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WEIGHTS AND MEASURES ADMINISTRATION

HANDBOOK SERIES
OF THE
BUREAU OF STANDARDS

No. 11

1927



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DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
GEORGE K. BURGESS, Director

HANDBOOK SERIES OF THE NATIONAL BUREAU OF STANDARDS No. 11

WEIGHTS AND MEASURES
ADMINISTRATION

By

RALPH W. SMITH
Inspector of Weights and Measures

June 1, 1927



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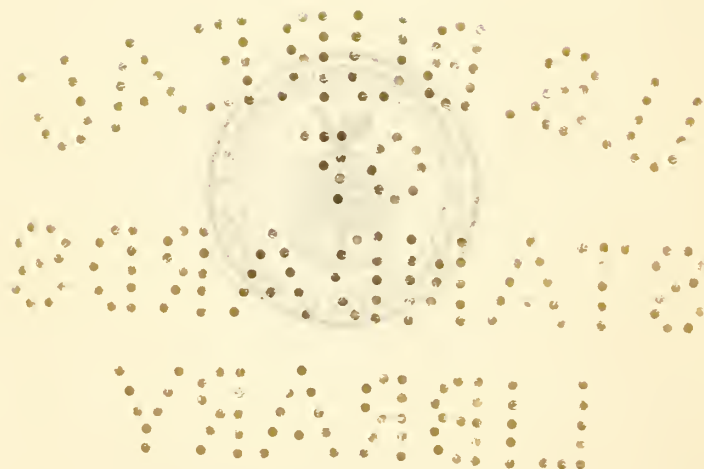
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Bureau of Standards

WEIGHTS AND MEASURES
ADMINISTRATION
1927

REPORT OF THE
COMMISSIONER OF STANDARDS

June 1, 1927



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PREFACE

There has been for many years, and there continues to be, a demand upon the National Bureau of Standards for information upon all phases of the subject of weights and measures supervision. This demand comes from four fairly well-defined groups, as follows: (1) State and local government officials and others interested in the establishment of adequate weights and measures departments in localities where such supervision is nonexistent or inadequate; (2) newly appointed weights and measures officials who are entirely untrained in the duties of a weights and measures officer; (3) more or less experienced weights and measures officials who desire to increase their knowledge along weights and measures lines; and (4) manufacturers of weighing and measuring devices and representatives of industry in general, who desire information as to existing weights and measures organizations, specifications and tolerances, methods of test, etc. As a recent example of the desire of experienced officials for additional information in this field there may be mentioned the specific request to this end made by resolution by the Eighteenth National Conference on Weights and Measures.

To meet this demand the National Bureau of Standards has from time to time issued publications of its regular series treating of one or more phases of weights and measures activity, and these publications have been supplemented by various mimeographed documents. Of the regular publications of the bureau, the most important in this connection are the reports of the annual meetings of the National Conference on Weights and Measures, and Handbook No. 1, "Manual of Inspection and Information for Weights and Measures Officials." While these publications have had a

very wide distribution and have been of very great assistance to those seeking weights and measures information, nevertheless the fact remains that nowhere in the publications of the bureau or, for that matter, in any outside publication, has there been assembled in compact form within the compass of two or three volumes a complete and consecutive presentation of the essential facts in connection with all of the aspects of weights and measures supervision.

It is now proposed to prepare and assemble comprehensive information on this subject and present it as a group of three publications, of which this volume (Handbook 11) is the first. It is felt that this plan will best serve the needs of those interested and at the same time will effect the greatest conservation of printed matter. These publications may briefly be outlined as follows:

The present volume is designed to present the general aspects of the subject and to comprise a complete picture of a comprehensive system of weights and measures supervision.

The second volume, under the title, "Specifications and Tolerances for Commercial Weighing and Measuring Devices," will contain all such codes of specifications and tolerances as have been adopted by the National Conference and recommended by the Bureau of Standards for adoption by the States, and will include citations to other similar codes recommended or adopted by other bodies.

It is proposed that the third volume, under the title, "Weights and Measures Technology," shall be in the nature of a textbook for the weights and measures official, embracing detailed descriptions of, and methods of inspection and test for, all types of commercial weighing and measuring devices.

Publication of the second and third volumes of this group will be made at as early a date as practicable.

WEIGHTS AND MEASURES ADMINISTRATION

Part I.—GENERAL

Chapter I.—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 which it is desired to correct and of the results which it is planned to accomplish. In the case of what is now generally known in this country as *weights and measures supervision*, all of the 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 our 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 the instrumentalities of weighing and measuring; and it is this principle which 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 an issue 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 those

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; but while we can be more sympathetic with the man who knows no better, than we can with the others, nevertheless it can not be overlooked that short weight or measure is equally damaging to the injured party whatever its underlying cause.

As the inevitable result, then, of these conditions there have grown up various systems of governmental control, the details of which we shall examine somewhat later. Under these 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 instrumentalities involved, and to take suitable steps to stop an unfair practice or secure the legal punishment of an offender. Moreover, it is his regular duty periodically to inspect and test the commercial weights, measures, and 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 less degree, enter into the distribution of all of the necessities of life, particularly of food and fuel. Furthermore it must not be lost sight of 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.

While the various phases of the work of the weights and measures official will be considered in detail in Parts II and III of this publication, it is believed that a brief presentation at this time of the scope of the official's duties will be appropriate. There are two main divisions of the work. The first has to do with the inspection and testing of the equipment itself, which is used in weighing and measuring; this branch of the work is ordinarily referred to as the *mechanical activities* of the official. The second division has to do with the way in which this equipment is used, and embraces all of the so-called *supervisional activities* of the official.

Under the first division 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, measuring device, etc., 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 inaccurate, worn out, conducive to the perpetration of fraud, or which 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 accurate and properly designed weighing and measuring equipment with which to carry on their trade.

Under the head of *supervisional* come such activities of the official as check-weighing or check-measuring packages 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 package goods put up by the manufacturer; checking loads or deliveries of fuel, ice, etc.; investigating complaints of shortages or unfair practices; educating buyers and sellers in general, 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 in protecting their interests; and developing that healthy spirit of cooperation between the department and each of the several groups with which it deals, without which the greatest measure of success can never be realized.

The mechanical side of the work must, of course, come first, because without accurate and properly designed equipment with which to weigh and measure his merchandise no one can be expected 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 have reached a state of efficient administration of his office. 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 the most efficient.

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. Nothing could be farther from the real facts. It is the function of the official to safeguard the interests of all who either buy or sell, and he is as quick, for instance, to reject a piece of weighing equipment which 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 bulk 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 have, in the very large majority of cases, the equipment and the opportunity to check for themselves the quantity of merchandise which is involved in the transaction before this is completed. The retail purchaser, on the other hand, frequently has neither. Therefore, the particular care which the weights and measures officer exercises to protect those who can not protect themselves is more than justified.

To sum up, then, we may say 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 of commodity is delivered, and that fraud, carelessness, and ignorance in this connection are eliminated.

Chapter 2.—PRESENT ORGANIZATION OF WEIGHTS AND MEASURES ADMINISTRATION IN THE UNITED STATES

The history of weights and measures administration in the United States begins with the birth of our Nation. The detailed story of the various steps in this development, from a national viewpoint, has been ably presented in another publication of the Bureau of Standards¹ and will not be repeated here. It will be sufficient for the purposes of this chapter to consider conditions as they exist to-day.

There is in the United States no Federal agency in charge of the supervision of commercial weights and measures throughout the country. This important governmental function is almost entirely in the control of the various States and cities, having been left to these agencies by the Federal Congress. The Congress has, of course, recognized certain standards of length, mass, and capacity, and at one time the several States were furnished with copies of these standards by the Government. The subsequent adoption by the States, as State standards, of the standards so furnished has resulted in our standards being uniform throughout the land.

The present National Bureau of Standards is an outgrowth and development of the old Office of Standard Weights and Measures of the Coast and Geodetic Survey; upon the organization of the Bureau of Standards in 1901, the weights and measures duties of that office were trans-

¹ Bureau of Standards Miscellaneous Publication No. 64, "History of the Standard Weights and Measures of the United States," by Louis A. Fischer. This publication may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents per copy.

ferred to the *division of weights and measures* of the new bureau. As the custodian of the national standards of length and mass, the Bureau of Standards has a most fundamental relation to all weights and measures activity in the country, and one of its primary functions is to test the standards of the States so that uniformity in this regard may be maintained. But beyond this point the bureau is without statutory authority to do more than act in an advisory capacity in the promotion of uniformity of weights and measures administration. However, every effort is made to do all that may properly be done in this direction. The bureau has available a large amount of technical weights and measures information, members of the staff are familiar with the practical problems arising in the field, and this information and the results of this experience are freely offered to weights and measures officials and others interested. In other words, the National Bureau of Standards endeavors to act at all times as a clearing house for weights and measures information, and the many inquiries which are received on a large variety of matters related to this subject indicate that a gratifying degree of success is being attained in this direction.

In addition to the recognition by the Congress of standards of weight and measure, there have been enacted a number of Federal laws, certain of which² may be summarized as follows: The *standard apple barrel law*, approved August 3, 1912, established a standard barrel for apples and standard grades for apples shipped in interstate commerce. As to its requirements in relation to standard barrels, this act was superseded by the *standard barrel law*, which was approved on March 4, 1915. In this later act the standard

² For the text of these laws and the rules and regulations promulgated thereunder, see Appendix I.

barrel which had formerly been established for apples was established for "fruits, vegetables, and other dry commodities other than cranberries," and a somewhat smaller barrel was made the standard for cranberries. The former has a capacity of 7,056 cubic inches, and the latter has a capacity of 5,826 cubic inches. Three-quarter-barrel, half-barrel, and third-barrel subdivisions were provided for in each case. This law applies both to interstate and to intrastate transactions and provides that all shipments in barrels of the commodities mentioned in the act must be in barrels of one of the standard sizes established. This law specifically provides that prosecutions may be begun upon complaint of State and local weights and measures officials.

The *standard lime barrel law* applies to importations and interstate shipments of lime and establishes a "large" barrel of 280 pounds net weight, and a "small" barrel of 180 pounds net weight. It also provides for the sale of lime in fractional parts of the "small" barrel, and requires that all such containers, as well as all barrels, shall be marked to show their net weight, the name of the manufacturer and where manufactured, and, if imported, the name of the country from which imported. This act was approved August 23, 1916.

The *standard container act*, approved August 31, 1916, fixes the standard for Climax baskets for "grapes and other fruits and vegetables" as baskets of 2, 4, and 12 quarts dry measure, and specifies the dimensions to be followed in the manufacture of these various sizes. It also provides that the standard baskets or other containers for "small fruits, berries, and vegetables" shall be of the capacities of one-half pint, 1 pint, 1 quart, and multiples of the quart, dry measure. This act applies only to interstate transactions.

The *net weight amendment to the Federal food and drugs act*, approved March 3, 1913, requires that when food is sold in package form the quantity of the contents must be marked on the package in terms of weight, measure, or numerical count; reasonable variations established by rules and regulations are permitted. This statute applies only to interstate transactions.

In general, however, the Congress has placed the issue of weights and measures supervision squarely up to the individual States and has left them free to enact such legislation as they deem expedient. As a result, we find that 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.

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.

A second plan is a dual system with both State and local officers regularly engaged in the testing of commercial weighing and measuring devices. 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 State 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.

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 issuance of rules and regulations, specifications and tolerances, methods of test, etc., and the periodical testing of the standards of the local officials.

Not all States, however, can be classified as having weights and measures organizations falling into one of the groups described above. Of those remaining, some States may have one or even several active local officials, while the balance have no active supervision whatsoever. Of this group it need only be said that it is extremely unfortunate

that the important field of weights and measures supervision has been so slighted in so many instances.

It is believed that it will be found very helpful to weights and measures officials, to those jurisdictions contemplating the creation of weights and measures departments, and to manufacturers and others who have occasion to get into touch with weights and measures departments throughout the country, to present a brief summary of the weights and measures organizations of the different States. The information given below is in accordance with the latest records of the National Bureau of Standards, and every effort has been made to bring this information up to date. There will be shown in the case of each State as much of the following information as can be given: (1) The titles of the State officers in charge of weights and measures administration. The names of the present incumbents will not be given; officials may always be addressed by title, thereby insuring the delivery of correspondence to the proper parties irrespective of who may be occupying the office at any given time. (2) The general character of the weights and measures organization. (3) The number and title of subordinate State weights and measures officers. (4) The number of cities and towns and the number of counties having weights and measures departments, and the titles of the local officials.

STATE WEIGHTS AND MEASURES ORGANIZATIONS

[AS OF 1926]

In this summary, the title of the officer actively in charge of weights and measures administration for the State, and who may be directly addressed when it is desired to communicate with the State office, is given in capitals, followed, in italics, by the name of the department of the State, if any,

having general supervision, and finally by the name of the city where the office is located, for each State having a State weights and measures organization, the whole forming a complete address. Below the address, titles of officials are indicated by italics.

ALABAMA

CHIEF, DIVISION OF WEIGHTS AND MEASURES, *Department of Agriculture and Industries*, Montgomery.

The *commissioner of agriculture and industries*, ex officio, *superintendent of weights and measures*, is the principal weights and measures officer of the State, has full authority to exercise supervision in all parts of the State, and carries on weights and measures work in all places not having local sealers. There are four *State inspectors and sealers of weights and measures*.

Any county or city may appoint a *sealer of weights and measures*; there are one county and five cities having local sealers.

ARIZONA

STATE INSPECTOR OF WEIGHTS AND MEASURES, Phoenix.

The *State inspector of weights and measures* is appointed by the governor and carries on weights and measures supervision in all parts of the State except in cities having city sealers. There are no deputy State inspectors.

Cities with populations in excess of 5,000 are required to appoint *sealers of weights and measures*; there are eight cities having such sealers.

ARKANSAS

The law makes the *secretary of state* (Little Rock) the custodian of the State standards of weight and measure.

No active weights and measures supervision is carried on by the State.

Counties are required to procure copies of the State standards, and *county clerks* are required to "seal all weights and measures that may be presented to them for that purpose which correspond with the county standard." *Constables* of townships and *marshals* of cities and towns are required to make annual weights and measures inspections.

CALIFORNIA

CHIEF, DIVISION OF WEIGHTS AND MEASURES, *Department of Agriculture*, Sacramento.

The division of weights and measures has broad powers of weights and measures supervision throughout the State, including the authority to appoint *deputy State inspectors of weights and measures* for counties of certain classes. In other counties the boards of supervisors are required to appoint *county sealers of weights and measures*; cities and towns may appoint sealers.

There are 23 counties with deputy State inspectors and 34 counties with county sealers.

COLORADO

The law makes the *State treasurer* (Denver) the custodian of the State standards of weight and measure. No active general weights and measures supervision is carried on by the State. The *State oil inspector* is required to test all "mechanical devices for the measurement of oil or gasoline."

Each county is required to appoint an *inspector of weights and measures*. Cities and towns may provide for weights and measures inspection.

CONNECTICUT

DEPUTY SUPERINTENDENT, DIVISION OF WEIGHTS AND MEASURES, *State Police Department*, Hartford.

The *superintendent of State police*, ex officio, *superintendent of weights and measures*, is the principal weights and measures officer of the State and has general supervision over all weights and measures matters in the State. There are two *State inspectors of weights and measures*.

All counties, and all cities having populations of 25,000 or more, are required to appoint *sealers of weights and measures*, and towns may so appoint; there are 6 counties and 12 cities having local sealers.

DELAWARE³

The law makes the *State chemist* (Dover) the custodian of the State standards of weight and measure. No active supervision of weights and measures is carried on by the State.

There are three *regulators of weights and measures*, one for each county, appointed by the governor.

DISTRICT OF COLUMBIA

SUPERINTENDENT OF WEIGHTS, MEASURES, AND MARKETS, Washington.

The department of weights, measures, and markets has entire charge of all weights and measures matters in the District except that it has no authority over the equipment of the Federal Government or the actions of Federal employees when acting in their official capacities.

³ A bill providing for comprehensive, state-wide weights and measures supervision was presented to the 1927 legislature, but failed of passage.

There are a *chief inspector*, six *inspectors of weights, measures, and markets*, and numerous employees at the municipal markets.

FLORIDA

An inspection of gasoline-dispensing devices is carried on under the direction of the *commissioner of agriculture* (Tallahassee); aside from this, no active weights and measures supervision is carried on by the State. A number of cities have local weights and measures officers.

GEORGIA

No active weights and measures supervision is carried on by the State. The *ordinaries* of the counties are given certain weights and measures authority and duties. A few cities have local weights and measures officers.

IDAHO

DIRECTOR, BUREAU OF WEIGHTS AND MEASURES, *Department of Agriculture*, Boise.

The *secretary of agriculture* is the principal weights and measures officer of the State and is authorized to carry on supervision in all parts of the State. There are two *State inspectors of weights and measures*.

Any municipal corporation may establish a local department of weights and measures, but none have exercised this option.

ILLINOIS

SUPERINTENDENT, DIVISION OF STANDARDS, *Department of Trade and Commerce*, Springfield.

The *director of trade and commerce* is the principal weights and measures officer of the State, has supervision throughout the State, and carries on all tests wherever there

are no local inspectors. There are eight *State inspectors of weights and measures*.

Cities having populations of 25,000 or more are required to appoint *city inspectors of weights and measures*. There are 16 cities having local inspectors.

INDIANA

COMMISSIONER, DEPARTMENT OF WEIGHTS AND MEASURES,
Indianapolis.

The *food and drug commissioner*, ex officio *commissioner of weights and measures*, is the principal weights and measures officer of the State and has broad powers of supervision throughout the State. There are three *State inspectors of weights and measures*.

With certain exceptions, counties having populations of 30,000 and over, and cities of the first, second, and third classes are required to appoint *inspectors of weights and measures*. There are 8 counties and 12 cities having local inspectors; in addition there are 6 joint jurisdictions.

IOWA

STATE SEALER OF WEIGHTS AND MEASURES, *Department of Agriculture*, Des Moines. (In charge of standards.)

CHIEF INSPECTOR, DIVISION OF DAIRY AND FOOD, *Department of Agriculture*, Des Moines. (In charge of inspectional activities.)

The department of agriculture has control of weights and measures supervision throughout the State, the *secretary of agriculture* being the principal weights and measures officer of the State. The *State sealer* (a member of the staff of the department of agriculture) has the custody of the standards

and conducts all tests of standards; the inspection service of the division of dairy and food conducts all field inspections. There are 2 *inspectors of heavy-capacity scales* and 30 *general inspectors* doing weights and measures work in connection with their other departmental duties.

Cities and towns may appoint local *sealers of weights and measures*; there are seven cities having such sealers.

KANSAS

DEPUTY STATE SEALER OF WEIGHTS AND MEASURES, Lawrence
(care of State University).

The *chancellor of the State university*, ex officio, *State sealer of weights and measures*, in conjunction with the *secretary of the State board of health*, exercises weights and measures supervision in the State. There are 14 food and drug inspectors who devote a part of their time to weights and measures field inspections; there is also a *scale expert* connected with the State grain weighing and inspection department (with offices at Kansas City, Mo.) who tests elevator and other grain-weighing scales at terminal points.

County clerks are ex officio *county sealers of weights and measures*; cities may appoint *city sealers of weights and measures*. None of the counties have active weights and measures organizations; five cities have city sealers.

KENTUCKY

The law makes the *secretary of state* (Frankfort) the custodian of the State standards of weight and measure. No active weights and measures supervision is carried on by the State.

Cities of the first to fourth classes, inclusive, may provide for local weights and measures supervision; other cities and towns may provide for *public weighers*.

LOUISIANA

The law makes the *secretary of state* (Baton Rouge) the custodian of the State standards of weight and measure.

The governor appoints two *inspectors of weights and measures* to act in the city of New Orleans. Elsewhere in the State the police juries of the several parishes and all municipal corporations are empowered to provide for weights and measures inspection when this is deemed necessary, but there is no active supervision outside of New Orleans.

MAINE

DEPUTY STATE SEALER, BUREAU OF WEIGHTS AND MEASURES,
Department of Agriculture, Augusta.

The *commissioner of agriculture*, ex officio, *State sealer of weights and measures*, is the principal weights and measures officer of the State and has full authority to exercise supervision throughout the State.

Every city and town is required to appoint a *sealer of weights and measures*; there are 100 cities and towns having sealers.

MARYLAND

CHIEF, DEPARTMENT OF MARKETS, *Board of Agriculture*, College Park.

The department of markets has concurrent jurisdiction with local weights and measures officials in the case of weighing and measuring equipment used in connection with farm produce.

The law requires the appointment by each county of a *keeper of standards of weights and measures*, but outside of the city of Baltimore, where there is an active division of weights and measures of the city bureau of standards, little active supervision is carried on.

MASSACHUSETTS

DIRECTOR, DIVISION OF STANDARDS, *Department of Labor and Industries*, Boston.

The division of standards has broad powers with respect to weights and measures supervision throughout the State, including statutory authority to approve or disapprove of type. There are eight *State inspectors of standards*.

Towns and cities of 10,000 population or more are required to appoint regular *sealers of weights and measures*, and smaller places must provide for an inspection and test of their weighing and measuring devices at least once annually. There are 355 cities and towns having sealers.

MICHIGAN

CHIEF, DIVISION OF WEIGHTS AND MEASURES, *Bureau of Foods and Standards, Department of Agriculture*, Lansing.

The *commissioner of agriculture* is the principal weights and measures officer of the State, and has full authority to exercise supervision in all parts of the State. There are three *State inspectors of weights and measures*.

Any county or incorporated city may appoint a local *sealer of weights and measures*; there are 13 counties and 23 cities having such sealers.

MINNESOTA

SUPERVISOR, DEPARTMENT OF SCALES, WEIGHTS, AND MEASURES, *Railroad and Warehouse Commission*, Minneapolis.

The department of scales, weights, and measures has exclusive control of all weights and measures matters in the State, no provision being made for local weights and meas-

ures officials. There are 22 *State inspectors of scales, weights, and measures*.

MISSISSIPPI

The law requires that copies of the State standards shall be deposited with the *secretary of state* (Jackson) and at the different State institutions of learning, and the secretary of state and the *proctors* of those institutions are authorized to test and seal weights and measures brought to them. No active general weights and measures supervision is carried on by the State.

The *inspector of provisions* of a county or city, or, if there be no such official, then the *clerk of the circuit court* (for counties) and the *clerk of the city* (for cities), is *ex officio keeper of the standards of weights and measures*.

