SCIENCE

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THE STORY OF THE ESTABLISHMENT OF THE NATIONAL BUREAU OF STANDARDS.

THE passage of a bill, during the closing days of the last session of Congress, providing for the establishment of a National Bureau of Standards, came as a surprise to many. As the work of this bureau ought in the future to have a large bearing upon science and industry it may not be without interest to record the circumstances under which this legislation was effected, and to bring to the attention of those who in the future may be interested in the matter the names of a few men who, though not men of science, gave their time and labor heartily in the interest of this work. It has so happened that, although my own part in this has been very small, the circumstances have been known to me.

The National Bureau of Standards, as the new title reads, grew out of what has been called for many years the Office of Weights and Measures. In the early thirties large discrepancies were discovered in the weights and measures of the United States in the various custom-houses, and Congress authorized the Secretary of the Treasury to establish a shop for the manufacture of uniform standards. In 1836 provision was made for similar standards for the different states, and the 'Office of Standard Weights and Measures' was established.

The Office of Weights and Measures while in law a separate bureau of the Treasury Department, has been practically a part of the United States Coast and Geodetic Survey, and has been, since its organization, under the direction of the superintendent of that bureau. During its existence standards of weights and measures have been furnished to most of the states, and a great impetus has been given to the adoption by international agreement of the metric system. In its custody are kept the international kilogram and meter, and it has for years done a valuable work in the standardizing of steel tapes, thermometers and similar measuring instruments; while more recently it has begun the standardizing of electrical instruments.

On coming to the Coast Survey in 1897 I found the Office of Weights and Measures engaged in the work which I have just mentioned. In its service were two scientific assistants, an instrument maker and a messenger, and a small appropriation was made for office expenses. The work was under the charge of a field officer of the Coast Survey. The arrangement by which a field officer was in this way detailed temporarily for this duty did not seem to me good administration; it deprived the Coast Survey of the service of a much-needed officer, and in addition there was required for this duty not a surveyor but a physicist. I therefore asked Congress to appropriate a salary sufficiently large to induce a physicist of high standing to take charge of the office, under direction of the superintendent. An appropriation of $3,000 was made. With this sum some difficulty was found in inducing any physicist of standing and reputation to accept the place, and only after many interviews and considerable correspondence I succeeded in persuading Professor S. W. Stratton, of the University of Chicago, to become a candidate. The appointment to the position was made after competitive examination.

Mr. Stratton, after coming to the bureau, was instructed to make a report upon the work and efficiency of the office as then constituted, and to recommend, if it seemed advisable, a plan for its enlargement into a more efficient bureau of standards, which might perform in some measure for this country the work carried on by the Reichsanstalt in Germany.

Mr. Stratton entered heartily into this work, and the outcome of his examination was the preparation of a scheme for a National Bureau of Standards. This plan, after being discussed in the office of the Coast Survey, and receiving the criticism of Assistant Superintendent Tittmann and others acquainted with the history of such work abroad, was submitted to a number of physicists, chemists and manufacturers of the country. After their criticisms had been digested a final plan for the bureau was drawn, which is practically that submitted to Congress. In all of this work Mr. Stratton endeavored to avail himself not only of the criticism of those at home, but also of the work which has been done abroad; and the bureau as finally planned is not intended to be simply a copy of the Reichsanstalt, but a standardizing bureau adapted to American science and to American manufacture.

When the final plan had in this way been agreed upon, it was incorporated into a bill and placed before Secretary Gage and Assistant Secretary Vanderlip, of the Treasury Department. The idea at once commended itself to their judgment, and Secretary Gage entered most heartily into a study of the purpose of the proposed bureau, and of the relations which it might have with industry, with commerce and with science. Supported by his hearty advocacy the bill went to the house and was

referred to the committee on Coinage, Weights and Measures. The measure was before this committee two sessions, and received from its members long and serious consideration. There appeared before the committee at one time and another, not only men of science, but manufacturers and engineers who were competent to speak on such matters. Amongst all those who appeared in favor of the bill, both before the committee of the House and the committee of the Senate, there was none whose opinion had more weight than that of the Secretary of the Treasury, Mr. Gage. The following extract from his testimony before the Senate committee is worth remembering in the history of this matter as the suggestion of a high officer of the government who appreciated not only the direct commercial results of the measure, but also its indirect moral effect:

> There is another side to this which occurs to me. It may appear to many to have a more sentimental than practical value, but it gives the proposition, to my mind, great force, and that is what might be called the moral aspect of this question; that recognition by the government of an absolute standard, to which fidelity in all the relations of life affected by that standard is required. We are the victims of looseness in our methods; of too much looseness in our ideas; of too much of that sort of spirit, born out of our rapid development, perhaps, of a disregard or a lack of comprehension of the binding sanction of accuracy in every relation of life.
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> Now, the establishment of a bureau like this, where the government is the custodian and the originator of these standards of weights and measures as applied to all the higher scientific aspects of life which we are so rapidly developing in, has, to my mind, a value far and above the mere physical considerations which affect it, although those physical considerations are fundamental and most important. Nothing can dignify this government more than to be the patron of and the establisher of absolutely correct scientific standards and such legislation as will hold our people to faithfully regard and absolutely obey the requirements of law in adhesion to those true and correct standards.

