Literary and Historical Society

OF QUEBEC.

OFFICERS,

1863.

PATRON,

HIS EXCELLENCY VISCOUNT MONCK, GOVERNOR GENERAL,

&c., &c., &c.

PRESIDENT,

JOHN LANGTON. M.A.

VICE PRESIDENTS,

R. S. M. BOUCHETTE,
E. A. MEREDITH, LL. D.

LIEUT. ASHE, R. N.,
C. M. TATE.

RECORDING SECRETARY,.....THOS. DEVINE, F. G. S.
CORRESPONDING SECRETARY,.....W. D. CAMPBELL.
COUNCIL SECRETARY.....E. T. FLETCHER.
CURATOR OF MUSEUM,....., ...S. STURTON.
CURATOR OF APPARATUS,.....G. W. WICKSTEED, Q.C.
TREASURER,.....T. D. HARINGTON.
LIBRARIAN,.....REVD. J. DOUGLAS.

ASSISTANT SECRETARY, WILLIAM COUPER.

TRANSACTIONS

OF THE

LITERARY AND HISTORICAL SOCIETY

OF

QUEBEC.

VOL. I.] NEW SERIES. [PART I.

CONTENTS.

QUEBEC:

PRINTED FOR THE LITERARY AND HISTORICAL SOCIETY, BY G. T. CARY, FABRIQUE STREET.

1863.

Article I.—Weights and Measures.—*By R. S. M. Bouchette, Esq., Commissioner of Customs, Associate Member.*

[Read before the Society, 18th March, 1863.]

There is a branch of Political Economy which, although one of the most important in its application to the dealings between man and man in the prosecution of foreign or domestic commerce, seems, nevertheless, to have, in a great measure, baffled all attempts hitherto made to give it that fixity and uniformity in practice which are, theoretically, its essential elements.—I refer, as you have no doubt already anticipated, to the subject of weights and measures, which you have kindly permitted, that I should examine and discuss before the Society this evening. I have not the pretension to believe that, in treating a question upon which philosophers and statesmen have differed, I am going to relieve it of its difficulties, and throw any new light on the subject; but having, in the course of my reading in connection with a branch of my official duties, collected some facts and opinions in reference to weights and measures, in Great Britain, in France, and in other countries, I thought the Society might not deem it wholly uninteresting to have those facts and opinions brought under its consideration, in the manner in which I am about to submit them, and I beseech the indulgence of the Society, for the imperfect manner in which I may perform the task I have undertaken.

The terms weights and measures, in their familiar import, narrow down our ideas to the daily business transactions of life, in which respect, however, from the multitude and variety of those transactions, the subject assumes a vast practical importance. But its scope is not confined to the operations of the mart; it bears upon far loftier objects, and embraces the arts and sciences. The dimensions of the globe we inhabit, those of the spheres which form part of our solar system, their distances and their density, are all computed by the same general rules by which we measure the distance between Quebec and Toronto, the cubic contents of a cylinder, or weigh an ounce of bread.

My present purpose aims at no higher ambition than simply to explain the system of weights and measures, as it prevails in each of those countries with which we are most intimately connected by commerce; and therefore, to consider those systems as they are found in France, in England, and in the United States, with the second of which, our metropolitan country, and with the United States, an aggregate trade in imports and exports is carried on by this Province, amounting annually to about $80,000,000.

I will also point out what is our own position with regard to the subject under consideration, and will offer a few general remarks upon existing systems of weights and measures, in relation to their bearing and influence on domestic trade, and on foreign or international commerce.

France.

In France, before the Revolution of 1789, which was one of those upheavings of the social fabric, the vibrations of which were felt in almost every civilized nation of the world, the weights and measures were

found to be in the greatest confusion. Reform seemed indispensably necessary; but the bit by bit reform which is characteristic of the wisdom of modern legislation, did not suit that period of bold and sweeping innovations, and the whole system of weights and measures, then existing in France, was suppressed, to give place to a new metrology established by the law of the 7th April 1795.

This, however, was not done lightly. The subject underwent the gravest examination, and the decision appears to have been based upon very enlarged views and philosophical considerations.

With the Bishop of Autun, better known as Prince de Talleyrand, originated the idea of a new system of weights and measures, founded upon the principle of a single and *universal* standard, and it was he, it appears, who first submitted to the National Assembly in 1790, the project of a decree upon the subject. Foreign nations, and especially the British Government, were invited to co-operate in the measure, and it was suggested that commissioners, chosen from the Royal Society in England, and from the Academy of Sciences in France, should meet to confer together on the subject, and carry out the design of fixing a common international standard for the weights nd measures of both countries. To this invitation, however, the Government of England did not respond, and the National Assembly of France was left to prosecute alone a scheme which seems to have originally aimed at the establishment of an international as well as a domestic system.

The adoption of a *unit*, which would at once furnish a standard for measures of length, weight, and capacity, suggested itself as the great desideratum, and the *mètre* was chosen as that unit, with its decimal parts, the mètre itself being the standard of measure of length, surface, and

solidity ; the cubic decimètre or tenth part of the mètre, of distilled water, weighed in vacuo, at the temperature of its greatest density, being the *kilogramme* or standard of weight, whilst the space occupied by the cubic decimètre of water became the *litre* or standard of capacity.

The momentous question, however, the key-stone of the whole fabric, was to fix the length of the mètre upon some more philosophical basis than that upon which some parts of the old system rested, in which, the standard of length, for instance was, it is stated, taken from the length of Charlemagne's foot, as the Greeks had before them adopted as their standard of that measure the length of the foot of Hercules.

Opinions were divided as to the best mode of obtaining the mètre—some advocated as the most accurate test, the length of the pendulum vibrating seconds in a given latitude, or at the equator; others preferred the fractional part of a terrestrial meridian.

To examine into this important question, a commission was appointed by the National Assembly, composed of some of the most eminent members of the Academy of Sciences of France. Borda, La Grange—who has been designated as the Newton of France,—La Place, Monge and Condorcet, composed this commission, which, on the 19th March, 1791, reported in favor of selecting the fractional part of the meridian, i. e. the 10-millionth part of the quarter of the meridian, instead of the length of the pendulum, as the standard unit sought for.