MISSOURI

No active general weights and measures supervision is carried on by the State. Cities are empowered to create departments of weights and measures, and a few of the larger cities have done so. *County clerks* are also made weights and measures officers for the counties.

MONTANA

DEPUTY STATE SEALER OF WEIGHTS AND MEASURES, *Office of the Secretary of State, Helena*. (All matters except scales for weighing grain.)

COMMISSIONER, DEPARTMENT OF AGRICULTURE, LABOR, AND INDUSTRY, Helena. (Scales for weighing grain.)

The *secretary of state*, *ex officio*, *State sealer of weights and measures*, and the *commisisoner of agriculture, labor, and industry* are the principal weights and measures officers of the State, for all matters except grain scales, and for grain scales, respectively. Under the supervision of the secretary

of state are the *county auditors* in counties of the first to fifth classes, inclusive, and the *county clerks* in other counties—who are, ex officio, *inspectors of weights and measures*—and the *deputy sealers of weights and measures* of municipal corporations; there is but one of the latter—in Butte. The *State scale expert*, under the supervision of the commissioner of agriculture, labor, and industry, performs the field work in connection with scales for weighing grain.

NEBRASKA

SECRETARY, DEPARTMENT OF AGRICULTURE, Lincoln.

The department of agriculture has full authority to exercise weights and measures supervision throughout the State. There are five *State inspectors of weights and measures*.

Any city or municipality may appoint a local *sealer of weights and measures*; there are such sealers in Lincoln and Omaha.

NEVADA

SEALER OF WEIGHTS AND MEASURES, Reno (care of Nevada Agricultural Experiment Station).

The *commissioner of the board of control of the Nevada agricultural experiment station*, ex officio, *sealer of weights and measures*, is charged with weights and measures supervision throughout the State, there being no local weights and measures officers. There are two *deputy sealers of weights and measures*.

NEW HAMPSHIRE

COMMISSIONER OF WEIGHTS AND MEASURES, Concord.

The commissioner of weights and measures is appointed by the governor and council and has general supervision over all weights and measures matters in the State. There are three *State inspectors of weights and measures*.

All cities of 10,000 population and over are required to appoint *sealers of weights and measures*; there are eight cities having such sealers.

NEW JERSEY

STATE SUPERINTENDENT OF WEIGHTS AND MEASURES, Trenton.

The State superintendent of weights and measures is appointed by the governor and has general supervision over all weights and measures matters in the State. There are four *assistant State superintendents of weights and measures*.

All counties, and all municipalities of 60,000 population and over, are required to appoint local *superintendents of weights and measures*, and smaller municipalities may appoint such officers. There are 21 counties having "county superintendents" and 17 municipalities having "municipal superintendents."

NEW MEXICO

The law makes the *secretary of state* (Santa Fe) the custodian of the State standards. No active weights and measures supervision is carried on by the State.

County sheriffs, ex officio, *public weighmasters*, are required to appoint *deputy public weighmasters* to carry on the duties of weights and measures supervision.

NEW YORK

DIRECTOR, BUREAU OF WEIGHTS AND MEASURES, *Department of Agriculture and Markets*,⁴ Albany.

The State bureau of weights and measures has general supervision throughout the State. There are four *State inspectors of weights and measures*.

⁴ The name was changed on Jan. 1, 1927, from "Department of farms and markets."

Each county and each city is required to appoint a local *sealer of weights and measures*; there are 56 counties and 58 cities having such sealers. In the city of New York the title of the weights and measures official is *commissioner, mayor's bureau of weights and measures*.

NORTH CAROLINA⁵

SUPERINTENDENT OF WEIGHTS AND MEASURES, *Department of Agriculture*, Raleigh.

The new, state-wide weights and measures law is to be administered by the department of agriculture, the superintendent of weights and measures being appointed by the commissioner of agriculture. Broad powers of supervision are granted throughout the State.

Towns and counties may appoint local *standard keepers* or *inspectors of weights and measures*; a few counties and cities already have such officials.

NORTH DAKOTA

The division of weights and measures (Bismarck) of the State department of agriculture and labor has the custody of the State standards of weight and measure and is charged with the testing of county standards. No active weights and measures supervision is carried on by the State.

County sheriffs are, ex officio, *inspectors and sealers of weights and measures*.

OHIO

CHIEF, DIVISION OF FOODS AND DAIRIES, *Department of Agriculture*, Columbus.

The *director of agriculture*, ex officio, *State sealer of weights and measures*, is the principal weights and measures

⁵ A law providing for comprehensive state-wide weights and measures supervision was enacted by the 1927 legislature.

officer of the State and has wide powers of supervision throughout the State; there are two *deputy State sealers of weights and measures* whose activities are directly supervised by the chief of the division of foods and dairies.

County auditors are, ex officio, *county sealers of weights and measures* and are required to appoint *deputy county sealers of weights and measures* to carry on weights and measures activities; cities may appoint *city sealers of weights and measures*. There are 88 counties having deputy sealers and 18 cities having city sealers.

OKLAHOMA

DIRECTOR, STATE BUREAU OF STANDARDS, Norman.

The director of the State bureau of standards and two assistant directors constitute a "board of control" which governs the activities of the bureau. The bureau has the custody of the State standards, tests local standards, and has control of "standard methods of weighing, measuring, and testing in the State." The State board of agriculture has certain authority with respect to farm and mill products.

Each county is required to have a *public weigher* whose scales must be tested by the *county sheriff*. Cities of the first class may prescribe rules for weighing and measuring every commodity.

OREGON

DEPUTY STATE SEALER OF WEIGHTS AND MEASURES, Salem.

The *State market agent*, ex officio, *State sealer of weights and measures*, is the principal weights and measures officer of the State, has general supervision throughout the State, and carries on weights and measures work in all parts of the State except in cities having city sealers. There are four *district sealers of weights and measures*.

Any incorporated city may appoint a *city sealer of weights and measures*. Portland is the only city having such a sealer.

PENNSYLVANIA

CHIEF, BUREAU OF STANDARD WEIGHTS AND MEASURES, *Department of Internal Affairs*, Harrisburg.

The bureau of standard weights and measures has broad powers of supervision throughout the State, including statutory authority to approve or disapprove of type. There are three *State inspectors of weights and measures*.

All counties, and cities of the first, second, and third classes, are required to appoint local *inspectors of weights and measures*; there are 68 counties and 42 cities having such inspectors. The title of the principal officers for Pittsburgh and for Allegheny County is *chief inspector of weights and measures*, and for Philadelphia *supervisor, bureau of weights and measures*.

RHODE ISLAND

STATE SEALER OF WEIGHTS, MEASURES, AND BALANCES, Providence.

The State sealer of weights, measures, and balances is appointed by the governor and has supervision over weights and measures matters throughout the State.

Towns and cities are required to appoint local *sealers of weights and measures*; there are 39 cities and towns having such sealers.

SOUTH CAROLINA

CHIEF INSPECTOR, *Department of Agriculture, Commerce, and Industries*, Columbia.

The *commissioner of agriculture, commerce, and industries* is the principal weights and measures officer of the

State and exercises exclusive supervision throughout the State, no provision being made for local weights and measures officers; all inspectional activities of the department, including weights and measures supervision, are in the immediate charge of the chief inspector of the department. There are three *State inspectors of weights and measures*.

SOUTH DAKOTA

DIRECTOR, DIVISION OF INSPECTION, *Department of Agriculture*, Pierre.

The *secretary of agriculture* is the principal weights and measures officer of the State and exercises exclusive supervision throughout the State, no provision being made for local weights and measures officers; all inspectional activities of the department, including weights and measures supervision, are grouped in the division of inspection. There are three *inspectors of weights and measures* who devote all of their time to such duties, and eight *general inspectors* and one *special inspector* who devote a part of their time to weights and measures duties.

TENNESSEE

STATE SEALER OF WEIGHTS AND MEASURES, Knoxville (care of University of Tennessee). (In charge of standards.)
SUPERINTENDENT OF WEIGHTS AND MEASURES, *Department of Agriculture*, Nashville. (In charge of inspectional activities.)

The *president of the University of Tennessee* is, ex officio, the *State sealer of weights and measures* and has the custody of the State standards. The *superintendent of the division of foods, fertilizers, and dairies* of the department of agriculture is, ex officio, *superintendent of weights and measures* and has general supervision over all weights and measures

matters in the State. There are six *inspectors* who devote a part of their time to weights and measures work.

Any county or city may appoint a local *sealer of weights and measures*; a number of counties and cities have exercised this option.

TEXAS

CHIEF INSPECTOR, DIVISION OF WEIGHTS AND MEASURES,
Department of Agriculture, Austin.

The *commissioner of agriculture* is the principal weights and measures officer of the State and has full authority to exercise supervision throughout the State. There are 11 *State sealers of weights and measures*.

Any city may appoint a *city sealer of weights and measures*; there are 10 cities having such sealers.

UTAH

DEPUTY SUPERINTENDENT OF WEIGHTS AND MEASURES, *Department of Agriculture, Salt Lake City.*

The *commissioner of agriculture*, ex officio, *superintendent of weights and measures*, is the principal weights and measures officer of the State, has broad powers of supervision, and is required to exercise supervision in all parts of the State where the appointment of city sealers is not required. There are three *State inspectors of weights and measures*.

Cities having populations of 25,000 and over are required to appoint *city sealers of weights and measures*; Salt Lake City and Ogden have such sealers.

VERMONT

DEPUTY COMMISSIONER OF WEIGHTS AND MEASURES, *Department of Industries, Montpelier.*

The *commissioner of industries*, ex officio, *commissioner of weights and measures*, is the principal weights and meas-

ures officer of the State and exercises exclusive supervision throughout the State, there being no active local weights and measures offices. There are three *State inspectors of weights and measures*.

VIRGINIA

DIRECTOR, DIVISION OF MARKETS, *Department of Agriculture and Immigration*, Richmond.

The *commissioner of agriculture and immigration* is the principal weights and measures officer of the State and has full authority to exercise supervision throughout the State.

Counties and cities may appoint local *sealers of weights and measures*. There are 9 counties and 11 cities with active local sealers.

WASHINGTON

SUPERVISOR, DIVISION OF WEIGHTS AND MEASURES, *Department of Agriculture*, Olympia.

The *director of agriculture* is the principal weights and measures officer of the State, has general supervision throughout the State, and carries on all weights and measures work except in cities having local sealers. There are five *State sealers of weights and measures*.

Cities having populations of 50,000 and over are required to appoint *city sealers of weights and measures*. There are three cities having such sealers.

WEST VIRGINIA

COMMISSIONER OF WEIGHTS AND MEASURES, Charleston.

The *commissioner of labor*, ex officio, *commissioner of weights and measures*, has broad powers of supervision throughout the State and carries on weights and measures work where there are no local sealers. There are two *State*

inspectors of weights and measures. The *director of the physical laboratory of the West Virginia University* (Morgantown) is, *ex officio*, *assistant commissioner of weights and measures*, and conducts tests of standards.

Cities having populations of 25,000 and over are required to appoint, and counties may appoint, *local sealers of weights and measures*. There are 5 cities and 16 counties having such sealers.

WISCONSIN

CHIEF INSPECTOR, DIVISION OF WEIGHTS AND MEASURES, *Dairy and Food Department*, Madison.

The *dairy and food commissioner*, *ex officio*, *superintendent of weights and measures*, has full authority to exercise supervision throughout the State and carries on weights and measures work in all parts of the State except in cities having city sealers. There are eight *State sealers of weights and measures*.

Cities having populations of 5,000 or more are required to appoint *city sealers of weights and measures*. There are 36 cities having such sealers.

WYOMING

COMMISSIONER, DAIRY, FOOD, AND OIL DIVISION, *Department of Agriculture*, Cheyenne.

The *commissioner of agriculture* is the principal weights and measures officer of the State and exercises exclusive supervision throughout the State, there being no local weights and measures officials. There are two *State inspectors of weights and measures*.

Chapter 3.—WEIGHTS AND MEASURES ADMINISTRATION ABROAD

Questions frequently arise as to the character of weights and measures supervision which prevails in various foreign countries. Moreover, it is always a matter of interest to one engaged in a particular line of activity to learn something of the conditions under which similar work is carried on in other lands. The purpose of this chapter, then, is to supply a brief synopsis of typical weights and measures organizations of foreign countries.

The limitation on the space which can be devoted to this subject precludes anything but an outline of the organization of each country reported upon. The information given has been supplied in each case by a responsible official of the country in question who was asked to prepare a short article upon the general character and scope of the national organization, the title and headquarters of the principal officer, the number and title of national field inspectors, the scope and number of local or subordinate organizations with the titles of their principal officers, the degree of control exercised by the national organization over local personnel, the total number of officials in all groups, the classes of weighing and measuring devices examined in the field, and the situation with respect to specifications and tolerances. These articles have been briefed so that the method of presentation may be uniform in all cases.

No effort has been made to include in this summary all foreign countries having weights and measures organizations; it may also be mentioned that the data requested have

not been received from all of the countries originally addressed upon the matter.

FOREIGN WEIGHTS AND MEASURES ORGANIZATIONS

ARGENTINA

Ministry of Agriculture (Ministerio de Agricultura).

National Office of Weights and Measures (Oficina Nacional de Pesas y Medidas) (Buenos Aires).

The control of weights and measures matters is exercised jointly by the national and municipal governments. All weighing and measuring instruments must be approved as to type, verified, and sealed before exposure for sale, and this work is performed by the Federal authorities. The authority of the municipalities is strictly limited to the periodic retesting of these instruments in the localities where they are used commercially, and this work is regulated by the Federal authorities. The latter also have exclusive jurisdiction over all instruments used by the various departments of the Federal Government.

The number of municipal inspectors is small at present, only the larger cities having any weights and measures organizations, and the inspectors are dependent for their compensation upon the fees collected.

AUSTRIA

Ministry of Commerce and Trade (Bundesministerium für Handel und Verkehr).

Bureau of Standards and Surveys (Bundesamt für Eich-und Vermessungswesen) (Vienna).

Chief: President (Präsident).

Standardization Division (Fachgruppe für das Eichwesen).

3 Inspectors (Located at Vienna, Linz, and Graz).

126 Standardization Offices (Eichämter).

Total personnel about 150, of whom 110 are technically trained.

The control of weights and measures matters is in the hands of the National Government. The *Standardization Division* has the custody of the national standards, makes examinations for approval of type, issues specifications and tolerances and instructions for testing, supervises all activities of the various standardization offices, and tests electric and water meters. The *standardization offices* are directly charged with the enforcement of the weights and measures regulations. Fees are charged for testing.

The president of the *Bureau of Standards and Surveys* confers with an advisory committee on technical and scientific matters.

In the *Standardization Division* there are a *scientific section* (wissenschaftliche Abteilung) which conducts physical and technical research and tests precision instruments for industry, and a *meter section* (Eichung der Zähler und Wassermesser) which tests water and electric meters.

BELGIUM

Ministry of Industry, Labor, and Social Welfare (Ministère de l'Industrie, du Travail et de la Prévoyance Sociale).

General Directorate of Industry (Direction Générale de l'Industrie).

Technical Service of Weights and Measures and of Electrical Calibration (Service Technique des poids et mesures et de l'Étalonnage électrique) (Brussels).

Chief: Director (Directeur).

Chief Inspector (Verificateur en chef).

17 Testing Districts.

Chiefs: Inspectors (Verificateurs).

10 Assistant Inspectors (Verificateurs-adjoints).

The control of weights and measures matters is entirely in the hands of the National Government. The *Technical Service of Weights and Measures* carries on scientific work, precision testing, testing of standards, etc. Weights, measures of capacity and length, and instruments for weighing

are regularly tested in the field. Gas and electric meters are submitted for first verification only.

Regulations applicable to the entire country are drawn up by the central office, and all equipment in use must conform to these regulations. The design of apparatus must also be approved by the central office.

CANADA

Department of Trade and Commerce.

Weights and Measures Standards Branch (Ottawa).

Chief: Director.

One Chief Factory Inspector.

Two Superintendents.

18 Districts.

Chiefs: District Inspectors.

114 Inspectors.

The control of weights and measures matters is entirely in the hands of the National Government. All weighing and measuring devices must be approved as to type, and all classes of weighing and measuring devices, including railroad-track scales and post-office scales, are tested yearly. Fees are charged for all testing. Supervisional work, in addition to testing, is regularly carried on.

CZECHOSLOVAKIA

Ministry of Public Works (Ministerstva verejnych prací).

Central Inspection Board (Československý ústřední inspektorát pro státní službu cejchovní) (Prague).

53 employees on technical and administrative staff.

3 Inspection Boards (Prague, Brno, and Bratislava).

151 Field Inspection Offices

30 Branch Offices

26 Barrel-Testing Offices

} 237 employees.

The control of weights and measures matters is entirely in the hands of the National Government. Commercial

weighing and measuring devices are tested when new and at regular intervals thereafter. Fees are charged for all testing.

The *Central Inspection Board* has the custody of the national standards of length and mass and provides the subordinate *boards* with the necessary equipment. The *Central Inspection Board* makes all examinations for approval of type of commercial apparatus and maintains a laboratory for precise measurements of length, area, volume, mass, and temperature, for the determination of physical constants, and for the testing of gas, water, and electric meters.

FRANCE

Ministry of Commerce and Industry (Ministère du Commerce et de l'Industrie).

Bureau of Commercial and Industrial Affairs (Direction des Affaires commerciales et industrielles) (Paris).

Chief: Director (Directeur).

6 Districts (circonscription régionale).

Chiefs: Chief Inspectors (Vérificateurs en chef).

295 Verification offices (bureaux de vérification).

345 Inspectors (vérificateurs) and Assistant Inspectors (vérificateurs-adjoints).

The control of weights and measures matters is entirely in the hands of the National Government. In general, all classes of weighing and measuring apparatus are subject to test, and, in addition, the inspectors are charged with the duty of carrying on supervisory work. The work of the *inspectors* is supervised by the *chief inspectors* of their respective districts.

In the case of all new types of weighing and measuring apparatus a request for admission to verification and sealing must be made to the *Committee on Commercial Measuring Apparatus* (Commission de Metrologie Usuelle). Inspec-

tors are notified of all apparatus which is approved. The *committee* must also pass upon all regulations and notices which have to do with instruments of measurement.

GREAT BRITAIN

Board of Trade.

Standards Department (London).

Chief: Deputy Warden of the Standards.

1 Chief Technical Assistant.

3 Examiners.

4 Assizers.

The control of weights and measures matters is partly national and partly local. The *Board of Trade* has the custody of the national standards; it must approve of the type of novel weighing and measuring appliances before these may be used in trade; it examines and certifies candidates for local inspectorships; it verifies and re-verifies the standards of the local *inspectors*; and it issues information and advice on weights and measures matters to *local authorities* and *inspectors*.

Local weights and measures administration is in the hands of the various *local authorities* (county and borough councils) who appoint *inspectors* and *assistants* and provide their equipment. There are nearly 300 *local authorities* and about 575 *inspectors*. In addition, there are about 110 *inspectors of gas meters*.

All weights, measures, weighing instruments, and gas meters must be verified and stamped by *inspectors* before being used in trade; the conditions under which they may be accepted, the tests to be applied, and the tolerances are specified in the regulations of the *Board of Trade*. Aside from gas meters, only such measuring instruments are required to be stamped as are prescribed by regulations made

by the *Board of Trade* under the new act of 1926. No such regulations have yet (July 1, 1926) been issued. Gasoline-measuring devices will probably be the first class of measuring instruments to be brought under control.

Although the *inspectors* are appointed by their *local authorities* and are directly under their control, the authorities must see to it that the requirements of the regulations and instructions of the *Board of Trade* are met by the inspectors.

MEXICO

Ministry of Industry, Commerce, and Labor (Secretaria de Industria, Comercio y Trabajo).

Department of Weights and Measures (Departamento de Pesas y Medidas) (Mexico City).

Verification Office of the First Order (Verificadora de Primer Orden) (Mexico City).

31 Verification Offices of the Second Order (Verificadoras de Segundo Orden) (Capitols of States and other principal cities).

The control of weights and measures matters is entirely in the hands of the National Government. There is a total of 242 employees engaged in weights and measures activities. The titles of the different grades are as follows:

1. Engineer Specialists (Ingenieros Especialistas).
2. Supervisors (Visitadores) who supervise personnel.
3. Technical Officials (Oficiales Técnicos).
4. Chiefs of Offices (Jefes de Oficina).
5. Testing Inspectors of electrical or photometrical instruments (Inspectores Verificadores de instrumentos eléctricos o fotométricos).
6. Testing Inspectors of other instruments than those mentioned.

All instruments which serve or which may serve to obtain measurements which enter directly or indirectly into any commercial transaction or which are used in determining the compensation for personal services are subject to official inspection and test. Fees are charged for these services.

New types of instruments not in compliance with existing regulations may be submitted to the *Department of Weights and Measures* for examination for approval of type.

NETHERLANDS

Ministry of Labor, Industry, and Commerce.

Service of Weights and Measures (The Hague).

Chief: Inspector of the Service of Weights and Measures (Inspecteur van het IJkwezen).

12 District Bureaus of Verification (ijkkantoor).

Chiefs: Inspector, Chief of Service (IJker, Chef van dienst).

8 Inspectors (IJkers).

8 Assistant Inspectors (Adjunct-ijkers).

The control of weights and measures matters is entirely in the hands of the National Government. New weights, measures, and gas meters must be sealed before use; thereafter they must be retested every two years (with some exceptions for gas meters) and after repairs. Owners may have retests as often as desired. Fees are charged for all testing. The inspectors periodically establish a testing station in each town, and weights and measures are brought there for test by the owners.

Weighing instruments and measuring instruments are not subject to control, but inspectors may test and report upon them.

NORWAY

Department of Commerce.

Director of Weights and Measures (Justervesenet) (Oslo).

9 District Offices of Verification.

The control of weights and measures matters is entirely in the hands of the National Government. All weighing and measuring devices must be approved as to type before verification, and verification must precede sale. Scales and weights of the railways, customs, and post offices, automatic

scales, and gasoline pumps are regularly tested in the field by Government inspectors every one or two years.

As to other equipment, portable devices must be sent to the nearest office for test, and nonportable devices are tested *in situ* by the office inspectors upon request. Seventy per cent of the work of verification is carried on by the Oslo office.

