The Lead-Miners' Standard Dish or Measure and a Supposed Duplicate.

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PART II.

THE first part of this enquiry, which appeared in the *Journal* for 1937, dealt with the history and uses of the miners' customary measure of about fourteen Winchester pints. This has been the unit of measurement for the ore in the Wapentake ever since the Brazen Standard Dish was made in the year 1512 and deposited in the Moot Hall of Wirksworth. It was the writer's endeavour to explain the peculiar local character of this ancient measure and to make it clear that it was originally intended to fix a unit of measurement by bulk in respect to certain statutory proportional dues. As to the intrinsic value of the ore in open trading, in which quality and weight play an important part, this was left to find its own level in due time as marketing transactions became more and more exact with expanding trade. Primarily the Dish fixed royalty or lot, every thirteenth dish, with secondary charges dependent upon it, i.e. every ninth dish, 6d. for cope and 3d. for the barmaster's measuring fee. Tithe, or every tenth dish was due to the church. All these obligations were rigorously enforced for centuries, and under early conditions, when lead-ore was plentiful and easily worked from the surface, they perhaps caused little discontent.

Early counting methods were simple and direct and at the same time laborious. Some explanation has already been given but a few more words seem required. The first dish of ore from a new mine (Freeing Dish) was paid over to establish title and did not recur until change of ownership. The second dish began the counting and the miner paid the tenth and thirteenth dishes for tithe and lot. The first lot (13th dish) carried over three dishes from the first tithe for the next tithe (20th dish) and the next lot (26th dish) carried over six for the next tithe (30th dish), and so on to the one hundred and thirtieth dish when, for the first time, the two proportionate reckonings would coincide. These dues, then, being so much out of step, required careful watching by the Barmaster. But as every ninth dish bore a charge of 3d. measuring fee, which belonged to the Barmaster, the latter could be trusted to make sure of every ninth dish, while the buyer would watch that he did not pay cope at the eighth, a mutual check. Cope, every ninth dish, was also in the nature of a royalty, a pre-emption fee for the right of selling outside manorial or other corresponding claims.

From the above observations we begin to realise what a long and tedious arithmetic was involved in old days at the mines. While the Barmaster made up the tallies the miners handled the full dishes, seldom less that 60 lbs. in weight, dish after dish to be filled and emptied, filled and emptied, perhaps several tons of ore to be thus turned over in a long day's work. The eighteenth century brought some mitigation of these conditions when tithe was reduced to one-fortieth, but counting was no less necessary. The demand for more expeditious methods can be well understood when we remember the boom years of trade. Miners combined in ownership, companies were formed, and wholesale methods were adopted by the use of averages of selected dishes to cover large quantities of ore. As deep mines became more and more expensive owing to water

the lot was reduced to one-twenty-fifth. Another charge which resulted from water troubles was an agreed payment for 'unwatering the mines.' Combined capital was essential for such engineering and the work was often carried out by independent companies, but as to the terms of agreement, they are little mentioned in writers on lead-mining and require some hunting up from original papers.

The above remarks bear with great emphasis upon another matter, namely the tendency for the customary standard to become a mere 'shadow' measure. The Barmaster tells me that, in actual experience, the method of taking averages of dish content for computation of the whole, works very well in practice, and comes out very near to truth. If ever the trade should boom again it might even be advisable to establish an average at each mine, according to the normal quality of its output, a theoretical, not actual use of the dish. Moreover, the latest information concerning charges on output is to the effect that new remittances are now offered to encourage prospecting, but these reliefs are not stated in relation to the Dish but in percentages, and this well illustrates the tendency in the trade to by-pass the old methods. The announcement as to these further reliefs was made by the Barmaster at the Barmote Court held in October last, and I believe he will agree with me that, but for the long-established customary methods confirmed by the Acts of 1851 and 1852, it would be quite possible to abrogate any actual use of the measure. The intrinsic principle of the Dish could be continued by such an adoption of averages and would thus 'save the face' of the said Act. The Mill Close mine at Darley Dale not being in the King's Field is free from these entanglements.

It need scarcely be explained that the Weights and Measures Act of 1824 tended to check the use of purely local measures for general trade. But for local trading,

in accordance with ancient and exceptional custom, the Miners' Dish was not interdicted. It is not the only example of its kind which illustrates the curious deference to ancient uses which appears so frequently in English law. The Winchester bushel, now illegal in general business, was treated with similar respect by the same Act. It was not made obsolete for fixing corn rents, and it was used in Lincolnshire in 1855.

