WEIGHTS AND MEASURES ADMINISTRATION

NATIONAL BUREAU OF STANDARDS
HANDBOOK 82

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

WEIGHTS AND MEASURES ADMINISTRATION

Prepared by the
Office of Weights and Measures

NATIONAL BUREAU OF STANDARDS
HANDBOOK 82

Issued June 22, 1962

Recommended by the
National Conference on Weights and Measures

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*
NATIONAL BUREAU OF STANDARDS
A. V. Astin, *Director*

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Without a scientific form in these inquiries, by which the results are worked out from their principles, it is impossible to give to that establishment the credit necessary to secure confidence, and make it acceptable.

The accuracy aimed at must be far greater than might at a first glance appear necessary, if that which is indispensable is to be secured with certainty, and proved so fully as to command confidence; thence time, care, and assiduity, cannot be spared in the operation.

Ferdinand Rudolph Hassler—1832

Foreword

The present Handbook supersedes and is a revision of National Bureau of Standards Handbook 26, issued in 1941. The original title is retained. The exhaustion of the stock of copies of Handbook 26 afforded an opportunity to bring the text up-to-date, to take cognizance of recent trends in the organization of State activities, and to incorporate some new material.

Copies of the manuscript of the revision were made available for technical and editorial review to the members of the Weights and Measures Advisory Committee to the Director of the National Bureau of Standards. This Committee, as constituted at that time, included P. C. Brinkley, Commissioner, Virginia Department of Agriculture and Immigration; R. E. Meek, Director, Division of Weights and Measures, Indiana State Board of Health; E. C. Westwood, City Sealer of Weights and Measures, Salt Lake City, Utah; Dr. L. J. Gordon, Director, Weights and Measures Research Center, Denison University, Granville, Ohio; L. T. Gustafson, General Sales Engineer, Creamery Package Manufacturing Company; and J. E. Moss, Consultant, American Petroleum Institute. The Committee recommended unanimously that the document be published.

In order that the 46th National Conference on Weights and Measures might be permitted to take official action with respect to the Handbook prior to its publication, the Conference Chairman, Mr. R. E. Meek, assumed the responsibility of reading the material with the viewpoint of the Conference in mind. His conclusions were presented to the Executive Committee, and, as a result, that Committee recommended Conference adoption of the following resolution:

> Whereas, there has been prepared by Ralph W. Smith of the Office of Weights and Measures, National Bureau of Standards, the manuscript of a revision to NBS Handbook 26, "Weights and Measures Administration"; and
>
> Whereas, the original version of Handbook 26 has become a standard text in this field; and
>
> Whereas, the Chairman of the 46th National Conference on Weights and Measures has carefully read

and studied the manuscript and has formally recommended both its contents and its publication: Therefore, be it

Resolved, That this 46th National Conference on Weights and Measures urge the publication of the Handbook by the National Bureau of Standards and authorize the printing on the title page of the legend "Recommended by the National Conference on Weights and Measures"; and be it further

Resolved, That the principles set forth in the revision to Handbook 26 are recommended by the Conference to all weights and measures officials and legislative bodies of States, counties, and cities.

This motion was adopted unanimously by the 46th National Conference on Weights and Measures; accordingly, the principles set forth in the text assume the status of formal recommendations of that body of State and local weights and measures officials.

This Handbook is, therefore, a recommendation to agencies and individuals interested in setting up weights and measures supervision in a State or subdivision thereof, or concerned with strengthening such supervision where it now exists. The Handbook presents a comprehensive picture of what an effective weights and measures program should embrace. The Handbook should be useful as a training manual for new weights and measures officials and as a manual for review training for experienced officials, in the field of fundamental principles and general procedures.

This publication is issued by the Bureau in partial discharge of its statutory function of "cooperation with the States in securing uniformity in weights and measures laws and methods of inspection."

Major credit for carrying out the revision goes to Ralph W. Smith, Consultant to the Office of Weights and Measures of the National Bureau of Standards. In addition, important contributions to the work were made by M. W. Jensen, Chief of the Office of Weights and Measures, and by W. S. Bussey, Executive Secretary of the National Conference on Weights and Measures and Assistant to the Director for Weights and Measures Administration.

A. V. Astin, *Director.*

Preface

Since the present Handbook is a revision of NBS Handbook 26, with which many weights and measures officials are already acquainted, it may be helpful to point out some of the respects in which Handbook 82 differs from its predecessor.

Present chapter 2, presenting a historical review of weights and measures legislation in the United States, is new and provides background information. Chapter 18, Testing by Sample, also is new. As compared with corresponding material in Handbook 26, some chapters have been expanded, the text has been revised where it was felt that improvement could be effected, and minor changes of an editorial character have been made throughout.

Detailed information on State organizations, such as appeared in chapter 2 of Handbook 26, has been omitted. Such details change from time to time; the most useful part of the information is covered by a small separate compilation, frequently revised, available from the Office of Weights and Measures of the National Bureau of Standards; and additional details, fully up to date, can readily be obtained as required either from the Bureau or direct from the State.

The availability of NBS Circular 501, Federal and State Weights and Measures Laws, for which periodic cumulative supplements are planned, eliminates the need for including in this Handbook the text of the Federal weights and measures statutes and regulations. Accordingly, appendix I of Handbook 26 has been dropped.

The text of each Model Law and Model Regulation adopted by the National Conference on Weights and Measures is prepared as a separate document (or may be included in a separate compilation of such material) and is available from the Office of Weights and Measures of the Bureau. Accordingly, there is no need for duplicating such material in this Handbook, and appendix II of Handbook 26 has been dropped.

There is in progress in the Office of Weights and Measures a reevaluation of the schedule of recommended standards and equipment that was published as appendix III of Handbook 26. This review is dictated in part by recent studies

on materials for and design of standards of mass and the development of some special items of equipment, and in part by considerations of the availability from commercial sources of supply of various items of standards and equipment formerly recommended. The best current information on this subject may be obtained at any time from the Office of Weights and Measures of the National Bureau of Standards. Accordingly, old appendix III has been dropped.

In general, the objective has been to modernize the text of the Handbook, bringing this into harmony with changes that have taken place during the past two decades, and causing it to reflect current weights and measures thinking particularly as developed through the program of training schools for officials, conducted by the Office of Weights and Measures.

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Part IV.—SYSTEM OF RECORDS

Abstract

This Handbook presents a comprehensive picture of what an effective weights and measures program should embrace. The principles set forth are specifically recommended by the National Conference on Weights and Measures to all weights and measures officials and to the legislative bodies of States, counties, and cities. The Handbook should be helpful to agencies and individuals interested in setting up weights and measures supervision in a State or subdivision thereof, or concerned with strengthening such supervision where it now exists. It should also be useful as a training manual for new weights and measures officials and as a manual for review training for experienced officials, in the area of fundamental principles and general procedures.

WEIGHTS AND MEASURES ADMINISTRATION

Part I.—GENERAL

Chapter 1.—Functions of the Weights and Measures Official

For the intelligent study of any problem it is essential that a clear understanding exist of the conditions desired to be corrected and of the results planned to be accomplished. In the case of what is now generally known in this country as weights and measures supervision, all major elements of the problem are included, and the desired goal is established, in the statement that the primary function of the weights and measures official is to see to it that equity prevails in all commercial transactions involving determinations of quantity. To this end are passed all of the laws on weights and measures; for this purpose are promulgated the weights and measures rules and regulations affecting the conduct of business and the specifications and tolerances governing weighing and measuring instruments; and it is this principle that constitutes the keynote of the daily activity of the weights and measures official.

The delivery of full weight and measure and the elimination of fraud and misrepresentation have been objectives in commercial transactions from the time of the inception of quantity determination of merchandise down to the present day. It has been demonstrated that there are always some who will avail themselves of an opportunity for an unfair or dishonest advantage, and that, even though this number be relatively small, the results of their fraudulent practices constitute a serious problem in their community. Again, it has been shown that another group, larger than the one just mentioned but still constituting only a small percentage of those engaged in business, are careless in the conduct of their affairs to such a degree that the community suffers almost as much from their unintentional errors as from the intentional inaccuracies of the fraudulently minded. Still a third group adds its share to the total of inequities attendant upon commercial quantity determination, and this is made up of those whose errors result from ignorance rather than from carelessness or intent to defraud. Of these three groups, one can be more sympathetic toward the last, the

ones who know no better, than toward the other two. But it must not be overlooked that short weight or measure is equally damaging to the injured party whatever its underlying cause.

Responsibilities and Duties of Official. As the inevitable result, then, of these conditions, there have grown up various systems of governmental control, the details of which will be examined somewhat later. The weights and measures official stands always between buyer and seller to see that the interests of both are safeguarded. He is the impartial arbiter who may be called upon by either party to establish the actual amount of merchandise or service in question, to determine the condition of the weighing or measuring instruments involved, or to take suitable steps to stop an unfair practice or bring about the legal punishment of an offender. Moreover, it is his regular duty periodically to inspect and test the commercial weighing and measuring devices within his jurisdiction and, upon his own initiative, to carry on all investigations necessary to uncover and put a stop to short weight or measure.

The importance to a community of adequate weights and measures supervision can scarcely be overestimated. Next to the personal safety and health of the people, one of the most important of the fundamental obligations of the State or municipality to its citizens is this of the regulation of commercial weighing and measuring instruments and the exercise of a reasonable control over the users thereof. There is no single individual in a community whose interests are not affected by these considerations, for weighing and measuring operations, to a greater or lesser degree, enter into the distribution of all of the necessaries of life, particularly of food and fuel.[1] Furthermore, an important consideration in this connection is that in the case of the less prosperous members of a community, those whose purchases are necessarily made in the smallest quantities and most frequently, this interest is a vital one.

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[1] The following excerpt from the "Report upon Weights and Measures" made in 1821 to the Congress by John Quincy Adams, then Secretary of State, is of interest:

"Weights and measures may be ranked among the necessaries of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family. They are necessary to every occupation of human industry; to the distribution and security of every species of property; to every transaction of trade and commerce; to the labors of the husbandman; to the ingenuity of the artificer; to the studies of the philosopher; to the researches of the antiquarian; to the navigation of the mariner, and the marches of the soldier; to all the exchanges of peace, and all the operations of war. The knowledge of them, as in established use, is among the first elements of education, and is often learned by those who learn nothing else, not even to read and write. This knowledge is riveted in the memory by the habitual application of it to the employments of men throughout life."

Although the various phases of the work of the weights and measures official will be considered in detail in Parts II and III of this Handbook, it is appropriate at this point to outline briefly the scope of the official's duties.

There are two main divisions of the work. The first has to do with the inspection and testing of the equipment that is used in commercial weighing and measuring; this branch of the work may be referred to as the mechanical activities of the official. The second division has to do, among other things, with the way in which this equipment is used, and embraces all of the so-called supervisory activities of the official.

Mechanical Activities. Under the first division—that of mechanical activities—it is the duty of the official to inspect and test with his standards, at regular intervals, every scale, weight, measure (whether of length or capacity), weighing device, and measuring device, used commercially in his jurisdiction. Such of this equipment as is found to be correct is suitably marked to show that it is approved for use; such of it as is found to be incorrect, worn out, conducive to the perpetration of fraud, or that shows signs of having been tampered with for dishonest purposes is promptly removed from the channels of trade until it is again in proper condition for use. Thus, through his mechanical activities the official secures to those in business the possession of accurately and properly designed weighing and measuring equipment with which to carry on their trade.

Supervisory Activities. Under the head of supervisory come such activities of the official as check-weighing or check-measuring purchases of merchandise that have been delivered to a customer, that are ready for delivery to customers, or that are put up by the merchant in advance of sale; checking the quantity of contents of package goods put up by the manufacturer; checking loads or deliveries of coal, wood, and other bulk commodities; investigating complaints or shortages or unfair practices; educating buyers and sellers generally as to their rights and duties under the weights and measures laws; teaching the retail purchasing public—the consumers—how to buy and how to help official agencies in protecting their interests; and developing a healthy spirit of cooperation between the weights and measures office and each of the several groups with which it deals.

The mechanical side of the work must, of course, come first, because without properly designed and accurate equipment with which to weigh and measure his merchandise no one can be expected consistently to deliver accurate weight and

measure. However, the mechanical side of the work is but half, or less than half, of the official's task. It is only when he has brought about and maintains a proper use of this correct equipment and a proper observance of all of the other provisions of the weights and measures statutes that he can be said to be fully discharging his duties and to have brought his office to a state of efficient administration. In this connection it should be remembered that a very large part of the good resulting from the work of the weights and measures officer is intangible, in that it consists of the *prevention* of short weight and short measure and of faulty or dishonest practices. Thus a department with the least number of complaints and prosecutions may, in fact, be among the most efficient.

A further argument for emphasis on supervisory activities is found in the modern trend in retail merchandising toward sale of packaged commodities as distinguished from sales from bulk stocks. As the weighing and measuring devices at the retail level become relatively less important because of their less frequent use in serving customers directly, the consistent checking of packaged merchandise becomes more important and merits a larger share of the time and effort of the official. This holds true whether the packages are "factory packed" or whether they are put up in advance of sale by a retail merchant upon his own premises or by a warehouse serving a group of local merchants.

Apportionment of Effort. Even when a weights and measures department is undermanned, when all phases of a complete program can not be carried on as effectively as desired, the available manpower should be so assigned that no phase of the work will be neglected. For example, it may be found at a particular time that because of insufficient funds only enough men can be employed to do a thoroughly competent job of equipment testing with the frequency demanded by the statute. Under these circumstances it would be most unfortunate were all supervisory work to be dropped until an increase in the number of inspectors could be obtained, all effort in the meantime being devoted to mechanical activities. Instead of putting into effect such an unbalanced program as this, the official charged with the planning responsibility will realize much better overall results and do a much better job of weights and measures protection for his jurisdiction if he will decrease the frequency of equipment inspection and testing (but without any decrease in the thoroughness of the inspections and tests that *are* made) and devote the man-hours so saved to maintaining

his supervisory activities at a proportionate level. Except for the first year or so of operation, when as previously mentioned much of the emphasis must be placed on the mechanical side of the work, it is again suggested that a "50–50" ratio between mechanical and supervisory activities be the general planning target.

The principle of a due apportionment of effort to provide a well-rounded enforcement program applies with equal force to a one-man department and to one employing many inspectors. All phases of weights and measures administration are important, and none should be slighted.

It is a not uncommon belief that the weights and measures official's sole duty lies in the protection of the interests of the retail purchasing public, the group commonly referred to as the ultimate consumers. The true function of the official is to safeguard the interests of all who either buy or sell. He should be as quick, for example, to reject a piece of weighing equipment that is in error against the merchant as he is to follow the same course when the customer's rights are jeopardized. It is true that a large part of his energy is devoted to equipment and transactions affecting the retail purchaser; but if this work receives the greater share of his attention, it is because the number of pieces of this class of equipment and the number of this character of sales are relatively very large, and because in these cases the purchasers are least able to protect their own interests. When one business man buys from another, both frequently have the equipment and the opportunity to check for themselves the quantity of merchandise that is involved in the transaction. The retail purchaser, on the other hand, usually has neither. Therefore, the weights and measures officer has a particular responsibility to protect those who cannot protect themselves.

Summation. To sum up, then, it may be said that the functions of the weights and measures official are to safeguard the entire public whom he serves in all matters involving the commercial determination of quantity—to see to it that, whenever merchandise or service is bought or sold by weight or measure, a just weight or a just measure is delivered, and that fraud, carelessness, and misrepresentation in all "quantity" aspects of such transactions are eliminated.

Chapter 2.—Historical Background and Review of Federal Weights and Measures Legislation in the United States [1]

The Constitution of the United States makes two grants of power to the Congress in the area of weights and measures controls. Both are found in Article I, section 8 of the Constitution, the pertinent language being as follows:

> The Congress shall have Power * * * To regulate Commerce * * * among the several States, * * * To * * * fix the Standard of Weights and Measures * * *

The Interstate Commerce Clause. The first of these grants, dealing with the regulation of commerce among the States, is known as the "interstate commerce" clause of the Constitution. Here is found an authority that is broad and reasonably specific but that is restricted in that it does not embrace all commerce but is limited to commerce *among the several States*, that is, to interstate commerce. Interstate commerce may be broadly defined as commerce that crosses one or more State lines, and is to be distinguished from intrastate commerce, which is commerce that is confined within the borders of a single State. It may be noted that the majority of the weights and measures laws that have been enacted by the Congress are interstate, rather than intrastate, in their application.

The Weights and Measures Clause. The constitutional power to "fix the standard of weights and measures" is referred to as the "weights and measures" clause, and is specific, broad, and unrestricted in an area basic to the conduct of all business and commerce. When the Congress acts under this authority it legislates for the country as a whole, without regard to State boundaries.

Colonial Action. Although during colonial times the several Colonies, acting independently, adopted standards and defined units of weight and measure largely based on the standards recognized in England, there appears to have

[1] This chapter is a greatly condensed version of National Bureau of Standards Circular 593, "The Federal Basis for Weights and Measures," to which the reader is referred for a detailed account of the Federal contribution to the legislative basis for weights and measures administration in the United States. Circular 593 is available for purchase from Superintendent of Documents, Government Printing Office, Washington 25, D.C.

been no close uniformity in the weights and measures in use, with resulting confusion in the channels of trade.

The Jefferson Report. As a direct result of President Washington's recommendations to the first Congress for uniformity in the weights and measures of the United States, the House of Representatives requested the Secretary of State, Thomas Jefferson, to report to the House a plan for establishing such uniformity. Jefferson submitted a rather extensive report to the House in July 1790, in which he recommended two plans—the first being to retain the customary units of yard, gallon, bushel, and pound but render these "uniform and invariable" by referring them "to the same invariable standard" (of length); and the second being to adopt a strictly decimal system of weights and measures. At intervals during the next several years the Jefferson proposals received attention in Congress, but no agreement was reached as to what should be done.

The First Federal Law. The first Federal weights and measures law enacted was the Act of March 2, 1799, which dealt with the testing for accuracy of the weights, measures, and other instruments used at the various ports in ascertaining duties on imports, with standards to be provided by the several collectors of customs. But since no standards had ever been adopted this law was ineffective until, more than thirty years later, weights and measures standards were adopted by the Treasury Department.

The Adams Report. President Madison suggested in his message to Congress in December 1816 that a decimal system of weights and measures, as suggested by Jefferson, be adopted. As a result the Senate, by resolution, instructed the Secretary of State, then John Quincy Adams, to prepare a report on "the standards for weights and measures in the several States" together with recommendations for steps "proper to be adopted in the United States." Under date of February 22, 1821, Adams transmitted his report, a very comprehensive document, to the Senate. As to what steps it would be appropriate for the Congress to take, a two-part plan was proposed:

> 1. To fix the standard, with the partial uniformity of which it is susceptible, for the present excluding all innovation.
> 2. To consult with foreign nations for the future and ultimate establishment of universal and permanent uniformity.

No legislation resulted from the Adams report.

The Troy Pound of the Mint. Some consideration (that did not lead to legislation) was given to weights and measures proposals during the next few years, and eventually, in the Act of May 19, 1828, there was enacted the first effective weights and measures law of the United States. Under this act a certain troy pound that had been brought to this country from England was declared to be "the standard troy pound of the mint of the United States, conformably to which the coinage thereof shall be regulated." Actually, this troy pound became the fundamental mass standard of the United States, from which the avoirdupois pound was later derived. (For the regulation of the coinage the "standard troy pound of the mint" was replaced by the "standard troy pound of the Bureau of Standards of the United States" by the Act of March 4, 1911.)

Hassler's Early Activities. By resolution of May 29, 1830, the Senate directed the Secretary of the Treasury to cause a comparison to be made of the standards of weights and measures in use at the principal customhouses. This work was assigned to Ferdinand Rudolph Hassler, a man of great ability and energy, who during the succeeding decade played a most important part in fixing the standards of weight and measure of the United States. The customhouse investigation established that serious differences existed in the values of the standards used at the various ports, and the Secretary of the Treasury took steps to correct this situation upon his own authority by instructing Hassler to undertake construction of uniform and accurate standards for the customhouses. As a necessary prerequisite to the construction of the weights and measures for the customs service, certain fundamental units were adopted by the Treasury Department, upon Hassler's recommendation, as follows:

1. The yard of 36 inches.
2. The avoirdupois pound of 7000 grains, being $\frac{7000}{5760}$ pounds troy.
3. The gallon of 231 cubic inches.
4. The bushel of 2150.42 cubic inches.

The Joint Resolution of June 14, 1836. Reports to the Congress on the progress being made in the construction of standards for the customhouses again stimulated an interest in uniformity of standards throughout the country. Finally the Congress adopted the Joint Resolution of June 14, 1836, directing the Secretary of the Treasury to supply each State with copies of the weights and measures adopted

as standards for the customhouses, "to the end that a uniform standard of weights and measures may be established throughout the United States." Thus, sixty years after the declaration of independence the Congress took the first definite action directed to nationwide uniformity of standards, and there was initiated, under Hassler's direction, a program to that end.

The Act of July 7, 1838. A gift of balances to the States was authorized by the Act of July 7, 1838, Hassler being made responsible for their construction. To carry out the directives of 1836 and 1838 there was set up in the Treasury Department the Office of Weights and Measures, and the program of constructing and distributing standards and balances was vigorously prosecuted.

The Act of July 28, 1866, and the Joint Resolution of July 27, 1866. The use in the United States of the weights and measures of the metric system was legalized by the Act of July 28, 1866. By the Joint Resolution of July 27, 1866, the Congress directed the Secretary of the Treasury to furnish to each State a set of standards of the metric system.

The Joint Resolution of March 3, 1881. A "complete set of all the weights and measures that had been adopted as standards" was ordered to be delivered to each State for use by land-grant agricultural colleges, under the terms of the Joint Resolution of March 3, 1881.

Standards and Balances Furnished to States. The standards furnished to the States under the Joint Resolution of 1836 comprised a yard measure and matrix, avoirdupois weights from 50 pounds to fractions of a grain, troy weights from 1 pound to fractions of a grain, liquid capacity measures from 1 gallon to ½ pint, and and a ½-bushel dry measure. Metric standards furnished to the States under the Joint Resolution of 1866 comprised one "line" meter bar, one "end" meter bar, weights from 10 kilograms to 1 milligram, and capacity measures of 1 liter and 1 dekaliter. Under the Act of July 7, 1838, three balances having different capacities were furnished to at least some of the States and perhaps to all, although the act itself mentioned only "one standard balance" for each State.

Effects of Congressional Action. The Joint Resolutions of 1836, 1866, and 1881, and the laws of 1838 and 1866 comprise the total of congressional directives in the field of standard systems or units of weights and measures. There are no broad and specific congressional requirements imposing uniformity among the States in the matter of standards. However, the immediate result of the early distribution of

standards to the States was, in almost all cases, the adoption as State standards of the standards so received from the Federal Government. Thus, by indirection, was uniformity brought about. It may be noted in passing that two provisions common to many current State weights and measures laws operate now to establish a firm basis for national uniformity of standards. The first of these provisions is to the effect that weights and measures in conformity with those furnished to the State by the Federal Government, supplied by the State and certified by the National Bureau of Standards, shall also be State standards. The second provision is to the effect that the State standards shall be submitted once every 10 years to the National Bureau of Standards for recertification.

The Metric Convention. In 1870, 1872, and 1875 the United States was represented at conferences in Paris, France, attended also by representatives of other countries, at which it was decided (1) that new standard meters and kilograms be constructed, these to be of uniform material and design and conforming in value to the national standards of France, the meter and kilogram "of the Archives," (2) that one of the new meter bars and one of the new kilograms be selected to become international standards, (3) that other new meters bars and kilograms be distributed by lot among the participating countries, and (4) that an International Bureau of Weights and Measures be created and its duties prescribed by treaty. This treaty, known as the "Metric Convention," having been signed by the United States representatives in 1875, was ratified and proclaimed by the President of the United States in 1878.[2] The standards were constructed and distributed as planned; the United States was awarded Meters Nos. 21 and 27 and Kilograms Nos. 4 and 20. The first to arrive in this country were Meter No. 27 and Kilogram No. 20; these were opened at the White House on January 2, 1890 and were accepted as authentic by President Harrison. The other two standards were received in July of the same year. All of these standards were placed in the custody of the Office of Weights and Measures of the Treasury Department.

The "Mendenhall Order." As of April 5, 1893, the Secretary of the Treasury approved a ruling of fundamental importance made by T. C. Mendenhall, Superintendent of

[2] The treaty was amended in 1921 and proclaimed in amended form by the President in 1923. For a translation of the amended text of the convention and of the regulation appended thereto, see National Bureau of Standards Circular 501, "Federal and State Weights and Measures Laws," pp. 3–5.

the Office of Weights and Measures. This ruling has come to be known as the "Mendenhall Order"; its essentials are expressed in the following quotation from Coast and Geodetic Survey Bulletin No. 26, "Fundamental Standards of Length and Mass," in which form the "order" was published by the Treasury Department.

> * * * the Office of Weights and Measures, with the approval of the Secretary of the Treasury, will in the future, regard the International Prototype Metre and Kilogramme as fundamental standards, and the customary units, the yard and the pound, will be derived therefrom in accordance with the Act of July 28, 1866. * * *
>
> Note.—Reference to the Act of 1866, results in the establishment of the following:
>
> *Equations*
>
> $$1 \text{ yard} = \frac{3600}{3937} \text{ metre.}$$
>
> $$1 \text{ pound avoirdupois} = \frac{1}{2.204\,6} \text{ kilo.}$$
>
> A more precise value of the English pound avoirdupois is $\frac{1}{2.204\,62}$ kilo., differing from above by about one part in one hundred thousand, but the equation established by law is sufficiently accurate for all ordinary conversions.
>
> As already stated, in work of high precision the kilogramme is now all but universally used and no conversion is required.

In Appendix No. 6—Report for 1893 of the Coast and Geodetic Survey, under the heading "Tables for Converting Customary and Metric Weights and Measures," and under the dateline March 21, 1894, it was stated, "The yard in use in the United States is equal to $\frac{3600}{3937}$ of the metre." This was considered by the old Office of Standard Weights and Measures, and by the National Bureau of Standards until July 1, 1959, to be an exact equivalent. Under the same heading in Appendix No. 6 it was stated, "1 avoirdupois pound=453.592 427 7 grammes"; this equivalent was recognized by the National Bureau of Standards until July 1, 1959.

The International Yard and International Pound. In the Federal Register of June 30, 1959, the National Bureau of Standards published an announcement reading, in part, as follows:

Since 1893 the National Bureau of Standards and its predecessor agency, the Office of Standard Weights and Measures of the Treasury Department have derived the yard and the pound and the multiples and submultiples of these units from metric standards, namely, the international meter and the international kilogram. The original announcement of this derivation, together with the numerical ratios upon which the derivations were based, is given in Bulletin 26, "Fundamental Standards of Length and Mass," of the U.S. Coast and Geodetic Survey, approved for publication April 5, 1893, by the Secretary of the Treasury. An amendment to the 1893 Bulletin was made in 1894 in which there was a small adjustment in the pound-kilogram ratio to bring it into closer agreement with the British Imperial pound.

In the latter half of the period since 1893 minor but troublesome discrepancies have developed among various groups, both in this country and abroad, that are concerned with very accurate measurements involving yard and pound units or their customary multiples and submultiples. As a result of study and negotiation, it has developed that most of the discrepancies can be resolved and a high degree of measurement uniformity obtained by small refinements of the ratios defined in the 1893–94 bulletins relating the yard and pound to the meter and kilogram. Accordingly, the following announcement is made:

Announcement. Effective July 1, 1959, all calibrations in the U.S. customary system of weights and measures carried out by the National Bureau of Standards will continue to be based upon metric measurement standards and, except those for the U.S. Coast and Geodetic Survey as noted below, will be made in terms of the following exact equivalents and appropriate multiples and submultiples:

$$1 \text{ yard} = 0.914\,4 \text{ meter}$$
$$1 \text{ pound (avoirdupois)} = 0.453\,592\,37 \text{ kilogram}$$

Currently, the units defined by these same equivalents, which have been designated as the International Yard and the International Pound, respectively, will be used by the National Standards Laboratories of Australia, Canada, New Zealand, South Africa, and United Kingdom; thus there will be brought about, international accord on the yard and pound by the English-speaking nations of the world in precise measurements involving these basic units.

Any data expressed in feet derived from and published as a result of geodetic surveys within the United States will continue to bear the following relationship as defined in 1893:

$$1 \text{ foot} = \frac{1200}{3937} \text{ meter}$$

The foot unit defined by this equation shall be referred to as the U.S. Survey Foot and it shall continue to be used, for the purpose given herein, until such a time as it becomes desirable and expedient to readjust the basic geodetic survey networks in the United States, after which the ratio of a yard, equal to 0.914 4 meter, shall apply.

* * * * *

Yard. In the 1893 Bulletin the yard was defined as:

$$1 \text{ yard} = \frac{3600}{3937} \text{ meter}$$

which results in the approximate relation:

$$1 \text{ yard} = 0.914\ 401\ 83 \text{ meter.}$$

Thus the new value for the yard is smaller by 2 parts in one million than the 1893 yard. Numerical measures expressed in terms of the new unit will, therefore, be increased by 2 parts in one million.

Pound. The pound was defined in the 1893 Bulletin as:

$$1 \text{ pound (avoirdupois)} = \frac{1}{2.204\ 62} \text{ kilogram.}$$

The 1894 amendment, based on a recent determination of the British Imperial pound, gave the ratio as:

$$1 \text{ pound (avoirdupois)} = \frac{1}{2.204\ 622\ 34} \text{ kilogram}$$

which results in the approximate relation:

$$1 \text{ pound (avoirdupois)} = 0.453\ 592\ 427\ 7 \text{ kilogram.}$$

Thus the new value for the pound is smaller by about 1 part in 10 million than the 1894 pound. Numerical measures expressed in terms of the new unit will, therefore, be increased by about 1 part in ten million.

Changes concern science and precision tools. Such small changes are beyond the limits of accuracy by which many reference standards are now calibrated by the National Bureau of Standards, including the standards furnished to or calibrated for the State governments. Therefore, the refinements in the definitions of the yard and the pound will have no effect at all upon ordinary trade and commerce. The differences are significant, however, in a number of very precise metrological determinations such as are found in the precision machine tool and instrument industries and in certain scientific activities.

Standard inch. The value for the inch, derived from the value for the yard effective July 1, 1959, is exactly equivalent to 25.4 millimeters. It may be noted that this value was approved by the American Standards Association for "Inch-millimeter Conversion for Industrial Use" in 1933 (ASA Standard B48.1–1933), was adopted by the National Advisory Committee for Aeronautics in 1952, and has been adopted by many standardizing organizations in other countries.

Relation to grain. The new conversion factor for the pound is exactly divisible by 7 and results in the following exact value for the grain:

$$1 \text{ grain} = 0.064\ 798\ 91 \text{ gram.}$$

The grain is the common unit of the avoirdupois, apothecary, and troy systems, there being 7000 grains in the avoirdupois pound and 5760 grains in the apothecary pound and in the troy pound.

Nautical mile. On July 1, 1954, it was announced that the Secretary of Commerce and the Secretary of Defense had agreed officially that the International Nautical Mile would henceforth be used within their respective departments. The International Nautical Mile is based on the meter and is equal to 1852 meters. Based on the yard-meter relationship then in use, the International Nautical Mile was shown as being equivalent to 6 076.103 33 feet. Under the new conversion factor, the International Nautical Mile is equivalent to 6 076.115 49 International feet approximately.

New Definition of the Meter. The action of the 11th General [international] Conference on Weights and Measures in adopting a new definition of the meter in terms of the wavelength of Krypton 86 light was reported in the Technical News Bulletin of the National Bureau of Standards for December 1960. The report read, in part, as follows:

On October 14, 1960, the world adopted a new international standard of length—a wavelength of light—replacing the meter bar which had served as the standard for over 70 years. The action was taken by the 11th General Conference on Weights and Measures, which met in Paris.

* * * * *

The new definition of the meter as 1 650 763.73 wavelengths of the orange-red line of Krypton 86 will replace the platinum-iridium meter bar which has been kept at Paris as an international standard for length since 1889 under the Treaty of the Meter.

These actions of the General Conference are of great importance to those engaged in precision measurements in science and industry. For many years the world has relied on a material standard of length—the distance between two engraved lines on the International Meter Bar kept at Paris. Duplicates of the International Standard were maintained in the standards laboratories of other countries of the world. From time to time it was necessary to return these duplicates to Paris for recalibration, and occasionally discrepant results were obtained in these recalibrations. Also, there was doubt in the minds of some scientists regarding the stability of the International Meter Bar. The new definition of the meter relates it to a constant of nature, the wavelength of a specified kind of light, which is believed to be immutable and can be reproduced with great accuracy in any well-equipped laboratory. Thus it is no longer necessary to return the national standards of length to Paris at periodic intervals in order to keep length measurements on a uniform basis throughout the world. Also it is possible to measure some dimensions more accurately in terms of the new definition than was possible before. The meter bars which have served as standards of length throughout the world for over 70 years will not be dis-

carded or placed in museums because of this decision, the Conference said. They will remain important because of the ease with which they can be used for certain types of measurement and for comparison measurements between national laboratories.

This new definition of the meter will not materially change the measurement of length nor in any way the relation between the English and Metric units. Careful experiments performed at the National Bureau of Standards * * * immediately prior to the meeting of the Conference confirmed that the wavelength standard and the metal standard are in satisfactory agreement. The inch now becomes equal to 41 929.399 wavelengths of the krypton light.

Federal Legislation Proposed and Enacted. From the passage of the metric act in 1866 until well into the twentieth century—about 1933—consistent but unsuccesful efforts were made to enact legislation relating to the metric system, or some other decimal system, of weights and measures. Some bills were intended to facilitate use of the metric system, some proposed limited adoption of the metric system (e.g., for the departments of the Federal Government, or for the customs service), while some were designed to adopt the metric or some other decimal system for the entire country. On other weights and measures subjects, more than 100 unsuccessful bills or resolutions are found to have been introduced into House or Senate during approximately the first half of the present century; these dealt with many matters among which may be mentioned units and standards of weight and measure, Federal pattern approval for commercial devices, standard weights for bread loaves, standardization of can sizes, net weight for cotton bales, standard containers for fruits and vegetables, and standardization of food packages.

But the twentieth century was by no means unproductive of legislation of interest and importance to weights and measures officials. In fact, most of the Federal statutes with which weights and measures officers of today are concerned or in which they are interested were enacted between 1900 and 1940; the more important of these are enumerated below in the order of dates of original enactment.

1901. The Act of March 3, 1901, created the National Bureau of Standards as the successor to the Office of Standard Weights and Measures of the Treasury Department, but with greatly enlarged functions. The original "organic act" of the Bureau was amended in 1913, 1930, 1932 and 1950 as need arose for changing or broadening the operations of the Bureau. Originally assigned to the Treas-

ury Department, the National Bureau of Standards was transferred to the new Department of Commerce and Labor in 1903. Ten years later, "Commerce and Labor" was divided into "Commerce" and "Labor," and the National Bureau of Standards was assigned to the Department of Commerce, where it has since remained. The principal functions of the National Bureau of Standards with respect to weights and measures administration may be summarized by saying that the Bureau has the custody of the national standards of weights and measures, that it tests the reference standards of the States, and that through its Office of Weights and Measures it cooperates closely with State and local weights and measures officials by supplying technical information, advice on practical problems of administration, and training of personnel. These activities are not of a "regulatory" character, the Bureau having no enforcement power or authority. [U.S. Code 1958 Ed., Title 15, Ch. 7.]

1906. The "Food and Drugs Act of June 30, 1906" was enacted, containing (among many others) provisions relative to content declarations on packages of foods. This act was the culmination of a long effort to enact legislation to require purity in foods and drugs; it is said that "in the 27 years between 1879 and 1906, over 190 measures relating to the control of the adulteration and misbranding of foods and drugs were introduced in the Congress of the United States."[3] In its original form, the labeling of packages of food with declarations of net quantity was not mandatory; "if in package form and the contents are stated in terms of weight or measure," then such statement was required to be correct. In 1913 the act was amended (the so-called "Gould net-weight amendment") to require that all foods in package form bear net-content declarations in terms of weight, measure, or numerical count, but with the proviso that "reasonable variations shall be permitted, and tolerances and also exemptions as to small packages shall be established by rules and regulations." The "Kenyon wrapped meat amendment" was adopted in 1919; under this, wrapped meats were declared to be "in package form" for purposes of the act. The enforcement of the act was in the Department of Agriculture, first in the Bureau of Chemistry, later in the Food, Drug, and Insecticide Administration, and finally in the Food and Drug Administration. (This act has largely been superseded by the Food, Drug, and Cosmetic Act of 1938.)

[3] "Food Regulation and Compliance," by Arthur D. Herrick, v. I, p. 8.

1911. The standard for the regulation of the coinage of the United States was changed from the "troy pound of the Mint" to the "standard troy pound of the Bureau of Standards of the United States" by the Act of March 4, 1911. [U.S. Code, 1958 Ed., Title 31, Ch. 8.]

1912. The act of August 3, 1912, known as the "Standard Apple Barrel Act," established by dimension and capacity a standard apple barrel of 7056 cubic inches, and standard grades, for apples shipped in interstate commerce. (The standard-barrel provisions of this act were superseded by the "Standard Barrel Act of March 4, 1915.")

1914. The Federal Trade Commission was created in 1914, and since then the act has been amended from time to time. Under the law, "unfair methods of competition in commerce, and unfair and deceptive acts or practices in commerce, are declared unlawful." Some elements of the activities of the Commission lie in the general "weights and measures" area. [U.S. Code, 1958 Ed., Title 15, Ch. 2.]

1915. The "Standard Barrel Act of March 4, 1915" fixed, by dimension and capacity, a standard barrel for "fruits and vegetables and other dry commodities other than cranberries," this being the same barrel as had been fixed for apples in 1912 (7056 cubic inches), and fixed, by dimension, a standard barrel for cranberries having a capacity some 1230 cubic inches smaller. Subdivisions of ¾ barrel, ½ barrel, and ⅓ barrel were provided for in each case. This law applies in the case of both intrastate and interstate transactions, and specifically provides that prosecutions for violations may be begun upon complaint of State and local weights and measures officials. [U.S. Code, 1958 Ed., Title 15, Ch. 6.]