SWEDEN

Royal Mint and Standards Department (Kungl. mynt-och justeringsverket) (Stockholm).

Chief: Director of the Mint (myntdirector).

Supervisors (justeringskontrollör).

29 Districts.

Chiefs: Sealers (justerare).

The control of weights and measures matters is entirely in the hands of the National Government. In general, approval of type by the *Standards Department* is necessary in the case of scales and liquid-measuring devices. With certain exceptions in the case of scales used for weighing imports, liquid-measuring devices, and measure containers, all weighing and measuring devices must be sealed before use. Retests are required as follows: Linear measures and hydrometers every six years; weights every three years; liquid-measuring devices every year. Retests are not required on balances and scales.

The *Standards Department* tests all precision instruments and issues instructions for the testing of commercial devices by the sealers. Except in special cases weighing and measuring devices are brought to the sealers' offices for examination. The police make yearly inspections to determine that all commercial weighing and measuring devices have been sealed as required by law.

The equipment of the *sealers* is tested and adjusted and their work supervised by the *supervisors*. The *sealers* are

not paid by the State but receive the fees collected as compensation.

SWITZERLAND

Federal Council (Bundesrat).

National Department of Finance (Eidg. Finanzdepartement).

Bureau of Weights and Measures (Amt für Mass und Gewicht)
(Bern).

42 Testing Stations (Prüfämter) for electric meters.

Chiefs: Chief (Prüfamtvorsteher).

24 Testing Stations for water meters.

10 Testing Stations for gas meters.

129 Standardization Stations (Eichstätten).

Sealers of Weights and Measures (Eichmeistern).

The *Bureau of Weights and Measures* controls weights and measures administration throughout the country and is also the national technical laboratory, but outside the laboratory actual testing is not carried on by Federal employees. The *chiefs* of the *meter testing stations* are employees of the meter companies, but must conform to the regulations of the *bureau*; the *sealers of weights and measures* are officers of the 22 Cantons.

The law requires that commercial measures of length and capacity, weights, balances, hydrometers (tested only by the *bureau*), and gas, water, and electric meters must be tested—electric meters every 10 years, water meters every 7 years, dry gas meters every 10 years, wet gas meters every 15 years, weighing and measuring devices every 3 years, with but one test required on hydrometers.

Instructions for testing are issued by the *bureau* and inspectors of the *bureau* regularly examine the work and records of the *testing* and *standardization stations*. *Sealers of weights and measures* must successfully pass a course of instruction at the *bureau* after their appointment by their respective Cantons and before entering upon their official

duties. The *sealers* receive the fees collected in lieu of salary.

UNION OF SOUTH AFRICA

Superintendent of Assize (Pretoria).

District Assizers.

First and Second Grade Assizers.

Senior Inspectors and Inspectors.

} Total, 40 officials.

The control of weights and measures matters is entirely in the hands of the National Government, with the exception of gas, water, and electric meters, which, for the present, are taken care of by the municipalities. With the exception noted, all weighing and measuring devices must be approved as to type by a *board* representing Government, engineering, and commercial interests before such devices may be used, and they are thereafter subject to the control and test of the Government.

Heavy-duty scales, automatic scales, and gasoline pumps are tested in the field; other devices must be brought to the office of the assizer for examination.

The *Superintendent of Assize* also has authority with relation to the standardization of packages of certain commodities. General supervisional work is carried on in addition to testing.

Chapter 4.—A MODEL FORM OF WEIGHTS AND MEASURES ORGANIZATION

Where it is desired to create a department of weights and measures in a jurisdiction previously without one, or to reorganize an existing department along more efficient lines, the question arises as to what form shall be adopted for the new organization. In the study of this question careful consideration must 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 which seems to be best suited to various situations.

It must have been evident from what has gone before that, in the opinion of the National Bureau of Standards, 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 which 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.

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 it is certainly justified in providing for a comprehensive system of supervision.

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 they throw a great burden upon the manufacturers of weighing and measuring equipment, a burden which is eventually borne by the ultimate consumer through increased costs of the articles which he buys. In the second place they are most confusing to the business interests of the State who are unable to accept any single code for their guidance, but must endeavor to conform to whatever requirements may be in force in the locality where a particular transaction takes place. Again, they are conducive to confusion and discouragement on the part of the purchasing public, a group whose cooperation must be secured if maximum results are to be achieved. They also complicate the enforcement of the law and hamper the officials who are trying to

¹ See chapter 8 for the essential elements of an adequate weights and measures law.

enforce it. Lastly, they tend to bring into disrepute and contribute to a general dissatisfaction with the entire scheme of weights and measures supervision.

And these unfortunate results follow without any compensating benefits; moreover these conflicts, these variations, and these divergencies are entirely unnecessary in the first instance. Surely it can not sincerely be contended that conditions vary so widely within the confines of a single State that what is right and proper in the way of weights and measures supervision in one part of the State is not equally right and proper in all other parts.

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.

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 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

² See chapter 10.

official is not as 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 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.

These three essentials must be borne in mind whatever form of organization may be decided upon. Let us examine next the question of population and see how this bears upon our problem. Two factors must be considered in this connection, 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 relatively scattering, with few towns of any size—in some cases there are even very large areas with scarcely any people or business in them at all—while other sections are closely built up with a relatively high concentration of population. Finally we

have those States in which are located many large cities, with their dense populations, their large industries, and the very great amount of business which results from these.

Due consideration must be given to facts such as these in determining the type of organization which will give best results. In this relation it should be remembered that the larger the city the more necessary it is to have the services of the weights and measures official available at all times. It may also be taken as a general guide that any ordinary city of 25,000 to 50,000 population will usually provide enough work fully to employ the 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 must be given consideration. The danger of establishing an arbitrary State-wide system which may be suited to one locality, but not to another, should be guarded against; for instance, a plan requiring separate county weights and measures officers 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.

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 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 appeals 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 which has undoubtedly been followed in many States, as shown by their present organizations.

It must 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 which is required to appoint should be large enough to support a full-time official. In some States which 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 this action is not taken in many, or, perhaps, in the majority of the cases, and we merely have a continuance of the condition which 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.

When that type of organization is adopted which provides that all inspectional work shall be carried on by State officers, then the States 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.

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 must be comprehensive and due regard must 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 must be provided for.)

(c) An adequate number of properly trained and equipped officials. (Reasonable compensation must be provided for so that capable officials may be secured 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.

The organization must, therefore, be headed by an active State office of weights and measures which 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; which will issue decisions upon any questions of interpretation of law, specifications, regulations, etc.; and

which will maintain supervision over the equipment and activities of all weights and measures officials of the State.

The individual city or county which 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 must be a comprehensive ordinance or law,³ the work must be carried on in a vigorous and uniform manner throughout the jurisdiction, and there must be a sufficient number of officials to provide adequate protection 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 will probably be found advantageous to divide the territory 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 present as separate topics.

³ See chapter 8.

Chapter 5.—THE INDEPENDENT VERSUS THE SUBSIDIARY ORGANIZATION

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. The present tendency in this country, as indicated by recent reorganizations in a number of our 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" 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 organization scheme of the State.

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 office charged with the duty of making it effective be ranked on a par with the other major subdivisions of the service.

There are other reasons for this, however, besides that of propriety. 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 petty political restraints in his enforcement of law, and his authority should be adequate for able administration.

It is believed that in the organization 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. If this be done, at least the foundation will be laid for an efficient weights and measures administration and it will only remain to provide the necessary funds and secure the services of a man fitted to take charge of the office.

In this connection it is appropriate to mention that the tenure of office of the members of any weights and measures organization should not be dependent upon political considerations. 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. The folly of changing the personnel of the weights and measures office and field force at every change in the political complexion of the State or local administration must be obvious to even the most casual observer, for what could be more inefficient than the repeated removal from office of men who may, perhaps, just be reaching a state of efficiency after several years experience and study, in favor

of inexperienced and untrained men who must again 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. With the possible exception of the administrative head of the State office of weights and measures, all weights and measures officials should be under a form of civil service which provides for continuance in office during good behavior, so that the cumulative effects of their experience and study may be realized upon to the betterment of the service.

It has sometimes happened that when a State has undertaken 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 which 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 to a parallel with the weights and measures organization in this respect, but even here the field covered by the former is but a small part of that which 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, and he can hardly be expected

to display in the study of the new weights and measures problem the same enthusiasm and industry which animate the official whose sole duty it is to be to handle this matter. The attitude of the chief is reflected in the attitude of his subordinates, and the result may be a more or less half-hearted enforcement which can never be fully efficient.

The situation is often further aggravated by adding weights and measures duties to the duties of the existing subordinate officials, particularly the field men. Here again we have a divided interest and responsibility, with the probability that the new duties will be looked upon with disfavor and will be correspondingly poorly administered. "Weights and measures" is a technical subject and one which 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 which he can accomplish are in direct proportion to the extent of his mastery of this subject, and this 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 this 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 which it merits.

It is frequently urged in support of the plan just discussed that as 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 in objection 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 secure 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 whereby 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 been previously urged 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.

Chapter 6.—FEE SYSTEM AS APPLIED TO WEIGHTS AND MEASURES INSPECTIONS

The support of a particular activity of government, and especially the compensation of the officers engaged therein, by means of special assessments 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 to-day in the administration of State and local government 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, on the other hand 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.

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, which means, of course, that practically that entire branch of the official's work which we have designated as his "supervisional 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.

It is the general opinion to-day that the fee system in connection with weights and measures supervision is most unfortunate and can not be recommended or defended except in the most 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 ignorant, 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 the only logical excuse for the fee system, which in effect is a special tax upon the users of weighing and measuring equipment, falls to the ground, since it is manifestly unfair to single out one class and burden them 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.

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 which can be quickly made, rebalancing of scales found out of balance, etc. 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. In other words, 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.

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 co-operation, 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 supervisional activities are greatly interfered with.

Again, the official finds himself constantly confronted with the necessity for making a financial showing. He may feel that he must do the work which 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 which should be avoided by all means.

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 secure 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 the pernicious system of fees. Whether or not this somewhat extreme opinion be accepted, nevertheless it is believed that the concensus 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.

Chapter 7.—LICENSE SYSTEM IN RELATION TO WEIGHTS AND MEASURES ADMINISTRATION

Within recent years there has been a noticeable trend toward a more general use of licensing systems in connection with the enforcement of State and municipal laws. This can be accounted for by reason of the two outstanding characteristics of the license system. The first of these is that the authority to suspend or revoke a license forms a most powerful weapon in the hands of the government for the enforcement of the regulations in connection with which the license is granted. The second is that the granting of a license is almost invariably contingent upon the payment of a fee, as a result of which the license system lends itself very readily to the production of revenue.

The use of the licensing principle in connection with weights and measures administration is comparatively new, it is developing but slowly, and it is still rarely encountered. It seems to have started more or less indirectly through cooperation between weights and measures offices and license offices, each of which came into official contact with identical commercial groups. At the present time the license system has been proposed or adopted as an aid to the weights and measures supervision of a variety of groups among which may be mentioned peddlers, transient vendors, dealers in fuel, weighmasters, operators of gasoline-dispensing devices, operators of creameries, cheese factories, etc.

In principle the system is applicable to any group using commercial weighing or measuring devices; in practice, however, it is believed that, if used at all, it will be found ad-

visable to limit the application of the system to as small a number of groups as possible, including only those which present some special problem not otherwise readily susceptible of control. It is further believed that in those instances in which the license system is utilized, the weights and measures office will secure the most satisfactory results by using the system for its control features only and not as a source of revenue. These various points will be enlarged upon in the discussion which follows.

Considering first some of the objectionable features of the license 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 which 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 which, because of the general benefits resulting, should be maintained from general taxation funds. 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 license 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 upon 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, and that weights and measures licenses should be issued without a fee or, at most, that only a sufficient amount be charged to cover the actual cost of the licensing.

The principal advantage of the license system lies in the authority to suspend and revoke licenses. This constitutes a powerful argument for compliance with regulations in the minds of those who otherwise 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 prerequisite 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 tied up 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.

Assuming that a decision has been reached to the effect that a resort to licensing is unavoidable, it may be said that a license which is issued primarily for weights and measures purposes 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 it 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, the office principally concerned should handle this matter.

While not advocating the general extension of the use of the license system to problems of weights and measures control, it may be said that, when utilized, the requirements of such licenses are usually confined to the character of the weighing and measuring equipment and necessary accessories, the maintenance and official approval for use of such equipment, and the giving of short weight or measure or the perpetration of fraud. Whatever the details of the form may be, it is believed that a weights and measures licensing law to be effective 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 which is suitable and in an amount which is sufficient for the purposes of the business in question, including any auxiliary equipment which 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 detail 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 for otherwise perpetrating fraud

upon those with whom the licensee does business. Provision should be made for appeal to a court by the licensee from a decision of the weights and measures official.

A license system 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 or in situations where experience has demonstrated that extraordinary checks are demanded for the proper safeguarding of the interests of the community.

Chapter 8.—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 which will successfully resist the vicissitudes of the complicated and strenuous commercial life of the present day, or to realize the full measure of protection which 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 which 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 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. However, a general résumé of the essential elements of an adequate weights and measures law will undoubtedly be of assistance as supplementing the specific recommendations for the text of a model State law which will be found in Appendix II, and it is the purpose of this chapter to present such a résumé. As in earlier chapters the discussion

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 other subdivision of the State will be entirely obvious both as to the subject matter of this chapter and as to the text of the model law.

In relation to the text of the model law it may be mentioned here that the development of this law is described in Appendix II. It may also be pointed out that three alternative forms of text are there presented, these being identical in their basic provisions but differing in details of departmental organization to meet the needs of differing local conditions of population. From time to time in the discussion which follows reference will be made by number to specific sections of the model law; since "Form No. 2" is given in full in the appendix the references will be to this form.

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 which are to be followed throughout the State and provide for the physical copies of these standards necessary for purposes of enforcement. Provision must 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. (See Model law, secs. 1, 2, 5, 6, and 16.)

The weights and measures organization of the State should be outlined in the law and definite and mandatory provision should be made for the necessary officials 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. (See Model law, secs. 3, 12, 13, and 14.)

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 which may arise, and so as to avoid the strict limitation of authority which may result if the language of the law is too specific. 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.

The weights and measures officer must first have full and complete authority over the mechanical equipment used in commercial weighing and measuring, and this includes 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 must likewise have jurisdiction in the matter of the use of that equipment. He must be empowered to reweigh and remeasure commodities and to carry on all necessary investigations incident to his duties. He must have access to all places where his presence is demanded for purposes of inspection, testing, or supervision. As to his duties, as distinguished from his powers, these should also be stated in general terms and should provide

for periodic mechanical testing and as much supervisory work as practicable. (See Model law, secs. 7, 8, 9, 10, 11, 17, 18, and 19.)

To be effective the weights and measures statute must 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 must not be lightly treated. A fine of a dollar or two means nothing to the man who is deliberately setting out to defraud his customers; such a one must be shown the error of his ways by a penalty commensurate with his offense. A graduated scale of 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 which will arise in weights and measures supervision. (See Model law, secs. 20, 21, and 31.)

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 classes of commodities should be prescribed: Liquid commodities by weight or liquid measure; commodities not liquid by length, weight, or count; coal, coke, and charcoal by weight only, with special regulations regarding delivery tickets; butter in prints of certain sizes only; bread in standard-weight loaves; berries by weight or in certain sized boxes only, etc. Definite rules should be laid down in relation to the marking of packages with a statement of their net contents. Special regulations should be included for such an item as milk bottles. Certain standard container-measures, such as the standard barrel, should be recog-

nized. The principle of sale by net instead of by gross weight should be established. (See Model law, secs. 21a, 22, 23, 24, 25, 26, 27, 28, 29, 29a, and 30.)

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. (See Model law, sec. 6.)

The inclusion in a weights and measures statute of requirements of a minor character, of requirements which 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, recently the entire standard-weight-bread law of a State was rendered inoperative by a successful attack upon the numerical value of the tolerance which 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 seal on a milk bottle and the tolerances which 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 which may be expected to require modification from time to time, and all regulations of

a minor character be left for promulgation to 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, general in its terms, easily understood, and readily enforceable, providing ample authority for its enforcing officials and adequate penalties for violations of its provisions.

Chapter 9.—SPECIFICATIONS AND TOLERANCES

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 which must be set forth in precise language for the guidance of manufacturers, users, and officials. These technical requirements are embraced in codes of specifications and tolerances, and experience has shown that these may best be promulgated as rules and regulations by the principal State weights and measures officer. They may then be altered from time to time as the standards of design and manufacture of existing types are developed; at the same time the basic requirements of the law act as an adequate check upon the possible promulgation of any unnecessary or unreasonable regulations.

Specifications and tolerances ordinarily deal exclusively with the mechanical instrumentalities of weighing and measuring. Specifications are concerned with design, construction, materials, workmanship, etc.; tolerances are the maximum variations from the true standard of performance which will be permitted by the official when he tests commercial weighing and measuring devices. Specifications are intended to insure (1) that devices are so made that they may readily be used for the purposes intended without the introduction of elements which would be detrimental 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 considerations of the probable uses of the different classes of devices, manufacturing expediency, costs of refinements necessary to decrease errors, limitations of reading the indications of the devices, etc.

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. To remedy the situation, it was recognized that specifications and tolerances should be reduced to written form so that all interested parties might know definitely the requirements for any particular device. This matter was taken up for serious study by the National Conference on Weights and Measures¹ in cooperation with the National Bureau of Standards, with the idea of developing comprehensive codes of specifications and tolerances which 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 many States, without material change, of the recommendations of the conference and the Bureau of Standards. Moreover, this movement is still going on, newly established departments usually adopting the recommended codes as represent-

¹ For a discussion of the National Conference on Weights and Measures, see chapter 12.

ing 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 occasional amendments of a minor character which are still found necessary from time to time, all of the codes referred to may be said to be in stable form. This is to be expected when it is remembered that they are very carefully worked out in the first instance by an experienced committee, that they are freely discussed by weights and measures officials from all parts of the country and by representatives of the interested manufacturers, that they are tentatively adopted at first, and that at least one year elapses after tentative adoption before final action is taken. States already having organized weights 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 which have stood the practical test of actual use in many States, and which may safely be adopted with the assurance that they are in no sense experimental. As regulations for new classes of devices are developed, these may be added to the existing codes of the State.

Uniformity in specifications and tolerances is most desirable and lack of uniformity is productive of endless confusion and increased costs. While under our system of government, 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 specifica-

tions and tolerances is progress toward a simplified and more efficient administration of weights and measures law.²

One class of tolerances other than those already discussed may be mentioned briefly; these are known as "commodity tolerances," and prescribe limits of permissible variation 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 Standards has ever recommended any general list of commodity tolerances. However, the laws of some States require that the heads of their departments of weights and measures shall publish such lists, and all weights and measures officials, either consciously or unconsciously, make use of such tolerances in the course of their supervisory work. Commodity tolerances, therefore, are occasionally promulgated.

One objection has been urged against the publication of commodity tolerances, and this objection seems to have some merit. It is contended that the publication 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; in other words, that there may be a tendency to "aim," not at the full amount, but instead at the lower limit of the tolerance. In an effort to overcome this ob-

² A revised compilation of the codes of specifications and tolerances adopted by the National Conference on Weights and Measures and recommended by the National Bureau of Standards is to be published as a Handbook of the Bureau of Standards under the title, "Specifications and Tolerances for Commercial Weighing and Measuring Devices."

jection, these tolerances frequently contain *average* limits considerably smaller than the *individual* limits specified, or they may require that errors be as often above as below the stated amounts; the tolerances are also kept as small as may be, so that it will be difficult, under ordinary commercial practice, to take advantage of them without frequently running below the minimums stated and thus incurring the liability of prosecution. These are useful provisions, and should be carefully considered whenever it may become necessary to fix commodity tolerances; since there are, however, many instances where such expedients are of no avail, and where individual facts and circumstances should be the dominant factors for consideration, it is probably advisable not to promulgate commodity tolerances at all where it is practicable to avoid doing so.

Chapter 10.—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 must carry on all of his mechanical activities, the clear-cut thinking and keen analysis which must be exercised in the drafting and interpretation of laws, regulations, specifications, and tolerances, and the resourcefulness and initiative which are necessary for the solution of the many perplexing problems which are continually arising.

In the discussion which follows we will have in mind especially the principal weights and measures officer of a State. However, it will be at once apparent that whatever may be said of the chief State officer applies with equal propriety and with only slightly 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 which arise is as great in the one case as in the other. Even the small jurisdiction is but a reproduction on a small scale of the large jurisdiction, with similar problems and duties and with similar demands as to 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. Let us consider first the information which 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 which he finds out of proper condition, and that some of the qualifications which 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 can not be done efficiently, without the basic knowledge and the mechanical aptitude which have been specified as qualifications for the modern weights and measures officer.

Granting, then, that these qualifications are of importance, what, specifically, are we to expect in the way of preliminary training? It is believed, first, that every weights and measures officer should have completed a four-year high-school course or its equivalent as a minimum educational requirement. Such a course will have provided a 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.

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 must familiarize himself specifically with the details of the instruments with which he is to deal—scales of all types, gasoline-dispensing devices, linear-measuring devices, etc. Such information can best be secured by a careful study of the catalogues and other descriptive literature of the manu-

facturers, 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 catalogues and keeping him supplied with descriptive material on new developments as these are made from time to time.

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. Frequent 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.

Finally, there is to be considered the technic of the inspection and testing of weighing and measuring instruments.

At the present time testing methods have been fairly well standardized for the customary types of devices met with in the field and these are generally recognized and followed by the experienced officials. In the case of the new and inexperienced official 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 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 technic 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 which could otherwise be realized only after a considerable time had elapsed.

If it is 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 which 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 technic of his own which will be satisfactory, even though it may differ from that of other officials.

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 must keep abreast of the developments in his field. This means that, first, he must keep informed about weighing and measuring instruments—the modifications of existing types and the new types being developed by manufacturers. Second, he must 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, etc. Third, he must keep accurately informed as to 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 must be keenly alive to 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. In this connection the official must develop the ability to phrase needed legislation or regulations in concise and unambiguous form.

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 which should logically be his and which may be his with reasonable effort. If he then proceeds with the constant aim of making his department of ever increasing value to the people of his jurisdiction he will achieve real service to society.

Chapter 11.—THE STATE WEIGHTS AND MEASURES ASSOCIATION

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.