The bill for the establishment of the bureau received at the hands of the Committee on Coinage, Weights and Measures a consideration seldom given to such a measure, and when it was finally reported it received from that committee on the floor of the House a support which indicated their appreciation of its importance and value. In particular the names of the chairman of the committee, Hon. James H. Southard, of Ohio; and Hon. John F. Shafroth, of Colorado, deserve special mention. In the closing days of the fifty-sixth congress, when it was doubtful whether the speaker could permit consideration of the measure, Mr. Southard kept his seat day after day, and even night after night, in order that no opportunity might slip by when the speaker might be able to recognize him for the passage of the bill. In the splendid new building which Congress has provided for the housing of this bureau, and which is to become in the future the home of the great influence which it will exert on science and on industry, two names of those who had to do with its successful inception, so far as legislation is concerned, may well be placed high on its walls; and these are the names of Lyman J. Gage, Secretary of the Treasury, and James H. Southard, Chairman of the Committee on Coinage, Weights and Measures.

In the Senate, also, the bill received friendly consideration at the hands of the Committee on Commerce.

Looking back over the history of this legislation, which was effected without the help of any lobby, at the recommendation of a few men qualified to speak on such matters, it is evident that it has been the result, in the first place, of the work of those who founded the Office of Weights and Measures; of the influence of the scientific recommendations of the last twenty years looking toward the enlarge-

ment of that bureau, and of the intelligent interest of the Secretary of the Treasury and of the Chairman of the Committee on Coinage, Weights and Measures. And finally, but by no means least in importance, the successful outcome is due to the intelligent way in which this bill was placed by Mr. Stratton before the committees in the House and in the Senate. The enactment of such a measure ought to reassure scientific men in their judgment of the relation of Congress to legislation in such matters, since it shows that such legislation can be had without the help of any lobby, without the stimulus of personal interest on the part of Congress, if there is presented a clear and satisfactory reason for such legislation by those in whom Congressmen themselves have confidence.

Another feature of this bureau, which is unique, will also be watched by scientific men, as time goes on, with great interest, and that is the provision under which a visiting committee of five men, not connected with government service, report each year on the efficiency and needs of the bureau. I shall be greatly disappointed if this does not have a wholesome effect on the bureau itself, and on the relations of the bureau with Congress and with the department. It is scarcely possible that a Secretary of the Treasury will dismiss from office a competent head of the bureau who is supported courageously by this committee, nor will he appoint to the office of director a man whom they consider incompetent and unsuitable. If out of this relation there comes a wholesome criticism and a quickening of the scientific spirit, one may well hope that this feature may find a place in other departments of government scientific work.

Henry S. Pritchett.

THE ASTRONOMICAL AND ASTROPHYSICAL SOCIETY OF AMERICA.

II.

The Constant of Aberration: C. L. Doolittle.

For some time a revision of the latitude work carried on at the Sayre Observatory, Bethlehem, Pa., from 1876 to 1895, has been in progress with the view to its publication in a complete and final form. The first fasciculus of this publication appeared in the spring of 1901 and it is hoped that the remainder may be in form for the printer in the course of two or three months.

The present communication deals primarily with the value of the constant of aberration resulting from the series of observations extending from October 10, 1892, to December 27, 1893. A preliminary solution of the problem was published in the *Ast. Journal,* No. 406, 1897, which may be consulted for a fuller statement as to the method employed. The micrometer screw had become much worn by constant use for several years and the value was not constant throughout the series. Also the progressive errors which had been previously determined by means of Harkness' measuring engine were no longer applicable. It seemed very desirable that the screw value should be derived from the latitude observations themselves, but at the time spoken of the star declinations were not known with the requisite precision. For these reasons there was some hesitation as to the desirability of publishing the preliminary result, as it was thought possible that a considerable error might be involved. Recently a very careful discussion of the declinations has furnished the required data, and a result obtained which seems entirely free from the above named objections.

From the method of observing it is not possible to separate the correction to the aberration constant from the latitude vari-