1916. The "Standard Lime Barrel Act of August 23, 1916" established a "large" barrel of 280 pounds net weight and a "small" barrel of 180 pounds net weight for importations and interstate shipments of lime, and also recognized transactions in fractional parts of the small barrel. Net-content declarations are required on barrels or other containers. [U.S. Code, 1958 Ed., Title 15, Ch. 6.]

Also enacted in this year was the "Standard Container Act of 1916," approved on August 31, 1916, and amended (with respect to mushroom baskets) on June 11, 1934. The act is enforced by the Department of Agriculture. It fixes the standards for Climax baskets for "grapes and other fruits and vegetables" and for mushrooms as baskets of 2, 4, and 12 quarts dry measure, and specifies the dimensions to be followed in the manufacture of the baskets. Provision is also made for a 1-pound Climax basket of specified dimensions

for mushrooms only. Baskets or other containers for "small fruits, berries, and vegetables" are required to be ½ pint, 1 pint, 1 quart, and multiples of the quart, dry measure. This act applies to interstate transactions only. [U.S. Code, 1958 Ed., Title 15, Ch. 6.]

1921. The "Packers and Stockyards Act of August 15, 1921," subsequently amended several times prior to 1958, gave the Department of Agriculture considerable authority over weighing facilities and practices at stockyards of a specified size engaging in interstate commerce, and at designated live-poultry markets. The Act was last amended in 1958 (Public Law 85–909, approved Sept. 2, 1958); under this amendment, livestock transactions *in commerce* are placed under the jurisdiction of the Department of Agriculture, and the Federal Trade Commission is given primary jurisdiction over transactions *in commerce* in oleomargarine and over retail sales of meat, meat food products, livestock products in unmanufactured form, and poultry products. Under certain conditions, the Department of Agriculture and the Federal Trade Commission are given concurrent jurisdiction in specified areas of enforcement. [U.S. Code, 1958 Ed., Title 7, Ch. 9.]

1928. The "Standard Container Act of 1928," approved May 21, 1928, supplements the Standard Container Act of 1916 by extending controls to hampers, round stave baskets, and splint baskets. This act is intrastate as well as interstate in application, and is enforced by the Department of Agriculture. Standard hampers and round stave baskets for fruits and vegetables were originallly fixed as ⅛, ¼, ½, ⅝, ¾, 1, 1¼, 1½, and 2 bushels; in 1954 the act was amended to add the ⅜-bushel size. Splint baskets for fruits and vegetables are fixed as 4, 8, 12, 16, 24, and 32 quarts, standard dry measure. Manufacturers' specifications for baskets covered by the act are required to be approved by the Secretary of Agriculture. The act does not apply to Climax baskets, berry boxes, and till baskets that comply with the provisions of the Standard Container Act of 1916. [U.S. Code, 1958 Ed., Title 15, Ch. 6.]

1938. The "Federal Food, Drug, and Cosmetic Act of June 25, 1938" supersedes, with specified exceptions relative to butter and wrapped meats, the Food and Drugs Act of 1906. It is administered by the Food and Drug Administration, an agency that was in the Department of Agriculture until June 30, 1940, when it was transferred to the Federal Security Agency; it remained there until April 11, 1953, when it was assigned to the newly created Department

of Health, Education, and Welfare, where it has since remained. The act declares, among other provisions, that a food, drug, device, or cosmetic shall be deemed to be misbranded (a) if its labeling is false or misleading in any particular, (b) if in package form unless it bears a label containing an accurate statement of the quantity in terms of weight, measure, or numerical count, and (c) in the case of food if its container is so made, formed, or filled as to be misleading. Provision is made for reasonable variations and for exemptions as to small packages. [U.S. Code, 1958 Ed., Title 21, Ch. 9.]

1946. The "Agricultural Marketing Act of 1946" contains provisions relative to the packaging of agricultural commodities, and is administered by the Department of Agriculture. [U.S. Code, 1958 Ed., Title 7, Ch. 38.]

Chapter 3.—State and Local Weights and Measures Legislation

From the preceding review of Federal weights and measures legislation in the United States, it is clear that beyond the area of weights and measures units and standards (a standard being the physical embodiment of a unit or of a multiple or subdivision of a unit) there has been no tendency on the part of the Congress toward regulation of or control over *all* weighing and measuring devices and practices, and that regulation and control have been limited to devices and practices directly related to the exchange of specific commodities or groups of commodities, largely those moving in interstate commerce. It is also obvious that the Congress has left almost exclusively to the States (and their political subdivisions) the control of commercial weighing and measuring devices and the regulation of commercial weighing and measuring practices and associated activities.

Commercial Equipment and Practices. In the development of weights and measures laws and regulations at the State level and below, the Congressional example has been followed, and it has become the universal practice to restrict the scope of weights and measures controls to equipment and practices of a commercial character, avoiding the area of manufacturing, processing, and preparation of commodity for sale, and those activities (such as stock taking) that are of direct interest only to the owner or holder of commodities or that otherwise are not directly related to buying or selling or the checking of purchased amounts. "Commercial" weighing and measuring equipment has been defined as "weights and measures and weighing and measuring devices commercially used or employed in establishing the size, quantity, extent, area, or measurement of quantities, things, produce, or articles for distribution or consumption, purchased, offered or submitted for sale, hire, or award, or in computing any basic charge or payment for services rendered on the basis of weight or measure."[1] Other weighing and measuring equipment, not controlled or supervised by the weights

[1] From the General Code of the Specifications, Tolerances, and Regulations for Commercial Weighing and Measuring Devices, adopted by the National Conference on Weights and Measures, NBS Handbook 44, 2d Ed.

and measures official, is referred to as "noncommercial"; noncommercial equipment used in manufacturing and by industry is frequently referred to as "industrial."

State Coverage. In the United States, then, excluding those few Federal regulatory services such as the testing of certain livestock scales, the control of certain containers for fruits and vegetables, and the enforcement of the quantity provisions of the Food, Drug, and Cosmetic Act, it is found that regulatory weights and measures activities are based on State statutes and local ordinances and are carried on by officials of the States, counties, and cities. The States being independent in the field of legislation for their respective areas, it is inevitable that the weights and measures statutes of the several States are not alike. Efforts have been made, with some success, by the National Bureau of Standards and the National Conference on Weights and Measures [2] to promote uniformity among the States in their weights and measures legislation, but there remains much room for improvement.

In some States the law provides only a limited coverage; in others the coverage is comprehensive. In a particular State there may be essentially a single weights and measures statute; elsewhere there may be a series of statutes, each dealing with a particular phase of weights and measures control, the whole comprising the legal basis for the enforcement program. The State law may or may not be supplemented by local ordinances; or, as is the case in some few instances, the enforcement activities in a State may be based almost wholly on local legislation. In some States much of the weights and measures legislation on the statute books is very old and in need of revision. There is noticeable a trend toward the repeal of obsolete provisions and the modernization and codification of the weights and measures laws, a movement that is resulting in a betterment of protection to the people in those States where such action is being taken.

In subsequent chapters (5, 6, 7, 8, and 9) of this publication there will be found discussions on several topics related to the general subject of State weights and measures legislation.

Compilation of Federal and State Laws. It may be noted that in NBS Circular 501, Federal and State Weights and Measures Laws, published in 1951, there will be found the texts of the weights and measures laws of all of the States through the 1949 enactments, and most of the weights and measures portions of current Federal statutes.

[2] See Chapter 13 for a discussion of the National Conference on Weights and Measures.

Chapter 4.—Current Organization for Weights and Measures in the United States

The independence of each of the States in the field of weights and measures legislation originally produced, as stated in Chapter 3, a considerable degree of diversity in statutory requirements and in the degree and form of regulatory controls for commercial weighing and measuring devices and practices. The first effort toward coordination of State activity in this area and toward uniformiy of requirements among the States arose after creation of the National Bureau of Standards, when officials of that Bureau, in 1905, called together representatives of the States to effect cooperation among State weights and measures inspection services. This meeting was the genesis of the National Conference on Weights and Measures, since become a potent instrument in unifying weights and measures activity throughout the United States. The National Conference as an organization, and the relations of the National Bureau of Standards to the Conference, are discussed in Chapter 13 of this publication.[1] Even apart from its connection with the National Conference, however, the National Bureau of Standards has important official relations with the States in the weights and measures area, and although this Bureau has no regulatory powers it is appropriate that a discussion of the current organization for weights and measures in the United States open with a brief review of the organization and weights and measures functions of the National Bureau of Standards.

The National Bureau of Standards. The National Bureau of Standards is one of several bureaus of the United States Department of Commerce. Its principal activities (including those on weights and measures) are centered in Washington, D.C.,[2] but extensive laboratories (radio) are maintained in Boulder, Colo., and some 22 field stations are operated, a number of these being outside the continental limits of the United States. The Bureau personnel approximates 3,000.

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[1] See p. 79.

[2] The Washington offices, laboratories, and other facilities of the Bureau are to be transferred to a new site at Gaithersburg, Md. Ground was broken in 1961, and it is anticipated that construction will be completed and that transfer of activities will be fully effected by 1965.

The Bureau is headed by a Director, assisted by a deputy director, several associate directors, and an adequate administrative staff. In general, the technical activities of the Bureau are separated into "divisions," and divisions are broken down into "sections." One of the technical divisions is the Office of Weights and Measures, the function of which is to provide technical assistance to the States in all matters dealing with weights and measures supervision. Cooperation with the States on matters of weights and measures law and administration are handled by an Assistant to the Director for Weights and Measures Administration. Also having a direct relation to weights and measures matters are the Length Section, the Mass and Scale Section, and the Volumetry and Densimetry Section, all in the Metrology Division.

As the custodian of the national standards of length and mass—the meter and the kilogram—the National Bureau of Standards is brought into its most fundamental relationship with State weights and measures activity. Most of the State laws provide for the periodic testing and certification by the Bureau of their State reference standards of weight and measure, and by this means the standard is kept uniform throughout the country.

Under its statutory authority to undertake "cooperation with the States in securing uniformity in weights and measures laws and methods of inspection" the Bureau acts, through its Office of Weights and Measures, in an advisory capacity in the promotion of efficiency, adequacy, and uniformity in all technical phases of State and local weights and measures administration. There is available in the Bureau a large amount of technical weights and measures information, and members of the staff are experienced in dealing with practical field problems. This information and the results of this experience are freely offered to weights and measures officials and others interested. Upon occasion, special studies and investigations are made by the Office of Weights and Measures and by technical sections of the Bureau to develop information and procedures relative to new devices and new fields of enforcement activity. In sum, the Bureau endeavors to act as a clearing house for weights and measures information and as a general coordinating agency for the many weights and measures jurisdictions throughout the country.

As a measure of assistance to State regulatory officials, suggestions are offered below for making contact with certain Federal agencies when questions involving Federal weights and measures requirements arise.

The U.S. Department of Agriculture. With respect to the Federal Standard Container Acts of 1916 and 1928, enforcement is carried on by the United States Department of Agriculture through its Regulatory Branch, Fruit and Vegetable Division, Agricultural Marketing Service. Inquiries should be addressed to Washington 25, D.C.

With respect to its enforcement activities in connection with the Federal Packers and Stockyards Act, the United States Department of Agriculture operates through its Packers and Stockyards Branch, Livestock Division, Agricultural Marketing Service. The Packers and Stockyards Branch has some 20 District Offices, principally located at the major livestock terminal markets, and employs three area Livestock Scales and Weighing Specialists. Inquiries should be addressed to any District Office or to the headquarters office at Washington 25, D.C.

The U.S. Department of Health, Education, and Welfare. With respect to the Food, Drug, and Cosmetic Act, enforcement is carried on by the United States Department of Health, Education, and Welfare through its Food and Drug Administration. Some sixteen District Offices are maintained, strategically located throughout the country. For handling contacts with State officials (both "food and drug" and "weights and measures") there is a special office in the Washington headquarters designated the Division of Federal–State Relations. Inquiries should be addressed to Washington 25, D.C., or to any District Office.

The Federal Trade Commission. With respect to the Commission's enforcement activities in connection with the Federal Packers and Stockyards Act, and with respect to any other matters of weights and measures significance falling within the jurisdiction of the Commission, inquiries should be addressed to Washington 25, D.C.

The U.S. Treasury Department. Certain Federal requirements relative to quantity marking of packaged tobacco products, and certain Federal weights and measures provisions relative to packaged alcohol and fermented and distilled liquors are enforced by the United States Treasury Department through its Alcohol and Tobacco Tax Division, Internal Revenue Service. Inquiries should be addressed to Washington 25, D.C.

Reference to Federal Agencies. With respect to any weights and measures matters that involve Federal agencies, State officials in doubt regarding proper addresses may write to the Office of Weights and Measures of the National Bureau

of Standards and suitable information will be supplied or an appropriate reference of the communication will be made.

State Organizations. Turning now to the weights and measures organizations of the States, it may be repeated that the States have been allowed by the Congress almost entire freedom to enact such legislation as they deem expedient. As a result, different States have handled the problem of organizing their weights and measures control in different ways, but, although considerable diversity may exist in the details of the several organizations, one of three general plans has usually been adopted wherever any serious attempt has been made to provide adequate supervision.

Exclusive State Operation. The simplest of these plans is for all weights and measures supervision in a State to be exercised by the State government through a State office of weights and measures. Under this plan the actual inspection and testing of all commercial apparatus, as well as all of the supervisory activities connected with weights and measures administration, are performed by State inspectors directly under the control and supervision of the head of the State office. This plan makes possible a high degree of uniformity in weights and measures matters throughout the State, for not only are the law, the specifications and tolerances, and the rules and regulations the same in all sections but, as a result of the unified control by the central State office of all of the field inspectors, uniform methods of inspection and test may be realized and every community of the State may be given its fair share of attention.

Dual State and Local Operation. A second plan is a dual system with both State and local officers regularly carrying on full weights and measures duties. In practice this plan has developed several modifications; for instance, the local officers may be city or county officials, and the plan may include either group alone or a combination of the two. The States officials perform all work in certain sections of the State, as, for example, in the less thickly settled portions, where it is felt that the amount of work does not justify the appointment of resident local officers. The State department also exercises at least a general supervision over all of the weights and measures officials of the State. This plan permits of a certain flexibility, which is a decided advantage at times; it also provides resident inspectors in the more thickly populated sections of the State, where their services are most needed; and in some States the fact that under this plan the larger part of the expense for weights and measures supervision is met from

local rather than from State funds is considered an advantage.

Local Operation under State Supervision. Under the third plan all actual inspectional and testing work is performed by local officials. The functions of the State department may include the general supervision of the work of the local officials, the promulgation of rules and regulations and specifications and tolerances, the fixing of uniform methods of test, and the periodical testing of the standards of the local officials.

The Situation in the States. The plans of organization outlined above contemplate reasonably complete weights and measures coverage by each of the units involved in enforcement activity. In practice, however, the degree of coverage actually accomplished differs from jurisdiction to jurisdiction, depending upon such factors as the comprehensiveness of the statute and the availability of manpower, equipment, and funds. In a very small number of States, activity by a State unit is nonexistent or is limited to one very restricted class of commercial devices, and there may or may not be activity on the part of a very few local officials.

Divergence among the States is also found in the placement of the weights and measures unit in the organizational structure of State agencies, and changes in placement and designation of units and in titles of officials are not infrequent. Over the years there has been observed a trend toward consolidating State activities into a relatively small number of major groups for each State, these usually being designated as departments. The groups most favored for the principal State weights and measures unit is the department of agriculture, approximately two-thirds of these units now being concentrated in departments of agriculture with most of the remaining units scattered widely among the other departments of State government.

Within the weights and measures units themselves, it is also found that changes are frequent in the number and assignment of personnel. Most units appear to be understaffed, although there is a tendency toward correcting this condition as communities, and particularly legislatures, reach a better understanding of the economic advantages of adequate weights and measures supervision. In field work there is a trend toward specialization, particularly in activities demanding the use of special testing equipment designed for specific purposes; for example, an inspector may be assigned exclusively to the examination of large-capacity scales or

prescription scales or retail liquid-measuring devices or wholesale-type meters, or to the investigation of complaints, thus becoming especially experienced and proficient in handling one individual phase of enforcement work.

Lists of State Officials. Because of the frequency of changes in organization, position titles, number of personnel, and work assignments, current information on these matters is not included here for each State as was done in the preceding edition of this Handbook. The Office of Weights and Measures of the National Bureau of Standards issues a "List of Weights and Measures Offices" of the States, the District of Columbia, and the Commonwealth of Puerto Rico; the organizational structure (not including personnel), the mailing address, and the name and title of the active head of the unit are given in each case. This list is revised from time to time to keep it up to date, and copies may be obtained without cost upon application to the Office of Weights and Measures.

Foreign Organizations. It is of interest that in many foreign countries, weights and measures control is exercised exclusively by the central government, no provision being made for any enforcement activity under local authority. Even where local officials are provided for, there appears to be a strong tendency for the central government to exercise a very close control over the operations of such local officers.

Another basic difference between the weights and measures controls exercised in the United States and abroad is found in the fact that it is the rule rather than the exception for the central governments of foreign countries to follow a system of mandatory examination of the pattern of weighing and measuring devices intended for commercial use, pattern approval being a prerequisite for the sale or use of the device.

Chapter 5.—A Model Form of Weights and Measures Organization

Where it is desired to create a weights and measures unit in a jurisdiction previously without one, or to reorganize an existing unit along more efficient lines, the question arises, What form shall be adopted for the new organization? In the study of this question careful consideration should be given to a variety of factors, and it is the purpose of this chapter to discuss these and to suggest the form of weights and measures organization that seems to be best suited to various situations.

It should have been evident from what has gone before that weights and measures supervision is such a vital function of government that it should be comprehensive in its scope and that it should be under the control of no less a political subdivision than that of the State; that is to say, there should be in every State some agency of the State government that takes an active part in weights and measures supervision at least to the extent of providing a uniform basis for all weights and measures work within the State and of coordinating the activities of all of the various State and local officials who may be engaged in such work. For this reason a large part of this discussion will be directed to the weights and measures organization of a State as a whole. Realizing, however, that there are cases in which the progressive local community, convinced of the necessity for prompt and adequate weights and measures protection, prefers not to await action by the State and desires to proceed independently until such time as the State may decide to act, consideration will also be given to the needs of the separate local weights and measures jurisdiction.

Uniform Coverage. Considering first, then, the State as a whole, the first essential is that all sections of the State be accorded the same degree of protection and that this protection be adequate.[1] The small community is as much entitled to protection as is the large city, and if the State is justified in undertaking the work at all there should be provided a comprehensive system of supervision.

[1] See Chapter 9 for the essential elements of an adequate weights and measures law.

Uniformity of Requirements. The second essential is uniformity. Conflicting regulations, varying interpretations of the same or similar requirements, and divergent methods of enforcement seriously interfere with the efficiency of any program and are particularly unfortunate when associated with the administration of a weights and measures law. In the first place such conflicts and divergencies throw a great burden upon the manufacturers of weighing and measuring equipment, a burden that is eventually borne by the ultimate consumer through increased costs of the articles he buys. In the second place these are most confusing to the business interests of the State, which are forced to conform to whatever requirements may be in force in the locality where a particular transaction takes place. Again, nonuniform requirements are conducive to confusion and discouragement on the part of the purchasing public, a group whose cooperation must be obtained if maximum results are to be achieved; they also complicate the enforcement of the law and hamper the officials who are trying to enforce it; lastly, they tend to bring into disrepute and contribute to a general dissatisfaction with the entire scheme of weights and measures supervision. These unfortunate results follow without any compensating benefits; moreover these conflicts, these variations, and these divergencies are entirely unecessary in the first instance.

Every effort, therefore, should be made to have uniformity prevail throughout the State in all matters affecting weights and measures administration. This can readily be accomplished without adversely affecting the rights of business, the public, or the official, and under a uniform system ample opportunity will still remain for the exercise of all of the energy and initiative of the individual official, the interests of all parties will be adequately protected, and the administration of the law will be so stabilized that a high degree of efficiency may be developed.

Personnel. The third essential for an efficient weights and measures organization is a well-trained, properly-supervised personnel, made up of intelligent, interested, and impartial officials, and large enough so that the work of weights and measures supervision may be thoroughly performed. The character and training of the official will be treated more fully at a later point,[2] but one related matter must be discussed here because of its bearing upon the type of organization to be adopted in any given State; this has

[2] See Chapter 11.

to do with the amount of work to be performed by a weights and measures officer. Experience has demonstrated that in general the part-time official is not so successful as the one who devotes all of his time to weights and measures duties. This work is of a highly technical nature, and study and experience on the part of the official are required for efficiency. Where the official has a variety of duties and interests aside from those of weights and measures it is almost inevitable that his weights and measures efficiency will be lower than that of the official who devotes his full energies to this field. Particularly is this true if an official is himself engaged, during a portion of his time, in business pursuits; this combination of official responsibilities and commercial interests is usually fatal to results except, perhaps, along purely mechanical lines. It follows that a well-planned weights and measures organization will provide for such an apportionment of duties among the personnel that each man may devote his full time to this work.

Population Factor. These three essentials should be borne in mind whatever form of organization may be decided upon. Next the question of population may be examined to see how this bears upon the problem. Two factors need consideration in this relation—the number, and the geographical distribution, of the people of the State. In some States the urban population is more or less evenly distributed in cities of moderate size and in smaller towns and villages, without any great concentrations, so that, in general, an area of a given size in one part of the State represents approximately the same number of people and the same amount of business as any other area of similar size. In other States it is found that the distribution is much less nearly uniform and that in certain sections the population is thinly distributed, with few towns of any size (in some cases there are even very large areas containing scarcely any people or business establishments), while other sections are closely built up, with a relatively high concentration of population and business interests. Finally, there are those States in which are located many large cities, with their dense populations, their large industries, and the very great amount of business that results from this combination.

Resident Officials. Due consideration should be given to facts such as these in determining the type of organization that will give best results. In this relation it should be remembered that the larger the city the more necessary it is to have a resident weights and measures official so that his services will be available at all times. It may also be taken

as a general guide that in any ordinary city of 25,000 to 50,000 population there will usually be enough work to require the full time of one weights and measures official.

The question of transportation of the necessary equipment throughout the thinly settled sections and the general accessibility of these sections should be given consideration. The danger of establishing an arbitrary State-wide system that may be suited to one locality but not to another, should be guarded against; for example, a plan requiring separate county weights and measures officials in every county may work very well in the well-populated counties, but may be most unsatisfactory in the others. Zeal in providing resident officials should not be carried to the extreme of requiring officials for jurisdictions too small to justify their employment.

State, County, and City Officials. It is readily apparent, then, that a city of a given size will provide enough weights and measures work to occupy the full time of at least one official. Similarly, in the absence of a large city, the county subdivision may be of such a size as to provide a proper field for a full-time official. However, in the less thickly settled sections it may require a group of several counties to keep a single official busy. To those accustomed to dealing with political matters, and thinking in terms of our customary political subdivisions, in the first case mentioned the city official appears as offering the logical answer to the question of the type of organization to be adopted; in the second case the county official seems to meet the demands of the situation; while in the last case the State officer offers a satisfactory solution. And this is the line of thought that has undoubtedly been followed in many States, as shown by their present organizations.

Full-Time Officials. It should again be emphasized, however, that in making provision for local officials there is danger to the successful operation of an organization if the State law requires the appointment by local authorities of separate weights and measures officials in *all* political subdivisions of a certain class—cities, counties, etc.—without regard to the amount of work in those subdivisions; it should always be borne in mind that the local jurisdiction that is required to appoint should be large enough to support a full-time official. In some States that have not provided for State inspectors to take care of thinly settled sections, an attempt has been made to meet this situation through legislation permitting adjoining jurisdictions to combine for purposes of weights and measures supervision and to appoint an official

to serve jointly for such jurisdictions. This plan would be fairly satisfactory except for one weakness—small jurisdictions are not required to combine, with the result that such action is not taken in many, or, perhaps, in the majority of the cases, and there results merely a continuance of the condition that it was sought to overcome. The solution would be to establish a suitable minimum salary and to require that all weights and measures officials devote their full time to this work; thus small jurisdictions would be constrained to combine for purposes of weights and measures control. While this suggestion may appear at first glance to be a somewhat radical one, nevertheless it is believed that it is sound and should be followed in the particular circumstances under consideration. (Such a statutory minimum salary as is here discussed should be kept realistic, and in a rising economy will need upward revision from time to time.)

District Officials. When there is adopted a type of organization under which all inspectional work is required to be carried on by State officers, then the State should be divided into districts of such extent that each district will be of suitable size to be handled completely and efficiently by one man, and the force of officials should be large enough to permit of the assignment of one official to each such district. If the State includes one or more heavily populated areas, a variation of the one-man-district plan is the designation of the area or a part of the area as a "district," placing one man in charge thereof, and assigning as many inspectors as may be required for proper coverage of such "district" to work under his immediate supervision.

Special Crews. An exception should be noted to the general recommendation that all work in a given district be performed by one man; this is the case of activities requiring specialized equipment such, for example, as the testing of vehicle scales or the calibration of vehicle tanks. In these fields it will ordinarily be neither economical nor efficient to provide the relatively expensive special equipment for each inspector, and the work is best carried on by separate crews trained for and concentrating upon their particular specialties.

Summation. The foregoing discussion may be summarized as follows:

1. A model State weights and measures organization should provide for:

(a) Adequate supervision for all sections of the State. (The State law should be comprehensive and due re-

gard should be given to small as well as to large communities.)

(b) Uniformity of legal requirements, specifications and tolerances, methods of test and general enforcement, etc. (A closely knit organization with active supervision by the State office should be provided for.)

(c) An adequate number of properly trained and equipped offiicals. (Adequate compensation *must* be provided for, so that capable officials may be employed and retained in service.)

2. The density and distribution of the population should be carefully studied, especially if provision is to be made for local officials.

(a) Full-time weights and measures officials should be required in all cases.

State Coordination and Supervision. In any event, it is essential, for efficiency, that the organization be headed by an active State office of weights and measures that will be the source of specifications and tolerances for weighing and measuring devices, methods of test, and rules and regulations for the general guidance of weights and measures officials of the State; that will issue decisions upon any questions of interpretation of law, specifications, regulations, etc.; that will maintain supervision over the equipment and activities of all weights and measures officials of the State; and that will provide the leadership and coordination that are necessary for effective State-wide accomplishment.

Local Organization. The individual city or county that decides to establish weights and measures supervision upon its own initiative in the absence of a State department has a simpler problem because of the restricted territory to be considered. In the main, however, the same principles apply as in the case of the State; that is, there should be a comprehensive ordinance or law,[3] the work should be carried on in a vigorous and uniform manner throughout the jurisdiction, and there should be a sufficient number of officials to provide adequate portection to the business interests and to the people at all times. In addition, if there are other independent weights and measures organizations in the State, cooperative effort should be made to coordinate the activities of all such organizations so that all may proceed in a uniform manner and under uniform regulations. In the large city or county it may be found advantageous to divide the terri-

[3] See Chapter 9.

tory into districts of suitable size and to make one man more or less responsible for each district, as was suggested in the case of a State organization.

In several succeeding chapters there will be discussed questions having a bearing upon the general one of the weights and measures organization, and which it has been deemed advisable to consider as separate topics.

Chapter 6.—Organizational Placement of the Weights and Measures Unit

Efficiency and economy of administration demand that the various duties of the State be grouped according to some systematic plan so that duplication of effort may be avoided and so that responsibility may be definitely fixed. As noted in Chapter 4, the present tendency in this country, as indicated by recent reorganizations in a number of States, seems to be to eliminate the independent establishments, to reduce the number of main divisions, and to bring each of the activities of the State into one of a small number of main groups, each under the direction of a single official. These groups are then subdivided according to the nature of the work to be done. Following the general lines of the Federal organization, these main groups are usually designated "departments," with "bureaus" and "divisions," or "divisions" and "sections," as primary and secondary subdivisions, each with its director or chief. It is the purpose of this chapter to establish the necessity for the assignment of the State weights and measures organization to a proper place in the general organizational scheme of the State.

Suitable Rank. Weights and measures supervision is of great economic importance to the State; in one or more of its phases it is of direct financial importance to almost every citizen. It is appropriate, therefore, that it be recognized as one of the principal functions of the government, and that the unit charged with the responsibility of making it effective be ranked on a par with other major subdivisions of the service.

In addition to propriety, there are other reasons for placement of weights and measures administration at a major subdivisional level. The nature of weights and measures supervision is such that, for success, it must be directed by a well-informed and active official, who is free to proceed in an energetic, impartial, and fearless enforcement of law without being hampered by the possible indifference or opposition of several superiors. He should be a man of such ability and integrity that he may be trusted to act more or less independently in the discharge of his official duties, and, as the active head of his organization, he should be held responsible for results. Particularly should such an officer

be relieved of political restraints in his enforcement of law, and his authority should be adequate for able administration.

It is believed that in the organizational scheme outlined in the opening paragraph of this discussion the office of weights and measures should be rated not less than a bureau, and that in other organization schemes an equivalent rating should be given. When this is done, the foundation will have been laid for efficient weights and measures administration.

Tenure of Office. In this connection it is appropriate to mention that the tenure of office of the members of a weights and measures organization has an important bearing upon the amount and character of the useful work performed. It has been pointed out that weights and measures supervision comprises a large field of activity, and demands for its able administration an unusual amount of technical knowledge and experience on the part of all concerned. It is obvious that a high rate of turnover among technical personnel is not conducive to economy, procedural continuity, and efficiency of overall results, from which it follows that with the possible exception of the administrative head of the State office, changing the personnel of the weights and measures office and field forces whenever changes occur in the political complexion of State or local administrations should be avoided. When weights and measures officials are covered by a form of civil service or its equivalent such that continuance in office during good behavior is assured, the cumulative effects of their experience and study are capitalized upon to the betterment of the service. Such provisions have for many years been included in the model weights and measures law adopted by the National Conference on Weights and Measures. When an effective merit system is in operation, there can be avoided the frequent removal from office of men who may, perhaps, just be reaching a state of efficiency after several years of experience and study, in favor of inexperienced and untrained men who must begin at the bottom in the matter of their understanding of the principles and duties of their position and their knowledge of its technical requirements.

Combination with Other Activities. It has sometimes happened that, when a State has initiated weights and measures supervision, these new duties have been added to those of an existing organization in such a way as to make the weights and measures work, from an administrative standpoint, of purely secondary importance to the other work. There is no other branch of the government that comes into

contact with the large and varied group of interests affected by weights and measures supervision in the intimate manner essential to such supervision. The activities of the dairy and food organization probably approach most nearly a parallel with the weights and measures organization in this respect, but even here the field covered by the former is but a part of that that is assigned the latter. On the one hand, there is a strict limitation to those concerned with dairy and food products; on the other hand, the weights and measures official is directly concerned with every commercial transaction involving weighing or measuring of whatsoever kind.

Whenever weights and measures duties are added to those of an existing organization so as to be administratively subordinate, it is inevitable that the official in charge of the office has been trained along other lines and that his main interest lies in other directions. Thus he can hardly be expected to display in the study of the new weights and measures problem the same degree of enthusiasm and industry that is to be expected from the official whose duties are to be confined to the weights and measures field.

"Combination" Inspectors. The situation may be further aggravated by adding weights and measures duties to the duties of the existing subordinate officials, particularly the field men. Here again there is a divided interest and responsibility, with the probability that the new duties will be looked upon with disfavor and will be correspondingly poorly carried on. "Weights and measures" is a technical subject and one that demands sympathetic and prolonged study if it is to be mastered. It is obvious that the efficiency of a weights and measures official and the amount of good that he can accomplish are in direct proportion to the extent of his mastery of this subject, and this observation applies equally to the chief and to all of his assistants and subordinates. It follows, therefore, that the duties of weights and measures supervision should not be loosely "tacked on" to some other office, and that weights and measures activity should stand practically alone, guided and carried on by officers who have the opportunity and the will to devote to it the study and energy that it merits.

It is frequently urged in support of the plan just discussed that since weights and measures supervision involves inspectional activity it should, as a matter of economy, be handled by an existing force of inspectors of some other kind who will then perform both classes of duties. In addition to what has been said above about the objections to this plan, it may

be mentioned that experience seems to have shown that the anticipated savings are seldom realized in practice, provided that a serious attempt is made to supply adequate enforcement. Weights and measures duties are a sufficient undertaking in themselves, and if a man is charged with additional duties and does not slight any of them, his progress is just that much slower than it would otherwise be. In other words, it takes just about so many men to cover a given territory along certain lines, and but little time, if any, is saved by loading down each inspector with a multiplicity of duties, as compared with the plan wherby each inspector performs duties of only one general kind. In fact, it is believed that in the majority of cases a single inspector endeavoring to carry on a variety of diverse lines of work will actually consume more time and do his work less satisfactorily than the one whose thoughts are concentrated upon a single character of activity.

The question of equipment also has a bearing upon this discussion. The weights and measures officer is obliged to carry a considerable amount of equipment with him for the inspection and testing of commercial weighing and measuring devices. Even when reduced to the bare essentials, this equipment is burdensome. If a "combination" inspector must also carry other special equipment for other purposes, the probability is that some essentials of one or both equipments will be sacrificed to obtain facility of movement, to the detriment of the quality of results.

In the case of the local weights and measures organization the foregoing arguments are equally applicable. It has previously been emphasized that the weights and measures official should, for best results, devote his full time to weights and measures duties. It is unfortunately common for the local weights and measures inspector to be burdened with a large variety of diverse offices. In some cases a weights and measures force, originally inadequate in number, will, in effect, be still further reduced through this repeated assignment of additional duties. Students of government will probably agree that such a policy is economically unwise when the weights and measures protection of the community is involved.

Chapter 7.—Fee System as Applied to Weights and Measures Inspections

National Conference Attitude. From time to time the National Conference on Weights and Measures[1]—the national organization of weights and measures officials—has considered the general proposition of the assessment against the owner or user of a weighing or measuring device of a fee for each examination of the device by the weights and measures officer. Obviously, the objective of a fee system is to produce revenue, so that, within the jurisdiction employing it, weights and measures supervision may be made wholly or partially self-supporting

The collection of fees by the weights and measures officer has been opposed by the National Conference. In 1915 a resolution of disapproval was adopted, the Conference going on record as being "unalterably opposed to any fee system for weights and measures inspection or sealing." In 1919 a paper by an official operating under a system of fees concluded by stating that the fee system is "antiquated, . . . is dangerous from a political-economy point of view, places a burden on a small class alone in the community, greatly adds to the troubles of an inspector in the field, and hinders the work in general." In another paper presented to the Conference in 1936, the author characterized the fee system as "iniquitous"; in the debate that followed the presentation of the paper, one speaker referred to the "viciousness" of the fee system, and another reported that the sealers of his State were "very pleased that we, as a body, could defeat" a bill introduced into the State legislature providing for charging fees for weights and measures services.

Nonetheless, proposals for the adoption of fee systems recur with sufficient frequency to warrant some further examination here into the possible effects of such a system upon the efficiency and smoothness of operation of a regulatory weights and measures program.

General Considerations. The support of a particular activity of government, and especially the compensation of the officers engaged therein, by means of special assessments

[1] For a discussion of the National Conference on Weights and Measures, see chapter 13.

or fees levied whenever a service is performed has for centuries been a favorite expedient of law-making bodies for avoiding additional demands upon the public treasury when it has been found necessary to inaugurate a new activity or expand one already in existence. Many examples of the survival of this plan may be found today in the administration of State and local governments in this country; and while in many instances the fee system may still be justified by reason of the personal or individual character of the service rendered, the contrary is certainly true in other instances, where the service partakes more of a public than of a private nature. For example, the recording of a deed in the public record is primarily a protection to the owner of the property in question, the value of this record to the people of the State at large being of a secondary character; the assessment against the property owner of a special fee for this service may, therefore, be considered as an equitable method of meeting the expenses incident to the maintenance of the service. On the contrary, one would not consider it fair for the cost of a State road to be assessed entirely against the abutting property, because the benefits are primarily to the people of the State as a whole, the benefits to the individual property owner being of a purely secondary nature.

Two Forms. The fee system was adopted in many jurisdictions for the maintenance of weights and measures supervision when such supervision was originally established, and in some jurisdictions has survived to the present time. Two modifications of the system have been utilized. In the earlier form a system of fees is prescribed by law for the various mechanical services performed by the weights and measures official, and all fees collected by the official are retained by him as his compensation for his efforts. It can readily be surmised that in the majority of cases this plan does not contemplate the performance by the official of any duties except those for which a fee is provided; this means, of course, that practically that entire branch of the official's work that has been designated as his "supervisory activities" will be untouched. The later form of the fee system specifies the legal fees as before, but provides that these be turned in to the treasury, the official or officials in this case being remunerated by a fixed compensation independent of the amount of fees collected.

A Special Tax. It is the general opinion of weights and measures officials today that the fee system in connection with weights and measures supervision is most unfortunate and cannot be recommended or defended except in extraordinary

cases. This conclusion is based upon the character of the benefits resulting from weights and measures supervision, which are primarily of a public nature. While it is a fact that the inspection of weights and measures undoubtedly protects the honest merchants from certain injurious effects of dishonest competition by compelling all to give honest weight and measure, and also protects the merchants from delivering overweight through ignorance of the condition of their apparatus, nevertheless one of the main objects of inspection is to protect the consumer from being defrauded by the use of false scales, weights, and measures, or by misrepresentation or fraudulent practices of any kind, on the part of careless or dishonest tradesmen. In other words, the service is to the community as a whole, and the community as a whole derives the benefits of the official's activity. When viewed in this light it becomes apparent that the fee system, which in effect is a special tax upon the users of weighing and measuring equipment, is not equitable, since it is manifestly unfair to single out one class and burden it with taxes for the benefit of the whole community. This service is of the character of police protection and all residents participate in its advantages. Therefore, the equitable way in which to distribute the cost of maintaining the service is to meet its expenses from funds raised by general taxation.

Not Equitable as Charge for Service. The argument is sometimes advanced that the fee system is equitable because certain services not strictly required by law or ordinance are rendered by the official to users of weighing and measuring devices, such as slight repairs that can be quickly made, rebalancing of scales found out of balance, and the like. The owner of the equipment in such cases does receive something of pecuniary value not contemplated by the law, and may thus have less grounds for objecting to the charges made. But that this argument is not a good one may easily be shown. Probably not one owner out of four ever receives the services mentioned; therefore, if services equivalent to the fees charged are in fact rendered, one owner in four receives four times the amount of service for which he pays while the remaining three receive nothing. The effect is a tax upon careful and honest owners for the benefit of their careless or, perhaps, dishonest competitors; the former are penalized and the latter are encouraged in their laxity or dishonesty.

