## AMERICAN CITIZEN

"Let us have Faith that Right makes Might; and in that Faith let us, to the end, dare to do our duty as we understand it"--A. LINCOLN

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## The Metric System of Weights and Measures.

Official

LAWS OF THE UNITED STATES—Passed at the First Session of the Thirty-Ninth Congress.

[Public-No. 183.]

[Public—No. 183]

An Act to authorize the use of the Metrice System of Weights and Measures.

Be it enacted by the Senate and House of Representatives of the United States of Hourica in Congress assembled, That from and after the passage of this act it shall be lawful throughout the Inited States of America to employ the Weights and measures now in use in the United States of America to employ the Weights and measures expressed therein in terms of the metric system; and ho contract or dealing, or pleading in any court, shall be deemed invalid or liable weights and measures the weights and measures the weights and measures the weights and measures the weights and measures the

to objection, because the weights or meas ures expressed or referred to therein are weights or measures of the Metric Sys-

tem.

Section 2. And be it further enacted,
That the tables in the schedule hereto

Metric decominations and	values	Equivalents in denominations in use.
Alyriameter Klhom ter Livetometer Livetometer Livetometer Livetometer Livetometer Livetometer Livetometer Loentimeter Limiter Limiter Limiter Limiter Livetometer Limiter Livetometer Limiter Livetometer Livetome	100 metre 10 metre 1 metr 1-10 of a metr 1-100 of a metr	8. 0 62137 mHes, or 3290 feet and ten inches.  328 feet and ten inch, 3237 inches.  3337 inches.  0.3337 inches.  0.3337 inches.

		MEASURES (	OF CAPACITY.	
METRIC DENOMINATIONS AND VALUES.			EQUIVALENTS IN DENOMINATIONS IN USE.	
Namow.	Number of	Cubic Measure.	Dry measure.	Liquid *r wine measure.
Kiloliter, or stere Hectoriter. Dekaliter Liter Decaliter Centriter Milliner	100 10 1-10 1-100	1-lo of a cubic meter 10 cubic decimeters 1 cubic decimeter 1-l0 of a cubic decimeter 10 cubic centimeters	1.308 cubic yards	264 17 gallons, 26.417 gallons, 2 6417 gallons, 1 0567 quarts, 0.845 gills, 0.438 fluid ounces, 0*27 fluid drams.

	NATIONS IN USE.		
Names.	Number of grams.	Weights of what quantity of water at maximum density.	A veird pois weight.
Miller or Tonneau guntal dyragram kriogram or kilo lectogram lectogram dyragram dyragram lectigram lectigram lectigram desigram desigram desigram	100,000 10,000 1,000 1,000 100 10 10 1-10 1-	cubic moter.	220.46 pdim.15, 22.46 pounds, 22.046 pounds, 3.527 ounces, 0.3527 ounces, 15.452 grains, 1.4452 grains, 0.1545 grains,

other time I might be induced to go words: into this question at some length; but and founded on the case rule of decimal proportions now, in these letter days of a weary session, and founded on the early rule of decimal proportions self-control to the control to the control to the control to the control to the pull is and control to work will be a just this to the pull is greatured." must be briel. And yet I could not par- Out of this recommendation originais now proposed

idea of one system of weights and meas other. After reviewing all that bad apures, which shall be common to all the peared in the past, and subjecting it all be overcome. Kindred to this is that only n experiment: other idea of one system of money.—
And both of these ideas are, perhaps the forerunners of that grander idea of one did not grander idea of one did not grander idea. language for all the civilized world,fillment of this aspiration at some disfallment of this aspiration at some dis-tant day; but a common system of money is already within the sphere of actual therisbution. The work has already be-therisbution. The work has already begun, and it cannot cease until this great looking to a system which shall be comobject i accomplished.

measures. I confess that I have pleasure in calling attention to the historic fact that at a very confess that I have pleasure in calling attention to the historic fact that, at a very early day, this important Pefore proceeding to explain the pro subject was commended to Congress - posed system, consider for one moment used the word "uniformity," in connec. times past. tion with this subject. "Uniformity," Language is, of course, coeval with ard "invarable and universal."

while Secretary of State, made an elab. tions.