The thrilling events which immediately followed 1791, a period historically known as the Reign of Terror, for a time eclipsed this learned Commission, several of the members of which were dismissed by the Committee of Public Safety, as not being thorough Republicans.—*Ils étaient*

soupçonnés d'être suspects—but in 1795 all the operations which had been commenced under the direction of the Academy of Sciences, in reference to the standard of weights and measures, were resumed, and the National Convention which had succeeded to the National Assembly, prosecuted the original plan to its final accomplishment. The admeasurement of the arc of the meridian was at once resumed, and eventually completed by Delambre and Méchain. The accuracy of their respective operations will readily be conceived, when it is stated that, after a series of triangulations and levels, over a country upwards of 600 miles in extent between Dunkirk and Barcelona, upon two bases, the one of 6075.90 toises, the other of 6006.25, the latter base, though at a distance of 400 miles from the former, when calculated by inference from the chain of triangles between them, differed from its actual measurement less than one foot.

Such were the means by which the length of the *mètre*, the fundamental unit of the French metrical system, was established; and if I have dwelt upon this branch of the subject longer than is consistent with the humble practical view which, at the outset, I professed to take of the question, I shall perhaps be forgiven on account of the deep interest we must all feel in the triumphs of science, and in the contemplation of those large and ennobling conceptions which are so well calculated to impress us with the vast resources and elevation of the human mind.

The standard mètre thus definitively adopted is equal to $443\frac{296}{1000}$ lines or $36\frac{84}{100}$ inches of the old French measure, and corresponds nearly to $39\frac{37}{100}$ inches English measure. The length of the pendulum vibrating seconds at Paris, that is 86,400 oscillations in 24 hours, is $440\frac{560}{1000}$ lines old French measure, or $\frac{99.383}{100.000}$ of the mètre, and there-

fore $\frac{617}{100,000}$ shorter than the mètre as deduced from the meridian. The attempt to regulate the length of the pendulum by a given number of decimal oscillations, that is 100,000 in 24 hours reduced its length in the same latitude to $\frac{74.193}{100,000}$ of the mètre.

The mètre is the centre of the French system of weights and measures. From it are formed in decimal ratios two scales, the one ascending, the other descending, and it furnishes the standard not only for linear, superficial, and solid measure, but it also, with its decimal parts, becomes the standard of weight and capacity, as I have had already occasion to mention.

This ascending and descending scale has its application to all the forms of measurement, and by means of Latin and Greek prefixes you at once know whether you are dealing with multiples or divisions of the standard, the Latin prefixes being indicative of the descending scale, whilst the Greek are applied to the ascending scale. Thus we have, with reference to measures of length, capacity, and weight, the following nomenclature.

LENGTH.

The Millimètre or.....	.001	of the Mètre.
" Centimètre "	.01	
" Decimètre "	.1	
" METRE "	1.=39$\frac{37}{100}$	Eng. Inches
" Decamètre "	10.	
" Hectomètre "	100.	
" Kilomètre "	1,000.	
" Myriamètre "	10,000.	

CAPACITY.

The Millilitre or.....	.001	of the Litre.
" Centilitre "	.01	
" Décilitre "	.1	

" Litre "	1.	.26418 of wine
" Decalitre "	10.	gallon, rather
" Hectolitre "	100.	more than a
" Kilolitre "	1,000.	quart
" Myrialitre "	10,000.	

WEIGHT.

The Milligramme or.....	.001	part of the
" Centigramme "	.01	Gramme.
" Decigramme "	.1	
" Gramme "	1.	15.43 grains.
" Decagramme "	10.	
" Hectogramme "	100.	
" Kilogramme "	1,000.	about 2⅕. lbs. avoir-
" Myriagramme "	10,000.	dupois.

And then, with respect to solidity and surface, the following, viz:—

SOLIDITY.

	The Decistère..	.1 of Cubic Mètre.
35.3166 cub. ft.	" Stère.....	1. or a Cubic Mètre.
	" Decastère...	10. or 10 Cubic Mètres.

LAND MEASURE.

	The Centiare..	.01	of the are or square mètre.
4 sq. perches nearly.	" Are.....	1.	one hundred square mètres.
2½ acres nearly	" Hectare...	100.	10,000 square mètres.

It would be impossible to devise a decimal system more perfect and harmonious in its parts, coupled with a nomenclature so expressive of the multiple or division of the unit of weight or measure it represents: as remarked by Mr. Adams in his admirable report to Congress on this subject, in 1821; "no two words express the same thing; and no two things are signified by the same word."

Beautiful, however, as this system is admitted to be in theory, it was, from its inception, met with the most overwhelming difficulties in practice. A population of millions, accustomed for ages to a particular mode of domestic trade, could not readily give up the use of the weights and measures with which they were familiar, and they so pertinaciously clung to their old system, that the Government of France was forced to make, at different times, such concessions to popular usages, and so to modify the laws, that the result, for nearly forty years, was to produce enhanced confusion in reference to the weights and measures of the country.

It was not until the reign of Louis Philip that this great metrical system may be said to have been, as a whole, imposed upon France. The law of the 4th July 1837, which abrogated the decree of the 12th February 1812, permitting under certain restrictions the use of old weights and measures with their former designations, utterly swept away the old system, so far as a legal enactment could do it, and bodily substituted in its place the decimal metric system, which I have just described. The use, however, of the old weights and measures was tolerated until the 1st January 1840, after which date heavy penalties were attached, not only to the use of such old weights and measures, but even a reference to them in contracts was prohibited, and a notary who should in any deed of conveyance describe lands by the abrogated terms of measurement instead of using the language of the new metrology, was not only fined, but the deed itself was declared to be null and void. Such is the present stringency of the law upon this subject in France.