Under our 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 the local officials. By its very nature this function is one which must 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 which 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, whereby the best thought on any given question may quickly be developed and a satisfactory solution be worked out; they offer the most excellent means of introducing new laws or regulations, of inaugurating state-wide activity along specific lines, and of checking divergent tendencies in methods of test or administration; and, finally, they foster an esprit de corps which stimulates the entire organization.

These 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 the formation of a definite association will be advantageous in all cases where there are 10 or more officials in the State. 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 which it would not otherwise have, and in general enhances the value of the meetings and makes easier the realization of their objects as previously outlined.

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. All of 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 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 must establish an organization, they must work in harmony and as a unit, and the organization must embrace the greatest possible number of the limited personnel of the group. The alternatives are the discouraging, uphill battle which 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 which will inevitably result.

With an active organization having a membership representing 100 per cent 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.

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 which 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.

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 which 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 the strengthening of existing associations are, therefore, to be strongly recommended.

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., which 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 securing outside speakers, arranging for exhibit material, and similar matters.

Programs should be arranged sufficiently in advance of the meetings to give the speakers ample time to secure 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; it is better to treat thoroughly a few subjects than to touch superficially upon a large number. Ample

time should be allotted for discussions, and all of those in attendance should be urged to participate, for it is often the discussions which 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 of opinion, and in fixing in the minds of those present any conclusions which may be reached.

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 secure copies of the prepared papers and should record at least a brief summary of extemporaneous talks 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 which can be printed or which can be issued in mimeographed form if funds for printing are not available, and which will be extremely valuable to the members of the association, particularly any who might have been unable to be in attendance.

In the matter of a meeting place there is one consideration which should not be lost sight of, and that is ease of access. A meeting held in a city which is inconvenient to reach, either by reason of difficult or limited train connections or because it is not centrally located, usually falls far short in point of attendance and general success of the meeting held in a city more favorably situated.

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 must share in the activities and responsibilities of the association just as he expects to share in its benefits.

Each member must vouchsafe loyal support to the association, whole-hearted 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 which it receives from its members, and its strength will determine its power.

Chapter 12.—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.

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." Fifteen months after the first meeting the second conference was held, agreeably to a resolution adopted at the closing session of the 1905 meeting to the effect that these conferences be held annually thereafter. 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 World War (1917 and 1918), meetings have been held each year. The conferences have always met at the National Bureau of Standards in Washington and have always been fostered by the bureau, every facility being offered to make them of maximum interest and benefit to all in attendance. The informal character of the organization has been preserved; that is, 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.

The attendance during recent years has approximated 200, and this includes State, county, and city weights and measures officials (a group comprising something more than 50 per cent of those present), representatives of chambers of commerce, boards of trade, railroads, and industry who have to do with the installation, maintenance, testing, or

use of weighing equipment, representatives of manufacturers of commercial weighing and measuring devices, and others interested in the objects of the conference. One distinction is made between weights and measures officials and others who may be in attendance: The former are classed as "delegates," and the latter as "guests," and the privilege of voting is restricted to delegates. Thus the conclusions of the conferences, as expressed in its formal actions, represent the concensus of the weights and measures officers of the country.

In continuation of the practice started at the first conference the proceedings of the meetings have been published each year,¹ and these "conference reports" constitute a valuable library of weights and measures information.

¹ The reports of the weights and measures conference are included in the "Miscellaneous Publications" series of the Bureau of Standards. A complete list of the reports issued up to the present time is as follows:

Title	B. S. Misc. Pub. No.	Price
		<i>Cents</i>
First conference, 1905.....	4	10
Second conference, 1906.....	5	15
Third conference, 1907.....	6	25
Fourth conference, 1908.....	7	15
Fifth conference, 1910.....	8	15
Sixth conference, 1911 *.....	9	20
Seventh conference, 1912.....	10	20
Eighth conference, 1913 *.....	11	35
Ninth conference, 1914.....	12	20
Tenth conference, 1915.....	13	50
Eleventh conference, 1916.....	14	35
Twelfth conference, 1919.....	41	20
Thirteenth conference, 1920.....	43	20
Fourteenth conference, 1921.....	48	20
Fifteenth conference, 1922.....	51	15
Sixteenth conference, 1923.....	55	30
Seventeenth conference, 1924.....	59	35
Eighteenth conference, 1925.....	70	50
Nineteenth conference, 1926.....	74	60

* Out of print.

Except for those which may be out of print, copies of these publications may be purchased at the prices shown from the Superintendent of Documents, Government Printing Office, Washington, D. C. They may also be consulted at libraries which have been designated as "Government depository libraries," which will be found in all principal cities.

In general, it may be said that the principal objects of the conference are two: First, to promote uniformity among all weights and measures jurisdictions with respect to laws, regulations, specifications and tolerances for commercial weighing and measuring devices, methods of testing commercial equipment, and administrative methods generally; second, to raise the standard of weights and measures supervision by assisting in the development and adoption of the most efficient methods for carrying on all branches of the work, with particular attention to specifications, tolerances, and test methods for new types of equipment, to the solution of newly arisen problems, and to the examination of the requirements of new business and industrial conditions with respect to weights and measures activity. A secondary object is to bring together weights and measures officials, representatives of manufacturers, and others engaged in any branch of weighing or measuring activity so that they may make personal contacts, become acquainted with each other and with each others' problems, and develop that spirit of tolerance and cooperation which is so essential to a realization of the most constructive results from the efforts of each individual.

To these ends the programs of the meetings are carefully arranged. It usually happens that each year there are one or two matters of outstanding interest in the weights and measures field, and these are naturally given prominence. In presenting any question which 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 which may be taken or any recommendations which 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 which he represents. Following the formal presentation, the opportunity for questions and general discussion from the floor is always provided. If the question is one which involves specifications or tolerances no code is adopted until the matter has been reported upon by the standing conference committee on specifications and tolerances; except in the case of minor modifications to existing codes, specifications and tolerances are always adopted first in tentative form, and an interval of at least one year is 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.

In the matter of special investigations which may be necessary to develop certain 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.

As to its internal organization, there is just enough of this to enable the conference to function smoothly and efficiently. From the time of the first conference the Director of the National Bureau of Standards has been regularly elected president and has presided at the sessions whenever possible. The present organization provides for first and second vice presidents and for a treasurer, who are elected from the delegates. The chief of the weights and measures division of the bureau has regularly been elected to serve as secretary of the conference. There is an executive committee composed of the officers and of a group of delegates elected annually, and, as mentioned previously, there is the important standing committee on specifications and toler-

ances, of five members, the chairman being the secretary of the conference and the remaining members being appointed by the president as occasion may require. As might be imagined, the chief consideration in making selections for this committee is an extensive practical weights and measures experience. Other committees are appointed for special purposes from time to time as the need arises.

The actions of the National Conference on Weights and Measures are, of course, purely recommendatory and in no sense mandatory. A code of specifications and tolerances, for instance, or a model law which has been adopted by the conference can have no effect in any given jurisdiction until it is promulgated or passed 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 jurisdictions which 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. 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, an active agency for the realization of those objects for which it was organized.

Chapter 13.—RELATIONS BETWEEN THE OFFICIAL AND MANUFACTURERS OF AND DEALERS IN WEIGHING AND MEASURING DEVICES

The relations which 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.

The weights and measures official is not alone a public officer, but is likewise a public arbiter in all things 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.

In his contacts with representatives of those engaged in the making and selling 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, and because cooperation among manufacturer, dealer, and official should be encouraged to the end that commercial equipment may continually be improved. The experience of the official who tests commercial equipment is 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 may keep abreast of

the latest developments of the industry; together, many problems may be worked out and many minor difficulties adjusted.

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 which 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 which is almost sure to make itself felt at some future time and which may wean him from that impartiality which should always remain his distinguishing characteristic. Therefore, the official should conscientiously avoid being drawn into any such compromising relations.

The weights and measures official should likewise be extremely cautious about making general statements, either oral or written, about the merits or demerits 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.

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, which 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 salesman or repair man, or when he is importuned for information as to 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 objectionable tactics. The weights and measures official can not afford to lend himself, even passively, to such petty practices.

If it is necessary for the official to exercise all of the precautions which have already been mentioned, it is certainly obvious that under no circumstances 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.

Part II.—MECHANICAL ACTIVITIES

Chapter 14.—WEIGHTS AND MEASURES STANDARDS AND EQUIPMENT

The character of weights and measures standards, the materials of which they are constructed, their design, finish, etc., differ according to the use intended for them, and in their material aspects these standards range from the finest which science can design and which 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 which 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 treated platinum-iridium alloy; the corresponding standard of length 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 lesser refinement, until finally we reach the cast-iron weight and the wooden yardstick 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. Let us examine for a moment the

many steps necessary before a fundamental standard of our country is translated into a quantity of merchandise in the hands of the consumer.

Taking the standard of mass as an example, we begin 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, and the relation of which to our avoirdupois pound is likewise known. This primary standard is used but rarely, and then only to standardize the *office 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.

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

In addition to its office standards, if these are provided (and all cities and counties having several inspectors should

have these), 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 reference standards, or will be returned to the State department for reverification in case the local reference standards are lacking. The field equipment, of 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 which 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 tolerances¹ have been promulgated by the National Bureau of Standards 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,

¹ Specifications and tolerances for primary, secondary, and working standards have been promulgated, and these requirements must be met in order that such standards shall be certified by the bureau. Manufacturers of standards are entirely familiar with these requirements, which are of a technical character, and which it is believed to be unnecessary to repeat here. Anyone desiring to know the details of these requirements may communicate with the Bureau of Standards, specifying the types of standards in which he is interested, and complete information will be furnished him.

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. In the schedule of weights and measures standards given in Appendix III, the recommended requirements are noted for standards to be used for different purposes. It should be unnecessary to say that all standards should be rigidly examined to insure that the requirements which have been set up are met. Standards which are found to conform to the requirements should be suitably marked or "sealed" to indicate this fact, or this fact should be attested in a suitable certificate.

The National Bureau of Standards tests the primary reference standards of the States without charge. After the initial test of State primary standards, these should be returned to the Bureau of Standards for retest at regular intervals of 5 or 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 should immediately be made whenever any accident occurs or other condition develops which 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.²

For a discussion of methods of conducting tests on standards of mass, reference may be made to a paper entitled, "Testing standards of mass (office standards and test weights)," appearing in the report of the Nineteenth National Conference on Weights and Measures.³

In Appendix III of this volume, "Schedule of weights and measures standards and equipment," will be found listed the standards and equipment considered necessary for various classes of weights and measures offices. It will be observed upon consulting this appendix that certain items of standards and equipment are referred to as 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 advised 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-

² In the case of cities and counties, the organic act creating the 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.

³ See footnote 1, p. 93.

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.

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 secure a sum of money each year to be used in purchasing 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 which clearly comes within the scope of his duties as established by the law.

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 ade-

quate 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.

In this same connection may be mentioned 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. The use of 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 use of the regular carrying case with its complement of larger weights, measures, tools, sealing equipment, etc., in addition to the small equipment; the equipment for the special work is thus kept separate from the regular outfit, and the impression made upon the proprietor of the pharmacy is far better.

Having secured suitable and adequate equipment it becomes the continuing duty of the official to maintain that equipment in proper condition. There are two kinds of maintenance—maintenance of accuracy, and maintenance of appearance. As to the first, there must never be any doubt as to the accuracy of the weights and measures standards used by the official; this is fundamental. If there is 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.

Referring to weights, under ordinary circumstances we are apt to consider a piece of metal as fairly stable and free from changes affecting its mass as a result of conditions

of use such as those which prevail in the case of standard weights; moreover, weights are made from or coated with metals selected for their resistance to such changes. Nevertheless special precautions must be observed in handling and using standard weights, for every effort must be made to guard against even very slight changes in their values, changes which may be multiplied manyfold before the final effect is reached, and which 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, primary and reference standards should never be touched with the hands, but always 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 must 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.

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 foreign material on the weights, and any cleaning which may become neces-

sary 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; when it becomes necessary to move a weight it should be lifted and set down gently in its new position.

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 which may be done to preserve the accuracy of that standard should be done.

As to maintenance of the good appearance of 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 revealed by the appearance of his working outfit. Of course, it may so happen that a scratched and battered weight, for instance, has been adjusted to just as true a 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 did, his work would inevitably be discredited and its accuracy questioned by anyone who witnessed 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 exer-

cised in his work by one so obviously careless with his equipment.

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 appearance of the official himself and of the standards and other equipment with which he works.

Chapter 15.—INSPECTION OF COMMERCIAL WEIGH- ING AND MEASURING DEVICES

In the same way that weights and measures activity as a whole may be broadly separated into two divisions—mechanical and supervisional—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.

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 no particular importance; the essential consideration is that it be made. No examination can be considered complete which does not embrace a thorough inspection as well as a careful test.

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, etc.); and, in the case of apparatus previously exam-

ined, to insure that no additions or alterations have been made by the operator since the preceding inspection, which might adversely affect official approval.

2. To insure that working parts are in the proper condition to function as intended, and to determine whether or not there are indications of abuse or of a lack of proper attention on the part of the operator.

3. In the case of unfavorable test results, to enable the official to diagnose the trouble and advise the operator as to a remedy.

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

The necessity for inspection for the first purpose mentioned must be at once apparent. The specifications set up certain standards, 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 scale—the inspection will naturally be made much more carefully and thoroughly than in the case of devices of a type which 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 sold 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 which were not apparent upon first inspection, however carefully it may have been made. In the second place, manufacturers frequently find it expedient to make modifications in the devices which they manufacture, but the modified device may, to all outward appearances, be unchanged; without inspection by the official of the devices actually being sold and used in his territory, he will not know whether or not these conform to the sample which he carefully examined when it was first brought to his attention. Again, the user of a device may make or cause to be made changes which may create very unsatisfactory conditions. Such changes may be made for the purpose of adapting a device to some peculiar local condition, or, in comparatively rare instances, they may be inspired by a desire to provide a ready means for the perpe-

tration of fraud upon the public; in either event the official should become advised of the situation, and regular inspections of all equipment examined are the surest means to this end.

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 secure 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 display 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 which may be made with the best of intentions and for a perfectly legitimate purpose by someone who does not understand the equipment concerned 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.

In relation to the second purpose of inspection, it must be borne in mind that a weighing scale 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 can not retain its accuracy if subjected to abuse. 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 which may exist, and to take the necessary steps to correct them and prevent their development in the future.

In relation to the third purpose, we have said that in the case of unfavorable test results inspection is made to enable the official to diagnose the trouble and advise the operator as to a remedy. Here, again, we meet 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 found correct, and condemn it if found incorrect, and that to go further than this is unnecessary and inadvisable. With a full knowledge of this statutory provision, however, we are firmly convinced that the official who stops with the mere statement to an operator that his equipment is incorrect, without making an effort to advise him as to the probable source of the inaccuracy, is not doing all which may properly be expected of him, and certainly is not capitalizing all of his opportunities to be of service to his community. The conscientious official will not be satisfied until he has made a reasonable effort to discover the reasons for any discrepancies which his test reveals, so that he may assist the operator in having these discrepancies corrected and so that he may advise him how to avoid their recurrence.

The final purpose of inspection—to insure that there exists no unusual condition external to the apparatus which may be conducive to inaccuracy or to the perpetration of fraud—is to disclose external conditions which 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, provisions for drainage and ventilation of 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 ultimate performance of commercial weighing and measuring devices which must be learned through inspection and which the efficient official must take into consideration in connection with his examination of the apparatus which is under his control.

Chapter 16.—TESTING OF COMMERCIAL WEIGHING AND MEASURING DEVICES

The mechanical accuracy of the instrumentalities of weighing and measuring in any community is a prerequisite to that fuller enforcement of the weights and measures laws which concerns itself with the use of those devices; too great care can not be given, therefore, to the precision with which the tests to establish this accuracy are made.

Weights and measures testing as we know it to-day is apparently a far different operation from what it once was. It seems to be a well-established fact that at one time the test applied to a device was in numerous cases more or less a matter of form, the important part of the operation being the attachment of the "seal" and the collection of the inevitable fee. But the story of weights and measures supervision has been a story of development, a development which has kept pace with the progress of business and industry, and so now we find that the weights and measures officer in the progressive jurisdiction is a trained man, and that his training extends along several specialized lines.

This development is well illustrated by the specialized apparatus which constitutes the equipment of the modern weights and measures office, by the increased amount of equipment supplied to meet the demands of present-day commercial devices, and by the improvement in his technic. More searching tests are being applied, methods are becoming more or less standardized, tolerances allowed are approaching uniformity among different jurisdictions, and indefinite and uncertain factors are being eliminated.

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 average conditions of use. The official will, therefore, try in his test to approximate service conditions of operation, and any method of use which may reasonably be employed in service may, with propriety, be duplicated in the test.

In general, it may be said that the official should not base his conclusion upon single observations under the different conditions or at the different stages of his test. Check observations should always be made if possible, 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.

Another point which should be very strongly stressed is that for the efficient conduct of tests, the loads of known weights which the official applies to scales must approach as nearly as practicable to the capacities of the scales; and as scales are built stronger and larger to accommodate the increasing loads of automobile trucks, so the amount of the test load applied by the testing official must grow steadily greater. Where not so many years ago the official found it necessary to have not more than 1,000 pounds of weights for testing large scales, he is to-day confronted with the necessity of providing five or ten times that amount and of devising means for quickly and efficiently transporting and handling these large loads.

It should also be remembered that a determination of the sensitivity of a device is an essential part of any test, since inaccuracies will inevitably result from the use of devices

not having a proper degree of sensitiveness. In the case of certain classes of scales a simple method of determining whether or not the device is acceptable in this relation has been made possible in recent years by closely defining a new expression, "sensibility reciprocal" or "SR," and expressing the requirements in terms of this characteristic. In the case of other classes of apparatus also, the factor of sensitiveness has received careful consideration.

During the progress of a test a constant effort should be made to eliminate the effect of outside influences lest a result be ascribed to imperfection in the device which is really caused by some condition entirely outside the device itself. Thus, for instance, the effects of wind upon a platform scale, or the effects of changes in the temperature of the air 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.

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 which 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 question, for example, but what many a nose iron, many a pendulum, and many a spring on weighing scales, and many a piston stroke on measuring pumps, have been adjusted to force a correct indication when the real cause of the inaccuracy lay elsewhere; and the unfortunate part of it 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 revealed by the test.

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 which has developed inaccuracies and determine the reasons therefor. Second, so that he may have a complete record for his files of the work which he has done and of the performance of the devices which 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 later chapters.

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 can well concentrate on one class of work at a time; for instance, heavy capacity scales which require maximum test loads; platform scales from 300 to 2,000 pounds; small scales and other miscellaneous equipment in retail establishments except pharmacies, jewelry stores, etc.; the fine equipment in pharmacies, jewelry stores, etc.; gasoline and oil measuring devices, and so on. 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 question 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.

In general, 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 very 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 small equipment may be tested before delivery or even before sale at the office of the official or at the wareroom of the dealer, and whereby advance notice may be given of the installation of large equipment which 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 must be remembered that advance tests by the official upon devices which 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 which will interfere with the correct functioning of the device after reassembly. Even in the case of a self-contained device

which 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.

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 which would be incurred in moving inspectors here and there throughout their district wherever a new piece of equipment was sold, and the resulting interference with the regular program of testing and inspection. A plan which 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 a makeshift, 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 practical 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 which 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 which has come in since his former visit, and the equipment which he rejected and which has been repaired, are of distinct advantage and reduce the intervals during which equipment which has not been officially tested and approved, may be in commercial use. The rights of the purchasers of new equipment which can not at once be tested

may be safeguarded if they are taught to make their purchases subject to the approval by the weights and measures official; with the manufactures realizing their added responsibility under these circumstances and exercising due care to avoid placing any equipment which will not meet the requirements, no serious difficulties should develop.

Finally, it should be emphasized that the weights and measures official must thoroughly understand the principles of testing and be able to adapt these principles to the needs of the devices which he meets in the field. New types will be encountered from time to time, and rule-of-thumb methods will be found inadequate, and 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 which 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 17.—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."

Considering first the sealing to indicate approval for commercial use, it may be said that 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 be suitably marked to indicate this fact. Such a mark 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 the evidence of the work which 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.

To serve these various purposes the seal of approval itself should first be sufficiently conspicuous to be readily seen by all interested parties. Secondly, it should be suitably designed to indicate its official character, it should contain the

necessary information, and it should be dignified in appearance. 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; modern modifications of this type include the branding of an impression on wood by means of a hot metal stamp, stamping with ink, stenciling with paint, and etching on glass with special "etching inks." 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 can not 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 which constitute the legal sealing mark.

There are also a number of varieties of seals employing wire and lead plugs which 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. A widely used 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. Then there is the paper seal with gummed back; in size these run from diameters of about $1\frac{1}{2}$ inches to over 4 inches. Finally, there is the cloth or paper tag, with eyelet, designed to be attached in the same manner as the metal tag.

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 and the gummed-paper seal 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 or cloth tag ranks first on account of its large size, the gummed-paper seal and the metal tag coming 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 seal of moderate size are about on a par; the impression seal rates second if properly applied; and the paper or cloth tag, the very large sizes of gummed-paper seals, and the lead-and-wire seal used alone constitute a rather poor third.

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, either the metal tag in combination with the lead-and-wire seal or the paper seal of moderate size should be used whenever practicable.

Uniformity of character and location of the seal is another important consideration. For each type of equipment which is examined a type of seal and a location for sealing should be selected which 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. To do this 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 can not 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, leaving in view only the latest one; when fastening a metal tag by means of a sealing wire 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 aligned; in other words, 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 wooden measures, with the pos-

sible 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 soldering in place a brass seal, or a less prominent mark may be affixed 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 must have the seal etched on the glass.

Paper seals may be used on most other weighing and measuring devices except where exposure to weather effects or 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 can be successfully used in practically every case where the paper seal is suitable, and, in addition, it meets the needs 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.