Owner Reactions. Nor can the system be defended in practice. Many of the abuses found in connection with the

earlier enforcement of the weights and measures laws throughout the country may be traced to the fee system. As a result of their objections to the system of charging fees, owners of weighing and measuring devices look with hostility upon the activities of the weights and measures official and frequently question his sincerity and efficiency in the discharge of his official duties. As a consequence, the reputation of the office suffers, the official is hampered in carrying on his work, and the cooperation, so important to success, on the part of that large element of the community comprising the owners of weighing and measuring equipment is extremely difficult, if not impossible, to obtain. Since the owners of commercial equipment do not wish to pay these special taxes any oftener than is absolutely required by law, they rightfully protest against more than the legal number of visits of the official, who is thus hampered in conducting special or "surprise" inspections, and whose supervisory activities are greatly interfered with.

Official Reactions. Again, the official finds himself constantly confronted with the necessity for making a financial showing. He may feel that he must do the work that brings in money whether other phases of his work are attended to or not. When the collection of fees is contingent upon the approval of the apparatus tested, even the most conscientious official is constantly tempted to strain a point and put the official seal upon apparatus not entirely up to standard since he knows that the success or failure of his office is too often measured by the amount of fees turned in. Finally, in aggravated cases, the official who operates under the fee system may lose all initiative and interest in his work, his activities may degenerate into a mere mechanical routine, and he may learn to look upon weights and measures supervision as a source of revenue and nothing else. A deplorable situation, certainly, and one that should be avoided by all means.

Fees as Last Resort. In relation to the foregoing arguments the question is sometimes asked: But suppose that the fee system is the only basis upon which it is possible to bring about the establishment of weights and measures supervision; what is then to be done? Usually half a loaf is considered to be greatly preferable to no bread, yet weights and measures officials who have had experience with the administration of weights and measures under the fee system and who have observed its operation in other jurisdictions have been known to express themselves forcefully to the effect that no supervision at all is preferable to attempted supervision under the handicap of a system of fees. Whether

or not this somewhat extreme opinion be accepted, it is believed that the consensus of all who have given careful study to the dangers attendant upon the fee system is to the effect that in no case should it be adopted except as the very last expedient by which weights and measures supervision can be maintained.

Licensing systems, which have some similarity to a fee system, are discussed in the succeeding chapter.

Chapter 8.—Licensing Systems in Relation to Weights and Measures Administration

During comparatively recent times, some weights and measures administrators have shown interest in the adaptation to their official programs of one or another form of licensing. There has been no significant increase in the number of jurisdictions utilizing licensing for purposes of control or revenue production, but a willingness in certain areas to base a program of weights and measures supervision upon a system of licensing is demonstrated by the occasional introduction of bills incorporating licensing provisions. It is appropriate, therefore, to examine critically some of the principal characteristics of licensing as it may be applied to weights and measures administration, and to contrast the apparent advantages and disadvantages of licensing for the production of revenue and for the purposes of control.

Licensing for revenue, an expedient for raising the money needed to maintain weights and measures supervision, is open to many of the objections cited in Chapter 7 in relation to the fee system. The principal objection is that such licensing is, in effect, a special tax upon a small group—the business segment of the community—for the support of a service that provides protection to the community as a whole.

Distinguishing Characteristics. Licensing systems are distinguished by two important characteristics. The first of these is the control feature; the authority to suspend or revoke a license is a powerful instrument in the hands of the government for the enforcement of the requirements in connection with which the license is granted. The second important characteristic of licensing is its revenue feature; the granting of a license is almost always contingent upon the payment of a fee.

Application. The licensing principle has been used in connection with weights and measures administration to a limited extent. Up to now its application has largely been confined to special groups such as peddlers, transient vendors, dealers in fuel, weighmasters, operators of gasoline-dispensing devices, operators of creameries and cheese factories, and the like; here the primary objective has been control rather than the production of revenue. Proposals have been advanced, however, for the general licensing of commercial

establishments in which weighing and measuring devices are used, for the primary purpose of providing the funds necessary for the administration of a weights and measures program.

Objectionable Features. Considering first some of the objectionable features of a licensing system, it may be said that a license implies, in the majority of instances, the existence of a special set of requirements for a particular group. In a way it is based upon a form of class legislation and is open to the objections that may be urged against all such legislation. When fees are collected for licenses and used for the support of a weights and measures office, the same objections apply as were cited in connection with the discussion of fee systems in general; that is, the license fees constitute a special tax, the proceeds of which are used to support an activity that, because of the general benefits resulting, should be maintained from general taxation funds.

In the minds of some, another objectionable feature of the weights and measures license system is that it gives to the administrative official quasi judicial functions in the matter of suspending and revoking licenses; if a license law does not give that power to the official, the chief purpose of the system—provision for direct and summary control over the licensee—is not realized, and justification for the system fails. Finally, for a license system to be effective, all matters must be promptly and completely followed up, and the administration of the system will be found to entail considerable work on the part of those in authority and to introduce at least some complications for the licensees.

From the foregoing it appears that the necessity for licensing a particular group should be very well established before this scheme is undertaken. If group licensing is to be adopted for control purposes, it will be advisable to limit the application of the system to those groups that present some special problem not otherwise readily susceptible of control. It is suggested further that licenses of this type be issued without a fee or that, at the most, the fees be fixed at amounts only sufficient to cover the actual cost of the licensing.

Advantages. On the positive side, it may be pointed out that the principal advantage of a licensing system for control purposes lies in the authority to suspend or revoke licenses. This produces a powerful argument for compliance with regulations in the minds of any who might be tempted to follow the dictates of their own desires rather than those of the law; for, with a strong basic law to the effect that a

license is a prerequsite to doing business, the licensee must not fail to conform to the conditions upon which the license is granted if he wishes to continue in business. In other words, when a man is licensed he is told, in effect, that he may engage in certain activities only so long as he observes certain rules, and that when he fails to observe those rules his privilege will be taken away from him. It can readily be appreciated that one in this situation will think well before he engages in questionable practices, and likewise that the consistent offender may be effectively dealt with.

Another advantage, which in a way is associated with the one just mentioned, is that the necessity for periodic renewals of licenses makes it possible periodically to check up on the condition of the mechanical equipment being used by the itinerant or transient licensee. The license also serves in the case of this character of merchant as a valuable means of identification when apprehended in a violation of the law. Again, the regularly displayed physical evidence of the issuance of a license, that is, the license tag or plate, in itself serves to reassure those with whom the licensee does business, because it is tangible and readily apparent proof that regular supervision exists.

Administering Agency. Assuming that it has been decided to resort to group licensing, it is suggested that a license issued primarily for purposes of weights and measures control may very properly be issued by the weights and measures office, and that unless this plan introduces complications with a general licensing office already in existence, this will usually be found more simple and satisfactory than for the license to be issued by a separate office upon recommendation of the weights and measures office. In those cases where weights and measures requirements and requirements of other kinds are to be grouped together as a basis for a single license it is, of course, desirable for some single agency to handle the actual issuance of the licenses after the individual offices concerned have signified, in relation to each applicant, that the requirements in which they are interested have been met. In these cases the general licensing office, if one exists, is the logical choice; otherwise, if the weights and measures requirements predominate it is believed that the weights and measures office should be the issuing agency, and if not, that the office principally concerned should handle this matter.

Details of System. The extension of the use of the licensing system to general problems of weights and measures control is not advocated. It may be said, however, that when

so utilized, the issuance of the license is usually made contingent upon requirements respecting (a) the character of the weighing or measuring equipment and necessary accessories, (b) the maintenance and official approval for use of such equipment, (c) the giving of full weight or measure, (d) the avoidance of the perpetration of fraud, and (e) a general compliance with the applicable provisions of the weights and measures law. Whatever the details of the system may be, it is believed that, to be effective, the law should embrace the following provisions:

1. No one shall engage in the business in question without a license. (Since this is the basic requirement, a relatively heavy penalty should be provided for violation thereof.)

2. The license shall be granted originally only after two conditions are satisfied: (a) The licensee shall have provided weighing or measuring equipment of a character that is suitable and in an amount that is sufficient for the purposes of the business in question, including any auxiliary equipment that may be necessary; and (b) this equipment shall have been tested and approved for use by the weights and measures official. (Since the chief of the weights and measures office is the recognized authority on weights and measures matters in his jurisdiction, the law should leave to his discretion the framing of the necessary regulations under condition (a), thereby providing for a more flexible and efficient administration than would follow if it were attempted to include detailed provisions of this character in the law itself.)

3. The license shall be renewed annually (or oftener if deemed necessary) provided that the weighing and measuring equipment of the licensee is, upon inspection, found still to conform to the original requirements and is, after retest, found to be in satisfactory condition for use.

4. Authority shall be vested in the chief of the weights and measures office to suspend any license for cause, such as failure to maintain adequate weighing or measuring or auxiliary equipment, failure to maintain such equipment in suitable condition for use, or consistent violation of the regulations governing licensees. Provision should be made for judicial review, upon the appeal of the licensee, of the action of the weights and measures official in suspending any license.

5. Authority shall be vested in the chief of the weights and measures office to revoke any license following a conviction of the licensee by a competent court for delivering

short weight or measure or otherwise perpetrating fraud upon those with whom the licensee does business, or for violating any other applicable provision of the weights and measures law. Provision should be made for appeal to a court by the licensee from a decision of the weights and measures official.

Bond. Licensing for control can be made even more effective by requiring the licensee to post a deposit or to file a bond. It will normally be unnecessary, however, to resort to this rather drastic requirement; such action would only be justified in the case of groups largely made up of the less responsible members of a community, such as, for example, peddlers or other itinerant vendors, or in situations where experience has demonstrated that extraordinary checks are demanded for the proper safeguarding of the interests of the community.

Licensing for Revenue. Licensing for revenue may be directed to the business establishment rather than to individual weighing or measuring devices as such, in which case the license is, in effect, only a form of receipt showing the payment of a charge for the privilege of doing business. Even though the amount of this charge for a particular establishment may be computed from the number and kind of commercial weighing and measuring devices in use in that establishment, the issuance of the license is automatic upon payment of the assessed charge and is not contingent upon the condition of the weighing and measuring devices in use, upon the proper use of such devices, upon compliance with the mandates of the weights and measures statute, or upon the amount or kind of work performed in the establishment by the weights and measures officer.

The revenue produced under this system depends entirely upon the thoroughness with which all establishments in the jurisdiction that are appropriate for licensing are actually licensed. Licensing being independent of the technical activities of the official, the system does not hamper the official in carrying out all such tests, inspections, and investigations as he deems advisable, such as might readily be the case under a fee system. In this important respect the licensing system for revenue is greatly to be preferred to the fee system.

A variant from the establishment-licensing plan just considered is a plan under which each individual major piece of commercial weighing or measuring equipment is separately licensed, but again without regard to its condition or manner of use or to the amount and kind of official attention

it receives. This equipment-licensing plan appears to offer no advantages over the establishment-licensing plan, and has the comparative disadvantage of being somewhat more complicated and requiring more time and effort to administer.

If it is found wholly impracticable to establish and maintain weights and measures supervision upon the orthodox and preferred basis of appropriations from general taxation funds, establishment-licensing for revenue is to be recommended over the system of fees for testing and inspection services.

Chapter 9.—Essential Elements of an Adequate Weights and Measures Law

The weights and measures statute is, of course, the foundation upon which the structure of weights and measures supervision is reared. Without an adequate foundation no enduring building can be erected; likewise, without an adequate law for a basis it is impossible to erect a comprehensive system of weights and measures supervision that will successfully resist the vicissitudes of the complicated and strenuous commercial life of the present day, or to realize the full measure of protection that such an edifice should afford. It is of primary importance, therefore, that this basic law be carefully planned along broad lines to meet the exigencies of modern business, that it be executed with precision and with an attention to detail that will insure a cohesive and substantial whole, and that it be reinforced by such provisions for administrative authority and penalties for violations of its provisions as will make possible effective enforcement.

All that has preceded and much that will follow in this Handbook has a direct bearing upon the subject of this chapter; in fact, the previous discussion of some points has been so detailed that further reference will not be made to them at this time.

Model State Law on Weights and Measures. One of the first undertakings of the National Conference on Weights and Measures [1] was the preparation of a model State law on weights and measures, to the end that uniformity among the States in the matter of their weights and measures legislation might be promoted. The first such model law was adopted by the National Conference in 1911. Since then the model law has been amended on numerous occasions, through addition and modification, to strengthen it and keep it up to date. In its present form this "Model State Law on Weights and Measures" contains the necessary general and basic provisions and numerous commodity provisions. The National Conference has also adopted a "Model State Weighmaster Law" and a "Model State Regulation Pertaining to Packages: Exemptions, Marking Requirements, Varia-

[1] For a discussion on the National Conference see Chapter 13, p. 79.

tions." Copies of these models may be obtained without cost upon application to the Office of Weights and Measures, National Bureau of Standards.

It is the purpose of this chapter to present a general résumé of the essential elements of an adequate weights and measures law; for information on specific details and on proposed bill language, the full text of the models cited above should be consulted. As in earlier chapters, the discussion here will be, primarily, from the standpoint of the State rather than of the local jurisdiction; such modifications as will be necessary to meet the requirements of the municipality or county should be entirely obvious as to both the subject matter of this chapter and the texts of the model laws and regulation.

Standards. It has been stated that the function of the weights and measures official is to secure equity in all commercial determinations of quantity. This statement presupposes the existence of standards as the first requisite. It is therefore fitting that the weights and measures statute should first establish the standards of length, mass, and capacity that are to prevail throughout the State and provide for the physical copies of these standards necessary for purposes of enforcement. Provision should also be made for the verification and the periodic reverification of these standards so that their initial accuracy may be established and their integrity maintained.

Department Organization. The weights and measures organization of the State should be outlined in the law and definite and mandatory provision should be made for the personnel necessary for its enforcement. In general, it is inadvisable to limit, by statute, the State or local personnel. If this be done there will be no opportunity to increase the number of officials to take care of increasing duties except through legislative action. Within the limits set by his appropriations, the responsible head of the office should be free to handle this matter as conditions warrant. Also, it is considered inadvisable to specify salaries in the statute; were this to be done it would be necessary to obtain action by the legislature to adjust the salary schedule to changing conditions, as may be necessary from time to time. (With respect to local officers required or authorized by State statute, it is sometimes found expedient, as has been mentioned in an earlier chapter, to specify *minimum* salaries, in order to insure that the local authority will not fix the salary so low that qualified applicants cannot be found.)

Powers and Duties of Officials. The powers and duties of all weights and measures officials should be stated in unmistakable terms, for it is largely upon these sections of the law that the efficiency of the weights and measures administration will depend. The powers granted should be broad so that ample authority may reside in the officials. These sections of the law should be worded in general terms so as to cover, as nearly as possible, all contingencies that may arise, and so as to avoid the strict limitation of authority that may result if the language of the law is too restrictive. It should be remembered in this connection that the rule of construction for a criminal statute is to construe strictly against the State and liberally in favor of the alleged violator.

Authority of Officials. The weights and measures officer should first have full and complete authority over the mechanical equipment used in commercial weighing and measuring, including not only equipment used in the buying and selling of commodities or things but also equipment used in the buying and selling of service. The official should likewise have jurisdiction over the use of that equipment. He should be empowered to reweigh and remeasure commodities and to carry on all necessary investigations incident to his duties. He should have access to all places where his presence is demanded for purposes of inspection, testing, or supervision. He should be clothed with reasonable police powers as necessary to the execution of his duties and with authority to issue emergency orders as circumstances demand. As to his duties, as distinguished from his authority, these should also be stated in general terms and should provide for periodic mechanical testing and as much supervisory work as practicable.

Penalties for Offenses. To be effective the weights and measures statute should provide penalties for violations of its provisions, and these penalties should be of a character to discourage violators in a forceful way. Short weight, short measure, and other frauds prohibited by the weights and measures law are serious offenses and should not be lightly treated. A very small fine means nothing of itself to the man who is deliberately setting out to defraud his customers; such a one should be shown the error of his ways by a penalty commensurate with his offense. A graduated scale of mandatory fines beginning at, say, $20 (or more than this for particularly serious classes of offenses), with alternative or additional jail sentences, are necessary to cope with

the situations that will arise in weights and measures supervision.

Specific Provisions. In addition to the general provisions of the weights and measures statute as outlined in the foregoing, certain specific matters require special treatment. The method of sale of particular commodities or classes of commodities should be prescribed: Liquid commodities by weight or liquid measure; commodities not liquid by weight, measure of length or area, or count; coal, coke, and charcoal by weight only, with special regulations regarding delivery tickets; butter and oleomargarine by weight only, and when in prints, only in prints of specified weights; meat, fish, and poultry, whether cooked or uncooked, by weight only; bread in standard-weight loaves; flour and meal in standard-weight packages; berries and small fruits by weight or in boxes of specified sizes; and so on. Definite requirements should be included in relation to the marking of packages with statements of their net contents. The marketing of packages that are slack-filled or otherwise deceptive or misleading in appearance should be prohibited. The principle of sale by net instead of by gross weight should be established. There should be a general prohibition of misleading representations of quantity and price of commodities or services sold or offered for sale. Necessary definitions of terms and units should be included.

Standard Containers. Although the National Conference has not as yet developed a model standard-container law, it may be noted that reenactment into State law of the provisions of the Federal Standard Container Acts of 1916 and 1928 will generally be found advisable. Adaptation of these acts to the form of a State statute will be a relatively simple matter.

Licensed Public Weighmasters. Provision for licensed public weighmasters under the general superintendence of the State weights and measures chief is advisable, particularly in agricultural and industrial States. Requirements should be included to insure that licenses will be issued only to responsible persons who are technically qualified to perform weighmaster duties. The statute should be specific with respect to the issuance, renewal, suspension, and revocation of licenses, the form and execution of weight certificates, the scales to be used by weighmasters, and offenses and penalties.

Rules and Regulations. Finally, the chief weights and measures officer of the State should be empowered to make reasonable rules and regulations for the enforcement of the

statute and for the guidance of all weights and measures officers of the State, and should be required to promulgate specifications and tolerances for commercial weighing and measuring devices, designed to insure accurate and reliable commercial equipment free from features conducive to the perpetration of fraud.

Inappropriate Minor Details. The inclusion in a weights and measures statute of requirements of a minor character, of requirements that will or may need revision from time to time, and of requirements of a particularly technical character, all of which can be better and more satisfactorily handled by rules and regulations, is so frequently productive of unfortunate results that it is felt that the unwisdom of this course should again be emphasized. For example, some years ago the entire standard-weight bread law of a State was rendered inoperative by a successful attack upon the numerical value of the tolerance that was specified in the law; had this tolerance been established by regulation, authorized by the law, instead of by the law itself, it might readily have been modified, if found to be improper, without in any way affecting the basic statute establishing the standard-weight-loaf principle. Again, such matters as the particular location of the capacity statement on a milk bottle and the tolerances that are to be permitted on each size of bottle are sometimes written into the statute itself. Such actions certainly do not make for flexibility in meeting changing conditions, and may, as in the bread case cited, defeat the entire purpose of the legislation. It is urged, therefore, that technical regulations, such as specifications and tolerances, regulations that may be expected to require modification from time to time, and all regulations of a minor character be left to promulgation by the principal weights and measures officer of the State, and that the statute itself be confined to fundamentals of the character outlined earlier in this chapter. In short, the weights and measures statute should be comprehensive, broad in its terms, easily understood, and readily enforceable, providing ample authority for its enforcing officials and adequate penalties for violations of its provisions.

Model State Regulation Pertaining to Packages. Although the National Conference has not developed model regulations on a variety of subjects, one such regulation has been adopted, dealing with one of the principal phases of weights and measures control; this is mentioned here because of its importance in supplementing basic statutory require-

ments. The material in question is the "Model State Regulation Pertaining to Packages; Exemptions, Marking Requirements, Variations." This is based upon the package-marking regulations promulgated by the Federal Food and Drug Administration under authority of the Food, Drug, and Cosmetic Act, but is broader in scope, covering packages of all commodities instead of being limited in application to packages of foods, drugs, and cosmetics only. It is designed to provide a set of State package requirements in harmony with the Federal requirements, such that in the area of coverage common to both, conflicts will be avoided and the enforcement of both sets of requirements will be simplified and made more effective.

Advantage of Short Bills. In the foregoing discussion statutory requirements of four classes have been considered—(1) organization of a system of weights and measures supervision and basic requirements relative to standards, testing of commercial equipment, and fundamental principles of commodity exchange; (2) special rules applicable to particular commodities; (3) standard containers for fruits and vegetables; and (4) licensed public weighmasters. The enactment of a single bill embracing this entire field may be found difficult, because of the sheer length of the bill and its broad scope. As a practical procedure it is suggested that enactment be sought in four steps, whether in the case of the inauguration of full weights and measures control in a State or in the case of a comprehensive revision of existing weights and measures statutes.

The order in which these steps are undertaken may well be the relative order of importance in which these classes have been listed. Although the "Model State Law on Weights and Measures" of the National Conference covers both basic and commodity requirements, the commodity sections have been placed in sequence to facilitate lifting these as a group for incorporation in a separate bill. Of course, this full legislative program should be planned as a unit so that ultimately the several acts, together with any other weights and measures acts considered advisable or necessary to meet local conditions, will form an integrated whole.

Repeal of Obsolete Provisions. As a further comment apropos of a well-integrated structure of weights and measures statutory requirements, it is urged that outmoded statutory requirements be repealed, such action being based upon careful and periodic reviews of all weights and measures requirements on the statute books. Also, whenever new

legislation is proposed, adequate provision should be made therein for the repeal or suitable amendment of any existing requirements that are to be superseded by, or that are in conflict with, the new proposals or that duplicate or overlap to any degree the new proposals. Every effort should be made to avoid ambiguities and to eliminate sources of uncertainty as to the scope and exact meaning of the statute.

Chapter 10.—Specifications, Tolerances, and Regulations

In addition to the weights and measures statute or ordinance, there is a large field of technical requirements in relation to weighing and measuring devices that must be set forth in precise language for the guidance of manufacturers, users, and officials. These technical requirements are embraced in codes of specifications, tolerances, and regulations, and experience has shown that these may best be promulgated as rules and regulations by the principal State weights and measures officer, thus making it possible to keep the codes up to date at all times with respect to developments in the design and manufacture of commercial apparatus. When it becomes advisable to do so, codes may readily be altered and new codes may be adopted; at the same time the basic provisions of the law act as an adequate check upon the possible promulgation of any unnecessary or unreasonable requirements.

Scope and Purpose. Such specifications, tolerances, and regulations ordinarily deal exclusively with the mechanical instrumentalities of weighing and measuring. Specifications are concerned with design, construction, materials, and workmanship; tolerances are the limits of the variations from the true standards of performance or value that will be permitted by the official when he tests commercial weighing and measuring devices; regulations relate primarily to the use or maintenance of commercial devices. Specifications are intended to insure (1) that devices are so made that they may readily be used for the purposes intended without detriment to the accuracy of the results or to the interests of the buyer or seller, (2) that devices are so made that they are reasonably permanent in their indications and adjustments, and (3) that devices are not so made that they are conducive to the perpetration of fraud. Tolerances are required by reason of the fact that mechanical devices are never perfect even when new, and that they deteriorate in use; it therefore becomes necessary to countenance errors. The tolerances are based upon such considerations as the accuracy demands in the probable fields of use of the different classes of devices, manufacturing expediency, costs of refinements necessary to decrease errors, and limitations in reading the

indications of the devices. Regulations are primarily directed to the owners and operators of devices, and are intended to assist in bringing about accurate weighing and measuring.

Development. In the early days of organized weights and measures supervision, codes of specifications and tolerances were usually lacking, and in reality it rested largely on the judgment of the individual inspector whether or not a device was approved for use. As may readily be imagined, this plan led to much confusion and an almost entire absence of uniformity, even in restricted jurisdictions. It was recognized that to remedy the situation, specifications and tolerances should be reduced to written form so that all interested persons might know definitely the requirements for any particular device. This matter was taken up for serious study by the National Conference on Weights and Measures [1] in cooperation with the National Bureau of Standards, with the idea of developing comprehensive codes of specifications and tolerances that might be recommended for general adoption, thus providing the opportunity for uniformity among the States in this important regard.

As a result, very great advances have been made in the direction of uniformity through the promulgation by the majority of the States, without serious change, of the recommendations of the Conference and the National Bureau of Standards. Moreover, this movement is still going on, newly established departments usually adopting the recommended codes as representing the most authoritative information on the subject, and older departments keeping their regulations up to date by amending them to conform to recent changes recommended, and incorporating new codes as these are developed.

Notwithstanding amendments, sometimes of a minor character, that are found necessary from time to time, particularly to keep abreast of equipment development, all of the older codes referred to may be said to be in reasonably stable form. This is to be expected because normal procedure is for a code to be very carefully worked out in the first instance by an experienced committee, to be freely discussed by weights and measures officials from all parts of the country and by representatives of the interested manufacturers, to be tentatively adopted at first, and to lie over for at least one year after tentative adoption before final action is taken. States already having organized weights

[1] For a discussion of the National Conference on Weights and Measures, see Chapter 13.

and measures supervision, but not having as yet adopted comprehensive specifications and tolerances, and States establishing weights and measures supervision now or in the future, have available, therefore, complete codes of specifications and tolerances that have stood the practical test of actual use in many States, and that may safely be adopted with the assurance that they are in no sense experimental; and as codes for new classes of devices are developed, these may be added to the existing requirements of the State.

Advantages of Uniform Adoption. Weights and measures jurisdictions are urged to promulgate and adhere to the National Conference codes, to the end that uniform requirements may be in force throughout the country. This action is recommended even though a particular jurisdiction does not wholly agree with every detail of the National Conference codes. Uniformity of specifications and tolerances is an important factor in the manufacture of commercial equipment. Deviations from standard designs, to meet the special demands of individual weights and measures jurisdictions, are expensive, and any increase in costs of manufacture is, of course, passed on to the purchaser of equipment. On the other hand, if designs can be standardized by the manufacturer to conform to a single set of technical requirements, production costs can be kept down, to the ultimate advantage of the general public. Moreover, it seems entirely logical that equipment that is suitable for commercial use in the "specification" States should be equally suitable for such use in other States.

Another consideration supporting the recommendation for uniformity of requirements among weights and measures jurisdictions is the cumulative and regenerative effect of the widespread enforcement of a single standard of design and performance. The enforcement effort in each jurisdiction can then reinforce and support the enforcement effort in all other jurisdictions. More effective regulatory control can be brought about, and this result can actually be realized with less individual effort, under a system of uniform requirements, than under a system in which even minor deviations from standard practice are introduced by independent State action.

Promulgation. Since the National Conference codes represent the majority opinion of a large and representative group of experienced regulatory officials, and since these codes are recognized by equipment manufacturers as their basic guide in the design and construction of commercial weighing and measuring equipment, the acceptance and pro-

mulgation of these codes by each State is strongly recommended. In this relation it is appropriate to mention a process made use of by a number of States to keep their specifications, tolerances, and regulations for commercial weighing and measuring devices continuously in agreement with the decisions of the National Conference and the recommendations of the Bureau without the necessity for repeated promulgations or legislative enactments to incorporate acceptable additions and changes from year to year. This is accomplished by a single statute or regulation stating that "the specifications, tolerances, and regulations for commercial weighing and measuring devices, together with amendments thereto, as published in National Bureau of Standards Handbook 44 [2] and supplements thereto, or in any publication revising or superseding said Handbook 44, except insofar as specifically amended or rejected by a regulation issued by the State [insert title of weights and measures enforcing officer], shall be the specifications, tolerances, and regulations for commercial weighing and measuring devices of the State of ————."

While under the system of government that prevails in this country differences among the several States may sometimes be inevitable, any divergence in matters of this kind within the borders of a single State should never be countenanced, and where such divergence exists it should be eliminated without delay. As to the States as a group, it is firmly believed that every movement toward uniformity in specifications, tolerances, and regulations is progress toward a simplified and more efficient administration of weights and measures law.

Commodity Tolerances. One class of tolerances other than those already discussed may be mentioned briefly; these are known as "commodity tolerances," and prescribe either general or numerical limits of permissible variations in the amounts of commodities packed or delivered, as compared with the amounts represented by the packer or seller. While such variations are, of course, inevitable and must be recognized, neither the National Conference on Weights and Measures nor the National Bureau of Stand-

[2] Compilations of the codes of specifications, tolerances, and regulations adopted by the National Conference on Weights and Measures and recommended by the National Bureau of Standards are published from time to time in the Handbook Series of the Bureau under the title, Specifications, Tolerances, and Regulations for Commercial Weighing and Measuring Devices. The current compilation is National Bureau of Standards Handbook H44, 2d Ed., 1955 (corrected through 1961), issued in loose-leaf form. Sets of replacement sheets are issued annually, reporting changes made by successive National Conferences.

ards has ever recommended any general list of numerical commodity tolerances.

The principal objection that has been urged against the publication of numerical commodity tolerances, and one that seems to have much merit, is that the publication in numerical terms of permissible variations in amounts of commodity to be packed or delivered may have a tendency to cause packers and dealers to try to take advantage of the tolerances by deliberately packing to, or trying to deliver, the minimum amounts permitted by the tolerances, rather than the full amounts represented. Specifically, there may be a tendency to "aim," not at the full amount, but instead at the lower limit of the tolerance. This objection may largely be overcome by specifying *average* limits considerable smaller than the limits for *individual* packages or deliveries; in any event, the numerical values should be kept as small as practicable, so that it will be difficult, under ordinary commercial practice, to take advantage of them without frequently running below the prescribed minimum values and thus incurring the liability of prosecution.

Since fixed numerical commodity tolerances, even with the safeguards discussed above, are by no means invariably equitable, there being many cases in which individual facts and circumstances should be the dominant factors for consideration, it is recommended that numerical commodity tolerances be not promulgated at all if it is practical to avoid doing so. In lieu thereof, tolerances stated in general terms are recommended for promulgation whenever it may become necessary to publish commodity tolerances; an example of this form of treatment is found in the regulations under the Federal Food, Drug, and Cosmetic Act (and in different language in the Model State Regulation Pertaining to Packages; Exemptions, Marking Requirements, Variations), where the statement of tolerances reads as follows:

> Variations from the stated weight or measure shall be permitted when caused by ordinary and customary exposure, after the commodity is sold and delivered by the manufacturer, packer, or distributor, to conditions that normally occur in good distribution practice and that unavoidably result in change of weight or measure.
>
> Variations from the stated weight, measure, or numerical count shall be permitted when caused by unavoidable deviations in weighing, measuring, or counting the contents of individual packages, that occur in good packing practice; but these variations shall not be permitted to such extent that the average of the quantities in the packages of a particular commodity comprising either a shipment or other delivery of the commodity or a lot of the commodity that is

kept, offered, or exposed for sale, or sold, is below the quantity stated; and no unreasonable shortage in any package shall be permitted, even though overages in other packages in the same shipment, delivery, or lot compensate for such shortage.

It must be recognized, of course, that even under the "general" treatment of commodity tolerances discussed immediately above, it is necessary for officials, as a matter of practical administrative procedure, to operate under certain limited numerical criteria. Not being published, however, these are not open to the objections previously cited to straight numerical tolerance lists.

Regulations. The "regulations" that have been referred to heretofore in this chapter are the regulations incorporated in codes of "specifications, tolerances, and regulations for commercial weighing and measuring devices." Certain weights and measures rules that do not relate specifically to weighing or measuring equipment are in many cases also known as "regulations." Examples of these are detailed requirements, promulgated under specific statutory authority, for package marking, fill of containers, license applications, administrative procedures, etc. In general, regulations such as these have application and interest only within a particular State, although in the case of package-marking requirements there is definitely an interstate factor, and uniformity among States is highly desirable. The National Conference on Weights and Measures has recognized this and has adopted a "Model State Regulation Pertaining to Packages; Exemptions, Marking Requirements, Variations," which is recommended for uniform promulgation.

Chapter 11.—Training of the Weights and Measures Official

The work of the weights and measures official is of a technical and highly specialized character. From this it follows that if the official is to be successful in meeting the exacting demands of his position he must be possessed of a considerable degree of technical knowledge and skill and must acquire experience with the many diverse phases of his work. Other important characteristics of successful weights and measures work are the precision with which the official should carry on all of his mechanical activities, the thoroughness with which supervisory activities should be conducted, the clear-cut thinking and keen analysis that should be exercised in the interpretation and drafting of laws, regulations, specifications, and tolerances, and the resourcefulness and initiative that are necessary for the solution of the many perplexing problems that are continually arising.

A coordinated series of job descriptions for the various positions found in a well-planned weights and measures organization has been prepared by the Office of Weights and Measures of the National Bureau of Standards. Copies of this series of job descriptions may be obtained, upon request, from the Office of Weights and Measures.

The discussion that follows is directed especially to the principal weights and measures officer of a State. However, it will be apparent that whatever may be said of the chief State officer applies with equal propriety and with only lessened emphasis to every individual in the weights and measures organization. The responsibilities of the official charged with the administration of the weights and measures department of the very large city are equal to those of the average State officer, and the diversity of the problems that arise is as great in the one case as in the other. Even the small local jurisdiction is but a reproduction on a small scale of the large jurisdiction, with similar problems and duties and with similar demands respecting the qualifications of the official. The quality of the service rendered by the weights and measures officer should be independent of the size of his jurisdiction.

Scope. Actual training should be provided in both the mechanical area and the supervisory area. Because of the

extended discussion of supervisory activities presented in Part III of this Handbook, training in this field will be dismissed at this point by saying that study and training in the varied phases of "supervision" as distinguished from "testing"—especially such phases as the checking of packaged merchandise, the conduct of investigations, and prosecutions—are just as necessary as in the mechanical field, to fit the official to carry on his specialized activities. This chapter, then, will be devoted largely to a discussion of training in the mechanical area.

Mechanical Knowledge and Manual Skill. What is the character of information that the weights and measures officer should possess preliminary to his active undertaking of the administration of weights and measures duties? The officer's first official task is to bring about and maintain a satisfactory condition of mechanical accuracy with respect to all of the commercial weighing and measuring instrumentalities in his jurisdiction. Since this mechanical phase of the work is the basis for all weights and measures supervision, it follows that the official should be well grounded in the principles of operation of the devices with which he is to deal and that his practical mechanical knowledge should be sufficient to enable him to understand the application of these principles to the devices in question, to understand the operation of and to manipulate intelligently the various adjustable features of these devices, and to analyze these devices for sources of error and make constructive suggestions for overcoming faulty conditions.

If the argument be advanced that the weights and measures official is charged only with the duty of testing weighing and measuring devices to determine whether or not they are accurate, that it is no part of his function to adjust, repair, or criticize the construction of devices that he finds out of proper condition, and that some of the qualifications that have been outlined as desirable for the official are, therefore, unnecessary, it may be said in reply that there will be many cases where special conditions make it not only expedient but necessary for the official to do more than to conduct mere routine tests. Moreover, his routine tests should not be conducted blindly by rule-of-thumb methods, but should be intelligently made with a thorough understanding of the effects of the test upon the device under examination and of the reactions of the device to the various testing operations utilized. These things can scarcely be done at all, or at most they cannot be done efficiently, without the basic knowledge

and the mechanical aptitude that have been specified as qualifications for the modern weights and measures officer.

Education. Granting, then, that these qualifications are of importance, what, specifically, should be expected in the way of preliminary training? It is believed, first, that every weights and measures officer should have completed a 4-year high-school course or its equivalent as a minimum educational requirement. Such a course should have provided some knowledge of mathematics and of the principles of physics which is essential if the official is to be efficient and successful. If the educational groundwork is more extensive, embracing higher mathematics, more advanced physics, engineering theory and practice, etc., the official will be correspondingly better equipped for the discharge of the manifold duties of his office.

Mechanical Details. Whatever his educational qualifications may be, the man without what is commonly spoken of as a "mechanical sense" can never make an entire success of weights and measures work, since so much of this work has to do with the design, construction, operation, and adjustment of mechanical appliances. If the official has had previous mechanical training or experience he will find it of the greatest value. Supplementing his natural or acquired mechanical ability along general lines, the official should familiarize himself specifically with the details of the instruments with which he is to deal—scales of all types, liquid-measuring devices, linear-measuring devices, and the like. Such information can best be built up by a careful study of the catalogs and other descriptive literature of the manufacturers, combined with examinations of the devices themselves, many of which are more or less complicated. The official should have a working knowledge of as many weighing and measuring devices as possible, and he should keep himself up to date in this respect by availing himself of every opportunity for examining new devices, whether or not these are already in use in his jurisdiction. It is believed that without exception manufacturers will be glad to cooperate with the official along these lines by supplying him with catalogs and keeping him supplied with descriptive material on new developments as these are made from time to time.

Knowledge of Law and Regulations. It is axiomatic that a thorough knowledge of his weights and measures law, and an equal familiarity with the specifications and tolerances affecting commercial weighing and measuring devices, are prerequisites to any official activity, and such

knowledge can only be acquired by painstaking study. Embarrassment and even legal entanglements may best be avoided by the most precise understanding on the part of the official of the exact requirements and especially the exact limitations imposed by his laws and regulations. The importance of this part of his training will be realized when it is remembered that the weights and measures official is essentially a law-enforcement officer, that there is a legal aspect to his every official move, that upon occasion he must institute prosecutions for violations of law, and that he is being called upon continually to give advice to the users of commercial weighing and measuring devices and to those affected by their use upon questions of their legal rights and obligations.

Techniques of Testing and Inspection. Finally, there is to be considered the technique of the inspection and testing of weighing and measuring instruments. The National Bureau of Standards has published two handbooks on this subject, Handbook 37, "Testing of Weighing Equipment," and Handbook 45, "Testing of Measuring Equipment," [1] and some multilithed material supplementary to Handbook 45 has been issued; these texts are recommended for study and reference, as well by experienced officials as by those who are new and inexperienced.

Staff Training. When a State weights and measures department is created, and whenever personnel additions or replacements are made in a department already in operation, group study and training are recommended. Group refresher training at regular intervals is recommended for organizations comprising experienced officials, so that a proper level of efficiency and uniformity of operations may be maintained. In all cases the training should be practical as well as theoretical, and should be conducted by or under the supervision of the best qualified persons obtainable.