Measures were, however, immediately taken to facilitate as far as possible the dissemination of the system. On the

17th August, 1839, was promulgated the "*Ordonnance du Roi sur la vérification des poids et mesures.*" The *surveillance* of the *vérification* is by it assigned to the *préfets* and *sous préfets* of Departments into which France is divided, but the *vérificateurs* or Inspectors are appointed by the Minister of Public Works, Agriculture and Commerce. It is provided that each Department should be put in possession of a complete assortment of standard weights and measures, duly stamped in the Department of the Prototypes, and these standards are to be verified every ten years.

Great pains were evidently taken in the framing of this ordinance, the details of which appear amply to provide for the effectual administration of this important branch of domestic national economy. Whether the law of 1837 and the ordinance first referred to, have wholly succeeded in the establishment of the new system throughout France, may yet be problematical. It has unquestionably triumphed in all the great centres of commerce of the Empire, but I have heard it stated that some deviations from it still exist in other parts of the country, notwithstanding the stringency of the law, so much is the *vis inertiæ* of the human mind opposed to change.

It would appear from evidence given before the Committee of a British House of Commons last year, that the French metrical system prevails or is about being adopted, in the following countries, viz:

France,
Holland,
Belgium,
Italy,
Spain,
Portugal,

Switzerland,
Greece,
And part of South America.

Having thus given you a brief account of the decimal system of the French metrology from its origin in the days of the Revolution to its final establishment under Louis Philip, as the only legal system recognised or tolerated in France, I shall now cross the British Channel and inquire into the system of weights and measures which prevails among a people so famed in the annals of the world, not only for their indomitable courage in war, and their profound knowledge of the science of government, but for their pre-eminent skill in the industrial arts and the world-wide scope of their commerce, the result at once of the wisdom of their commercial laws and of that enterprise which has in all directions extended the boundaries of the British Empire.

ENGLAND.

The policy of all communities that have grown sufficiently large to have commercial dealings, whether it be in the sale or barter of commodities, or of lands, will naturally be to adopt some *uniform* weight or measure by which quantities may be ascertained. The wisdom of this policy appears to have been felt at an early period of the history of the British people, and the records of Parliament of the remotest dates bear evidence of the attempts made through legislation to establish uniformity in weights and measures; but whether the defects were in the legislation itself, or whether there are any inherent obstacles in the nature of things to baffle the attainment of this uniformity, certain it is that later enactments on the same subject do not appear to have been more successful in reaching the goal than the primitive laws, framed ages ago for the accomplishment of that momentous object.

We find in the great Charter of Henry III, which was a confirmation of the famous Magna Charta of King John, his predecessor, an express enactment having for its object the establishment of *uniformity* in weights and measures. This was in 1266. Avoirdupois and Troy weights do not at this time appear to have been the standards of weight in England. The first mention of avoirdupois weight in the English statutes is to be found in a statute of Edward III, anno 1335.

The weight of the *silver penny* sterling, was it seems, the basis of the whole fabric of the system of 1266. This penny was the $\frac{1}{240}$th part of the Tower pound, and was equal in weight to 32 kernels of wheat. (51 Henry III.) But the language of the law itself is so singularly precise, and the system of uniformity as to coins, weights and measures, which it prescribes, is so ingenious, that I must quote the words themselves.

"By the consent of the whole realm of England, the "measure of the King was made; that is to say; that "an English penny called a sterling round, and without "any clipping, shall weigh 32 wheat corns in the midst "of the ear, and 20 pence do make an ounce, and twelve "ounces one pound, and eight pounds do make a gallon of "wine, and eight gallons of wine do make a London bushel "which is the eighth part of a quarter."

It would, perhaps, be impossible to lay down in fewer words so complete and congruous a system as that here defined, and it shows how much in all ages, and we might say in all countries, the tendency was to borrow standards of weight and value from the cereal products of the earth, and how wheat especially was considered as the basis of values.

It would involve a lengthy enquiry, and exceed the

legitimate limits of the present paper, if I were to trace the various phases of the English system of weights and measures, as found in the statutes at large. I can only invite those whose curiosity may tempt them fully to investigate the subject, to consult the report of Mr. Adams, which I have already referred to, a report full of profound research and of most philosophical views on this important question.

It will suffice for me to state that, despite of the efforts of statesmen and legislators to impart uniformity and permanency to the system of weights and measures within the British realm, that system at this day would appear to be in a state of imperfection and confusion, which modern enactments have in vain endeavoured to remedy.

The fundamental law of weight and measures in England at this day is the statute 5 Geo. IV cap. 74, which is in a great measure a declaratory act, but of which the provisions are so important, that at the risk of appearing to you somewhat tedious, I would solicit your permission to dwell upon it with some particularity.

5 Geo. IV, Cap. 74.

1.—From and after the 1st May, 1825, the straight line or distance between the centres of the two points in the gold studs in the straight brass rod now in the custody of the Clerk of the House of Commons, whereon the words and figures "Standard Yard 1760" are engraved, shall be, and the same is hereby declared to be, the original and genuine standard of that measure of length or lineal extension called a yard; and that the same straight line or distance between the centres of the said two points in the said gold studs in the said brass rod, the brass being at the temperature of 62° of Fahrenheit's thermometer, shall be and is hereby denominated the "*Imperial*

Standard yard," and shall be, and is hereby declared to be, the unit or only standard measure of extension wherefrom or whereby all other measures of extension whatsoever, whether the same be lineal, superficial, or solid, shall be derived, computed and ascertained; and all measures of length shall be taken in parts or multiples, or certain proportion, of the said standard yard, and that one third part of such yard shall be a foot, and the 12th part of such foot shall be an inch, and that the pole or perch shall contain five such yards and a half, the furlong 220 such yards, and the mile 1760.

3.—This section provides that the yard, if lost, &c., may be restored by reference to the length of a pendulum vibrating seconds of mean time in the latitude of London, in a vacuum at the level of the sea, in the proportion of 36 inches to 39 inches and $\frac{1393}{10000}$th part of an inch.