Considering now the other kind of sealing, we have first to inquire what features of weighing and measuring devices are included in the "adjustments" which may be sealed in place. These adjustments comprise all of the adjustable elements of a device by means of which the indications or deliveries of the device may be altered, except those the manipulation of which by the operator is contemplated in the course of ordinary operation. The sealing of these adjustments 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 only with respect to certain classes of commercial devices that the specifications require that provision be made by the manufacturer for sealing the adjustments. Moreover, among weights and measures officials there are two schools of thought on the question of whether or not adjustments should be sealed. Originally it was generally believed that this should be done. Recently, however, the thought has been advanced that the owner or operator of a commercial weighing or measuring device should be held responsible for keeping his equipment in proper condition once it has been placed in that condition by the weights and measures official, and that if the adjustments have been sealed in place he can not do this, and, furthermore, that he would use this fact as an excuse for operating his equipment in any sort of condition, saying that the device was "just as the inspector left it." This argument has been made particularly with reference to liquid-measuring devices, in connection with which it has become customary in many jurisdictions to require the operator himself to make daily tests to determine the accuracy of the devices.

While agreeing with the premise of this argument, the conclusion appears to be unsound; the whole thing comes back to the question of whether we are going to treat symptoms or causes. What, for example, is going to happen to a liquid-measuring device in the course of ordinary use which should necessitate changing the length of the piston stroke or the height of the overflow? There may be inaccuracies, it is true; but if the device has been correctly installed and

has once been correctly adjusted, as shown by the official's original test, the discrepancies which later develop should be corrected by correcting the conditions which caused them and not by making changes in the adjustments provided for an entirely different purpose. In other words, if the maintenance of the equipment is what it should be troubles will not arise, and if they do arise the remedy lies outside the mechanical adjustments of the device itself.

It seems to be a reasonable conclusion that the adjustable features of a weighing or measuring device had best 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 remarks relative to the sealing of adjustments are in no sense applicable to such adjustments as balance balls, leveling screws, etc., which 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 on 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 18.—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 can not be approved for use there are two courses open to him; he can "condemn for repairs" or condemn outright, and his selection of the course to pursue is governed by the character of the conditions which he has found.

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 "condemning for repairs." When equipment is so rejected it is suitably marked by the official to indicate this fact. The customary mark is a tag of distinctive color, usually red, setting forth the fact of rejection, the reasons therefor, the penalty for commercial use until repaired and sealed, and 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.

The time to be allowed for making repairs will differ with circumstances. In a city where manufacturers' 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 unrea-

sonable. 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 tags are 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 31) 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.

In the case of the State inspectors covering large territories it is usually impracticable to follow up matters of this kind as promptly or effectively as can be done in the city or other small territory on account of the expense involved. 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 to the effect that he has made the necessary repairs and left the equipment in good condition is required before the permit is issued. Sometimes instructions, on a special form, are left with the operator, telling him how to make a test of the device in question and pro-

viding 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 far from 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.

Mention should be made at this point of the fact that under most codes of specifications and tolerances certain provisions are retroactive and apply to all devices in use regardless of when they were purchased, while other provisions are nonretroactive and apply only to equipment put into use after some specific date. The official must distinguish between these two classes of equipment in order to avoid rejecting devices for noncompliance with certain specifications which, perhaps, do not properly apply to them.

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 disposed of 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.

In concluding the discussion of weighing and measuring devices "condemned for repairs" it may be said that, in the interests of economy and the conservation of equipment, the official should always adopt this course rather than condemn outright whenever, in his best judgment, it appears that equipment may be so repaired as to meet the requirements of the regulations.

As to outright condemnation there is little to be said. This action is taken with relation to equipment which can not be repaired and is usually accompanied by confiscation or destruction. The practice of merely marking as "condemned" equipment which is not proper for use and which can not be repaired and leaving this equipment in the hands of the owner is to be discouraged; 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 worn-out wagon scale, for instance; in this case he should see to it that the scale is so dismantled that it will be put out of use. But in the majority of cases of condemned equipment, confiscation and subsequent destruction, or destruction 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 apparatus "condemned for repairs."

Chapter 19.—ADJUSTMENT AND REPAIR OF COMMERCIAL WEIGHING AND MEASURING EQUIPMENT

In practically all jurisdictions the law more or less clearly defines the duties of the weights and measures official. Included in these duties we do not find any requirement that the official shall adjust or repair the equipment which he tests, although it is not uncommon to discover provisions relating to those instances in which he does make adjustments or repairs. Thus 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 grounds 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 but 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 they should always embrace diagnosis, should usually include frequent adjusting and, in exceptional cases, should extend to actual 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 char-

acter 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 which he does not understand and which he does not believe himself competent to carry out. 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 controversy 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.

As to the character of adjustments which should be undertaken and the local conditions affecting the official's decision on this matter, it may be said that, except for minor adjustments which are but the work of a moment and which 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, quickly, and inexpensively have such apparatus put into suitable condition for use, and 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 which prevails in the small village or at the crossroads store. To secure 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 time, it seems that he will not be justified in refusing to do so when the best interests of the entire community will be served by his doing the necessary work.

Moreover, rejection under the circumstances outlined will entail another visit on the part of the official which is almost certain to represent a greater expense to the State or local 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.

Between the two extremes of large cities and villages or country districts, discussed in the foregoing, 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 commercial 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 reinspection, and similar factors.

When work of this kind is to be done, however, it should be the invariable rule to secure the definite consent of the owner or of some responsible representative of the owner of the equipment upon which repairs or major adjustments are contemplated, to undertake such repairs or adjustments. 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.

There is one other phase of this situation which should be emphasized at this point. In some cases weights and measures officers 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 can not 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 a connection is sure to arouse the suspicions of the owners of weighing and measuring devices as to the entire integrity of the official, and cooperation can not 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 which he officially tests, even though this be done upon his private time, then this is a hardship which he must assume when he takes his oath of office. Anything which he does in the way of adjustment or repair of commercial devices must be done as a part of his official activity and as a gratuitous service rendered to his community.

Chapter 20.—WEIGHING AND MEASURING DEVICES USED IN INDUSTRY

In some weights and measures jurisdictions there has developed the most 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 which 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, can not be justified in a single instance.

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, a moment's reflection will show 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 which the weights and measures official can render to the individual will be a 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 inaccuracies, 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 which that ultimate consumer will be required to pay for the things which he buys.

Again, the tremendous volume of business transacted by our industrial and manufacturing plants results in immense sums of money changing hands on the basis of weighing or measuring operations of some kind. 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 which determines the business life of a firm or of an individual; moreover it must 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.

Aside from the equipment just referred to, which is "commercial" in the weights and measures sense, there is another class of equipment which 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 which 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, etc., operations which 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 to do this under the law; 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 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 which 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 which 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, preferably of cloth, containing the necessary statement and warning, attached by a lead-and-wire seal. 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 which may reasonably be spared for such work, the availability of other testing services, etc.

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 which may confidently be expected to result in expansion and increased opportunities for service.

This appears to be a suitable place to comment upon another class of equipment with which the weights and measures official comes frequently into contact. This is equipment which 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 can not 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.

Chapter 21.—SERIAL SEALING BY MANUFACTURERS

Theoretically, all commercial weighing and measuring devices should have been inspected, tested, and sealed by the weights and measures official before they were put into use, but owing to the regrettably small number of these officers and to the very large numbers of certain types of commercial devices in use it is impracticable for this condition to be realized.

However, even were it possible so to increase the weights and measures personnel that every milk bottle, every piece of Babcock glassware, all commercial and druggists' graduates, all baskets, and all paper single-service measure-containers might be individually tested, it is doubtful if such a task should be undertaken. If this were done, these classes of equipment would be receiving a disproportionate amount of attention; furthermore, the very factors which now make it possible to reach a reasonable solution of the problem make it unnecessary for each individual piece of such equipment to be examined. These factors are the precision attained by the production methods employed in our manufacturing plants and the careful supervision maintained by these plants under the check supervision of the weights and measures official.

These factors, then, are responsible for the development of what is generally spoken of as "serial sealing by manu-

facturers," and make feasible the operation of this plan which is legalized by statute in many States for use in connection with one or more of the types of equipment previously enumerated.

Briefly stated, this plan is as follows: The manufacturer submits to the State weights and measures office several samples of each size and type of device which he desires to market as "serially sealed." These samples are inspected and tested by the State officials to determine whether or not they conform to the requirements of existing State law and specifications and tolerances. If changes are necessary the manufacturer is so informed and modified samples are submitted. When the equipment is satisfactory the manufacturer is so informed, after which he submits a bond, usually in the amount of \$1,000, conditioned upon his sending into the State only equipment conforming in all respects to the legal requirements and marked in the manner specified. When the bond has been approved by the proper authorities a serial number or letter or combination of numbers and letters is assigned to the manufacturer as his identification; this marking, in addition to whatever other marks may be specified, is required to appear upon all of the "sealed" equipment. The word SEALED is frequently included in the other marks referred to. Finally, samples of completely marked equipment are submitted to the State office and kept there for reference, and the manufacturer is then ready to distribute his product to users in the State.

Equipment manufactured and marked as outlined is then accepted throughout the State in question as equipment legally sealed, enjoying the same status as though each piece had been individually tested and marked by the weights and

measures official; it is subject at all times, however, to actual inspection and test by such official, and any equipment found incorrect is treated just the same as unmarked equipment would be treated. The weights and measures official tests samples of serially sealed equipment from time to time to see that it continues to conform to the approved samples. He also tests representative samples of large shipments of such equipment before being put into use; if the results of such a test indicate inaccuracies or other noncompliance with the requirements, the entire shipment is rejected and, if necessary, the manufacturer's bond is proceeded against. State laws frequently prescribe a \$500 penalty in such cases; and in the event of repeated violation of the requirements, the manufacturer's authority to mark with the serial seal may be revoked.

Variations of the plan outlined may be found in some States. For instance, all marking requirements are sometimes waived with respect to certain equipment, as paper measure-containers, for example. Again, permission to mark is sometimes made contingent upon approval of the manufacturer's facilities for manufacturing, inspecting, and testing his own product before shipment. Sometimes the manufacturer is not required to file a bond.

As with other weights and measures regulations, this matter is in the control of the States, and conflicting State requirements sometimes result in working considerable hardship on the manufacturers whose markets extend to several States. In a number of instances several States have agreed to assign to a particular manufacturer the same serial number, and where there has been no conflict in other regulations, this has made a single piece of serially sealed equip-

ment legal in all of those States. Such cooperation is to be commended, and continuing efforts should be made to harmonize the requirements of the several States so that the making of many varieties of a product and the necessary segregation of stocks for different States, all of which increases ultimate costs, as well as the confusion resulting from a variety of markings on a single article, may be eliminated.

Part III.—SUPERVISIONAL ACTIVITIES

Chapter 22.—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, on account of the large and important part which education plays in weights and measures supervision. This will be better appreciated when it is remembered that the most efficient department is the one which prevents the development of unsatisfactory conditions, which reduces to a minimum the violations of the law, and which secures 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 which it is desired to convey to the commercial users of weighing and measuring devices will differ in some respect 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 which 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.

If the instruction given is to be of most use to the recipients the information must be specific at all times, and will usually be technical, although it must be presented in such a way that its meaning 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 in so far as these affect him and his business, and he should be thoroughly informed as to his obligations and responsibilities and also as to 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 his auditor. Proprietors, managers, superintendents, etc., must also be informed of their responsibility 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 must likewise be informed that this is a continuing responsibility, requiring the in-

struction 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 as to selection, use, and maintenance of such equipment, involving specific recommendations as to many things which should be done or which 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 which 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. 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 instance, 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.

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 or as to 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 must 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 which 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 repair men or companies. 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.

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.

As to the means for carrying on the educational work discussed in the foregoing paragraphs, it may be said that individual personal contacts, meetings of trade and business associations, 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 secure 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 which has been revealed 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 which he wishes to reach with his message and try to secure 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 which are not of general application and which only concern particular establishments and should be discussed with those connected with such establishments. Moreover, every visit of the official to any establishment presents an opportunity for personal conference which 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 of assistance in connection with both the personal conference and the appearance before meetings of different kinds, and will form a complement to whatever verbal 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.

Chapter 23.—EDUCATION OF THE PUBLIC

The primary purpose in educating the general public along weights and measures lines is to get the people to do their share in supplementing the efforts of the weights and measures official. The public must first be taught what weights and measures supervision is. They must 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.

Specifically, the people should be taught to use correct buying methods, the cardinal principles of which are to buy by definite quantity and to check the amounts received. They should be taught to buy by weight whenever possible, to observe the zero and load conditions of the instrumentalities used in serving them, to distinguish between proper and improper methods of buying different commodities as established by the law, to provide themselves with reliable weighing and measuring devices for use in their own households, 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 learn 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 educated to report to the weights and measures department full information regarding any violation of the weights and measures law, not alone for their personal protection but also for the protection of the community at large.

Many channels are available to the official for reaching the public with weights and measures information. One of the least spectacular, but probably the most important in the final analysis, because it is fundamental, is offered by schools and universities. A large part of the household buying is done by children of common-school age, and these children as well as the graduates of higher institutions of learning develop into the householders of the future; moreover, principles may be most surely inculcated during the formative years of life. It follows, therefore, that the efforts which the official expends in conveying weights and measures information to the children, the youths, and the young men and women in schools and colleges may be expected to be of the greatest permanent value, not only with respect to present conditions but also with respect to the conditions in years to come. In carrying on this work the information given out must, of course, be suited to the ages and mental abilities of the various audiences; but something of value can always be offered, ranging from the simple ideas for the child of 9 or 10

to the complete discussion appropriate for the graduate student in home economics.

For immediate results as applied to present-day conditions the official will find his best opportunities in the meetings of men's and women's clubs, in exhibits at fairs, food shows, etc., and in general publicity. Clubs made up of women are especially interested in weights and measures subjects, because women as a rule superintend or actually do most of the household buying. It is very easy for the official to demonstrate to such groups that they should have a very strong interest both as individuals and as organizations in the successful operation of his department. It is not unusual for women's clubs to form weights and measures sections or committees for the purpose of studying and working actively along this line, and such efforts will be encouraged and supported by the thinking official.

Radio broadcasting will occur to many as a valuable means for reaching large numbers of people with a spoken message. When this means can be employed the opportunity should not be overlooked. Owing to the scope of the radio broadcast, program directors are not inclined to permit the use of their facilities for broadcasting on subjects of local interest only, unless the low power of the station restricts its audience to local territory. So, except in such special cases, the radio message must be of general interest, dealing with principles of broad application, presenting local experiences only for emphasis and illustration, and then only when they are striking, unique, or unusually interesting to a general audience. Moreover, the radio talk must be most carefully prepared; the listener has but one contact with the speaker—his voice and words—and each word and tone used should be chosen for maximum effect in creating and hold-

ing the interest of the audience and conveying the desired message.

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 worn-out, incorrect, and even fraudulent apparatus which 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 opinion as to 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.

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 the reading and study of 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.

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, he 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 he told it.

Chapter 24.—PUBLICITY

Strictly speaking, publicity may be realized by the general dissemination of information by whatever means accomplished. Thus, addresses before meetings, radio talks, official publications of the department, and exhibits of all kinds are means of securing 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.

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. To achieve this result, however, publicity material must be dignified both as to subject matter and as to presentation; it must be truthful, accurate, and rest upon facts which can readily be proven; and it must be fair, in statement and implication, to all parties concerned. Finally, it must be interesting—or there will be no publicity.

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 as to 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 which has been done during the preceding month or quarter, comparisons with the accomplishments of corresponding earlier periods, etc., descriptions of any phases of the work which are being given special attention, stories of unusual experiences and of unusual apparatus or methods encountered, 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 statute.

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 publicity which might otherwise be secured. It is usually helpful in securing 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.

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 would be quite unsuitable, however, for use by the press associations serving newspapers throughout the State or in even a wider territory and by magazines of general circulation or written for particular trades or industries. 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.

Primarily, editors, reporters, and special writers demand truthful material which will *interest* the readers they serve, and it is useless for the official to oppose this policy in his efforts to secure publicity. His understanding of this policy and his thoughtful cooperation in conforming to it when offering material for publication will be of material assist-

ance to him, just as a disregard of it will operate actively to his disadvantage.

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 which is new or rarely encountered, which is an exaggeration of a common form, or which 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 which 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.

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 and the official will find that impartiality 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 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 which 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.

Finally, there may be mentioned one sort of resistance which will often be met by the official from the representatives of newspaper and journal toward much which the official considers important and worthy of publication. This is the resistance due to a failure to understand what weights and measures supervision is intended to do and what it is actually accomplishing—the same resistance which 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 secure 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 25.—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 which may have been expended by the official in educating owners and users of weighing and measuring equipment to a knowledge of what should be done, the proof that conditions are as they should be—that equity does prevail in commercial determinations of quantity—lies in the condition of commercial deliveries and may be determined only by an examination of such deliveries. This is what is meant by try-out inspections, which correspond to the "eating" in the test of the proverbial pudding.

Specifically, the purpose of the try-out inspection is to see whether or not full weight and measure are being given, due allowances made for wrappers and containers, marking requirements observed, and, in general, whether or not there is misrepresentation as to the quantity delivered. 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 sales 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 which they receive.

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, special visits being made for this purpose at appropriate hours to examine 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, or at any time when it is felt that an unexpected visit will have beneficial results. Certain try-out work will be performed "in the field," as it were—that is, not in regular business establishments—and is most systematically carried on by making a business of it for the necessary time and not trying to carry it on in conjunction with mechanical testing or other duties.

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 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.

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 which the weights and measures officer can not personally check, but which he attempts to study in this manner. It

is following out this principle when the official 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, vegetables, or ice 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 which he secures 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 some one violating the law, although, of course, prosecutions may be found necessary in aggravated cases.

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. Gasoline sales to motorists are a good example of this; here the use of a specially equipped automobile with an auxiliary tank, providing means for segregating and subsequently measuring individual purchases of gasoline, is a practical necessity.¹

"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, wood, and ice, and in similar situations; actual purchases by the official, or pre-arranged cooperation between the official and actual purchasers, will frequently be required.

Whenever shortages or other discrepancies are found the official should take prompt and vigorous steps to have them

¹ See the Report of the Nineteenth National Conference on Weights and Measures, B. S. Misc. Publication No. 74, for three papers on "The use of auxiliary automobile tanks for checking gasoline deliveries."

corrected in the specific instances discovered as well as to prevent their recurrence. Short-weight packages put up prior to sale should be refilled to the correct amount; 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 immediately corrected; etc.

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 which he uncovers in the course of his supervisional 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 which will eradicate the trouble at its general source, so that his treatment may become effective throughout the entire jurisdiction under his control.

It will frequently be found that a "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 which should be most carefully guarded against, and that is the danger of dropping supervisional activity along the line covered by the drive as soon as this is finished and allowing matters to take their own course. If this be done much of the effect

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.

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

In carrying on supervisional 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 must be prepared to take a firm stand regardless of circumstances and insist upon the prompt observance of legal requirements. Courtesy should always be displayed, but this must 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 which will be destructive of authority and usefulness.

Chapter 26.—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 which they may have along weights and measures lines, and will carefully investigate every complaint officially reaching his department. 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 which 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 must 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.

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 be also be utilized to advantage in the State department.

Those engaged in this sort of work must 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; but 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 we must have an impartial, open-minded attitude and freedom from a tendency to form hasty conclusions.

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.

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 must 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 as to 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,

previous warnings or instructions, either general or individual, which have been given, etc. While the law may say that prosecutions shall be instituted in the case of violations 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 which must be settled upon the facts in each individual instance.

But in the case which we are considering—where a complaint has been found to have been justified—there is one action which 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 instance, one running through an entire industry, then further facts should be collected, if necessary, and immediate steps taken to bring the practices of the industry or other group into harmony with the spirit and letter of the weights and measures law.

In general, it is not only courteous but good policy to make a formal report to any complainant at the conclusion of the investigation which 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 which might jeopardize the success of an investigation by advising interested parties beforehand of the intentions of the official.

Chapter 27.—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 people, but who, on the contrary, will strive to discount future troubles by preparing for the solution of problems which 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 which 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 we find the opportunity for a somewhat different type of independent investigation than those first mentioned, frequently consisting largely

of an analysis of existing data and a logical presentation of the results.

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 which is truly representative of the whole, otherwise general conclusions can not 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 which can be demonstrated to be representative, otherwise general conclusions can not 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 secured 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.

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 which 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 which 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 for 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, costs of operation, etc., 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, the number of complaints, etc., 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.

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. So may the investigation be made of maximum utility, and its results may so be preserved to meet any future demands which may arise.

Chapter 28.—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.

While it is fortunate that there is this discretionary power, nevertheless it entails a grave responsibility, for the official must make the decision as to 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 which affect the question, 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

Weights and measures laws are almost always what are known as "criminal" statutes; that is, a violation of their provisions is constituted a 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, as to 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 be-

¹ See also Report of the Nineteenth National Conference on Weights and Measures, B. S. Misc. Publication No. 74, for paper on "Weights and measures prosecutions."

tween 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 which 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 secure conviction in a criminal than in a civil action and that the former may be lost upon evidence which would be entirely adequate in the latter.

In deciding whether or not to institute a prosecution there are several general considerations which 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 but 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 can not 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 prosecution must be resorted to to supply that lesson.

The mention in the preceding paragraph of restitution to an injured party raises a point which 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 securing 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* resti-

tution unless this is specifically provided for in the law. He can take steps to *punish* an offender by instituting 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.

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 which 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 which is incomplete to a degree which raises a material doubt as to the ultimate decision. Acquittals, dismissals, and cases which, on account of inherent weakness, are terminated by an entry of *nolle prosequi*, do harm rather than good. Of course the official can not 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 which 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 which he does not feel reasonably assured of winning, his record of convictions as compared with prosecutions started will be a satisfactory one.

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 secure 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 which 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 overt 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 view—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.

Officials sometimes raise the question of procedure in the case of a corporation, which can not 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.

From this point onward in this discussion the reader should remember that the material presented has been pre-

pared upon this theory: If a prosecution is warranted, every just means should be employed to push the prosecution as vigorously as possible and to secure 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 which, in the exercise of his best judgment before the case was begun, he has deemed to be necessary and deserved.

With these preliminary considerations, let us now proceed to a discussion of the physical aspects of a weights and measures prosecution. There are some "exhibits" introduced in practically every weights and measures trial. These may be merchandise which has been purchased or seized, unsealed or faulty weighing or measuring equipment which 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 must be exercised to protect and preserve the integrity of all of the physical evidence. When first secured, all of this should be marked for identification and all packages of merchandise should be sealed.

A complete official record should at once be made of these identifying marks, the date and hour when the evidence was secured, the source of the evidence, and a full description of all of the circumstances which it is thought may have any bearing upon the subsequent conduct of the case, including

any relevant statements or remarks which may be made by any of the parties at interest. This record should, of course, be signed by the official. Too much emphasis can not 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 which 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.

