Four Roman Pigs of Lead from the Mendips.

BY

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SYNOPSIS

"A Note on the Inscriptions" by R. P. Wright, M.A., F.S.A.

"Appendix" and "Additional Note" by L. S. Palmer,

I CIRCUMSTANCES OF THE DISCOVERY

The discovery of the four Roman pigs of lead to be discussed in the present paper was the result of a tractor-driven plough catching the end of Pig No. 1. The pig was partly up-ended and turned over. Mr. Merriman, who was following the plough, attempted to kick away what he thought was a dressed stone. He then realised it was no ordinary stone and called the attention of the farmer, who was driving the tractor, to what had been ploughed up. The farmer—Mr. D. A. Thompson, who is a member of the Mendip Nature Research Committee of the Wells Natural History and Archaeological Society—at once recognised the " stone " to be a Roman pig of lead. The pig was removed to his home and washed, and the Honorary Secretary of the M.N.R.C. (H.W.W.A.) was called in to help with the task of examining the locality where the pig was found. After some digging, the ends of three other pigs were exposed. Professor Palmer was then consulted and in this way the authors, with Mr. Thompson and other members of the M.N.R.C., were able to carry out a thorough examination of the area. Before further excavation was attempted, the site was photographed by Mr. L. Devenish (see Figures 1, 2 and 3). Preliminary measurements were then made and records taken of the precise location of the finds that had already been obtained within less than a foot of the surface.

II THE SITE AND EXCAVATION

The field in which the pigs were found belongs to Rookery Farm, near Green Ore on Mendip. The grid reference is 31/576514. This point is about 1,100 yards west of the Bristol-Wells road and 700 yards north of the old Roman road that runs approximately north-westwards from Green Ore crossroads. The site is shown in Figure 1, from which it is apparent that no conspicuous or unusual features suggest the presence of four Roman pigs of lead within a foot or so of the surface of the field. On the other hand this particular field is covered with broken sherds of pottery, mostly Roman-British. Mr. Thompson had found previously a bronze fibula, a Roman glass bead and other Romano-British relics in the same field. These finds lead one to suspect a Roman or Romano-British settlement in this locality. An aeroplane photograph shows curious shadows on the otherwise uniform whitish colour of a newly

ploughed field. The shadows are blackest where the pottery is most thickly scattered and it is proposed to carry out further investigations in this field in the near future. The field is one which has been ploughed on several previous occasions, but not to a depth such that the plough could reach the pig nearset the surface. The depth of this particular pig (No. 1) must have been about 6 to 8

FIG. 1 THE SITE LOOKING SOUTH

inches. Figures 2 and 3 show the other three pigs in situ. The highest part of Pig No. 2 (the one nearest the camera in Figure 2 and farthest from the camera in Figure 3) was 10 inches from the surface and Pig No. 4 was 12 inches down. Pigs Nos. 1 and 2 lay with their moulded or top faces uppermost and Pigs Nos. 3 and 4 were with their bases uppermost. Pigs Nos. 1, 2 and 3 were almost touching each other (judged from the hole from which Pig No. 1 had been removed) whilst Pig No. 4 lay about 6 inches from Pig No. 3 (see Figure 4). Furthermore, whereas Pigs Nos. 1, 2 and 3 were slightly up-ended in a pit which was subsequently excavated, Pig No. 4 lay alongside the pit, as shown in Figure 4 A. The

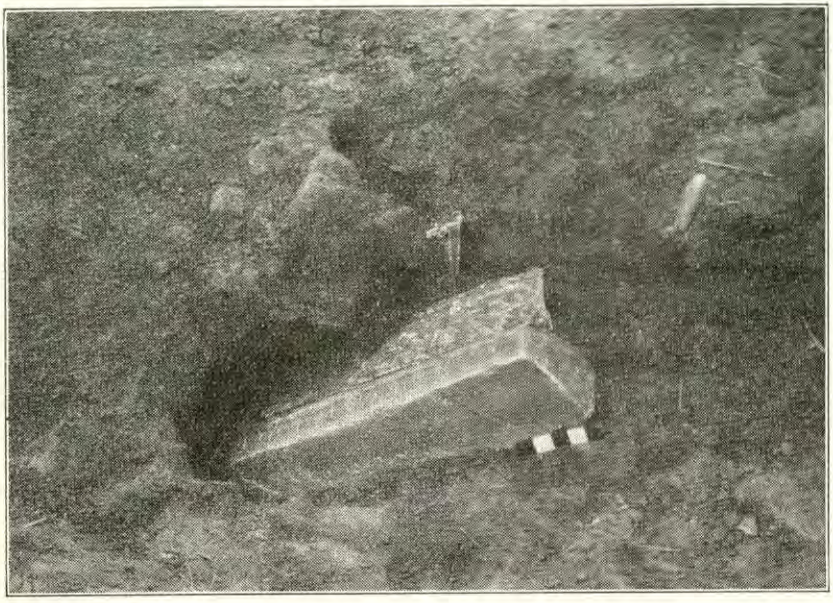


FIG. 2 SIDEVIEW LOOKING NORTH-EAST

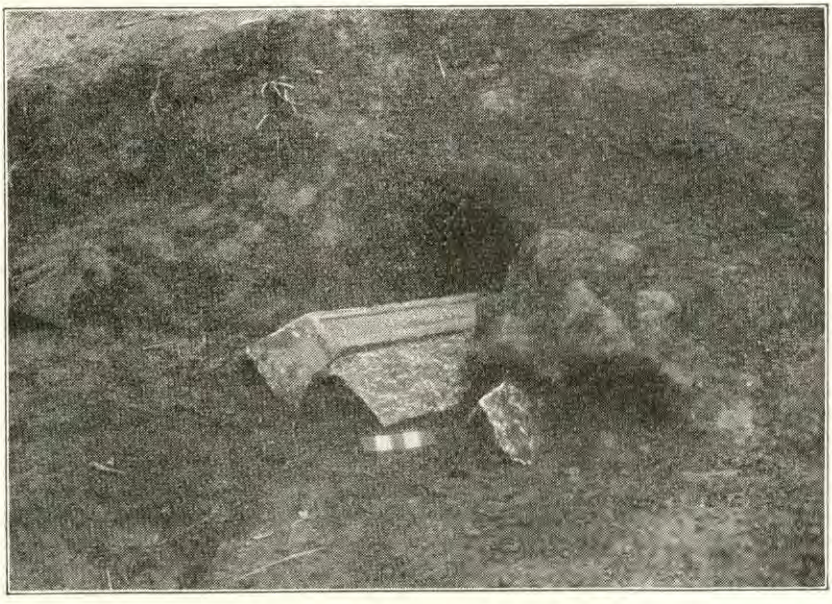


FIG. 3 SIDEVIEW LOOKING NORTH-WEST

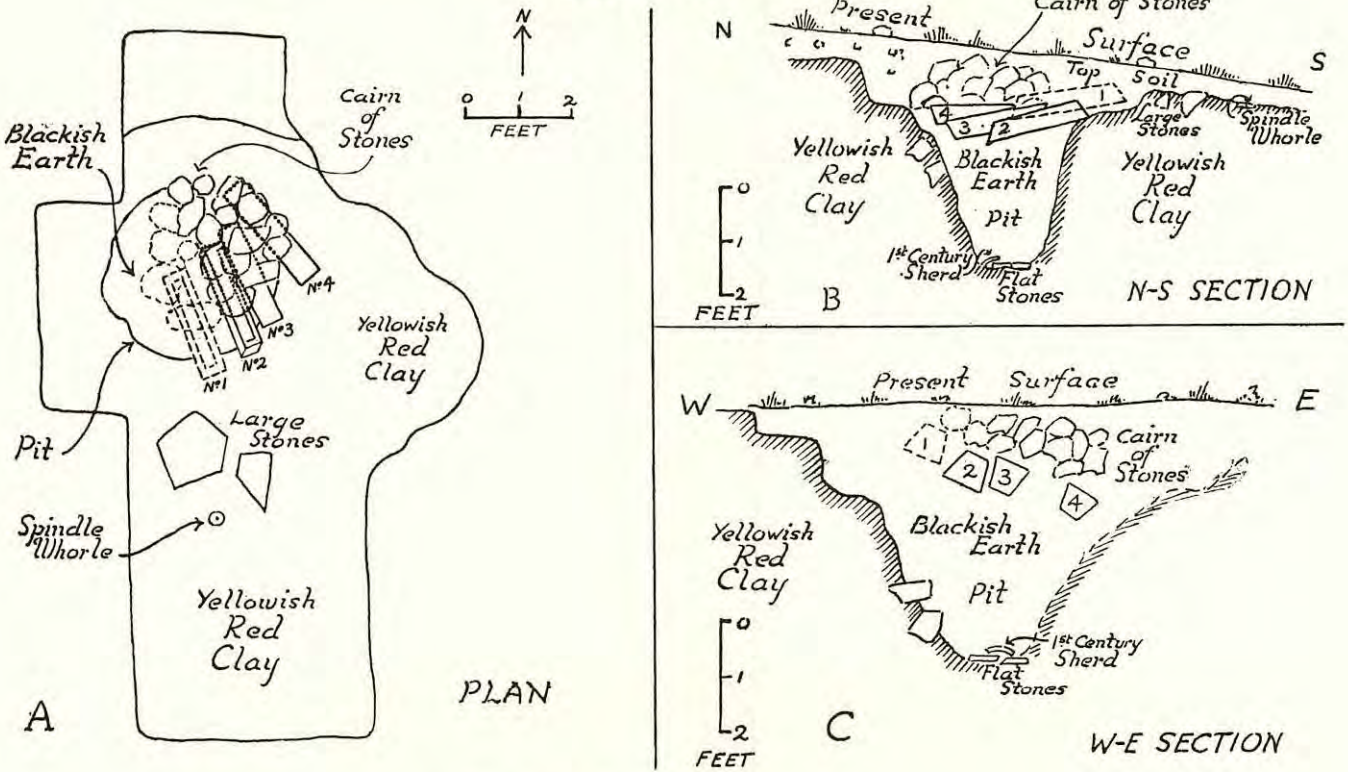
three pigs (2, 3 and 4) were covered with what appeared to be a small cairn of stones (Figures 2 and 3), and it is probable that the heap of stones originally extended above the hole from which the first pig was removed by the plough. It would seem that the pigs had been placed over a loosely filled pit with the southern ends of Pigs Nos. 1, 2 and 3 resting on the edge of the pit. In the course of time their northern ends had sunk into the material with which the pit was filled.