Self Education. For the new and inexperienced official who must rely for training upon his own resources, the obvious course is the best one to follow; that is, after he has learned all that he can from the published material on the subject of inspection and testing, let him seek the assistance

[1] Handbooks 37 and 45 are out of print, but may be consulted in government depository libraries. Revision of these handbooks is presently being considered. When such revisions are printed, the handbooks will de assigned new numbers. Two supplements to Handbook 45, "Testing of Farm Milk Tanks" and "Testing Liquefied Petroleum Gas Liquid-Measuring Devices," have been issued in multilithed form and are available from the Office of Weights and Measures. Test procedure outlines for commercial weighing and measuring devices are also available from the Office of Weights and Measures.

of an experienced official for a course of practical training in actual field work. If such an arrangement can be made the new man should first observe the methods followed by his instructor; next he should assist his instructor; and finally, under the observation and with the advice of his instructor, he should carry on the work without actual assistance. During this period of instruction every effort should be made to cover all types of devices commonly encountered, so that when the new official begins independent work his experience will be as broad as practicable. Such a period of practical training will not only enable the new official to develop a proper technique in a minimum of time but will also enable him to avoid the otherwise inevitable embarrassment of one who is feeling his way along and will give him a degree of confidence in his work that could otherwise be realized only after a considerable time had elapsed.

If it is wholly impracticable for the new official to associate himself with an experienced weights and measures officer for a period of practical instruction in methods of field inspection and testing he must, of course, rely wholly upon the published material and his own efforts. Here it is of especial importance that there be a thorough understanding of basic principles of operation and of the theory of inspection and testing; published manuals can not do more than describe methods for characteristic types. and it will be necessary for the official to adapt general methods and principles to the many individual modifications of the general types of commercial devices that will be encountered. By proceeding slowly and by analyzing each operation to learn whether or not the desired result is being accomplished, the official may make consistent progress and avoid serious mistakes. Thus in time he may build up a technique of his own that will be satisfactory, even though it may differ from that of other officials. It is to be emphasized, however, that *every* effort should be made to supplement self-instruction, or even classroom instruction, by practical field instruction under an official experienced in following recommended standard testing procedures.

General Knowledge of Field. While in many particulars the weights and measures officer occupies a unique position, there is one respect in which his profession differs in no wise from others: If he is to be truly successful, the weights and measures official should keep abreast of the developments in his field. This means that, first, he should keep informed about weighing and measuring instruments—the modifications of existing types and the new types being developed by

manufacturers. The importance of study to keep abreast of mechanical advances is illustrated by two developments still in progress. Liquefied petroleum gas (LPG) is a recent addition to the list of household and automotive-engine fuels; the characteristics of this product and the design and operation of the special provers required for testing the devices used for dispensing the product, should be understood. In the field of weighing, the recent use of "load cells," "capsules," and other elements as substitutes for the conventional lever system, and of electric and electronic components in connection with the indication and recording of weight indications and their transmission, for reading and recording, to considerable distances from the weighing elements, presents a new concept of weighing operations as well as a new vocabulary of terms.

The official should also keep informed about what is being done by the weights and measures departments of other jurisdictions—special investigations of general importance, new branches of work being undertaken, special methods being employed in supervisory or mechanical work, special apparatus being developed, and the like. Third, he should keep accurately informed on court decisions, not only in his own jurisdiction but in other jurisdictions as well, because these have a very direct bearing upon many of his activities.

Finally, it may be said that the weights and measures administrator is being continually confronted with new problems, and he should keep informed upon commercial and industrial practices and conditions in his own jurisdiction so that he may take prompt measures to check the development of any unfair or illegal practice involving commercial determination of quantity or to provide the remedy demanded by any newly arisen condition.

Assistance from National Bureau of Standards. Turning from the generalities of the training of a weights and measures official to a brief consideration of certain specific aids to this end, attention may be invited to services available from the Office of Weights and Measures of the National Bureau of Standards. This Office does not yet have the facilities for conducting full courses of training for weights and measures officers either in office and laboratory procedures or in field operations. Accordingly, substitute measures have been worked out along the lines indicated in what follows.

Correspondence is welcomed, and every effort is made to supply helpful information on specific questions and to suggest remedies for particular problems. Not infrequently

the assistance rendered by correspondence lies in citing publications or other sources from which the desired information may be obtained. At times publications of the Bureau can be supplied, particularly to new officials, some of these (such as the weights and measures handbooks) having been specially prepared as training manuals.

New officials, both administrators and technicians, may come to the Office of Weights and Measures in Washington for limited periods for a series of discussions or laboratory sessions covering the entire field of weights and measures supervision or any particular phase thereof on which help is desired. These programs of instruction are flexible and informal and are adapted to the need in each particular case; they are especially helpful to newly appointed heads of weights and measures units and their principal assistants, and to specialists such as laboratory technicians and field supervisors. It is necessary to restrict the number of persons receiving training at any one time, and the programs must be fitted into the general schedule of activities of the Bureau personnel at such times as to avoid undue interference with or interruption of the regular work of the Bureau.

Within the limitations of available funds and of other commitments of its limited personnel, the Office of Weights and Measures will arrange, upon request, for a representative to spend one or several days in a State office discussing with a newly appointed chief and his principal assistants (or, for that matter, with any such officials, whether or not newly appointed) any matters with regard to which it is felt that the Bureau representative can be helpful. Within the same limitations, the Office of Weights and Measures will, upon request, arrange to conduct a training school at some suitable location within a State, to be attended by all of the weights and measures officials of the State. Depending upon the particular need, such a school may be planned to cover the highlights of the entire area of weights and measures supervision—as would be appropriate for a group made up largely of new officials—to be followed by subsequent schools devoted to the intensive and detailed study of special phases of mechanical or supervisory activity; or the curriculum of the school may be directed to some form of activity about to be undertaken or to some one or more matters of special current concern or interest to the jurisdiction in question.

Again within the stated limitations, it is possible for the Office of Weights and Measures, upon request, to arrange for field demonstrations of testing equipment and techniques for

particular classes of commercial devices or even to conduct general field training for small groups of inspectors.

The Office of Weights and Measures has undertaken a modest program of producing training motion pictures for the instruction of weights and measures officials; the films may be purchased or they may be borrowed, without cost, for short periods.

State Training Schools. It should not be assumed from the foregoing discussion of training schools conducted with assistance from the Office of Weights and Measures that useful training schools cannot be conducted successfully under State auspices alone. On the contrary, a systematic program of training schools, planned and carried out under the direction of the State weights and measures office, is strongly recommended. Such schools can be utilized for instructing new officials in the fundamentals of their jobs and in the performance of their daily tasks. They can also be utilized for the instruction of old and new officials in new techniques, new laws, new regulations, new forms, special surveys and investigations, and for the consideration of any new procedures or any program, instruction, or interpretation that is new to the group. Another very important purpose of the training school is the periodic review of prescribed procedures that presumably are in effect but with respect to which deviations have gradually and inadvertently grown up among the officials; this sort of retraining will restore uniformity throughout the jurisdiction, a consideration of major importance.

The more technical the subject matter on the agenda of a particular training school, the more important is it that the school group be kept small. For technical sessions, twenty is suggested as a maximum number for best results; it is considered far more effective to hold several schools with identical subject coverage for groups of reasonably small size than to attempt to handle these technical subjects in a single large class.

The distinction between a training school and the sessions of an ordinary meeting of a weights and measures association lies partly in the character of the subject matter offered to those in attendance and very emphatically in the manner in which that subject matter is offered. In the association meeting the speakers deliver their papers or present their talks, usually treating the broader aspects of their subjects and avoiding mathematical and other technical details; there may (and should) be enough discussion following the speaker's presentation to clear up pertinent questions and

leave the audience with a clear conception of the speaker's ideas, but by and large the audience is present merely to listen, to get new ideas, to be introduced to new and interesting subjects related to their professional field, and to receive general instruction.

In the school, however, the primary effort is to *teach*, to *train*, to make certain that each member of the class not only understands what is being taught but acquires competence to *do* what is taught, in the manner prescribed, when he returns to his normal sphere of independent activity. The school demands of the instructor clear initial presentation, repetition of explanation and instruction from different viewpoints and in varied terms, demonstration whenever appropriate, meticulous attention to detail, patience in dealing with those slow to understand, and ingenuity in devising methods of drilling the students so that the lesson may be fixed in their minds by their actually doing, perhaps over and over, whatever is being taught. Obviously, all of this requires careful preparation on the part of the instructor.

The school demands of the student an open mind, close attention to the instruction, a considerable degree of individual thinking, and willing participation in the tests, discussion periods, and practice sessions arranged by the instructor. This adds up to "work" for the student, and the extent to which he makes this active personal contribution *to* the school will mark the extent of the benefit that he will derive *from* the school.

In conclusion, all of the foregoing may be summed up by saying that the weights and measures official should live up to his opportunities by fitting himself to be the weights and measures expert of his community. This is the status that should logically be his and that may be his with reasonable effort.

Chapter 12.—State and Regional Weights and Measures Associations

It has been said previously that one of the important considerations in weights and measures activity is that there be uniformity in legal requirements, in specifications and tolerances, and in methods of inspection and testing. It has likewise been pointed out that the official should keep himself informed of what is being done in jurisdictions other than his own. Furthermore, if manufacturers of weighing and measuring devices and industry and business in general are not to be unfairly hampered, and if improper methods, fraudulent practices, and other weights and measures abuses are to be eliminated promptly and effectively, there must be genuine cooperation among weights and measures officials.

State Associations. Under the existing system of political subdivision the State is the logical unit for the coordination of the activities of the individual weights and measures officials within its borders, and the coordinating function naturally devolves upon the State weights and measures office. An important part of the duties of the State office is to bring about unity and standardization throughout the State and to supervise and direct along general lines the activities of all local officials. By its very nature this function is one that should be exercised continuously, and in discharging it the State office will make use of formal printed documents, frequent bulletins, general letters and individual correspondence with local officials, and personal visits and conferences with single officers or with small groups.

However, highly important and necessary as all of this is, there is one element essential to a closely knit and efficiently operating organization that can only be supplied by the periodic assembly of all of the State and local officials as a single group. Such assemblies provide the opportunity for personal contacts and acquaintance among all of those engaged throughout the State in weights and measures administration; they enable each official to learn at first hand of the activities, the special problems, the successes, and the reverses of his associates, to the mutual benefit of all; they allow all to participate in the discussion of general problems; they offer a means of introducing new laws or regulations, of inaugurating State-wide activity along new

lines, and of checking divergent tendencies in methods of test or administration; and, finally, they foster an *esprit de corps* that stimulates the entire organization.

Regular meetings, which should be held at least once each year, may be arranged for by the State office and held under its auspices in the absence of a State association of weights and measures officials. It is believed, however, that an association offers definite advantages. The organization of the weights and measures personnel of the State into such an association, with appropriate officers and simple by-laws, makes for increased interest on the part of the individual, gives the organization a status with the outside agencies that it would not otherwise have, and in general enhances the value of the meetings and makes easier the realization of the objects previously outlined.

Accomplishment Through Collective Effort. It is well recognized that a group of individuals with common interests and common purposes can accomplish infinitely more toward the realization of their aims by collective effort than can ever be hoped for by uncoordinated activity. Especially is this true in the case of relatively small groups and of groups whose activities are of a technical nature and of a character not thoroughly appreciated by the community as a whole. These conditions are fulfilled in the case of the weights and measures organization of a State. Numerically the group is small. The work of weights and measures officers is of a technical and highly specialized nature. Unfortunately, the community as a whole too often fails to value weights and measures supervision at its true worth, and even those whose contacts with the official are most frequent and direct—the merchants and other owners and users of commercial weighing and measuring equipment—often fail fully to appreciate the service being rendered to them by the weights and measures official.

It follows that if rapid, consistent, and constructive progress is to be made, this group of public servants should establish an organization, they should work in harmony and as a unit, and the organization should embrace the greatest possible number of the limited personnel of the group. If this is not done, there remain the discouraging, uphill battles that must be waged more or less independently by each official without the organized support of those in other localities who are striving to meet similar situations, and with little probability of any but scattered and purely local successes, or else the final acceptance of the status quo with the eventual stagnation that will inevitably result.

With an active organization having a membership representing 100 percent of the weights and measures officials of the State, the association will, on the other hand, be in a commanding position. The officers and committees will be granted a ready and respectful audience by the people, by the press, and by the legislature. The recommendations of the association, representing the combined judgment of every weights and measures officer of the State, will receive most careful consideration and will be given the weight accorded to expert opinion by those to whom the recommendations may be addressed.

"Official" Character. It is considered advisable that the weights and measures association be primarily an organization of weights and measures officers, and not an organization comprising a combination of regulatory officials and those individuals, companies, and interests regulated by such officials. By this it is not meant that an association should exclude entirely from its membership representatives of equipment manufacturers, commercial and industrial users of weighing and measuring equipment, and consumer groups. An association of which they are a part offers an excellent medium of cooperation between such representatives and interests on the one hand and the regulatory officials on the other. Moreover, such individuals and interests can make valuable contributions to the association by supplying technical information, discussing the viewpoints and problems of the groups or activities for which they can speak, and suggesting courses for cooperative effort. They can very properly be admitted to membership in the State weights and measures association with an "associate" or "advisory" status (as in the National Conference on Weights and Measures, discussed in Chapter 13), thus becoming an integral part of an organization devoted to the improvement of weights and measures supervision in the State. But it is believed that the basic "official" character of the association should be preserved, that association committees should have officials as chairmen, and that decisions of the association should rest on the votes of the officials alone.

Public Relations. The association can make tremendous advances toward educating the public to a livelier appreciation of what it means to them to have a department of weights and measures in operation. Through timely publicity of what its members are doing, of the results of special surveys and investigations, of the exposure and elimination of improper practices, and of similar matters of almost daily occurrence, the people of the State may be brought to a

proper realization of the protection that they are enjoying and will rally to the support of the movement for strengthening the weights and measures administration and making it more nearly adequate in all respects.

Association Support for Individual Officials. With the support of a State-wide association behind him, each individual State and local official will be strengthened in the administration of his department; as mentioned previously, through such an association the efforts of all officials may be coordinated, and State-wide uniformity of regulations, methods of test, supervisory activities, and details of administration may best be realized; and, finally, and this is really most important of all because fundamental, the people of the State may receive a greater measure of that protection that it is the function of every department of weights and measures to provide. The formation of weights and measures associations in States where they do not now exist and where the number of officials is sufficient to justify association activity and the strengthening of existing associations are, therefore, to be strongly recommended.

Organization of the Association. Some observations on the general character of weights and measures associations may not be out of place at this point. The association should be representative of the entire State, and, as emphasized before, should include in its membership every weights and measures officer of the State. Since cooperation and coordination are the basic principles of the association, it should never be characterized by a clannish spirit on the part of particular groups; an association composed of local officials and excluding State officials is as unfortunate as an association would be whose membership was composed of State officials to the exclusion of all local officials. Any restrictions as to qualifications, dues, etc., that would tend to limit the membership to a selected few should be avoided.

It is always advisable for the chief of the State department or his assistant to be one of the active officers of the association or to be on the executive committee, because the closest relations should exist between the State office and the association. The State office almost invariably has much wider weights and measures contacts than has the individual city or county, and is in the best position to advise in such matters as policy, program arrangement, etc., as well as to assist in obtaining outside speakers, arranging for exhibit material, and similar matters.

Programs. Programs should be arranged sufficiently in advance of the meeting to give the speakers ample time to

develop desired data and prepare their remarks. Some diversity of program subjects is desirable, although the mistake of trying to cover too wide a field at a single meeting should be avoided, since it is better to treat thoroughly a few subjects than to touch superficially upon a large number. Above all, the program should not just be hastily "thrown together"; it should be thoughtfully *planned*, and the planning for one meeting should begin with the adjournment of its predecessor, when the successes and failures of that meeting, its strong points and its weak points as demonstrated by the reactions to the meeting itself, are fresh in mind. The topics selected should not only be interesting; they should be timely and related closely to existing or anticipated weights and measures activities of the State. Considerable success has attended the scheduling in succession of papers on several aspects of the same general subject, or on several closely related subjects. Diversification of speakers is desirable; speakers from ranks outside of the association membership lend interest to the programs, but the association membership should not be excluded from the formal program and assignments should, over the years, be well distributed among the members. The topics and speakers should in most cases be clearly listed on the printed program for the information and guidance of those in attendance.

Ample time should be allotted for discussions, and all of those in attendance should be urged to participate, for it is often the discussions that bring out the most constructive suggestions upon a perplexing problem, and in any event these discussions result in focusing attention upon the matters under consideration, in developing a consensus, and in fixing in the minds of those present any conclusions that may be reached.

Provision for some diversion is probably advisable, but it is submitted that on the program of any meeting attended primarily by government officials at government expense, entertainment should very definitely be a secondary consideration, and never should be allowed to interfere with the serious purposes of the meeting.

Report of Proceedings. If it is possible to do so, a record of the proceedings should be kept and an early report made to the association members and others interested. Even if a full stenographic record is out of the question, the secretary should procure copies of the prepared papers and should record at least a brief summary of extemporaneous remarks and discussions; he should also keep a very careful record of any decisions reached by the association and of the exact

wording of any resolutions adopted. From these data the secretary will be able to prepare a digest of the proceedings that can be printed or that can be issued in mimeographed form if funds for printing are not available, and this will be extremely valuable to the members of the association, particularly any who might have been unable to be in attendance at the meeting.

Meeting Place. In the matter of a meeting place there is one consideration that should not be lost sight of, and that is ease of access. A meeting held in a city that is inconvenient to reach, either by reason of poor transportation facilities or because it is not centrally located, usually falls far short in attendance and general success as compared with the meeting held in a city more favorably situated.

District Meetings. A very successful adjunct to the annual meeting of the State association has developed in recent years in certain States of large area. This is the district meeting, participated in by a small number of officials from one district or section of the State. Usually the districts are small so that no official has to travel far to reach the meeting place, and one-day meetings are the general rule. As compared with the State meetings the district meetings are ordinarily very informal as to both agenda and procedure, and attendance is frequently limited to the weights and measures officials of the district. The purpose of these meetings, in the main, is twofold: (1) To talk over purely local—that is, district—problems and develop close and cordial working relations among the officials of the district. (2) To provide an opportunity for very informal group discussions of problems of wider scope—a sort of "kicking around" of ideas—leading to some crystallization of the thinking of the group and the possible development of lines of inquiry and fruitful areas for discussion at the State-wide level when the State association holds its annual meeting.

District meetings are usually held more frequently than once each year, perhaps twice or even four times annually. As informal miniatures of annual State meetings they appear to be serving a constructive purpose, and their extension to States where they are as yet untried is recommended.

Regional Associations. Toward the other extreme from the small district meeting (whether of an informal group or of a district association) there is found the regional association with its annual meeting. The area represented by the regional association comprises a number of States, which may or may not have individual State weights and measures associations. The regional association, therefore, has a dual

role. It provides a forum below the national level for officials of States where State associations have not been formed. And it defines a regional level at which State associations within its area may, in effect, combine for the study of regional problems and the evolution of a regional consensus.

Practically all that has been said earlier in this chapter regarding the State association is, when placed in perspective, applicable to the regional association.

There are at present in the United States only three regional weights and measures associations, the "Southern," the "Northwest," and the "Western." The potential of the regional association with respect to constructive thinking and action within its area, especially in the direction of uniform group action on strictly regional problems, and with respect to the development of appropriate lines of inquiry and fruitful areas for discussion at the national level, is such as to argue strongly for the formation of such additional regional associations as would permit every State to become affiliated with one of these bodies.

Membership Responsibilities. Finally, it should be emphasized that no organization, however well planned, will function successfully independent of individual effort on the part of its members. Each individual should share in the activities and responsibilities of the association just as he expects to share in its benefits. Each member should vouchsafe loyal support to the association, wholehearted participation in its activities, and a sincere application of the true principles of cooperation in all of his relations with the association as an organization and with its members individually. Doing so he will help himself at the same time that he will help others, for the strength of the association will be in direct proportion to the support that it receives from its members, and its strength will determine its power.

Chapter 13.—National Conference on Weights and Measures

The coordinating functions of the State association with respect to the local jurisdictions within the borders of the State, as discussed in the preceding chapter, are exercised with respect to the States themselves, and both directly and indirectly with respect to the local jurisdictions of the States, by the National Conference on Weights and Measures. The National Conference is an unofficial organization in that it has no legal status and no authority to enforce its recommendations. Notwithstanding these facts, however, the Conference in reality exerts a powerful influence in weights and measures affairs and enjoys an enviable reputation among all who have any part in the distribution or control of commercial weighing and measuring devices. A major part of the influence of the National Conference on Weights and Measures rests on the fact that it is sponsored by the National Bureau of Standards as an important means of implementing its Congressionally assigned responsibility of "cooperation with the States in securing uniformity in weights and measures laws and methods of inspection."

Early History. The National Conference on Weights and Measures had its beginning in January 1905, when, at the invitation of the National Bureau of Standards, a small group of men who either were already engaged in weights and measures administration or were interested in this subject gathered at the Bureau for a more or less informal consideration of how best to promote cooperation among all of the officials charged with enforcement of weights and measures laws, to the end that the great divergencies which then existed among the various jurisdictions in practically every phase of this service might be reduced, and the service, as a national institution, be placed upon a basis approaching uniformity, at least in its essential aspects. A printed report of the proceedings of this first meeting was issued as a publication of the National Bureau of Standards under the title "First Conference on the Weights and Measures of the United States."

At the close of the first meeting a resolution was adopted to the effect that these Conferences be held annually thereafter, and the second meeting was held 15 months after the

first. When the report of the second meeting was issued it appeared under the title "Second Annual Conference on the Weights and Measures of the United States;" from this the Conference came to be popularly known as the Annual Conference on Weights and Measures, and continued to be so called until the eighteenth meeting, held in 1925, when, by a formal vote of the delegates, the name was changed to National Conference on Weights and Measures, a title more truly descriptive of the broad scope of the organization.

The third, fourth, and fifth conferences were held, respectively, in May 1907, December 1908, and February 1910; thereafter, with the exception of an interval during the First World War (1917 and 1918), an interval of three years (1932, 1933, and 1934) when economic conditions made it impracticable to hold meetings, an interval during the Second World War (1942, 1943, 1944, and 1945), and one calendar year (1948) that intervened when a changeover was made from Fall to Spring meetings, conferences have been held each year. The Conference has always met in Washington, D.C. and has always been sponsored by the National Bureau of Standards, every facility being offered to make the meetings of maximum interest and benefit to all in attendance.

Present Organization and Procedure. The informal character of the organization has largely been preserved. Attendance at the meetings is not limited to a particular group, but the sessions are open to all who may be interested in any phase of weights and measures activity, and all may participate in the discussions. Voting, however, is restricted to the "active" membership, that is, to weights and measures officials. Since these officials come from all sections of the United States, the conclusions of the Conference, as expressed in its formal actions, may be said to represent the consensus of the weights and measures officers of the country.

The National Conference on Weights and Measures refrained for many years from binding its organization and activities by a formal constitution and by-laws. However, in 1957, upon recommendation of a special study committee appointed the year before to consider the matter, the Conference formalized and approved a "Statement of the Organization and Procedure of the National Conference on Weights and Measures."

This documentation of the organization and procedure of the National Conference sets forth in formal, yet concise, language (1) the objectives of Conference, (2) its relationship with the National Bureau of Standards, (3) its constituent membership, (4) its officers and committees and their

duties, (5) voting, and (6) procedures during a meeting.

Copies of the Organization and Procedure of the National Conference on Weights and Measures may be obtained from the Conference Executive Secretary, National Bureau of Standards, Washington 25, D.C.

From an initial attendance of 11 persons in 1905, the Conference has grown consistently until now it brings together at its meetings a total of approximately 500 persons, comprising weights and measures officers, other officials of Federal, State, and local governments, and representatives of equipment manufacturers, industry, business, and consumers.

Reports of Proceedings. In continuation of the practice begun at the first meeting of the Conference, the proceedings of each meeting have been published in the Miscellaneous Publications series of the National Bureau of Standards. Many of these "Conference Reports" are out of print; copies of these may be consulted, however, at libraries that have been designated as Government Depository Libraries, which will be found in all principal cities. Copies of Reports that are not out of print may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

Programs of Meetings. In pursuit of the Conference objectives, the programs of the meetings are carefully arranged for timeliness and balance. It usually happens that each year there are one or two matters of outstanding interest in the weights and measures field, and naturally these are given prominence. In presenting any question that has several aspects, particularly if the interests of the different interested groups seem to be conflicting, every effort is made to give voice to each viewpoint so that any action that may be taken or any recommendations that may be made may be predicated upon comprehensive information. Thus, papers upon a particular subject may be given by speakers representing the weights and measures official, the manufacturer, and the user, each discussing the matter from the standpoint of the group that he represents. Following the formal presentation, the opportunity for questions and general discussion from the floor is always provided. If the question is one that involves specifications or tolerances, no code is adopted until the matter has been reported on by the standing Conference committee on specifications and tolerances; except in the case of minor modifications to existing codes, specifications and tolerances are frequently adopted first in tentative form, an interval of at least one year being

allowed to intervene before final adoption occurs. It will be apparent that this policy of the Conference provides every facility for reaching impartial and well-considered conclusions.

Cooperation of National Bureau of Standards. In the matter of special investigations that may be necessary to develop certain technical facts or experimental data essential to the intelligent consideration of some question, the National Bureau of Standards is always willing to cooperate with the Conference and is frequently called upon in this connection.

Conference Decisions. The decisions of the National Conference on Weights and Measures are, of course, purely recommendatory. A code of specifications and tolerances, for example, or a model law that has been adopted by the Conference, can have no effect in any given jurisdiction until it is promulgated or enacted by competent authority within and for that jurisdiction. However, the reputation of the Conference for making only reasonable and proper recommendations is so well established that even many jurisdictions that never find it possible to be represented by delegates at the sessions of the Conference accept the conclusions of the Conference as expressing the best thought upon a given subject, and, at the earliest convenient opportunity, take the necessary steps to put those conclusions into effect. In some States provision has been made for the automatic acceptance of specification material adopted by the Conference, unless this is specifically modified or rejected by the State. Thus, through voluntary cooperative effort on the part of weights and measures officials, both those who find it possible regularly to attend the Conference sessions and those who are prevented from attending, the National Conference on Weights and Measures is, in fact, effective in realizing its objectives.

Chapter 14.—Relations Between the Official and Manufacturers of and Dealers in Weighing and Measuring Devices

The relations that exist between weights and measures officials and manufacturers of and dealers in weighing and measuring devices are worthy of careful consideration on the part of the official. Proper relations will be conducive to efficiency; improper relations may jeopardize the successful operation of the entire department.

Impartiality. The weights and measures official is not alone a public officer, but is likewise a public arbiter in all matters relating to commercial quantity determination; accordingly he is charged with both duties and obligations of a serious character, one of the chief of which is that he shall in all of his activities preserve the strictest impartiality.

Intimacy. In his contacts with representatives of those engaged in the making, selling, and servicing of commercial weighing and measuring devices, the weights and measures official should cultivate an attitude of dignified friendliness but should avoid intimacy. Mutual advantage will result from proper intercourse, because there is always something to be learned on both sides. The experience and ideas of the official who tests commercial equipment are of value to the manufacturer who designs and makes it. Likewise the official may learn from the manufacturer many valuable details relative to the construction, adjustment, and operation of commercial devices, and, through his contacts with representatives of manufacturers, may keep abreast of the latest developments of the industry. Proper cooperation among manufacturer, dealer, and official is, therefore, to be encouraged, to the end that the design of new equipment and the condition of commercial equipment in use may continually be improved.

Gratuities. On the other hand, any relations tending directly to the financial advantage of either party are inexcusable and indefensible. However vigorous the disclaimer on the part of the donor of any wrong intentions or of any desire for favor, the official who accepts gratuities from a manufacturer of apparatus that it is his duty to examine and pass upon in his official capacity, is almost

certain to be condemned by public opinion if the facts in this relation come to light. Moreover, even though no impropriety is intended, consciously or unconsciously there is developed in such an official a feeling of obligation that is almost sure to make itself felt at some future time and that may wean him from that impartiality that should always remain his distinguishing characteristic. The official should conscientiously avoid being drawn into any such compromising relations.

Comments. The weights and measures official should likewise be extremely cautious about making general statements, either oral or written, about the merit or lack of merit of the product of any manufacturer. In the course of advertising and sales promotion such statements may readily be misconstrued and unfairly used, and the official should do nothing to make such a condition possible.

Commercial Advantages. In the matter of attempting to secure to themselves all of the advantages in the nature of sales of new equipment or repair contracts for old equipment, that may result from the rejection or condemnation of equipment by the official, most commercial representatives stay within proper bounds. However, this is not invariably the case. When the official discovers that he is being closely followed on his inspection trips by salesmen or repair men, or when he is importuned for information about the owners of rejected or condemned equipment, the offending representatives should first be cautioned to desist; and if this is not an effective remedy the weights and measures office should notify the offender's superiors of the conditions, with a request that he be ordered to drop these unethical and objectionable tactics. The weights and measures official cannot afford to lend himself, even passively, to such petty practices.

Financial Interest. If it is necessary for the official to exercise all of the precautions that have already been mentioned, it is certainly obvious that under no circumstance should he himself be connected in any way with the selling of commercial weighing or measuring equipment or with repairing it for profit. The latter phase of the question will be discussed in a subsequent chapter; as to the former it should be sufficient to say that no portion of the profits or commissions on the sale of commercial weighing or measuring equipment should ever go to the officer whose duty it is to examine that equipment in his official capacity.

Cooperation. Consultation between officials and manufacturers, industries, or business interests for fact finding

and as a preliminary to the promulgation of new requirements or the inauguration of a new regulatory action or program, has become accepted procedure in many areas and is to be recommended for more widespread use. Such procedures are facilitated when it is possible for officials to deal with representative associations of manufacturers, industries, etc., and their technical committees.

Part II.—MECHANICAL ACTIVITIES

Chapter 15.—Weights and Measures Standards and Equipment

The character of weights and measures standards, the materials of which they are constructed, their design, their finish, differ according to the use intended for them, and in their material aspects these standards range from the finest that science can design and that the best of workmen can produce, as demanded for the primary standards of a nation, to the relatively crude examples of commercial weights and measures that adequately meet the demands of ordinary trade. Thus the primary standard of mass (or weight, as it is commonly called) of the United States is a cylinder of specially prepared platinum-iridium alloy; the primary "working" standard of length [1] is a bar of similar material and of unusual cross section, the defining lines being so finely engraved that a microscope is required for observing them. From standards of this high order there extends a long sequence of standards of successively lesser refinement, until finally we reach the cast-iron weight and the sheetmetal measure of trade.

Throughout this long succession of standards of varying classes, however, there is maintained an unbroken sequence of contact from the highest to the lowest in the scale. Were this not true, were there any points where the line of official contact became broken, no one could say that the pound at the merchant's counter was actually a pound, or that the yard was actually a yard. It will be appropriate here to review the many steps necessary before a fundamental National standard is translated into a quantity of merchandise in the hands of the consumer.

Federal Standards. Taking the standard of mass as an example, the sequence begins with the *primary standard of the United States*, the prototype kilogram preserved at the National Bureau of Standards, the value of which, in terms of the International Standard Kilogram, is known with high precision. (There is, of course, a recognized relation between

[1] See Chapter 2 for a statement covering the definition of the National standard of length.

the kilogram and avoirdupois-pound units. For this relation see Chapter 2.) This primary standard is used but rarely, and then only to standardize the office (laboratory) standards of the mass laboratory of the Bureau. The office standards of the Bureau are used in the frequent checking of the values of the Bureau's working standards, which in turn are used in the testing of weights submitted to the Bureau for examination.

State and Local Standards. One of the important classes of weights submitted to the National Bureau of Standards for test comprises the *primary standards of the several States*, and when these are tested their corrections are determined and reported to the State. Returned to the custody of a State, the State primary weights are expected to be used, with their corrections, within the State in a manner corresponding to that followed at the National Bureau of Standards with respect to the national primary standard; that is, they should be used occasionally to test the *office standards of the State*. These latter standards should, in turn, be used to prove the *State working standards*, including the field standards of the State inspectors, and the *office or the working standards of the cities and counties* throughout the State. In addition to their use for the testing performed in the field, the working standards of the State are available for use in the office for testing commercial apparatus, and in the other office work not demanding a very high degree of precision.

In addition to its office standards if these are provided, the city or county department of weights and measures will have its field equipment, or *working standards*, which, on account of the hard service to which they are subjected, will frequently be checked against the local reference standards, or will be returned to the State department for reverification in case local reference standards are lacking. The field equipment, of the State or local department, is carried to the establishments of industry and trade, there to be used directly in the testing of the *weights and weighing devices in commercial use*. The last step is the use of this commercial equipment by the trader in the buying and selling of merchandise.

Considering the foregoing, it must be apparent to even the most casual observer that the variations that may safely be permitted upon any test throughout the long list given are small, and that the greatest care must be exercised at all points to preserve the integrity of the standards themselves.

Specifications and Tolerances for Standards. Specifications and tolerances are issued by the National Bureau of Standards[2] for the standards of weight and measure of the States, and when procuring weights and measures to serve as State standards, compliance with these specifications and tolerances should be demanded. Similarly, the State office should prescribe the specifications and tolerances to be met by the office and working standards of the local jurisdictions under its control. Preferably, local office standards should conform to the requirements for State office standards, and local working or field standards should, of course, conform to the requirements for State working or field standards. It should be unnecessary to say that all standards should be rigidly examined to insure that they meet the requirements that have been set up.

Sealing and Certification of Standards. The fact that a standard or a particular set of standards has been found to conform to the requirements applicable to it should always be attested in a suitable manner. For standards of the lower orders this attestation may properly be limited to marking or "sealing" the standards themselves, especially in those cases in which the design of the standard is such as to provide an appropriate surface to receive the mark or seal. For standards of the higher orders, such as reference and office standards or other standards of high precision, the issuance of informative certificates is recommended, and it is suggested that certificates can be used to advantage clear down to field standards. In the case of reference and office standards, the availability of a specific certificate or other written record covering each periodic determination of the value and overall suitability of the standard or set of standards may be especially valuable in quickly resolving formal questions on the validity or legality of the standards. And even the field inspector may from time to time have opportunity to make impressive use of a certificate covering his working standards, when he is asked the pointed question, "How do you know that your standards are accurate?"

Calibration of Standards. The National Bureau of Standards calibrates the primary reference standards of the States without charge. After the initial calibration of State primary standards, these should be returned to the National Bureau of Standards for recalibration at regular intervals of

[2] Manufacturers of standards are entirely familiar with these requirements, which are of a technical character; it is considered unnecessary to give them here. Anyone having need to know the details of these requirements should communicate with the National Bureau of Standards, specifying the types of standards in which he is interested.

about 10 years; the law of the State usually specifies this interval, and the provisions of the law should, of course, be observed. The periodic retesting of standards of lower order, of both State and local offices, is of no less importance, and should be carried out by the State or local office at frequent intervals; the frequency of these tests will be determined by the amount and character of use to which the various standards are subjected. It may be mentioned here that in the case of any standard, a retest before further use should be made whenever any accident occurs or other condition develops that casts any suspicion upon the accuracy of the standard.

Examinations of the standards of cities and counties are supposed to be made by the State office, and this course should always be followed whenever the State is in a position to do this work. In those States where there is no State office equipped to do the testing, it will be necessary, in order to establish the authenticity of the local standards, that they be sent to the National Bureau of Standards for test.[3]

Recommended Standards and Equipment. A schedule of weights and measures standards and equipment, listing the standards and equipment considered necessary for various classes of weights and measures offices, may be obtained from the Office of Weights and Measures of the National Bureau of Standards. Certain items of standards and equipment are somewhat less essential than others, particularly for a newly organized department or office. This distinction is made because frequently funds for complete equipment are not available at the time of the organization of an office, and it is desirable for the new official to be informed as to what items of equipment are most necessary; moreover, the new office is usually fully occupied for a time with taking care of the mechanical condition of the more common types of weighing and measuring devices, and does not have the time fully to cover the entire weights and measures field. However, if funds are available for completely equipping an office with all of the standards and equipment recommended, this should be done by all means, so that the office may at once be in a position to render weights and measures service in all of its branches.

Since weights and measures supervision is a highly specialized service, specialized equipment is demanded. Fur-

[3] In the case of cities and counties, the organic act creating the National Bureau of Standards requires that a reasonable fee be charged for the work of verifying standards. A schedule of the fees fixed may be obtained upon request.

thermore, the fundamental character of this service and its great importance to all elements of a community require that this equipment be of unquestioned good quality. By reason of its special character and the limited market for it, and because of the precision required in its manufacture, weights and measures equipment of good quality is necessarily expensive; this fact should not, however, cause officials to purchase such equipment purely on a price basis, sacrificing quality on the altar of a false economy. It is far better for a weights and measures office to have a slightly smaller amount of the best equipment than to be fully equipped with standards and apparatus of doubtful quality and permanence.

Procurement of Standards. Wherever an office is not completely equipped, and this refers alike to the field equipment of the inspectors working out of an office and to the equipment actually located within the office itself, every effort should be made to procure a sum of money each year to be applied to the purchase of the missing items. This program should be continued until the officials involved are able to meet any demands made upon them for weights and measures service. It is not only embarrassing to the official, but it is most unfortunate for the community as well, if the weights and measures officer is forced to refuse, through lack of standards, equipment, or supplies, to undertake some phase of activity that clearly comes within the scope of his duties as established by the law.

Special Equipment. It should also be borne in mind that, while certain special classes of the official's work may be carried on with regular equipment designed primarily for other purposes, not infrequently such work may be performed in a much more satisfactory and efficient, and, perhaps, in a much more precise manner, with special equipment designed for that particular purpose. Another consideration in support of adequate equipment for every purpose is the very unfavorable impression created in the minds of the public if the weights and measures officer must resort to makeshift methods every time a slightly unusual situation develops, and the contrary impression created by well designed equipment of good appearance, obviously well suited to perform the particular service in which it is being employed.

With respect to certain major items of special equipment (such as vehicle-scale testing units, for example) a special procurement problem may arise in that the item can not be bought "from stock" or even on the basis of "stock" or standardized designs and specifications. Faced thus with the

necessity of having his equipment built to special order, the official may proceed largely on the basis of his own knowledge alone to design and engineer the equipment; not infrequently it happens that the resulting piece of equipment would have been materially improved, or its cost materially reduced, if the official had had the benefit of experience developed in other jurisdictions with equipment for a similar purpose. Since the Office of Weights and Measures of the National Bureau of Standards is, in general, well informed on the activities of weights and measures departments throughout the country, it is in a good position to make helpful suggestions on the design and construction of special testing equipment for weights and measures purposes. It is urged, therefore, that officials planning to procure new items of special equipment consult with the Office of Weights and Measures before deciding on the design for such items.

