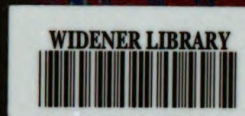

The Yard or the Metre, WHICH Will Ye Choose.

DR. WATSON F. QUINBY.

1891.

WILMINGTON, DEL.
W. COSTA, THE PRINTER,
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THE METRIC SYSTEM.

EXPRESSED IN INCHES.

MEASURES OF LENGTH.

	INCH.
Millimetre,	.03937
Centimetre,	.39371
Decimetre,	3.93710
Metre,	39.37100
Decametre,	393.71000
Hectometre,	3937.10000
Kilometre,	39371.00000
Myriametre,	393710.00000

MEASURES OF CAPACITY.

	CUB. IN.
Millilitre,	.061028
Centilitre,	.610280
Decilitre,	6.102800
Litre,	61.028000
Decalitre,	610.280000
Hectolitre,	6102.800000
Kilolitre,	61028.000000
Myrialitre,	610280.000000

MEASURES OF WEIGHT.

	GRS.
Milligramme,	.0154
Centigramme,	.1543
Decigramme,	1.5434
Gramme,	15.4340
Decagramme,	154.3402
Hectogramme,	1543.4023
Kilogramme,	15434.0234
Myriagramme,	154340.2344

FIG. I.

.000000000000000I
.00000000000000I
.0000000000000I
.000000000000I
.00000000000I
.0000000000I
.000000000I
.00000000I
.0000000I
.000000I
.00000I
.0000I
.000I
.00I
.0I
.I
I..
I0.
I00.
I000.
I0000.
I00000.
I000000.
I0000000.
I00000000.
I000000000.
I0000000000.
I00000000000.
I000000000000.
I0000000000000.
I00000000000000.
I000000000000000.

Fig. 1 is the numeration table. It has no reference to anything in particular, only number.

The dots are decimal points. All numbers on the left hand side of the decimal points are whole numbers.

All numbers on the right hand side of the decimal points are fractions.

Units, tens, hundreds, thousands, tens of thousands, hundreds of thousands; millions, tens of millions, hundreds of millions; billions, tens of billions, hundreds of billions; trillions, tens of trillions, hundreds of trillions; quadrillions.

I have stopped at quadrillions, but that is but a small portion of the numeration table.

You may go on to quintillions, sextillions, octillions, decillions, dodecillions, clean on up to centillions if you want to; more than you can count in a life time.

The decimalization of this table is perfect; its extent practically unlimited, both upward and downward, and its nomenclature has been skillfully devised.

Now, our system of weights and measures has been joined to this numeration table, and they therefore partake of all its excellencies.

You may call the unit any measure or weight, and then decimalize it, either upwards or downwards to any extent desired. An inch; tenth of an inch, hundredth of an inch, thousandth of an inch. Or a yard, or a mile; ten miles, hundred miles, thousand miles. Or a cubic inch, tenth of a cubic inch, hundredth of a cubic inch. Or an ounce, ten ounces, hundred ounces, thousand ounces.

FIG. 2.

	.001	Millimetre
	.01	Centimetre
	.1	Decimetre
	1.	Metre
Decametre	10.	
Hectometre	100.	
Kilometre	1000.	
Myriametre,	10000.	

Now Fig. 2 is the metric system; what there is of it. Deci, centi, milli and that is all; tens, hundreds, thousands, and there it stops.

If you wish to go further, you come to subfractions. Deci, centi, milli, are no better than tens, hundreds, thousands, and not as good for English ears.

And you are asked to exchange our splendid numeration table for this miserable abortion. For the Metric System is simply an abortive attempt to create a numeration table, and failed dismally. Be not deceived because it takes three tables to do what one would do.

Fig. 3 shows the Metric System applied to the inch, cubic inch and grain. Inch, deci inch, centi inch, milli inch.

FIG. 3.

.001	.001	.001
.01	.01	.01
.1	.1	.1
1. inch	1. cub. inch	1. grain
10.	10.	10.
100.	100.	100.
1000.	1000.	1000.
10000.	10000.	10000.

FIG. 4.

.001	.001	.001
.01	.01	.01
.1	.1	.1
1. metre	1. litre	1. gramme
10.	10.	10.
100.	100.	100.
1000.	1000.	1000.
10000.	10000.	10000.

Now, it is evident that one table would do for all of these.

