3

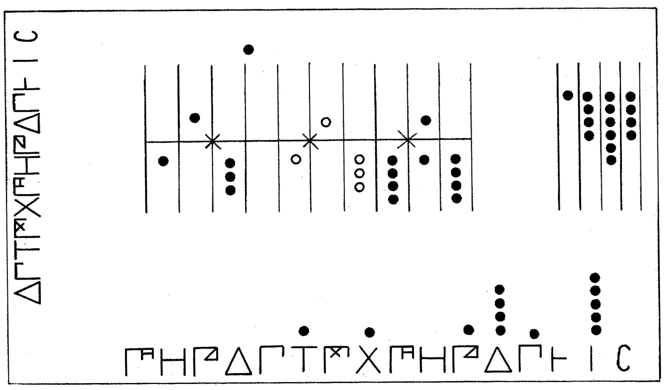


Fig. 4

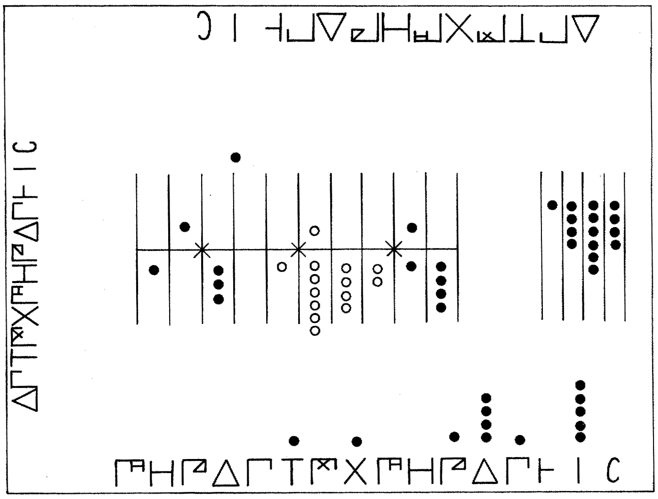


Fig. 5

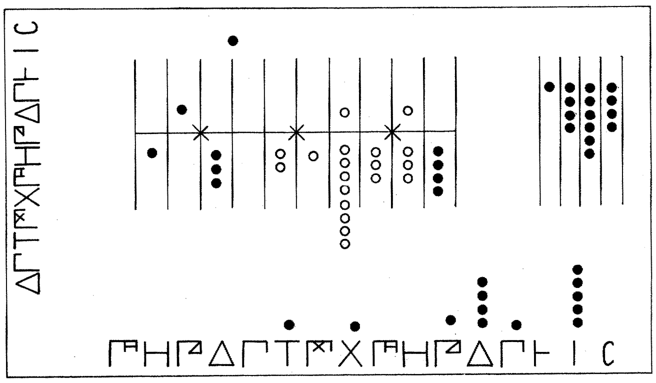


Fig. 6

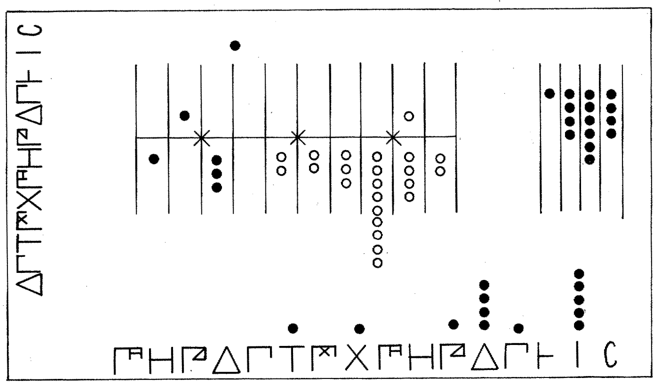


Fig. 7

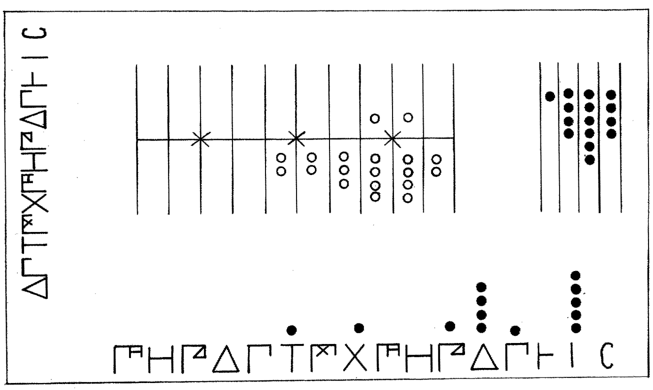


Fig. 8

Calculation of Interest on 765 Talents.