The miners' standard is commonly described as containing about fourteen Winchester pints and we must now enter into the question concerning these Winchester standards. They were first established in the reign of Henry VII. They were revised by Queen Elizabeth, and remained in force until the Weights and Measures Act of 1824. For our purpose, and in relation to the making of the original Brazen Standard, only the measures of Henry VII need be considered, as the Standard was made in the fourth year of Henry VIII. (See inscription on the Dish). This fact seems to have been overlooked by some writers who have not realised that the ancient standards known as "Winchester" had two statutory origins, 1497 and 1601 which varied in some slight degree. Their statements are irritatingly at odds, and to argue from them is a vain effort. Some have even got muddled by confusion with the Imperial standards of 1824. Fortunately I am able to give the agreed official capacities of the old measures from information sent by Mr. F. G. Skinner of the Metrology Section of the South Kensington Science Museum, for which help I am very grateful. They are as follows:—

TABLE NO. 1.

Henry VII (1497)	Gallon	268.43	cubic inches
	to the Pint	33.55	,, ,,
	14 pints	469.76	,, ,,

(*Table No.* 1 *continued*).

Henry VII (1497)	Bushel	2144.81	cubic inches
	to the Gallon	268.1	,, ,,
	to the Pint	33.5	,, ,,
	14 Pints	469.0	,, ,,

The bushel basis is ignored in Tables 3 and 4.

Whichever basis was taken in 1512 for the intended capacity of the Miners' Standard of fourteen pints (one gallon and three quarters) its cubical content should be about 469 inches, actually 469.76 if based on the gallon, 469.0 if based on the bushel. The discrepancy is so slight that little doubt need be cast on the assumption that fourteen pints was the intention. It is common knowledge with those interested in the subject that old measures are not mathematically correct. Practical difficulties of precision are easily understood in relation to certain kinds of old work. In connection with this question Mr. Skinner writes me " It is probable that the Winchester Corn Gallon did vary a little, though not intentionally, but rather from inaccurate copying from one vessel to another, and various anomalies in the old Statutes of the Realm."

The capacities of the first Winchester measures were slightly increased under Queen Elizabeth (1601) and remained in force until 1824 when capacities were settled with mathematical accuracy by the use of distilled water. The Imperial standards set at this time made the Winchester standards obsolete as previously stated, except in rare cases. Ten pounds of water determined the gallon, equal to 277.42[1] cubic inches, an increase of about three per cent. on the 1601 standard. It is not on record that the Brazen Dish at Wirksworth has ever been tested in this modern way, while the irregularities in its interior surfaces make any attempt to compute from three dimensions merely an approximation, but we have other

[1] This figure is given in the South Kensington Correspondence.

means of getting somewhere near the mark pending an actual test.

In the first part of this enquiry (1937) it was stated that a writer in the year 1836 (J. Rosewarne) gave the cubical capacity of the Barmote Standard as 472 cubic inches. We are not told by what method this figure was arrived at and on the above scale of capacities it makes the Standard a trifle more than fourteen pints (see *Journal*, 1937, p. 103). Stokes' " Lead and Lead Mining," also gives this figure, but he evidently quotes from the same author. This figure was compared with a standard capacity given by H. Chisholm, Warden of the Standard, in a work entitled " The Science of Weighing and Measuring " (1877) and found to be less, and not more than the required capacity. Both writers are open to question so far as their figures are concerned but on quite another basis the true result is arrived at, namely that the Standard is slightly *below* fourteen pints on the old Winchester basis. Which settles a long argument.

The working measure now in the Derby Museum, of which a full account was given last year, has been ' sized ' in the Barmote fashion, i.e., with small seed, at the Weights and Measures Office in Derby and found to contain 13.39 Imperial pints. The old equivalent of this is 13.84 pints on the basis of the gallon, 13.86 after the bushel (Henry VII). The calculated cubical capacity is 464.36 c.i. Compare table No. 1 for Winchester capacities.

Again, the Weights and Measures Department at South Kensington (Science Museum) possesses an oaken dish from the Wapentake, branded by the Barmaster " G.R. 1770." The measurements and also the approximate capacity, have been given to me in Mr. Skinner's correspondence. They are:—

TABLE NO. 2.