SPEECH OF HON. CHAS. SUMNER ject was revived at different times in Con IN THE UNITED STATES SENATE, JULY gress without definite result. President 27th, 1866. Madien, in his annual message of 1816, MR. SUMNER,-Mr. President, At a1. called attention to it in the following

don myself if I did not undertake, even ted that call of the Segate which drew at this time, to present a plain and sim- forth the masterly report of John Quin ale account of the great change which cy Adams on the whole subject of weights and measures, where learning, philosophy, now proposed

There is semething captivating in the and prophetic aspiration vie with each civilized world; so that, at least in this to a careful examination, he says of the particular, the confusion of Babel may metric system of Fran e, which was then the county. Latterly in the United

This was in 1821, when the metric Philosophy does not despair of the ful-system, already fovented; wa still strug-

object i accomplished.

If the United States seem to come tardily into the circle or nations recognizing a common system of weights and

Washington in his message to the First the necessity of a change, as illustrated Congress touched the key note when he by a glimpse at weights and measures in

he said, "in the currency, weights and man as a social being. Weights and sight simple and complete. It is unques ured with the most scientific care. Some measures of the United States is an ob- measures are hardly less early in their ject of great importance and will, I am origin. They are essential to the operapersuaded, be attended to." Then again tions of society, and are naturally comin 'is message to the next Congress he mon to all who belong to the same socia went further in expressing a desire for a circle At the beginning each people standard at once invariable and univer- had a system of its own; but as nations (sql." In these words, he foreshadowed gradually intermingle and distant places a system that should be common to the are brought together by the attractions civil zed world. It is for us now to reco of commerce, the system of one nation ognize the standard which he thus sen, becomes inadequate to the necessities of tentiously described. All hail to a stand- the composite body. A common system becomes important, just in proportion to . I shall not occupy your time inadevel. the community of interests among diffoping the history of these efforts on the erent nations. Next to diversity of lanpart of our Government. But I cannot guages, the discordant systems of weights forbear mentioning that Mr. Jefferson, and measures attest the insulation of na-

orate report, in which he proposed to re- The earliest measures were naturally duce "every branch to the same decimal derived from the several parts of the hu ratio already established in coins, and man body. Such was the cubit, which we seem to see always those early days representing this length with all possible confesion! A boy at school can master thus bring calculation of the principal was the distance between the elbow and "wild in woods the noble savage ran," accuracy. This bar was deposited in the affairs of life within the arithmetic of the end of the middle flager, being about and fo his arithmetic used his fingers or archives of France as the perpetual every man who can multiply and divide twenty two inches. Such also, were the his toes. An octaval system, founded on standard. Other bars have been plain numbers." Here is an essential foot, the hand, the span, the nail, and the number eight, would have been bet from it and distributed throughout France element in that common system which the thumb, These measures were de- cor adapted to the divisions of material and in foreign countries. we seek to establish. This was in 1790, rived from nature, and they were to be things. Among us the decimal system while France was just beginning those found wherever a Luman being existed. is adopted for money; but you all know the idea of this measurement of the earth mystery of compound arithmetic is es. has added her name to this list. The efforts which ended at last in the estab- But they partook of the uncertainty in that we are not able to carry it into rig. in order to find a measure for daily life. sential in the calculations which they re- first step is taken there by making the

the conscience of the chanceller, to a measure which was determined by the length of the chancellor's foot, he exposed not only the uncertainty of equity but also the uncertainty of such a meas

Even in Greece, where art prevailed in the most beautiful forms, the famous stadium was none the less uncertain .-It was the distance that Hercules could run without taking breath, which, divided by 600, gave the Grecian foot.

Our own standards, derived from England, are of an equally fanciful charac ter. The unit of length is the barley corn, taken from the middle of the ear straight line make an inch. The unit of weight is a grain of wheat taken, like the barleycorn, from the middle of the car and well dried. Of these, thirty-two are equal to a pennyweight. Twenty pennyweights make an ounce, and twelve ounces make a pound. The unit of capacity is derived from the weight of grains of wheat. Eight pounds of these make one gallon of wine measure.