Although many small pieces of pottery were scattered around the locality, nothing but stones occurred in the cairn. This was eventually removed and the pigs taken out in order that the pit (first recognised by the dark colour of the earth compared with the surrounding yellowish clay) could be investigated.

Further excavation disclosed the details shown in Figure 4. The pit was roughly of circular cross-section, was about three feet in diameter at the top (which was about a foot from the surface) and tapered to almost one foot six inches at the bottom. The depth was approximately three feet. Although many stones were in this pit there was no clearly marked surrounding wall; but there were two small flat stones that appeared to have been placed horizontally on the bottom. Close to them was a shred of pot which Dr. Philip Corder considers to be of late 1st. Century, (See Section IV (*a*) below). It does not seem that the pit had ever been used as a smelting furnace.

In order to be assured that the four pigs and the pit were isolated, the area in the immediate locality was dug over to such a depth (about 15 inches) that the original undisturbed yellowish red clay was exposed. In particular an area approximately 6 feet by 4 feet was cleared immediately south of the pit (Figure 4). Apart from a miscellaneous mixture of broken shreds, a partly finished stone spindle-whorl and a small flint pebble (possibly a gaming stone) there were no indications of hearths, other pits or signs of occupation. Similar shreds are to be found all over the field.

FIGURE 4



PLAN AND SECTIONS OF THE SITE

III DESCRIPTION OF THE PIGS

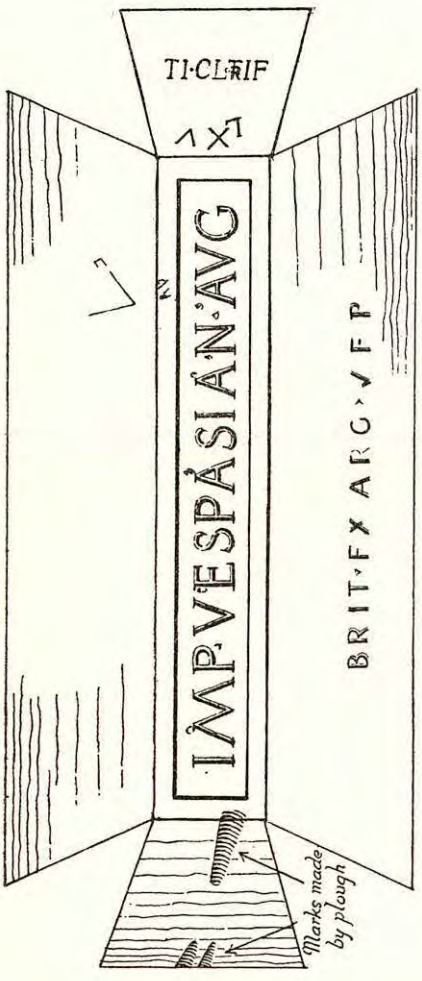
(*a*) **General**: The four pigs are of the shape common to all those found in England, namely, truncated pyramids with bases approximately 24 inches by 6 inches. The truncated top of each pig is about 20 inches by $3\frac{1}{4}$ inches and contains the principal inscription cast in a sunken panel enclosed in a three-quarter inch frame. The depth of the panel is about $\frac{1}{4}$ inch below the top of the frame. The top of the pyramid corresponds of course, to the bottom of the mould in which the pig was cast. The thickness of the pig or depth of the mould is about $4\frac{3}{4}$ inches.

The pigs are in extremely good condition and are but little damaged. Pig No. 4 is slightly bent and sags half an inch in the middle. All the pigs are whitish-yellow in colour. This is probably due to corrosion, but where the surface is particularly smooth it looks just as if the pigs had been protected by a coat of paint. Only where Pig No. 1 was damaged by the plough (Fig. 5) is the bright metallic colour of the lead exposed. Other indentations, scratches, hammer marks, etc. are indistinguishable in colour and patina from their surroundings and are therefore contemporary with the age of the pigs. They had undoubtedly lain where they were found since the day they were deliberately placed (and not dropped) on the pit and covered with the cairn of stones.

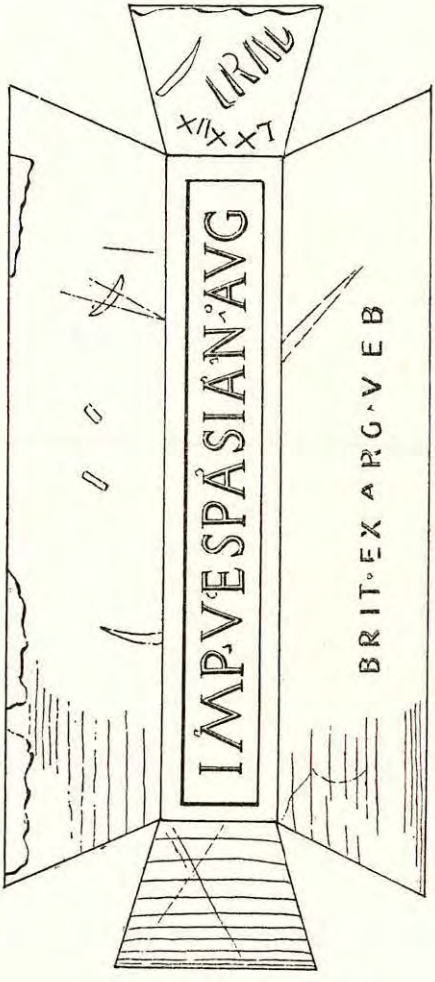
The bases of the pigs showed cooling wrinkles and parallel marks made by a brush or rough wood when levelling off the tops of the mould. Pieces of slag and cinders were sometimes embedded in the surface.

(*b*) **Inscriptions**: The various inscriptions on the four pigs are made in three different ways; namely—(i) letters impressed on the mould and cast as embossed letters on the pig; (ii) letters and numbers cold-stamped on the pig after it had been removed from the mould. Such letters are cut into the surface of the pig and occur either as individual letters usually badly aligned and irregularly spaced or as a complete stamp, in which case the alignment and spacing are good. (iii) Letters cut or stamped from strips of lead which are then impressed or struck on the cold surface of the pig. Such letters could easily be knocked off and this may account for the fact that this method of marking on Roman pigs has not been recorded hitherto.

FIG. 5

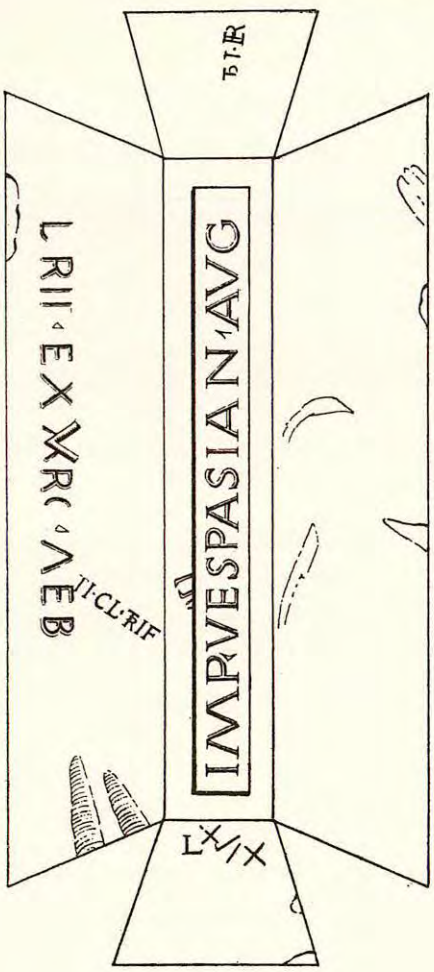


Pig. 1

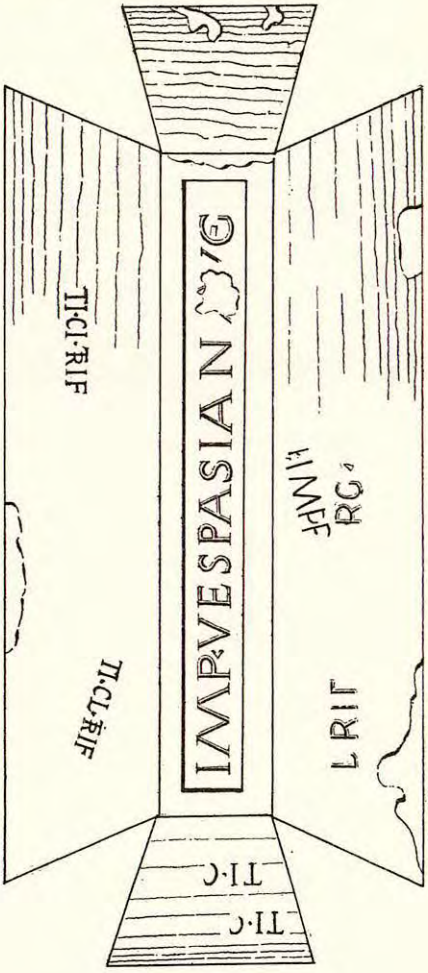


Pig 2

FIG. 5 (*continued*)