Length $22\frac{5}{8}$ inches top and bottom.
Width $5\frac{5}{16}$ to 6 inches.
Depth uniform at $3\frac{7}{16}$ inches.

"Giving a calculated capacity of *nearly* 467 cubic inches." The measure is in good condition and squarely built as usual, and capable of giving a close cubical capacity from its dimensions, which contain 13.92 pints on the basis of Henry VII's gallon or 13.94 on the bushel.

These two measures then give respectively 464.36 and 467 cubic inches, which fall slightly below 14 pints Winchester (see Table No 1) and certainly come very close to the actual capacity of the Standard Bronze Measure.

We now give two short tables to make these matters clearer by comparison, with the reminder that decimals beyond the second place must be allowed for:—

TABLE NO. 3.

	Imperial (cubic inches)	Winchester Henry VII. (cubic inches).
Gallon	277.42	268.43
Pint	34.68	33.55
Capacity required for 14 pints	485.48	469.76

TABLE NO. 4.

	Imperial Pints	Winchester Pints (Gallon basis)
Derby Dish (464.36. c.i.)	13.39	13.84
S. Kensington Dish (*nearly* 467. c.i.)	13.46	13.92

Now although it has seemed useful to analyse these various figures to establish an argument which has received very little attention in the past, it will be too

much to expect that all the working measures will agree precisely among themselves. Actually to test all such measures, including the Standard, is to use pure distilled water and a gauge mathematically exact. Dry material, i.e. fine seed however fine, cannot be depended on to lie in a given space always with the same degree of closeness. So although it seems a paradox to standardise dry measures with water, this is the only way. The old lead-miners knew quite well the liability to variation in this respect when they made a rule that no buyer of ore should shake the dish to make it give more measure. It is a world-old question, this, of measures 'pressed down and running over.' It is doubtful, however, if wooden measures could be tested with water.

The Weights and Measures Act of 1824 while it revised and legalised capacities, certainly did not abolish the anomalies of common use. Who has not seen dry fruit, peas and beans in pod, even potatoes, sold in country markets by measure, and seen also the haggling which resulted between buyer and seller? Perhaps not so much in modern days, public common sense has altered much of this. But the writer remembers how disputes of this sort once upon a time often titillated the life of a certain Devonshire market over a peck or a pottle of something or other. Perhaps readers will remember similar things in Derbyshire.

It is clear then, that we cannot affirm the capacity of the Brazen Standard exactly by comparing it with any working measure, for even if Barmote Court methods have been carried out carefully on all occasions it cannot be assumed that the dry seed used has always settled in the Dish with the same closeness. Thus the working measures may have been adjusted by trimming to slightly different capacities on different occasions. But that it is possible for any great differences to occur we have no reason to believe.

A few more words will not be amiss at this point. The business of testing with seed requires much nicety of handling, especially when 'strickling' the top of the full dish, i.e. stroking it level with a straight-edge. A glass bar is used in the Weights and Measures office to-day. Then, to transfer the full contents to another measure and not to spill any so as to falsify the test, requires patience and care. Some slight errors may certainly be allowed to Barmote procedure through many years. But it is remarkable that a working measure of 1770 by *calculation* of its dimensions and not by actual trial, and a measure of 1858 just 'sized' in the old and customary way should give such close results viz.:—'*nearly* 467 cubic inches' and 464.36 respectively. The 'nearly' appertaining to the first will bring the figures still closer. The difference is .07 of a pint, i.e. 2.64 c.i. or just over one-third of a pound on an average of sixty-five pounds to the Dish.

Concerning these differences, which have never before been scrutinized so far as is known, the framers of the Lead Mining Acts, of 1851-2, were indifferent. The very nature of the subject is beyond legislation, except by abolishing such a method altogether and leaving the trade to adopt its own ways of settling values. It was really immaterial, inasmuch as the Dish, as already explained, was only used to determine a proportional, and not an absolute quantity of a given mass. For this purpose any material of fine grain or perhaps dry sand might be used. Rape seed was the earliest we hear of, and later turnip seed. The latter is extremely fine and not capable of much variation in density if reasonably managed. When this method was first adopted many centuries ago the payment of lot and tithe would certainly be in kind. Hence it mattered not that the measures varied slightly. If short there would be more dish-fulls to compensate, and thus rectify the reckoning for both sides, and vice versa. It may be assumed that as soon as money payments began