Nor is the extreme vagueness and instability of these standards the only matdram four quarts to a gallon, five quars errors creeping into the weights and meassixteen ounces to a pound, twenty units nearly as practice will warrant, in con-

we have different measures bearing the sible. same name, such as the wine pint and confusion. They both seem to come from France. The Troy weight is supposed to derive its name from the French town of Treyes, where a celebrated fair was once held. The term avoirdupois is a statute which declared how weights avoirdupois are different measures.

Those measures, having constant diffrences, had accidental differences also. in different parts of England, and also in different parts of our own country.-Even where the names are alike the measures are often unlike. In England the diversity was almost infinte, so that these same measures differed in different coun ties, and sometimes in different towns of States the standard has been regulated by law, but the confusion from the meas ures still continues. The question natu rally arises why such confusion has been allowed to continue so long without cor rection. The answer is easy. Except in rare instances the triumphs of science are slow and gradual. Traditional prej udices must be overcome. Each nation is attached to its own imperfect system, as to its own language. Even though inferior to another system, it has the great advantage of being already known to the people that use it. To this constant impediment it is only proper to add the intrinsic difficulty of establishing as uniform system of weights and measures which shall satisfy the demands of civilization in scientific precision, in immediate practical applicability, and in nomenclature.

the decimal system, which seems at first nean near Barcelona, in Spain, was meas difficulty in the circumstance, long since scale of decimal arithmetic is more the great career. The work proceeded, not child of chance than of philosophy. I know not if any better reason can be giv- foreign war. The reign of terror at en for its adoption than because man has home and invasion from abroad did no everywhere reckoned by his ten fingers arrest it. Ten years elapsed before the On this account it has been often called 'natural." But on considering whether the number ten possesses any intrinsi operate in the establishment of the new excellence, convenience, or fitness as a system. ratio of progression, good authorities have answered in the negative. It is the du ten millionth part of the distance be furnish, neither a square or a cube, and thus measured. It receives the name of which cannot be halved without depart | metre, from the Greek, signifying measure ing from the decimal scale. In this scale | A bar of platinum was carefully prepared

When Selden, in his Table Talk, wittily necessity, requires the half dollar, the the conception seems to have been rather mal-progression, so that the first four likened equity, so far as it depended on quarter dollar, the half dime, and the vast than practical. There is reason to rules of arithmetic are ample for the puthree-cent piece. In fact, eight divisions believe, from later labors, that there was pil. to the dollar, as prevailed in Spain, are a serious error in the work. Thus the available in the business of life, more distance of 10,000,000 meters from the we must confess its simplicity and symthan the decimal division. The number equator to the north pole, established by eight is capable of an indefinite bisection the French observers, is too small by 935 it is according to rule. Master the rule proceed to 4, 8, 16, 32, 64, and so on.

by the happy system of notation borrowed from the Hindoos, which might be thority of his great name against the ac- Thus it becomes labor-saving and timeapplied equally well to an octaval scale But at this cime, it would be vain to propose a change in the radix of the numer; cal scale. The number ten is the rec. ognized starting point, and gives its name to the scale It only remains for us at and well dried. Three of these in a present to follow other nations in applyiug it to an improved system of weights and measures.

A system of weights and measures born of philosophy rather than of chance, is what we now seek. To this end old systems must be abandoned. A chance tree omers of France will not verify the system cannot be universal. Science is accuracy of the bar of platinum which is measure. They combine the peculiar adsystem cannot be universal. Science is accuracy of the partificial standard, by another scienuniversal. Therefore, what is produced the artificial standard, by another scientransfer of partificial standard, by another scie If we consider the proper elements or characteristics of such a system we shall find at least three essential conditions .ter of surprise. There is no principle of First, the new system must have in itself science or convenience in the progression | the assurance of unvarying stability, and, of the different series. Thus we have to this end, it should be derived from two pints to a quart, three scruples to a some standard in nature by which any ted in practice only by the distribution that which it learned in childhood. Even ters to an ell, five and a haif yards to a ures, from time or imperfect manufacts perch, six feet to a fathor, eight fur-longs to a mile, twelve inches to a foot, parts should be divided decimally, as formity with our arithmetic. Thirdly, it Then, as if the only ruling principle should be of such a character as to diswhich governed the selection was discord turb national prejudices as little as pos-