4.—Standard brass weight of one pound Troy weight made in the year 1758, shall be the Imperial standard Troy pound, and is declared to be the unit or only standard measure of weight, from which all other weights shall be derived, computed and ascertained; $\frac{1}{2}$ part an ounce, $\frac{1}{20}$ of the ounce 1 pennyweight, and $\frac{1}{24}$ of such pennyweight shall be 1 grain, so that 5760 such grains shall be a Troy pound, and 7000 such grains shall be a pound avoirdupois, $\frac{1}{16}$ of the said avoirdupois pound shall be 1 ounce, and $\frac{1}{16}$ of the said avoirdupois ounce 1 dram.

5.—Standard pound Troy if lost, &c., to be restored by reference to a cubic inch of distilled water weighed in air, by brass weights at the temperature of 62° Fahrenheit's thermometer, the barometer being at 30 inches, the weight of which is equal to 252 grains $\frac{458}{1000}$ of a grain, of which the Imperial Troy pound contains 5760.

6. The measure of capacity as well for liquids as for dry goods, not measured by heaped measure, shall be the gallon containing 10 pounds avoirdupois weight of distilled water weighed in air, temperature 62° Fahrenheit's thermometer, barometer 30 inches—unit of all *standard measures* of capacity *the Imperial standard gallon*, as well for wine, ale, beer, spirits, and all sorts of liquids, as for dry goods not measured by heaped measure—and parts and multiples —quart $\frac{1}{4}$, pint $\frac{1}{8}$—2 such gallons a peck, 8 such gallons a bushel, and 8 such bushels a quarter of corn or other dry goods, not sold by heaped measure.

11.—Copies and models of the said standards to be deposited in the office of the Chamberlain of the Exchequer at Westminster, and to be sent to the Lord Mayor of London, &c.

12.—Magistrates in Counties, Cities and Towns, etc., in England, Scotland and Ireland, to purchase models, etc., for their respective Counties, etc.

14.—Bulk of 10 lbs. avoirdupois weight of water equal to 277 cubic inches, and $\frac{274}{1000}$ths of an inch, constituting the capacity of a gallon, and so forth for parts and multiples.

23.—56 Acts or parts of Acts relating to divers weights and measures in Great Britain repealed.

This act was followed by the 4th and 5th William IV. Cap. 49,* which appears chiefly to have been intended

---

* 4 & 5 Will. IV, Cap. 49.

4.—Heaped Measures abolished.

5.—Justices in Quarter Session in England to determine number of copies of Imperial standard weights and measures which they may deem requisite for the comparisons of all weights and measures, in use in counties, &c., and shall direct that such copies, verified and stamped at the Exchequer, shall be provided and deposited under care of Inspectors, to be appointed or valued by them.

12.—Stone to consist of 14 standard pounds avoirdupois, the cwt. to consist of 8 such stones, and the ton of 20 such cwt. Contracts made by any other stone, cwt. or ton, after 1st January 1835, null and void.

to provide for the means of distributing standard weights and measures; but its provisions seem to have been insufficient or imperfect, since it was repealed the following year by the 5th and 6th William IV. Cap. 63, (1835.) This last act renders unnecessary identity of shape or form in standards, and provides for their adjustment. One of its most important features is that it abolishes, *the Winchester bushel*, (†) the *Scotch ell*, AND ALL LOCAL AND CUSTOMARY measures. *Imperial measures* as established by the 5th George IV, are the only legal measures recognized or "parts and multiples thereof." The binary division is affirmed, and the $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{8}$ $\frac{1}{16}$ and $\frac{1}{32}$ are specifically designated as the only legal aliquot parts. But there is a some-

---

13.—All articles to be sold by avoirdupois weight except gold, silver platina, diamonds, or other precious stones and drugs, which may be sold *in retail* by Troy weight.

14.—Weights and measures in use to be stamped. Penalty £5 and forfeiture.

5 & 6 WILLIAM IV, CAP. 63, 1835.—REPEALS 4 & 5 WILLIAM IV, c. 49.

4.—Abrogates necessity of identity of shape or form in standards.

5.— Copies of Imperial standards to be sent when defective to the Exchequer at Westminster, to be again compared and verified, on payment of fees of verification only.

6.—*Winchester bushel, Scotch ell, and all local and customary measures abolished.* Penalty for selling by any other than Imperial measures or multiples thereof, $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{8}$ $\frac{1}{16}$ $\frac{1}{32}$ 40s. "Provided always that nothing herein contained shall prevent the sale of any articles in any vessel where such vessel is not represented as containing any amount of Imperial measure, or of any fixed local or customary measure heretofore in use.

7.—Heaped measures, abolished.

8.—Coals to be sold by *weight and not by measure.*

9.—All articles to be sold by avoirdupois, except gold, &c., which may be sold in the retail by apothecaries' weight (Troy ?)

12.—Contents of weights and measures to be stamped on them.

13.—No weight of lead or pewter to be stamped unless cased in brass, copper or iron, and so marked "cased."

21.—No weight above 56 lbs. to be stamped.

22.—Expenses of providing copies of standard weights, and the remuneration to Inspectors to be defrayed out of county rates.

(†) This measure is traced back to the reign of Edgar, anno 972, and it derives its name no doubt from the fact that the standard was by law kept at Winchester.

what singular proviso attached to the 6th clause, it is this:—"Provided always that nothing herein contained "shall prevent the sale of *any articles in any vessel* where "such vessel is not represented as containing any amount "of Imperial measure, or of any fixed local or customary "measure heretofore in use.

Whether this proviso was artfully introduced with a view of rendering the act in some degree nugatory, or whether the bearing of the proviso was not weighed or understood, certain it is that it opens a wide door for the evasion of the otherwise stringent provisions of the law, and it appears in fact to have had that effect.

The evidence given before the Committee of the House of Commons, the report of which Committee was presented to the House so recently as the 15th July last, (1862,) would tend to the inference that notwithstanding the strenuous efforts of all legislation to reduce weights and measures to positive and practical uniformity, extreme irregularity and disorder still prevail upon this subject in Great Britain. It is stated, for instance, by one of the witnesses examined before the Committee, that wheat is sold by the bushel of.....168 lbs.