There is suggested the advisability, in certain cases, of providing separate kits for special classes of field work, and of so planning the work of routine field testing that effort will be concentrated upon a particular class of work at a given time. As an example, consider the examination of the prescription scales of pharmacies. A special kit containing the small balance for testing prescription weights, the sets of small weights, and the small dies and tools required, is much more suitable for this delicate work than the regular carrying case with its complement of larger weights, measures, tools, and sealing equipment, in addition to the small equipment; the equipment for the special work being thus kept separate from the regular outfit, the probability of inadvertent damage or loss of small items is greatly reduced, and the psychological effect produced upon the proprietor of the pharmacy is far better than would otherwise be the case.

Adequacy of Testing Apparatus. It should be apparent that tests can be made properly only if, among other things, *adequate* testing apparatus is available. Testing apparatus may be considered to be adequate only when it is properly designed for its intended use, when it is so constructed that it will retain its characteristics for a reasonable period under conditions of normal use, when it is available in denominations and types appropriate for a proper determination of the value or performance of the equipment under test, when it is available in an amount sufficient to make a reasonably complete test, and when it is accurately calibrated.

Accuracy of and Corrections for Standards. A general principle that has long been recognized by the National

Bureau of Standards is that the error on a standard used by a weights and measures official should either be known and corrected for when the standard is used or, if the standard is to be used "without correction," its error should be not greater than 25 percent of the smallest tolerance to be applied when the standard is used. The reason for this is to keep at a minimum the proportion of the tolerance on the item being tested that will be "used up" by the error of the standard. Expressed differently, the reason is to give the item being tested as nearly as practicable the full benefit of its own tolerance.

Field testing operations are complicated to some degree when corrections to standards are applied, and except for work of relatively high precision it is recommended that the accuracy of standards used in testing commercial weighing and measuring equipment be so established and maintained that the use of corrections is not necessary. Also, whenever it can readily be done, it will be desirable to reduce the error on a standard below the 25-percent point previously mentioned.

At the National Bureau of Standards various "classes" have been established for standards of mass, appropriate tolerances being specified for each class. This system of "classes" has not been extended to standards of measure, but tolerances have been fixed by the Bureau for standards of length and capacity considered suitable for use by weights and measures officials.

The accuracy of testing apparatus should invariably be verified prior to the use of the apparatus.

Maintenance and Use of Testing Equipment. Having procured suitable and adequate equipment, it becomes the continuing duty of the official to maintain that equipment in proper condition. There are three kinds of maintenance—maintenance of accuracy, maintenance of good operating condition (in the case of mechanical equipment), and maintenance of appearance. As to the first, there should never be any doubt of the accuracy of the weights and measures standards used by the official; this is fundamental. If there be any suspicion of inaccuracy, immediate steps should be taken to resolve the doubt, and if the suspicion proves to have been well founded, adjustment, repair, or replacement, as the case may require, should promptly be made. If use is made of "secondary" standards, such as special fabric testing tapes or mechanisms such as fluid meters, these should be verified much more frequently than such basic standards as weights,

standard liquid measures, volumetric provers, or steel tapes, to demonstrate their constancy of value or performance.

Referring to weights, these are made from or coated with metals selected for their resistance to corrosion and wear that might affect the mass of the weights. Nevertheless, special precautions should be observed in handling and using standard weights, for every effort should be made to guard against even very slight changes in their values, changes that may be multiplied manyfold before the final effect is reached, and that may be reflected in a departure from standard throughout an entire community. It follows that the higher the class of a weight the greater protection it should be accorded. Specifically, State primary standards and State and local office standards should never be touched with the hands, but should always be handled by means of the special lifters provided for that purpose; the accumulation of dust or other foreign material should be prevented; moisture and corroding gases should be excluded from contact with these standards; and the greatest care should be exercised to prevent any abrasion or scratching of the bottom or any other surface. Such weights should always be kept under glass, in a closed cabinet, or in properly lined, closed boxes when not in use, and in use they should be handled most carefully and should rest upon a freshly cleaned surface. Should there be required any cleaning of these standards, the greatest care should be exercised to avoid any damage to the surfaces being cleaned; any accumulation of dust should be gently removed with a soft camel's-hair brush, and if rubbing with gauze or cotton is a necessity, gauze or cotton should be moistened with alcohol or distilled water and the rubbing pressures should be kept at a minimum.

Similar precautions should be observed in the case of office working standards, although the requirements are not so strict. It is advisable to avoid handling these standards (except those reserved for testing commercial scales and weights) with the bare hands, the use of the special lifters being recommended in all cases.

Field standards must, as a matter of expediency, be handled without lifters, but care should be exercised to avoid any accumulation of moisture, dirt, or other foreign material on the weights, and cleaning should be performed without abrading or scratching the weights in any way. Particular attention should also be given to avoiding any tendency to slide the weights about, for this will cause wear and consequent loss of material; when it becomes necessary to move a weight it should be lifted and set down gently in its new

position. To avoid heavy condensation of moisture on small weights used by field inspectors during winter months in cold climates, it is suggested that steps be taken to keep the temperature of the weights reasonably close to indoor working temperatures; this can be accomplished if the weights are stored indoors whenever they are not in use for several hours or more.

As to standards of length and capacity, the precautions to be observed for their proper care in storage and use are so obvious that detailed comment should be unnecessary. It should always be borne in mind that when any standard is being used it represents, for the moment at least, the last word in precision, and that everything that may be done to preserve the accuracy of that standard should be done.

Standards and Equipment of Service Agencies. As a corollary to this discussion on the accuracy and adequacy of standards and equipment for the weights and measures official, there may be noted the lack of attention to the accuracy and adequacy of their working standards and equipment that is displayed by some repair agencies and service men. Accurate and dependable results can not be obtained with faulty and inadequate standards, and if the service man is inadequately equipped, it can not be expected that his work will be wholly satisfactory or that his results will check consistently with those of the properly equipped weights and measures official. Disagreements between serviceman and official can be avoided, and the servicing of commercial equipment can be expedited and improved if servicemen and officials give equal attention to the adequacy and maintenance of their testing apparatus.

Appearance of Testing Equipment. As to maintenance by the official of the good appearance of his equipment, this is considered to be second only to the maintenance of accuracy. The standards of the weights and measures officer, his balances, his tools and carrying cases, in brief, his entire equipment, should be of such appearance as to inspire confidence in the minds of all, not only with relation to the integrity of the standards of weight and of measure but also with relation to the ability and carefulness of the official himself as disclosed by the appearance of his working outfit. Of course, it may so happen that a scratched and battered weight, for example, has been adjusted to as nearly true value as another weight with polished, unscratched surfaces, and free from all evidences of misuse; but the thoughtful official will never use the former, because if he does, his work will inevitably be discredited and its accuracy questioned

by anyone who witnesses it. Again, the carrying case with the broken hinge and the shabby cover may serve its utilitarian purpose as well as another in perfect condition, but in the mind of the observer there is almost sure to arise a doubt as to the degree of care exercised in his work by one so obviously careless with his equipment.

Finally, the weights and measures official is supposed to be the expert of his community in all matters relating to his official duties, and he should conduct himself at all times in conformity to that status. If he is the sole official in his city, the department will succeed or fail through his individual efforts; if he is a State inspector or one of several assistants in a city, the impression of his department gained by those with whom he comes officially in contact is gained as a result of his efforts. These impressions will be good or bad, depending upon many factors; but no small part will be played by the personal appearance and conduct of the official and by the looks of the standards and other equipment with which he works.

Chapter 16.—Inspection of Commercial Weighing and Measuring Devices

In the same way that weights and measures activity as a whole may be broadly separated into two divisions—mechanical and supervisory—so the mechanical division may very properly be subdivided into two branches, namely, inspection and testing. These two branches are closely allied, and at times the line of demarcation is very indefinite; but, in general, inspection may be defined as that portion of the examination of a piece of apparatus conducted independently of the physical standards of weight or measure, while testing is that portion of the examination involving the use of such standards. Or, in other terms, inspection is largely directed to determining compliance with the requirements of the "specifications" and the "regulations" of the official codes, whereas testing is specifically directed to determining compliance with the "performance requirements" and the application of the "tolerances" of those codes. This distinction is recognized by the codes themselves; a commercial device is said to be "accurate" if it "conforms to the standard within the applicable tolerances and other performance requirements," and is said to be "correct" only "when, in addition to being accurate, it meets all applicable specification requirements." The loose usage whereby the term "inspection" is understood to embrace everything that the official has to do in connection with commercial equipment is rather common and is to be discouraged, and consistent discrimination between inspection and testing is recommended.

General Considerations. It is not enough merely to determine that the errors of equipment do not exceed the appropriate tolerances. Specification requirements may be equally as important as are tolerance requirements, and both should be enforced. Inspection is particularly important, and should be carried out with unusual thoroughness, whenever the official examines a type of equipment not previously encountered. This is the way the official learns whether or not the design and construction of the device conform to the specification requirements. But even a type of device with which the official is thoroughly familiar and which he has previously found to be in agreement with the specifications

should not be accepted entirely "on faith." Some part may have become damaged, or some detail of design may have been changed by the manufacturer, or the owner or operator may have removed an essential element or made an objectionable addition. Such conditions may be learned only by inspection. Some degree of inspection is, therefore, an essential part of the official examination of every piece of weighing or measuring equipment.

In actual field practice, inspection will sometimes precede testing, at other times the reverse will be the case, and again inspection may be carried on simultaneously with the testing operations. When the inspection is made, is, in most instances, a matter of secondary importance; the essential consideration is that it be made. No examination can be considered complete that does not embrace a thorough inspection as well as a careful test.

Purposes. Inspection is but one of the means resorted to by the weights and measures official to insure that only proper weighing and measuring devices are used commercially in his jurisdiction. Specifically, the principal purposes of inspection may be enumerated as follows:

1. To insure that the requirements of the code of specifications are met (design, construction, materials, finish, marking, and the like); and, in the case of apparatus previously examined, to insure that no additions or alterations that might adversely affect official approval have been made by the operator since the preceding inspection.

2. To insure that working parts are in the proper condition to function as intended, to determine whether or not there are indications of abuse or of a lack of proper attention on the part of the operator, and to establish the facts upon which to base any needed recommendations for improved maintenance designed to improve performance or prolong the useful life of the equipment.

3. In the case of unfavorable test results, to aid the official in determining the source or underlying cause of the trouble, thus enabling him to discuss more intelligently with the operator the steps necessary to a proper remedy.

4. To insure that there exists no unusual condition external to the apparatus that may be conducive to inaccuracy or to the perpetration of fraud.

5. To assist the official in checking compliance with applicable regulations (as distinguished from specifications).

Inspection for Specification Compliance. The necessity for inspection for the first purpose mentioned must be at once apparent. The specifications set up certain stand-

ards, and it is the duty of the official to require that these standards be met by the apparatus in his jurisdiction. In the case of a new type of device—as, for instance, a new model of a weighing scale—the inspection will naturally be made much more carefully and thoroughly than in the case of devices of a type that has previously been examined. If the new device in question has been submitted for examination to the office of the weights and measures official, the inspection can be made more conveniently and probably more effectively than a similar inspection in the field; but if the new device is encountered in the field for the first time, the inconvenience of making a thorough inspection should not be permitted to influence the official to slight this important duty. Should the device prove to be unsatisfactory, it will be found much easier to control the situation if this fact is discovered promptly and suitable action taken before the devices have secured a foothold by reason of numbers of them having been put into use in the territory in question.

In making a first inspection of a new type of device, the official should consider first what specifications are applicable to it; then, with the written specifications before him, he should examine the device with reference to the provisions of each paragraph of the specifications referred to. A record should be made of the results of the inspection, with detailed notations in relation to any points of noncompliance with the requirements. This record should be preserved as the basis for any future actions of the official with respect to the device.

It is sometimes felt by weights and measures officials that, once having made a thorough examination of a certain type of device, no further inspection of similar devices will be necessary when these are encountered in the field. It is true that subsequent inspections need not be so detailed in character as the first one, but by no means should they be omitted entirely. In the first place, conditions of use may bring out objectionable features of design, poor workmanship, or faulty materials that were not apparent upon first inspection, however carefully it may have been made. In the second place, manufacturers find it expedient from time to time to make modifications in the devices that they manufacture, and the devices so modified may or may not conform to specification requirements. Again, the user of a device may make or cause to be made changes that may create very unsatisfactory conditions; whether such changes are made with good intentions or, as may rarely happen, with a desire to provide a means to defraud, the official should become

advised of the situation. In each of these cases, regular inspection of the devices examined offers the official the means of keeping informed on the general mechanical condition of the equipment so that corrective action can be taken whenever needed.

It should be emphasized that when an unscrupulous operator sets out to modify a piece of equipment so as to make it easier for him to practice fraud or so as to enable him to obtain a greater advantage than he could otherwise obtain, he is very apt to display considerable ingenuity in concealing traces of his attachment or modification; it therefore behooves the official to observe the greatest care in making his inspections whenever he has any suspicion that fraud is being practiced. It should also be mentioned that the changes in or additions to a piece of apparatus that may be made with the best of intentions and for a perfectly legitimate purpose by someone who does not understand the equipment or appreciate all the effects of doing certain things to that equipment, are frequently found to have a most serious effect upon the accuracy of the apparatus and its suitability for commercial use.

Inspection should be extended beyond the weighing or measuring device itself to include any auxiliary equipment the performance of which has a bearing upon the performance characteristics of the instrument under examination or that has any weights and measures significance in relation to the operation of that instrument.

Inspection for Operating Condition. In relation to the second purpose of inspection, it should be borne in mind that a weighing scale, for example, or a gasoline-measuring device, is but a machine, and that it requires intelligent care if it is to continue to discharge its intended functions; similarly, that even a weight or an ordinary measure cannot retain its accuracy if subject to abuse. There are occasions when for particular purposes, an inspector will wish to determine the value or performance of a piece of equipment that is not in proper condition for use but is, nevertheless, being used commercially in that condition; however, in the course of normal routine examinations it would be foolish for the official to spend his time testing a device the parts of which were disarranged, broken, or otherwise out of operating condition. If these conditions were the result of lack of attention or of misdirected effort on the part of the owner or operator, the official would be remiss if he did not caution the careless man and instruct the ignorant one. Inspection becomes necessary, therefore, to enable the official to discover

any improper maintenance conditions that may exist, and to take the necessary steps to have such conditions corrected and prevent their development in the future. Moreover, an important service may be rendered to those equipment owners who, through ignorance of proper maintenance measures, suffer their equipment to deteriorate at a rapid rate, by giving them instructions in maintenance methods and thus assisting them to prolong the useful life of their equipment.

Inspection to Locate Cause of Inaccuracy. In relation to the third purpose, it has been said that in the case of unfavorable test results inspection is made to aid the official in determining the source or underlying cause of the trouble so that he may intelligently discuss remedial measures with the operator. Here, again, is met the much-discussed problem of how far the official should go in the direction indicated. Many officials are inclined to take the stand that their statutory duty is to test commercial equipment, approve it if it is found accurate, and reject it if it is found inaccurate, and that to go further than this is unnecessary and inadvisable. Notwithstanding this statutory provision, however, it is submitted that the official who stops with the mere statement to an operator that his equipment is inaccurate, with an unwillingness to discuss with him the probable sources of the inaccuracy, is not doing all that may properly be expected of him, and certainly is not capitalizing upon all of his opportunities to be of service to his community. The conscientious official will not be completely satisfied until he has made a reasonable effort to be of maximum assistance to the operator, even to the extent of discovering for himself the underlying reasons for the discrepancies that his test has disclosed and discussing with the operator ways of avoiding their recurrence.

Inspection of Environment. The fourth purpose of inspection—to insure that there exists no unusual condition external to the apparatus that may be conducive to inaccuracy or to the perpetration of fraud—is to disclose external conditions that may be equally as important as faulty conditions in parts of the mechanism under test. Currents of air upon the under or upper sides of a scale platform, insecure supports for a counter scale, conditions in a scale pit, the possibility of variation in the pressure at which liquid may be supplied to a meter, the character of fuel dispensed through a gasoline pump, the character of material being measured through a fabric-measuring device—these are but examples of the factors entering into the ulti-

mate performance of commercial weighing and measuring devices that must be learned through inspection and that the efficient official should take into consideration in connection with his examination of the apparatus that is under his control.

Inspection for Regulation Compliance. The final purpose of inspection has been said to be to assist the official in checking compliance with applicable "regulations," that is, those requirements that are directed to the owner and operator rather than to the commercial equipment itself. During the inspection of the equipment and its environment, clues may be discovered or definite evidence found that will point the way to establishing a violation of regulations that might not otherwise be brought to the attention of the official.

Recommendations Based on Inspection. A comprehensive knowledge of each installation will enable the official to give to the owner constructive suggestions regarding the proper use and maintenance of his equipment and its suitability for the purposes for which it is being used or for which it is proposed that it be used. Such recommendations are always in order and may be very helpful. The official should, of course, avoid showing any partiality toward or against equipment of a particular manufacturer, and should be very careful to confine his recommendations to matters upon which he is qualified, by knowledge and experience, to make suggestions of practical merit.

Chapter 17.—Testing of Commercial Weighing and Measuring Devices [1]

Since the purpose of testing is to learn how the device under test will perform in service, a test should extend further than a study of performance under a set of more or less ideal conditions; it should be carried to the point of establishing the probability, at least, of the performance of the device under conditions of average use. The official will, therefore, try in his test to approximate service conditions of operation, and any method of use that may reasonably be employed in service may, with propriety, be duplicated in the test.

Check Observations. In general, it may be said that the official should not base his conclusion on the acceptibility of performance, upon single observations under the different conditions or at the different stages of his test. Check observations should always be made if practicable, and if groups of several observations can be made the average of these will probably represent much more nearly the actual conditions than any one series of individual observations.

Outside Influences. During the progress of a test a constant effort should be made to eliminate the effect of outside influences lest there be ascribed to imperfection in the device under test, a result that is really caused by some condition entirely outside the device itself. Thus, for example, the effects of wind upon a platform scale, or the effects of changes in the temperature of the atmosphere upon deliveries from a gasoline pump, might seriously prejudice the test results of the official who is not alert to the possibilities along these lines.

Analysis of Test Results. The official should also be cautioned against "jumping at conclusions" before he has made a careful analysis of the test results and of any other facts that may have a bearing upon the performance of the device under test; likewise it should be emphasized that data as nearly complete as practicable should be at hand before the analysis is undertaken or the conclusion drawn. There is no doubt, for example, that many a nose iron, many a pendulum ball, and many a spring on weighing scales have

[1] See also Chapter 18, Testing by Sample.

been adjusted, and the adjusting elements of many a fluid meter have been manipulated, to force a correct indication when the real cause of the inaccuracy lay elsewhere. The unfortunate part of this is that such adjustments are almost never effective for more than a very short time, because the real source of the trouble, which was uncorrected, still persists, and the effects will probably grow more pronounced as time goes on. The old adage to the effect that the wise physician treats the cause and not the symptom may well be borne in mind in this connection. In short, the adjustable features of a weighing or measuring device should never be made use of to correct its indications except as a last resort and when it has been demonstrated beyond question that their improper adjustment is the real cause of the inaccuracies disclosed by the test.

Recording Results. The careful official will record the results of his test for two reasons: First, so that he may have the data at hand to study the performance of the device that has developed inaccuracies and determine the reasons therefor. Second, so that he may have a complete record for his files of the work that he has done and of the performance of the devices that he has examined; such a record may prove invaluable at some future time. (More will be said on the question of weights and measures records in Chapter 31.)

Planning the Testing Program. The efficiency with which the testing program is carried out will depend to a considerable extent upon the wise planning of the work. In the individual city the best results will undoubtedly be obtained if effort is concentrated upon some special phase of the work at any given time or by any given inspector or group of inspectors. In the city having but one or two officials the official will be called upon to perform all classes of testing, but in the regular routine work he may well concentrate on one class of commercial apparatus at a time. Some examples of such classes of apparatus are large-capacity scales requiring maximum test loads; platform scales from 300 to 2,000 pounds; small scales and other miscellaneous equipment in retail establishments except pharmacies, jewelry stores, and the like; the fine equipment in pharmacies and jewelry stores; and gasoline and oil measuring devices. In the city having a larger force of inspectors it will be found an excellent plan to have certain of them specialize on a particular class of work; this will tend toward higher individual efficiency, will simplify the problem of equipment, will create a more favorable impression among merchants and public, and will expedite the work of the

department. In the case of one or two State inspectors covering a territory of considerable size, the work in any given city within their territory may be arranged as suggested for the city having but one or two officials.

Approval Before Use. In theory, all weighing and measuring equipment should be tested and approved by the official before this is put into commercial use. This is usually required by the law, but very frequently this provision is not strictly enforced. It should be enforced wherever possible as a protection to manufacturer, merchant, and public, and in the city having local officials there should be no particular difficulty in enforcing it unless the department is seriously handicapped in the matter of personnel. A plan of cooperation between manufacturers' representatives and the department on all new devices sold may readily be worked out, whereby certain small equipment may be tested before delivery or even before sale at the office of the official or at the establishment of the equipment dealer, and whereby advance notice may be given of the installation of other equipment that must be tested in the place where used, so that the official may plan his work to make the necessary tests without loss of time or interference with his other duties.

In this connection it should be remembered that advance tests by the official upon devices that are disassembled after the test and later set up again at the establishment of the purchaser, are largely wasted effort, because many things may occur in the course of such operations that will interfere with the correct functioning of the device after reassembly. Even in the case of a self-contained device that is not taken apart after test but is merely transported to the purchaser's place of business, it is advisable for the official to make an inspection and at least an abbreviated test as soon after delivery as convenient, whenever the device is at all delicate or complicated or susceptible of becoming out of adjustment as a result of handling or transportation.

Permits for Use. In the case of a State department operating over a wide territory it is usually impracticable to test all new devices before use on account of the great expense that would be incurred in moving inspectors here and there throughout their district wherever a new piece of equipment is sold, and the resulting interference with the regular program of testing and inspection. A plan that has given good results in some States has been a system of permits issued by the head of the State department to each purchaser of a new weighing or measuring device, these

permits giving permission for the use of the equipment in question pending a test by an inspector. This plan is admittedly an expedient, but unless the districts of the State inspectors are small so that they can handle the work as a city official would, there appears to be no practicable alternative. The assignment of one or more State inspectors to go about the State taking care of original tests on new equipment upon which permits have been issued and of retests on equipment that has been rejected for repairs, helps materially in handling the situation. Flying trips by an inspector in his own district, during which he covers the "permit" equipment that has come in since his former visit, and the equipment that he rejected and that has been repaired, are of distinct advantage and reduce the intervals during which equipment that has not been officially tested and approved, may be in commercial use. The rights of the purchasers of new equipment that cannot at once be tested may be safeguarded if they are taught to make their purchases under guarantee from the sellers that the apparatus conforms to all weights and measures requirements; with the manufacturers realizing their added responsibility under these circumstances and exercising due care to avoid placing any equipment that will not meet the requirements, no serious difficulties should develop.

Application of Basic Testing Principles. Finally, it should be emphasized that the weights and measures official should thoroughly understand the principles of testing and be able to adapt these principles to the needs of the devices that he meets in the field. New types will be encountered from time to time, and rule-of-thumb methods will be found inadequate. The routine of testing must frequently be varied to conform to the peculiar design and construction of a particular device. But if the official knows what his test should develop, if he familiarizes himself with the mechanical principles of the device that he examines, if he understands the effects of the various testing operations and is able to choose the proper operation to bring out the desired facts, and if his equipment is adequate, he should be able to carry on his testing of weighing and measuring devices with entire success.

Chapter 18.—Testing by Sample

There are two categories of measures for which individual examination and sealing are quite impracticable. One of these categories comprises principally milk bottles and lubricating-oil bottles; the other category comprises "measure-containers," intended for one-time use and utilized for measuring and containing deliveries of ice cream and other frozen desserts (whether prepacked or from bulk supply) and certain semisolid foods. Very large numbers of measures in both categories are used.

The impracticability of individual testing for milk bottles and similar measures is found in the tremendous numbers in service and the limited personnel available for examining and marking them. The impracticability of individual testing for measure containers is more nearly "impossibility," and lies in the necessity for preserving the initial sanitary characteristics of these single-service paperboard measures, which would be adversely affected by testing and which cannot be restored by subsequent cleaning. But even if it were possible to make individual tests on these measures it is believed that this would be inadvisable under prevailing processes of mass production for if this were done these classes of equipment would be receiving an entirely disproportionate amount of attention. Futhermore, the production methods employed in manufacturing plants and the checking provided by the weights and measures official make it possible to reach a reasonable solution of the problem of adequate controls for these two categories of measures, and so make it unnecessary for each individual piece of such equipment to be examined. These factors, then, are responsible for the development of what is generally spoken of as the "testing by sample" of commercial equipment.

Legal Recognition. In most jurisdictions at the present time the statute provides that *all* commercial measuring devices should have been inspected, tested, and sealed by the weights and measures official before being put into use. In this relation, attention is invited to a proviso recently added to the section of the Model State Law on Weights and Measures that prescribes the general testing duties of the State Superintendent of Weights and Measures, reading as follows:

Provided, That with respect to single-service devices—that is, devices designed to be used commercially only once and to be then discarded—and with respect to devices uniformly mass-produced, as by means of a mold or die, and not susceptible of individual adjustment, tests may be made on representative samples of such devices; and the lots of which such samples are representative shall be held to be correct or incorrect upon the basis of the results of the inspections and tests on such samples.

It is recommended that, wherever necessary, amendments be made to existing statutes and ordinances to incorporate these provisions and to harmonize therewith the penal sections of such statutes and ordinances.

Identification of Equipment. Also relevant to sample testing is that specification (nonretroactive) of the General Code of the Specifications, Tolerances, and Regulations for Commercial Weighing and Measuring Devices as adopted by the National Conference on Weights and Measures, that reads as follows:

Identification.—All commercial equipment except weights shall be conspicuously, clearly, and permanently marked, for purposes of identification, with the name, initials, or trademark of the manufacturer and with the manufacturer's designation that positively identifies the pattern or the design of the device.

The identification provided for by this specification makes workable the system of testing by sample, because the identity of the equipment and its manufacturer may always be determined, and so responsibility for any failure of the equipment to meet applicable code requirements becomes fixed.

Justification. The validity of approving or rejecting an aggregate, or lot, of items on the basis of results obtained from testing a sample from that lot, rests on the concept that paperboard measure-containers and devices produced from molds or dies are, or can be, mass-produced with a high degree of uniformity. Upon this premise, if a representative sample of a lot of measure-containers or milk bottles of a particular make, style, and nominal capacity is found to be correct, it is reasonable to assume that the entire lot from which the sample was taken is correct; or if the sample is found to be incorrect, the entire lot may properly be assumed to be incorrect. Testing by sample is recognized by statisticians as a proper testing procedure when the sampling is conducted with due regard to certain factors.

Size of Sample. In testing by sampling, two considerations are of particular importance, (1) the size of the sample,

and (2) the manner of selection of the sample. As to its size, the sample must adequately represent the lot, the number of items in the sample bearing a reasonable relation to the number of items in the lot. For example, the sample might be 10 percent of a small or moderate-sized lot, ranging down to as little as 1 or 2 percent of a very large lot, actual numbers of sample items ranging from a minimum of 8 or 10 items to a maximum of perhaps 100 items. The size of the sample to be selected should be decided upon before sample selection actually begins.

Selection of Sample. As to the manner of selection of the sample, this should always be "random choice," which is to say that the procedure used to select items from the lot (to make up the sample) should be such that each item in the lot has an equal chance of being included in the sample. No fixed pattern of selection should be followed, items being picked instead on the basis of "chance" or "blind" selection. If appropriate to do so, sample items may be picked from different locations in the lot; for example, when sampling a carload of milk bottles, selections should be made from various parts of the car.

Results. From the recorded results of the tests on the individual items comprising the sample, the order of magnitude of the errors and the range of the errors, due regard being had for the signs of the errors, give information on the care and accuracy with which the manufacturer is making his product. Inspection of the sample items discloses the degree of compliance with specification requirements.

Procedures. Whenever it is practicable to do so, it is advisable for the official to conduct his testing by sample at the level of the manufacturer or wholesale distributor of the measures rather than at the level of the commercial user of the measures.

It is to be remembered that satisfactory results for one variety or one capacity in a manufacturer's line is not a guarantee that other varieties and capacities in the line will be found satisfactory—each should be sampled and examined. With respect to measure-containers, a manufacturer's product may be satisfactory at one time, but later, through carelessness of one kind or another, the product may become unsatisfactory; the official, therefore, needs to repeat at periodic intervals—perhaps once every two or three years—his complete testing (by sample) of each manufacturer's product used in his jurisdiction. In the intervals between complete tests, "spot checking" of a few samples of measure-containers picked up at the user level every few months

should provide adequate control, and will serve to disclose any trend toward an unsatisfactory product.

In the case of milk bottles, a good plan is to arrange for notification by each dairy whenever a new shipment of bottles is received. The shipment of new bottles should be sampled and tested by the official before any of the bottles are placed in service; then if the test shows the bottles to be unsatisfactory, the entire shipment can be returned to the manufacturer or distributor, as the case may be. This plan provides a simple method of effecting control over all milk bottles in service in a jurisdiction, and can be carried out with a minimum of effort by and inconvenience to all concerned. A similar plan can be worked out with the wholesale distributors of measure-containers located within the official's jurisdiction.

It may be suggested that the official can render a useful service to the users and distributors, in his jurisdiction, of milk bottles and measure-containers by cooperating with them in the drawing of purchase orders for these items. If purchases are made on the basis of compliance of the product with applicable weights and measures requirements, either in so many words or by incorporation in the purchase orders of the essentials of those requirements, the interests of the purchasers will be protected, and, by means of tests made before the product is placed in service, compliance with the weights and measures requirements may readily be brought about.

Chapter 19.—Sealing of Commercial Weighing and Measuring Devices

The term "sealing," as used in this chapter, has two distinct meanings; it is used to denote the operation of marking a weighing or measuring device in a manner to indicate its approval for commercial use, and it is used to denote the operation of fixing in place the adjustable elements of a weighing or measuring device in such a manner that unauthorized adjustments may not be made without destroying or mutilating the "seal."

Necessity or Approval Seals. Considering first the sealing to indicate approval for commercial use, it may be said that with the exception of those classes of commercial equipment that are approved on the test of samples only and not on the basis of the test of each individual piece of equipment (as discussed in Chapter 18), whenever the weights and measures officer examines a piece of equipment and reaches the conclusion that it is satisfactory for use in commercial transactions, the equipment in question should, in general, be suitably marked to indicate this fact. A further exception to the general recommendation that approved devices be sealed is found in a recent addition to the Model State Law on Weights and Measures under which provision is made for the issuance of a regulation exempting from the sealing and marking requirements of devices "of such character or size that such sealing or marking would be inappropriate, impracticable, or damaging to the apparatus in question."

A mark of approval is of importance to the operator of the equipment, to the public, and to the official; to the operator because it serves as evidence that the requirements of the law have been met; to the public because it serves to show that the weights and measures official is active and because it inspires confidence and fosters cooperation; and to the official because it is evidence of the work that he has done and is one of the means by which he checks up on the condition of the equipment in use in his jurisdiction.

Types of Approval Seals. To serve the various purposes enumerated, the seal of approval itself should first be sufficiently conspicuous to be readily seen by all interested parties. Second, it should be suitably designed to indicate

its official character, it should contain the necessary information, and it should be dignified in appearance. Third, it should be of such a character that it may reasonably be expected to remain in position until officially removed. The large variety of devices to which such a seal must be applied, with their varying characteristics of design, material, and environment, has resulted in the development and use of a variety of seals. The oldest type of seal is probably the impression cut into the object being sealed by means of a metal stamp. Glassware may be marked by using a "glass-marking pencil" having a diamond or carbide point. The lead-and-wire seal is very widely used, and adapts itself admirably to many of the special needs of the weights and measures official. This seal consists of a short length of wire, usually about 8 or 10 inches long, to one end of which is attached a lead plug with holes through which the other end of the wire may be threaded. When the seal is affixed a special clamp is used to press the lead plug tightly around the wires so that they cannot be removed, at the same time making an impression on both sides of the plug; these impressions are usually the month and year of sealing and the initials that constitute the legal sealing mark.

Characteristics of Approval Seals. There are also a number of varieties of seals employing wire and lead plugs that are designed for particular uses. Some of these are self-locking; that is, they do not require the use of a clamp to secure them in position. Another type of seal is the metal tag, designed to be secured in place by means of the ordinary lead-and-wire seal; these metal tags are usually made of aluminum alloy or brass and are about the size of a half-dollar. There is the cloth or paper seal with adhesive-coated back; in size these run from diameters of about 1½ inches to over 4 inches. Finally, there is the decalcomania transfer seal, usually circular or rectangular in shape, that will adhere firmly to glass or porcelain-finish surfaces.

With the exception of the small impression seals and the lead-and-wire seals used alone, all of the types mentioned satisfy the condition of being conspicuous in themselves. Even the small impression seals, when properly applied, may be conspicuous in some instances, as, for instance, when applied to a weight. As to proper design to indicate their official character, the metal tag, the adhesive-coated paper seal, and the decalcomania transfer are usually entirely satisfactory, and the lead-and-wire seals and the impression seals are least satisfactory. As to ability to contain the

necessary information, the paper seal and the decalcomania transfer are on a par and the metal tag comes next in order; in the impression seal and the lead-and-wire seal the information must be expressed very briefly. As to dignity of appearance, the metal tag in combination with the lead-and-wire seal and the neatly affixed paper or decalcomania seal of moderate size are about equal; the impression seal rates second if properly applied; and the very large sizes of gummed-paper seals, and the lead-and-wire seal used alone constitute a rather poor third.

With respect to permanence, or security of attachment, it may be said that impression seals, stamped directly on the apparatus, are unquestionably permanent—sometimes annoyingly so, as when approval is ultimately followed by rejection, and it is desired to remove the seal of approval. For all ordinary weights and measures requirements the decalcomania transfer may be classed as a sufficiently permanent type of seal, excluding deliberate attempts at removal; although slightly more troublesome to apply than seals of other types, the greater security and lasting good appearance of the decalcomania seal recommend it highly. Some gummed-paper seals will not adhere to some surfaces at all, and in time will curl and peel from some others; also, these seals will not ordinarily prove satisfactory when exposed to the elements. However, it has been found [1] that plastic-coated paper backed with a pressure-sensitive adhesive provides good adhesion to even glass and porcelain surfaces and under conditions of exposure to outdoor weather for up to one year. It was found that the outdoor life expectancy of paper and cloth adhesive-backed seals in ascending order was as follows:

1. Soft paper with water-soluble adhesive.
2. Gloss or varnished paper with water-soluble adhesive.
3. Cloth with water-soluble adhesive.
4. Composition-coated cloth with water-soluble adhesive.
5. Good-quality hard finish paper with pressure-sensitive adhesive.
6. Plastic-impregnated paper with pressure-sensitive adhesive.

Lead-and-wire seals, and metal tags affixed by means of such seals, may be expected to remain in place for long periods if not tampered with, even when exposed to the elements, but the wires are frequently found to have been

[1] See National Bureau of Standards Miscellaneous Publications 212 (pp. 65–69) and 216 (pp. 109–110), reports of the 39th and 40th National Conferences on Weights and Measures, respectively, for papers by M. W. Jensen on "Weights and Measures Approval Seals."

broken as a result of inquisitive or mischievous twisting of the lead plugs. Under extreme conditions of outdoor exposure paper dyes and printing inks may fade seriously, even to the point of the seals becoming illegible.

Summing up the observations given above, the conclusion is drawn that the lead-and-wire seal should not be used alone as a mark of approval, that the impression seals should be used only where some other type is not suitable, and that, in general, the paper seal of moderate size, plastic-impregnated and with pressure-sensitive adhesive, or the decalcomania transfer should be used, the metal tag in combination with the lead-and-wire seal being employed only when use of the paper or transfer seals is impracticable.

For making entries on paper seals two means have been found satisfactory: A very soft graphite pencil and a waterproof stamp-pad ink.

Selection and Placement of Approval Seals. Uniformity of character and location of the seal is another important consideration. For each type of equipment that is examined there should be selected a type of seal and a location for sealing that appear to be most suitable, and then, whenever other examples of those types are encountered, this decision should be adhered to unless there are good reasons for deviating from the standard practice. On equipment in public places, seals should be so placed that the public can readily see them. Uniformity of placement will not only help the official himself when he is examining a piece of equipment to see whether or not it is sealed, but the general public will learn what to look for in the way of a seal and where to look for it. In this connection it should be emphasized that variety in the types of seals used should be kept at a minimum. If so many different types of seals are used that the ordinary person cannot readily identify them without close inspection or a reading of their text, this variety will tend to defeat one of the purposes of sealing—that of letting the public know the condition of the equipment at last examination—and will also prove confusing to the operators of the equipment as well.

The desirability of neatness in applying the seals should also be kept in mind. When necessary to write a date or a signature on a seal this should be done in neat, legible fashion; the seal should be affixed so that the text is readable and not upside down; old seals should be removed, or if decalcomania transfers are being used, the new seal should be applied over the old seal, leaving in view only the latest one; when fastening a metal tag by means of a lead-and-wire seal,

the wire should be drawn up tight and the end cut off close up to the lead plug; when applying an impression seal the impression should be made uniform throughout and should be properly alined. In short, the same care should be used in the sealing operation as is used in testing.

Some remarks may be appropriate as to the types of seals best suited to different classes of commercial equipment. Weights can only be sealed with impression seals consisting of steel dies. The same is true, in general, of measures of length. Where dry-capacity measures are still permitted in use, the branding or stenciling of the seal will be found most suitable in the case of capacity measures made of wood, with the possible use of the steel die to mark top, bottom, and lap, so that tampering with the measure may be more readily detected; in the case of metal dry capacity measures stenciling or soldering in place a brass seal are preferable to the use of the steel die on account of greater prominence of the seal.

Liquid-capacity measures made of tin, copper, or galvanized iron may be sealed by affixing a mark with a steel die or special clamp; when made of fiber or enameled ware the metal seal affixed with the lead-and-wire seal offers about the only practicable method; glass measures and graduated glassware are best marked by cutting the seal on the glass.