To a common observer the difficulties the dry pint the ounces Troy and the of finding an unvarying standard are not ounces avoirdupois. Take these last two readily apparent; but philosophy shows measures as illustrating the prevailing that all things in nature are undergoing a constant change, so that there would seem to be no invariable magnitude, the same in all countries and in all times, as Cicero described the great principles of Natural Law, by which a lost standard on French, and seems to have been part of an inaccessible island might be reproduced with m thematical certainty. There should be determined. But Troy and is but one magnitude in nature, which, so far as we know, approximates to these requisites. I refer, of course, to the length of the pendulum, vibrating seconds, which in our latitude is about 39.1 inches. This length, however, varies in traveling from the equator to the pole, and it also varies slightly under different to all in the ascending series and capmeridians and the same latitude; but the law of variation has been determined with considerable accuracy. One clement in this variation is the difference of temperature. Mr. Jefferson, in his report, on weights and measures, proposed. that we should find our standard in the pendulum. At the same time the French ancestral institutions, conceived the idea of a new system of weights and measures which, founded in science, should be common to the civilized world.

The French began not only by discarding all old systems, but also by discarding a measure derived from the pendulum. They conceived the idea of measuring an are of the meridian of the earth, and finding a new unit in a subdivision of this immense span. At the same time the National Assembly invited the co-operation of other nations, so that the system should become universal.— The work proceeded. An are of the meridian, embracing upward of nine degrees of latitude, and extending from Take, for instance, the application of Dunkirk, in France, to the Mediterrationably an immense improvement on the of the most illustrious names in French eld confusion; but even we encounter a science were engaged in it, of whom I may mention Mechain, Delambre, Biot, recognized by mathematicians, that our and Arago, the latter just beginning his withstanding domestic convulsion and measurements were completed, when again other nations were invited to co

The unit of measure adopted was on plication of an odd number which can tween the equator and the north pole decigram, eentigram, milligram.

There is something transcendental in

preserved in the archives of France. It their universality and defining power. is not less arbitrary as a standard than the yard or foot, and it can be perpetuais the assumed meter.

cause I desire that the admirable system garded as a certain portion of the dispole, but as an artificial measure determined with peculiar care. Had the same or any other measure been selected without any measurement of the earth, the

beautiful or perfect. Look now at the system. The meter which is assumed to be one ten-millionth part of the distance from the equator to the poles, is, in fact, 361 inches or 39.37 inches in length. It is 'especially the unit of length, but it is also the unit from which all measures of weight and capacity, square or cubic, are derived. It is at once the foundation-stone and cap-stone to stone to all in the descending series.

The unit of measures of surface of land measures is the are, from the Latin area, and is the square of ten meters, or, in other words, a square of which each side is ten meters in length. The unit of solid measure is the stere

from the Greek, and is the cube of a me-Government, just struggling to throw off ter, or, in other words, a solid mass one meter long, one meter broad. und one me-

The unit of liquid measures is the liter, from the Greek, and is the cube of the tenth part of the meter, which is the decimeter, or, in other words, it is a vessel, where by interior measurement each side and the bottom are square decimcters.

The unit of weight is the gram, also liter of distilled water-at its greatest

its multiples and its subdivisions. It is multiplied decimally upward and divided The multiples are decimally downward. derived from the Greek. Thus, weca ten : hecto, hundred ; kilo, thousand ; and myria, ten thousand, prefixed to meter, signify ten meters, one thousand meters and ten thousand meters. The subdivisions are derived from the Latin. Thus dect, centi, milli, prefixed to meter, signify one-tenth, one-hundredth, and onethousandth of a meter.