73 lbs.
80 lbs.
70 lbs.
63 lbs.

It is sold also by the bushel of 8 gallons at Saltash, and of 20 stones at Dundalk.

The load consists in some places of 5 quarters, in others of 5 bushels, in others of 3 bushels.

At Roystone, or Stowemarket, it is composed of 488 quarts, and at Ulverstone of 144 quarts. And so it is with weights and land measures.

The cwt. may contain 100 lbs.
112 lbs.
130 lbs.

As to superficial measure, it is stated that at Falmouth an acre of land consists of 4,840 square yards. *
At Preston of... 10,240 square yards.
And,..... 9,000 square yards.

The instances here mentioned are simply given as illustrations of the diversity of weights and measures stated to exist in England; but if the extent of that diversity be estimated by the fact stated by Dr. Kelly, before a Committee of the House of Lords in 1823, that 200 laws had been enacted to secure uniformity in weights and measures without success, and that 500 various measures have been adopted in defiance of those laws,† one would almost be led to the inference that the subject matter is one which naturally eludes legislative subjection. With these alleged facts before us how idle, however wise, seems to have been the injunction of Magna Charta, nearly six centuries ago, that there should be but one weight and one measure throughout the realm.

There is reason, however, to believe that this statement of the extraordinary variety of weights and measures in use in Great Britain, is in some degree, if not greatly, exaggerated. It is not at all improbable that many of the alleged differences in weights and measures are more apparent than real, and result more from the modes of expressing, and perhaps of combining them, than from any difference in the weights and measures themselves. Their basis or fundamental value as a weight or a measure might still be referable to some recognized legal stan-

* That is the legal acre in square yards.
† London Morning Chronicle, May 1836.

dard, and the difference of expression would probably, as remarked by Mr. Franklin before the Committee, be analogous to a difference of dialect between two counties.

I have now given you a brief, and I am afraid but a very imperfect, outline of the history of weights and measures in England, and have specially drawn your attention to the Imperial acts which define what are at the present day the standards of weights and measures in the United Kingdom. We have seen that the standard yard of 1760, "the Imperial standard Yard" is declared to be the *unit* or only standard measure of extension, and here it may be observed that, although the act declared that "one third part" of the said standard yard shall be a foot, and the "twelfth part of such foot shall be an inch," the yard itself is the only *standard*, the foot and the inches being but a designation of the parts into which the yard may be legally divided. Then as to weight, *The Imperial standard Troy pound* is declared to be the *unit* of weight, $\frac{1}{12}$ part of which is an ounce, $\frac{1}{20}$ of the ounce one pennyweight, and $\frac{1}{24}$ of such pennyweight one grain—5760 such grains being a pound Troy, and 7000 a pound avoirdupois.

The standard unit of all measures of capacity is the Imperial standard gallon containing 10 pounds avoirdupois weight of distilled water, weighed in air at the temperature of 62° Fahrenheit's thermometer. This is equal to $277\frac{1}{4}$ cubic inches, or about $\frac{1}{5}$ more than the old wine gallon.

To those who, like ourselves, are familiar with the English system of weights and measures, the act cited of 5 Geo. IV, will appear simply declaratory of pre-existing standards, but it has theoretically, nay legally, done away with distinctions which had for ages, I may say, existed between the Winchester bushel and the Imperial bushel, the wine

gallon and the ale gallon, the scotch ell and English yard, and abolished all local weights and measures.

It may be questioned, however, how far the uniformity aimed at by this law is perfectly consistent in all its relations with the nature of things. The Imperial gallon, for instance, is made a common standard measure for liquid and dry substances—for wine or for wheat. But in these are found an inherent difference of specific gravity, and the metallic weight which would be equiponderant to a gallon of wine, would not be equiponderant to a gallon of corn. Thus in the difference between the specific gravities of the wheat and the wine, nature seems to have indicated two standard measures of capacity.

It is not, however, my province to discuss just now the merits of particular systems. My purpose is chiefly to state what those systems actually are, and consistently with that view of the task I have assumed, I now pass from the consideration of weights and measures in Great Britain, of which I have given but a very general idea, to the few remarks I have to make upon the same subject in reference to the

United States of America.

When British settlers colonized Virginia in the reign of Elizabeth, and the Pilgrims emigrated to New England in 1620, they carried with them the laws and institutions of England, so far as those laws and institutions were applicable to their new condition, and among these the weights and measures of the parent state were naturally imported by them.

The weights and measures thus introduced were afterwards universally adopted in the then North American Colonies, and although partial modifications appear to

have been from time to time made by the local legislatures, or to have been introduced by usage, yet the standards of British weights and measures were, in general, the only legal standards recognized in the Colonies, most of which had procured duly stamped and authenticated copies of those British standards from the English Exchequer or from Guildhall, in the City of London.

Deriving their system from such a source, it is scarcely to be expected that any wide differences should exist between the British and the American system of weights and measures—indeed both countries have a common standard of extension, *the yard*, and a common standard of weight, the pound Troy of 5760 grains, and the pound avoirdupois of 7000 such grains, the parts and multiples of such standards being the same in the two countries.

They had also a common standard of *capacity* until 1826, when an act of the British Parliament, excluding all other measures of this order, adopted as the standard unit of capacity the "Imperial standard gallon," equal to 277 $\frac{274}{1000}$ cubic inches, both for liquid and dry substances, thus doing away with the wine gallon of 231 cubic inches, the ale gallon of 282 cubic inches, and the corn gallon of 272 cubic inches.

The old English wine gallon is the only recognized standard of liquid measure in the United States. It contains 8,339 pounds avoirdupois of distilled water, at the temperature of about 39°. Fahrenheit, its capacity being as before stated, 231 cubic inches, which is almost exactly equal to a cylinder of 7 inches in diameter and 6 inches deep.