Pressure-sensitive seals and decalcomania-transfer seals may be used on most other weighing and measuring devices, and paper seals with water-soluble adhesive are suitable except where exposure to weather effects, adhesion to certain surfaces (such as porcelain), and the character of commodity handled (as, for instance, gasoline or lubricating oils) become factors in the problem. The metal seal affixed by means of the lead-and-wire seal meets the needs of some of the special cases where the paper seal is unsuitable. The sealing of a scale by stamping the beam with a steel die is not good practice; the beam may be injured and the mark is inconspicuous. Some weighing and measuring devices may be provided with lead sealing plugs to receive the imprint of an impression seal; such a seal is inconspicuous and is thus considered unsatisfactory.

Security Seals. Considering now the other kind of sealing, which may be denominated "security sealing," this is for the purpose of preventing the making of any unauthorized changes in a device after the weights and measures official has approved it for use, whether these changes be accidental or made with fraudulent intent, without either destroying or mutilating the official seal or seals. Missing

or mutilated seals, therefore, become evidence of some sort of unauthorized tampering with the device.

It is recommended that the adjustable features of a commercial device be sealed in place by the official at the conclusion of his test in the case of all devices required by the specifications to be provided with the means for such sealing.

Perhaps it should be definitely stated that the foregoing recommendation relative to the security sealing of adjustable elements is in no sense applicable to such adjustments as balance balls, leveling screws, and the like, that are provided to enable the operator to maintain his device in proper operating condition; it is obvious that these should never be "sealed" by the official.

The most common arrangement for sealing adjustments is utilization of the lead-and-wire seal. Parts whose relative movement is to be prevented are drilled to provide a small hole just large enough to receive the wire of the seal; caps over adjustable elements are held in place in a similar manner; bolts holding caps or cover plates in place are drilled for the insertion of the sealing wire; nuts or adjacent bolts are drilled so that when tied together with a sealing wire neither can be removed; and other similar methods are made use of.

The adjusting holes in weights are frequently partially filled with lead. Exposed lead surfaces in weights should be marked with a steel die after the weight has been adjusted.

Chapter 20.—Rejection and Condemnation of Commercial Weighing and Measuring Devices

When a weights and measures official finds, as a result of his inspection and test of a commercial device, that this cannot be approved for use, there are two courses open to him. On the one hand he can "reject" or "condemn for repairs," and on the other hand he can condemn outright; his selection of the course to pursue is governed by the character of the conditions found.

Rejection and Rejection Tags. If, in his best judgment, the official believes that the device in question can be repaired and put into proper condition for use he temporarily puts it out of use—until repairs have been made and the device has been retested and approved. This is spoken of as "rejecting" or "condemning for repairs." When equipment is so rejected it is suitably marked by the official to indicate this fact—unless the repairs are to be begun immediately. The customary mark is a tag (occasionally an adhesive label) of distinctive color, usually red, setting forth (1) the fact of rejection, (2) the reasons therefor, (3) the penalty for commercial use before repairs have been made and the device has been reexamined and sealed, and (4) the time limit set for the making of repairs. The tag is signed by the official and is attached to the rejected device in a prominent position by means of the lead-and-wire seal, but not in such a way as to interfere with the making of the necessary repairs. The operator is then fully advised as to the situation and given all necessary instructions.

Follow-up on Rejected Equipment. The time to be allowed for making repairs will differ with circumstances. In a city where service men are available at all times, 5 or 10 days is usually an ample period; in a country district 30 to 60 days may not be unreasonable. In the fixing of this period the official should be given discretionary powers, and he should be careful to allow ample time for the work to be done. In order to follow up cases of rejected equipment, the rejection tag is sometimes made with a perforated stub, which can be filled out with the name of the operator, a description of the device, and the date when repairs should be completed, this stub being retained by the official for his follow-up record; or this same result may be accomplished

by retaining a copy of the special "rejection report" (discussed later in Chapter 32 [1]) when this is used. Needless to say, the official should check up on rejected equipment shortly after the date when repairs should have been completed, and if there is evidence of improper use, or if the operator is negligent about having the repairs made, the official should take whatever action is best suited to the circumstances.

Retests and Permits for Use. In the case of the State inspectors covering large territories it is usually impracticable, on account of the expense involved, to follow up matters of this kind as promptly or effectively as can be done in the city or other small territory. The expedient of one or two special inspectors to handle retests of rejected equipment has been discussed in a previous chapter in connection with the tests of new equipment. Where this arrangement has been out of the question some State departments have evolved a permit system whereby the use of the repaired equipment is permitted under certain circumstances before actual retest by an inspector. Sometimes an affidavit from a service representative or repair man, who may be registered with or licensed by the department, to the effect that he has made the necessary repairs and left the equipment in good condition, is required before the permit is issued. Instructions, on a special form, may sometimes be left with the operator, telling him how to make a test of the device in question and providing space in which to report the results to the State office; if the results indicate reasonably good performance the permit is issued. While these expedients are not wholly satisfactory in their results, something must be done, in fairness to the owner of the equipment, to avoid tying up his equipment for an indefinite period until the inspector can again examine it. Here, as in other phases of weights and measures supervision, the advantage of an adequate number of weights and measures officers is clearly demonstrated, for with a sufficient force of men, districts may be small and each official may quickly and at a minimum of expense reach any part of his district where his services may be needed.

Equipment Exempt from Nonretroactive Requirements. Mention should be made at this point of the fact that under most codes of specifications certain provisions are retroactive and apply to all devices in use regardless of when they were purchased, while other provisions are non-

[1] See page 186.

retroactive and apply only to equipment put into use after some specific date. It is customary to identify nonretroactive provisions by printing them in italic type. The official must distinguish between the two classes of equipment in order to avoid rejecting devices for noncompliance with certain specifications that, perhaps, do not properly apply to them. One way of doing this is to identify with some distinctive and permanent symbol all devices subject to the retroactive provisions of the specifications—that is, exempt from the nonretroactive provisions. This should be done with respect to any particular class of device at the time a code for such class becomes effective.

Discarded Rejected Equipment. It frequently happens that when a device is rejected the owner prefers to buy new equipment rather than to have the old equipment repaired. In such cases the rejected device is often turned in as part payment on the new equipment and so passes into the hands of a dealer in weighing or measuring devices. When this occurs the interest of the weights and measures official in the equipment in question does not cease; he should be just as careful in seeing that proper repairs are made before the device is again placed in commercial use as though it had remained in the hands of the original owner, and he should exercise strict control over all reconditioned equipment handled in his territory.

Condemnation of Equipment. As to outright condemnation, this action is taken with relation to equipment that, because of mechanical deterioration or construction deficiencies, is in such bad condition that in the best judgment of the official it is impractical so to recondition it that it will meet specification and performance requirements. When a device is condemned, the official frequently confiscates and destroys it.

Authority to "seize and destroy" is customarily granted to the official by his law with respect to equipment that he condemns and also with respect to equipment that he has rejected but that the owner has not had properly repaired within the specified time limit. This authority should be exercised by the official with discretion. He should keep always in mind the property rights of an equipment owner, and cooperate in working out suitable arrangements whenever it is thought practicable for an owner to realize at least something from equipment that has been condemned. In cases of doubt the official should initially reject rather than condemn. Destruction of equipment is a harsh procedure, as is also confiscation; power to seize and destroy is

necessary for adequate control of extreme conditions, but seizure and destruction should be resorted to only when clearly justified.

Disposition and Salvage of Condemned Equipment. On the other hand, rejection for repair is clearly inappropriate for numerous items of measuring equipment. This is true in the case of most linear measures, of many liquid and dry measures, and of graduates, measure-containers, milk bottles, and lubricating-oil bottles. When such equipment is incorrect it is either impractical or impossible to adjust or repair it, and the official has no alternative to outright condemnation. When only a few such items are involved, immediate destruction or confiscation is probably the best procedure. If a considerable number of items are involved—as, for example, a stock of measures in the hands of a dealer, or a large shipment of bottles—return of these to the manufacturer for credit or replacement should ordinarily be permitted so long as the official is assured that they will not get into commercial use. Thus the official can protect the owner financially and can make possible the conservation of at least some of the material of which the equipment is constructed. In rare instances confiscation and destruction of large lots are justified as a method of control where less harsh methods have failed.

In the case of incorrect mechanisms such as most weighing scales, fabric-measuring devices, taximeters, gasoline and oil measuring devices, and the like, repair of the equipment is usually possible, so rejection is the customary procedure. Seizure may occasionally be justified, but in the large majority of instances involving these and similar items, confiscation should be unnecessary. Even in the case of worn-out equipment, some salvage is usually possible, and this should be permitted under proper controls.

The practice of merely marking as "condemned" equipment that is not proper for use and that cannot be repaired and leaving this equipment in the hands of the owner is to be discouraged if there is any other way in which the equipment can definitely be put out of service; such equipment should be removed from the channels of trade so as to eliminate the possibility of its again being used commercially. Of course, it will not be practicable for the official to confiscate a large item such as an entire gasoline dispensing unit or a complete vehicle scale; if such an item must be condemned the official should see to it that the unit is so dismantled that it is effectively put out of use. But in the case of small devices, which comprise the majority of the units that it is

necessary to condemn, dismantling when practicable and removal (by the owner) from the premises, confiscation (by the official) and subsequent destruction, or destruction by the official at the time of test, is the proper method of procedure.

As in the case of equipment approved for use, the official should keep complete records of all equipment rejected or condemned, the reasons for the action taken, and the ultimate disposition of the equipment. As mentioned earlier, follow-up records are also essential in the case of "rejected" apparatus.

Chapter 21.—Adjustment and Repair of Commercial Weighing and Measuring Devices

In practically all jurisdictions the law more or less clearly defines the duties of the weights and measures official. Included in these duties there will almost never be found any requirement that the official shall adjust or repair the equipment that he tests, although there may be provisions relating to those instances in which he does make adjustments or repairs. Thus some of these laws recognize that there will be times when adjustment of commercial equipment by the official will be expedient. Many officials have been known to express themselves as opposed to the making of any adjustments or repairs whatsoever, on the ground that they were not supposed to do more than inspect and test, and then seal, reject, or condemn as the results of the test and inspection indicate. Technically, there can be little doubt that such officials are within their legal rights; but as the weights and measures experts of their communities, as the officials to whom both the users of commercial apparatus and the general public look as authorities along these lines, it is submitted that their services to their communities should frequently go beyond mere inspection and testing; and that these should always embrace discussion with operators of needed remedial measures, may include frequent minor adjusting, and, in exceptional cases, may extend to actual minor repairs.

Of course, it must be realized that no hard and fast rule can be laid down here, any more than in the case of many other weights and measures problems; the amount and character of the "extra-official" work performed depend to a large extent upon individual circumstances. Again, one official may properly undertake more of this sort of work than another by reason of being more experienced and hence better qualified. Perhaps there is no better place than this for emphasizing that under no circumstances should the official undertake adjustments or repairs that he does not understand and that he does not believe himself competent to carry out, nor should he experiment with equipment belonging to a commercial user. To do so may result in getting a device into worse condition than it was in originally, it may involve the official in a most unpleasant contro-

versy relative to possible damages, and the official will probably suffer in his reputation more than if he did not undertake in the first instance to put the device into proper condition.

Circumstances Justifying Adjustments. As to the character of adjustments that should be undertaken and the local conditions affecting the official's decision on this matter, it may be said that, except for minor adjustments that are but the work of a moment and that the official may be expected to attend to in practically all cases, the availability of commercial service agencies is probably the governing factor. In the large city, where various manufacturers maintain service or repair staffs, or where there are one or more concerns having mechanics skilled along lines of weights and measures adjustment and repair, the owner of a piece of rejected apparatus may easily and quickly have such apparatus put into suitable condition for use, and thus there is no necessity for the weights and measures official to concern himself with more than the minor adjustments mentioned heretofore. Contrast with this, however, the condition that prevails in the small village or at the crossroads store. To procure a service man may require days instead of hours, the cost will be high, and the economic waste of time and effort will be large. If the official is competent to make the necessary adjustment or supervise the making of the required repairs, and if this does not involve an unreasonable expenditure of his time, it seems that he will not be justified in refusing to make this contribution to the best interests of the entire community.

Moreover, rejection under the circumstances outlined will entail another visit on the part of the official, which may well represent a greater expense to the jurisdiction than would be represented by the time required for the official to do the work himself, so that the latter procedure will in all probability actually be the cheaper. Another consideration is that by performing some simple operations the official may be able to keep the equipment in question in service without interruption, a very important consideration to the owner if he happens to be dependent upon only a single item of equipment and would be "out of business" while this was tied up for repairs.

Between the two extremes of large cities and villages or country districts, discussed above, there is, of course, a complete series of gradations. It is here that individual local circumstances will determine the extent to which the weights and measures official will adjust and repair faulty commer-

cial equipment; and in this relation he will give consideration to the character of the trouble, the availability of competent service or repair men, the effect of rejection upon the business operations of the owner of the equipment in question, the probable cost to the government of reexamination, and similar factors.

Permission to Undertake Adjustments. Before work of this kind is undertaken, however, it should be the invariable rule to obtain express permission to do this from the owner or some responsible representative of the owner of the equipment upon which anything more than very minor adjustments is contemplated. Also, as a matter of protection to himself, the official should clearly establish his position as that of being willing to undertake the work in question without implying any guarantee of accomplishing the desired results; in this way the official may avoid adverse criticism and possible claims for damage to equipment.

Adjustment a Final Resort. The official is cautioned about turning too quickly to the adjustable elements of a commercial device to correct for inaccuracies. Many times the cause of inaccurate performance of such an instrument as, for example, a liquid meter or a weighing scale, lies not in a faulty positioning of the adjustable elements, but in some fault of installation or some defective part. Any faulty installation conditions should be corrected, and any defective parts should be renewed or suitably repaired, before adjustments are undertaken. In other words, adjustment should be made only when it is certain that by this means the real cause of the inaccuracy will be corrected.

Officials in Repair Business. There is one other phase of this situation that should be emphasized at this point. In some cases weights and measures officials have been known to carry on a weights and measures repair business in connection with their official duties. In their official capacity these men have rejected faulty equipment; then in their private capacity they have made the necessary repairs, charging for their services as any other mechanic would do; finally, reverting to their official status, they have duly approved and sealed the equipment in question. Such activity cannot be too strongly condemned. It is wrong in principle, because the weights and measures officer should in no way be financially interested, aside from a proper official compensation for his official acts, in any phase of the weights and measures industry. Such activities present a tremendous temptation to the upright officer and fairly invite the weak or thoughtless one to realize an improper, or at the

very least an unethical, personal profit. Moreover, such an arrangement is sure to arouse the suspicions of the owners of weighing and measuring devices regarding the entire integrity of the official, and cooperation cannot thrive in such an atmosphere. If it be a penalty for the weights and measures officer to be barred from engaging for profit in the repair of those devices that he officially tests, even though this be done upon his private time, then this is a hardship that he must assume when he takes his oath of office. Anything that he does in the way of adjustment or repair of commercial devices should be done as part of his official activity and as a gratuitous service rendered to his community.

A possible exception to the foregoing generality is found in those rare instances where the weights and measures law authorizes or directs the assessment against an equipment owner of charges for repairs or corrections made by a weights and measures official; but it is believed that it will be far better that such laws be changed to delete such authorization or directive.

Chapter 22.—Weighing and Measuring Devices Used in Industry

In some weights and measures jurisdictions there has developed the unfortunate practice of confining weights and measures supervision largely to retail establishments; or, stated in another way, it may be said that this practice consists of ignoring almost entirely industrial, manufacturing, and many wholesale establishments. Where a weights and measures department is seriously undermanned there is justification for adopting this practice as a temporary expedient during the first few months or even the first year of the department's activity, on the ground of giving attention first to those matters that most directly affect that group in the community least able to protect its own interests—the retail purchasing public. But it is believed that the continuance of this practice over long periods, or its adoption as a settled policy, cannot be justified in a single instance.

Importance of Industrial Equipment. In the first place, the duties of the weights and measures officer, as set forth in the law, extend to all weighing and measuring devices used commercially in his jurisdiction. Moreover, as a public officer, he should serve his community as a whole and should not confine his efforts to the interests of any single group. Finally, it should be obvious that any activity in the community affects the community as a whole and thus affects each individual in that community, and that, in consequence, the best service that the weights and measures official can render to the individual will be well-balanced, impartial service to every element in the community.

Nor is it alone on these general grounds that a comprehensive weights and measures supervision is justified. There are innumerable instances in which the interests of the individual are affected with surprising directness by the weighing and measuring operations in industrial, manufacturing, and wholesale establishments. Specific examples of this will be unnecessary; it will be sufficient to mention the large field in which weighing or measuring operations determine the compensation for personal services rendered, the increasing importance of these operations in connection with the sale of service of a variety of kinds, and the fact that inaccura-

cies, unfairness, or excessive costs at any point in the line of progression from the producer to the ultimate consumer will be reflected in an increased price that the ultimate consumer will be required to pay for the things he buys.

Again, the tremendous volume of business transacted by industrial and manufacturing plants results in immense sums of money changing hands on the basis of weighing or measuring operations of various kinds. The aggregate error in the course of a year's business as a result of even a small inaccuracy in the weighing or measuring equipment utilized may be tremendous. Such discrepancies may represent the margin of profit that determines the business life of a firm or of an individual; moreover it should be remembered that these errors may be in either direction, and whether plus or minus are sure eventually to have an adverse effect.

As embraced in that class of equipment referred to as meriting the regular attention of the weights and measures officer, the following typical groups may be mentioned: Equipment used in actual buying or selling, equipment used in checking the quantity of purchases, equipment used in tare determinations, and equipment used in computing or checking any charge or payment for services rendered.

Noncommercial Equipment. Aside from the equipment just referred to, which is "commercial" in the weights and measures sense, there is another class of equipment that is frequently met by the official in manufacturing and industrial plants. This is equipment originally designed by the manufacturer, in most instances, for commercial use, but that is not being used commercially; that is, it is being used for such purposes as compounding, gathering data for production or cost records, keeping track of stock used in manufacturing processes, and the like, operations that are not "commercial" in that the quantity determinations made do not directly enter into a buying or selling transaction.

The weights and measures official is very apt to feel that he should not test noncommercial equipment used in industry and trade for several reasons: First, he is not required under the law to do this; second, if the owner does not want the test made, the official is not in a position to demand that this be done; and third, if such equipment is tested and proves to be unsatisfactory the official has no authority to reject or condemn it. As a result, much of this equipment is never inspected or tested, and in consequence it is frequently in poor condition. The danger in these cases lies in the possibility of such equipment coming into commercial use. To guard against this, the official should treat as commercial any

weighing or measuring devices that are ever used commercially; and whenever it seems probable that other apparatus is likely to be used commercially, either by accident or intention, every effort should be made to hold such apparatus to the same standards as are enforced in the case of regular commercial equipment. Then, in the case of all strictly noncommercial apparatus that is not tested, it is advisable that the official conspicuously mark each piece of equipment to show that it has not been tested and that it must not be used for commercial purposes until it has been tested and approved for such use. This marking can best be accomplished by means of a distinctive tag containing the necessary statement and warning, attached by a lead-and-wire seal, as, for example, "Not Tested—Do Not Use for Commercial Purposes." The official should also keep a record of the noncommercial equipment in use at each establishment in his territory, and should check up on this at each regular inspection trip to make sure that it is still properly marked, and that it is still properly to be classified as noncommercial.

However, there will be many times when the official will be asked by the owners to test noncommercial equipment, and of course, if he can do so without interference with his regular duties, it is advisable for him to accede to such requests. Whether or not such tests will be undertaken will depend upon such considerations as the importance of the equipment in question, the time that may reasonably be spared for such work, and the availability of other testing services. If a noncommercial device is found upon examination to meet all of the applicable "commercial" requirements, the device may properly be sealed; any devices so sealed would, of course, be exceptions to the general recommendation of the preceding paragraph for the marking of noncommercial devices with a warning against commercial use.

Quite aside from the satisfaction of rendering his best service to his entire community, there is a further reward for the weights and measures officer who carries on his work in the broad manner recommended herein. Industrial and business interests will appreciate the value of the service rendered to them by the efficient weights and measures officer, and this appreciation will find its expression in a hearty support of the department. In its turn, this support will assist in bringing about that official recognition of the great economic importance of weights and measures supervision that may confidently be expected to result in expansion and increased opportunities for service.

"Household" Equipment. This appears to be a suitable place to comment upon two special classes of devices that are not used by industry in the ordinary sense but with which the weights and measures official has to deal from time to time. The first of these is equipment that is designed by the manufacturer for household use. This may be just as carefully designed and well made as equipment intended for commercial use; in fact, if the housewife is to receive the full measure of protection from the weighing and measuring devices in her kitchen, these should be accurate and should be sealed by the weights and measures official. Unfortunately, however, many examples of "household" equipment fall so far short of commercial requirements that their use even in the kitchen is of doubtful value, and that their use in trade cannot be permitted. In order to protect their market for inexpensive equipment designed for household use, manufacturers frequently mark such devices with such statements as, "For household use only," "Not legal for use in trade," etc. Apparatus so marked should never be permitted by the weights and measures official to be used commercially, nor should it be permitted to be kept in locations where it may be so used.

Postal Scales. Scales used by business and industrial concerns for the determination of postal charges offer a special problem to the weights and measures official. These scales are in one sense used in a commercial operation—the determination of charges for the service of transporting and delivering mail matter, for the purpose of the prepayment of such charges by the mailer. But the case becomes special by reason of the fact that the Federal Government has final authority for the determination of postal charges, using for this purpose Federally-owned scales for which the Post Office Department may prescribe special performance requirements. When an industrial owner of a postal scale requests the weights and measures officer to test such scale, it is suggested that if the test is undertaken the examination be based upon the appropriate commercial requirements for a scale of the general design of the one under test.

At times an official may be asked by a local postmaster to test one or more scales in use in the post office. Under the terms of the Postal Manual, a postmaster who suspects that a particular scale or scales under his control are defective may authorize a State or local weights and measures official to examine these, applying his regular commercial performance requirements. It is suggested that, for purposes of record, the official may properly ask that the post-

master's request for his services be in writing. If the performance of a scale so tested fails to meet commercial requirements, the postmaster should be informed of this fact; it is then the postmaster's responsibility to have the defective scale replaced.

The postmaster's request that the official test certain scales does not confer on the official any authority over the scales in question, which are the property of and are used by the Federal Government. The testing service is rendered by the official merely as a courtesy to the Federal authorities.

Part III.—SUPERVISORY ACTIVITIES

Chapter 23.—Education of the Users of Weighing and Measuring Devices

The discussions on the education of the users of weighing and measuring devices, the education of the public, and publicity are placed at the beginning of the treatment of supervisory activities in general, because of the large and important part that education plays in weights and measures supervision. This will be the better appreciated when it is remembered that the most efficient department is the one that prevents the development of unsatisfactory conditions, that reduces to a minimum the violations of the law, and that brings about the highest degree of weights and measures cooperation among all of the elements of the community. Since education is such a valuable means to these ends, it follows that the thoughtful official will devote a reasonable part of his time to this sort of activity.

The character of information that it is desired to convey to the commercial users of weighing and measuring devices will differ in some respects from that most suitable for the general public, as will also the methods best adapted to the dissemination of this information. The education of these two groups will, therefore, be treated in separate chapters, following which some comments will be offered on the general subject of publicity, which is so closely related to education.

Whether considered from an altruistic or from a selfish viewpoint, the weights and measures official is constrained to do his best to teach the owners and operators of weighing and measuring devices in his jurisdiction the obligations that devolve upon them under the law, for in the one case it is seen that thereby the objects of the department may the sooner be realized, while in the other case it is clear that this program will result in economy of money, a saving of time and trouble for the official, and a resulting opportunity for greater diversity of activity.

Scope and Nature of the Teaching. If the instruction given is to be of most use to the recipients, the information should be specific at all times and will usually be technical, although it should be presented in such a way that its mean-

ing will be plainly understood by what will in most cases be nontechnical persons. In the first place, the requirements of the law should be made plain to every user of weighing or measuring equipment insofar as these affect him and his business, and he should be thoroughly informed regarding his obligations and responsibilities and also regarding his rights under the law. It is very desirable for the official to supply those in charge of commercial establishments with copies of the law for study and reference, but he should not be satisfied with the mere distribution of these printed documents. Legal language means but little to many people, and it is always well for the official to explain in homely terms what the law means in general, and especially its application to the particular business of the owner or operator with whom he is dealing at the moment. Proprietors, managers, superintendents, etc., should also be informed of their responsibilities in giving all necessary instruction to those working under them and in seeing to it that their subordinates observe the requirements of the law; they should likewise be taught that these are continuing reponsibilities, requiring the instruction of each new employee and regular supervision over all.

From his knowledge of the uses and abuses of weighing and measuring instruments the official is in a position to give much valuable instruction to owners and operators of these instruments on the selection, use, and maintenance of such equipment, involving specific recommendations for many things that should be done or that should not be done in this connection. The lack of knowledge along these lines on the part of those who daily use weighing and measuring instruments is oftentimes astonishing, and emphasizes how necessary it is for the official to be well posted in this field and to disseminate the information that he possesses. One source of information on use and maintenance is the instructions issued by the manufacturers of commercial devices, and these instructions can be emphasized and supplemented by the official as the occasion demands.

Maintenance of Equipment. One very important point to bring home to those in charge of weighing and measuring equipment is the necessity for periodic attention on their part in order that this equipment may be maintained in proper condition. Too many people have the idea that a scale, for example, needs no attention, and that once installed it may thereafter be totally neglected; they forget that a scale is nothing but one kind of a machine, and that, like other machinery, it must receive proper care if it is to give

satisfactory service. Moreover, the official should urge that some particular person in every establishment be definitely assigned the duty of regularly caring for the weighing and measuring equipment.

Improvements in Methods and Equipment. As a part of his educational work the official should train himself to analyze the needs of a given situation so that he will be in a position to give constructive advice as to improvements in weighing and measuring methods or conditions and on types of weighing or measuring equipment best suited to a particular situation. However, in any advice relative to the selection of equipment the official should confine himself largely to type, and should scrupulously avoid any actual or apparent bias if it becomes necessary to mention manufacturers' names; it is perfectly proper for the official to discuss freely and to recommend various *kinds* of equipment, but in the selection of a particular *make* of equipment the prospective purchaser should neither ask for nor receive assistance from the official. The official should remember that *anything that meets the requirements of the law and regulations*, regardless of who makes it or sells it, satisfies all official demands.

Notwithstanding what has just been said, it is frequently a matter of considerable assistance to one in need of weighing or measuring equipment for the official to give him the names and addresses of manufacturers of or dealers in the desired articles; similarly the official is frequently asked for the names of reliable repairmen or service agencies. Consequently, each weights and measures office should maintain a fairly comprehensive list of such names and addresses, including those of local representatives where these exist. As a general principle, however, an inquirer should never be given one name only, unless it is quite impossible to do otherwise. In the large majority of cases three or more names may readily be supplied.

Cooperation. Finally, the official should bend every effort to the fostering of a cooperative spirit between the users of commercial weighing and measuring equipment and the weights and measures office. It is believed that no upright and intelligent dealer or manufacturer will fail to cooperate with an ably administered weights and measures department after he understands the purposes and possibilities of such a department, and upon the weights and measures official rests the task of bringing about that understanding.

Procedures. As to the means for carrying on the educational work discussed in the foregoing paragraphs, individual personal contacts, meetings of trade and business as-

sociations, printed circulars, and general publicity are the four principal resources of the official. Very effective results may be accomplished along general lines by addressing meetings of trade and business associations, particularly when weights and measures supervision is being inaugurated, and when some new law or regulation is about to become effective. Similarly, if it is desired to obtain the concerted support of any group in the elimination of some faulty practice, in bringing about some improvement in business methods, in focusing attention upon some condition that has been disclosed by the official's work, and for similar purposes, the association, if a suitable one exists, offers an excellent agency through which to work. If there is no suitable association in existence the official should endeavor to call a meeting of the group that he wishes to reach with his message and try to bring about joint action of the group favorable to his proposals. In this way, matters may be officially presented to a large proportion of the individuals of the community having a certain common interest, or at least to a representative group of such individuals. More speedy results can be accomplished, because all members of the group are simultaneously instructed, and, through group action, more effective results will be accomplished, because the timid, the indifferent, or the recalcitrant individual will be swayed by the group sentiment and will tend to conform to the group action.

There will, of course, be those who can only be reached as individuals, and there will be many details to be considered that are not of general application and that only concern particular establishments and should be discussed with those connected with such establisments. Moreover, every visit of the official to any establishment presents an opportunity for personal conference that may be of the greatest value. The individual conference, therefore, is of the utmost importance in the educational work of the weights and measures official, and the official should continuously avail himself of this means of improving conditions in his jurisdiction.

Appropriate printed literature will be found to be of assistance in connection with both the personal conference and the appearance before meetings of different kinds, and will form a complement to whatever oral instructions and explanations may be given. General publicity, which will be discussed in detail in a later chapter, will also be valuable in supplementing other educational activities.

Exhibits and Audio and Visual Aids. An important consideration in connection with all group meetings, large

or small, is the use to be made of exhibit material, demonstrations, charts, slides, and motion pictures. The use of such auxiliaries, carefully selected for their appropriateness for the group before which they will be employed, is strongly recommended. Such aids effectively supplement the official's oral presentation, not alone by reason of their intrinsic value, but also because they provide interesting interruptions to the oral discourse and serve to focus and sustain the attention of the audience. The following examples illustrate how these aids to the speaker may be utilized.

A few items selected from the office or field equipment of the official will give an audience a glimpse "behind the scenes" and help to broaden its understanding of weights and measures administration.

An exhibit of new or unusual types of commercial equipment will appeal to almost any audience when this is explained in understandable terms, as will also an exhibit of confiscated faulty equipment. The official is cautioned, however, against unfairly overemphasizing faulty practices and fraudulent equipment and failing to give appropriate emphasis to the constructive side of the picture; what is wrong and what should *not* be done should be balanced by what is right and what *should* be done.

Demonstrations. If the objective is to teach or promote certain techniques or procedures, the oral presentation should, if at all practicable, be accompanied by suitable demonstrations. For the type of meeting here under discussion the very effective procedure of "learning by doing" can seldom be utilized, but the opportunity to "learn by seeing it done" is a reasonable substitute, and this will prove much more effective than merely listening to an oral explanation. Demonstration equipment, "blackboard talks," slides, and motion pictures are recommended as aids to the speaker.

Charts and Slides. Charts by means of which conditions or results are presented in graphic form are very useful. Frequently a series of related charts illustrating successive steps in the development of the subject being dealt with or progressive changes in conditions or results can be used with advantage. Charts should be kept fairly simple, so that their meanings may be grasped quickly, and should carry concise identifying or explanatory legends. Whether a chart is displayed before an audience or projected on a screen, it is most important that the details of the drawing and the legends be large enough and clear enough to be seen and read by the entire audience. Large overall size, heavy

lines, and strong block lettering will make this possible Charts displayed at the front of a room or projected on a screen may be supplemented by reproductions, on paper of convenient size, for distribution to each member of the audience, these to be scrutinized by the audience either independently or in conjunction with the large chart (displayed or projected) while the speaker's explanation progresses.

Pictorial slides illustrating elements of the speaker's discourse add greatly to audience interest and understanding if the slides are distinct and the scenes are well selected. A slide projector is inexpensive and simple to operate, and the slides are not costly. As compared with black-and-white slides, color slides are more realistic and enhance audience interest, and so are much to be preferred. The official can easily acquire a slide library of 100 or more diversified views, from which to select 15 to 30 slides for projection at a particular meeting; it is suggested that not more than 30 slides be used at a single meeting, for, interesting as a slide presentation is to an audience, a presentation that is too prolonged is sure to become boring.

Motion Pictures. The motion picture in color and with sound probably represents the ultimate in audio-visual aids, and full advantage should be taken of this medium to complete or supplement a weights and measures address or period of instruction. Some professionally produced films on weights and measures subjects are available for purchase or loan. Strictly local films can be produced on a non-professional basis, perhaps by the official himself, at a cost that is not prohibitive, and the element of local interest will compensate for minor technical inadequacies.

The foregoing discussion on visual and audio-visual aids to a speaker before audiences of users of weighing and measuring devices applies with equal force to the efforts of the official that are directed to the education of the public and to general publicity, topics that are discussed in the two succeeding chapters of this Handbook.

Trade Publications. Finally, with particular reference to the users of weighing and measuring devices, it is suggested to the official that he take advantage of all opportunities to reach groups of such users through the pages of trade publications. These publications may be local and informal, such as bulletins or circulars issued periodically by a trade association, a chamber of commerce, or the like; or they may be formally prepared, printed magazines having circulations beyond the local area. The character of the material submitted for publication should be carefully

selected or prepared, keeping in mind the character and special interests of the probable readers of the publication in question. Having established contact, by correspondence or personal visit, with the editors of publications of this kind, the official with a constructive and interesting story to tell or submit will, it is believed, be cordially welcomed as a contributor.

Chapter 24.—Education of the Public

The primary purpose in educating the general public along weights and measures lines is to get the people to cooperate in supplementing the efforts of the weights and measures official. The public should first be taught what weights and measures supervision is. They should know its purpose, the methods by which it is accomplished, how it affects the individual and the economics of his home, and the rights, duties, and responsibilities of the public under the weights and measures law. An intelligent knowledge of these things, resulting in a thorough understanding of the principles of weights and measures supervision, will place the public in a position to assist in their own protection and will make it possible for the official to show much greater progress than could be hoped for if he attempts to proceed independently.

Scope of the Teaching. Specifically, the people should be taught correct buying methods, the cardinal principles of which are to buy by definite quantity whenever practicable, and to check the amounts received. They should, in general, be urged to buy by weight whenever possible; to observe the zero and load conditions of the instruments used in serving them; to distinguish between proper and improper methods of buying different commodities as established by the law; to observe the quantity statements on packaged merchandise and use this information in evaluating the real cost of the merchandise and comparing the values of competing brands; and, finally, to take the same exception to a shortage in the amount of commodity delivered to them as to a discrepancy in the amount of money returned to them as change. They should likewise be urged to look for the evidence of the approval of the weights and measures department on all weighing and measuring devices in commercial use; to look with suspicion upon any departure from well-recognized methods of quantity determination; to expect the same sort of quantity determination from the peddler or transient vendor as is demanded from the established merchant; and to recognize their own responsibility in the matter of correct buying methods. Finally, they should be encouraged to report to the weights and measures department full information regarding any violation of the weights and meas-

ures law that comes to their attention, not alone for their personal protection but also for the protection of the community at large.

Visual and Audio Aids. The attention of the reader is invited to the discussion of visual and audio-visual aids in the chapter preceding this one; what is said there in relation to exhibit material, demonstrations, charts, slides, and motion pictures as aids in the education of the users of commercial weighing and measuring devices is equally applicable to a program of educating the public. Because these aids are useful in themselves as teaching means, and because they serve excellently to stimulate and hold the interest of an audience, their employment by the official to supplement and reinforce the spoken word is strongly recommended.

Television Broadcasting. Television merits special mention as a means for educating the public. Whenever the weights and measures officer has an opportunity to appear on a television program or to contribute something of weights and measures significance to such a program, he should take full advantage of it; moreover, he should seek such opportunities, particularly from noncommercial educational television broadcasting stations. Good motion pictures are suitable for TV broadcasting. An interesting TV program can be built around an exhibit or demonstration, with lively oral explanatory and associated factual contributions. The interview technique has good possibilities, but it should not be overlooked that even this simple form of program demands careful preparation if viewer interest is to be maintained. In planning any TV presentation it should be kept in mind that the TV audience is apt to be a general one; accordingly the program should be arranged for its general interest and appeal and should not be consciously directed to some limited group with specialized problems or interests.

Exhibits. Exhibits are a valuable means for teaching. A display attracts attention at once, and if skillfully arranged it can be made to tell a helpful story even to those who ask no questions and do not pause for more than a moment. There is a time in the early history of every weights and measures department when it is desirable to stress in all of the expressions of the office, and particularly in exhibits, the wornout, incorrect, and even fraudulent apparatus that has been found in commercial use. But the far-sighted official will not continue to emphasize this phase of things too long lest he create an unwarranted public opinion regarding the condition of the weighing and measuring apparatus in general use, which may do more harm than good; once this sort

of display has served its purpose in arousing the public conscience, the emphasis had far better be placed upon *proper* equipment and *proper* methods, thereby teaching what should be done rather than what should not be done. In other words, the exhibits should early assume a constructive character.

Publications for Distribution. The publications designed for general distribution will not in all cases be of the same character as those designed for the information of users or makers of weighing and measuring equipment. The public is not prone to reading and studying laws and specifications. The information necessary for their proper instruction should be prepared in short, easily readable, nontechnical form, and should, in general, be confined to essentials, leaving the treatment of details of restricted interest to other means. There is sometimes an advantage, too, in not trying to cover too much ground in a single publication, although the other extreme, in which the publication becomes so small that it is of little value to anyone, should likewise be avoided. The official should try to make each of his publications so helpful that everyone who receives a copy will wish to preserve it.

Continuity of Effort. In conclusion it may be said that the weights and measures official should carefully plan his educational work and that he should keep consistently at it. The buyers in a given locality are continually changing and new buyers in need of instruction are continually entering the field. Moreover, at any one time the official is able to reach only a small percentage of the people in his community to whom his message is of value. And even if he must repeat the same story many times, until it becomes a task instead of a pleasure, the official should persevere in the knowledge that to one who has not heard it before it is just as interesting and helpful as it was the first time it was told.

Chapter 25.—Publicity

Strictly speaking, publicity may be accomplished by the general dissemination of information by whatever means accomplished. Thus, addresses before meetings, television programs, radio talks, official publications of the department. and exhibits of all kinds are means of getting publicity just as much as newspapers, trade magazines, and similar publications. However, it is in the latter sense only that the term "publicity" is used at this point.

Essential Characteristics. The right kind of publicity should consistently be sought for the activities and accomplishments of the weights and measures department, since it serves to stimulate cooperation by keeping the people as a whole interested in the operation of the department, and to stimulate public support for the maintenance and expansion of the weights and measures program. To achieve this result, however, publicity material should be dignified in both subject matter and presentation; it should be truthful, accurate, and rest upon facts that can readily be proved; and it must be fair, in statement and implication, to all parties concerned. Finally, it should be interesting—or there will be no publicity.