MABEL LANG: THE ABACUS AND THE CALENDAR

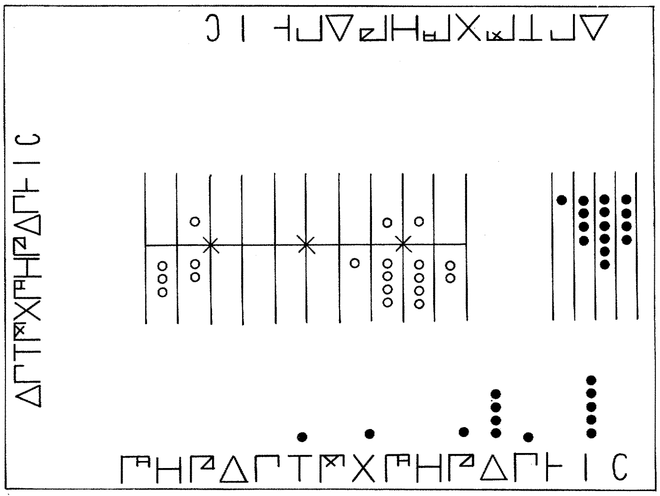


Fig. 9

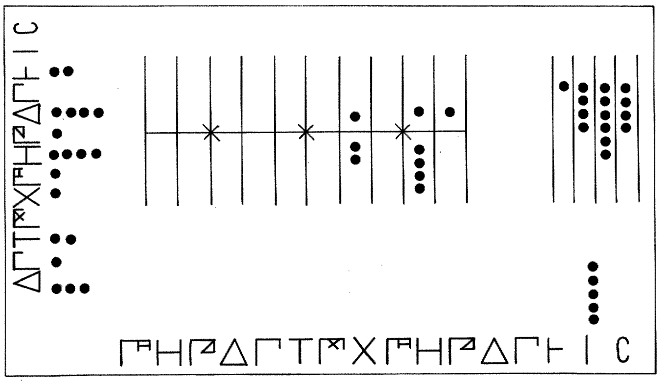


Fig. 10

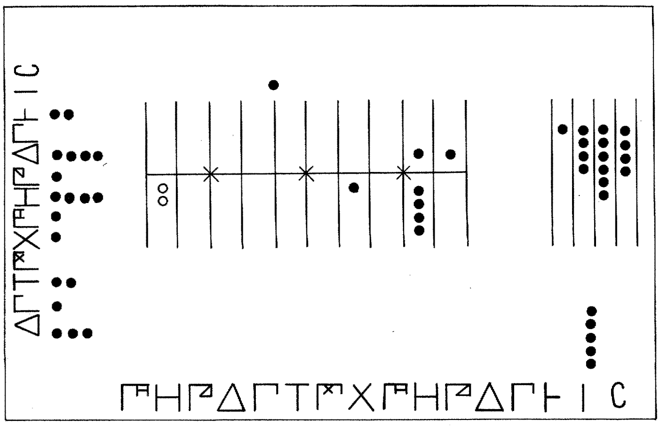


Fig. 11

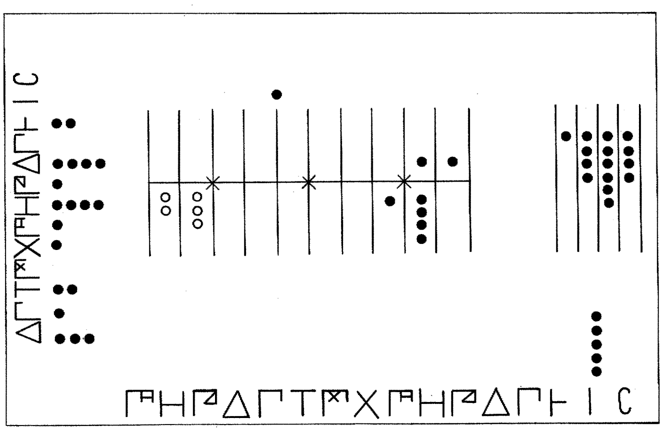


Fig. 12