Fig. 4 gives the metre, the litre and the gramme. It is equally plain that one table would answer for all of these.

It is a defect to attach any particular value to the numeration table; for then one table is good for the metre only; one is good

for the litre only ; and one for the gramme. But ours is good for all and every measure or weight ; for the inch, the yard or the ounce ; or for the metre, the litre or the gramme.

It is also of unlimited extent both upward and downward ; whereas the metric is only tens, hundreds, thousands.

The cubic tenth of an inch is contained in the cubic inch one thousand times.

The cubic hundredth of an inch is contained in the cubic inch one million of times.

The cubic thousandth of an inch is contained in the cubic inch one billion of times.

The cubic ten thousandth of an inch is contained in the cubic inch a trillion of times.

The cubic hundred thousandth of an inch is contained in the cubic inch a quadrillion of times. And so on you may go down to the very infinitesimals of matter, and find it all decimal, all cubic and all in entire harmony with the numeration table.

Now what has the metric system to offer for all this ? Why, nothing.

But it is claimed, that by means of the prefixes, that as soon as a number is pronounced, you know on which side of the decimal point it is. The Latin prefixes show that the number is on the right hand side of the decimal point. The Greek prefixes show that the number is on the left hand side of the decimal point.

That is true as far as it goes ; tens, hundreds, thousands. But we have no need of these prefixes. For we arrive at the same result by means of the termination of the word.

Every verb in the English language has two forms. He says, he saith ; he goes, he goeth ; he does, he doeth ; and so on.

Advantage has been taken of this in constructing our table to accomplish the same object by the suffix, as the metric system does with its prefixes. So that you know as soon as a number is pronounced, on which side of the decimal point it is.

If it ends in th, it is on the right hand side, among the fractions. Any other termination places it on the left hand side among the whole numbers.

NUMERATION TABLE.

quadrillionth	.000000000000001
hundred trillionth	.00000000000001
ten trillionth	.0000000000001
trillionth	.000000000001
hundred billionth	.00000000001
ten billionth	.0000000001
billionth	.000000001
hundred millionth	.00000001
ten millionth	.0000001
millionth	.000001
hundred thousandth	.00001
ten thousandth	.0001
thousandth	.001
hundredth	.01
tenth	.1
	1. unit
	10. tens
	100. hundreds
	1000. thousand
	10000. ten thousands
	100000. hundred thousands
	1000000. million
	10000000. ten millions
	100000000. hundred millions
	1000000000. billion
	10000000000. ten billions
	100000000000. hundred billions
	1000000000000. trillions
	10000000000000. ten trillions
	100000000000000. hundred trillions
	1000000000000000. quadrillion

Ten, tenth ; hundred, hundredth ; thousand, thousandth ; million, millionth ; so that with a single suffix, we attain the end which they might gain by any number of prefixes.

But they have only three one way and four the other ; whereas we can go up or down to an unlimited extent. But we also have prefixes. After tens, hundreds, thousands, then comes the mil, the bil, the tril, the quadril, and so on to any extent desired, up to centil if you will.

Our prefixes are the same upward and downward. So that our system is superior to the metric in this very matter, and we have no use for their prefixes.

ANOTHER FORM OF THE NUMERATION TABLE.

0
0
0
0 trillionth
0 hundred billionth
0 ten billionth
0 billionth
0 hundred millionth
0 ten millionth
0 millionth
0 hundred thousandth
0 ten thousandth
0 thousandth
0 hundredth
.1 tenth
1. unit
0 tens
0 hundreds
0 thousands
0 ten thousand
0 hundred thousand
0 million
0 ten millions
0 hundred millions
0 billion
0 ten billions
0 hundred billions
0 trillion
0 ten trillions
0 hundred trillions
0 quadrillions

THE METRIC SYSTEM.

Thousandths, - - - -	0	milli
Hundredths, - - - - -	0	centi
Tenths, - - - - -	.1	deci
	1.	unit
Tens, - - - - -	0	deka
Hundreds, - - - - -	0	hecto
Thousands, - - - -	0	kilo
Ten thousand, - - - -	0	myria

Again, the metric system claims to be the decimal system par excellence. You would naturally suppose then that its decimalization was perfect. I will show that it is not. They blundered at the very outset of their decimalization.

The decimetre, the tenth of a metre, is on the wrong side of the decimal point. The metre is so near forty inches, that to illustrate, we will call it that, as shown in Fig. 5.