Pig. 3



Pig. 4

The *cast inscriptions* will be described first. These occur on the panel which is itself cast and also on one side of each pig. By reference to Figure 5 it can be seen that the sunken panel on each pig contains the letters :—

IMP . VESPASIAN . AVG

The height of the letters is 1 1/5″ and the two stops are triangular on pigs Nos. 1 and 2, whilst the letters are 1″ high and the stops foliated on pigs Nos. 3 and 4. Also the panel on pigs Nos. 1 and 2 is 1 7/8″ wide, 5/16″ deep and surrounded by a frame 5/8″ wide. The comparable figures for pigs Nos. 3 and 4 are 1 9/16″, 3/8″ and 7/8″. By comparing certain blemishes on the letters of pigs 1 and 2 (see Fig. 5) it is evident that the bottom panels of the moulds for these two pigs were the same. With pigs 3 and 4 the moulds and the letters differed from those used for pigs 1 and 2. Furthermore the spaces between the letters of pig 3 were not the same as the spaces on pig 4.

The only other *cast* inscriptions occur on one of the sloping sides of each pig. These inscriptions read :—

BRIT . EX ARG . VEB

This inscription is, like that just described, embossed but is barely visible on pigs 3 and 4 without special oblique lighting. Again the mould used for pigs 1 and 2 is different from that used for pigs 3 and 4. In the former case the letters are 7/10″ high and the stops triangular, whilst in the latter the letters are 7/8″ high and are also more widely spaced. The stops are probably foliated but are not very distinct. An interesting sidelight on the method of making the moulds arises when this particular inscription is compared on pigs 3 and 4. In one case (Pig 3) it is on the back face when the pig is viewed with the panel inscription the correct way up, but on pig No. 4 this inscription is on the front of the pig. Furthermore the ' V ' in ' VEB ' on pig No. 3 is upside down ; a mistake that must have arisen when making the die. This particular letter is also more distinct than any of the others, as though it had become displaced. Such a curious error suggests that the inscriptions as a whole was made up of separate letters possibly stuck on a board, and the whole board was then impressed on one

or the other side of the mould without considering which way the panel letters were facing. The die for this inscription was certainly quite independent of that used for the panel inscription. That separate letters were used in this way is supported by the fact that the pig found in 1869 in Chatenoy-le-Royal near Chalon-sur-Saone [1] has the inscription BFLIDOC stamped in such a way that it appears as the mirrored image reading from right to left. This could only happen if the type setter had deliberately reversed the letters on the die. It would then appear normal on the side of the mould and reversed on the side of the pig. Good alignment and spacing of the letters would easily be possible with this technique.

As no moulds for lead pigs have yet been found, it seems probable that the material used was clay or other perishable substance. It is perhaps equally significant that no dies have been found, but they were possibly broken up in order to re-use the letters.

It may be noted here that these cast inscriptions are the only ones common to all four pigs.

The incuse *cold-stamped inscriptions* will now be considered for each pig.

Pig No. 1. The left-hand end of this pig is that which was caught by the plough but no other marks are apparent. On the right-hand end are two inscriptions shown in Figure 5, namely: LXV and (upside down) TI.CL.TRIF. The former was made with three separate stamps badly aligned, and the latter was a complete stamp of clear letters with ceriphs and circular full stops as shown. The diphthong TR was cut as a single symbol.

Pig No. 2. The back face is without any stamped letters, but short rectangular pieces of lead are stuck on as shown in Fig. 5.

The left hand end shows very clearly the series of laminae which are discussed below. Superimposed on them is a large but faint cross which may have been scratched deliberately.

On the right hand end is the number LXXIIX and (upside down) a stamp which looks like " RAD ' or " LRAD ' if the letter ' L ' is not the impression of the end and bottom left hand corner of the stamp. The stamp was certainly tilted in such a manner as to leave the top of the ' A ' and the top half of the ' D ' only lightly touching the pig. The ' A ' has no visible horizontal bar joining the two sides.

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1 C.I.L. XIII No. 2612*b*.

Pig No. 3. No inscriptions of any kind could be discovered on the front face of this pig. On the back face, in addition to the cast inscription referred to above, there is the TI.CL.TRIF inscription stamped obliquely across the back and extending from the E of VEB to the top edge of the pig.

The number LXIIX was stamped on the left hand end and two overlapping (?) attempts seem to have been made to imprint the TI.CL.TRIF stamp on the right hand end of this pig. The uppermost of these stamps may be LRAD.

Finally a very illegible stamp occurs on the rim or frame of the panel. Parts of two or three letters look as if a stamp had been very carelessly banged on the edge with considerable force and haste. They might be parts of the letters IMP but this is largely conjectural.

Pig No. 4. On the front face of this pig and above the barely visible cast inscription are the letters IMP with the edge of the stamp or possibly a second letter P showing after the first P. The edge of the stamp also appears very faintly before the I. The letters are upside down as though the stamp had been used when looking down on the pig from above. The TI.CL.TRIF inscription is deeply and clearly impressed twice on the back face and the first three letters of this stamp occur twice upside down on the left hand end. There are no numerals on this pig and no stamp on the frame of the panel.

Strip Letters :— On the back face of Pig No. 1 there is a very faint impression of an inverted letter Λ not unlike the lead strip letter V on the back face of Pig No. 3. This V on Pig No. 3 appears to have been cut or stamped out of a strip of lead and stuck over the cast letter A in ARG on the back face. The ends of the letter A just show on either side of the V as indicated in Figure 5. The letter is about 1/16″ thick and the arms are 1/4″ wide and 1″ long. Three similar odd bits of metal strip are stuck in an apparently haphazard manner on the back face of Pig No. 2. They may possibly have just been dropped or inadvertently stuck on the side of the mould and so adhered to the side of the pig when it was being cast. They may have no significance whatever but they are made from the same width strip as the letter V on Pig No. 3.

(*c*) **Weights** : After careful washing the pigs were weighed on a spring balance that had just previously been checked and passed by the local Weights and Measures Officer. The weights were

tested again later and were as follows :—

Pig No. 1	....	187·0 lbs.
Pig No. 2	....	197·5 lbs.
Pig No. 3	....	189·5 lbs.
Pig No. 4	....	187·0 lbs.

These are quite normal weights for Roman pigs of lead made in this country and compare with other pigs from the Mendips which vary from 163 to 223 lbs.

Certain relationships are believed to exist between these weights, the laminae (discussed below in Section III (*d*)) and the numbers stamped in the ends of the pigs which are referred to above (Section III (*b*)). These relationships are discussed in Section V.

(*d*) **Laminae.** In 1901 Professor W. Gowland [2] pointed out that Roman pigs of lead were stratified as though made layer by layer at intervals of time sufficiently long to allow each layer to cool before the next was added. He also stated that the laminations were " tolerably uniform in thickness." A careful examination of the laminae on many pigs suggests that Professor Gowland's statement should be re-examined. The laminae are not uniform but gradually *decrease* in thickness from the top to the base of the pig (see Fig. 5). At the same time it is apparent that the area of the laminae *increases* as their depth increases. In other words, as the mould was gradually filled with molten lead a layer at a time so the depth or thickness of each successive layer decreased. This obviously suggests that possibly the volume of each lamina is constant. To test this hypothesis careful measurements were made of the depth, area and thickness of successive laminae on as many pigs as were available, and in particular on the pigs now under consideration. This was possible with pigs Nos. 1, 2 and 4 but the laminae were not clearly defined in No. 3 pig. The method adopted was as follows. Rubbings were taken where the laminae were distinct and their depth from the top of the pig and their thickness were directly measured. The area of each lamina at a given depth was read directly off a rectilinear graph. This was obviously possible because the unknown areas vary directly with the depth,

2 " The Early Metallurgy of Silver and Lead " Archæologia Vol. LVII, pp. 359-422.

from the known area of the top panel (at zero depth) to the known area of the base at a depth equal to the thickness of the pig. The product of these areas with their respective thicknesses was then plotted against the depth. The resulting graphs for Pigs 1, 2 and 4 are shown in Figure 6. In this figure the products, that is the volumes of the laminae, are plotted horizontally as abscissae and the depths are the vertical ordinates. Below a depth of about one inch these graphs are practically straight vertical lines, the abscissae value of which gives directly the constant volume of the laminae and thus confirms our hypothesis.