to be used intrinsic values would come into operation. Thus, any one measure consistently used would give the just relative amount, and there was little chance of cross-measuring with different dishes inasmuch as the Barmasters, probably on grounds of policy, never seem to have had more dishes in commission than was absolutely necessary. Perhaps one for the Barmaster and one for his deputy. There is one in the Moot Hall of 20th century date for current use, but old dishes are very rare. It is probably due to the lapse of the trade in recent years that any of them have passed into other hands. These investigations seem to show that they are not obsolete through imperfections of 'sizing' nor from defects of wear and tear.

The above analysis is especially relevant to the following information. At the South Kensington Science Museum, Weights and Measures Section, to which we have already referred, there is a bronze measure which claims to be the original Miner's Standard for the Wapentake of Wirksworth. This is a complete surprise for Derbyshire and neither the Barmote Grand Jury, nor the Barmaster nor the Steward of the Court have hitherto been aware of any such measure. It has been equally a surprise to South Kensington to receive my correspondence on the subject and to hear that we have the original Dish in Wirksworth, which has never left its place so far as records go, and that it still hangs by a chain in the Moot Hall.

Illustrations of these two bronze measures appear opposite this page, and the South Kensington label on p. 115. For the photographs and the label I am indebted to Mr. F. A. Skinner.

Several points arrest our attention, but the great question lies in the first paragraph. We have no record of two Dishes at Wirksworth nor of any event when there was an exchange of one for another. The latter is the only possible solution, but highly improbable and it has no foundation. We must seek another explanation. The

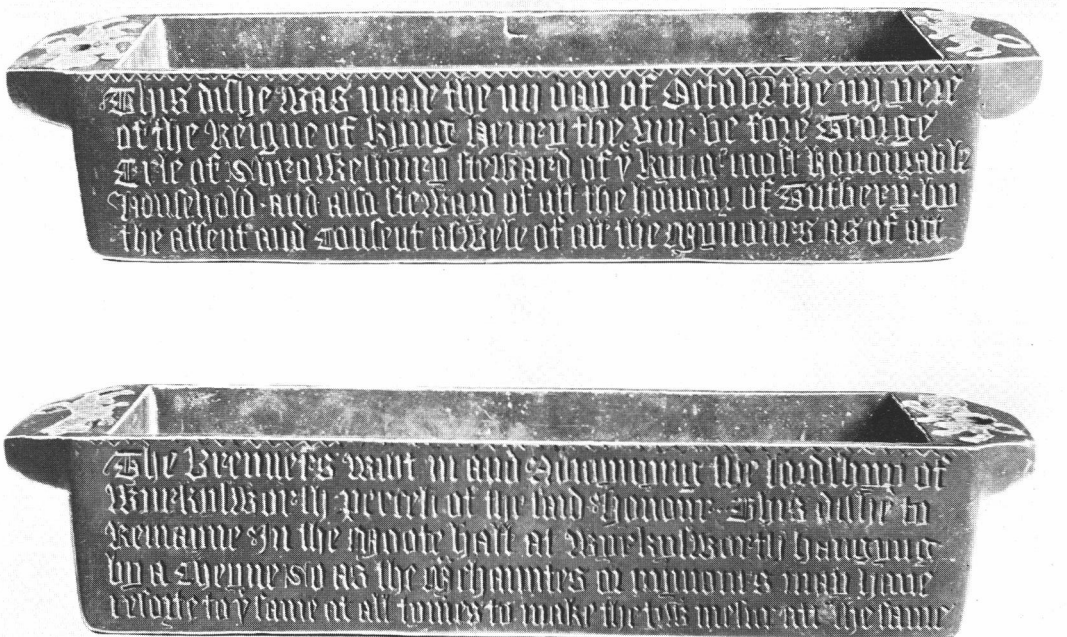

Fig. 1. The Brazen Standard in the Moot Hall in Wirksworth.