FIG. 5.		FIG. 6.	
Millimetre	.04	.02	milli
Centimetre	.4	.2	centi
Decimetre	4.	2.	deci
	40. Metre	20.	scruple
	400.	200.	
	4000.	2000.	

Fig. 5 shows the decimetre on the left hand side of the decimal point among the whole numbers.

Now, the centimetre, any one would call four tenths, and four tenths it is; and the millimetre is four hundredths. Now, if you call the unit in Fig. 1 a metre, the decimetre is on the right side of the decimal point among the fractions, where it ought to be. So the decilitre is on the wrong side of the decimal point and the decigramme is on the wrong side of the decimal point; and it is a blunder that cannot be corrected.

Fig. 6 is also a good illustration of the same fact.

I have thus shown that the metric system is exceedingly limited; that it is useless to us, and that it is imperfect. One of the most singular things in this connection is, that Fig. 1 is the French numeration table, devised by their own wise and skillful mathematicians, and which we use in common with them, in preference to the English system of notation.

We will now proceed to measures of length.

The metre is composed of 39.37 inches. This sum is not evenly divisable by any whole number, which makes it exceedingly unhandy in practical work.

The inch does not belong to the metre, but they were forced to adopt it, from its great practical usefulness. They might have made a metric inch that would have harmonized with the new measure, but that would have made greater difficulty in introduc- [illegible] other countries.

Now, as an abstract number, any mathematician would say that 36 was a better number than 39.37.

The number 36 will divide evenly into halves, quarters, thirds, sixths, ninths, twelfths and eighteenths; and 24 inches into halves, thirds, quarters, sixths, eighths and twelfths; and 12 inches into halves, thirds, fourths and sixths and 6 inches into halves and thirds.

But the yard of 36 inches is not only evenly divisable by even numbers, but by all the uneven ones as well. In this way. There are 360 tenths of an inch in a yard; 324 ninths; 288 eighths; 252 sevenths; 216 sixths; 180 fifths; 144 fourths; 108 thirds; 72 halves; 396 elevenths, and 432 twelfths.

In the two-foot rule, there are 288 twelfths; 264 elevenths; 240 tenths; 216 ninths; 192 eighths; 168 sevenths; 144 sixths; 120 fifths; 96 fourths; 72 thirds, and 48 halves.

The foot rule will divide as follows: 144 twelfths; 132 elevenths of an inch; 120 tenths; 108 ninths; 96 eighths; 84 sevenths; 72 sixths; 60 fifths; 48 fourths; 36 thirds and 24 halves of an inch.

This seemed to me a wonderful series of numbers; so I set them down as follows:

½	3rds	4ths	5ths	6ths	7ths	8ths	9ths	10ths	11ths	12ths
72.	108.	144.	180.	216.	252.	288.	324.	360.	396.	432
48	72	96	120	144	168	192	216	240	264	288
24	36	48	60	72	84	96	108	120	132	144
144	216	288	360	432	504	576	648	720	792	864

And when that was done, I saw that I had before me a system of Logarithms; but differing from Napier's in that the numbers under the indices were not geometrical series, but the product of the indices with a common multiplier. In the upper line the multiplier was 36. In the next line it was 24. In the third line it was 12. In the fourth line it was the sum of all of these which is 72.

NAPIER'S.

0	1	2	3	4	5	6	7	8
1.	10.	100.	1000.	10000.	100000.	1000000.	10000000.	100000000.

THE NEW.

0	.1	1	2	3	4	5	6	7	8	9	10
0.	1.	10.	20.	30.	40.	50.	60.	70.	80.	90.	100.

LOGARITHMIC TABLE.

0	0.00000
1	0.10000
2	0.20000
3	0.30000
4	0.40000
5	0.50000
6	0.60000
7	0.70000
8	0.80000
9	0.90000
10	1.00000
11	1.10000
12	1.20000
13	1.30000
14	1.40000
15	1.50000
16	1.60000
17	1.70000
18	1.80000
19	1.90000
20	2.00000
21	2.10000

Here are the two systems compared.

In Napier's the numbers under the indices are increased by multiplying by 10 each time.

In the other the numbers are increased by adding 10 each time.

Any other number besides 10 may be used in either case.

In Napier's system, multiplication and division are accomplished.

In the other, addition and subtraction are accomplished.

A name seems to be wanting for the numbers under the indices. I propose ondices.