There are one or two special features to note. Firstly, the graphs bend over towards larger volumes for values of the depth less than about one inch. This is to be expected because the panels are hollow and consequently a given volume of lead will occupy an abnormally greater thickness. Secondly, the graphs are not quite vertical but slope slightly to smaller volumes for the thinner layers. This can be explained in two ways, either or both of which may be acceptable. As the mould gradually began to fill up, the plumbarum or lead-smith may have taken greater care not to over-fill the mould and so he only partly filled his ladle. Alternatively he may have got tired after lifting twenty or more full ladles each ontaining approximately 8 lbs. of molten lead. Possibly both these reasons are equally applicable. Thirdly, it will be seen that for Pig No. 4 there are two distinct sets of points. Calculations based on the laminae exposed on the sides of the pig give a smaller laminae volume than those measured on the two end faces. This arises because this particular pig was bent and sagged about half an inch in the middle. Thus the centres of the laminae were compressed whilst those exposed on the ends tend to open out. The mean value is taken as that which would have arisen had the pig been straight. On each graph the constant volume of the laminae represents the volume of the ladle used. These volumes are shown on the graphs.

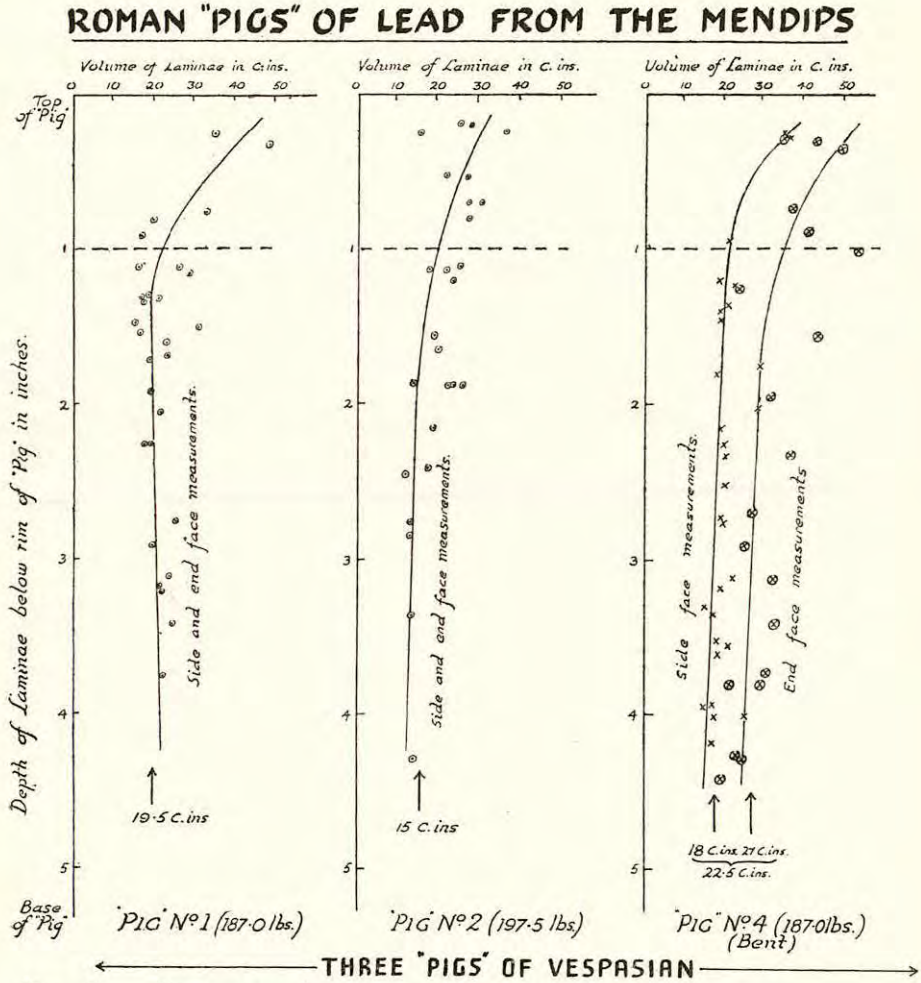

FIG. 6 GRAPHS OF LAMINA VOLUMES AGAINST DEPTHS OF LAMINÆ BELOW RIM OF PIG

It is interesting to compare these results with those obtained from other pigs. They are tabulated together below.

TABLE I

PIG		*Volume of ladle*	*A Weight of lead*	*B Weight of pig*	*B/A = Number of laminae*
Emperor	*Present Locality*	(*c. ins.*)	(*lbs.*)	(*lbs.*)	
VESPASIAN 1 (Charterhouse)	Wells Museum	19·5	8·0	187·0	23·4
2	,,	15·0	6·2	197·5	31·8
4	,,	22·5	9·3	187·0	20
VESPASIANI (Charterhouse)	Bristol Museum	22	9·0	182	20
ANTONINUS (Charterhouse)	,,	16	6·6	89 (portion only)	—
,,	Roehampton Priory	26	10·6	223	21
HADRIAN	Bath	22	9·0	195	22
ABASCANTI (Derbyshire)	British Museum	18	7·4	176	24
NERO (Stockbridge)	,,	16 × 2 (Two ladles per lamina)	6·6	166	26(2 × 13)
AVERAGE VALUES		19·7	8·1	—	23·6

Some consequences of this analysis are discussed in Section V.

(*e*) **Chemical Analysis.** The four pigs, a piece of cast lead (probably from a pig) and a sample of mineral from the excavation were analysed for their silver content. The results are given in Table II.

TABLE II

Sample	*Troy weight of silver per ton.*	*Per centage of silver.*
Pig No. 1.	Nil.	Nil.
,, ,, 2.	Trace.	Trace.
,, ,, 3.	Trace.	Trace.
,, ,, 4.	18 ozs. 12 dwts.	0·05
Lead casting.	13 ozs. 14 dwts.	0·04
Lead mineral.	Trace.	Trace.

To obtain these results about an ounce of lead was taken from each pig by drilling holes in the base of the pig and thereby obtaining an average sample of the lead.

When considering these results, it is of importance to recollect that in all other cases where the silver content has been obtained for other British lead pigs the results have either varied from 1 to 3 ozs. per ton or merely a trace.

Professor Smythe[3] has already pointed out that pigs with "EX ARG" on them may contain more silver than some without this inscription. He came to the obvious conclusion that "EX ARG" did not mean that the silver had been extracted. He also conclusively showed that in certain cases no cupellation had taken place although the particular pig was marked "EX ARG." It is now generally accepted that this inscription merely indicates that the pig has passed through or come from the lead-silver works. "EX ARG" is therefore to be expanded to "EX ARGENTARIIS."

The results for the four pigs in Table II clearly support this conclusion. It is remarkable that Pig No. 4 contains a greater percentage of silver than has been found in any pigs from this country hitherto. A similar statement may be made for the piece of cast lead, which, incidentally, was shaped as though it had once been sticking to one of the basal corners of a pig. This could have happened if the mould had been allowed to overflow.

Because there is only a trace of silver in the mineral sample, it seems possible that the silver content of galena might vary considerably between nearby veins or localities. Dr. I. G. Slater

[3] Trans. Newcomen Soc., XX 139 1939/40

suggests this could account for variations in the silver content of pigs from the same works, apart from the question of cupellation. It is a matter for further chemical research to confirm such variations from place to place within a limited area.

It has also been pointed out to us by Doctor Slater that on page 97 of the 1870 Edition of Percy's " Metallurgy of Lead " a sample of galena from Somerset contained 0·041% of silver, which accords with the value for the lead casting in Table 11.

IV ASSOCIATED FINDS

As mentioned in Section II many finds were made during the excavation. For convenience of discussion they may be classified under the headings (*a*) pottery (*b*) lead and slag (*c*) charcoal, cinders, etc. (*d*) artifacts.

(*a*) **Pottery.** Over 150 broken pottery sherds have been found but most of them are very small abraded pieces similar to thousands which cover the particular field in which the pigs were found.

They vary in date from the 1st century to medieval. On the whole the general character of the ware is Romano-British. It is important that no definite pre-Roman sherd and no imported Samian ware have been discovered. A few pieces are sufficiently complete to be datable and their location is therefore important.

On the very bottom of the pit were pieces of a reddish-buff bowl which Dr. Philip Corder, who kindly examined them, compares with a form Cam. 218c in Hawkes and Hull, " Camulodunum " Pl. LXXVII. This he places between 60 to 80 A.D. It is therefore contemporary with the reign of Vespasian (A.D. 69-79).

Another piece of a coarse heavy two-handled jar of grey ware with the stump of one of the loop handles is considered by Dr. Corder to be 3rd Century. It is to be compared with a similar pot figured in Somerset Archaeological and Natural History Society. Proceedings XCIII, Fig 8 on p. 162. This particular sherd, which is much worn, came from *above* the pigs in the top foot of the excavation. In this same upper foot were found most of the small sherds, including one or two pieces of glazed medieval pottery.

In the second foot *below* the pigs were some sherds of soft reddish ware rather like modern mugs with cylindrical sides at right angles to flat bases. These are identical with pots produced in a local pottery at Shepton Mallet. Similar ware has just been

excavated by one of us (H.W.W.A.) at a Romano-British farmstead above Wookey Hole, where they were associated with 1st to 2nd Century artifacts and datable stamped Samian ware.

