CHAPTER XV

BUREAU OF STANDARDS

The Constitution vests the Federal Government with power to "fix the Standard of Weights and Measures," and from the beginning of the Republic many of the foremost statesmen and scientists have worked assiduously to bring our system of weights and measures to a more satisfactory and scientific condition. Washington recognized this as one of the important subjects committed to Congress by the Constitution, and repeatedly urged the necessity for uniform and reliable standards. In 1790 Thomas Jefferson, Secretary of State, was directed by Congress to investigate this subject, and after a most careful consideration submitted a report in which he suggested important reforms, which were not, however, adopted.

A reference to the subject of weights and measures appears in the act approved March 2, 1799 (R. S. 2627), where it was ordered, among other things, that "The surveyor (of each port of the United States) shall from time to time, and particularly on the first Monday in January and July in each year, examine and try the weights, measures, and other instruments used in ascertaining the duties on imports, with standards to be provided by each collector." Apparently this act was not enforced, probably for the reason that no standard had been adopted by Congress or by the Treasury Department. In 1817 President Madison reminded Congress that nothing had been accomplished in reforming and unifying the weights and measures, whereupon the whole subject was referred to John Quincy Adams, then Secretary of State. Mr. Adams, after four years of research, prepared a report which has become a classic in metrology; in it he advised the adoption of a universal standard by international agreement.

By Senate resolution of May 29, 1830, the Secretary of the Treasury was directed to have an examination made of the weights and measures in use at the principal custom-houses, and, as was expected, large discrepancies were discovered. As a consequence, the Secretary of the Treasury directed that standards be adopted by the Treasury Department, and that copies be made and distributed to the various custom-houses. The avoirdupois pound was adopted as the standard of weight, and the distance between certain lines on a brass bar in the
possession of the Department, and supposed to conform with the English yard, was taken as the standard of length. In June, 1836, Congress directed further that the Secretary of the Treasury should furnish each State with copies of these standards.

By act approved July 28, 1866, the use of the metric system of weights and measures was legalized, and the Secretary of the Treasury was directed to furnish each State with a set of standard weights and measures of this system.

In 1875, more than half a century after Adams had recommended a conference between nations for the purpose of establishing world-wide uniformity in standards, such a conference was held, and as a result there was established in Paris a permanent International Bureau of Weights and Measures. The Bureau thus established undertook the construction of prototypes of the metric standards, and in 1889 these were ready for distribution among the seventeen nations represented at the international conference. Two meters and two kilograms were sent under seal to the United States by special messengers, and were opened at the White House in the presence of the President, the Secretary of State, and a distinguished company of scholars.

The custody of the standards referred to above, and the execution of the provisions made by Congress, remained until July 1, 1901, under the direction of the Superintendent of the Coast and Geodetic Survey, Treasury Department, in his capacity as Superintendent of the Office of Standard Weights and Measures. The facilities of the latter office were exceedingly limited, and the exercise of its functions confined to departments of the General Government and the States.

The progress of science and the employment of exact scientific methods by the great industrial and commercial enterprises had brought about conditions which demanded radical changes in matters pertaining to standards. Whatever might have been said as to the necessity of improvement in the common measures of weight, length, and capacity, was equally true of the more accurate measures of these same quantities. Scientific investigators and manufacturers required for their work standards of the very highest order of accuracy and of far greater variety than those previously employed. Among these may be mentioned standards of high and low temperatures, pressure, illumination, electrical standards, and many others.

The benefits accruing to the public from fixed and reliable standards are obtained through the medium of a great variety of meters and precise measuring apparatus. That the graduations and indications of these instruments should agree with the fundamental standards is of vital importance; and without such agreement the public is deprived of the very benefits sought in establishing the standards. German and English makers of scientific apparatus furnish official certificates with their apparatus, and the value of such certificates was so well
recognized that our own manufacturers quoted prices on their apparatus which had been verified in the standardizing institutions of foreign governments.

It was this condition of affairs that led Congress to enact a law March 3, 1901, establishing the National Bureau of Standards, the functions of which include the custody of the official standards, the comparison of all standards used in scientific investigations, engineering, manufacturing, commerce, and in educational institutions, with the standards adopted or recognized by the Government; the construction, when necessary, of standards, their multiples and subdivisions; the testing of standard measuring apparatus, and the solution of problems which arise in connection with standards. It is also authorized to make physical and chemical researches for the purpose of determining physical constants and the properties of materials, when such data are of great importance to scientific or manufacturing interests. The Bureau is authorized to exercise its functions for educational institutions, firms, corporations, or individuals engaged in manufacturing or other pursuits requiring the use of standards, or standard measuring instruments.

The relation of the Bureau to the various branches of manufacturing is very important—far more important and comprehensive than that of a mere standardizing institution. It can not be expected that an engineer or manufacturer can keep in touch with the scientific literature of this and other countries; hence the Bureau is also intended to be a source of information along scientific lines for manufacturers and engineers. The progress of manufacturing and many commercial industries is closely connected with the scientific development of the country.

A site was purchased by the Government in the northwestern suburbs of Washington, in a locality free from mechanical and electrical disturbances. Two laboratories, suitably equipped for carrying on investigations, and testing standards and measuring instruments of all kinds, are in process of construction. The scientific work of the Bureau is under the immediate supervision of a Director, assisted by a corps of physicists and chemists.