Then, in Napier's plan the sum of any two indices will be the indice of the product of the two ondices; and the difference of any two indices will give the indice of the quotient of their two ondices.

In the new system, the sum of any two indices will give the indice of the sum of their two ondices; and the difference of any two indices will give the indice of the difference of their two ondices.

Still another logarithmic series may be formed, and based on the relation of the cubic inch to its decimal fractions.

$$\frac{10}{1000} \qquad \frac{100}{1000000}$$

$$\frac{1000}{1000000000} \qquad \frac{10000}{1000000000000}$$

$$\frac{100000}{1000000000000000}$$

$$\frac{1000000}{1000000000000000000}$$

The multiplication of the indices gives the indice of the product of their ondices. The division of the indices gives the indice of the quotient of their ondices.

If all of the fractional divisions of the inch were marked upon any one of our rulers, the rule would contain the elements of logarithms.

You may make almost any division of the inch, as thirteenth, fourteenth, fifteenth, sixteenth, eighteenth, thirty-second, sixty-fourth, or hundreds, or thousands, and when multiplied by 36 the resulting numbers will be remarkable for their even subdivisions.

All this is very convenient for practical work.

Now, the number of inches into which the metre has been divided will not permit of any of this even and convenient subdivision. The metre consists of thirty-nine inches and three hundred and seventy-one thousandths of an inch; the decimetre is three inches and nine thousand three hundred and seventy-one ten thousandths of an inch; the centimeter is thirty-nine thousand three hundred and seventy-one hundred thousandths of an inch; and the millimetre is three thousand nine hundred and thirty-seven hundred thousandths of an inch. The litre consists of sixty-one cubic inches, and twenty-eight thousandths of a cubic inch. The gramme is equal to fifteen grains and four hundred and thirty-four thousandths of a grain.

It is evident that the inch and the metre were not made for each other. Yet is the metre expressed in inches and fractions of an inch. And the yard is also expressed in inches. Hence it follows that neither the yard nor the metre is the real unit of length, but the inch.

As to how many inches you will have in your measuring rule then, is a matter of practical convenience. Measured by that standard, the yard and its subdivisions have much the preference over the metre.

For as I have shown, the yard can be divided evenly and without remainder by all numbers. Whereas, the metre expressed in inches is not evenly divisable without fraction, by any number.

In our tables the word ounce is used to denote volume and weight.

But there is an implied lineal ounce of twelve tenths of an inch in length, which could be made useful in decimalizing our measures of length.

Ten linear ounces make one foot, twenty make two feet, thirty make one yard; one hundred ounces make ten feet and a thousand ounces make one hundred feet, and so on; and ten ounces cubed make a cubic foot. This foot can be decimalized downward and upward the same as the cubic inch. The one foot rule connects our measures of length with those of volume.

The cubic foot may be considered the standard of weight and volume; as it weighs one thousand ounces avoirdupois of water. It will weigh 62½ pounds Avoirdupois; or 60 Troy, or 60 Apothecary pounds.

Our system of mensuration is then substantially perfect. But it is claimed that the metre is commensurable with the earth; that it is definitely the one ten millionth of a quadrant of the meridian passing through Dunkerke, France.

Meridian circles are great circles around the earth, passing through both poles. A quadrant of a meridian then extends from the pole to the equator.

Now, the French never measured a quadrant of the meridian. They have never been to the North pole; if they did, they could not measure across the ocean. No; they measured an arc of a meridian extending from Dunkerke to Barcelona, and the rest is too much guess work.

More recent measurements tend to invalidate the accuracy of the French measure; and Sir John Hershel asserts that the English yard is more nearly an aliquot part of the earth's axis, than the metre is of the quadrant of the meridian; and it is therefore more nearly earth commensurable. Besides, there is but one axis, which is also a straight line passing through the earth from pole to pole; whereas, there are thousands of meridian lines, all of unknown curve, and no two could measure alike.

We now come to measures of volume and of weight.

The unit of volume is defined to be "a small cube whose dimensions are known." The unit must be a cube. The unit

of volume for what are called English weights and measures, is the cubic tenth of an inch. It is not so set down in the books, but it is the fact, nevertheless.

It might be called the central unit, for you can go from it both upward and downward to an unlimited extent.