(*b*) **Lead and Slag.** When a mould is filled with molten lead, lead oxide (litharge)—Pliny's "froth of silver"—together with other impurities and dirt from the mould collect on the top as a scum. This is smoothed off with green wood or a brush (?) with the result that cooled solidified lumps of lead tend to stick to the exposed edges of the pig and remain adhering to the base of the pig when it is ultimately removed from the mould and stood base downwards. Several of these pieces or rounded lumps of solidified lead, which easily break away from the pigs, were found in the pit and one or two pieces also came from the excavation to the south of the pit. Pigs with such lumps still adhering cannot have had much rough handling in transport. A few small pieces of lead slag were also found at various depths, but no unused lead ore was present. One piece of lead had the appearance of a drop or splash. This was found within a foot of the surface in the superficial excavation undertaken before the pit was excavated and pigs 2, 3 and 4 removed.

(*c*) **Charcoal, cinders, etc.** Throughout the pit and in the surrounding yellowish-red clay were many specks of charcoal and small pieces of decayed blackened wood, which still retained indications of their botannical structure. They had not been burnt, and consequently may have been parts of a wooden shed that might have covered the pit.

There were, however, some signs of fire apart from the general blackening of the earth in the pit. One or two burnt and cracked flints and a blackened flint nodule showed undoubtedly that a fire or fires had been made near the pit. These came mainly from the excavation to the south of the pit. Some very light weight cinders were also present in the upper foot but none occurred below the pigs. The only other evidences of fire were two very small pieces of burnt bone—so small that no identification was possible. These were also found in the upper foot of disturbed material.

It is of interest and possibly significant that no animal bones, no food refuse and no indications of any permanent habitation were found throughout the excavations.

(*d*) **Artifacts**: A flint scraper and two small flint flakes were found in the excavation to the south of the pit. The blackened

flint nodule came from the same area. Three other unretouched flakes came from the pit about a foot below the pigs. Similar flakes are fairly common all over the surface of the fields.

Three small polished flint or chert pebbles were found. A yellow ellipsoidal one from above the pigs, a larger and more irregular black pebble came from below the pigs and the third pebble was similar to the first but a grey-white in colour. This one was found about 8 inches below the surface south of the pit It was close to an unfinished stone spindle-whorl which had had the hole partially drilled on both sides.

No metal weapons, ornaments or implements were found.

V DISCUSSION AND CONCLUSIONS

The facts concerning these four pigs and the details of their discovery having been outlined in the foregoing sections, it is now opportune to see what deductions can be made from them and what general conclusions can be reached concerning the history of these pigs.

(*a*) **Techniques.** From the defects in the inscriptions and from the varying types of lettering, it would appear that soft clay (?) trough like moulds were used. Upon the bottom of the mould the framed IMP.VESPASIAN.AVG inscription was impressed and on one of the long sides the BRIT.EX ARG.VEB inscription was similarly impressed. These impressions on the mould were made by dies built up from separate solid letters. There is no evidence to indicate whether or not the moulds were then baked.

The laminated structure of the pigs indicates that the molten lead was added a ladle full at a time at intervals long enough to enable the preceeding layer of molton lead to solidify. Assuming that the temperature of the lead did not exceed 800°C when in the mould, that the area exposed to the air was not less than one square foot and that the volume of lead in a filled ladle (that is, the volume of one lamina) was about 20 cubic inches, then a solid crust would form in a matter of a few seconds and be hard enough to support the next ladle of molton lead in less than a quarter of a minute. This is, of course, to be expected because lead has an abnormally low latent heat of fusion. The time for solidifying is not long enough to melt a ladle full of lead even in a hot coal fire. Consequently the formation of laminae is unavoidable unless a very large

crucible was available capable of holding 200 lbs. of lead which could all be melted and poured at once. No such crucible has ever been found. These conclusions are contrary to Professor Smythe's statement [3] that " Moulds were filled by continuous teeming of the metal, such as would result from the tapping of a furnace with a capacity at least equal to that of the mould." This method would obviously produce no laminae.

From the evidence given in Table 1 it can be concluded that a normal Roman lead ladle would hold about 20 c. ins. of molten lead and weigh just over 8 lbs. The ratio of the values in column B to those in column A gives the number of laminae in each pig ; the average number being 24. It is interesting to note that the Nero pig from Stockbridge was made up of 13 laminae of double thickness as though two ladles had been used concurrently for each lamina.

From the data in Table II it does not seem possible to determine precisely when the lead of pigs 1, 2 and 3 was de-silvered. It would be of value to re-excavate the locality of Town Field at Charterhouse in order to discover evidence for the cupellation process. It was certainly not carried out where the present pigs were found. It is curious that Pig No. 4 had not been desilvered, but as yet there is no explanation for this difference in treatment.

(*b*) **Weights.** The weights of the four pigs are given in Section III (*c*) and it is proposed here to suggest a relationship between them and the Roman numerals stamped on the ends of Pigs 1, 2 and 3. No numeral is stamped on Pig No. 4. Perhaps the numbers were stamped on when the pigs left the place where they were de-silvered. This would then account for the absence of a number on Pig No. 4 which had definately not been through any cupellation process. The numbers on Pigs 1 and 2 are LXV and LXXIIX respectively without any ambiguity. But the number LXIIX on Pig 3 might be read as LXVIX, if the very faint left arm of the V (?) which over-lies the first X be taken into consideration. If so the number would appear to be meaningless. It is therefore assumed that the symbol is to be read as stated.

In Table III these numbers are subtracted from the weights of the pigs expressed in Roman pounds (librae). The resulting figure is practically the same for all three pigs ; the mean value being equal to 195 librae or 141 lbs.

3 loc. cit.

TABLE III

Pig No.	*Weight*		*Stamped Number*		*A–B*	
	lbs.	*librae A*	*Roman*	*English B*	*librae*	*lbs.*
1	187·0	260	LXV	65	195	140·5
2	197·5	274	LXXIIX	78	196	141·0
3	189·5	263	LXIIX	68	195	140 5

Dr. A. R. Raistrick [4] has pointed out that in Yorkshire (and Derbyshire) the old standard of weight used by the miners until quite recently was the " fodder " of 2820 lbs. [5] Incidentally there is little doubt that the word " fodder " comes from the Latin fodio—to dig up ; and hence its use by lead miners.

If the Roman number stamped on a pig is intended to indicate the excess weight of the pig over an accepted or specified standard, then this standard weight is 141 English lbs. or one twentieth part of the old fodder. This can hardly be a chance coincidence when it occurs in all three cases. It suggests that our present system of weights originated from the weight of a standard Roman pig of lead. In fact 20 standard pigs equalled one fodder. It is also relevant to recall that our hundred-weight of 112 lbs. did not come into existence until the 17th century.

Having come to this conclusion it would be of immense value to be able to check it by reference to other pigs of lead made in this country. Unfortunately very few have any Roman number marked on them. The Nero pig found at Stockbridge in Hampshire [6] and now in the British Museum has the number XXX stamped on one side and according to the British Museum Guide the pig weighs 156 lbs. (or 216 librae). The difference

4 Trans. Newcomen Society VII p.81.

5 This weight should not be confused with that of the later fodder equal to 2184 lbs. which was based on a cartload or carretate of six sacks of wool.

6 C.I.L. VII. No.1203. See also " Appendix " which refers to two others.

between 216 and 30 is 186 librae which does not accord with the above hypothesis. Consequently, and in the belief that the equality of the figures in the last columns of Table III could not be chance, the British Museum was contacted. Mr. J. W. Brailsford kindly re-examined this pig and the relevant quotation from his reply is— " We re-weighed all our pigs recently and found the weight of this one to be 166 lbs. and not 156 lbs. as stated in the 1922 Roman Britain Guide."

This quotation is of vital importance in connection with the present hypothesis. If we now use the amended weight, which reduces to 230 librae, and take the number XXX to be the excess weight in librae above a specified standard, we find the standard weight to be 230–30= 200 librae or 144 lbs., which is about 2 per cent above the value deduced from the Mendip pigs now under consideration. This seems to provide an interesting confirmation of the suggested meaning of these numbers when found on the pigs made in Britain under Roman control.

It may be relevant to recall that Besnier [7] refers to a fragment of a pig from Holland which probably came from Britain. [8] On it is the inscription P XXX. It is thought that the P refers to PONDO ; a suggestion which supports the above interpretation of XXX on the Stockbridge pit. [9] Unfortunately the original weight of the Holland pig, now in Leeuwarden Museum, cannot be determined from the existing fragment.

It would be intersting to discover why pigs were made overweight if the weight of a pig was, in fact, specified by the Romans. In this connection it may be recalled that lead was mined on the Mendip Hills before the Romans invaded this country and some system of weights must have been in use. It was, as Professor I. A. Richmond has pointed out, [10] usual for the Romans to leave unaltered the customs and practices of the countries they occupied, as long as they could be made to conform to their requirements. If now in Table III the average figure of the second column, namely 192, be compared with the average figure of the penultimate

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7 Revue Archéologique 5th. Series Vol. 13, pp. 36-76.

8 C.I.L. XIII No. 10029—27.

9 In view of the foregoing interpretation of these numbers, Professor I. A. Richmond has suggested that this letter P may stand for PLUS.

