SCIENCE

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FRIDAY, MARCH 27, 1896.

CONTENTS:

PROPOSED LEGISLATION IN REGARD TO THE METRIC SYSTEM.

WE have received from Professor J. K. Rees, Secretary of the American Metrological Society: (1) The Report submitted to the House of Representatives on March 16th, by Mr. Chas W. Stone, from the Committee on Coinage, Weights and Measures. (2) A copy of the bill reported unanimously by the Committee on Coinage, Weights and Measures of the House. (3) A letter addressed by the American Metrological Society to persons interested in the Metric System. (4) A petition form to be signed by any and all persons favoring the bill. The Secretary will be glad to supply copies of the petition to those who will obtain signatures. In order to keep a record of all signers, the Society requests that a duplicate list be sent to the office of the Society at Columbia University, New York.

INTRODUCTION AND CONCLUSION OF THE REPORT SUBMITTED BY MR. STONE.

Almost the only power clearly and expressly vested in Congress by the Constitution which has remained practically unexercised to the present day is that of fixing the standard of weights and measures. This power is conferred in the fifth clause of Section VIII. of Article 1, which enumerates among the powers of Congress "to coin money, regulate the value thereof and of foreign coins, and fix the standard of

weights and measures." The same power had also been expressly vested in Congress by the earlier Articles of Confederation, and that part relating to the coinage of money was one of the first exercised, and one in relation to which the power of Congress continues to be most fiercely and passionately invoked to the present day.

In the passage of years the power, carrying with it inferentially the duty, to fix the standard of weights and measures seems to have been largely lost sight of. For more than a generation we lived with no legal standard by which could be determined even the amount of metal which went into the coin that came from our mints. Gallatin procured from France a platinum kilogram and meter in 1821 and from England a troy pound in 1827, and in 1828 the latter was recognized as the standard for mint purposes by the following act:

> For the purpose of securing due conformity in weight of the coins of the United States to the provisions of this title, the brass troy pound weight procured by the Minister of the United States at London in the year eighteen hundred and twenty-seven for the use of the mint and now in custody of the mint at Philadelphia, shall be the standard troy pound of the mint of the United States, conformably to which the coinage thereof shall be regulated.

Meantime both the people and the Government were using such weights and measures as were nearest at hand, derived in the main from the English ancestry, but made by themselves without any authoritative standard for comparison, and as a consequence differing materially from each other. In 1830 the Senate directed the Secretary of the Treasury to have a comparison made of the standards of weight and measure used at the principal custom houses of the United States and report the same to the Senate. This was done, and large discrepancies and errors were found to exist. These discrepancies were nullifying and violating the provision of the Constitution which prescribes that "all duties, imposts and excises shall be uniform throughout the United States." Varying scales and varying measures inevitably produced varying rates of duty. The Treasury Department, therefore, in the exercise of its executive power and as a necessary incident and means to the execution of the law and the observance of the Constitution, adopted for the use of that Department the Troughton scale, then in the possession and use of the Coast Survey, as the unit of length, and the troy pound of the mint as the unit of weight. From the latter the avoirdupois pound was to be derived, assuming that there were 7,000 grains in the pound avoirdupois to 5,760 in the pound troy. For measures of capacity the wine gallon of 231 cubic inches and the Winchester bushel of 2,150.42 cubic inches were adopted. This gave to the Treasury Department the basis of a system of weights and measures to be used in its operations, and in order to promote the general adoption and use of the same throughout the country, Congress, in in June, 1836, adopted the following joint resolution:

> That the Secretary of the Treasury be, and he hereby is, directed to cause a complete set of all the weights and measures adopted as standards, and now either made or in the progress of manufacture for the use of the several custom houses, and for other purposes, to be delivered to the Governor of each State in the Union, or such persons as he may appoint, for the use of the States, respectively, to the end that a uniform standard of weights and measures may be established throughout the Union.

In accordance with this resolution sets of the weights and measures adopted for use in the custom houses were sent to the several States, and only in this indirect and inferential way have the customary weights and measures of the United States been legally recognized. By the Act of March 3, 1881, similar sets of standards were directed to be supplied to the various agricultural colleges which had received land grants from the United States at a cost not exceeding

$200 for each set. This law was complied with as best it could be under the limitation of cost prescribed.