The cubic tenth of an inch is contained in the cubic inch one thousand times. The cubic hundredth of an inch, one million times. The cubic thousandth of an inch, a billion of times; the cubic ten thousandth of an inch, a trillion of times; the cubic hundred thousandth of an inch, a quadrillion of times, and the cubic millionth of an inch is contained in the cubic inch a quintillion of times; and so on you may go down to the very atoms of matter, and find it all decimal, all cubic and all in strict conformity to the numeration table.

In these days, when more and more account is taken of small things, this part of the English tables might prove of considerable utility, especially among chemists.

A cubic inch contains 1000 units.

Tenths	1000 units	$.1^3$
	1000	
Hundredths	1000000 Monas	$.01^3$
	1000	
Thousandths	1000000000 Minas	$.001^3$
	1000	
Ten Thousandths	1000000000000 Motes	$.0001^3$
	1000	
Hundred Thousandths	1000000000000000 Mites	$.00001^3$
	1000	
Millionths	1000000000000000000 Atoms	$.000001^3$

The cubic tenth of an inch which I will henceforth call the unit, is the one thousandth part of a cubic inch. It is therefore expressed as .001. The grain consists of four of these units of water, and so is expressed as .004. That is not so set down in the books either.

The modern avoirdupois grain is .00396 plus of a cubic inch. But that is evidently out of order in a cubic system. How much

is it out of order? It is out of order by the 4000000th of a cubic inch.

$$\begin{array}{r} .00396 \\ .00004 \\ \hline .004 \end{array}$$

That is a very small matter; yet it is like the sharp point of a railroad switch, which can turn yon rushing train off the main track and side track it.

FIG. 7.

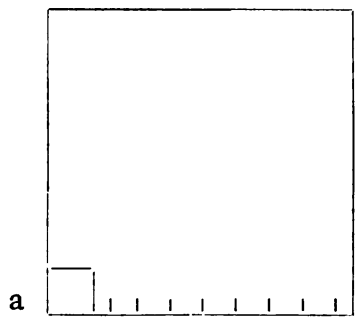


Fig. 7 represents a cubic inch, with its base divided into tenths; a is the unit of volume.

There are 250 of these .004 grains in a cubic inch of water.

The tables give 252½ grains in a cubic inch, but that is because the grains have become too small in the wear and tear of the centuries.

Here is a grain reduced to atoms.

Gr.
1
4
4 units
1000
4000 Monas
1000
4000000 Minas
1000
4000000000 Motes
1000
4000000000000 Mites
1000
4000000000000000 Atoms

The thousandth part of a grain is 4 monas. The millionth of a grain is 4 minas. The billionth of a grain is 4 motes. The trillionth of a grain is 4 mites; and the quadrillionth of a grain is 4 atoms.

Cubic in.
61.028 Litre
1000
61028.000 units of volume
1000
61028000 Monas
1000
61028000000 Minas
1000
61028000000000 Motes
1000
61028000000000000 Mites

The thousandth part of a litre is 61 units and 28 monas. The millionth of a litre is 61 monas and 28 minas. The billionth of a litre is 61 minas and 28 motes, and so on. Or, the thousandth part of a litre may be expressed as 61028 monas. The millionth of a litre then is 61028 minas, and so on.

The litre itself 61028 units. So the thousandth part of a millilitre is 61028 minas.

I cannot do anything with the gramme without correcting the grain. The litre is=61028 units. The gramme is one thousandth part of this 61.028 units=15.257 grains.

Gramme.

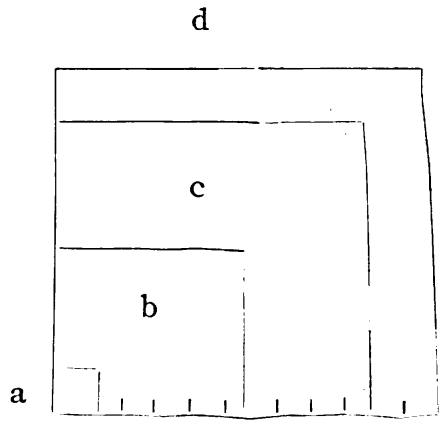
15.257 grs. of .004 cub. in.
4
61.028 units
1000
61028.000 Monas
1000
61028000 Minas
1000
61028000000 Motes

The thousandth part of a gramme is 61028 minas. The millionth of a gramme is 61028 motes, and so on. So this grain of 4 units makes the litre harmonize with the gramme.