These same prefixes may be applied in ascending and descending scales to the are; the liter and the gra u. Thus, for example, we have in the ascending scale decagram, hectogram, kilogram, and my riagram; and in the descending scale,

In this brief space you behold the whole metric system of weights and measnres. What a contrast to the antetio Months, if not years, are required to store away the perplexities, incongruities. and and measures; and then memory must lishment of the metric system. The sub- the proportions of the human form. - id prectice. Thus convenience, if not It was an immense undertaking. But quire. All this is done away by the dec. metric system permissine, as is now pro. but she took the first bite.

If we look closely at the metric system The progression beginning with 1 would yards, according to Bessel; by 1,410 and you master the system. On this acroceed to 4, 8, 16, 32, 64, and so on.

yards, according to Puissant; and by 1, count it may be acquired by the young
The decimal scale is made easy of use 967 according to Chazallon. Sir John with comparative facility, and when once Herschell has also testified with the au- acquired it may be used with dispatch; curacy of this result. If there be an saving I cannot hesitate to mention its error, such as is supposed, then the me- merits the nomenclature which it has ter ceases to be what it was originally called, one ten millionth part of the distance from the equator to the north pole. but this forgets that a system intended Even assuming that there is no error, for universal adoption must discard all and that the meter is precisely what it local or national terms. The prefixes empurports to be, yet it is not easy to see ployed are equally intelligible in all counhow the artificial standard can be cor- tries. They are no more French than rected by a recurrence to the standard in English or German. They are in their nature. The massive work originally un- nature common or cosmopolitan. And in dertaken will not be repeated. The as all countries they are equally suggestive completion. Therefore, for all practical measure with exquisite precision. If purposes the meter is really nothing else these words seem to be scholastic or pethan a bar of platinum of a certain length | dantic you must bear this for the sake of Unquestionably it is difficult for a gen

eration to substitute a new system for of exact sopies of the original bar, which in France the metric system was tardily adopted Napoleon himself, on one oc-I have entered into this explanation of casion, said impatiently to an engineer the origin and character of the meter be- who answered his inquiry in meters-"What are meters? Tell me in toises." which is founded on it should be seen ac. It was only in 1840 that the system was nothing from the theory which preceded at its origin. Its unit is not to be regal system of France, Cloth is sold by the meter. Roads are measured by the tance between the equator and the north kilometer. Meat is sold by the kilogram, or as it is familiarly abridged, by so many kilos.

It is generally admitted that the name are too long, although nobody has been metric system would not have been less able to suggest substitutes, unless we regard the various abridgments in that light. But no abridgment should be allowed to sacrifice that cosmoplitan character which belongs to the system. Thus in England a nomenclature has been proposed which would secure short names would be different in each language, and would be entirely different from the French names. This is a mistake. The names in all languages should be identical, or so nearly alike as to be recognized at once. This may be accomplished by an abbreviated nomenclature.

For instance, we may say met, ar, lit. and gram; and, in describing the denomination, we may say in the ascending scale, dec, hec, kil, and in the descending scale dec, cen, and mil, indicating respectively 10, 100, 1000, and 1-10, 1 100. and 1-1000. Compounding these words we should have, for example, kilwet, killit, kilgram, and cenmet, cenlit, cengram. These abbreviations might be substan tially the same in all languages. They would preserve the characteristics of the unabridged terms, so that the simple mention of the measure, even in this abridged for a, would disclose the proportion which it bears to its fellow-meas ures. Previous measures have been repderived from the Greek, and is the one-thousandth part of the weight of a cubic dram, gross, ounce, pound, stone, ton. dram, gross, ounce, pound. stone, ton.—
Where a word is often repeated in the formed the habit of doing everything in density—this being just above the freezed. Hurry of business it is instinctively abridged. We shall not err if we profit by to do so. It is to this I owe my prosections. Such are the main elements of the this experience, and seek to reduce the perity." metric system: But each of these has new nomenclature to its smallest propor-

> Twelve words are all that are required by this system. In learning these you There are the five words des learn all. ignating the different units of length. surface, solid capacity, liquid capacity, and weight. Then there are the seven prefixes, being four in the ascending pentine and wearing apparel. scale, expressing multiples or augmenta tions of the meter or other units, derived from the Greek; and also three in the tween the ages of five and twenty in the descending scale, expressing subdivisions or diminutions of the meter and other units derived from the Latin. These twelve words contain the whole system