Sources. Any official activity of the department may properly form the basis for publicity. Considered from one viewpoint, the public is entitled to receive full information on what its officers are doing in all cases except where the premature disclosure of plans or data would endanger the successful outcome of some survey, investigation, or other project. When surveys and investigations are completed, however, the results can usually be summarized and described in a way to make an interesting story for the general public; not infrequently such results can be presented in more detailed form to one or more groups especially interested in the particular phases of work covered by the investigation.

Frequent reports upon the general progress of the department's activities—the work that has been done during the preceding month or quarter, comparisons with the accomplishments of corresponding earlier periods, descriptions of any phases of the work that are being given special attention, stories of unusual experiences and of unusual apparatus or methods encountered, new equipment procured, and similar

material—may all be utilized for publicity purposes. Likewise, when it becomes necessary to prosecute violators of the weights and measures law a report of such prosecutions should be made public, not with the thought of further embarrassing the defendants, but so that the knowledge of the punishment of offenders may serve to discourage others of like mind from disobeying the mandates of the law.

Preparation of Releases. In connection with material offered for publication it is well to keep in mind that at least the essential data should be prepared by the official in written form and transmitted in that form to whatever publicity agencies are being utilized, and that copies of all such material given out should be carefully preserved. This plan is conducive to accuracy in published matter and protects the official in cases where inaccurate statements are published. If the official has facility or has had experience in that direction it is frequently advisable for him to prepare more than the essential data just referred to and to outline or even prepare a complete article or story; although to insist that such prepared articles or stories be published without any modifications may greatly lessen the amount of publicity that might otherwise result. It is usually helpful in getting publicity if appropriate photographs, suitable for reproduction, are available for use in connection with material offered for publication; illustrations make the published material more interesting and valuable, and this fact is fully appreciated by all editors.

Distribution of Releases. In preparing material for publication or in giving an interview to a representative of the press or to a special writer for a magazine the official should have in mind the character of readers reached by the publication in question, and the material should be selected and prepared or presented with particular reference to the interests of such readers. Some matters are of purely local interest, and a story upon these may be expected to appeal to the local press. Such material might be quite unsuitable, however, for use by the press associations serving newspapers throughout the State or an even wider territory, and by magazines of general circulation or written for particular trades or industries, unless it dealt with some very unusual facts or circumstances that gave it a general "news" value.

Again, the results of an investigation may have little interest for the majority of the readers of the regular newspapers, either local or otherwise, but may conform very well to the character of material published by certain trade papers or magazines and may be welcomed by the editors

and readers of such publications. Then, too, a given set of facts may usually be presented from several viewpoints, and contributions having their origin in identical circumstances or data, but at the same time acceptable to publications of various characteristics, may frequently be prepared by building the several stories around appropriate key ideas, emphasizing or detailing the items of interest to the class of readers reached by the publications in question, and subordinating or eliminating details not of interest to such readers.

Reader Interest. Primarily, editors, reporters, and special writers demand truthful material that will *interest* the readers they serve, and it is useless for the official to oppose this policy in his efforts to get publicity. His understanding of this policy and his thoughtful cooperation in conforming to it when offering material for publication will be of material assistance to him, just as a disregard of it will operate actively to his disadvantage.

News Value. While interest and truth are indispensable qualifications, the "copy" which can also claim unusualness has an unquestioned passport to the realm of the printed word. This is particularly the case with respect to newspaper publicity. Anything that is new or rarely encountered, that is an exaggeration of a common form, or that can be described in superlatives—as the lightest, the heaviest, the smallest, the largest—is sure to be favorably received. All this is bound up in that intangible characteristic called "news value." A "news sense," or a sense of news value, is the distinguishing mark of the good reporter and the good editor, and it is the exercise of this sense that so frequently causes an article or story prepared by the layman to be rewritten and presented in print in an entirely different fashion than intended by the original writer. News sense can be cultivated, however, and the official should make an effort to do this, for, if developed, it will be of very great assistance to him in selecting and preparing material for publicity purposes.

Fairness of Distribution. It will be found that editors and reporters are always glad to get material of the right sort for their publications, and the weights and measures official will find his publicity efforts simplified if he will make personal contacts and cultivate friendly relations with these persons. In the newspaper field there is apt to be considerable rivalry among competing papers for exclusive use of important items. The official will find that impartiality in his release of publicity material is usually by far the best

policy. In other words, all of the papers should be given a fair opportunity to use with advantage any available material. If there are both morning and afternoon papers, material should be divided between them, so that at times the items may appear for the first time in the morning papers and at other times in the afternoon papers. This may be handled conveniently on written copy by showing at the top of the manuscript the "release," as it is called; for example, "Release afternoon papers, June 10," or "Morning release, June 11," etc.

Press Associations. Press associations are organizations for supplying news by wire to member newspapers in a large number of cities. These associations usually have arrangements with local papers to report to them items of general interest originating locally, but it is well for the weights and measures official to have direct contacts with the branches of the press associations in his city so that he may advise them directly upon any publicity material that he considers to have more than a local interest and news value. Similar contacts with the representatives of trade publications open the way for timely articles in those journals.

Weights and Measures Indoctrination. Finally, there may be mentioned one sort of resistance that will often be met by the official from the representatives of newspaper and journal toward much that the official considers important and worthy of publication. This is the resistance resulting from a failure to understand what weights and measures supervision is intended to do and what it is actually accomplishing—the same resistance that the official is likely to meet everywhere among those who are uninformed. Here, as elsewhere, an educational groundwork must frequently be laid before progress can be made, but once this resistance is overcome, once the vital importance of weights and measures activity is understood, the official will be afforded a sympathetic hearing so long as he does not abuse his opportunities. To get publicity it then but remains for him to learn to tell a terse, connected, and interesting story, avoiding unwarranted implications or conclusions, shunning sensationalism, and adhering strictly to the true facts.

Chapter 26.—Try-Out Inspections

A discussion of try-out inspections brings to mind the old adage about the "proof of the pudding." Regardless of the excellent condition in which the mechanical equipment may be, regardless of the effort that may have been expended by the official in educating the sellers of commodities to a knowledge of what should be done, the proof that conditions are as they should be—that equity does prevail in commercial commodity exchange—lies in the amounts contained in commercial deliveries, whether completed or merely offered, and their agreement or failure to agree with the amounts charged for or represented by the seller. These facts may be determined only by an examination of such deliveries, and these examinations are what is meant by the term "try-out inspections"; they correspond to the "eating" in the test of the proverbial pudding.

Purpose and Scope. Specifically, the purpose of the try-out inspection is to determine whether or not full weight and full measure are being given, whether or not due allowances are being made for wrappers and containers, whether or not marking requirements are being observed, and, in general, whether or not there is any misrepresentation of the quantities being sold or offered for sale. This service should extend to all commercial transactions whether the commodities are packed locally or otherwise, and should embrace both wholesale and retail business; and by reason of its very great importance it is preeminent among the duties of the weights and measures official. In actual practice more time will be spent in connection with retail than with wholesale transactions because of the relatively large number of retail establishments and the general practice among wholesale purchasers of protecting their own interests by regularly checking the amounts that they receive.

General Procedure. Whenever an establishment is visited for any official purpose some try-out work should be done unless unusual circumstances prevent this. But a large part of this work will be performed independently of other activities. There will be routine visits for the checking of packaged merchandise, put up by the manufacturer or distributor or by the local merchant. There will be special visits made at hours appropriate for the interception of

commodities about to be delivered at rush hours, when carelessness is most apt to occur and when those intending to defraud are most apt to resort to their fraudulent practices. Special visits will also be made at other times—at any time, in fact, when the official feels that an unexpected visit will have beneficial results. Certain try-out work will be performed away from the business establishment of the seller, as when checking on deliveries to individual purchasers or when making random checks on commodities in process of delivery. It should be apparent that these special try-out activities are most systematically and effectively carried out by making a business of them for the necessary time and not trying to carry them on in conjunction with mechanical testing or other duties.

Witnesses. While most of the try-out work will be performed by the weights and measures officials themselves, it is sometimes advisable or even necessary to employ the services of a reliable assistant, either as a witness to or as one of the principals in a transaction. When actual purchases are to be made in an effort to discover whether or not short weight or measure is being given intentionally, it does no good for the official to make these purchases himself if his identity is known—no one would intentionally deliver short weight or short measure to the inspector of weights and measures. Some other person, appearing as an ordinary buyer, must act in his stead if the sale is to represent the treatment accorded the general public.

Duplication of "Purchaser" Conditions. This brings up an important point in connection with all try-out purchases: The official should reproduce as closely as possible actual "purchaser" conditions, so that the results may be representative of the thousands of purchases that the weights and measures officer can not personally check, but that he attempts to study in this manner.

The official is following out this principle when he weighs and measures packages of commodity put up ready for delivery to particular customers or put up in advance of sale, when he examines loads of fuel or packages of commodity actually in process of delivery to customers, and when he follows the peddler of fruits or vegetables and reweighs the amounts delivered to the purchasers. He must find out what the purchaser really is receiving in order to know whether or not the weights and measures law is being observed, and the information that he gathers enables him to take the necessary steps to correct faulty practices. This is the reason for weights and measures supervisory work,

and not any petty desire to catch someone violating the law, although, of course, prosecutions will be found necessary in cases of serious violations of the requirements of the law.

Sales of Service. In the case of sales of service and of some commodities, about the only way to check up is to go through with a regular purchasing operation.

"Field" Supervision. "Field" supervision, as distinguished from supervisory work in the establishments of dealers, is necessary in the case of farmers' and growers' markets, peddlers and hawkers of all kinds, deliveries of coal, coke, and wood, and in similar situations; actual purchases by the official, or prearranged cooperation between the official and actual purchasers, will frequently be required.

Action Following Inspections. Whenever shortages or other discrepancies are found the official should take prompt and vigorous steps to have them corrected in the specific instances discovered as well as to prevent their recurrence. It should be required that short-weight packages put up prior to sale be refilled to the correct amounts; shortages on deliveries about to be made or actually made should be supplied or suitable adjustment made in the amounts charged therefor; improper marking or billing should be corrected immediately; packaged merchandise that is short in weight, measure, or count and that has been packaged elsewhere than at the establishment where it is found offered for sale should be officially ordered "off sale" until the fault is corrected.

When it is discovered, the specific instance of shortage or improper practice may be made the occasion for forceful instruction and warning to those directly and indirectly responsible. The official should never be content to adjust merely the individual cases of short weight or measure or other improper practices that he uncovers in the course of his supervisory work, but he should consider these as the symptoms, which he has been so fortunate as to discover, of some general condition, and he should probe underlying causes and endeavor to apply remedies that will eradicate the trouble at its general source, so that his treatment may become effective throughout the entire jurisdiction under his control.

Drives. It will frequently be found that a short-term "drive" along some particular line will be more effective than will the same effort expended over a relatively long period. The drive focuses attention upon and makes something of

an issue of the specific matter being studied, and, in addition to the concrete and immediate effects of the drive, its results lend themselves well to specialized and intensive instruction, and to general publicity when this is desired. There is one danger, however, in the drive method that should be most carefully guarded against, and that is the danger of dropping supervisory activity along the line covered by the drive as soon as this is finished and allowing matters to take their own course from then on until the next drive. If this be done much of the good effect of the investigation will be lost, and the ultimate results may even be harmful, for if the idea should become current that between drives no attention is paid by the weights and measures official to certain matters, the tendency of the careless or fraudulently minded will be to consider the conclusion of the drive as the signal that they will not be disturbed for some time to come and that they may consequently do as they please until a new drive is imminent. It behooves the official, therefore, to follow up his drives in a consistent manner so that they may result in permanent rather than merely temporary improvement of conditions.

Supplementary Inspections. When making check weighings or check measurements some time should also be given to an inspection of the condition of the weighing and measuring instrument being used, especially the condition of zero-load balance of all weighing machines, and of general methods of selling as indicated by signs and merchandise displayed, special sales advertised, and the like.

NBS Handbook 67. A manual for weights and measures officials entitled Checking Prepackaged Commodities has been published as National Bureau of Standards Handbook 67. This presents an operational guide for the control, under law, of prepackaged commodities. It includes information on equipment, techniques, action, reporting, and, as an appendix, a comprehensive table that will facilitate the checking of total selling price extensions when these are based on stipulated unit prices. Although prepared primarily for use by weights and measures officials, the Handbook should also be found useful by persons employed by commercial and industrial establishments involved in the packing, distributing, and retailing of packaged commodities.

Inspection of Buying Operations. Up to this point this discussion of try-out inspections has been directed to operations involving *selling to* the public by businessmen or agencies. There is another segment of the business economy in which the basic commercial operation is *buying from* the

public; typical commodities here involved are junk, grain, tobacco, and livestock. The only essential difference between these two categories is that the role of the businessman or company is that of the seller in one and that of the buyer in the other. The fact of importance is that in both categories the responsibility for correct quantity determination normally rests upon the businessman or agency because it is the businessman or agency that provides the weighing or measuring devices needed and makes the quantity determinations upon the basis of which the money changes hands.

Transactions in the "buying" category should receive the attention of the weights and measures official just as do those in the "selling" category. The same general principles of try-out inspection are applicable in both areas, but there is a difference in one detail of procedure. In the buying transaction, it will usually be necessary for the official to do his check weighing or measuring either before or immediately following the determination made by the buyer. To determine the quantity before the buyer makes his determination, the official will need to obtain the cooperation of the seller; after the official's determination has been made, the transaction should proceed in normal manner until the buyer has completed his determination, after which the official can compare the two results and be guided accordingly as to any further action. If the official defers any action of his own until after the buyer has made his determination, the official must ordinarily do his checking very promptly in order that the identity of the particular lot of commodity in question be not lost.

Observation of Operations. Experience has demonstrated that the alert official can frequently gather much valuable information about the weighing or measuring methods of commercial buyers of commodities by unobtrusively observing the progress of normal buying operations. Depending upon what these observations disclose, instructions or warnings to correct faulty practices may be given at once, or a basis may be established for further investigation and possible "check" observations.

Consideration and Courtesy. In carrying on supervisory work, the same as in carrying on mechanical testing, the official should have a due regard for the business of the establishment or dealer concerned and should try to arrange to perform his necessary duties with a minimum of interference with such business; but there will be times when such interference is inevitable, and, if the occasion demands, the official should be prepared to take a firm stand regardless

of circumstances and to insist upon the prompt observance of legal requirements. Courtesy should always be displayed, but this should not be allowed to degenerate into an attitude of subserviency, for then the official will find himself doing his work by sufferance of those whom he is appointed to supervise, a condition that will be destructive of authority and efficiency.

Chapter 27.—Investigation of Complaints

The weights and measures official who has a sincere desire to do all in his power toward improving conditions in his jurisdiction will encourage dealers and purchasing public alike to report to him any complaints that they may have along weights and measures lines, and will carefully investigate every complaint officially reaching his department. In fact, the effectiveness of his public relations program may largely be gaged by the official on the basis of the number of justified complaints received by his office. If a proper educational groundwork has been laid, the number of unjustified complaints will be reduced, for then people will more clearly understand their own rights and duties and what constitutes a valid basis for complaint; moreover, they will be more apt to observe and report fully all of the facts that have a bearing upon the matter at hand, so that the official can proceed more quickly and effectively in his investigation. However, notwithstanding the best efforts of the department along educational lines, there will be many unwarranted complaints, based upon misunderstanding of facts, ignorance of rights, or even personal animus; but the official should not permit a knowledge of this fact to engender laxness in his attention to complaints or in his investigations, because real trouble may be found in the most unexpected places, and it will never be known when the most questionable-appearing complaint may lead to the uncovering of the most serious conditions.

Special Investigator. In the large local department it will probably be found advisable to assign to one official the investigation of all complaints, for the double purpose of relieving other inspectors of frequent interruptions to their regular duties, and of allowing this special inspector to become, through experience, particularly efficient in complaint investigation. To a certain extent this plan may also be utilized to advantage in the State department.

Those engaged in this sort of work need to develop two characteristics: First, an ability to get all of the facts, and second, a judicial attitude of mind. Getting the facts is not alone a matter of observation and asking questions, although keen observation and intelligent questioning have a great deal to do with it; for it is frequently necessary to

trace cause from effect, or vice versa, where the connection is not obvious, to follow involved and faintly marked trails of evidence, to study and analyze manufacturing, industrial, or marketing processes. Then in combination with this there is needed an impartial, openminded attitude and freedom from a tendency to form hasty conclusions.

Testimony. In many instances it may be found best not to disclose to the parties complained of, at least at first, the fact that there is a complaint. However, each party to any controversy should be permitted eventually to tell his side of the story; and sometimes the best way of getting at the truth is to get all parties together at one time for a joint hearing of the matter in dispute.

Action Following Investigation. When a complaint has been found to have been justified it is always a question of judgment as to what action should be taken at the conclusion of the investigation. Obviously something should be done, for it would be worse than useless to gather the information and then make no use of it. If the complainant has suffered damages it is frequently possible for the official to bring about a satisfactory settlement in this relation. The question then arises whether or not prosecution is called for, and this is usually resolved by such considerations as the previous record of the offender, the gravity of the offense, its possible accidental or inadvertent character, the existence of extenuating circumstances, and previous warnings or instructions, either general or individual, that have been given. While the law may say that prosecutions shall be instituted in any case of violation of its provisions, this does not mean that the official must invariably take this action, and it might well happen that more harm than good would result from prosecution in many instances; this is one of those matters that must be settled upon the facts in each individual instance.

But where a complaint has been found to have been justified there is one action that should always be taken: The official should endeavor to prevent a recurrence of the trouble, whatever it may be. If the investigation has indicated the existence of merely a localized condition, then local treatment will be sufficient. If, however, the investigation has disclosed or indicated that the faulty condition is a general one, as for example, one running through an entire industry, then further facts should be collected, if necessary, and immediate steps should be taken to bring the practices of the industry or other group into harmony with the spirit and letter of the weights and measures law. It frequently happens that general ills can be cured only by enlisting the

cooperation of officials of other jurisdictions, either for the collection of information or the application of corrective measures.

Reports of Investigations. In general, it is not only courteous but also good policy to make a formal report to any complainant at the conclusion of the investigation that he has inspired, whether the complaint was well founded or otherwise. It may also be said that, in general, the results of investigations of individual complaints are not suitable for publicity purposes; in any event, care should be exercised not to give out prematurely any information that might jeopardize the success of an investigation by advising affected interests beforehand of the intentions of the official.

Chapter 28.—Independent Investigations

Independent investigations will be resorted to by the efficient and progressive weights and measures official, who will not be content to remain passively at the accustomed routine until prodded into taking an interest in new developments by the complaints of his constituents, but who, on the contrary, will strive to discount future troubles by preparing for the solution of problems that can be seen to be developing and by solving existing ones without waiting for a public clamor to that end. New commodities come upon the market; new equipment comes into use; new conditions develop that affect the conduct of business; practices peculiar to a trade, an industry, a locality develop; a practice exists, so long countenanced by local custom that its unfairness or illegality is completely lost sight of by the community; any one or all of these conditions may challenge the attention of the official.

If he is to proceed intelligently the official must have available the facts, and in most instances he must gather them himself; hence the investigation carried on at the initiative of the official or, as we have termed it, the independent investigation. Authoritative facts may also be required for the information of others than the official himself. For example, proposals for increased equipment, personnel, or funds, or for new laws or regulations are best supported by facts freshly gathered, and here is found the opportunity for a type of independent investigation differing somewhat from those first mentioned, and frequently consisting largely of an analysis of existing data and a logical presentation of the results.

Planning the Investigation. If the investigation of conditions is to serve its purpose the results must be authoritative, and this means not only that they must be carefully and accurately gathered but that they must be comprehensive. Depending upon circumstances and the character of the investigation, the following elements should be carefully considered in planning the investigation.

1. *Accuracy.*—The accuracy of any data reported should be above question. This is of primary importance.

2. *Territory.*—If territorial distribution has any bearing upon the results, the investigation should embrace all sections of the territory involved, or a portion of that territory that is

truly representative of the whole, otherwise sound general conclusions cannot be drawn.

3. *Equipment.*—If different types of equipment have any bearing upon the results, the investigation should embrace all types of equipment involved, or types that can be demonstrated to be representative, otherwise sound general conclusions cannot be drawn.

4. *Establishments.*—If the character of establishments included in the investigation has any bearing upon the results, representative numbers of establishments of different sizes, of different kinds of business, or differing according to whatever criterional factors may be of importance, should be included.

5. *Amount.*—A sufficient amount of data of each class should be gathered so that the results may not be open to question on the ground of not being representative.

6. *Records.*—Written records should be made of all data collected.

7. *Authorities.*—The sources of any outside data utilized should be such as are generally recognized as responsible and authoritative.

8. *Secondary investigations.*—Related conditions or facts having a bearing upon the main investigation should be studied, so that a complete presentation may be made.

Analysis and Presentation of Results. Once the data have been collected they should be carefully studied, analyzed, and compared, so that the drawing of unwarranted conclusions may be avoided and so that the soundness of the conclusions that may be drawn will be unquestioned. For purposes of study and presentation, results may be tabulated or plotted or both. The object of this is to present a picture that can at once be grasped in its entirety, all elements being shown in their relations to all other elements, or to emphasize the relations existing among certain selected elements of importance. The plotting of results—their graphic representation on charts of various kinds—is admirably suited to this purpose, and whenever possible, charts should be prepared to supplement tables and descriptions. "Curves" prepared on cross-section paper and derived by plotting individual or average results under each of several conditions and then joining the plotted points by a line are unexcelled for demonstrating graphically the relation between results of particular kinds and different or changing conditions—for example, the increase or decrease of mechanical tests, supervisory activities, prosecutions, or costs of operation, from month to month or year to year; the effect of the type of equipment or installations, or the character of supervision exercised, upon the character or number of inaccuracies commonly found, or the number of complaints; the relation between load and error on equipment tested; the distribution

of errors in the weights of particular commodities on the basis of size and frequency (as on loaves of bread); the rate of shrinkage of packages of commodity (as of flour); and so on. Almost any sort of data may be plotted with advantage.[1]

Just as charts are prepared so that the results illustrated may be quickly grasped and more fully understood, both by the investigator and by those to whom he may wish to present his results, so the entire report should be prepared with these same thoughts in mind. When results are given in tabular form it should be remembered that comparisons can best be grasped as percentages; when used for purposes of comparison numerical values may be necessary for the sake of completeness, but, standing alone, they are usually confusing and, whenever possible, they should also be expressed as percentages so that the desired relations may be at once apparent. And then the results should be summarized—"boiled down," as it were; findings should be recapitulated briefly, numerical results should be combined and expressed in the minimum number of totals and percentages, and conclusions and recommendations should be stated in concise form and logical order. Under some circumstances it will be found advisable to prepare, as prefatory to the full report, an abstract setting forth in very brief form the salient facts of the investigation and the conclusions arrived at, so that the reader may learn "high lights" before undertaking the study of the full report. So may the investigation be made of maximum utility, and so may a record of its results be preserved to meet any future demands that may arise.

[1] See also the Report of the Twenty-third National Conference on Weights and Measures, National Bureau of Standards Miscellaneous Publication M116, for a paper on Graphical Presentation of Data.

Chapter 29.—Prosecutions

Notwithstanding the customary language of the weights and measures statute to the effect that the official shall institute a prosecution upon the discovery of a violation of the law, this should not be construed to mean that a prosecution must invariably be instituted every time any violation of the provisions of the statute is discovered. To do so would result in unfairness to many, the court calendars would be crowded with large numbers of cases of a kind never intended by the legislature to be brought into court, very many of these cases would necessarily be lost by the State to the consequent discredit of the department or official responsible for starting them, and the effectiveness of weights and measures supervision would be greatly decreased instead of increased. It is an unwritten but well recognized principle in connection with all law enforcement that certain discretionary power resides in the executive officer as to when prosecution shall be resorted to, and this principle is just as applicable to weights and measures supervision as to any other branch of governmental control.

Administrative Discretion. While it is fortunate that there is this descretionary power, nevertheless it entails a grave responsibility, for the official must make the decision on the question of when conditions justify the commencement of court action. If he proceeds too often he is open to censure for being harsh, arbitrary, and perhaps unfair; if he is too lenient he loses his control of the situation, his authority is no longer respected, and his administration suffers. He must, therefore, seek out the middle ground between the two extremes. Experience will be, perhaps, the best guide, but an effort will be made herein to point out some of the considerations that affect the problem, as well as to make some suggestions relative to various aspects of the prosecution about to be begun and its conduct after it is inaugurated.[1]

Criminal and Civil Statutes. Weights and measures laws are almost always what are known as "criminal" statutes; that is, a violation of their provisions is constituted a

[1] See also the Report of the Nineteenth National Conference on Weights and Measures, National Bureau of Standards Miscellaneous Publication M74, for paper on Weights and Measures Prosecutions.

criminal offense—usually a misdemeanor. Any prosecution instituted under them is a criminal prosecution, and fine, imprisonment, or both, may be specified as punishment for violations. In some few instances particular weights and measures acts or ordinances may be "civil" instead of "criminal"; but since these are exceptions no effort will be made here to differentiate them from the customary criminal enactment. The weights and measures official may inquire from his local prosecuting attorney, to whom he is always entitled to go for official legal advice, about the character of any laws or ordinances about which he may be in doubt. It may also be mentioned in passing that the same source should be consulted for information upon the proper legal procedure to be followed in a given jurisdiction with relation to weights and measures prosecutions, since the information given herein is necessarily of a general nature and may not be applicable in its entirety to all States and cities.

It is well for the weights and measures official to understand certain general distinctions between criminal and civil laws as a matter of general information; this is particularly desirable if by any chance he has both classes of laws to enforce and if, in consequence, he may at times choose between the criminal and the civil action when starting proceedings. It may be mentioned first that the stigma of conviction is generally considered to be very much more serious in the case of a criminal charge than in the case of a civil charge; in fact, a criminal conviction is usually felt to be a grave reflection upon a man's reputation, whereas the civil conviction may be but lightly considered in this relation. Criminal prosecution, therefore, involves a heavy moral penalty in addition to the punishment specified in the statute and should not be hastily or inconsiderately invoked by the official.

A very important difference between criminal and civil statutes and prosecutions lies in the way the language is construed and in the character of proof required for conviction. It is the invariable rule for the language of the criminal statute to be construed very strictly; that is, the court will adhere closely to the "letter" of the law, permitting nothing to be read into the language that may tend to increase the scope or broaden the application of the act. Moreover, in all cases of doubt as to the exact meaning of the criminal statute the accused is given the benefit of the doubt and the statute is construed against the State. As to the character of proof required for conviction, a decision will be rendered

in favor of the State in a civil action upon a preponderance of evidence, even though proof of guilt may not be conclusive; to win the decision in a criminal action, however, the State must prove its case beyond a reasonable doubt. It will thus be seen that a much stronger case is required to bring about conviction in a criminal than in a civil action and that the former may be lost upon evidence that would be entirely adequate in the latter.

Preliminary Considerations. In deciding whether or not to institute a prosecution there are several general considerations that are of value. The reason underlying the commission of an offense, when this can be determined, should have some consideration. There can be no question that the willful violator and the offender who deliberately lays and executes plans to defraud should be prosecuted and punished. On the other hand, sympathy can very properly be entertained toward those who are inspired by no vicious motive and whose offenses result from the mere lack of attention or absence of proper instruction; and upon the occasion of a first offense, leniency is to be recommended in such cases. It is almost certain that much more good can be accomplished in these instances, with more effective and lasting results, by causing appropriate restitution to be made to any injured parties, and by issuing suitable instructions and warning, than would result from prosecution. However, this consideration cannot safely be shown to the habitual offender, the one who is consistently careless, the one who repeatedly commits even minor infractions of the laws and regulations, or the one who regularly disregards the instructions and warnings of the official; these people require a painful lesson to awaken them to an appreciation of their duties and responsibilities, and to supply that lesson prosecution must be resorted to.

Restitution. The mention in the preceding paragraph of restitution to an injured party raises a point that is not well understood by many people and upon which inquiries are frequently made of the weights and measures official. Naturally, an injured party desires to be reimbursed for any losses occasioned by the illegal acts or failures of another. In weights and measures matters the official can often cause this to be brought about through the exercise of his good offices in obtaining a voluntary agreement to this end on the part of the individuals responsible for the losses. But it should be clearly understood that he has no authority to *require* restitution unless this is specifically provided for in the law. He can take steps to *punish* an offender by in-

stituting a prosecution; but when the State has punished it has exercised its full authority under the ordinary criminal statute, and if any losses sustained have not been made good voluntarily the only recourse of the injured party is a civil suit to recover damages. Just as the weights and measures officer may at times *unofficially* bring about an adjustment for damages inflicted, so the court will sometimes *unofficially* accomplish the same result by taking cognizance, when imposing sentence, of a restitution about to be made. Let it be definitely understood, however, that in the ordinary weights and measures prosecution, which is a criminal action, the statutory function of the court is to punish the offender against society, and that the legal redress for the civil wrong suffered by an injured individual lies in a civil suit for damages.

Probability of Successful Prosecution. Before finally deciding to start a prosecution, the weights and measures official should ask himself this question: "Can I prove to the satisfaction of the court all of the allegations that I propose making in the complaint?" Until this question can with fair assurance be answered in the affirmative, no action should be started except under unusual circumstances. It is rarely, indeed, that it is advisable to commence a case in court upon evidence that is incomplete to a degree that raises a material doubt of the ultimate decision. Acquittals, dismissals, and cases that, on account of inherent weakness, are terminated by an entry of *nolle prosequi* (that is, not to be prosecuted) do harm rather than good. Of course the official cannot be held responsible for the sometimes unaccountable action of juries or for the occasional failure of a prosecutor to prepare and present a case in the best manner; these are contingencies that can neither be foreseen nor guarded against. But the percentage of such unfortunate instances is small, and if the official will follow the rule of never starting a case that he does not feel reasonably assured of winning, his record of convictions as compared with prosecutions started, will be a satisfactory one.

Charging Principal or Agent. When a violation of the weights and measures law is actually committed by a subordinate—that is, an employee—there is sometimes doubt as to who should be charged with the offense and brought into court to answer therefor. It is a general principle of law that a principal is liable for the misdeeds of his agent while the latter is acting within the scope of his authority; moreover, weights and measures statutes usually place responsibility jointly upon principal and agent by using, in

their penal sections, such language as "any person who by himself or by his servant or agent or as the servant or agent of another * * *." It seems clear, therefore, that, in general, either the principal (employer) or the agent (employee), or both, may be held accountable when an offense has been committed.

In reaching a decision upon this point the best guide is probably this: Bring into court that person or persons upon whom rests the real responsibility for the offending action. For example, if an employer fails to give proper instruction to a new employee, and in consequence the latter violates the law, it is the employer who is really responsible for the violation and it is he who should be punished if punishment is to be administered; on the other hand, if the employer has taken all reasonable means to insure obedience to the law on the part of his employees, and if, contrary to his instructions, the latter violate the law, it is the employees who should be punished and not the employer. Of course an employee, even if not especially instructed by his employer, is properly chargeable with knowledge of the illegality of such acts as deliberate short weight or short measure, and should be held accountable for such acts; moreover, even though acting strictly in accordance with the instructions of his employer, the employee who practices fraud should be punished for his acts, which he must know to be illegal, although in such a case the employer should also be punished as the primary instigator of the fraud. In other words, fraud and dishonesty—as distinguished from less serious and from "technical" violations of law—should bring into court both those with whom they originate and those by whom they are actually effectuated.

The weights and measures official in a particular jurisdiction may find it necessary to be guided in this matter of the parties to be named in complaints by the practice that prevails in his community as laid down by the local judges, rather than by the general rules outlined in the preceding paragraphs. Some judges insist that the person who has actually committed the illegal act shall be the one brought into court, and regularly refuse to entertain complaints not drawn in accordance with this dictum; while other judges take the other veiw—that the person primarily responsible, and not the mere instrument of execution, is the one whom the law should summon to account. The official will conform, of course, to whatever rulings of this character may be in effect in his jurisdiction.

Charging a Corporation. Officials sometimes raise the question of procedure in the case of a corporation, which cannot be brought physically into a court. The corporation is, in the eyes of the law, an artificial being, and can be proceeded against the same as an individual; as the corporation acts through its duly constituted officers, so these officers may be named in the complaint and cited into court for corporate offenses.

Vigor of Prosecution Effort. From this point onward in this discussion the reader should remember that the material presented has been prepared upon this theory: If a prosecution is warranted, every just means should be employed to push the prosecution as vigorously as possible and to bring about conviction and sentence of the offender. Prosecutions are neither to be lightly considered nor treated as mere gestures, and if the machinery of the courts is once started in motion, the official who is responsible for inaugurating the movement should earnestly and consistently strive to bring about the conviction and consequent punishment that, in the exercise of his best judgment before the case was begun, he has deemed to be necessary and deserved.

Exhibits. Following the preliminary considerations discussed above, a discussion of the physical aspects of a weights and measures prosecution is next in order. There are some "exhibits" introduced in practically every weights and measures trial. These may be merchandise that has been purchased or seized, unsealed or faulty weighing or measuring equipment that has been seized, or seized attachments or devices of various kinds or foreign material used in the perpetration of fraud; or sales slips or other written or printed representations of the vendor or official records of the weights and measures officer, which we may designate as "documentary" evidence. From the time of the collection of the first evidence in the field, the greatest care should be exercised to protect and preserve the integrity of all of the physical evidence. When first obtained, all of this should be marked for identification and all packages of merchandise should be sealed.

Records and Memoranda. A complete official record should at once be made of all identifying marks, the date and hour when the evidence was obtained, the source of the evidence, and a full description of all of the circumstances that it is thought may have any bearing upon the subsequent conduct of the case, including a record of any relevant statements or remarks that may be made by any of

the parties at interest. This record should, of course, be signed by the official. Too much emphasis cannot be placed upon the necessity for completeness in these records. Considerable time may elapse between the collection of the evidence and the trial, and details that seem well fixed in mind at the time of their occurrence may be anything but clear after a lapse of several weeks, or, as sometimes happens, several months; sometimes in that interval other similar cases will arise and consequently the details of each may become confused. The official who attempts to rely upon his memory may easily be tripped up by a clever cross-examiner upon some detail of fact; and even though the detail may be relatively unimportant, the confusion of the official upon the witness stand and the inaccuracy of his statement tend to discredit his other testimony and to prejudice his case. A witness may always refresh his mind on the stand by reference to written memoranda made by him at the time of the occurrence of the events being described; and it is urged that whenever he is called upon to testify in court, the official use his field record for study before testifying and for reference while testifying. This record should, however, be the original memoranda made at the time the events occurred, and not a report made up at some later time from "notes"; if its character be disclosed, a record of the latter sort will almost surely be objected to by defense counsel.

Witnesses. The handling of a case involving the delivery of less than the amount represented is simplified if the actual purchase can be made by the official; he may then personally testify relative to all of the steps in the transaction. If this is impracticable, reliance must be placed upon the testimony of other witnesses, and the official should assure himself, insofar as possible, that such other witnesses are willing and prepared to testify to a set of facts that clearly establishes the violation to be charged; otherwise no action should be started. Complainants, even though anxious that court action be taken, are frequently reluctant from the first to appear in court, or develop such reluctance at the last moment; complaining witnesses depended upon by the prosecution to establish the conditions under which a particular sale was made have even been known to reverse upon the witness stand the story previously told and actually to give testimony against the State. It is usually desirable, therefore, for the official to proceed in court only upon purchases made by himself or by some reliable assistant under his direction, who can be depended

upon not only to establish definitely the conditions of sale at the time the alleged violation occurred, but also to give concise, clear, and definite testimony at the trial. One such witness is worth more than several witnesses whose testimony is indefinite, faltering, or inconclusive. In fact, if the testimony of a witness for the prosecution is not effective, it usually reacts definitely in favor of the defense; and testimony of that character had best not be offered.

The Representation. A sales slip should always be obtained with a purchase if this is possible. The price per pound or per unit of measure—established by oral statement at the time of purchase, by signs displayed, by published advertisements, or the like—in combination with the price extension shown by the sales slip or other receipt, serves to establish the representation of the quantity delivered by the vendor. If the sales slip also carries a statement of the quantity purported to be delivered, this representation is more conclusively established. When the offense under the law is "delivering less than the quantity represented," it is apparent how essential it is to establish clearly what the "representation" was.

Similarly, where the offense is the "taking of more than the quantity represented" when the buyer furnishes the means for and himself makes the quantity determination, the case hinges upon the "representation," and this must be clearly established.

Quantity Determinations by the Official. As soon as the transaction has been entirely completed, if it is indicated that the law has been violated, it is usually advisable for the official to make his identity known and to reweigh or remeasure the commodity in the presence of the vendor using the same weighing or measuring means that had been used by the vendor. Many officials follow the plan of at once testing this equipment with their standards, at least to such an extent as to demonstrate that the amount of commodity in question could have been correctly determined; and this plan is to be recommended. If the equipment is not at fault the responsibility for any inaccuracies is then placed squarely upon the individual. In the case of inaccurate or fraudulent equipment, its condition or character will be demonstrated by test and inspection, and if deemed advisable the equipment should be seized for use as evidence.

In addition to the reweighing or remeasuring made by the official with the equipment originally used, he should make, whenever practicable, an "official" determination of the quantity of commodity in question, using his own standard

equipment; and it is a good plan to have these results verified by a witness. The amount so determined will be the amount reported in the complaint or referred to in the testimony for comparison with the "representation" to determine the shortage in the amount delivered by the vendor or, in the case of a buying transaction, the amount of the excess taken by the buyer.

Safeguarding the Evidence. As soon as the official quantity determination has been made, and the evidence resealed if necessary and supplied with any additional identifying marks deemed advisable, steps should be taken to safeguard the evidence in such a manner that the official can testify, when the case comes to trial and the evidence is produced in court, that it has been continuously in his custody and has not been accessible to tampering by unauthorized persons. If at all feasible, such evidence should be kept securely locked up. It is obvious that what has been said refers to evidence that is not of a perishable nature. Where the character of the evidence is such that it cannot be preserved in its original condition this fact will be recognized by the court, but in such cases it is always advisable for the official's testimony to be supported by that of at least one additional witness upon all questions relating to the condition or quantity of this evidence that cannot be produced before the court. The same thing is true where for any other reason it is found impracticable or inadvisable to retain the evidence for court use.

At times a checkup on a buying operation will be simplified by making the "official" weighing or measurement before rather than after the commercial transaction; in such a case due care must be exercised to guard against any losses of the material weighed or measured as well as to establish continuous, responsible custody thereof during the interval between the determinations mentioned.