Meantime the metric system had come into extensive use among other nations, and into almost universal use in the realm of exact science the world over. We touched it at every turn in our commercial relations and scientific investigations. Uniformity in weights and measures throughout the the world was urged not only by scientists, but by sagacious business men, seeking to keep pace with the rapidly-growing tendencies to closer commercial and business relations among the nations resulting from the improved facilities of communication and transportation which had largely removed the barriers of space and distance. Hence in 1866 Congress, with the approval of the President, placed on the statute books the following law:

AN ACT to authorize the use of the metric system of weights and measures.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after the passage of this Act it shall be lawful throughout the United States of America to employ the weights and measures of the metric system, and no contract or dealing, or pleading in any court, shall be deemed invalid or liable to objection because the weights or measures expressed or referred to therein are weights or measures of the metric system.

SEC. 2. *And be it further enacted*, That the tables in the schedule hereto annexed shall be recognized in the construction of contracts, and in all leading proceedings, as establishing, in terms of the weights and measures now in use in the United States, the equivalents of the weights and measures expressed therein in terms of the metric system; and said tables may be lawfully used for computing, determining and expressing, in customary weights and measures, the weights and measures of the metric system.

To make this law of practical use the following joint resolution was adopted:

JOINT RESOLUTION to enable the Secretary of the Treasury to furnish each State with one set of the standard weights and measures of the metric system.

Be it resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury be, and he is hereby authorized and directed to furnish to each State, to be delivered to the Governor thereof, one set of standard weights and measures of the metric system for the use of the States respectively.

By inadvertence and without important legal significance the resolutions providing for furnishing the standards became a law before the act authorizing the use of the system. In the same year Congress put it in the power of the Post-Office Department to make extensive use of metric weights in its operations. The law of that year was restated and reënacted in 1872 and now stands in the Revised Statutes in the following terms:

The Postmaster-General shall furnish to the post-offices exchanging mails with foreign countries, and to such other offices as he may deem expedient, postal balances denominated in grams of the metric system, fifteen grams of which shall be the equivalent for postal purposes, of one-half ounce avoirdupois, and so on in progression.

The International Postal Convention of two years later, and which by subsequent renewals is now in force between the United States and fifty other nations, uses only metric weights and terms, and to-day the mail matter transported between this country and other nations, even between the United States and England, is weighed and paid for entirely in terms of metric weights.

Here legislation on the subject of weights and measures rests till 1893. In the meantime important action was taken by the Executive Department of the Government. The progress of science, carrying with it the capability of more accurate observation and measurement, had disclosed the fact that the metric standards in use in different countries differed among themselves, and indicated that even the standards in the archives of France could be constructed with greater precision and accuracy and

preserved with greater safeguards against possible variation from influence of the elements or other forces. Hence France invited the other nations to join in an international commission for the purpose of constructing a new meter as an international standard of length. This country accepted the invitation and was represented in the commission, which met in 1870 and continued its labors from time to time till they were finally consummated in the conclusion of a metric convention signed on May 20, 1875, by the representatives of the following nations, viz.: The United States, Germany, Austria-Hungary, Belgium, Brazil, Argentine Confederation, Denmark, Spain, France, Italy, Peru, Portugal, Russia, Sweden and Norway, Switzerland, Turkey, and Venezuela.

The first name signed to this convention is that of E. B. Washburn, the United States Minister and Representative. The treaty provided for the establishment and maintenance, at the common expense of the contracting nations, of "a scientific and permanent international bureau of weights and measures, the location of which shall be Paris," to be conducted by "a general conference for weights and measures, to be composed of the delegates of all the contracting governments." Beyond the construction and custody of the international standards and the distribution to the several countries of copies thereof, it was expressly provided as to this conference by the terms of the treaty or convention that "it shall be its duty to discuss and initiate measures necessary for the dissemination and improvement of the metrical system." This convention was duly ratified by the Senate, and since that time the United States has been regularly represented in the International Conference and has paid its proper proportion of the cost of maintaining the International Bureau of Weights and Measures. By the terms of the convention the privilege of acceding thereto and thus becoming a party to it was reserved to any nations desiring to avail themselves thereof, and accordingly the following nations have since become parties to the convention, viz., Servia in 1879, Roumania in 1882, Great Britain in 1884, Japan in 1885 and Mexico in 1891.

New standards were prepared with extreme care and accuracy, and duplicate copies thereof distributed to the several nations. Those for the United States were received with much ceremony at the White House, January 2, 1890, by the President in the presence of members of his Cabinet and other distinguished gentlemen, and are now carefully guarded in a fire-proof room set apart for the safe-keeping of the standards of weights and measures in the Coast Survey building.