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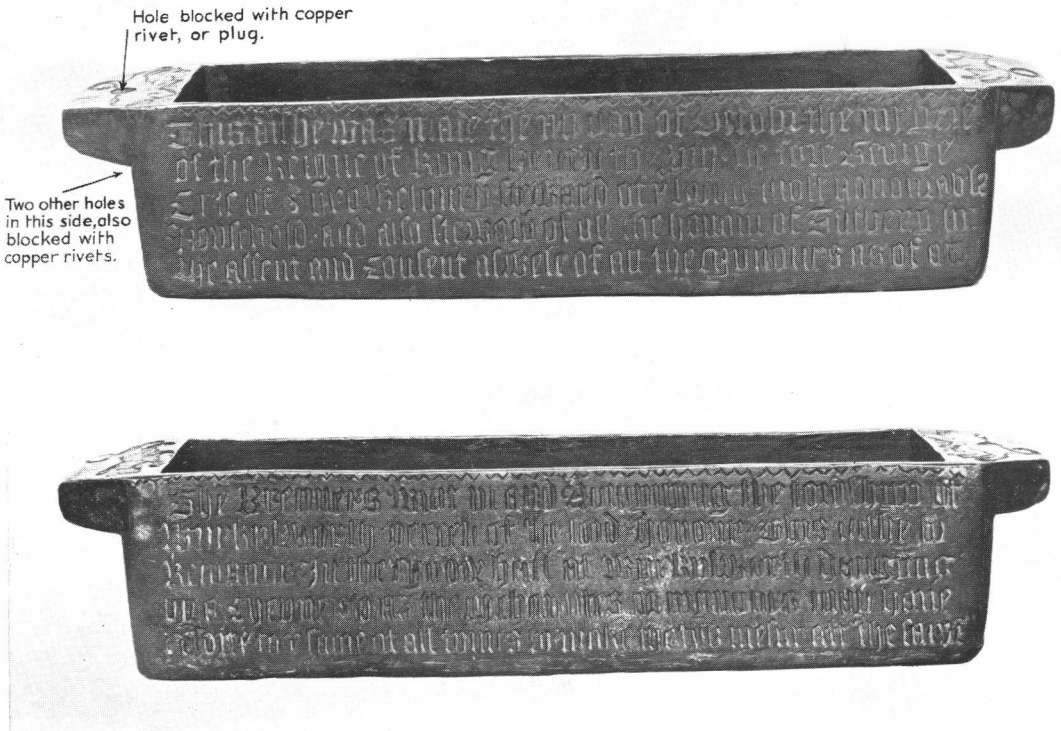

FIG. 2. Bronze vessel in the South Kensington Science Museum, Metrology Section. Note the three small holes at one end. These are now plugged with copper rivets.

By courtesy of F. G. Skinner, Esq.

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known facts about this mystery dish are few. It was transferred from the old Geological Museum in Jermyn Street in 1902 and no records seem to have been handed over with it. In general appearance it bears a complete resemblance to the Brazen Standard except in respect of three perforations near the head of the inscription, now stopped with copper rivets. We refer to these later. That this measure is not a mere copy in some inferior material seems to be established by its weight, which, I am informed, is 76 lbs., closely approximating to the Wirksworth Dish which has been recently weighed in the presence of the Steward of the Barmote Court (Capt. Symonds) and myself and found to be slightly under 79½ lbs., a short length of rope was included. The inscription, as a comparison of the two photographic illustrations will show, is the same in every detail, spacing, depth of cutting, and stylistic form. All the various dimensions sent to me, however, vary slightly from the measurements of the Moot Hall Dish, though it may be supposed that they are merely such as might occur in hand-finishing two vessels from the same mould. They are shown in the following table:—

TABLE NO. 5.

Comparative Table of the Internal Dimensions of the Moot Hall and the South Kensington Bronze Measures.

Length:	Wirksworth.	So. Kensington.
Top. Centre line	$21\frac{5}{8}$	$21\frac{1}{2}$
Top. Each side	$21\frac{1}{2}$ $21\frac{5}{8}$	$21\frac{3}{8}$ $21\frac{7}{16}$
Bottom:		
Bottom Centre line	$20\frac{7}{8}$	$20\frac{7}{8}$
Bottom Each side	$20\frac{7}{8}$ $20\frac{7}{8}$	$20\frac{13}{16}$ $20\frac{31}{32}$
Width:		
Top. Centre ..	$5\frac{3}{8}$	$5\frac{1}{16}$
Each end ..	$5\frac{1}{4}$ $5\frac{5}{16}$	$5\frac{1}{16}$ $5\frac{5}{16}$
Bottom Centre ..	$5\frac{1}{8}$	$5\frac{3}{16}$
Each end ..	$5\frac{1}{16}$ 5	$5\frac{1}{8}$ $5\frac{5}{32}$

(*Table No. 5 continued*).