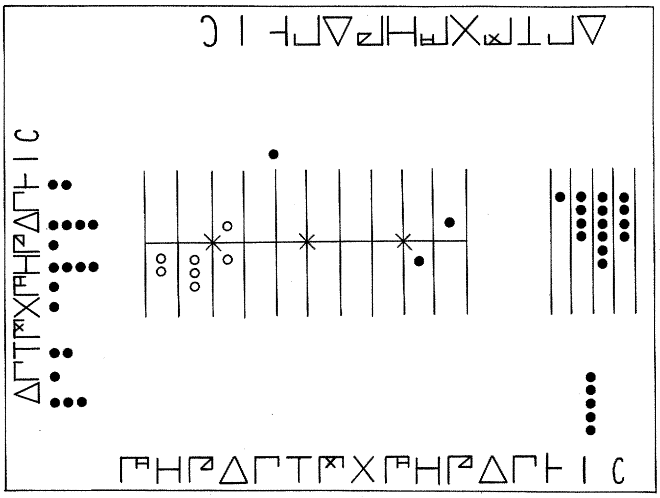


Fig. 13

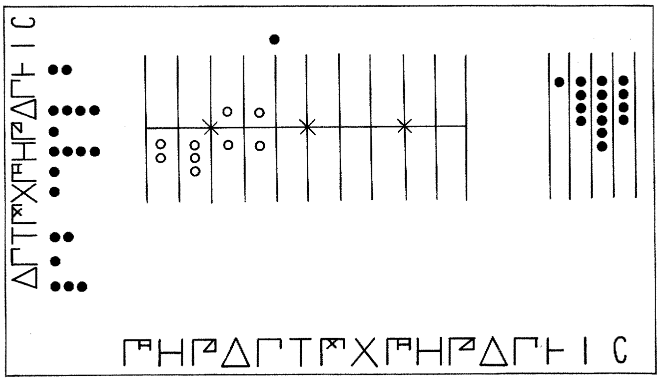


Fig. 14

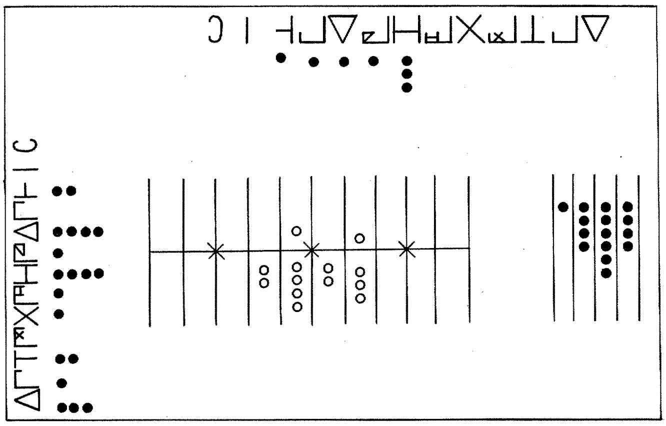


Fig. 15

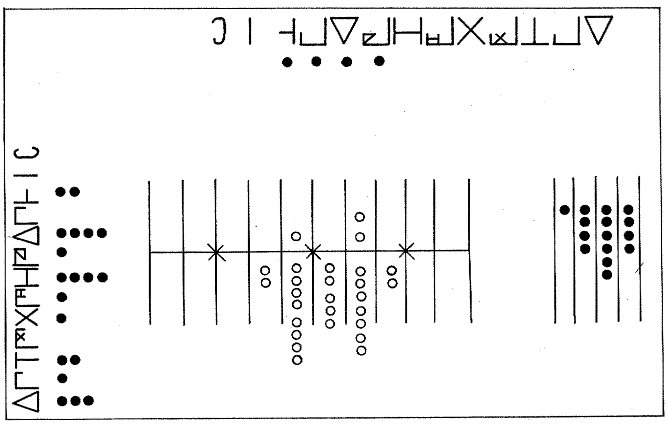


Fig. 16

Calculation of Interest on 1T 1095/5.