10 " Roman Britain." pp. 79 and 85.

column, namely 195, it is apparent that these two figures are practically the same. Does this mean that the British lead-smith, when told to make a pig weighing 195 librae, produced one according to the weight with which he was already familiar? The above figures are based on only three examples which is not sufficient to establish this equality with any reasonable degree of probability. Consequently the distribution of the weights of as many British pigs as possible was plotted; the data being taken mainly from the tables at the end of Mr. Graham Webster's paper. [11] The resultant distribution curve is shown in Figure 7. Under the peak of this graph 64% of the total weight of the 48 pigs is concentrated in pigs weighing between 180 and 200 lbs. Only $7\frac{1}{2}\%$ is concentrated in pigs weighing fron 130 to 150 lbs.; that is, in the neighbourhood of the Roman standard pig of 141 lbs. From this it does appear that British pigs were made in accordance with the British pound yet agreeing in numerical value with the specified weight in librae, namely 195. This is an interesting and important sidelight on the confusion which must have arisen when the Romans adopted the weights and measures of an occupied country without changing the nomenclature. At one time the Roman "pound" had seven or eight different values in as many different localities. Figure 7 definitely establishes the fact that this confusion existed in England, and confirms the suggestion made above that British pigs were deliberately made heavier than the specified weight by the difference between 195 British pounds and 195 Roman librae; namely 75 librae. It is not chance therefore that the mean value of the numbers in column B of Table III equals 70·3 librae. A further check on the fact that British pigs were made to a weight approximating to 195 pounds rather than to the specified weight of 195 librae follows from Table I. If we take the average weight of the lead which would fill a Roman lead-ladle, namely 8.1 pounds (Column A) and multiply it by the average number of laminae per pig, namely 24 (to the nearest lamina), then we arrive at the figure 194 pounds; approximately the peak value of the graph in Figure 7.

From the foregoing discussion it follows that a weight closely approximating to the present British pound was the unit of weight normally used in this country *before* the Roman occupation of the

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11 Trans. Flintshire Hist. Soc. Vol. 13. p. 18 et seq.

FIGURE 7

Distribution of weight between 48 Roman "Pigs" of Lead.

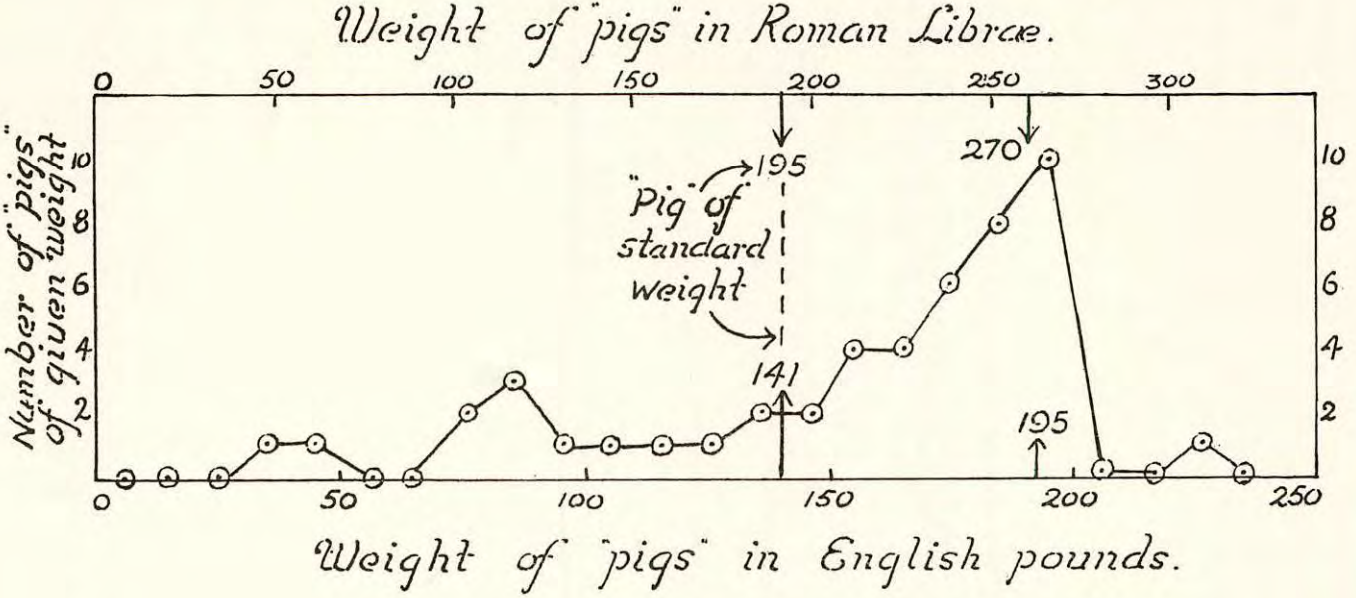

Fig. 7

first century A.D. The continuation of the use of this familiar unit after the Romans took over the Mendip lead mines gives a rational explanation for the weights of British pigs of lead when subsequently produced under Roman supervision.

A further deduction also follows from this difference between the weight of the specified standard pig and the average weight of the actual pigs produced. It would be expected that the standard pig of 195 librae would be balanced by 195 × 12 or 2340 unciae. But in actual practice it would be found that about 3240 (or 260 × 12) unciae would be required. This is, to the highest whole uncia, 16 times 195 ; 17 uncia being too heavy.

In other words, it follows that the British pound would contain 16 ounces if these weights originated in this way from Roman pigs of lead. It was not, of course, until 1340 that Edward III standardised 16 ounces each of 437 grains as equal to one British pound of 6992 grains.

It is interesting to recall in this connection that we still perpetuate the confusion between the English pound and the Roman libra when we retain the symbol " lb." for our present pound.

(*c*) **Other deductions.** That the mining of lead by the Romans was an imperial monoply is well known and the framed inscription IMP.VESPASIAN.AVG on the sunken panel of the pigs now under consideration is in accordance with this pratice. The absence of the genetival I at the end of the name of the Emperor Vespasian is possibly significant. The name " VESPASIANI " occurs on a Charterhouse pig in the Bristol Museum. This pig has no other names coldstamped upon it as have three of the present pigs. This suggests that control of the Mendip mines had already been delegated to a lessee or *procurator* when these present pigs were made. But this and similar topics are best left for Mr. R. P. Wright to discuss in his following " Note on the Inscriptions."

Under this sub-heading it may be appropriate to comment on the fact that the four pigs were found all together in one place. This also happened at Brough on the Humber, and at Pulborough in Sussex. In both these cases four pigs were found together and they were thought to be in transit, probably to the Continent.

The four Mendip pigs were some distance from the Charterhouse mines and were about 700 yards from the Roman Road which runs from Green Ore to this mining area. The pigs were

therefore probably en route to some destination such as the Roman port of Clausentum where two other Vespasian pigs with similar inscriptions were found. [12]

The presence of four pigs together in each of thase three cases suggests that such a load was sufficient for a two-wheeled cart on the rough roads of these times. The medieval " wey " or " wagh " of 250 librae was about the weight of one pig of lead, so that the weight of a Roman two-wheeled cartload would be equal to 4 " ways " or 1000 librae. This can be compared with the medieval carretate or wagon-load which was defined by Edward III as equal to " a load of lead of 3000 librae " or 12 weys or 6 wool-sacks. Thus the medieval carretate was equal to three Roman cart-loads and both seem to have been based originally on the weight of a pig of lead.

VI SUMMARY

The first of the four Roman pigs of lead described above was found by chance and the other three were then discovered after excavation at the same place. (Grid Reference : 31/576514). The pigs had been placed or hidden together on a filled-in pit which was not a furnace. The site was about 700 yards from a Roman Road running towards the south-east from Charterhouse-on-Mendip. They were covered with a small cairn of stones and were probably in transit to Clausentum where similar Vespasian pigs had been found. Associated finds, particularly pottery, were discovered during the excavations.

The pigs were in good condition and of normal shape, dimensions and weights. They had the usual moulded panel on top. In the panel was the cast inscription—IMP.VESPASIAN.AVG. On the sides and ends were twenty other inscriptions, some cast, some cold-stamped and one, a solitary letter V made from lead strip and stuck on. The pigs (except No. 3) showed a laminated structure.

From a study of the inscription, the laminae, and the weights the following conclusions have been reached :

1. The pigs were made during the reign of the Emperor Vespasian 69 to 79 A.D. and possibly towards the latter half of this period.

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12 P.S.A. 2 XXXI, 36.

2. They were made at the mines at Charterhouse ; the contraction of the Roman name for this settlement or district being VEB.

3. The mines at this time were controlled by a *Procurator* or by a British freeman whose name may have been TI(BERIUS) CL(AUDIUS) TRIF(OLIUS) [13] or TRIF(AUSTUS). [14] or TRIF(O) [3].

4. Separate dies made up of individual letters were used to impress the cast inscriptions on the sides and bottom of the moulds, which were probably made of local clay.

5. From the measured equality of the volumes of the structural laminae it was concluded that the moulds were filled layer by layer from a ladle 20 cubic inches in volume and holding about 8 pounds of molten lead. Approximately 24 ladles-full made one pig.

6. It was also concluded that the number cold-stamped on one end of a pig indicates its excess weight above a recognised specified standard. If this is correct then this standard weight is a constant and equal to 195 librae or 141 pounds. This happens to be one-twentieth part of the old lead miners' ton or " fodder " which weighed 2,820 pounds. Consequently 20 pigs equalled one fodder.