Depth:	Wirksworth.				So. Kensington.			
Centre of long sides	$4\frac{1}{16}$	$4\frac{1}{4}$				$4\frac{1}{8}$	$4\frac{1}{4}$	
At four corners ..	$4\frac{5}{16}$	$4\frac{1}{16}$	$3\frac{15}{16}$	$4\frac{3}{16}$	$3\frac{15}{16}$	$4\frac{1}{4}$	$4\frac{1}{8}$	$4\frac{7}{16}$

External Measurements:—

Depth at each corner	$5\frac{3}{8}$	$5\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{7}{16}$		Uniform at		
At centres of long sides	$5\frac{7}{16}$	$5\frac{7}{16}$				$5\frac{3}{4}$		

It is not certain that the order in which the corner measurements have been taken is the same in both cases. The Wirksworth figures were taken according to the reading of the Inscription, beginning over the words "This Dish."

The bottom (external) is sunk to a depth varying from five-sixteenths to fifteen-sixteenths of an inch at Wirksworth, but I am told that the South Kensington dish is uniform at three-quarters of an inch. All the measurements at Wirksworth were taken by the Steward and myself and I have to thank Capt. Symonds for this and much other help.

The chief fact we have been able to establish in the course of the foregoing remarks is that all the information we possess concerning the Barmote Standard and the measures dependent upon it proves that somewhere about fourteen pints, slightly less, is the true measure since the year 1512 Winchester. Hence these facts challenge the genuineness of the South Kensington measure which is stated to contain (see label) 14.047 Imperial pints (487 c.i.) of which the Winchester equivalent would be over fourteen and a half pints. This puts the said vessel entirely out of court as a Wapentake measure notwithstanding the inscription engraved on it. So the mystery awaits some further solution. This, however, should be said. The table of comparison (No. 5) of the respective dimensions shows the differences to be so small that it is difficult to see how the cubical content can differ by about 20 c.i. giving nearly two-thirds of a pint more to one than to the

other. On general analysis the Wirksworth Dish is very slightly longer and wider, but these dimensions are countered by the Dish being shallower, the averages are $\frac{3}{8}$ inch longer, $\frac{7}{32}$ wider, $\frac{5}{16}$ shallower.

There are other confusing particulars on the label. The inscription is not raised, but sunk, and it may be questioned whether the ' lion rampant ' on each handle is not rather intended for the Shrewsbury Talbot. In the Wirksworth measure these figures are of lead, countersunk in the face of each lug or handle.

Confusion is often made between the two Lead-mining Acts of 1851 and 1852. The former was for the High Peak and to quote it as applying to the Wapentake (Low Peak) is surely an error. Thus when the label quotes 15 pints in relation to this exhibit we reply that 15 pints was never the standard. Strangely enough the content quoted for this measure, 14.047 fits neither standard. These differences seem to arise with H. J. Chaney " Our Weights and Measures " (see label).

There is still a further difficulty, and a serious one. The London measure has three small holes at the end where the inscription begins. They are three-quarters of an inch in diameter, one in the lug, two underneath in the body of the dish. Why three, we are at a loss to explain. The Dish at Wirksworth has one hole for the chain by which it is fastened to the wall, one and a quarter inches in diameter, big by comparison, and taking a massive chain commensurate with the weight of the vessel. It is not easy to see how holes so much smaller could be efficient for hanging purposes. But again, two holes in the body of the dish would cause leakage, and this consideration alone is enough to invalidate the vessel as a working standard. The fact that all three holes have been plugged with copper rivets seems to prove that they were made by mistake, at least, two of them, while the plugged-up hole in the handle suggests that the vessel has not been

hanging anywhere, the small hole not being wide enough to take the necessary chain. Perhaps it was made merely as a token of the real purpose.

Another difference strikes us on close examination of the two illustrations. The inscription is not placed on the sides of each dish in quite identical manner. More space is left between the last line and the bottom of the dish in one specimen than in the other. This shows that the lettering was engraved on the dish and not cast, cut in from one and the same pattern traced on. The craftsmanship is remarkable.