The dry measure is the Winchester bushel. It contains 2,150.42 cubic inches, and holds 77.6274 pounds avoirdupois of distilled water at the temperature of its greatest density, and with the barometer at 30 inches. Its capacity is represented by a cylinder 18.5 inches in diameter and 8 inches deep.

The hundred-weight has been reduced, as in Canada, to 100 pounds, and the ton to 2000 pounds, but the old hundred-weight of 112 pounds, and ton of 2240 pounds, seem still to be used under the designation of the *long hundred weight* and the *long ton*; but these it is presumed are merely permissive, the reduced weights being the standards.

With the few differences pointed out, resulting from comparatively recent legislation in both countries, the weights and measures of the United States are similar to, and it may be said identical with, those of England.

Both countries have the same mile, yard, foot, and inch, the same acre, the same pound avoirdupois, and pound Troy.

And although the measures of capacity have since 1826 been changed in England, the Winchester bushel and wine gallon, the standard measures of capacity in the United States, are mere copies of English prototypes.

CANADA.

We now come to the weights and measures as established by law in Canada. The leading statute upon this subject is an act of the Legislature of Lower Canada, the 39th George III. cap. 7, which is to be found in the Consolidated Statutes of Lower Canada, cap. 62. Under this, three sets of various kinds of beams and scales, and four sets of standard weights and measures were imported from England, and these were declared to be the standard weights and measures of the province.

The weights and measures thus imported, were all made of brass and consisted of:

1.—*Avoirdupois* weights in sets as follows:

From one dram to four ounces,

" ¼ ounce to 4 pounds and

" 4 lbs. to 56 lbs. the standard being respectively 4, 7, 14, 28, and 56 lbs.

2.—Troy weights, in sets.
From ½ a grain to 1 ounce,
" ¼ of an ounce to 64 ounces, and
7 lbs. to 28 lbs. in weights of
7, 14 and 28 lbs.

3.— *Wine* measures, in sets from 1 gill to 1 gallon.

4.— *Winchester* measures, in sets from 1 gill to 1 gallon.

5.— *Winchester* bushels and ½ bushels.

6.—Canada measures (old French measures) from a *poisson* to a *pot.*

7.—The *minot* and ½ *minot.*

8.—" The English standard foot rule."

9.—" The Paris standard foot rule."

10.—The " English standard yard."

11.—The " English standard ell."

1.—The pound *avoirdupois* " with its parts, multiples and proportions," was made the standard weight " for weighing all goods, wares, and merchandise, butcher's meat, flour, meal, bread, biscuit and other commodities whatever, commonly sold by weight " (" gold, silver, coin, bullion, drugs and precious stones only excepted.")

2.—The *pound Troy* was the standard for weighing gold, silver, bullion, drugs and precious stones, as above excepted, from the applications of the avoirdupois weight.

3.—The *wine gallon* was made the standard liquid measure of Lower Canada, for " wine, cider, beer and " spirituous liquors of all kinds, treacle and molasses, and " all other liquids commonly sold by gauge or measure " of capacity."

4.—The *Canada minot* was the standard for measuring " all rents, payable in wheat or other grain, and also for measuring all grains or seeds, fruits or roots whatever, in cases in which no other special provision is made in any

act, and likewise for lime, sand, ashes, or any other kind of commodity, usually sold by measure of capacity, where no special contract is made to the contrary."

5.—The English *Winchester bushel** is made the standard for measuring salt, wheat, oats, peas, barley and other grains or seeds, in cases *only when such articles have been specially sold* or contracted for by such measure, and in cases in which no special provision is made for the mode of sale in any other act.

6.—*The Paris foot* was applicable to the measurement of lands, or lots granted or sold by the arpent or foot, and also, to the measurement of all kinds of wood, timber and stone, and "all manner of masons', carpenters', and joiners' work, or any other article or any other kind of work commonly measured by the foot or other measure of length, etc., where no special contract exists to the contrary."

7.—*The English foot* is applicable to the measure of lands granted by the British Crown, and also to the measure of wood, timber, etc., as above; *provided a special contract has been made for that purpose.*

8.—*The English yard* is made the standard for measuring all kinds of cloth or stuffs made of wool, flax, hemp, silk or cotton, or any mixture thereof, and all other kinds of goods, wares and merchandise commonly sold by measure of length.

9.—*The English ell*, "containing 3 feet 9 inches of the standard English foot" above mentioned, is declared to be the standard measure by which cloth or stuffs of wool, flax, &c. *may* be sold *when specially sold or contracted for by that measure.*

---

* 18½ inches diameter, 8 inches deep. Contents 2150.42 cubic inches. The present imperial bushel contains 2218.1907 cubic inches. —(Simmonds.)

We thus find that the legal weights and measures of Lower Canada have been borrowed from the old English standards as they existed antecedently to 1825, with the addition of certain French measures of length and capacity, *i. e.* the Paris foot, the *minot*, and the *pot*, *pinte*, *chopine* and *poisson*. But the law is silent as to the cases in which the latter measures of capacity are to be applied, and we are left to believe that they are merely legalized as measures by which liquids may be sold in retail, although the declared standard measure of capacity for all liquids, is the wine gallon.

In Upper Canada the measures of length, weight and capacity are the same as in Lower Canada, being derived from the same source, except that no French measure whatever is recognized in the former.

Under the system just described, grains were uniformly sold by the Winchester bushel, or by the minot, as measures of capacity, the cwt. was 112 lbs. and the ton 2,240 lbs. More recent enactments have changed the law in these respects and by acts passed in 1859, to be found in the Consolidated Statutes of Canada, cap. 53, the following is declared to be the *standard weights* which in all cases shall be held to be equal to the Winchester bushel of grains and seed, viz :—

Wheat, peas, beans and clover seed...	60 lbs.
Indian corn and rye.....	56 lbs.
Barley, timothy seed and buckwheat	48 lbs.
Oats.....	34 lbs.

The acts in question do not, however, stop there. The 22nd Vict. chap. 21, prescribes the *weight* which shall be equal to the Winchester bushel of the following articles, viz :—

Potatoes, turnips, carrots, parsnips, beets and onions.....	60 lbs.