There are none of our measures of volume that are evenly commensurable with the cubic inch, except the cubic foot; and that is not in use as a measure. Nor is the litre any better off, there being a long string of decimals.

But when it comes to measures of volume, our system drops the cubic inch and takes the cubic ounce.

FIG. 8.



In Fig. 8 d represents the cubic ounce, c the cubic inch, b the cubic drachm, and a the unit of volume. The base of the figure is divided into tenths of an inch. The unit of volume is one tenth cubed; the drachm is six tenths cubed; the inch is ten tenths cubed; the ounce is twelve tenths cubed.

The grain contains 4 units; the drachm 216 units; the inch 1000 units, and the ounce 1728 units. The drachm contains 54 grains; the inch 250 grains, and the ounce 432 grains. This is the avoirdupois or cubic system I am on now. It is entirely cubic throughout.

The modern ounce is 437½ grains, which is 5½ grains too much, which is owing to the grain having become too small.

The ounce of 432 grains is the old commercial ounce, which has descended from the Greeks to the Romans, and from the Romans to us.

The cubic foot contains 1728 cubic inches and 1000 of these ounces.

As to the ounce, the cubic foot is decimal; as to the inch it is duodecimal.

This ounce is an exact epitome of the cubic foot; the tenth of an inch is one corresponding to the inch of the other.

Or Fig. 7 may represent the cubic foot, and a the cubic ounce.

As a standard of volume, the cubic foot is unique.

It contains 1728000 units; 432000 grains; 8000 drachms; 1728 cubic inches and 1000 ounces.

The avoirdupois ounce contains 1.728 cubic inches. It is usually set down as 1.732 cub. in., but that is one grain too much and requires an ounce of 433 grains.

This last ounce agrees with one old system of weights and measures, but they were not cubic.

The avoirdupois measures are as follows:

4	ounces	=	one gill.
8	"	=	" half pint.
16	"	=	" pint.
32	"	=	" quart.
64	"	=	" half gallon.
128	"	=	" gallon.
256	"	=	" peck.
512	"	=	" half bushel.
1024	"	=	" bushel.

There are no fractions or decimals here.

The gill is half a cube.

The half pint is a perfect cube.

The pint is a double cube.

The quart is half a cube.

The half gallon is a cube.

The gallon is a double cube.

The peck is half a cube.

The half bushel is a cube.

The bushel is a double cube.

Even the grain is half a cube.

The avoirdupois is a system of one weight and two measures.

There is a liquid measure and a dry measure, which are to each other in volume as 4 is to 5.

This difference is founded on the nature of the substances to be measured; as for instance, water and wheat.

Sixteen ounces make a pint, and 16 ounces make a pound. "A pint of water (then) is a pound of water."

If a pound of water is=27,648 cubic in., a pound of wheat is=34.56 cubic in. This implies that as there is a wet grain of .004 cubic in., there is a dry grain of .005 cubic in. A wet pint contains as many wet grains as the dry pint does of dry grains.

		Dry Cub. in.	Wet Cub. in.	Grs.
One gill	=	8.64	6.912	1728
" pint	=	34.56	27.648	6912
" quart	=	69.12	55.296	13824
" gallon	=	276.48	221.184	55296

The same is true of the ounces; but the dry ounce is =2.16 cubic in.

A gallon weighs 8 pounds.

A dry gallon will hold 10 liquid pints=to 10 pounds of water; and a bushel will hold 10 liquid gallons=80 lbs. of water.

A bushel of wheat will weigh 64 lbs.

A cubic inch contains 200 dry grains.

A wet grain is=4 units; a dry grain is=5 units.

TABLE AVOIRDUPOIS.

Po.	Ou.	Drams.	Grs.	Units.
1	16	128	6912	27648
	1	8	432	1728
		1	54	216
			1	4

But we have in use amongst us another system of weights and measures in which the volume is constant and the weights vary.

This is the Troy and Apothecary system:

TROY WEIGHT.

Po.	Ou.	Dr.	Scrup.	Grs.	Cub. in.	Units.
1	12	96	288	5760	28.8	28800
	1	8	24	480	2.4	2400
		1	3	60	.3	300
			1	20	.1	100
				1	.005	5

APOTHECARIES MEASURE.

Gal.	Pts.	Fl. Ou.	Fl. Dr.	Min.	Cub. in.	Units.
1	8	128	1280	57600	230.4	230400
	1	16	160	7200	28.8	28800
		1	10	450	1.8	1800
			1	45	.18	180
				1	.004	4

Now what is the measure of volume which is common to these two tables?