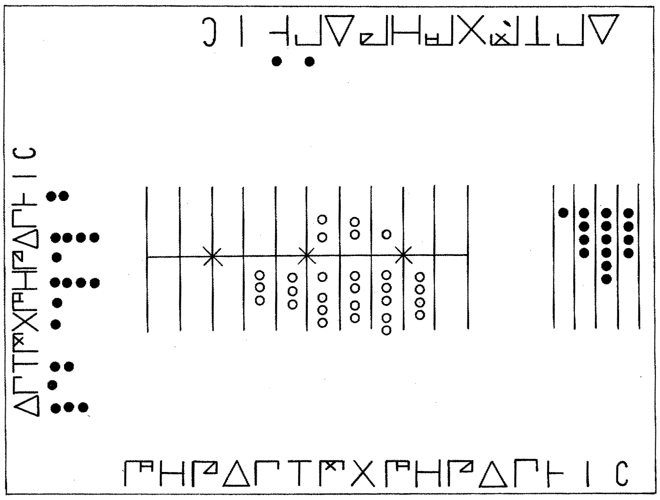


Fig. 17

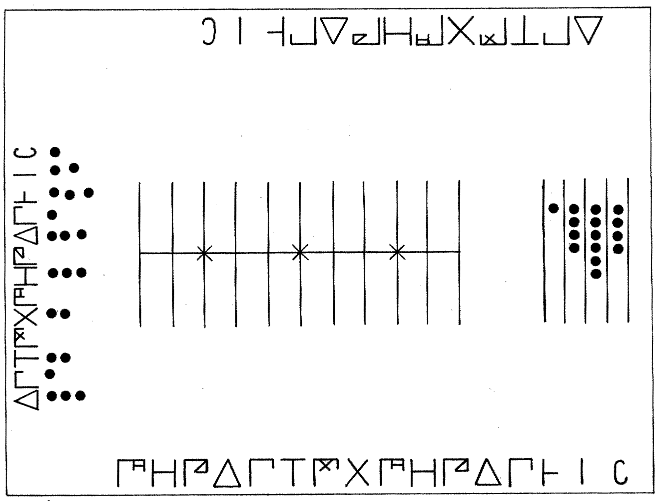


Fig. 21

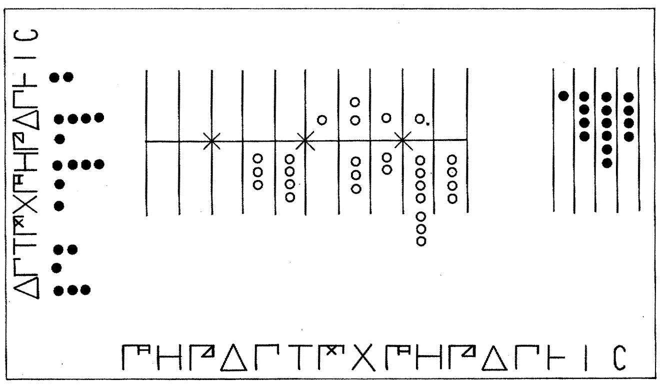


Fig. 18

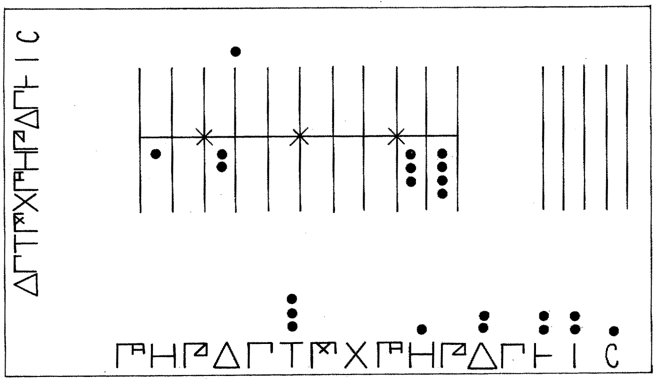


Fig. 22

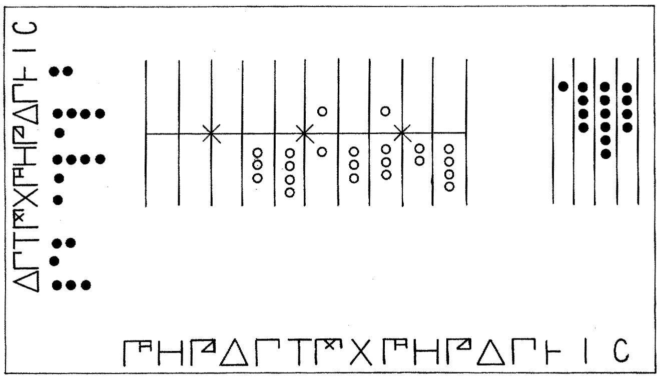


Fig. 19