Now whatever these differences amount to it is obvious that the measure at the Science and Art Museum is an important object and has some definite place in Derbyshire lead-mining history. If the problem can be cleared up and it can be proved that the two bronze measures we have been discussing are just twins, duplicates, made so that one was for actual use and one for reservation in State custody, then we are in possession of new information not hitherto suspected, either in London or Derbyshire. In such case, where was the reserved standard kept before it began its wanderings to arrive where it is? We suggest as a chance shot, Tutbury Castle, once the headquarters of the de Ferrers in these parts, but afterwards a stronghold of the Duchy of Lancaster when the de Ferrers' lands had been confiscated by the crown. Most likely, when the castle was ruined by the Cromwellian forces, this dish, among other State property, was removed to London, since when its movements have become more or less of a mystery.

Quite apart from the technical and historic interest of this enquiry there is an important legal consideration. On page 98 of the *Journal* for 1937 attention was drawn to a provision in the Mining Customs Act of 1852 to the effect that if at any time the Standard Dish should be lost or destroyed another should be made to conform with the

MINERS' STANDARD DISH, 1512.

This, the miners' standard ore-measuring dish for the Wapentake of Wirksworth, Derbyshire, is one of the oldest measures of its kind still extant ; it was formerly deposited in the Moot Hall at Wirksworth.

The measure is a bronze trough, of rectangular shape, containing 14·047 Imperial pints, and is fitted with lifting handles at the ends. Cast on the two sides is a raised inscription, in old English lettering, which reads on one side :—

This dishe was made the iiii day of Octobr the iiii yere of the Reigne of Kyng Henry the VIJJ. · before George Erle of Shrowesbury steward of y' kyng most honourable Household. and also steward of all the honour of Tutbery. · by the assent and consent aswele of all the Mynours as of all

and on the other side :

The Brenners within and Adioynyng the lordship of Wyrkysworth percell of the said honour. · This dishe to Remayne in the Moote Hall at Wyrkysworth hangyng by a Cheyne So as the Mchauntes or mynours may have resorte to y' same at all tymes to make the true mesur aft the same.

On the top face of each handle is stamped a lion rampant.

A wooden trough measure of the same capacity, for everyday use, branded " G R 1770 " is also shown. Under the Derbyshire Mining Customs and Mineral Courts Act of 1851, the measure for ore is to be provided by a " barmaster," and is to contain 15 pints.

See Chaney, " *Our Weights and Measures*," 1897, pp. 136–7.

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FIG. 3.—Facsimile of label appended to the bronze vessel at South Kensington, *By courtesy of F. G. Skinner, Esq.*

capacity of the High Peak standard, which the said Act recognised as 15 pints. Supposing now that the Wirksworth Bronze Measure should ever meet with such bad fortune, and supposing that the South Kensington Measure should turn out, on further enquiry, to be a genuine duplicate made for State custody as a safeguard against loss of the Standard, could the above-mentioned provision really take effect? Might not the Steward of the Wirksworth Barmote Court be able to establish relief from the operation of the Act on the ground that the Standard was neither lost nor destroyed seeing that such a contingency had previously been fully provided against? It seems probable, indeed, that the framers of the Act knew nothing about this 'mystery dish,' otherwise they would have taken it into account.

Just another word which should have been said before. Both vessels give a slightly rhomboidal cast i.e. drawn in towards the bottom. This would facilitate removal from the mould, but another idea strikes me. Seeing that the earlier dishes were of round shape, as they still are in the High Peak, was this radical change to a long, somewhat rectangular form prompted by known specimens of Roman pigs of lead? Those familiar with the usual types in England will perhaps understand this suggestion.

In conclusion I wish to say that much of this article would not have been possible without friendly and sometimes patient help in many directions. In addition to the names quoted in the text, Capt. J. D. B. Symonds, Steward of the Barmote Court, Mr. John Mort the Barmaster and Mr. F. G. Skinner, of the Metrology Section, South Kensington, I have to thank Mr. A. W. Dix and Mr. H. R. Robinson of the Weights and Measures Office in Derby for testing the Derby dish, Mr. Waters and Mr. S. Bunting of Wirksworth for enabling the Bronze Measure to be weighed by the steelyard, and Mr. F. Williamson, Director of the Derby Museum, for interest and help in several ways.