Flax seed	50 lbs.
Hemp seed	44 lbs.
Blue grass seed	14 lbs.
Castor beans	40 lbs.
Salt	56 lbs.
Dried apples	22 lbs.
Dried peaches	33 lbs.
Malt	36 lbs.

It may therefore be considered that, as a measure of capacity, the Winchester bushel and the minot are abolished, as standards, except in cases where the parties have specially agreed to buy and sell by measure instead of by weight.

By the same act the hundred-weight of 112 pounds, and the ton of 2240 pounds are abolished, and the hundred-weight is declared to be 100 pounds and the ton 2000 pounds avoirdupois, thus assimilating our hundred-weights and tons to those of our neighbors in the United States, and making one step towards the decimal system of computing weights.

With regard to the verification of the weights and measures of commerce, we find that at an early period of the legislation of Lower Canada, the law which authorized and directed the procuring of standards from England, provided for the annual inspection of weights and measures in the Province, and assigned that duty to certain public officers then known as Revenue Inspectors and now designated by law as Collectors of Inland Revenue.

At the period referred to, one of these officers resided in each of the municipal districts into which Lower Canada was divided—Quebec, Montreal, and Three Rivers,—and to each of these officers was entrusted one of the sets of standard weights and measures imported under the act; the 4th and remaining set being confided

to the custody of the successive clerks of the Legislative Assembly, by whom they were carefully preserved until April 1849, when they were destroyed by the conflagration of the Parliament Buildings at Montreal, thus meeting with the same fate which had twice attended the standard weights and measures of England, deposited in the Exchequer at Westminster.

We are thus left without reliable standards to resort to for the comparison and adjustment of the standards themselves, which are now in use in the various districts of the Province, the accuracy of which may well be questioned, when it is considered that the original sets from which copies have been made, and which are still used for the verification of the weights and measures of commerce, have been in use for upwards of 60 years, thus placing us very much in the condition of some of the States of the American Union, in which, until the subject was taken up by Congress after the Report of 1821, the original standards in many instances had not been verified since the declaration of independence, and in some cases, as in Massachusetts, standard weights had been 100 years without comparison or verification to test their accuracy.

The necessity, therefore, of providing new sets of duly authenticated and reliable English standards, has become paramount, and there can be no doubt that so important a branch of the commercial economy of the Province, will receive the immediate and earnest attention of the government.

GENERAL REMARKS.

Having thus considered what are the recognized legal standards of weights and measures in France, in England, in the United States, and in Canada; we are naturally led to the consideration of the systems themselves, which

have been shown to prevail in those countries—systems which, in the main, resolve themselves into two—that is to say, the French and the English systems, each of which has its advocates, and both of which are unquestionably possessed of great and distinct merits.

Theoretically, the French metrology is admitted to possess uniformity, symmetry, and simplicity, to perfection. Based as it is on a single fundamental unit, divided or multiplied decimally, and with a nomenclature essentially significant of the part or multiple of the thing meant, it cannot be denied that it has great claims upon the serious attention and consideration of civilized nations.

This excellence, however, of the French system, must be viewed in connection with the decimal currency of the country of which it forms a part, the franc being the standard unit of that currency, its subordinate divisions being *decimes and centimes.* It is therefore easy in practice to compute prices and keep accounts, when both the article sold and the money paid are governed by a common rule of decimal computation, the decimal system being avowedly best for counting or *aggregation*; although the binary is preferable for *segregation* or division.

We have seen that several of the continental powers of Europe have already adopted the French system, and the Committee of the House of Commons to which the subject was referred, reported last year in favor of the introduction and adoption of the metrical system in Great Britain.

The evidence given before that committee has thrown considerable light upon the respective merits and advantages of both the French and the English systems, and although the majority of the witnesses vouch for the superiority of the former and advocate its adoption, there will be

found able and weighty arguments in favor of the maintenance of the English system, for which strong predilections naturally exist in a country so steadfastly attached to its own institutions.

It is easy to discover in the evidence of those who would maintain the existing weights and measures in England, the repugnance with which would be seen any radical change in the English system that would be borrowed from a foreign country, and especially perhaps from France, and it is somewhat curious to find that as early as 1791 the existence of that feeling was foreseen as likely to interfere with the extension of the French system to other nations. In the report of the French Commissioners, to be seen in the "*Mémoires de l'Institut, Base du système métrique*," we find the following apologetical language for having selected for admeasurement a meridian in France, and having had the operations carried on by scientific men of that country.

"Enfin nous avons choisi le seul méridien où l'on "puisse trouver un arc aboutissant au niveau de la mer, "coupé par le parallèle moyen (45°) sans être cependant "d'une trop grande étendue qui en rende la mesure "actuelle trop difficile. Il ne se présente donc rien ici "qui puisse donner le plus léger prétexte au reproche "d'avoir voulu affecter une sorte de prééminence.

"En un mot si la mémoire des travaux venait à "s'effacer, si les résultats seuls étaient conservés, ils "n'offriraient rien qui pût servir à faire connaître "quelle nation en a conçu l'idée, en a suivi l'exécution." "*Discours préléms.*

Apart, however, from any national pride that would reject the adoption, by England, of the French metrical system and revive the cry *nolumus leges Angliæ mutari*,

so famous in the days of Henry III, it cannot be denied that there exist strong grounds for hesitating to subvert a system so closely interwoven with the habits and usages of a great commercial people, as that of the weights and measures that have had the sanction of ages.

There is no doubt that, taking a cosmopolitan view of the subject, it would be desirable, as ancillary to international commerce, that common standards of weights and measures should be recognized and adopted by all commercial countries, and it is not at all surprising that the International Statistical Congresses that met in London and in Paris, in connection with the World's Exhibitions in those two great capitals, should have advocated and recommended the metrical system which they considered as best calculated to attain that desideratum. The adoption of a common international standard would unquestionably facilitate the preparation of commercial statistics, and might possibly have a favorable influence upon the commercial intercourse of different countries; but I am inclined to think with Mr. Airy, the Astronomer Royal of England, that the advantage of adopting the French metrical system of weights and measures, on international grounds, "are not worth mentioning in comparison with the difficulty of introducing it."

