



# Weights and Measures Standards of the United States

## *a brief history*

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A historical account is given of the standards of weights and measures of the United States from the time of the American Revolution through the year 1962.\* Current and historical standards of length and mass now in the possession of the National Bureau of Standards are listed and described.

### 1. Introduction

When a housewife buys a quart of milk, when a mid-western farmer sells his grain crop—in all present-day commercial transactions—there is an implied faith that as goods are exchanged for money there is the same just balance for buyer and seller. In the early days of this country such faith was often lacking. Great variation existed in the weights and measures used in different localities, and even, at times, in those used by different individuals in the same locality. The transition from this chaotic situation to the present uniformity of weights and measures has resulted from the establishment of accurate, reliable national standards of length and mass and the enactment of comprehensive weights and measures statutes.

The present highly precise, and extremely stable national standards for these quantities were not achieved overnight, or even in a decade. They are the results of a long period of gradual evolution based on the dedicated efforts of men who recognized the growing need for accuracy of measurement. The story of this development is an interesting one that is of considerable historical importance, and is told in the pages that follow.

In 1905, Louis A. Fischer, then Chief of the Metrology Division of the National Bureau of Standards, presented a historical treatment of the United States standards of weights and measures before the First Annual Meeting of the Sealers of Weights and Measures of the United States. Although a great deal has occurred in weights and measures since then, Fischer's account has come to be considered a classic and will be used freely in the present publication, either verbatim or with such modifications as seem appropriate.

Fischer's paper was published first in the Proceedings of the First Annual Meeting of the Sealers of Weights and Measures (now the National Conference on Weights and Measures), then published in volume 1 of the Bulletin of the Bureau of Standards, then as a reprint designated as Scientific Paper No. 17 of the Bureau of Standards, and finally as Miscellaneous Publication No. 64 of the National Bureau of Standards, an illustrated edition of the address designated as a memorial to Fischer. Even though this last publication has long been exhausted, demands for it still continue, emphasizing the present need for an up-to-date historical treatment.

\* The addendum on page 25 covers the period 1963–1976.

The place of Louis A. Fischer in metrology has been so ably described in the Foreword to Miscellaneous Publication No. 64 that it is reproduced here verbatim.

As a matter of historical record, it is appropriate here to comment briefly upon Mr. Fischer's career as a metrologist, which began with his entry, in 1880, into the service of the Office of Standard Weights and Measures of the Coast and Geodetic Survey. Starting in the workshop, where he was trained in the fabrication of precise standards, he served in all branches of the work up to the making of the most accurate determinations of length and mass, and by 1898 he was in immediate charge of the weights and measures office. When the Bureau of Standards was established in 1901 that office was made a part of the new bureau, and in the new organization became the division of weights and measures of the Bureau of Standards. Mr. Fischer was at once made chief of this division, a position which he filled with conspicuous credit from that time continuously until his death in 1921, except while on duty with the United States Army during World War I.

Throughout the nearly 20 years of his service with the Bureau of Standards, Mr. Fischer was prominently identified with every movement in the United States having to do with the science of metrology or the supervision of commercial weights and measures. He became one of the world's foremost experts in the comparison of fundamental precision standards of length, his work at the International Bureau of Weights and Measures in the recomparison of certain meter bars being especially noteworthy and laying the foundation for a thorough intercomparison of all national prototypes with the international standard.

Mr. Fischer's services during the World War were of inestimable value. As technical advisor of the War Department in gauge standardization he was in large measure responsible for the efficient manufacture and inspection of munitions in the many plants throughout the country, by reason of his thorough practical knowledge of the subject and the tireless energy he displayed in standardizing and

coordinating the manufacturing processes and the activities of the hundreds of establishments engaged in this vital work.

Nor were his achievements less noteworthy in the more prosaic field of supervision of the weighing and measuring devices used in everyday commercial transactions. Appreciating as he did the fact that fundamental standards of precision mean but little to the business life of a community until these standards are translated into accuracy at the merchants' counters, Mr. Fischer unceasingly devoted his energies to the task of developing efficient and comprehensive weights and measures supervision on the part of the several States and their local subdivisions, to which agencies the Congress has left the administration of this important function of government. As early as 1905 he conceived the idea of an annual conference of State and local officers charged with the control of weights and measures in their respective jurisdictions, and in that year called a meeting of such officers as were then engaged, directly or indirectly, in this work. This first meeting had a total attendance of but 11 persons, and it was before this small gathering that Mr. Fischer delivered the paper which is published herewith, and which has since become the classic reference on this subject. From its humble beginning, however, the Annual Conference on Weights and Measures has grown until today it is truly national in its scope, and numbers among its members weights and measures officers from all parts of the United States, as well as scores of others, representatives of business and industry, who are interested in its objects and accomplishments. With the Conference as one of the important mediums through which to work, Mr. Fischer was unceasing in his efforts to carry to others his own firm conviction of the tremendous importance to every community of adequate weights and measures supervision, and to instill into those entrusted with the administration of weights and measures laws his own high ideals of the responsibility which is theirs and of the service which they should render. As a result, it may truly be said that Louis A. Fischer is the father of what we know today as weights and measures control in the United States.

## 2. Early History of Weights and Measures in the United States

Throughout its early history, the United States Government showed extensive interest in uniform weights and measures; several efforts were made to secure international agreements in this field. This interest has continued through the years and is stronger now than ever before.

The history of the original Confederation of States and of the constitutional government of the United States reveals much evidence of the perplexities arising from the diversity of weights and measures among the States and of the desirability of a uniform system.

The weights and measures in common use in this country at the time of the American Revolution were practically all of English origin and were intended to be equivalent to those used in England at that period. The principal units were the yard, the avoirdupois pound, the gallon, and the bushel. More or less authentic copies of the English standards of the denominations mentioned had been brought over from time to time and adopted by the different colonies.

Divergencies in these weights and measures were, however, quite common, due no doubt to the fact that the system of weights and measures of England was not itself well established, and hence the copies brought to this country were often adjusted to different standards.

That this condition was recognized very early is made evident by the Articles of Confederation, ratified by the colonies in 1781, which contained the following clause: "The United States in Congress assembled shall also have the sole and exclusive right and power of regulating the alloy and value of coin struck by their own authority, or by that of the respective States—fixing the standard of weights and measures throughout the United States— . . . ." This power was transferred to Congress by the Constitution of the United States, effective 1789, in article 1, section 8, which reads: "The Congress shall have Power . . . To coin Money, regulate the Value thereof, and of foreign Coin, and fix the Standard of Weights and Measures."