The name "Office of Construction of Standard Weights and Measures" was first used in the appropriation act of August 5, 1882. As before stated, the act of March 3, 1901, separated the National Bureau of Standards from the Coast and Geodetic Survey, and made it an independent bureau of the Treasury Department, where it remained until, on July 1, 1903, it became a part of the Department of Commerce and Labor, under the provisions of the law establishing that Department, approved February 14, 1903. By order of the Secretary of Commerce and Labor, the name "Bureau of Standards" was adopted July 1, 1903.
Prof. S. W. Stratton has been at the head of the Bureau since its organization in 1901.

The use of the facilities of the Bureau of Standards for research and study by scientific investigators and students of any institution of higher education is granted by law (31 Stat., 1039) and resolution of April 12, 1892. (See page 153.)

**LAW PERTAINING TO THE BUREAU OF STANDARDS**

[As modified by act of February 14, 1908.]

The Congress shall have Power to * * * fix the Standard of Weights and Measures.

The Office of Standard Weights and Measures shall hereafter be known as the Bureau of Standards. The functions of the bureau shall consist in the custody of the standards; the comparison of the standards used in scientific investigations, engineering, manufacturing, commerce, and educational institutions with the standards adopted or recognized by the Government; the construction, when necessary, of standards, their multiples and subdivisions; the testing and calibration of standard measuring apparatus; the solution of problems which arise in connection with standards; the determination of physical constants and the properties of materials, when such data are of great importance to scientific or manufacturing interests and are not to be obtained of sufficient accuracy elsewhere.

The bureau shall exercise its functions for the Government of the United States; for any State or municipal government within the United States; or for any scientific society, educational institution, firm, corporation, or individual within the United States engaged in manufacturing or other pursuits requiring the use of standards or standard measuring instruments. All requests for the services of the bureau shall be made in accordance with the rules and regulations herein established.

The officers and employees of the bureau shall consist of a director, at an annual salary of five thousand dollars; one physicist, at an annual salary of three thousand five hundred dollars; one chemist, at an annual salary of three thousand five hundred dollars; two assistant physicists or chemists, each at an annual salary of two thousand two hundred dollars; one laboratory assistant, at an annual salary of one thousand four hundred dollars; one laboratory assistant, at an annual salary of one thousand two hundred dollars; one secretary, at an annual salary of two thousand dollars; one clerk, at an annual salary of one thousand two hundred dollars; one messenger, at an annual salary of seven hundred and twenty dollars; one engineer, at an annual salary

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*Name added July 1, 1903.*
of one thousand five hundred dollars; one mechanician, at
an annual salary of one thousand four hundred dollars;
one watchman, at an annual salary of seven hundred and
twenty dollars, and one laborer, at an annual salary of six
hundred dollars.\(^a\)

The director shall be appointed by the President, by
and with the advice and consent of the Senate. He
shall have the general supervision of the bureau, its
equipment, and the exercise of its functions. He shall
make an annual report to the Secretary of Commerce and
Labor, including an abstract of the work done during the
year and a financial statement. He may issue, when neces-
sary, bulletins for public distribution, containing such in-
formation as may be of value to the public or facilitate
the bureau in the exercise of its functions.

The officers and employees provided for by this Act,
except the director, shall be appointed by the Secretary
of Commerce and Labor, at such time as their respective
services may become necessary.

The following sums of money are hereby appropriated:
\(\ast\) \(\ast\) \(\ast\) toward the erection of a suitable laboratory, of
fireproof construction, for the use and occupation of said
bureau, including all permanent fixtures, such as plum-
ing, piping, wiring, heating, lighting, and ventilation, the
entire cost of which shall not exceed the sum of three hun-
dred and twenty-five thousand dollars,\(^b\) one hundred thou-
sand dollars; for equipment of said laboratory, the sum of
ten thousand dollars; for a site for said laboratory, to be
approved by the visiting committee hereinafter provided
for and purchased by the Secretary of the Treasury,
the sum of twenty-five thousand dollars, or so much thereof
as may be necessary; \(\ast\) \(\ast\) \(\ast\) expenses of the visiting
committee, and contingencies of all kinds, the sum of
five thousand dollars, or so much thereof as may be nec-
essary, to be expended under the supervision of the Sec-
retary of Commerce and Labor.

For all comparisons, calibrations, tests, or investiga-
tions, except those performed for the Government of the
United States or State governments within the United
States, a reasonable fee shall be charged, according to a
schedule submitted by the director and approved by the
Secretary of Commerce and Labor.

The Secretary of Commerce and Labor shall, from
time to time, make regulations regarding the payment of
fees, the limits of tolerance to be attained in standards
submitted for verification, the sealing of standards, the
disbursement and receipt of moneys, and such other mat-
ters as he may deem necessary for carrying this Act into
effect.

There shall be a visiting committee of five members, to
be appointed by the Secretary of Commerce and Labor,
\(\text{Appointments, Sec. 5.}\)

\(\text{Appropriation Items, Sec. 7.}\)

\(\text{When fee is charged, Sec. 8.}\)

\(\text{Secretary of Commerce and Labor to make}
\text{regulations, Sec. 9.}\)

\(\text{Visiting committee, Sec. 10.}\)

\(a\) Appropriation act of April 28, 1902, increased the number of em-
ployees to 28, and act of February 25, 1903, increased the number to 58.
\(b\) Act of June 6, 1902.
to consist of men prominent in the various interests involved, and not in the employ of the Government. This committee shall visit the bureau at least once a year, and report to the Secretary of Commerce and Labor upon the efficiency of its scientific work and the condition of its equipment. The members of this committee shall serve without compensation, but shall be paid the actual expenses incurred in attending its meetings. The period of service of the members of the original committee shall be so arranged that one member shall retire each year, and the appointments thereafter to be for a period of five years. Appointments made to fill vacancies occurring other than in the regular manner are to be made for the remainder of the period in which the vacancy exists.