7. The actual weights of Roman pigs exceeded this standard and the average weight was about 195 British pounds. This practice seems to suggest that the present English pound was in use prior to the Roman occupation. It also gives a possible reason for there being 16 ounces to the pound in contrast to the 12 unciae of the libra.

8. Pigs 1, 2 and 3 have had their silver extracted but Pig No. 4 with no stamped number on it still contains the very large percentage of 0·05 by weight of silver comparable with that in some of the Mendip ores. In spite of this difference in silver content, all four pigs have the inscription BRIT.EX ARG. VEB cast on one of their long sides.

9. It is suggested that four pigs constituted a Roman cart-load because four were found together at Brough-on-Humber and at

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13 Forcellini's Onomasticon (Lexicon VI)

14 C.I.L. XIII, No. 2830.

3 loc. cit. Appendix by Professor I. A. Richmond.

Pulborough in Sussex. In both cases they appeared to be in transit to Roman ports. If this is so, then a Roman cart-load of four pigs of lead would be approximately equal to one-third of a medieval carretate of six sacks of wool.

VII ACKNOWLEDGMENTS

In the preparation of this paper much help has been required and has been freely given by many authorities to whom we would like to express our thanks, and in particular to Professors I. A. Richmond and W. Beare of Oxford and Bristol Universities respectively, and to Messrs R. P. Wright and Graham Webster of Durham, and Birmingham Universities. Dr. Philip Corder of the Society of Antiquaries kindly reported on some of the pottery; Mr. J. B. Atkinson through Dr. J. Newton Friend and Dr. I. G. Slater of the Metallurgical Department of the Birmingham College of Technology determined the silver content of the pigs and slag; Mr. J. W. Brailsford of the Department of Prehistory and Roman Britain, British Museum re-examined the Stockbridge pig and provided the information quoted on p. 74; Dr. F. S. Wallis and Mr. L. V. Grinsell of Bristol City Museum and Miss I. E. Anthony, then at the Roman Museum at Bath, granted facilities to examine the pigs in their respective Museums. Miss Nellie Kirkham kindly supplied data concerning medieval mining practices in Derbyshire.

We are also most grateful to Mr. D. A. Thompson of Rookery Farm and to Mr. Baber, the owner, for bringing the whole matter before us and for lending the pigs to Wells Museum where they are now on exhibition.

Finally, the photographs (Figures 1, 2 and 3) were taken by Mr. Luke Devenish and Figures 4, 5, 6 and 7 were drawn by Mr. E. B. Palmer, to both of whom we also express our thanks.

A NOTE ON THE INSCRIPTIONS[1]

BY R. P. WRIGHT, M.A., F.S.A.

The text moulded on the smaller face, or top, of each pig reads *Imp(erator) Vespasian(us) Aug(ustus)*. This dates them to A.D. 69-79. The sherds of a bowl found in the pit beneath the pigs (see p. 56 above) have been dated to the period A.D. 60-80, but do not give a closer limit.

The legend moulded on the front of Nos. 1, 2, and 4 and on the back of no. 3 reads *Brit(annicum) ex arg(entariis) Veb.* This occurs on three other pigs[2] of Vespasian's reign from the Mendip area.

As the tribes adjacent to the area are known to have been the Belgae and the Durotriges, *Veb.* cannot refer to either of them, and is unlikely to have referred to a small, unknown tribe. It may refer to a subdivision, or *pagus*, covering the Mendip region, or to the Roman name for the production-centre at Charterhouse. A comparable abbreviation, LVT or LVTVD for *Lutudarum*, occurs on some of the Derbyshire pigs (e.g. *CIL* vii 1208, 1214, 1215*a*, 1216), and refers to the production-centre.

The abbreviated names *Ti.Ci.Trif.* are fully or partially stamped on Nos. 1, 3 and 4. The *praenomen* and *nomen* of this individual, *Ti(berius) Cl(audius)*, are clear. The *cognomen* is much more likely to be *Trif(o)* or *Trif(on)*, as ten instances of this name in one or other of its spellings are cited by Dessau[3], whereas only one example seems to be furnished of other names[4] with this beginning. The feminine name Trifosa, cited at Bath[5] would seem to be a variant spelling of the Greek name Tryphosa, and support Trifo as a variant of Trypho. He is no doubt a member of the procuratorial staff in

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1 The following abbreviations are used: *CIL*: *Corpus Inscriptionum Latinarum*; *EE*: *Ephemeris Epigraphica*; *JRS*: *Journal of Roman Studies*; *PSA*: *Proceedings of the Society of Antiquaries of London.*

2 (*a*) *EE* iii 121*a* (from Charterhouse-on-Mendip), now at the Priory, Roehampton), Whittick *JRS* xxi (1931) 256; (*b*) *PSA*[2] xxxi (1918)37 (Bitterne); (*c*) *ibid.* (Bitterne).

3 *Inscriptiones Latinae Selectae.*

4 Professor Palmer suggests Trifaustus (*CIL* xiii 2830) or Trifolius (Forcellini *Onomasticon*). In *CIL* viii 13974 only Trifo [survives, so Trifo [lius] remains a conjecture there. Of Triferna there is one instance in *CIL* xv 2467.

5 *CIL* vii 53.

charge of the mines and their products and responsible for checking the latter.

Mr. G. Webster in a letter has suggested that, on the analogy of C. Nipius Ascanius[6], Ti(berius) Cl(audius) Trif(o) may perhaps be identified with Ti.Cl.Tr., whose name is moulded on the side of pigs[7] from Derbyshire. The suggestion is attractive, for a man who served on the imperial mining staff in Somerset might well later have become a lessee of a mine in Derbyshire. But the fact that the names are in this case abbreviated deprives the suggestion of the complete certainty that attaches to the Flintshire case. Dissimilar expansions are not completely excluded.

Numerals have been hammered on the ends of three of the pigs with separate dies used for making each figure. At the right end of no. 1 is LXV, at the right end of No. 2 is LXXIIX, at the left end of no. 3 is LXIIX. The third figure on No. 3 has been impressed with a V die which has registered little more than a digit. It seems reasonable to interpret it as LXIIX, as LXVIX appears to be meaningless. In his analysis given above (p. 00) Professor Palmer has shown that when these figures, treated as Roman *librae*, are deducted from the weight of each pig expressed in *librae*, the resulting figure is 195 or 196 *librae* (or 140.5 or 141 lbs.). In comparison he quotes the Somerset pig[8] of Nero found at Stockbridge which has XXX stamped on the back and, when recently re-weighed in the British Museum, weighed 166 lbs., or 230 *librae* : he then observes that, when 30 *librae* are deducted, a unit of 200 *librae* (or 144 lbs.) once more emerges. In contrast, however, there should also be cited the two pigs found in 1918 at Bitterne.[9] The larger one has IIVI, presumably a mistake for VIII, stamped

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6 His name is stamped on a pig of A.D. 60 from Stockbridge, (*CIL* vii 1203 with Webster *Flintshire*)*Historical Society Publ.* xiii (1952-3) 5), and later reappears as the main text moulded on a pig found at Carmel, Flintshire, (*JRS* xli (1951) 142 ; Webster, l.c.).

7 *CIL* vii 1215*a*, 1215*b* (four examples).

8 *CIL* vii 1203, *EE* vii 1120.

9 *PSA*2 xxxi (1918) 37. This report gives the weight as 178 lbs., and interprets the hammered figures as only VI. The other pig, now apparently lost, is recorded as having weighed 166 lbs. ; it was stamped VIII, as R. G. Collingwood confirmed in 1922. The present writer had the surviving pig re-weighed in 1951 on a company's tested scales.

on the back, and weighs 174 lbs., which is 241 *librae.*[10] The lighter pig, recorded in 1918 as weighing 166 lbs., had VIII stamped on the back. These pigs thus differed by 12 lbs. in their weight, as recorded in 1918, even if the scales then employed were not quite accurate, and yet they both have VIII (whether in correct or irregular order) stamped on them, and their weights after the deduction of this figure exceed Professor Palmer's " standard weight " by as much as 38 or 27 *librae.*

Other[11] British pigs or bars of lead which appear to be marked with numbers referring to their weight do not concern the present discussion, as the numbers in question appear to give the full weight of the pigs. Continental examples are rarely numbered, and as in some cases the pig is no longer complete the original weight cannot now be determined. In two examples [12] the numbers stamped on them approximate very closely to the actual weight in *librae.* More work is plainly needed on this comparative material, and on Professor Palmer's suggestion that these weights can be related to a native British system. Meanwhile Professor Palmer has shown that the three numbered pigs from Green Ore and also that from Stockbridge record in stamped figures what may be regarded as the number of *librae* by which they exceed the weight of 195-196 *librae.*

There are three other marks upon the pigs :

(*a*) IMP has been hammered on the front of No. 4. This is presumably an imperial checking-stamp.

(*b*) The large stamp LRAD has been hammered on the right end of no 2, and the lower left-hand corner of the same stamp occurs on the raised rim of the moulded face on No. 3. The meaning of this stamp[13] remains obscure.

(*c*) The letter V, cut as a leaden strip, has been applied to the

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10 The *libra* is here equated to 11.55 oz. (avoirdupois).

11 The pig from Carsington, Derbs, *JRS* xliii (1953) 129, has a scored number which comes within a small percentage of the actual weight. The examples from Kirkintilloch (*CIL* vii 1219) and from the R. Almond (*CIL* vii 1220) are poorly recorded, and cannot be checked as they are now lost.