By formal order of the Secretary of the Treasury of April 5, 1893, the meter and kilogram thus received and kept were recognized as 'fundamental standards' from which the customary units of the yard and pound should be thereafter derived in accordance with the law of July 28, 1866.

Meantime Congress by act of March 3, 1893, established a standard scale for measurement of sheet and plate iron and steel, expressed in terms of both the customary and metric measures. 'An act to define and establish the units of electrical measure' was passed by the Fifty-third Congress and approved July 12, 1894. It is based on the metrical system exclusively.

From this résumé of our legislation on the subject of weights and measures it appears that a legal standard of weight has been established for use in the mint, but that beyond that our weights and measures in ordinary use rest on custom only with indirect legislative recognition; that the metric weights and measures are made legal by direct legislative permission, and that standards of both systems have

been equally furnished by the Government to the several States; that the customary system has been adopted by the Treasury Department for use in the custom houses, but that the same Departmnet by formal order has adopted the metric standards as the 'fundamental standards' from which the measures of the customary system shall be derived. This presents a condition of legal complication and practical confusion that ought not to continue. The constitutional power vested in Congress should be exercised. Before considering how this should be done, it may be instructive to consider the attempts that have heretofore been unsuccessfully made in that direction.

* * * *

Your committee are not blind to the fact that considerable temporary inconvenience will accompany the change, but they believe that this is greatly overestimated and that it will be of short duration. This belief is founded on the experience of other nations less agile and versatile of intellect than we are, but whether the inconvenience be little or great it must some time be encountered, and it will not be decreased by the increase of our population. It will be no easier for a hundred millions of people ten years hence to make the change than for seventy millions to-day. It is simply a question whether this generation shall accept the annoyance and inconvenience of the change largely for the benefit of the next, or shall we selfishly consult only our own ease and impose on our children the double burden of learning and then discarding the present 'brain-wasting system.' The present generation must meet this test of selfishness or unselfishness, and answer to posterity for duty performed or neglected. The neglect of our fathers cannot justify us. They delayed for a greater light and clearer way. Passing years have brought the light, and the action of other nations has cleared the way.

A nation ordinarily progressive can not longer afford to linger in the rear of this great movement. A position of isolation is not consistent with American capacity or American destiny. Her sister American republics have appealed to this country to unite with them in this great reform. Her great Secretary of State joined in this appeal. Successive Secretaries of the Treasury, including the present head of that Department, have formally recommended it. Other eminent citizens, many representatives of a great commercial interest, the prevailing sentiment among her educators, the practically unanimous voice of her scientific men, ask for this legislation. By formal memorial the Governor and Legislature of a sovereign State join in this appeal. The experience of other nations confirms the belief in its wisdom. The commercial interests of our people, the economy of time, the saving of effort, even national honor, demand action on this subject.

The signature of our duly accredited representative leads the signatures to the compact of 1875, creating an agency "to discuss and initiate measures necessary for the dissemination and improvement of the metrical system," and since then she has been one of the largest contributors and most prominent actors in the work of guarding and testing the international metric standards and of constructing and distributing prototype copies of the same to other nations. On what theory are we thus zealously engaged in the 'dissemination' of the metric system except that its universal use is desirable; and if desirable for the other nations, why not for the United States? "With what measure ye mete, it shall be measured to you again."

In 1888 (by resolution of May 24) this country invited the republics of Central and South America, Mexico, Haiti and San Domingo, to a conference to be held in the city of Washington to consider among other things 'the adoption of a uniform system

of weights and measures.' The invitation was accepted; the conference was held. To the extent of its power it adopted a uniform system of weights and measures. The other nations, parties to the conference, with scarcely an exception have honorably proceeded to put in force in their respective limits the metric system thus adopted. On what principle of international honor can the United States, the originator of the conference, stand alone in refusing or delaying to abide by its action? What possible motive can this country have in thus coquetting longer on this subject with the nations of Europe and her sister republics? Having sought the verdict of a tribinal of our own choosing shall we fail to stand by its decision? A nice sense of honor, no less than her own interests, would seem to demand from the United States definite and complete action which should put her in full accord on this subject with the nations with which she has so long ostensibly been coöperating.