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 as 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, in so far as possible, that such other witnesses are willing and prepared

to testify to a set of facts which 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 sale was made, 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.

A sales slip should always be secured with a purchase if this is possible. The price per pound or per unit of measure—established by verbal statement at the time of purchase, by signs displayed, by published advertisements, etc.—in combination with the price extension shown by the sales slip or other receipt, serves to establish the representation of 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.

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 as used by the vendor. If the equipment is not at fault the responsibility for any inaccuracies is then placed squarely upon the individual. 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. In the case of incorrect or fraudulent equipment its condition or character will be demonstrated by test and inspection, and if deemed advisable the equipment will 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 another 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.

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 which is not of a perishable nature. Where the character of the evidence is such that it can not 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 which can not 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 check-up 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.

The evidence in some cases may be largely documentary; original documents or properly authenticated copies should be secured 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, nevertheless it is advisable to support it, whenever practicable to do so, with the testimony of other competent witnesses.

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 that which will be followed by the careful and conscientious weights and measures chief, who will give his personal attention to all prosecutions which 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.

Turning now to what may be termed the legal aspects of the prosecution, we have to consider briefly the law, the complaint, the court, and the trial. Before venturing a prosecution at all, the weights and measures official must know his law thoroughly. Reading the text, even repeatedly, is not enough; this must 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 which the law sets up to his authority and activities and those fields into which he can not go because of lack of authority. Moreover, he must be so conversant with all of the sections of the law which 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 interest, 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 the acquirement of that intimate knowledge of the law which has been recommended.

A thorough knowledge of the provisions of the law and also, incidentally speaking, of other regulations and of all of the technic of weights and measures supervision, will stand the official in good stead when he is being cross-examined in court. Defense counsel will frequently 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 technic.

The complaint (known in some jurisdictions as the "affidavit" or "information") is a formal legal document set-

ting 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 inferior 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 it 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 as to details in different jurisdictions, but are all 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 instance, "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 inferior 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 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 defendant. 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 which 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.

The State can not 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 State 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.

For the sake of the precedents which 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 secured, 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 advisable 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 par-

ticularly valuable when followed by a State department in a publication furnished to local weights and measures officials of that State.

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 the entire absence of any vindictiveness or personal 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 which 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 which comes to their rescue in affairs of this kind and which 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 which 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 which 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 which will clear away the apparent complexity which may seem to be inherent in the subject when its study is first undertaken.

Chapter 29.—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.

Aside from those matters which 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 which 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 which 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 which 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.

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, etc.

It has already been pointed out that there are but few Federal weights and measures laws which directly concern the weights and measures official; in fact there are only two Federal departments, Commerce and Agriculture, which 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 which 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.

The *Federal food and drugs act*, including the "net-weight amendment," is administered by the Department of Agriculture; until July 1, 1927, this will be handled by the Bureau of Chemistry, but after that date it will be handled by the Food, Drug, and Insecticide Administration. Questions relating to the enforcement of this law should, therefore, be taken up with the appropriate office, depending upon whether the inquiry is made before or after July 1, 1927, at Washington, D. C. The *Federal standard container law* is administered by the Bureau of Agricultural Economics of the Department of Agriculture, and questions relating to the enforcement of this law should be addressed to that bureau at Washington, D. C.

The *Federal standard-barrel law* and the *Federal standard lime-barrel law* are administered by the National Bureau of Standards of the Department of Commerce, which should be addressed at Washington, D. C., upon questions relating to the enforcement of these laws.

However, the National Bureau of Standards has a much closer relation to State and local weights and measures officials than that brought about as a result of the administration of these Federal laws. The bureau has the custody of the national standards of weight and measure, tests the standards of the States, and has as one of its principal divisions, a *division of weights and measures*, devoted to the study of all matters coming under that classification.

A very brief outline of the organization of the Bureau of Standards may be helpful to a better understanding of the bureau's activities: The work of the bureau as a whole is controlled by a *director*; each *division* is in charge of a *chief of division*; and for administrative purposes the various divisions are subdivided into *sections*, each in charge

of a *section chief*. The names of the various scientific and technical *divisions* of the bureau, in addition to the division of weights and measures already mentioned, are as follows: Electricity, heat and power, optics, chemistry, mechanics and sound, organic and fibrous materials, metallurgy, clay and silicate products, simplified practice, building and housing, and specifications. As to the division of weights and measures, this is subdivided into the following *sections*: Weights and measures laws and administration (cooperation with State and local weights and measures officials), investigation and testing of scales (especially railroad track and mine scales), length, mass (weight), gas-measuring instruments, capacity and density, thermal expansivity, time, and gauges.

As previously stated, the Bureau of Standards desires to be of assistance to weights and measures officials in every way permitted by its statutory authority and available funds, 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 30.—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 which 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.

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 which are made should be simple and

effective, so that desired information may quickly and surely be located when it is wanted; a record which can not be found is no better than no record at all. A third consideration is that a system which 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.

The elimination of excessive clerical work may probably best be secured 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.

The next question is the number of separate files which 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 fre-

quently 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 supervisional 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.

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 unbusiness-like but necessitates an almost blind search when some record is wanted.

In so far 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 celluloid clips, commonly called "flags" or "signals," which may be lettered or numbered or of distinctive color, may be employed.

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.

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.

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.

The foregoing discussion is confined to "lose-leaf" 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 must be adequately indexed so that information 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.

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 of size for reports which are to be filed together. Experience has shown that report forms about 4 inches wide and from 8 to 9 inches long are well suited to weights and measures uses. Such reports

may be filed vertically in standard "document" file units or horizontally in standard "check" or "voucher" file units. Ample space is provided on forms of this size to meet the requirements of the large majority of reports, and these forms may be bound, as perforated sheets, into book form of a size convenient to carry in the pocket or in the inspection kit. It is recommended, therefore, that this size of report form be adopted as a standard.

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. 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. 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 which 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. The form should likewise have a printed heading giving the name of the department under the authority of which it is to be used.

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

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 consider-

able 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 secure a check on all totals, and, in addition, the completion of the summaries at the end of the departmental report period then becomes a matter of a comparatively short time. Similarly, the smaller jurisdiction will find it advantageous to keep up to date the necessary summaries of its activities.

Chapter 31.—MECHANICAL, SUPERVISIONAL, AND MISCELLANEOUS REPORTS

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.

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 entered, 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, in so far as this is possible. Summaries should then be made up by well-defined classes which 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.

Books 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.

A plan which has given good results with respect to retests of 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.

In most jurisdictions it is believed that 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.

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 condemned for repairs. These special reports advise the owner of the equipment which 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 department whose 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.

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.

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 instance, 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 supervisional records are not given to those upon whom the official is checking up; 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 supervisional 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 supervisional reports of similar character, thus assembling, for example, all coal-reweighing reports, all ice-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 supervisional 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 check-up report and (2) the prosecution report.

The general check-up 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 balance in which the scales are kept and the general condition of other weighing and measuring equip-

ment. In the absence of special forms for reporting the results of fuel reweighings, ice reweighings, and the investigation of complaints of improper practices, the general check-up 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 between these several forms.

Suitable printed headings for these supervisional report forms, in addition to provision for the general information which should be entered 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 which 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.

The prosecution record form will depend as to 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.

In conclusion, it may be said that supervisional reports should be prepared and supervisional records should be preserved with the same care and attention as is given to mechanical reports, the principles of recording all official acts and of making all reports complete and fully informative being equally applicable to these two branches of the work of the weights and measures official.

No further comment will be necessary upon those miscellaneous reports which will be required, particularly in the larger jurisdictions, than 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.

APPENDIXES

Appendix I.—FEDERAL LAWS IN RELATION TO WEIGHTS AND MEASURES, AND REGULATIONS PROMULGATED UNDER AUTHORITY THEREOF

STANDARD-BARREL LAW

[38 Stat., ch. 158, p. 1186, 63d Cong.]

AN ACT To fix the standard barrel for fruits, vegetables, and other dry commodities

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the standard barrel for fruits, vegetables, and other dry commodities other than cranberries shall be of the following dimensions when measured without distention of its parts: Length of stave, twenty-eight and one-half inches; diameter of heads, seventeen and one-eighth inches; distance between heads, twenty-six inches; circumference of bulge, sixty-four inches, outside measurement; and the thickness of staves not greater than four-tenths of an inch: *Provided*, That any barrel of a different form having a capacity of seven thousand and fifty-six cubic inches shall be a standard barrel. The standard barrel for cranberries shall be of the following dimensions when measured without distention of its parts: Length of staves, twenty-eight and one-half inches; diameter of head, sixteen and one-fourth inches; distance between heads, twenty-five and one-fourth inches; circumference of bulge, fifty-eight and one-half inches, outside measurement; and the thickness of staves not greater than four-tenths of an inch.

SEC. 2. That it shall be unlawful to sell, offer, or expose for sale in any State, Territory, or the District of Columbia, or to ship from any State, Territory, or the District of Columbia to any other State, Territory, or the District of Columbia, or to a foreign country, a barrel containing fruits or vegetables or any other dry commodity of less capacity than the standard barrels defined in the first section of this act, or subdivisions thereof known as the third, half, and three-quarters barrel; and any person guilty of a willful violation of any of the provisions of this act shall be deemed guilty of a misdemeanor

and be liable to a fine not to exceed \$500, or imprisonment not to exceed six months, in the court of the United States having jurisdiction: *Provided, however,* That no barrel shall be deemed below standard within the meaning of this act when shipped to any foreign country and constructed according to the specifications or directions of the foreign purchaser if not constructed in conflict with the laws of the foreign country to which the same is intended to be shipped.

SEC. 3. That reasonable variations shall be permitted and tolerance shall be established by rules and regulations made by the Director of the Bureau of Standards and approved by the Secretary of Commerce. Prosecutions for offenses under this act may be begun upon complaint of local sealers of weights and measures or other officers of the several States and Territories appointed to enforce the laws of the said States or Territories, respectively, relating to weights and measures: *Provided, however,* That nothing in this act shall apply to barrels used in packing or shipping commodities sold exclusively by weight or numerical count.

SEC. 4. That this act shall be in force and effect from and after the first day of July, nineteen hundred and sixteen.

Approved, March 4, 1915.

RULES AND REGULATIONS PROMULGATED UNDER AUTHORITY OF THE FEDERAL STANDARD-BARREL LAW¹

In accordance with the provisions of section 3 of the act to fix the standard barrel for fruits, vegetables, and other dry commodities (38 Stat., ch. 158, p. 1186, 63d Cong.), approved March 4, 1915, there are hereby promulgated rules and regulations made by the Director of the Bureau of Standards and approved by the Secretary of Commerce.

PARAGRAPH 1. (a) The capacities of the standard barrel for fruits, vegetables, and other dry commodities,² other than cranberries, and its subdivisions, are as follows:

Size	Cubic inches	Bushels ^a	Quarts ^a
Barrel.....	7, 056	3. 281	105
Three-fourths barrel.....	5, 292	2. 461	78 ³ / ₄
One-half barrel.....	3, 528	1. 641	52 ¹ / ₂
One-third barrel.....	2, 352	1. 094	35

^a Struck measure.

¹ Department of Commerce, Circular of the Bureau of Standards No. 71.

² Lime is not included within the purview of the law or of these rules and regulations, since a more recent act (39 Stat., ch. 396, p. 530, 64th Cong.) has established standard barrels especially for lime upon a weight basis.

(b) The capacities of the standard cranberry barrel and its subdivisions are as follows:

Size	Cubic inches	Bushels ¹	Quarts ¹
Cranberry barrel.....	5,826	2.709	86 $\frac{1}{4}$
Three-fourths cranberry barrel.....	4,369.5	2.032	65 $\frac{1}{4}$
One-half cranberry barrel.....	2,913	1.355	43 $\frac{1}{2}$
One-third cranberry barrel.....	1,942	.903	28 $\frac{1}{2}$

¹ Struck measure.

PAR. 2. (a) Any barrel having the dimensions specified for a standard barrel for fruits, vegetables, and other dry commodities other than cranberries, in section 1 of the standard-barrel law, or any barrel or a subdivision thereof having the contents specified in section 1 of the standard-barrel law and in paragraph 1 (a) of these rules and regulations, regardless of its form or dimensions, is a legal standard barrel for fruits, vegetables, or other dry commodities other than cranberries, or a legal subdivision thereof. No other barrel or subdivision in barrel form is a legal container for fruits, vegetables, or other dry commodities other than cranberries.

(b) Any barrel having the dimensions specified for a standard barrel for cranberries in section 1 of the standard-barrel law, or any subdivision thereof having the contents specified in paragraph 1 (b) of these rules and regulations, regardless of its form or dimensions, is a legal standard barrel for cranberries or a legal subdivision thereof. No other barrel or subdivision in barrel form is a legal container for cranberries.

PAR. 3. The tolerance established hereafter for the dimension specified as "distance between heads" shall be applied as follows on the various types of barrels in use:

(a) When a barrel or subdivision thereof has two heads, the tolerance shall be applied to the distance between the inside surfaces of the heads and perpendicular to them.

(b) When a barrel or subdivision thereof has but one head and a croze ring or other means for the insertion of a head, such as an inside hoop, etc., at the opposite end, the tolerance shall be applied to the distance from the inside surface of the bottom head and perpendicular to it to the inside edge of the croze ring, or to a point

where the inside surface of a head would come were such head inserted in the barrel.

(c) When a barrel or subdivision thereof has but one head and no croze ring or other means for the insertion of a head, such as an inside hoop, etc., at the opposite end, the tolerance shall be applied to the distance from the inside surface of the bottom head and perpendicular to it to a point $1\frac{1}{8}$ inches from the opposite end of the staves in the case of a barrel or a $\frac{3}{4}$ barrel, and to a point 1 inch or $\frac{7}{8}$ inch from the opposite end of the staves in the case of the $\frac{1}{2}$ barrel and $\frac{1}{3}$ barrel, respectively. When a barrel or subdivision thereof has been manufactured with but one head and no croze ring or other means for the insertion of a head at the opposite end, and it is desired to insert a second head, the croze ring shall be so cut that the inside edge shall not be more than $1\frac{1}{8}$ inches from the end of the staves in the case of a barrel or $\frac{3}{4}$ barrel or not more than 1 inch or $\frac{7}{8}$ inch from the end of the staves in the case of the $\frac{1}{2}$ barrel and $\frac{1}{3}$ barrel, respectively, or the other means shall be so adjusted that the inside surface of the head when inserted shall not exceed these distances from the end of the staves.

PAR. 4. The tolerance established hereafter for the dimension specified as "diameter of head" shall be applied to the diameter of the head over all, including the part which fits into the croze ring of the completed barrel.

The tolerance established hereafter for the dimension specified as "effective diameter of head" shall be applied as follows on the various types of barrels and subdivisions in use:

(a) When a barrel or subdivision thereof has two heads, the tolerance shall be applied to the mean of the average diameters from inside to inside of staves at the inner edges of the heads.

(b) When a barrel or subdivision thereof has but one head and a croze ring or other means for the insertion of a head at the opposite end, the tolerance shall be applied to the mean of the average diameters, one taken from inside to inside of staves at the inner edge of the head, the other from inside to inside of staves at the inner edge of the croze ring, or from inside to inside of staves at a point where the inside surface of a head would come were such head inserted in the barrel.

(c) When a barrel or subdivision thereof has but one head and no croze ring or other means for the insertion of a head at the oppo-

site end, the tolerance shall be applied to the mean of the average diameters, one taken from inside to inside of staves at the inner edge of the head, the other taken from inside to inside of staves at a point $1\frac{1}{8}$ inches from the end of the staves in the case of a barrel or $\frac{3}{4}$ barrel, or at a point 1 inch or $\frac{7}{8}$ inch from the end of the staves in the case of a $\frac{1}{2}$ barrel or $\frac{1}{3}$ barrel, respectively.

The standard allowance for depth of croze ring shall be $\frac{3}{16}$ inch. Therefore, the standard "effective diameter of head" in the case of the standard barrel is $16\frac{3}{4}$ inches and in the case of the standard cranberry barrel is $15\frac{7}{8}$ inches.

PAR. 5. Whenever in these rules and regulations the error on a dimension is mentioned, this error shall be determined by taking the difference between the actual measured dimension and the standard dimension. The error is an error of excess and is to be preceded by a plus sign when the measured dimension is greater than the standard dimension. The error is an error in deficiency and is to be preceded by a minus sign when the measured dimension is less than the standard dimension.

(a) The standard dimensions of a barrel for fruits, vegetables, and other dry commodities other than cranberries, and of a barrel for cranberries, with which the actual measured dimensions are to be compared, are as follows:

Dimensions	Barrel for fruits, vegeta- bles, and other dry commodi- ties other than cran- berries	Barrel for cran- berries
	<i>Inches</i>	<i>Inches</i>
Diameter of head.....	$17\frac{1}{8}$	$16\frac{1}{4}$
Effective diameter of head (see par. 4).....	$16\frac{3}{4}$	$15\frac{7}{8}$
Distance between heads.....	26	$25\frac{1}{4}$
Circumference of bulge, outside measurement.....	64	$58\frac{1}{2}$
Length of stave.....	$28\frac{1}{2}$	$28\frac{1}{2}$

(b) In the case of all subdivisions of the barrel for fruits, vegetables, and other dry commodities other than cranberries, and all subdivisions of the barrel for cranberries, the following dimensions

are hereby standardized for the purpose of the application of tolerances, and the actual measured dimensions are to be compared with these:

Subdivisions of barrel for fruits, vegetables, and other dry commodities other than cranberries

Dimensions	$\frac{3}{4}$ barrel	$\frac{1}{2}$ barrel	$\frac{1}{3}$ barrel
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
Effective diameter of head (see par. 4)-----	15 $\frac{1}{4}$	13 $\frac{3}{8}$	11 $\frac{5}{8}$
Distance between heads-----	23 $\frac{1}{2}$	20 $\frac{1}{2}$	18
Circumference of bulge, outside measurement-----	58 $\frac{1}{2}$	51 $\frac{1}{2}$	45 $\frac{1}{4}$

Subdivisions of barrel for cranberries

Dimensions	$\frac{3}{4}$ barrel	$\frac{1}{2}$ barrel	$\frac{1}{3}$ barrel
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
Effective diameter of head (see par. 4)-----	14 $\frac{3}{8}$	12 $\frac{5}{8}$	11
Distance between heads-----	23	20	17 $\frac{1}{2}$
Circumference of bulge, outside measurement-----	53 $\frac{3}{8}$	47	41 $\frac{3}{8}$

PAR. 6. For the purpose of the application of tolerances, barrels for fruits, vegetables, and other dry commodities other than cranberries, are hereby divided into two classes as follows:

Class 1 shall include (a) all barrels no dimension of which is in error by more than the following amounts, and (b) all barrels one or more of the dimensions of which are in error by more than the following amounts, and which in addition have no dimension in error in the opposite direction:

	Error, inches
Effective diameter of head-----	$\frac{1}{4}$
Distance between heads-----	$\frac{1}{4}$
Circumference of bulge, outside measurement-----	1 $\frac{1}{2}$

Class 2 shall include all barrels at least one dimension of which is in error by more than the amounts given above, but which in addition have at least one dimension in error in the opposite direction. (This class includes all barrels mentioned in section 1 of the law in the proviso reading: "*Provided*, That any barrel of a different form having a capacity of seven thousand and fifty-six cubic inches shall be a standard barrel.")

PAR. 7. (a) The tolerances to be allowed in excess or in deficiency on the dimensions of all barrels of class 1 shall be as follows:

	Tolerance, inches
Diameter of head-----	$\frac{1}{4}$
Effective diameter of head-----	$\frac{1}{4}$
Distance between heads-----	$\frac{1}{4}$
Circumference of bulge, outside measurement-----	$1\frac{1}{2}$
Length of stave-----	$\frac{1}{2}$

If no dimension of a barrel of class 1 is in error by more than the tolerance given above, then the barrel is within the tolerance allowed.

If one or more of the dimensions of a barrel of class 1 is in error by more than the tolerance given above, then the barrel is not within the tolerance allowed.

(b) The tolerance to be allowed in excess or in deficiency on all barrels of class 2 shall be $1\frac{1}{2}$ inches (1.5 inches), and this tolerance is to be applied to the result obtained by the application of the following rule:

Having determined the error of each dimension and given to each its proper sign (see par. 5), add the errors on the effective diameter of head and the distance between heads algebraically and multiply the result by 1.67 (or $\frac{5}{3}$). Then add this result to the error on the circumference of bulge algebraically. If the result obtained is not greater than the tolerance given above, then the barrel is within the tolerance allowed; if the result is greater than this tolerance, then the barrel is not within the tolerance allowed.

NOTE.—To find the algebraic sum of a number of quantities having different signs, first add all those having one sign; then add all those having the opposite sign; then subtract the smaller sum from the larger, giving this result the sign of the larger quantity.

(c) The tolerance to be allowed in excess or in deficiency on the dimensions of all barrels for cranberries shall be as follows:

	Tolerance, inches
Diameter of head-----	$\frac{1}{4}$
Effective diameter of head-----	$\frac{1}{4}$
Distance between heads-----	$\frac{1}{4}$
Circumference of bulge, outside measurement-----	$1\frac{3}{8}$
Length of stave-----	$\frac{1}{2}$

If no dimension of a barrel for cranberries is in error by more than the tolerance given above, then the barrel is within the tolerance allowed.

If one or more of the dimensions of a barrel for cranberries is in error by more than the tolerance given above, then the barrel is not within the tolerance allowed.

(d) The tolerances to be allowed in excess or in deficiency on all subdivisions of the standard barrel for fruits, vegetables, and other dry commodities other than cranberries, and on all subdivisions of the standard barrel for cranberries, shall be the values given in the following table, and these tolerances are to be applied to the result obtained by the application of the following rule:

Having determined the error on each dimension and given to each its proper sign (see par. 5), add the errors on the effective diameter of head and the distance between heads algebraically and multiply the result by 1.67 (or $\frac{5}{3}$). Then add this result to the error on the circumference of bulge algebraically. If the result obtained is not greater than the tolerance given in the following table for the proper subdivision, then the barrel is within the tolerance allowed; if the result is greater than this tolerance, then the barrel is not within the tolerance allowed.