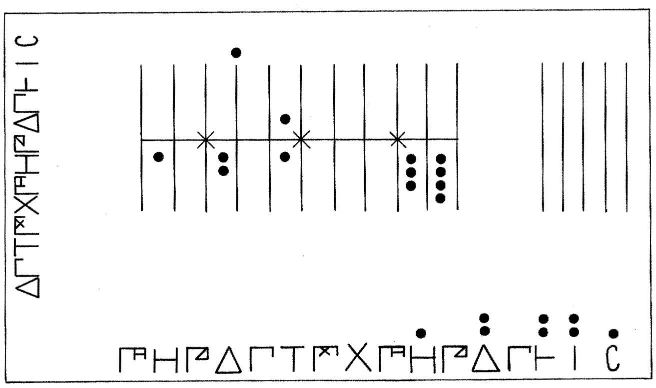


Fig. 23

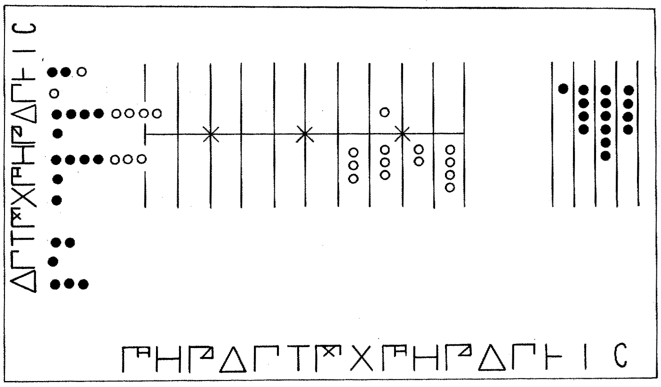


Fig. 20

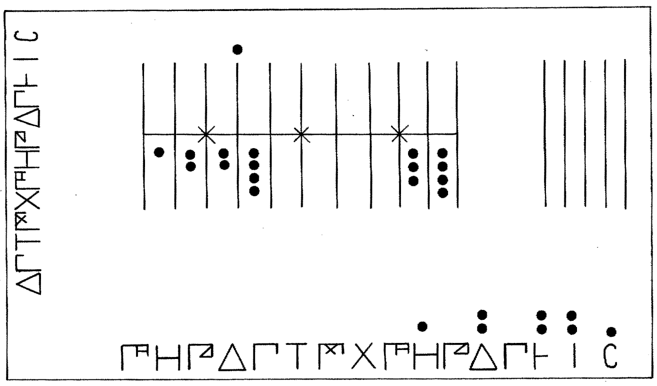


Fig. 24

Continued Calculation of Interest on 1T 1095/5 (Figs. 17-21); Neglect of Remainder in Year 4 (Figs. 22-24).