

OUR WEIGHTS AND MEASURES.



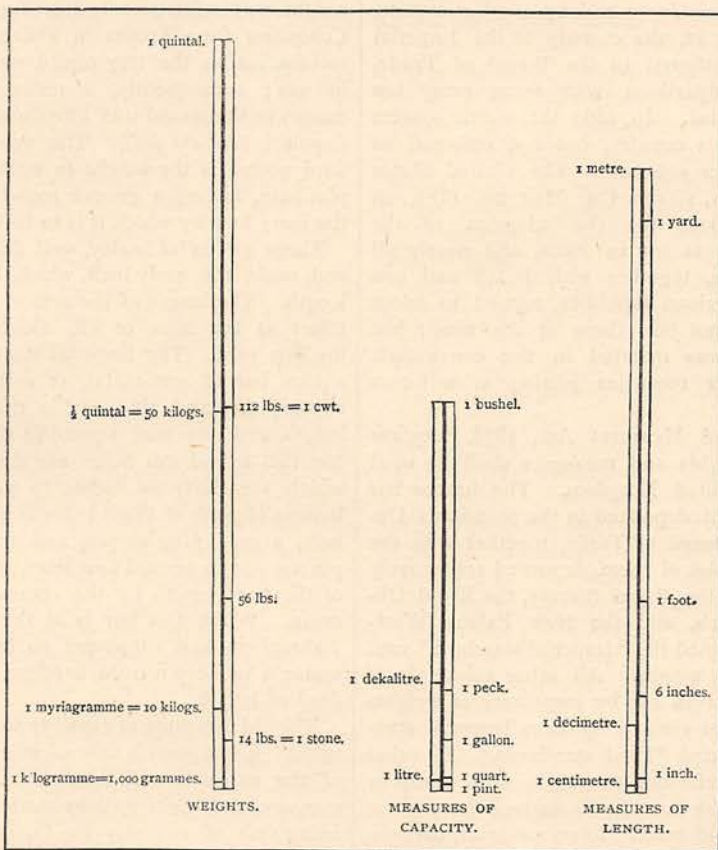
THE Weights and Measures Act, 1878, which came into force on the 1st of January, 1879, has again directed attention to the question of our weights and measures. In that Act it is set forth that a contract or dealing shall not be invalid or open to objection on the ground that

the weights or measures expressed or referred to therein

are weights or measures of what is known as the "metric system," or on the ground that decimal subdivisions of Imperial weights and measures, whether metric or otherwise, are used in such contract or dealing. A table is also appended to the Act, giving the authorised equivalents of the Imperial weights and measures in the metric system, for use in computing. These clauses caused some alarm among corn-factors and other merchants, who apprehended the introduction of the metric system and consequent confusion in their

turn values in the old units into their equivalents in the new; errors and litigation would ensue. They hold that the education of the masses is not sufficiently advanced for the use of the metric system, since a knowledge of decimal arithmetic is necessary to the working of the system. Some advocate the introduction of a system in which the number 12, not 10, would be the base, because 12 contains more sub-multiples than 10, being divisible by 2, 3, 4, and 6, while 10 is only divisible by 2 and 5.

The advocates of the metric system maintain that extra clerking would only be required to begin with, and that the saving of time by the use of the metric system would soon vastly over-balance the additional expense at first incurred. They point out that the time wasted in transforming values from one unit to another in the present clumsy system by means of arbitrary coefficients would be saved by the use of the metric units, in which no such coefficients are necessary. They also cite the fact that the metric system has been adopted in every European



PICTURE-CHART OF THE OLD AND NEW WEIGHTS AND MEASURES.

trading. The corn-factors held a meeting, and voted the "cental" of 100 Imperial pounds as the best standard of weight for the country. A deputation from Hull also recommended to the Board of Trade a system in preference to the metric, consisting of a cental or hundredweight of 100 pounds and a new ton of 2,000 pounds. It was then given out that the new Act is not intended to further the introduction of the metric system or to disturb the order now in vogue.

The opponents of the introduction of the metric system base their arguments chiefly on the confusion and inconvenience which would result from the change. Extra clerks would have to be employed to

country except Norway and England; and they state that the adherence of England to her old system of weights and measures places many of her manufacturers at a disadvantage with respect to the rest of Europe, since a Continental buyer, everything else being equal, will prefer a piece of machinery made to his own standards. Nearly all scientific measurements are now made on the metric system, in England as well as abroad, and almost all scientific men and educated engineers are in favour of its universal adoption.