Size of subdivision	Tolerance	
	For fruits, vegetables, and other dry commodities	For cranberries
Three-quarters barrel	<i>Inches</i> 1 $\frac{3}{8}$ (1. 375)	<i>Inches</i> 1 $\frac{1}{4}$ (1. 25)
One-half barrel	1 $\frac{1}{4}$ (1. 25)	1 $\frac{1}{8}$ (1. 125)
One-third barrel	1 $\frac{1}{8}$ (1. 125)	1 (1. 00)

S. W. STRATTON,
Director.

Approved :
WILLIAM C. REDFIELD,
Secretary.

WASHINGTON, June 30, 1917.

STANDARD LIME BARREL ACT

[39 Stat., ch. 396, p. 530, 64th Cong.]

AN ACT To standardize lime barrels

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby

established a large and a small barrel of lime, the large barrel to consist of two hundred and eighty pounds and the small barrel to consist of one hundred and eighty pounds, net weight.

SEC. 2. That it shall be unlawful for any person to sell or offer for sale lime imported in barrels from a foreign country, or to sell or offer for sale lime in barrels for shipment from any State or Territory or the District of Columbia, to any other State or Territory or the District of Columbia, unless there shall be stencilled or otherwise clearly marked on one or both heads of the small barrel the figures "180 lbs. net" and of the large barrel the figures "280 lbs. net" before the importation or shipment, and on either barrel in addition the name of the manufacturer of the lime and where manufactured, and, if imported, the name of the country from which it is imported.

SEC. 3. When lime is sold in interstate or foreign commerce in containers of less capacity than the standard small barrel, it shall be sold in fractional parts of said standard small barrel, and the net weight of lime contained in such container shall by stencil or otherwise be clearly marked thereon, together with the name of the manufacturer thereof, and the name of the brand, if any, under which it is sold, and, if imported, the name of the country from which it is imported.

SEC. 4. That rules and regulations for the enforcement of this act, not inconsistent with the provisions of the act, shall be made by the Director of the Bureau of Standards and approved by the Secretary of Commerce, and that such rules and regulations shall include reasonable variations or tolerances which may be allowed.

SEC. 5. That it shall be unlawful to pack, sell, or offer for sale for shipment from any State or Territory or the District of Columbia to any other State or Territory or the District of Columbia, any barrels or other containers of lime which are not marked as provided in sections 2 and 3 of this act, or to sell, charge for, or purport to deliver from any State or Territory or the District of Columbia to any other State or Territory or the District of Columbia, as a large or small barrel or a fractional part of said small barrel of lime, any less weight of lime than is established by the provisions of this act; and any person guilty of a violation of the provisions of this act shall be deemed guilty of a misdemeanor and be liable to a fine not exceeding \$100.

SEC. 6. That it shall be the duty of each district attorney, to whom satisfactory evidence of any violation of this act is presented, to cause appropriate proceedings to be commenced and prosecuted in the United States court having jurisdiction of such offense: *Provided, however,* That the penal provisions of this act shall not take effect until January 1, 1917.

SEC. 7. That this act shall be in force and effect from and after its passage.

Approved, August 23, 1916.

RULES AND REGULATIONS FOR THE ENFORCEMENT OF THE
LIME BARREL ACT³

In accordance with the provisions of section 4 of the act to standardize lime barrels (39 Stat., ch. 396, p. 530, 64th Cong.), approved August 23, 1916, there are hereby promulgated rules and regulations for the enforcement of this act, made by the Director of the Bureau of Standards and approved by the Secretary of Commerce.

PARAGRAPH 1. The act, "39 Stat., ch. 396, p. 530, 64th Congress," approved August 23, 1916, entitled "An act to standardize lime barrels," shall be known and referred to as the "standard lime barrel act."

PAR. 2. These rules and regulations are to be understood and construed to apply to lime in barrels, or other containers packed, sold, or offered for sale for shipment from any State or Territory or the District of Columbia to any other State or Territory or the District of Columbia; and to lime in containers of less capacity than the standard small barrel sold in interstate or foreign commerce; and to lime imported in barrels from a foreign country and sold or offered for sale; also to lime not in barrels or containers of less capacity than the standard small barrel sold, charged for, or purported to be delivered as a large or small barrel or a fractional part of said small barrel of lime from any State or Territory or the District of Columbia to any other State or Territory or the District of Columbia.

PAR. 3. Lime in barrels shall be packed only in barrels containing 280 pounds or 180 pounds, net weight. For the purposes of this paragraph the word "barrel" is defined as a cylindrical or approximately cylindrical vessel, cask, or drum.

PAR. 4. The term "container of less capacity than the standard small barrel," as mentioned in section 3 of the law and as used in these rules and regulations, is defined as any container not in barrel form containing therein a net weight of lime of less than 180 pounds.

The term "label," as used in these rules and regulations, is defined as any printed, pictorial, or other matter upon the surface of a barrel or other container of lime subject to the provisions of this act, or upon cloth or paper or the like which is permanently affixed to it by pasting or in a similar manner.

The term "tag" is defined as a tough and strong strip of cloth or paper or the like, bearing any printed, pictorial, or other matter,

³ Department of Commerce, Circular of the Bureau of Standards No. 64.

which is loose at one end and which is secured to a container of lime subject to the provisions of this act.

PAR. 5 (a). The lettering required upon barrels of lime by section 2 of the law shall be as follows: The statement of net weight shall be in boldface capital letters and figures at least 1 inch in height and not expanded or condensed; it shall be clear, legible, and permanent, and so placed with reference to the other lettering that it is conspicuous. The name of the manufacturer of the lime and where manufactured, and, if imported, the name of the country from which it is imported, shall be in boldface letters at least one-half inch in height and not expanded or condensed, and shall be clear, legible, conspicuous, and permanent. None of these letters and figures shall be superimposed upon each other, nor shall any other characters be superimposed upon the required lettering or otherwise obscure it. All the above statements shall form parts of the principal label.

(b) The information required upon containers of lime of less capacity than the standard small barrel by section 3 of the law shall be included in a label: *Provided, however,* That in order to allow the utilization of secondhand or returnable bags made of cloth, burlap, or the like, such information may be upon a tag firmly attached to the container in a prominent and conspicuous position. In case a tag is used to give the required information there must not be any label or another tag upon the container which bears any statement having reference to lime, or any statement of weight whatever, which is not identical with the information upon the tag mentioned above; if a container is to be utilized which bears any such inaccurate information upon a label, such container shall be turned inside out or such information shall be obliterated in so far as it is inaccurate by blotting out the letters or figures, or if such inaccurate information is upon a tag, by removing such tag.

If the required lettering is upon a label, the statement of net weight shall be in boldface capital letters and figures at least three-fourths inch in height and not expanded or condensed; it shall be clear, legible, and permanent, and so placed with reference to the other lettering that it is conspicuous. The word "net" shall form part of the statement of weight. The name of the manufacturer of the lime and the name of the brand, if any, under which it is sold, and, if imported, the name of the country from which it is imported, shall be in boldface letters at least one-half inch in height and not expanded or condensed, and shall be clear, legible, conspicuous, and

permanent. None of these letters and figures shall be superimposed upon each other, nor shall any other characters be superimposed upon the required lettering or otherwise obscure it. All the above statements shall form parts of the principal label.

If the required lettering is upon a tag, the statement of net weight shall be in boldface capital letters and figures not less than one-half the height of the largest letters or figures used upon such tag: *Provided, however,* That in every case they shall be not less than one-eighth inch in height (12-point capitals), and not expanded or condensed. The word "net" shall form part of the statement of weight. The statement shall be clear, legible, and permanent, and so placed with reference to the other lettering that it is conspicuous. The name of the manufacturer of the lime, and the name of the brand, if any, under which it is sold, and, if imported, the name of the country from which it is imported, shall be in boldface letters and figures not less than one-eighth inch in height (12-point capitals), and not expanded or condensed, and shall be clear, legible, conspicuous, and permanent. None of these letters and figures shall be superimposed upon each other nor shall any other characters be superimposed upon the required lettering or otherwise obscure it. All the above statements shall be included upon the same side of the tag.

(c) In case the lime is actually packed in barrels or in containers of less capacity than the standard small barrel by some person other than the manufacturer of the lime, the information mentioned above must be given in the manner there described, and in addition there must be a statement to this effect: "Packed by _____" (giving the name and address of the packer). This statement shall be in letters not smaller than is specified for the general statement required in the case of barrels and containers of less capacity than the standard small barrel, respectively (see (a) and (b) above); it shall not be obscured and shall form part of the principal label or be upon the same side of the tag as in those cases provided.

(d) In the case of all lime sold in barrels, the actual place of manufacture of the lime shall be stated on the barrel. In general, this will be the name of the post office nearest or most accessible to the plant. However, when the actual place of manufacture of the lime and the offices of the company are separated but are within the boundaries of the same county of a State, or when, though not within the boundaries of the same county they are so close together

that the post-office address of the offices represents substantially and to all intents and purposes the actual place of manufacture of the lime, then the post-office address of the offices of the company will be sufficient: *Provided, however,* That the address given shall always correctly show the State in which the lime is actually manufactured.

More than one place of manufacture of a manufacturer shall not be shown on the same barrel unless the one at which the particular lime in question is manufactured is pointed out.

If the location of the home offices is stated and this is not the place of manufacture within the meaning of the above definition, an additional statement must be included to this effect: "Manufactured at ——" (giving the location of the plant).

PAR. 6. (a) When lime is packed in barrels the tolerance to be allowed on the large barrel or the small barrel of lime shall be 5 pounds in excess or in deficiency on any individual barrel: *Provided, however,* That the average error on 10 barrels of the same nominal weight and packed by the same manufacturer shall in no case be greater than 2 pounds in excess or in deficiency. In case all the barrels available are not weighed, those which are weighed shall be selected at random.

(b) When lime is packed in containers of less capacity than the standard small barrel, the tolerance to be allowed in excess or in deficiency on individual containers of various weights, shall be the values given in the column headed "Tolerance on individual package," of the following table: *Provided, however,* That the average error on 10 containers of the same nominal weight and packed by the same manufacturer shall in no case be greater than the values given in the column headed "Tolerance on average weight," of the following table. In case all the containers available are not weighed, those which are weighed shall be selected at random.

Weight of package	Tolerance on individual package	Tolerance on average weight
	<i>Pounds</i>	<i>Pounds</i>
Not greater than 50 lbs.....	1½	⅝
More than 50 lbs. and not greater than 100 lbs.....	2	¾
More than 100 lbs. and not greater than 150 lbs.....	3	1¼
More than 150 lbs. and less than 180 lbs.....	4	1½

(c) When lime in bulk is sold, charged for, or purported to be delivered as a definite number of large or small barrels, the tolerance to be allowed in excess or in deficiency on such amounts of lime shall be 15 pounds per 1,800 pounds (10 small barrels), or 25 pounds per 2,800 pounds (10 large barrels).

S. W. STRATTON,
Director.

Approved:
WILLIAM C. REDFIELD,
Secretary.

WASHINGTON, *March 13, 1917.*

NET-WEIGHT AMENDMENT TO THE FOOD AND DRUGS ACT

[37 Stat., ch. 117, p. 732, 62d Cong.]

AN ACT To amend section eight of an act entitled "An act for preventing the manufacture, sale, or transportation of adulterated or misbranded or poisonous or deleterious foods, drugs, medicines, and liquors, and for regulating traffic therein, and for other purposes," approved June 30, 1906

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 8 of an act entitled "An act for preventing the manufacture, sale, or transportation of adulterated or misbranded or poisonous or deleterious foods, drugs, medicines, and liquors, and for regulating traffic therein, and for other purposes," approved June 30, 1906, be, and the same is hereby, amended by striking out the words "Third. If in package form, and the contents are stated in terms of weight or measure, they are not plainly and correctly stated on the outside of the package," and inserting in lieu thereof the following:

"Third. If in package form, the quantity of the contents be not plainly and conspicuously marked on the outside of the package in terms of weight, measure, or numerical count: *Provided, however,* That reasonable variations shall be permitted, and tolerances and also exemptions as to small packages shall be established by rules and regulations made in accordance with the provisions of section 3 of this act.⁴

SEC. 2. That this act shall take effect and be in force from and after its passage: *Provided, however,* That no penalty of fine, im-

⁴ This section has been amended (Kenyon amendment, 41 Stat. 271) as follows:

"That the word 'package' where it occurs the second and last time in the act entitled 'An act to amend section 8 of an act entitled "An act for preventing the manufacture, sale, or transportation of adulterated or misbranded or poisonous or deleterious foods, drugs, medicines, and liquors, and for regulating traffic therein, and for other purposes," approved March 3, 1913, shall include and shall be construed to include wrapped meats inclosed in papers or other materials as prepared by the manufacturers thereof for sale."

prisonment, or confiscation shall be enforced for any violation of its provisions as to domestic products prepared or foreign products imported prior to eighteen months after its passage.

Approved, March 3, 1913.

RULES AND REGULATIONS FOR THE ENFORCEMENT OF THE
FEDERAL FOOD AND DRUGS ACT⁵

* * * * *

Regulation 26.—Statement of Weight, Measure, or Count⁶

[Section 8, paragraph third, in the case of food]

(a) Except as otherwise provided by this regulation, a package of food shall be plainly and conspicuously marked with the quantity of the contents in terms of weight, measure, or numerical count on the outside of the container, or of the covering of the package usually delivered to the consumer.

(b) The quantity of the contents so marked shall be the quantity of food in the package.

(c) The statement of the quantity of the contents shall be plain and conspicuous, shall not be a part of or obscured by any legend or design, and shall be so placed and in such characters as to be readily seen and clearly legible when the size of the package and the circumstances under which it is ordinarily examined by purchasers or consumers are taken into consideration.

(d) The quantity of the contents when stated by weight or measure shall be marked in terms of the largest unit contained in the package, except that, in the case of an article with respect to which there exists a definite trade custom for marking the quantity of the article in terms of fractional parts of larger units, it may be so marked in accordance with the custom. Common fractions shall be reduced to their lowest terms; fractions expressed as decimals shall be preceded by zero and shall be carried out to not more than two places.

(e) Statement of weight shall be in terms of the avoirdupois pound and ounce; statement of liquid measure shall be in terms of the United States gallon of 231 cubic inches and its customary subdivisions, i. e., gallons, quarts, pints, or fluid ounces, and shall ex-

⁵ Department of Agriculture, Office of the Secretary, Circular 21, eighth revision, May 20, 1922.

⁶ This regulation supersedes old "Regulation 29."

press the volume of the liquid at 68° F. (20° C.) ; statement of dry measure shall be in terms of the United States standard bushel of 2,150.42 cubic inches and its customary subdivisions, i. e., bushels, pecks, quarts, or pints, or, in the case of articles in barrels, in terms of the United States standard barrel and its lawful subdivisions, i. e., third, half, or three-quarters barrel, as fixed by the act of March 4, 1915 (38 Stat. 1186) : *Provided*, That statement of quantity may be in terms of metric weight or measure. Statement of metric weight shall be in terms of kilograms or grams. Statement of metric measure shall be in terms of liters or cubic centimeters. Other terms of metric weight or measure may be used if it appears that a definite trade custom exists for marking articles with such other terms and the articles are marked in accordance with the custom.

(f) The quantity of solids shall be stated in terms of weight and the quantity of liquids in terms of measure, except that in case of an article in respect to which there exists a definite trade custom otherwise the statement may be in terms of weight or measure in accordance with such custom. The quantity of viscous or semisolid foods or of mixtures of solids and liquids may be stated either by weight or measure, but the statement shall be definite and shall indicate whether the quantity is expressed in terms of weight or measure, as, for example, "weight 12 oz." or "12 oz. avoirdupois," "volume 12 ounces" or "12 fluid ounces."

(g) The quantity of the contents shall be stated in terms of weight or measure unless the package is marked by numerical count and such numerical count gives accurate information as to the quantity of the food in the package.

(h) The quantity of the contents may be stated in terms of minimum weight, minimum measure, or minimum count, for example, "minimum weight 10 oz.," "minimum volume 1 gallon," or "not less than 4 fl. oz.," but in such case the statement must approximate the actual quantity and there shall be no tolerance below the stated minimum.

(i) The following tolerances and variations from the quantity of the contents marked on the package shall be allowed :

(1) Discrepancies due exclusively to errors in weighing, measuring, or counting which occur in packing conducted in compliance with good commercial practice.

(2) Discrepancies due exclusively to differences in the capacity of bottles and similar containers, resulting solely from unavoidable

difficulties in manufacturing such bottles or containers so as to be of uniform capacity: *Provided*, That no greater tolerance shall be allowed in case of bottles or similar containers which, because of their design, can not be made of approximately uniform capacity than is allowed in case of bottles or similar containers which can be manufactured so as to be of approximately uniform capacity.

(3) Discrepancies in weight or measure due exclusively to differences in atmospheric conditions in various places and which unavoidably result from the ordinary and customary exposure of the packages to evaporation or to the absorption of water.

Discrepancies under classes (1) and (2) of this paragraph shall be as often above as below the marked quantity. The reasonableness of discrepancies under class (3) of this paragraph will be determined on the facts in each case.

(j) A package containing one-half avoirdupois ounce of food or less is "small" and shall be exempt from marking in terms of weight.

(k) A package containing one fluid ounce of food or less is "small" and shall be exempt from marking in terms of measure.

(l) When a package is not required by paragraph (g) to be marked in terms of either weight or measure and the units of food therein are six or less, it shall, for the purpose of this regulation, be deemed "small" and shall be exempt from marking in terms of numerical count.

* * * * *

A. W. MELLON,
Secretary of the Treasury.
HENRY C. WALLACE,
Secretary of Agriculture.
HERBERT HOOVER,
Secretary of Commerce.

STANDARD CONTAINER ACT

[39 Stat., ch. 426, p. 673, 64th Cong.]

AN ACT To fix standards for Climax baskets for grapes and other fruits and vegetables, and to fix standards for baskets and other containers for small fruits, berries, and vegetables, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That standards for Climax baskets for grapes and other fruits and vegetables shall be

the two-quart basket, four-quart basket, and twelve-quart basket, respectively:

(a) The standard two-quart Climax basket shall be of the following dimensions: Length of bottom piece, nine and one-half inches; width of bottom piece, three and one-half inches; thickness of bottom piece, three-eighths of an inch; height of basket, three and seven-eighths inches, outside measurement; top of basket, length eleven inches and width five inches, outside measurement. Basket to have a cover five by eleven inches, when a cover is used.

(b) The standard four-quart Climax basket shall be of the following dimensions: Length of bottom piece, twelve inches; width of bottom piece, four and one-half inches; thickness of bottom piece, three-eighths of an inch; height of basket, four and eleven-sixteenths inches, outside measurement; top of basket, length fourteen inches, width six and one-fourth inches, outside measurement. Basket to have cover six and one-fourth inches by fourteen inches, when cover is used.

(c) The standard twelve-quart Climax basket shall be of the following dimensions: Length of bottom piece, sixteen inches; width of bottom piece, six and one-half inches; thickness of bottom piece, seven-sixteenths of an inch; height of basket, seven and one-sixteenth inches, outside measurement; top of basket, length nineteen inches, width nine inches, outside measurement. Basket to have cover nine inches by nineteen inches, when cover is used.

SEC. 2. That the standard basket or other container for small fruits, berries, and vegetables shall be of the following capacities, namely, dry one-half pint, dry pint, dry quart, or multiples of the dry quart.

(a) The dry half pint shall contain sixteen and eight-tenths cubic inches.

(b) The dry pint shall contain thirty-three and six-tenths cubic inches.

(c) The dry quart shall contain sixty-seven and two-tenths cubic inches.

SEC. 3. That it shall be unlawful to manufacture for shipment, or to sell for shipment, or to ship from any State or Territory of the United States or the District of Columbia to any other State or Territory of the United States or the District of Columbia, any Climax baskets or other containers for small fruits, berries, or vegetables, whether filled or unfilled, which do not conform to the provisions of this act; and any person guilty of a willful violation of any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not exceeding \$25: *Provided*, That nothing herein contained shall apply to the manufacture, sale, or shipment of Climax baskets, baskets, or other containers for small fruits, berries, and vegetables when intended for export to foreign countries when such Climax baskets, baskets, or other containers for small fruits, berries, and vegetables accord with the specifications of the foreign purchasers or comply with the law of the country to which shipment is made or to be made.

SEC. 4. That the examination and test of Climax baskets, baskets, or other containers for small fruits, berries, and vegetables, for the purpose of determining whether such baskets or other containers comply with the provisions of this act, shall be made by the Department of Agriculture, and the Secretary of Agriculture shall establish and promulgate rules and regulations allowing such reasonable tolerances and variations as may be found necessary.

SEC. 5. That it shall be the duty of each district attorney, to whom satisfactory evidence of any violation of the act is presented, to cause appropriate proceedings to be commenced and prosecuted in the proper court of the United States for the enforcement of the penalties as in such case herein provided.

SEC. 6. That no dealer shall be prosecuted under the provisions of this act when he can establish a guaranty signed by the manufacturer, wholesaler, jobber, or other party residing within the United States from whom such Climax baskets, baskets, or other containers, as defined in this act, were purchased, to the effect that said Climax baskets, baskets, or other containers are correct within the meaning of this act. Said guaranty, to afford protection, shall contain the name and address of the party or parties making the sale of Climax baskets, baskets, or other containers to such dealer, and in such case said party or parties shall be amenable to the prosecutions, fines, and other penalties which would attach in due course to the dealer under the provisions of this act.

SEC. 7. That this act shall be in force and effect from and after the first day of November, nineteen hundred and seventeen.

Approved, August 31, 1916.

RULES AND REGULATIONS OF THE SECRETARY OF AGRICULTURE UNDER THE UNITED STATES STANDARD CONTAINER ACT⁷

REGULATION 1.—DEFINITIONS

SECTION 1. Words used in these regulations in the singular form shall be deemed to import the plural, and vice versa, as the case may demand.

SEC. 2. For the purposes of these regulations, unless the context otherwise require, the following terms shall be construed, respectively, to mean—

Paragraph 1. *Standard container act*.—The act entitled “An act to fix standards for Climax baskets for grapes and other fruits and vegetables, and to fix standards for baskets and other containers for small fruits, berries, and vegetables, and for other purposes,” approved August 31, 1916 (39 Stat. L., p. 673).

⁷ Issued Sept. 18, 1917.

Par. 2. *Containers*.—Climax baskets for grapes and other fruits and vegetables, and baskets or other containers for small fruits, berries, and vegetables.