The French decimal system, combining as it does weights, measures and money, presents certainly a harmonious whole, such as no other known system possesses.—As an invention it is unparalleled for its ingenuity; but it may well be questioned whether its inflexible decimalization, and its fundamental unit, are in perfect harmony with nature. The duodecimal system, with its four factors and its binary character, seems to offer itself most naturally to our adoption. Apart from the mere computation

of numbers, to which decimalism is so peculiarly applicable, it is more allied to the nature of things than the decimal system. It is true man has ten digits, but he has eight fingers and two thumbs. His whole organization is based upon binary principles. His nerves are in pairs. His brain has two hemispheres and six lobes. His teeth are found in two rows of sixteen each. Our globe is divided into hemispheres equatorially or longitudinally. The quadrant is a natural division of the sphere. We have four seasons, and the phases of the moon are computed by quarters. Nature, in fact, seems to delight in binary combinations, and if we descend to the ordinary operations of the mind in the every day pursuits of life, we find the same tendency to halve or double objects of measurement or of weight, as the readiest way of forming a clear conception of quantities.

Under this aspect the English system possesses, in my humble apprehension, advantages over the French, in the every day commerce of life. The French system is theoretically admirable; but it is perhaps too artificial to square with the instincts of man, that are so suggestive of binary divisions, and therefore favorable to a duodecimal system, which is practically more susceptible of them than the decimal.

But this great decimal system which aimed at universality, was repelled by the circle and found unsuitable to the divisions of the day.—Geography and time have retained in France, as elsewhere, their pristine modes of measurement and computation; and the language and calculations of science have so far remained universal.

I have, in the foregoing remarks on weights and measures, abstained from the consideration of the kindred question of a decimal currency. 1st, Because that branch of the subject would be entitled to a fuller examination

than could be given to it here; and secondly, because the decimal system of currency prevails in the United States and in Canada as well as in France, with this difference, that the unit in France is *the franc*, in this Province and in the United States it is *the dollar*.

Of the wisdom or necessity of subjecting weights and measures to the law of decimals, it has been shown that differences of opinion exist; but it seems to be universally admitted that the decimalization of the currency is everywhere desirable, from the facilities it affords in the computation of money, and the simplicity to which it reduces the keeping of accounts.

That a system of weights and measures, based upon binary and duodecimal principles, can harmoniously co-exist with a decimal currency, is amply shown by the experience of our neighbours, who, as a commercial people, are second in the magnitude of their commerce, but to Great Britain. With us, a decimal currency was legalized in 1852, (16 Vict. Cap. 158,) but it was, and continues to be, not compulsory but permissive, the denomination of money in pounds, shillings and pence being still admitted and recognized. By a subsequent act, however, 20 Vict. cap. 18, passed in 1857, it is directed that all the public accounts of the Province shall be kept in dollars and cents—the banks have universally adopted the change, and the decimal currency may be considered as generally established, although the practice still prevails in the retail trade of making up their accounts in the old currency of "£. s. d."

In England the important question of decimalizing the currency has not been overlooked. The commission appointed in 1841-2 to restore the standard measures destroyed in 1834, point out, in their report, the facility of establishing in England a decimal coinage. Their plan

was to interpose a new coin of two shillings between the pound sterling or sovereign and the shilling, and of considering the farthing which is now the $\frac{1}{960}$ part of the pound, as the $\frac{1}{1000}$th of that unit. It proposed to establish a coin equal to the $\frac{1}{100}$ part of a pound, and of circulating besides these principal members of a decimal coinage, other coins of value bearing a simple relation to them, including coins of the same value as the present shilling and the six pence.

It was as a part of the scheme thus proposed that the English florin was coined; but the system, as a whole, was not adopted, and the new coin does not appear to have gone into very general circulation.

I feel that I have trespassed so long on your attention in the examination of a somewhat dry subject, that it would be abusing of your indulgence to protract this paper to any greater length. I would, however, before closing my remarks, throw out the suggestion, whether it would not be possible for nations to adopt two systems of weights and measures, the one of an international and universal character, which would be applicable to foreign commerce, the other suitable to the genius and habits of individual peoples, thus leaving undisturbed the weights and measures of domestic trade, the alterations of which offer every where such insuperable obstacles. International commercial standards might thus be established as contradistinguished from national ones, as the *jus gentium* or law of nations, is distinct from the *jus civile* or municipal law. The intelligence and enlightenment of the higher commercial classes in all countries would, it is believed, render such an object attainable, and obtain for commerce that universal language which, like the notation of music, the nomenclature of botany, and the terms of science, can be read and understood among all civilized nations.

I cannot more happily close this paper, in which I have dwelt upon the French and the English system of weights and measures, than by quoting from the concluding paragraph of Mr. Adams' report, the following eloquent and philosophical language :—

" *Uniformity* of weights and measures, permanent universal uniformity, adapted to the nature of things, to the physical organization, and to the moral improvement of man, would be a blessing of such transcendent magnitude, that, if there existed upon earth a combination of power and will, adequate to accomplish the result by the energy of a single act, the being who would exercise it, would be among the greatest of the benefactors of the human race. But this stage of human perfectibility is yet far remote. The glory of the first attempt belongs to France. France first surveyed the subject of weights and measures in all its extent and all its compass. France first beheld it as involving the interests, the comforts, and the morals of all nations and of all after ages. In forming her system, she acted as the representative of the whole human race present and to come. She has established it by law within her own territories ; and she has offered it as a benefaction to the acceptance of all other nations. That it is worthy of their acceptance is believed to be beyond a question. But *opinion* is the Queen of the world ; and the final prevalence of this system beyond the boundaries of France's power, must await the time when the example of its benefits, long and practically enjoyed, shall acquire that ascendency over the opinions of other nations, which gives motion to the springs and direction to the wheels of power."