Evidence. The evidence in some cases may be largely documentary; original documents or properly authenticated copies should be obtained whenever such evidence is to be introduced. Sometimes the collection of evidence is primarily a matter of fact finding by the official. In such cases, notwithstanding the fact that the testimony of a sworn public officer, such as an inspector of weights and measures, when testifying upon matters in the line of his duties, is given great weight in court, it is nevertheless advisable to support it, whenever practicable to do so, with the testimony of other competent witnesses. It is to be understood, however, that

it is not being recommended that investigations be invariably conducted by two officials acting as a team.

Preliminary Hearings. It might be mentioned in passing that some laws enforced by weights and measures officials provide that a "hearing" shall be held whenever a prosecution shall be contemplated and before the case is actually started. The details of such procedure are always described in the law, so that these need not be considered here. The purpose of these hearings is to provide for a review of the facts and circumstances of the case, to be conducted usually by the head of the department, and at which the alleged offender may present his views informally, the ultimate object presumably being that the hearings shall serve as a check upon hasty or ill-considered court action. Except for the specific provision that the accused shall be given an opportunity of appearing, this procedure differs in no wise from the procedure that will be followed by the careful and conscientious weights and measures chief, who will give his personal attention to all prosecutions that are contemplated and to their progress after being started. In this connection he will frequently suggest to those found to have been violating the law, and in whose cases the field inspector believes that court action should be resorted to, that they call upon him for a conference upon the matter so that both sides of the controversy may be fully understood by both parties thereto.

The Law. Turning now to what may be termed the legal aspects of the prosecution, there are to be considered briefly the law, the complaint, and the trial. Before venturing a prosecution at all, the weights and measures official should know his law thoroughly. Reading the text, even repeatedly, is not enough; this should be studied and analyzed until the official knows every element necessary to establish a violation, until he knows into what fields and how far the law permits him to go, and particularly until he knows very definitely those limits that the law sets up to his authority and activities and those fields into which he cannot go because of lack of authority. Moreover, he should be so conversant with all of the sections of the law that he is administering and with their relations one to another that he will be able to decide with respect to any situation what is the composite or "net" application of the law to that situation. In deciding upon or preparing a case for prosecution, the penal sections of the law, wherein are enumerated the penalties for specific offenses, are of especial importance, because often these sections

define the offenses as well as prescribe the penalties. Wherever the offenses may be defined, however, it behooves the official never to begin a prosecution unless all of the conditions prescribed by law as essential to the commission of the offense are supplied; and this presupposes that the official has acquired that intimate knowledge of the law that has been recommended.

A thorough knowledge of the provisions of the law and regulations and of all of the techniques of weights and measures supervision, will stand the official in good stead when he is being cross-examined in court. Defense counsel may attempt to confuse an official and picture him to the court and jury as incompetent, so as to discredit his testimony for the prosecution and create a reaction favorable to the defendant. Nothing will frustrate these tactics so effectively as a solid foundation of knowledge of the weights and measures law, regulations, and techniques.

The Complaint. The complaint (known in some jurisdictions as the "affidavit" or "information") is a formal legal document setting forth the alleged offense, and its preparation is the first legal step in most weights and measures prosecutions. In the absence of a demand to that effect on the part of the accused, the written complaint may not be required before certain lower courts, such as those presided over by justices of the peace, mayors, aldermen, etc., when the defendant appears voluntarily or in the custody of the weights and measures officer; but even in these courts the written complaint will customarily be required if a warrant must be issued for the arrest of the defendant. It is quite necessary that the complaint be prepared in proper form, because if it be found defective the case may be dismissed or postponed by the court upon motion by the defense.

Complaints may differ in details in different jurisdictions. but all are alike in their general aspects. Essentially this instrument, which is addressed to the court, sets forth the name and address of the defendant, and alleges that on or about a specified day and at a specified place the party named as defendant did commit a specified offense, which is then described in detail, this being stated to have been in violation of the provisions of a specified section or chapter of the statutes. In specifying the offense, the language of the statute should be followed, as, for example, "did, in selling, deliver less than the quantity represented"; going on then to the detailed description, the complaint might continue thus: "in that he delivered as and for 5 pounds of sugar less than 5

pounds, to wit, 4 pounds and 12 ounces," or "in that he delivered a quantity of sugar representing the same to be of the amount of 5 pounds, when in truth and in fact the said amount was less than 5 pounds, to wit, 4 pounds and 12 ounces." This complaint must be signed and sworn to by the complainant.

Printed forms, with appropriate blank spaces for inserting details, are customarily used for these documents, and they are usually made out by some officer of the court, such as the prosecuting attorney. When this is done it is unnecessary for the weights and measures official to concern himself about the language used; but sometimes situations arise where no one else seems to know just how a weights and measures complaint should be drawn, so that it is a good plan for the official to acquaint himself at the earliest opportunity with the form and requirements current in his city or State, and then, if occasion requires, he can draw up this instrument without assistance.

The weights and measures official will, obviously, sign and swear to those complaints alleging offenses of which he has personal knowledge. However, when some citizen complains to the official about some violation of law and insists upon a prosecution being started on the basis of the facts in his possession—as he has a perfect right to do—the official should give to this citizen such assistance as is within his power and as may be desired, except that he should not sign the formal complaint; since the citizen possesses at first hand the information to be alleged in the complaint it is he who should sign the complaint and swear to its truthfulness. Indeed, any citizen may, if he so desires, present direct to the public prosecutor, without any intervention on the part of the weights and measures official, information to the effect that there has been a violation of the law, and if the evidence submitted is deemed sufficient, the prosecutor will proceed with court action.

Except in the lower courts, weights and measures cases are normally handled in court by the prosecuting attorney or one of his assistants; this may be a city or county attorney or a representative of the office of the State attorney general, depending upon the court in which the case is being tried, upon the character of the law—city ordinance or State statute—under which an action is to be brought, or upon other factors. The regular procedure is for the weights and measures official to present to the prosecutor's office the facts and evidence upon which he proposes to act; after

convincing the prosecutor of the propriety of the proposed action and signing the complaint, the weights and measures official has little more to do with the matter until the case comes to trial, the prosecutor attending to all details. However, in country districts or small towns the weights and measures official may be required to act alone in the preparation for and conduct of his cases.

The Trial. The trial of a case is essentially the same before whatever court it may be held, although the degree of formality observed varies widely. Trial by judge is more informal and expeditious than trial by jury, and probably the large majority of weights and measures trials are of the former character; not infrequently, however, jury trials are demanded by the defendants. The principal concern of the official at the trial is to give his testimony in the most effective manner possible. He should also be on the alert to counteract any false impression that may be conveyed to the court by the tactics or testimony of the defense. What should be done in these connections has been discussed heretofore in sufficient detail so that further comment at this point is unnecessary.

Appeals. The State cannot appeal from an adverse decision in a criminal case, but the defendant can and frequently does appeal; and sometimes cases are carried up to the highest courts of the State, and may even be carried to the United States Supreme Court. The legal formalities connected with an appeal are handled by the attorney as in the original action, so that there is little for the official to do except to preserve the evidence intact (sometimes the exhibits are preserved by the prosecutor's office) and hold himself ready to testify when called upon to do so.

Decisions. For the sake of the precedents that may be established by court decisions from time to time, a knowledge of which may be of great value in connection with subsequent prosecutions, it is advisable for the official to index his prosecution record to show under what sections of the law court decisions have been rendered. The higher the court the more valuable is the precedent. Copies of weights and measures decisions handed down by any court the proceedings of which are printed in a regular series of bound "reports" (State supreme courts are invariably of this class), should always be obtained, marked with the "citation" (the name of the case, the designation of the report series in which it is reported, and the volume and page numbers where it will be found) as soon as this has been determined, and filed with the office prosecution record on the case or in a separate file. It is also advis-

able to do this with decisions rendered in any other "court of record"; that is, in district courts or other courts of appellate jurisdiction. While these latter decisions are not so authoritative as those of State supreme courts, and will be given less weight in other courts of equal rank than would be accorded a supreme court decision, nevertheless the citation of such a decision rendered upon a state of facts or a question of law similar or analogous to the facts or law involved in a subsequent case can do no harm and will frequently be found of material assistance.

Sometimes in the printed copies of the weights and measures law, as prepared by him, the official will give in footnotes to the several sections citations to and digests of decisions rendered under those sections. This plan is particularly valuable when followed by a State department in a publication furnished to local weights and measures officials of that State.[2]

Personal Aspects. It is appropriate that brief comment be offered upon some of the personal aspects of the prosecution, particularly the relations of the weights and measures officer with the defendants, the prosecutor, and the court. Considering first the man who has violated the law and who is brought into court as a defendant, it should be emphasized that the relations between him and the official should, if possible, remain friendly. By this is meant that an effort should be made to maintain a cooperative spirit, notwithstanding the fact that a prosecution has been found unavoidable, so that the prosecution may be constructive in its effects. It is by no means impossible to do this, as can be testified by many experienced officials; in fact, a prosecution may mark the beginning of a genuine and intelligent cooperation where before there was indifference or opposition.

The attitude of the weights and measures officer in all of his official contacts will have a great deal to do with the character of reaction on the part of those brought into court. General preliminary instruction should have been given fully, carefully, and in a kindly way, so that all may have had an opportunity and may have been encouraged to become familiar with the provisions of the law. Then, when a prosecution becomes necessary, frankness, fairness, firmness, and an entire absence of any vindictiveness or personal

[2] NBS Circular 540, "Weights and Measures Case Reference Book," indexes and digests weights and measures decisions in Federal and State courts of record through July 1952. Citations are given in all instances. Most of the decisions cited are briefed. The material is thoroughly cross-indexed.

animus should characterize the preparation for the case; throughout the action the official should preserve the dignified and impersonal attitude of the public officer who, being charged with responsible duties affecting the welfare of the entire community, is proceeding with the discharge of those duties in a just and unbiased manner; and when the trial is concluded, special effort should be made by the official to assist still further in correcting the conditions responsible for the prosecution, and the erstwhile defendant should continue to receive the same sort of courteous consideration that was accorded him before his dereliction. There will be those who will not respond to this fair and impartial treatment, who will be incensed rather than chastened by the punishment occasioned by their misdeeds, who will raise the cry of "persecution" and attempt to impugn the motives and to discredit the administration of the official; but most men have an inborn sense of fair play that comes to their rescue in affairs of this kind and that sooner or later brings them to realize that, having been given ample opportunity to conform to the law, they have no one but themselves to blame if they have failed to observe its provisions, and that therefore their punishment has been justly deserved.

As to the public prosecutor, the official should give him every possible assistance. The prosecutor is just as anxious to win decisions as the official is to have him do so; therefore let the official not go to him with poor cases, but give him a fair chance to be successful, by asking him to prosecute only cases in which the evidence is reasonably complete and conclusive. Let all the data for a case be prepared in condensed form and logical sequence, including such references to the statutes and previous court decisions as can be supplied, the record of the offender, the names and addresses of witnesses, etc., and let these be submitted with any material or documentary evidence that may have been collected, when asking that the case be started. When a date has been set for trial, the official should avoid asking for continuances to suit his own convenience and should try to arrange his work so that he can always be present on the date originally fixed. Finally, let him be prompt when attending court. Attention to these suggestions will simplify and expedite the work of the prosecutor and the conduct of cases, and so will react to the advantage of weights and measures supervision.

Little need be added with respect to the official's relations with the court. If cases are selected, prepared, and presented in accordance with the principles and in the manner that

have been recommended, the weights and measures officer will have the sympathetic support of the judges before whom he appears and they will uphold his efforts to give his community adequate weights and measures supervision.

Weights and measures prosecutions comprise a specialized branch of activity, one in which experience is especially necessary for efficient execution. But with experience will come a familiarity with details of procedure that will clear away the apparent complexity that may seem to be inherent in the subject when its study is first undertaken.

Chapter 30.—Cooperation With Other State and Local Officials and With Federal Agencies

The necessity for mutual effort among the weights and measures officials of different jurisdictions frequently arises in connection with some specific problem, and such cooperation should always be given. Instances of this kind are more common among the local jurisdictions of a single State, but it is not at all unusual for problems to be interstate in character and to call for joint action by two or more States if satisfactory solutions are to be reached; and although less numerous, these latter cases may be of greater average importance than the former.

Out-of-State Manufacturers or Packers. Aside from those matters that are common to all weights and measures jurisdictions, to which all weights and measures officers give regular attention, and some of which, upon occasion, may form the basis for a request for interjurisdictional cooperation, the problems that most often inspire such requests are those in which certain effects are felt in one State or locality as a result of causes originating or existing in some other State or locality. For example, a given manufacturer or packer may be putting up for local distribution, or for distribution within his State, a product that conforms in all respects to the local or State weights and measures requirements; but this same manufacturer may put up, for distribution in some other State or community, packages that are short in weight or otherwise in violation of the law. This has a very demoralizing effect at the points where the goods are received, creating unfair competition and tending to lower the business standards. While certain remedies may be applied at the receiving end, these may not be entirely effective until supplemented by official inquiry and action at the source of the trouble.

Exchange of Information. Another example of how cooperative effort may be effective may be found in the exchange of information as to faulty equipment, improper practices, the probable movements of individuals engaged in fraudulent operations who may have been forced to leave a certain community, the results of investigations and surveys, and the like.

Federal Laws and Agencies. It has already been pointed out that there are but few Federal weights and measures laws that directly concern the weights and measures official; in fact there are only four Federal agencies—the Department of Commerce, the Department of Agriculture, the Department of Health, Education, and Welfare, and the Federal Trade Commission—that in their activities touch at all closely the work of State or local weights and measures officers. The cooperation of these officers, however, is welcomed by the national agencies, which in turn wish to be of maximum assistance to weights and measures officials.

The enforcement of Federal laws differs somewhat from the enforcement of State laws and local ordinances. A more ponderous machinery is involved and a wide territory comprises the jurisdiction, facts that militate against speedy action; problems of imports and interstate commerce introduce delays, complicate the collection of evidence, and make difficult the establishment of proof of violations; the Federal courts must be resorted to when court action is necessary, and their dockets are not infrequently so crowded that long delays are here introduced; finally, funds available for enforcement may be insufficient to do all that the officials in charge would like to do. In comparing Federal with local enforcement these conditions should be borne in mind.

Although already stated elsewhere in this Handbook, it may be repeated here for convenience of reference that the *Federal Food, Drug, and Cosmetic Act* is administered by the Food and Drug Administration of the U.S. Department of Health, Education, and Welfare, that the *Federal Standard Container Acts* of 1916 and 1928 and much of the *Packers and Stockyards Act* are administered by the U.S. Department of Agriculture, and that parts of the *Packers and Stockyards Acts* and certain general requirements having weights and measures significance are administered by the Federal Trade Commission. Each of these agencies may be addressed at Washington 25, D.C.

The National Bureau of Standards of the U.S. Department of Commerce has the custody of the national standards of weight and measure and tests the standards of the States. It has as one of its divisions the Office of Weights and Measures, which deals (in an advisory capacity) primarily with State and local weights and measures officials and with technical problems related to the duties of such officials, and serves as liaison between State and local officials and the several technical and scientific sections in the Bureau organization. The Assistant to the Director for Weights and Measures Adminis-

tration serves as Executive Secretary of the National Conference on Weights and Measures and as Chairman of the Weights and Measures Advisory Committee to the Director of the Bureau, and advises State and local officials on matters of law, regulations, and administrative procedures. Communications should be addressed to the National Bureau of Standards at Washington 25, D.C.

The National Bureau of Standards desires to be of assistance to weights and measures officials in every way permitted by its statutory authority and to the extent of funds available, and welcomes inquiries relative to all of the various lines of its work. This cooperation is likewise extended to industry and to manufacturers, to the end that the Bureau's activities may be made of maximum service to the entire people of the United States.

Part IV.—SYSTEM OF RECORDS

Chapter 31.—General Considerations

The keeping of adequate records is an essential part of the duties of the weights and measures official. The law usually specifies that records shall be kept of all standards and equipment and of all official acts, although the details of the record system to be followed are not generally prescribed. This is a matter that merits careful thought on the part of the official, not only when a department is organized, but at intervals thereafter; a poor record system may defeat its own purpose by providing inadequate information or by being too complicated, and every effort should be made to avoid these defects, or, if they exist, to correct them.

So many different conditions prevail in the hundreds of weights and measures jurisdictions throughout the country, that no single system can be recommended for all cases. In what follows there will be presented some general considerations on the subject of records, and various plans for keeping records will be briefly described and commented upon.

Basic Principles. The first principle to be observed is that an informative record should be preserved of every official act. By an informative record it is meant that the recorded data should be sufficiently detailed in character and should be so presented that they will fully answer all questions, whenever in the future it may become necessary to seek information in the files. The second principle is that the system of indexing and filing the records that are made should be simple and effective, so that desired information may quickly and surely be located when it is wanted; a record that cannot be found is no better than no record at all. A third consideration is that a system that involves a large amount of clerical work—copying, cross indexing, etc.—should be avoided because it is unnecessary, inefficient and expensive, and may become so great a burden upon those responsible for its upkeep that the entire record system will fall into disuse.

Utilization of Original Records. The elimination of excessive clerical work may probably best be brought about by a systematic utilization of original records; if these are neatly and legibly made out in the first place, there is no

reason why they may not constitute the file records of the department. Moreover, the card or loose-leaf system of keeping records is so flexible, so readily adaptable to different conditions, and so convenient and generally satisfactory in use, that it may safely be selected for the weights and measures office of whatever size.

Number of Separate Files. The next question is the number of separate files that are to be maintained; that is whether an effort shall be made to consolidate all records affecting a given firm or individual into one file, or whether it is better to keep separate files for each class of records, as, for instance, routine mechanical tests, reinspections, prosecutions, check weighings, special investigations, etc. Each method possesses its advantages. The first presents at once the complete history of any given firm or individual so far as the relations with the department are concerned, but has the disadvantage that duplicate records or indexing or some similar expedient must be resorted to if it is desired to have readily available, as distinct groups, the records of each phase of weights and measures activity. The system of separate files keeps all similar records together but frequently necessitates the examination of a number of files before desired information can be assembled.

Except for very small offices, it is probable that a combination of the two general methods mentioned, so worked out as best to meet local conditions, will be the most satisfactory arrangement. It is suggested that in general all mechanical records should eventually be assembled in one file and that likewise supervisory records should be grouped together, probably upon the basis of the firms or individuals directly concerned. This plan can readily be followed by compiling, at frequent intervals, such necessary summaries of the different classes of work as may be required for the periodic reports upon the activities of the office, after which the reports may be filed as suggested.

Types of Files. There are a number of bases for filing, each of which possesses certain advantages. Primary grouping by firm name, by address, by business, or by number may be resorted to. In the case of the State department doing inspectional work throughout the State it is undoubtedly best for the primary separation of the records to be made by towns and cities, the post-office address being used in the case of establishments located in strictly country districts. Then, under the name of the city or town, the records are probably best filed alphabetically by the names of the firms or individuals.

In the case of a large local jurisdiction, either county or city, it may be found desirable to adopt a primary grouping on the basis of towns or of sections of the city, the secondary separation being alphabetical by name as in the case of the State department records. The records for the small county or city may be conveniently filed directly by name of firm or individual. It should be emphasized that the records of even the small jurisdiction should be systematically filed so that any particular report may be located when desired; allowing the records to remain in the field books with no effort toward systematic filing is not only most unbusinesslike but necessitates an almost blind search when some record is wanted.

Insofar as available filing space permits, it is desirable to keep reports of succeeding inspections together, that is, to file the reports of each inspection for a given firm or individual in proper order with previous reports for the same party. If and when it becomes necessary to relieve congestion in the files by removing some of the records, the older records may be transferred, and the records of more recent inspections retained in the active file.

The reports affecting particular firms or individuals may conveniently be kept together in the file by means of secondary guide cards or by being placed in separate envelopes; the latter may best be of the open-top "pocket" variety without flaps, the name of the firm or individual being typed or written at the top edge, or, if the reports have the name at or near the top edge, the envelope may be cut short enough for the reports to project and identify themselves.

If it is desired to identify in the files the records pertaining to certain lines of business, differently colored guide cards or envelopes may be used, or small metal or plastic clips, commonly called "flags" or "signals," which may be lettered or numbered or of a distinctive color, may be employed.

Subdivision of Files. The degree of subdivision to be effected in the files by primary guide cards will depend entirely upon the amount of material to be filed; this must be individually determined in each jurisdiction. As a general principle, however, it may be stated that the subdivision should be such that no group of records is so large as to require an unreasonable time either for filing or finding a report. It should also be strongly emphasized that when filing alphabetically the proper alphabetical sequence should be established with reference to all of the letters of the name and not with reference only to the first one or two letters.

In this way there will be just one place in the file for each report, and any report can be found without loss of time.

Index Cards. A modification of the plan described in the foregoing, and which is in use in some cities, is as follows: For every firm or individual for whom any work is done an index card (3 by 5 inches) is made out. On this card appear the name, address, and business, and a permanently assigned serial number; below this the card is ruled into a series of spaces marked with yearly dates, and in the appropriate spaces are entered from time to time the month and day upon which inspections are made. These cards are filed alphabetically. When reports are received in the office, corresponding index cards are located or new cards are made out, the date of inspection entered upon the cards, and the appropriate serial numbers entered upon the reports. Reports are then filed by serial numbers. At the end of a given period an examination of these cards will quickly disclose whether or not all places previously inspected have again been visited, a blank space under the appropriate year indicating at once that no inspection was made.

Another modification involving the use of 3 by 5 cards, and used in some cities having several field inspectors, is as follows: Report forms are handled just as originally outlined, but in addition there is maintained a card index of all firms and individuals, arranged, not alphabetically, but by inspectors' districts and by streets, squares, or other small units in each district. When an inspector starts out for the day he takes with him the cards of all places previously inspected in the particular locality where he plans to work. As these places are again visited he notes on the cards the current date; for any newly established places a new card is made out; if establishments previously visited have changed names or are out of business, appropriate notations are made on the cards. Such a file represents the active list of establishments having weighing and measuring devices within the city, and makes it possible to determine at any time, section by section, how the mechanical work in the city is progressing.

Maps. Another method of showing the progress of the work in any jurisdiction is the use of maps and colored pins or colored crayons; this graphic method possesses the advantage of showing at a glance the general conditions in any locality.

Bound Records. The foregoing discussion is confined to "looseleaf" or "card" systems of records. It is believed that in the majority of instances it will not be necessary to go

beyond such systems. If, however, because of auditing or other local requirements, ledger records are made necessary, such records should be adequately indexed so that infomation may be located when desired. It should also be repeated for emphasis, that, in the absence of some special requirement, the copying of records may largely be eliminated by the selection of suitable original-record forms, and that every effort should be made to reduce to a minimum or to eliminate entirely all such copying.

Sizes and Assembly of Forms. The plan herein recommended—that of utilizing original reports as file records—makes it desirable to consider the size of report forms from three viewpoints: First, standard sizes of filing cabinets and guide cards; second, utility and convenience for field use; and third, uniformity in at least one dimension for reports that are to be filed together. A consideration of all of these factors leads to the conclusion that, in general, two sizes of report forms are to be recommended, 5 x 8 inches and 8 x 10½ inches. The former size will be accommodated in standard 5 x 8 file drawers, and the latter will be filed conveniently in standard "letter size" file drawers. If both sizes of forms are to be filed together, the 5 x 8 forms should be filed upright or vertically, so that the top edges of all forms will be at the same height.

It is recognized that a small form is more convenient to carry and use than is the large 8 x 10½ form, but it is strongly urged that completeness and clarity of the record be not sacrificed for mere convenience of handling, and that the larger form be utilized whenever a considerable amount of data *should* be entered if the record is to be fully informative.

Forms should be prepared as perforated sheets of standard size and these should then be assembled and bound in book form, or should be cut to standard size and assembled as pads. Or the so-called "carbon insert" system may be used; in this, the printed sheets are assembled in "sets" with carbon paper inserted as required, the carbon paper being discarded after one-time use.

Design of Forms. In designing a report form, provision should be made for the entry of information under appropriate printed headings so that the purport of the report may be unmistakable; zeal in supplying printed captions should not be carried to an extreme, however. The form should have a heading giving the name of the agency under the authority of which it is to be used. Space should always be provided for entering the date and the name, address, and business of the firm or individual concerned, and for the

signature of the weights and measures officer making the report. In general it is desirable that space for the name and address of the firm or individual concerned be provided as near as practicable to the edge of the report that will be uppermost in the file; if intended for use in a vertical file this would be along one of the short edges, and if intended for use in a horizontal file it would be along one of the long edges. Whenever a report forms deals with an operation (mechanical test or tryout inspection) such that as a result of the operation the inspector may issue official instructions or warnings, space should be provided on the form for the entry of a brief statement of any such instructions or warnings. Space for other remarks by the inspector should be so designated if there is room for this; an alternative to this would be a general instruction to use the reverse of the form for this purpose. Space should also be provided for the signature of the owner or operator of the eastablishment where the work covered by the report is performed, or of his representative; such a signature acknowledges receipt of the report and of its instructions and warnings, if any.

Colored Paper. To differentiate between reports of different kinds or between the several copies of a single report that go to different people, tinted papers may be used with advantage.

Summary Reports. Quarterly, semiannual, or annual reports of a weights and measures department always contain itemized summaries of the work performed during the periods covered by the reports. In a large jurisdiction, the examination of all of the detail records for several months or a year, in the course of preparation of the various summaries, is a very considerable task. This may be simplified by causing each individual officer in the jurisdiction to prepare daily or weekly summaries of his own work; the summation of these is then comparatively easy. Even with this plan, however, it is believed advisable for the large office to keep the summaries up to date month by month; the small number of individuals' reports to be handled in each instance makes it easy to locate errors and check all totals, and, in addition, the completion of the summaries at the end of the departmental report period then requires only a comparatively short time. Similiarly, the smaller jurisdiction will find it advantageous to keep up to date the necessary summaries of its activities.

Details of report forms are discussed in the succeeding chapter.

Chapter 32.—Mechanical, Supervisory, and Miscellaneous Report Forms

Field reports on mechanical work may be of several kinds—reports on routine tests, reports on retests of rejected equipment, reports on special tests, and special reports on rejected equipment. Ordinarily reports of the first three kinds mentioned are made on the same form; the fourth kind, if used at all, requires a special form.

Considering first the regular mechanical report form, it is believed that in addition to the general requirements for all report forms, as given in the preceding chapter, this form should make provision for entering the following data:

1. A description of the equipment examined, including a statement of the kind, make, serial number, and capacity of weighing or measuring instruments, the kind and capacity of measures, and the nominal and actual values of weights.
2. The condition of the equipment as found by the inspector—balance, cleanliness, etc.
3. The disposition of the equipment by the inspector; that is, whether approved, adjusted, rejected, or condemned.
4. The reasons for adjustment, rejection, or condemnation.
5. The signature of the owner of the equipment or his representative.

This sort of information is necessary for a proper record of the inspector's activity.

Description of Equipment. With reference to 1 above, it should be mentioned that the practice of having printed upon the form the names of a large number of classes of weighing and measuring devices, particularly scales, and providing for no further identification of a piece of equipment examined than a mark opposite one of these classes indicating that a device of that class has been approved, adjusted, rejected, or condemned, is to be strongly discouraged. In the first place, this does not at all identify the equipment in question; "1 'beam' scale," for instance, means nothing so far as identification is concerned. Secondly, the classifications commonly employed are indefinite, various classes overlapping in numerous instances; for example, three "classes" frequently appearing on one of these report forms are "beam," "platform," and "counter," and the question at once arises, "Where shall a beam-counter-platform scale be en-

tered, since it would appear to fit in each of the three classes?" Even if arbitrary definitions are set up for the multiplicity of classes employed, it is almost inevitable that where a number of inspectors are endeavoring to follow them there will be differences of interpretation and that summaries compiled from these reports will be inaccurate as to the actual numbers of the different classes of equipment examined. This is particularly true in the case of the summaries compiled by a State department on the work of the local officials throughout the State.

A third objection to the long printed list of classes is that so much of the report form is taken up by this list, only a few of the items of which will apply to the equipment of any one establishment, that insufficient room remains for the entry of desired information.

Finally, because of the indefiniteness of the information at best, this classification means but little either on the individual report or in a summary. The individual report should definitely identify the equipment examined, insofar as this is practicable. Summaries should then be made up by well-defined classes that admit of no uncertainty as to their meaning; in the case of scales it is believed that the subdivision is best made by capacities, not less than four and probably not more than six groups being recognized.

Duplicate Copies and Numbering. Books or pads of mechanical report forms should always be made up so that at least two copies of the report may be made, one copy for delivery to the owner of the equipment examined, or to his representative, as their record of what the inspector has done, the other copy for the official record in the office. In anything larger than a one-man department it may be found advisable to have the reports made out in triplicate, so that the inspectors may retain copies. It is probably a good plan, at least in the larger departments, for the report forms to be serially numbered; in some cases departments employing a number of inspectors have, in addition to the serial numbering, had these report forms printed with as many different single check letters as there are inspectors, assigning the "A" series to one inspector, the "B" series to another, and so on, each series being independently numbered.

Detailed Test Results. There are some important classes of commercial equipment for which test reports can only be properly informative if these include detailed test results; outstanding examples of such classes of equipment are vehicle and livestock scales, wholesale-type fluid meters (vehicle-tank, loading-rack, and liquefied-petroleum-gas), taximeters,

and farm milk tanks. For these detailed reports it is obvious that special forms are required, and these should be carefully drawn up to make it as easy and simple as practicable for the inspector to enter the necessary data and to make the report informative and readily understandable to the equipment owner and to any repair agency to which the owner may show a report on a piece of rejected equipment. A special report form, designed for use only in connection with one class of equipment, may properly make use of numerous printed captions, but it should be remembered that a single fixed test routine cannot be followed in all cases and that the report form should be so arranged that the inspector will not be hampered in entering full test data for the special as well as for the standard case.

Inspection Results. In the case of vehicle scales, the importance of inspection results, as distinguished from test results, is such as to justify special provision for the entry of inspection data, either on the test report form or on a special inspection report form. Greater use of printed captions is advisable for an inspection report than for a test report and much of the needed information can be shown by check marks or brief entries in appropriate spaces or by striking out certain printed material; provision should, however, be made for adequate space in which to enter a running account descriptive of conditions found.

Size and Assembly. Special report forms, by reason of the amount and character of the data to be entered, are usually required to be of the "large" size—8 x 10½ inches. Here, as on all forms, spaces provided for the entry of data should be large enough so that the inspector can easily make legible entries. The preferred method of assembling these special forms is to have them prepared in pads or sets instead of being bound into books. It will be found advisable in many cases, particularly where more than one sheet may be required for reporting a single test, to omit printed numbering of the sheets, thus making it convenient for the inspector to prepare whatever number of report copies may be required on any particular test.

Color Identification. A plan that has given good results with respect to retests or rejected equipment is to have the original and duplicate copies of the report forms of different colors, for instance, a white original and a blue duplicate; on regular tests the white copy is sent to the office and the blue copy is given to the owner, while on retests these are reversed, the blue copy going to the office and the white copy to the owner. This automatically distinguishes the

reports on retests from those on regular tests and assists in clearing the record on rejected equipment.

Reports for Special Tests. It is believed that in most jurisdictions special tests are reported on the regular forms; this would appear to be entirely satisfactory, because the regular form can easily be marked to indicate the special character of the test reported on, and any additional report required can readily be attached. However, sometimes a special form of report is used for tests of this kind, embodying all of the information in connection with the case.

Supplementary Reports. In a number of jurisdictions it has been found expedient to supplement the regular report with a report on a special form whenever equipment has been rejected for repairs. These special reports advise the owner of the equipment that is to be repaired what his duties are in this connection, usually specify the time limit within which repairs are to be made, and point out the penalties for unauthorized use of the equipment in question, and, of course, always contain a complete description of the equipment and the reasons for its rejection. The duplicates of these special reports constitute the record for the office follow-up of rejected equipment, a very necessary part of the office administration, Sometimes, in the case of a State where the inspectors must frequently leave a town before all of the rejected equipment therein has been repaired, these special reports contain a space to be used by the owner or by specially authorized repair or service men in notifying the department when the necessary repairs have been completed, so that a permit may be issued authorizing use pending an official retest; in other cases provision is made for a report by the owner of the results of such a test as he has been able to make upon the repaired equipment, the permit mentioned being issued if these results indicate that satisfactory repairs have been made.

Permits. It might be repeated in this connection that whenever possible, repaired equipment should be tested by the weights and measures official and approved before its commercial use is again permitted. But under certain circumstances this is out of the question, and the permit system must be resorted to as the only practicable expedient to handle the situation. In any event, retests should be made at the earliest practicable time.

Supervisory Reports. The making of reports and the keeping of records of supervisory work are just as important as in the case of mechanical work. These records may have an important bearing upon the outcome of prosecutions,

and they most certainly should be consulted in very many cases to determine whether or not the official should proceed to prosecution. For example, repeated evidence of carelessness, repeated cases of scales slightly out of balance, repeated cases of slight shortages on delivered amounts of commodity, all are proper grounds for prosecution when other methods of correction have failed; and in cases of this kind the memory may not be relied upon and written evidence is demanded.

Ordinarily copies of supervisory records are not given to those upon whom the official is checking; therefore, it is frequently considered unnecessary to make more than one copy of such reports unless the inspector is to retain a copy for his information, in which case one carbon copy is made. There is, however, an advantage to be gained by having two copies of supervisory reports in the office; one copy of each report may then be filed with the mechanical reports for the firm or individual, thus assembling a complete record in one place, while the other copies may be filed with other supervisory reports of similar character, thus assembling, for example, all coal-reweighing reports, all meat-tryout reports, etc. The additional effort occasioned by this plan seems to be entirely justified by the increased value of the resulting records.

Field reports on supervisory work call for at least two forms, and this number may be increased to four or more in the larger jurisdictions where the volume of work done will justify the additional printing expense. The two principal forms are (1) the general package-checking report and (2) the prosecution report.

Package-Checking Reports. The general package-checking report form is to be used for recording the results of general reweighing and remeasuring in commercial establishments, including a report on the condition of zero-load balance observed for the scales in service and the general condition of other weighing and measuring equipment. In the absence of special forms for reporting the results of fuel reweighings and the investigation of complaints of improper practices, the general try-out form may be used for these purposes; however, where there is a considerable amount of this character of work to be performed, the use of special forms will be found to save time as well as to be conducive to uniformity and completeness of the record. Distinctively colored paper may be employed to advantage to distinguish these several forms.

Because of the importance and probable volume of package reweighing, particularly the reweighing of prepackaged

meats and meat products in self-service meat departments of large markets, an especially useful special try-out report is one adapted to this particular operation of package reweighing. If an extensive survey on some single packaged commodity is to be undertaken—flour, or feed, or fertilizer, for example—it will be advantageous to utilize in the survey a special reweighing report form designed for this particular purpose.

Suitable printed headings for these supervisory report forms, in addition to provision for the entry of the general information that should be shown on all report forms as previously explained, will readily suggest themselves to the official. Extremes of printed detail are to be avoided except in the case of a form designed for one particular use only. For example, a coal-reweighing form may reasonably have a printed caption for each item of information that the inspector is supposed to enter, and, as mentioned before, this will be conducive to completeness and uniformity of reports; but to attempt such detail on a general report to be used for a variety of purposes could only result in confusion and the defeat of the very ends sought.

Prosecution Reports. The prosecution record form will depend for its make-up upon the court procedure in the jurisdiction in question. If there is ordinarily but one step in a prosecution, as before a justice of the peace or a local magistrate, a single form will suffice. If ordinarily there are several steps, as the issuance of the complaint, preliminary hearing or fixing date of trial, and the trial itself, the form should be made up of a corresponding number of parts, so that reports may be made upon the progress of the case from time to time. This is particularly necessary where prosecutions are handled by field inspectors at places other than the headquarters of the department, as would be the case in a State department.

Each section of the prosecution report should contain the full history of the case up to that point, and as succeeding reports are received at the office, preceding reports on that case may be destroyed. Where prosecutions are handled by field inspectors it is essential that copies of their preliminary reports on each case remain in their possession, so that they may follow up their cases, and it is desirable that the final office record of prosecutions be in duplicate; these reports should, therefore, be made out in duplicate, one copy of each preliminary report and two copies of each final report being forwarded to the office. Of the final reports, one copy will

then be filed with the record of the defendant individual or firm and the other will be filed in the prosecution file.

Preservation of Records. It should be emphasized that supervisory reports should be prepared, and supervisory records should be preserved with the same care and attention as are given to mechanical reports and records; the principles of recording all official acts and of making the records complete and fully informative is equally applicable to these two branches of the work of the weights and measures official.

Use of Back of Form. As a general comment, it may be mentioned that some economies can be effected in the cost of forms and in the number or actual weight of the forms carried by the inspector, if the back as well as the face of the form is utilized for the entry of data. The data on the two sides of a single form should, of course, be closely related; appropriate filing, and the location of material after filing, would become complicated if dissimilar information were entered on the two sides of a single sheet. An example of appropriate utilization of both sides of a form would be a vehicle-scale form, one side of which is designed for the entry of test results and the other side designed for the entry of inspection results and recommendations. A disadvantage of these double forms arises when carbon copies are required, through possible difficulty of keeping the sheets in proper register after they have been loosened from the pad, and possible offset from carbon copies when the sheets are reversed, resulting in a reduction of legibility.

Miscellaneous Forms. No further comment will be necessary upon those numerous miscellaneous forms that will be required, particularly in the larger jurisdictions, except to mention a few of the more important. Forms for proposed weekly itineraries are desirable in the case of traveling inspectors. Expense-account forms are necessary in the case of traveling inspectors and daily work-report forms are desirable; these may conveniently be combined into a daily sheet, to be sent to the office, together with the office copies of individual reports. Monthly expense accounts for traveling inspectors are usually demanded by State auditing departments. Monthly, quarterly, or annual report forms are customarily supplied by a State office to local jurisdictions reporting to it. The State or large local office should maintain a running record on each principal standard or set of standards owned by it, for inventory and accounting purposes. The laboratory testing of standards of weight and sets of such standards is simplified and improved by using special forms for entering data and computing results.

Equipment inventory forms are useful. A post-card form for notification of the installation of new or repaired weighing or measuring devices will encourage dealers to report such information to the weights and measures office.

Sample Forms. Patterns for a number of basic and special weights and measures forms, prepared in accordance with the principles discussed in this chapter, have been worked up by the Office of Weights and Measures of the National Bureau of Standards, and copies may be obtained upon request.

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