The weights and measures of the United Kingdom have been regulated by statute since 1824, when

uniformity of the standards was enforced by a statute, 5 Geo. IV., c. 74; a standard yard, pound weight, and gallon being deposited in custody of the Clerk of the House of Commons. This statute was altered by a subsequent statute of 5 and 6 Will. IV., c. 63, and inspectors, having power to examine and stamp weights and measures in use, were authorised to be appointed by justices of the peace. It was enacted that any contract, bargain, or sale made by any weight or measure unauthorised by the Act should be void, and that any such weight or measure might be seized by the inspector and forfeited, one or two exceptions being made. By an Act, 22 and 23 Vict., c. 56, inspectors were given power to inspect weights and measures of street vendors; and by another statute, 29 and 30 Vict., c. 82, the custody of the Imperial standards was transferred to the Board of Trade, and periodical comparisons with these every ten years were authorised. In 1864 the metric system was *legalised* in this country, but not enforced as it had been in other countries. The United States also legalised it in 1866. On May 20, 1875, an international congress for the adoption of the French metric system sat in Paris, and nearly all European countries, together with Brazil and one or two South American republics, agreed to adopt it. England did not join these at the time; but a special clause was inserted in the convention, providing for other countries joining at a future time.

The Weights and Measures Act, 1878, requires that the same weights and measures shall be used throughout the United Kingdom. The bronze bar and platinum weight deposited in the Standards Department of the Board of Trade, together with the four authorised copies of them, deposited respectively at the Royal Mint, the Royal Society, the Royal Observatory, Greenwich, and the New Palace, Westminster, are constituted the "Imperial standard" yard length, and pound weight. All other standards of measure and weight in use by inspectors of weights and measures, when verified by these Imperial standards, are constituted "local standards." All other measures having reference to length, superficies, or weight and capacity are to be derived from these according to the old rules. Every contract, bargain, sale, or dealing, and all tolls and duties, are to be effected in terms of the Imperial measures and weights; but, as cited above, a contract or dealing in decimal subdivisions of the Imperial standards or in the standards of the metric system shall not be invalid or open to objection. Every weight or measure, except where its small size renders it impracticable, is to be legibly stamped by an inspector with its denomination on the top or side. Every person who uses, or has in his possession for use, for trade, any measure or weight unstamped as required shall be liable to a fine not exceeding £5, or in the case of a second offence, £10, and shall be liable to forfeit the said weight or measure, and any contract or dealing made by it shall be void. Similarly, a person using lead or pewter weights

uncased shall be liable to a fine of £5, or in case of a second offence, £10.

The Weights and Measures Act of 1878 also empowers the Board of Trade to undertake all duties connected with the subject, such as the custody and periodical verification of the standards, the verification of local standards, inspection of weights and measures in use, whether metrical or Imperial.

The germ of English measures is the grain of corn. Thirty-two grains of dry wheat, gathered from the middle of the ear, weighed what was called a pennyweight, twenty pennyweights equalled one ounce, and twenty ounces equalled one pound. The pennyweight was afterwards divided into twenty-four grains. Troy weight was subsequently introduced by William the Conqueror from Troyes in France; but it gave dissatisfaction, as the troy pound was lighter than that in use; consequently, a mean weight of sixteen ounces to the pound was introduced and called *avoir-du-pois* (*avoir du poids*). The present Imperial standard pound is the weight *in vacuo* of a cylinder of platinum, having a groove round it for insertion of the ivory fork by which it is to be lifted.

Three grains of barley, well dried and set end to end, made the early inch, which became the unit of length. The length of the arm of King Henry I. was taken as the *ulna* or ell, which answered to the modern yard. The Imperial standard yard is a solid square bar of gun-metal, of certain proportions of copper, tin, and zinc. It is thirty-eight inches in length and one inch square in thickness. Into this bar two cylindrical holes are drilled, the centres of which are thirty-six inches (a yard) apart. At the bottom of each of these holes is inserted, in a smaller hole, a gold plug or pin, and across the top of this pin are drawn several fine lines, which mark the ends of the yard length by the central point where they cross. When this bar is at the temperature of 62° Fahrenheit, and supported on bronze rollers, placed under it to keep it from bending, it is the legal standard of length.

The old measures of capacity were based on the troy table. Eight pounds troy of wheat, from the middle of the ear and well dried, made a gallon of wine measure, and eight gallons made a bushel. The existing unit of capacity for liquids and dry goods is the Imperial gallon, containing ten Imperial standard pounds of distilled water, weighed in air against brass weights, with the water and the air at the temperature of 62° Fahrenheit and the barometer at 30 inches. Its exact volume is said to be 277.123 cubic inches.

The germ of the French metric system is the metre length, which is, at least very approximately, equivalent to one-ten-millionth of a quadrant of the terrestrial meridian through the Observatory of Paris—that is, one-ten-millionth of the arc from the equator to the pole. The legal length is taken as 39.3708 inches, and two platinum standards are lodged in the Palais des Archives, at Paris.

The standard kilogramme (1,000 grammes) is the weight of a cubic decimetre ($\frac{1}{10}$ metre) of distilled

water at 4° Centigrade, or 39·1° Fahrenheit, when it is at its maximum density. It is equivalent to 2 lbs. 3 oz. 4·383 drams, or 15,432·34874 grains. A platinum kilogramme is also kept in the Palais des Archives, at Paris.