12 (Sardinia) *CIL* x 8073, 1, p.1002 ; Besnier *Revue Archeologique* xii (1920) 222. (Worms *CIL* xiii 10029, 25 ; Besnier *ibid.* xiii (1921) 66.

13 Parts of the same die are impressed on the front and the left end of the larger of the two Bitterne pigs (as observed by this writer in 1951).

A of ARG in the back of No. 3, and V, as another strip, has been applied to the back of No. 1. Of these applied letters no solution is forthcoming. They are easily removed and it is not certain that they stood alone.

The writer makes grateful acknowledgement to Professor Palmer for his drawing and the loan of his report, and to Professor I. A. Richmond for taking measurements and making squeezes of the inscribed areas, and to Mr. H. E. Balch and Mr. G. Webster.

APPENDIX

BY L. S. PALMER

Mr. R. P. Wright has kindly allowed me to see his "*Note on the Inscriptions*," and to avoid unnecessary duplication I have withdrawn from the foregoing account our observations upon this palaeographic aspect of the Mendip pigs.

I would however, like to make the following comments on the Roman numbers which occur on the Carsington pig from Derbyshire and on the remaining pig at Bitterne to which he refers.

1. My attention was called to the Carsington pig after the foregoing paper had been written. Mr. W. R. P. Cockington forwarded a copy of his account of the discovery (Journ. of the Derbyshire Archaeological and Natural History Society, Vol. LXXIII, p. 110, 1953), whilst Mr. J. P. Heathcote supplied a copy of the photograph from which the unretouched enlargement.

FIG. A PHOTOGRAPH OF THE ROMAN NUMBER ON THE CARSINGTON PIG

in Figure A was made. This enlargement shows the Roman number which had been cold-stamped on the pig. It was interpreted by Mr. Wright as CCX or 210 librae, and he suggested that this represented the weight of the pig. The pig weighs 144 pounds, but 210 librae are equal to 151½ pounds. The error is over +5 per cent, which means that about 8 pounds of lead must have disappeared in the course of time. This is equal to the weight of a whole lamina, and since both the top and bottom laminae are complete, it is difficult to account for this loss.

On further examination of the inscription it is clear that the two first symbols are made entirely of straight lines like a letter L, but the vertical strokes are more heavily inscribed than the horizontal ones. A similar device was used to indicate a figure one on Mendip pig No. 3. It is therefore suggested that this inscription should be read as IIX or 8 librae. If we now assume, as before, that this is the excess weight above the standard of 195 librae, we get for the weight of the pig 203 librae or 146 pounds. This is less than 1½ per cent above the present weight of the pig. It appears therefore that this Carsington pig supports the present interpretation of these inscribed numbers, if the symbols can be read as IIX, and this seems to be a reasonable supposition.

2. In his "*Note*" Mr. Wright refers to the inscription I I VI which occurs on the Bitterne pig and has kindly sent me a tracing of his squeeze. He has re-

weighed the pig and finds it to be 174 pounds. Mr. Wright suggests that the inscription is a mistake for VIII. He also points out that the number 8 bears no relation to an excess weight above a specified weight of 195 librae or 141 pounds. It may be added that the number 8 is still more remote from the weight of the pig itself. Furthermore, if the number *was* intended to be 8, then there would appear to be no reason why it should not have been completed as IIX ; the recognised form for the figure 8 used on the Mendip pigs 2 and 3.

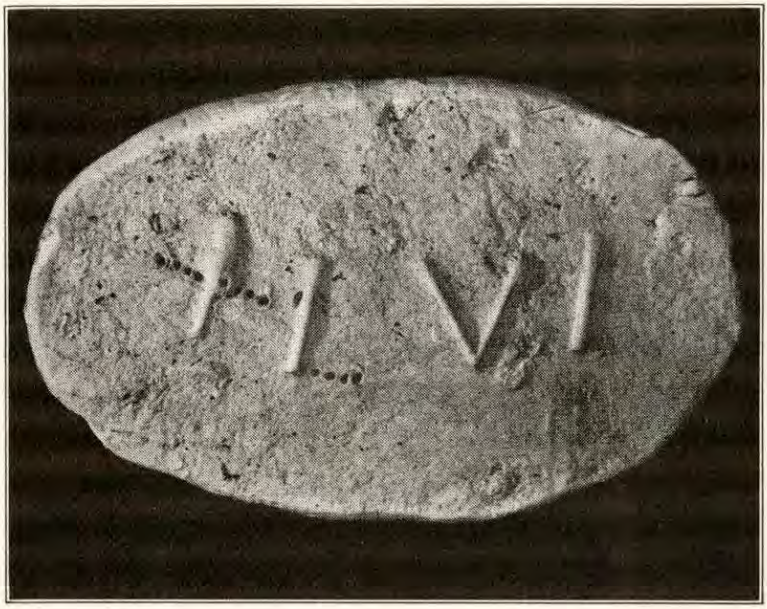

FIG. B PHOTOGRAPH OF A PLASTIC MOULD MADE FROM THE ROMAN NUMBER ON THE BITTERNE PIG

I therefore tentatively suggest that the order of the symbols and their form was not a mistake but was deliberate, and that the number was never completed. If the original intention was to make the first two strokes into letters as the spacing suggests, then the number would have a meaning without the symbols having to be re-arranged. It is therefore believed that two horizontal strokes have been omitted accidentally where the dotted lines are shown in Figure B and that the number was intended to be XLVI or 46 librae. This is equivalent to 33 pounds. Figure B is a photograph of a plastic mould made directly from the pig now preserved at Bitterne.

If this hypothesis be acceptable, then this number would represent almost exactly the excess weight of the pig above the standard of 141 pounds ; namely :— 174–33=141 pounds.

We are thus faced with the following alternatives,—either,

(*a*) the symbols are correct but arranged in the wrong order leading, when re-arranged, to the figure 8, which bears no relationship to the weight of the pig, or

(*b*) the symbols are incomplete but in the correct order leading, when completed, to the figure 46, from which the exact weight of the pig can be deduced.

I am inclined to think that the second alternative is the more attractive, especially now that it can be supported by five other similar cases.

I am unable to comment on the second Bitterne pig because it seems to have been lost.

Thus the six British pigs, the weights of which are known and upon which numbers have been cold-stamped, all conform to the same interpretation ; namely, that the numbers represent the excess weight of the pig above a specified standard and that this standard is 141 pounds equal to one-twentieth part of the lead-miners' fodder.

I would like to express my gratitude to Mr. W. R. P. Cockerton and to Mr. J. P. Heathcote for their kind help with the Carsington pig, and to Mr. R. P. Wright and to Mr. Risdon-Beazley for helping to clarify the nature of the symbols on the Bitterne pig.

ADDITIONAL NOTE

by L. S. PALMER.

Since the above paper was wri ten Professor E. K. Tratman has called my attention to two pigs of lead now exhibited at the National Museum of Ireland, Dublin. The Pigs are boat-shaped with Roman numerals cold-stamped on their flat elliptical upper surfaces. One pig weighs 144 English pounds 6 ozs. and has the number XXXII stamped on it. The other weighs 128 pounds, 11 ozs. and is stamped with the number XV ; the last figure being inverted.[1]

It is at once apparent that the interpretation of the number XV on the lighter pig cannot conform to the theory put forward in the foregoing paper on the four Mendip pigs, because the weight of this pig does not exceed the Roman standard weight of 141 pounds. However, it is thought that these two boat-shaped pigs are not of Roman date and consequently may not conform to Roman standards and weights, even though the numbers might be interpreted according to Roman practice. With this possibility in mind it is assumed that the numbers represent English pounds and not Roman librae, and that the standard or specified weight was the twentieth part of the modern ton, namely 112 pounds, and not a twentieth part of the old miner's fodder. If this idea is correct and the cold-stamped numbers represent the excess weight of the pig in pounds above the standard weight of 112 pounds, then the weights of the pigs should be :—

112 + 32 or 144 English pounds and

112 + 15 or 127 English pounds, respectively.

These weights differ from the actual weights by 0·3 % for the heavier pig, and 1·3% for the lighter pig—These are quite acceptable tolerances for the weights of lead pigs.

Thus we arrive at the interesting conclusion that the numbers cold-stamped upon these two Irish pigs can be interpreted according to the Roman practice but in terms of modern English weights. This is in keeping with the fact that many Roman customs and Roman numerals have persisted long after the present systems of measurements had become standardised and generally accepted.

That these boat-shaped Irish pigs may be of medieval date is supported by the fact that on the Commoner's Map of Mendip [2] (Ashweek Court Rolls, 1460-1470) pigs of lead at each Mendip " mynery " are drawn, not as rectangles, but as somewhat pointed and elongated ellipses.

Furthermore, Mr. G. T. Lucas, (Director of the National Museum of Ireland), informs me that the Irish pigs are not laminated This indicates that the moulds were not filled by using a ladle but by the continuous flow of molten lead : a medieval technique depicted in the Commoners' Map of Mendip by a trough or gulley directly connecting each furnace to one pig.

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1 These weights have been certified by the Weights and Measures Department of the Dublin Corporation through the kindness of Mr. G. T. Lucas, the Director of the National Museum of Ireland.

2 Procds. Somerset Archaeological and Natural History Society. Vol. XLI, pp. 65—72, 1895.