In closing this shapter of the unquestionable advantages of the metric sys tem, I must not forget that it is already the received system in the majority of vets, laces, jewelry, paper and gunpow countries. Thus it appeared at the Staistical Congress assembled at Berlin in 1663, that it was adopted partly or entirely in Austria, Baden, Bavaria, Bel fustic campeachy wood, pimente, druge gium, France, Hamburg, Hesse, Han- and dyestuffs. over, Mecklenburg, the Netherlands. Parma, Portugal, Saxony, Spain, Sardininconsistencies of the existing weights in, Switzerland, Tuscany, the Two Sicilies, and Wurtemburg. Since then Great Britian, by an act of Parliament,

posed in the bills before Congress. The example of Great Britian is of especial importance to us, since the commercial relations between the two countries render it essential that there should be a common system of weights and measur On this point we cannot afford to differ f.om each other.

The adoption of the metric system by the United States will go far to complete that circle by which this great improvement will be assured to mankind. Here is a new agent of civilization which will be felt in all the concerns of life, at home and abroad. It will be hardly less important than the Arabic numerals, by which the operations of arithmetic are rendered common to all nations. It will help undo that primeval confusion of which the Tower of Babel was the tepresentative

As the first practical step to this great end I ask the Senate to give its sanction, to the bills which have already passed the other House, and which I have reported from the special committee on the metric system. By these enactments the metric system will be presented to the American people, and will become an approved instrument of commerce. It will not be forced into use, but will be left for the present to its own intrinsiq merits. Meanwhile it must be taught in the schools. Arithmetics must explain it. They who have already passed a certain period of life may not adopt it; but the rising generation will embrace it and ever afterwards number it among the choicest possessions of an advanced civ-

-During the first years of the war, says the Bellows Fall "Times," when change was scarce and some large firms were issuing currency of their own, a farmer went to a store iu a neighboring town and bought some goods, and gave to the merchant a five dollar bill, of which he wanted seventy-five cents back. The merchant counted out the amount and handed it over to the farmer. He looked at it a moment and inquired, "What's this?" "It's my currency," said the merchant. "Wal, 'taint good for nothin' where I live," said the farmer. 'Very well," replied the merchant, "keep it till you get a dollars worth, and bring it to my store and I will give you a dollar bill for it." The farmer pocketed the change and departed. A few weeks after he went into the same store and bought goods to the amount of one dollar, and after paying over the identical seventy five cents, he took ont a handful pumpkin seed and counted out twenty five of them, and passed them over to the mer-chant. "Why," said the merchant; "wnat's this?" "Wal," says the farmer, "this is my currency, and when you ge a dellar's worth bring it out to my place and I will give you a dollar bill for it."

A GOOD RULE. - A men who is very rich now, was very poor when he was a o .. When asked how he got his riches, he replied, "My father taught me never play till my work was finished, and never spend my money until I had earned it.
If I had but one hour's work in a day I must do that the first thing, and in an hour, and after this I was allowed to play; and I then could play with more pleasure than if I had the thought of an

East India exports cloves, nutmegs mace, pepper, rice, indigo, gold dust. camphor, benzoin, sulphur, ivory. rat tans, sandal wood. zinc and nuts.

-The United States export principally agricultural produce, cotton, tobacco flour, provisions of all kinds, lumber, tu--Rev. Daniel Dorchester estimates

the number of children and youth be United States at 12,57,7329. -Hindoostan exports alike, shawls

carpets, opium, saltpetre, pepper, gum indigo, einnamon; cochineal, diamonds, pearls and drugs. -Switzerland exports cattle, cheese

butter, tallow, dried fruit, lime, silk vel -Mexico exports gold and silver, coch

ineal, indigo, sarsaparilla, vanilla, julap, -Chicago shipped 72,824 barrels of flour and 648,226 bushels of wheat east

ward last week. -The Chicago water pipes are choked up with small fishes in all stages of des

composition.

Woman shared the sple with man