From the small number of grains in the Troy pound it is evidently a dry pound.

5760 x .005=28.8 cubic inches.

The Apothecaries pound is properly 7200 grains.

7200 x .004=28.8

So 28.8 cubic in. is the size of the common measure.

But that is the Apothecaries pint, and is so found in the tables to-day. It is also a pound; so "a pint's a pound the world around."

That is it will hold a pound Troy of wheat, and an Apothecaries pound of water.

There are twelve ounces in a Troy pound, 28.8 divided by 12=2.4 cubic inches, which is the size of the Troy ounce.

There are sixteen ounces in the Apothecary pound—28.8 divided by 16=1.8 cubic inches; and that is the size of the Apothecary ounce to-day.

How many grains are in the Troy ounce?

In two cubic inches there are 400 dry grains; in four tenths of an inch there are 80 grs. So there are 480 grs. in the Troy ounce.

How many grains are in the Apothecaries ounce?

In one cubic inch there are 250 wet grains; in eight tenths of an inch there are 200 grs. So there are 450 grs. in the Apothecaries ounce; not 455½ grains as set down in the modern tables.

Like the modern Avoirdupois ounce, that is five and a half grains to much, and for the same reason, the grain has become too small. These results go to show that the grains of .004 and .005 cubic inches are correct.

The cubic foot will contain 720 Troy ounces, and 960 Apothecary ounces.

It will contain 60 lbs. Troy of wheat, or 60 Apothecary pounds of water, and 60 pints and 30 quarts.

The Avoirdupois or cubic system, has come down from unknown antiquity. But where does the Troy system come from?

Maybe we can find out.

Near the centre of the Great Pyramid of Egypt is a large, elegant room, lined with polished red stone.

In that chamber is a monolithic stone box made of the same polished red granite.

Many persons have measured that stone box with a view of ascertaining its cubical contents, but no two of them have agreed exactly in their measurements. They vary from the 71118 cubic in. of Prof. Greaves to the 72000 cubic in. of Sir Flinders Petrie.

Now how would a skilled mechanic proceed if requested to measure the inside of a rectangular box.

Would he measure around the top and down the side? or would he measure around the top and around the bottom and down both sides, and average them?

He would do nothing of the kind.

He would measure half way down the middle of the length, half way down the middle of the breadth, and down the middle of the chest at the centre, and then he would tell you at once the contents of the box.

Knowing this, long before Sir Flinders Petrie went to Egypt, I had arrived at the same conclusion that he did, and had published it from Prof. Piazzi Smyth's middle measures.

Here they are—$\overset{\text{in.}}{78.08} \times \overset{\text{in.}}{34.41} \times \overset{\text{in.}}{26.80} = 72004$ cubic inches.

Now any mathematician knows that if that box was intended for a standard of volume, that those four inches are a slight plus. And as Prof. Smyth went out to prove that the box was so intended, and as Sir Flinders Petrie went out to prove that it wasn't, when two such men substantially agree we must conclude that they are about right.

Now what is the result of that measure of 72000 cubic in.? Why, it is that the Apothecaries pint is contained just 2500 times in that stone box. That is, that as that pint will hold one pound Troy of wheat and one pound Apothecary of water, that that stone box will hold 2500 pounds Troy of wheat, and 2500 pounds Apothecary of water.

So there's where you get the Troy weight from, and from whoever put it there. I might add that the box will contain 40000 Apothecary ounces and 30000 Troy ounces and 72000000 units of volume.

You have here two very perfect systems of weight and measure, the Avoirdupois and the Troy, one with a constant weight and different measures, and the other of one measure and

varying weights; which will ye choose? This difficulty confronts all systems of weight and measure. The litre is one measure and different weights, but it is confronted with this same problem of one weight and various measures.

We get around this difficulty, if it is one, by adopting them both; and as each has some advantages of its own, and as each is applied practically to different purposes, they mutually supplement each other.

As the unit of volume is the same in both, and the grains the same and the inch the same, and as 5 pounds Avoirdupois are equal to 6 pounds Troy, they can readily be converted one into the other.

I have thus shown that our systems of weight and measure are substantially perfect, and that the Metric system is exceedingly limited; that its decimalization is imperfect and that to us it is useless. I so submit the case.

The yard or the metre, which will ye choose?