Your committee in the investigation of this subject have not only heard such gentlemen as saw fit to come before them, but they sought the views of officers of the Government whose work would be most directly affected by the proposed change. They have examined the facts submitted to former committees of this House, and have availed themselves of the testimony lately taken before the committee of the House of Commons of England in their investigation of this subject extending over several months. They have sought to learn by letters of inquiry to the Superintendent of Public Instruction of each of the States, as well as the Commissioner of Education of the United States, the extent to which instruction is now afforded in the metric system in the various States. The replies indicate that this instruction varies much as the educational progress of the States varies. Utah has placed in her constitution a provision requiring such instruction in all the public schools. In all the States the instruction is largely abstract and theoretical, and necessarily so, but the moment the system goes into practical operation, or it becomes certain that it is to go into operation at no very distant date, the character of the instruction will at once change and become practical. The English school authorities are already furnishing to schools asking for them actual specimens of the liter, meter, etc., and a similar course by the school authorities of this country would be wise.

Your committee, after a careful consideration of this subject, have unanimously reached the conclusion that the metric system of weights and measures should be put into exclusive use in the various Departments of the Government at such future date as shall allow adequate preparation for the change, and at the end of a fixed time thereafter that said system shall be recognized as the only legal system for general use. They, however, do not deem it wise at present to require a change in the methods of surveying the public lands, as this would in that respect destroy rather than promote uniformity.

Your committee also deem it prudent to enlarge the time for the proposed system to take effect to a date somewhat later than the date proposed in the bill submitted, adopting for this country about the average time deemed necessary by other nations. Your committee, therefore, recommend that the time for adoption in the Departments and operations of the Government, except in the completion of the survey of the public lands, be fixed for July 1, 1898, and that the adoption of the metric system for use in the Nation at large be fixed as coincident with the dawn of the twentieth century, and that date be accordingly changed to January 1, 1901, the first day of the new century.

Your committee also deem some changes

in phraseology desirable in the proposed law to avoid ambiguity and uncertainty. To most clearly and intelligently express those proposed changes and the scope of the bill after they are made, your committee have embodied them in a substitute bill which they report herewith and respectfully recommend that it do pass.

A BILL to fix the standard of weights and measures by the adoption of the metric system of weights and measures.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after the first day of July, eighteen hundred and ninety-eight, all the Departments of the Government of the United States, in transaction of all business requiring the use of weight and measurement, except in completing the survey of the public lands, shall employ and use only the weights and measures of the metric system.

SEC. 2. That from and after the first day of January, nineteen hundred and one, the metric system of weights and measures shall be the only legal system of weights and measures recognized in the United States.

SEC. 3. That the metric system of weights and measures herein referred to is that in which the ultimate standard of mass or weight is the international kilogram of the International Bureau of Weights and Measures, established in accordance with the convention of May twentieth, eighteen hundred and seventy-five, and the ultimate standard of length is the international meter of the same bureau, the national prototypes of which are kilogram numbered twenty and meter numbered twenty-seven, preserved in the archives of the office of standard weights and measures.

SEC. 4. That the tables in the schedules annexed to the bill authorizing the use of the metric system of weights and measures passed July twenty-eighth, eighteen hundred and sixty-six, shall be the tables of equivalents which may be lawfully used for computing, determining and expressing the customary weights and measures in the weights and measures of the metric system.

LETTER SENT ON MARCH 15, 1896, FROM THE OFFICE OF SECRETARY, AMERICAN METROLOGICAL SOCIETY, COLUMBIA UNIVERSITY, NEW YORK.

DEAR SIR: You are aware, no doubt, that the Committee on Coinage, Weights and Measures, of the House of Representatives, Hon. C. W. Stone, Chairman, has directed that a favorable report be made, to the House, of a bill making the use of the metric system obligatory in the United States after certain dates named in the bill. The bill reported is a substitute for the Hon. D. M. Hurley's bill. A copy of the substitute bill is enclosed.

It is very important that all interested in this bill should act promptly and vigorously.

If you are in favor of the bill sign the enclosed petition and obtain on it the signatures of friends in your neighborhood. Mail the signed petition, with a personal letter, as soon as practicable, to your Representatives in Washington, D. C. Kindly send the Society a postal card stating when you sent the petition and the number of names signed.

The Society would be glad to know the condition of feeling toward the metric system in your vicinity.

Yours respectfully,

B. A. GOULD,
President.
J. K. REES,
Secretary.

FORM OF PETITION.

The undersigned citizens residing in his Congressional District respectfully urge the Honorable Mr. ———— to consider favorably and vote for the bill reported to the House of Representatives by the Committee on Coinage, Weights and Measures, to fix the standard of weight and measures by the adoption of the metric system of weights and measures.

ON THE REFLECTION OF THE RÖNTGEN RAYS FROM PLATINUM.

THE interest connected with this subject led me on March the 9th to undertake a