The metric unit of capacity is the litre, which is defined as the volume of a cubic decimetre. It is equivalent to 0·22009 of an Imperial gallon, or 1·76077 pints. No standard litre is kept at Paris.

Authorised copies of the metric standards, including multiples of the metre, kilogramme, and litre, are in the custody of our own Board of Trade.

The following authorised tables give the correct equivalents of the chief Imperial and metric denominations :-

MEASURES OF LENGTH.

Metric Denominations and Values.		Equivalents in Imperial Denominations.				
—	Metres.	Miles.	Yards.	Foots.	Inches.	Decimals.
Myriametre	10,000	6	376	0	11'9	
Kilometre	1,000		or 10,936	0	11'9	
Hectometre	100		1,093	1	10'79	
Dekametre	10		109	1	1'079	
Metre	1		10	2	9'7079	
Decimetre	$\frac{1}{10}$		1	0	3'3708	
Centimetre	$\frac{1}{100}$				3'9371	
Millimetre	$\frac{1}{1000}$				0'3937	
					0'0394	

WEIGHTS.

Metric Denominations and Values.		Equivalents in Imperial Denominations.					
—	Grammes.	Cwt.s.	Stones.	Pounds.	Ounces.	Drams.	Decimals.
Millier	1,000,000	19	5	6	9	15'04	
Quintal	100,000	1	7	10	7	6'304	
Myriagramme	10,000		1	8	0	11'8304	
Kilogramme	1,000			2	3	4'3830	} (or 15432·3487 grains)
Hectogramme	100				3	8'4383	
Dekagramme	10					5'6438	
Gramme	1					0'56438	
Decigramme	$\frac{1}{10}$					0'056438	
Centigramme	$\frac{1}{100}$					0'0056438	
Milligramme	$\frac{1}{1000}$					0'00056438	

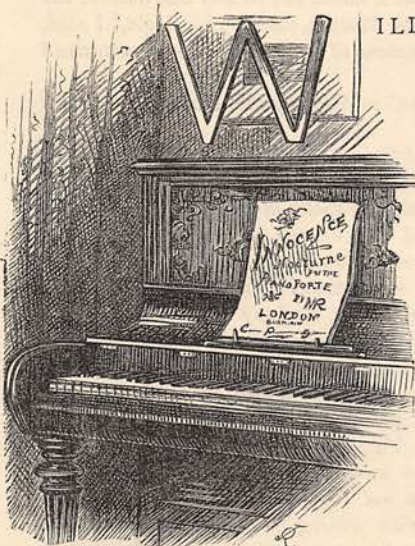
MEASURES OF CAPACITY.

Metric Denominations and Values.		Equivalents in Imperial Denominations.						
—	Cubic Metres.	Quartlers.	Bushels.	Pecks.	Gallons.	Quarts.	Pints.	Decimals.
Kilolitre, i.e. 1,000 Litres	1	3	3	2	0	0	0	0'77
Hectolitre, i.e. 100 Litres	$\frac{1}{10}$		2	3	0	0	0	0'077
Dekalitre, i.e. 10 Litres	$\frac{1}{100}$			1	0	0	0	1'6077
Litre	$\frac{1}{1000}$							1'76077
Decilitre, i.e. $\frac{1}{10}$ Litre	$\frac{1}{10000}$							0'176077
Centilitre, i.e. $\frac{1}{100}$ Litre	$\frac{1}{100000}$							0'0176077

J. MUNRO, C.E.



WHO TOOK IT?



WILL you take charge of £20 till tomorrow morning, Marian?"

"Take charge of £20, Harold!" echoed my wife in amazement. "What do you mean?"

I settled myself down to an explanation. Explanations are things I hate, nevertheless they are necessary sometimes. One was due on this occasion.

"You know, my dear Marian," I began with a business-like air, "that the failure of Hardinge Brothers threw scores

of men, women, and children in this neighbourhood out of work, in the very hardest part of a very bad year. This evening a meeting was held with a view to enlisting the sympathy of the public. A subscription list was got up, and a collection made there and then to the tune of £20. As nothing else could be done with the money to-night, I was, as treasurer, obliged to bring it home; and very nervous I felt, I can assure you, at coming along these lonely roads with such a sum. However, I have reached home safely in spite of my fears, and now I shall deliver it over to you until I can get rid of it."

"And so free your mind from all responsibility," added my wife with a smile. She knows that one of my chief weaknesses is a dread of responsibility.

"As far as possible," I replied.

We immediately went into a consultation as to where the money should be put. I suggested the meat-safe, as a place to which thieves would never dream of going for money, but my wife pooh-poohed the idea, as well as several other suggestions of mine, which I thought were not so bad. At last an idea struck her in the shape of the wine-drawer,