REGULATION 2.—TOLERANCES AND VARIATIONS

SECTION 1. For the purpose of ascertaining whether a container is within the tolerances and variations as to capacity allowed by these regulations it shall be tested by the use of a dry measure of the standard capacity applicable to such container, approved by the Bureau of Standards of the United States Department of Commerce. Such test shall be made with rape seed or other medium giving equivalent results. The capacity of the container shall be determined by stricken measure; only the actual capacity when level full shall be considered, and such portion of the contents as may be heaped above the level of the top of the sides shall be disregarded, notwithstanding any raised cover which might permit the extension upward of the contents. In making such test both the container to be tested and the measure of standard capacity by the use of which it is to be tested shall be filled with the testing medium, in the same manner and under the same conditions, by means of a hopper of the type customarily employed for the same purpose in State and Federal laboratories.

SEC. 2. Paragraph 1. As prescribed in this section, the following tolerances and variations in the capacities of containers are found to be reasonable and necessary and are hereby allowed.

Par. 2. The excess or deficiency in capacity of any container, over or under the capacity prescribed for such container in the standard container act, as specified below in the column designated "Standard capacity," may be as much as, but not greater than, the amount stated in cubic inches in the same line in the column designated "Excess" or "Deficiency," as the case may be; but, among any lot of containers which are not all of the standard capacity prescribed for such containers by the standard container act, the number over shall be as nearly equal as may be practical to the number under

such standard capacity, within the tolerances and variations allowed therefor in this section.

Standard capacity	Tolerances and variations		Standard capacity	Tolerances and variations	
	Excess	Deficiency		Excess	Deficiency
	<i>Cubic inches</i>	<i>Cubic inches</i>		<i>Cubic inches</i>	<i>Cubic inches</i>
1 bushel.....	50	30	2 quarts.....	5	3¼
½ bushel.....	30	18	1 quart.....	3	2
12 quarts.....	23	15	1 pint.....	2	1½
1 peck.....	16	10	½ pint.....	1	¾
½ peck.....	10	6½			

Par. 3. In case of a container having a capacity to which a standard is applicable which is not specified in the column headed "Standard capacity" in the foregoing table, the excess or the deficiency allowed shall be that permitted for the next smaller standard capacity specified in the table, but this shall not apply to containers for which variations and tolerances shall be permitted and established under the act entitled "An act to fix the standard barrel for fruits, vegetables, and other dry commodities," approved March 4, 1915 (38 Stat. L., p. 1186), when such variations and tolerances become effective.

SEC. 3. Paragraph 1. As prescribed in this section, the following tolerances and variations in dimensions of Climax baskets for grapes and other fruits and vegetables are found to be reasonable and necessary and are hereby allowed, subject, however, to the tolerances and variations in capacity allowed in section 2 of these regulations.

Par. 2. The excess or deficiency in any dimension specified below in the column designated "Dimensions," over or under the measurement prescribed for such dimension in section 1 of the standard container act, may be as much as, but not greater than, the amount specified opposite such dimension in the column designated "Excess" or "Deficiency," as the case may be.

Dimensions	Tolerances and variations	
	Excess	Deficiency
	<i>Inches</i>	<i>Inches</i>
Length of bottom piece of 2-quart, 4-quart, or 12-quart Climax basket.....	$\frac{1}{8}$	$\frac{1}{8}$
Width of bottom piece of 2-quart, 4-quart, or 12-quart Climax basket.....	$\frac{1}{8}$	$\frac{1}{8}$
Thickness of bottom piece of 2-quart, 4-quart, or 12-quart Climax basket.....	$\frac{1}{2}$	$\frac{1}{2}$
Height of 2-quart, 4-quart, or 12-quart Climax basket, outside measurement.....	$\frac{1}{8}$	$\frac{1}{8}$
Length of cover of 2-quart, 4-quart, or 12-quart Climax basket.....	$\frac{1}{8}$	$\frac{1}{8}$
Width of cover of 2-quart, 4-quart, or 12-quart Climax basket.....	$\frac{1}{8}$	$\frac{1}{8}$
Combined length and width of top of 2-quart Climax basket, outside measurement.....	$\frac{1}{2}$	$\frac{1}{4}$
Combined length and width of top of 4-quart Climax basket, outside measurement.....	$\frac{5}{8}$	$\frac{3}{8}$
Combined length and width of top of 12-quart Climax basket, outside measurement.....	$\frac{3}{4}$	$\frac{1}{2}$

Appendix II.—MODEL STATE LAW ON THE SUBJECT OF WEIGHTS AND MEASURES

DEVELOPMENT OF MODEL LAW

Shortly after the National Bureau of Standards was established in 1901 a systematic study and compilation of the laws of the United States and of the several States relating to weights and measures was begun, in order to determine the foundation that existed at that time for the protection of purchasers and consumers against the use of false weights, measures, and apparatus, and against the fraudulent use of correct apparatus in commercial transactions. As a result of this investigation, the material having been found to be of the greatest importance, a special publication was issued by the Bureau of Standards in 1904, entitled "Laws Concerning the Weights and Measures of the United States."¹

A study of the laws there presented incontestably demonstrated that the laws of the States on the subject of weights and measures were antiquated, weak, and contradictory in their provisions and, moreover, independent investigation proved that in very few States was any attempt being made to enforce such requirements as they contained. It was then recognized that new and strict statutes were absolutely necessary in every State if faulty weights, measures, and apparatus were to be eliminated from commercial use and if the delivery of short amounts of commodity was to be prevented.

In 1905 the Annual Conference on the Weights and Measures of the United States was inaugurated, when invitations were sent to the various States requesting the appointment of official delegates to such a meeting. The delegates who assembled immediately saw the necessity of more satisfactory legislation, and with this idea in mind it was very natural that they should consult with one another as to

¹ A revised edition of this publication, known as Bureau of Standards Miscellaneous Publication No. 20, 3d Ed., "Federal and State Laws Relating to Weights and Measures," has been printed and is available for purchase from the Superintendent of Documents, Government Printing Office, Washington, D. C., at \$2.30 per copy.

the provisions which should be included. It was apparent to all of them that unless the laws about to be enacted by the several States were uniform the enforcement of all of them would be made very much more difficult and there would be a very great lack of efficiency in administration. The conclusion was inevitable that the conference should make some official recommendations on the question of State legislation, if it was to be of the maximum assistance in the improvement of conditions then existing throughout the States. As a result, a resolution was adopted, which read as follows:

Resolved, That it is the sense of this convention that meetings of State sealers or custodians of weights and measures be held annually in Washington to discuss and facilitate both National and State legislation tending toward securing uniformity in the laws pertaining to weights and measures and their inspection throughout the United States, and the Bureau of Standards is requested to arrange such a meeting.

At the second annual conference the question of procuring uniformity in the laws of the various States was again discussed, and at that meeting the following resolution was passed:

Resolved, That the executive committee be instructed to draw up a model set of laws to be submitted to this body at its next meeting.

In accordance with this resolution the executive committee of the conference prepared a set of suggestions for National and State laws, embraced in 34 sections, and their recommendations were adopted by the conference. These were, as the name implies, merely suggestions on which laws for the various States were to be based.

The next step in this matter was taken at the Sixth Annual Conference on Weights and Measures, held at the bureau in 1911, when a model law on the subject of weights and measures, drafted by the National Bureau of Standards, due consideration being had for the suggestions for National and State laws and for the various bills which had been framed in accordance with these suggestions and introduced in some of the States, was presented for the action of the conference. After debate on the various provisions and a few minor changes and additions, this model law was adopted by the national conference and recommended for passage to the various States.

The next steps to produce the present model law were taken at the Eighth and Tenth Annual Conferences on Weights and Measures, held at the Bureau of Standards in 1913 and 1915, respectively. Several new sections were inserted, the old sections were rearranged and in some cases split up into shorter sections in order to simplify them

for reference and consultation, and a somewhat simpler wording was adopted where it was believed that the matter would be clarified by so doing. These changes were not of sufficient importance, however, to make those States which had already adopted the law essentially nonuniform with States passing it after these changes were made.

At the Fourteenth Annual Conference on Weights and Measures, held in 1921, the bread section was amended to require that loaves be of certain standard weights only. In 1925 the Eighteenth National Conference on Weights and Measures authorized changes to extend jurisdiction to devices used in connection with the sale of service, and to penalize the delivery of less service than represented. Both of these changes are important ones and should be enacted by the States. Finally, the Twentieth National Conference on Weights and Measures, held in 1927, added provisions relative to tenure of office and a section defining the ton and cord, and authorized certain other changes of a minor character.

While prepared in form for enactment as a State statute, the model law may be used by a city desiring to pass a weights and measures ordinance by making appropriate deletions and modifications of language which will be obvious and which need not be detailed here.

FORMS OF MODEL LAW²

The model law is presented in three different forms instead of in the one standard form at first adopted and recommended. The basic provisions of all three forms are exactly the same, the only variations occurring in the methods of enforcement involved. It has been conclusively proven that the original form is not directly applicable to many of the States and that, to gain respectful attention in some of these States, it is necessary to submit it in a practicable form, at once applicable to local conditions. No desirable uniformity is sacrificed by presenting it in these various forms.

² The text of the model law, as given herein, differs in a number of respects from the text given in Bureau of Standards Handbook No. 1, "Manual of Inspection and Information for Weights and Measures Officials." Attention is directed, by means of footnotes, to modifications involving changes in substance, made by the Twentieth National Conference; modifications made for the purpose of making plain the meaning originally intended are not noted.

The following is a brief description of the three forms and of the local conditions in which each will be found to be peculiarly applicable.

Form No. 1.—This form provides that the entire weights and measures inspection system shall be in the hands of a State department and that the weights and measures laws shall be wholly enforced by men in the service of the State.

This form is intended primarily for States having a comparatively small population per unit of area and few large centers of population; and, secondarily, for those States in which it is believed that such a law can be most competently enforced by a centralization of power.

Form No. 2.—This form provides that the State shall take entire charge of the enforcement of the law in those jurisdictions in which the population per unit of area is so small that local authority can not enforce the provisions with the highest efficiency, and that in those jurisdictions where the population is large enough to justify it a local inspection service under the supervisory authority of the State department shall take up the enforcement of the provisions of the law.

This form is primarily intended for those States having part of their territory thickly settled and other parts only thinly settled.

Form No. 3.—This is the original form of the model law and provides for the enforcement of the provisions by local inspectors in each city and each county, all under the general supervisory control of a State department of weights and measures.

This form is intended for those States having a large population per unit of area and none or but few sections which are sparsely settled.

Inasmuch as a number of sections in the three forms are identical, the text of Form No. 2 only is included in full here. In the case of Forms Nos. 1 and 3, only those sections are given in full which are not identical with one of the sections of Form No. 2, there being an accompanying reference which indicates the numbers of the sections to be taken from Form No. 2 to complete Forms Nos. 1 and 3.

TEXT, FORM NO. 2

SECTION 1. The weights and measures received from the United States under joint resolutions of Congress approved June 14, 1836, and July 27, 1866, and/or such new weights and measures as shall be received from the United States as standard weights and measures

in addition thereto or in renewal thereof, and/or such weights and measures in conformity therewith as shall be supplied by the State shall, when the same shall have been certified by the National Bureau of Standards, be the State standards of weights and measures.

SEC. 2. In addition to the State standards of weights and measures, provided for above, there shall be supplied by the State at least one complete set of copies of these, to be kept at all times in the office of the State superintendent [commisisoner], and to be known as office standards; and such other weights, measures, and apparatus as may be found necessary to carry out the provisions of this act, to be known as working standards. Such weights, measures, and apparatus shall be verified by the State superintendent [commisisoner], or his deputy or inspectors, at his direction, upon their initial receipt and at least once in each year thereafter, the office standards by direct comparison with the State standards, the working standards by comparison with the office standards. When found accurate upon these tests the office and working standards shall be sealed by stamping on them the letter "—" and, in the case of working standards, the last two figures of the year, with seals which the State superintendent [commissioner] shall have and keep for that purpose. The office or working standards shall be used in making all comparisons of weights, measures, and weighing or measuring devices submitted for test in the office of the superintendent [commissioner] and the State standards shall be used only in verifying the office standards and for scientific purposes.

SEC. 3.³ There shall be a State superintendent [commissioner] of weights and measures, who shall be appointed by the governor, by and with the advice and consent of the senate. Such superintendent [commissioner] shall be appointed for a term of five years, and shall receive a salary of \$—— a year. There shall be a deputy superintendent [commissioner] of weights and measures and inspectors of weights and measures, to be appointed from eligible lists prepared by the civil-service board and under the rules of said board. *[In the absence of a civil-service board in the State, substitute for the preceding sentence the following:* There shall be a deputy superintendent [commissioner] of weights and measures and inspectors of weights and measures, to be appointed by the superintendent [commissioner] of weights and measures and to hold office during good behavior, and they shall not be removed, discharged, or reduced in pay or position except for inefficiency, incapacity, conduct unbecoming an employee, or other just cause, and until they shall have been furnished with a written statement of the reasons for any such contemplated removal, discharge, or reduction, and shall have been given a reasonable time to make written answer thereto; nor shall such removal,

³ As given in Bureau of Standards Handbook No. 1, this section provided for the appointment of the deputy superintendent without regard to civil service and for a specified term; also in the absence of a civil-service board no alternate method was specified for the appointment of inspectors. The form here given is believed to be much more desirable, and is recommended by the National Bureau of Standards; this amendment was adopted by the Twentieth National Conference on Weights and Measures.

discharge, or reduction be made until the charge or charges shall have been examined into and found true in fact by the governor or a committee which he may appoint for this purpose, at a hearing, upon reasonable notice to the person charged, at which time he may be represented by counsel and offer testimony of witnesses and any other evidence in his own behalf.] The superintendent [commissioner] of weights and measures shall be allowed for salaries for the deputy superintendent [commissioner] of weights and measures and inspectors of weights and measures, and for clerical services and traveling and contingent expenses for himself, his deputy, and inspectors, such sums as shall be appropriated by the legislature.

SEC. 4. The State superintendent [commissioner] of weights and measures shall forthwith, on his appointment, give a bond in the penal sum of \$5,000, with sureties, to be approved by the secretary of state [attorney general] for the faithful performance of the duties of his office and for the safe-keeping of the standards intrusted to his care and for the surrender thereof immediately to his successor in office or to the person appointed by the governor to receive them. The deputy superintendent [commissioner] of weights and measures and each inspector of weights and measures shall forthwith upon his appointment give a bond in the penal sum of \$1,000, with sureties, to be approved by the secretary of state [attorney general], for the faithful performance of the duties of his office and for the safe-keeping of any apparatus intrusted to his care.

SEC. 5. The superintendent [commissioner] of weights and measures shall take charge of the standards adopted by this act as the standards of the State, and cause them to be kept in a fireproof building belonging to the State (or in a safe and suitable place in the office of the superintendent [commissioner]), from which they shall not be removed except for repairs or for certification, and he shall take all other necessary precautions for their safe-keeping. He shall maintain the State standards in good order and shall submit them at least once in ten years to the National Bureau of Standards for certification. He shall keep a complete record of the standards, balances, and other apparatus belonging to the State and take a receipt for same from his successor in office. He shall annually, on the first day of ———, make to the governor a report of all work done by his office.

SEC. 6. The superintendent [commissioner] of weights and measures, or his deputy, or inspectors, at his direction, shall at least once in five years try and prove by the office standards all standard weights, measures, and other apparatus which may belong to any county or city, required to appoint a sealer and purchase and keep standards of weights and measures by the provisions of this act, and shall seal such when found to be accurate by stamping on them the letter "—" and the last two figures of the year with seals which he shall have and keep for that purpose.

The State superintendent [commissioner], or his deputy, or inspectors, at his direction, shall inspect all standard weights, measures,

and other apparatus used by such counties and cities at least once in two years, and shall keep a record of the same. He, or his deputy, or inspectors, at his direction, shall at least once in two years visit these cities and counties for this purpose and in order to inspect the work of the local sealers, and in the performance of such duties they may inspect the weights, measures, balances, or any other weighing or measuring devices of any person, firm, or corporation, and shall have the same powers as the local sealer of weights and measures. The superintendent [commissioner] shall issue from time to time regulations for the guidance of county and city sealers, and the said regulations shall govern the procedure to be followed by the aforesaid officers in the discharge of their duties.

SEC. 7. The State superintendent [commissioner] of weights and measures shall have and keep a general supervision of the weights and measures, and weighing or measuring devices offered for sale, sold, or in use in the State. He, or his deputy, or inspectors, at his direction, shall, upon the written request of any person, firm, or corporation, or educational institution in the State, test or calibrate weights, measures, and weighing or measuring devices used as standards in the State. He, or his deputy, or inspectors, at his direction, shall at least once annually test all scales, weights, and measures used in checking the receipts or disbursements of supplies in every institution for the maintenance of which moneys are appropriated by the legislature, and he shall report in writing his findings to the supervisory board and to the executive officer of the institution concerned, and, at the request of such board or executive officer, the superintendent [commissioner] of weights and measures shall appoint in writing one or more employees then in the actual service of the institution who shall act as special deputies for the purpose of checking the receipts or disbursements of supplies.

SEC. 8. When not otherwise provided by law the State superintendent [commissioner] shall have the power, and it shall be his duty in those parts of the State in which a city or county sealer is not required to be appointed by the provisions of this act, to inspect, test, try, and ascertain if they are correct, all weights, measures, and weighing or measuring devices kept, offered, or exposed for sale, sold, or used or employed in proving the size, quantity, extent, area, or measurement of quantities, things, produce, or articles for distribution or consumption purchased or offered or submitted for sale, hire, or award, or in computing any charge for services rendered on the basis of weight or measure, or in determining weight or measure when a charge is made for such determination; and he shall have the power to and shall from time to time weigh or measure and inspect packages or amounts of commodities of whatsoever kind kept for the purpose of sale, offered or exposed for sale, or sold or in the process of delivery, in order to determine whether the same contain the amounts represented, and whether they be offered for sale or sold in a manner in accordance with law. He shall at least twice each year and as much oftener as he may deem necessary see that all

weights, measures, and weighing or measuring devices used are correct. He may for the purpose above mentioned, and in the general performance of his official duties, enter and go into or upon, and without formal warrant, any stand, place, building, or premises, or stop any vendor, peddler, junk dealer, coal wagon, ice wagon, delivery wagon, or any person whatsoever, and require him, if necessary, to proceed to some place which the State superintendent [commissioner] may specify, for the purpose of making the proper tests. Whenever the State superintendent [commissioner] finds a violation of the statutes relating to weights and measures, he shall cause the violator to be prosecuted.

SEC. 9. Whenever the State superintendent [commissioner] compares weights, measures, or weighing or measuring devices and finds that they correspond or causes them to correspond with the standards in his possession, he shall seal or mark such weights, measures, or weighing or measuring devices with appropriate devices.

SEC. 10. The State superintendent [commissioner] shall condemn and seize and may destroy incorrect weights, measures, or weighing or measuring devices which, in his best judgment, are not susceptible of satisfactory repair; but such as are incorrect and yet, in his best judgment, may be repaired, he shall mark or tag as "Condemned for repairs." The owners or users of any weights, measures, or weighing or measuring devices of which such disposition is made shall have the same repaired and corrected within such reasonable period as may be specified by the superintendent [commissioner], and they may neither use nor dispose of the same in any way, but shall hold the same at the disposal of the superintendent [commissioner]. Any weights, measures, or weighing or measuring devices which have been "condemned for repairs," and have not been repaired as required above, shall be confiscated by the superintendent [commissioner].

SEC. 11. The powers and duties given to and imposed upon the State superintendent [commissioner] of weights and measures by sections eight, nine, and ten are hereby given to and imposed upon his deputy and inspectors also, when acting under his instructions and at his direction.

SEC. 12.⁴ There shall be a county sealer of weights and measures in each county having a population of twenty thousand or more inhabitants, exclusive of any city having a population of twenty-five thousand or more inhabitants situated therein, according to the latest official State or United States census, who shall be appointed by the board of county commissioners from a list to be furnished by the civil-service board and under the rules of such board where such board exists; otherwise he shall be appointed by the board of county commissioners to hold office during good behavior, and shall not be removed, dis-

⁴ As given in Bureau of Standards Handbook No. 1, this section provided that, in the absence of a civil-service board, the appointment of the sealer should be for a specified term. The form here given is believed to be much more desirable, and is recommended by the National Bureau of Standards; this amendment was adopted by the Twentieth National Conference on Weights and Measures.

charged, or reduced in pay or position except for inefficiency, incapacity, conduct unbecoming an employee, or other just cause, and until he shall have been furnished with a written statement of the reasons for any such contemplated removal, discharge, or reduction, and shall have been given a reasonable time to make written answer thereto; nor shall such removal, discharge, or reduction be made until the charge or charges shall have been examined into and found true in fact by the board of county commissioners or a committee which such board may appoint for this purpose, at a hearing, upon reasonable notice to the person charged, at which time he may be represented by counsel and offer testimony of witnesses and any other evidence in his own behalf. He shall be paid a salary determined by such board, said salary not to be less than \$—— a year, and no fee shall be charged by him or by the county for the inspecting, testing, or sealing or the repairing or adjusting of weights, measures, or weighing or measuring devices. Whenever the board of county commissioners of such county shall deem it necessary, one or more deputy sealers of weights and measures may be appointed to hold office under the same conditions as those specified for the sealer of weights and measures, and the salaries of such deputies shall be fixed as in the case of the sealer of weights and measures. All deputies appointed shall have the same powers and may perform the same duties as the county sealer, when acting under his instructions and at his direction.

SEC. 13.⁵ There shall be a city sealer of weights and measures in cities of not less than twenty-five thousand population, according to the latest State or United States census, to be appointed by the mayor from a list to be furnished by the civil-service board and under the rules of such board where such board exists; otherwise he shall be appointed by the mayor, by and with the advice and consent of the common council, to hold office during good behavior, and shall not be removed, discharged, or reduced in pay or position except for inefficiency, incapacity, conduct unbecoming an employee, or other just cause, and until he shall have been furnished with a written statement of the reasons for any such contemplated removal, discharge, or reduction, and shall have been given a reasonable time to make written answer thereto; nor shall such removal, discharge, or reduction be made until the charge or charges shall have been examined into and found true in fact by the common council or a committee which they may appoint for this purpose, at a hearing, upon reasonable notice to the person charged, at which time he may be represented by counsel and offer testimony of witnesses and any other evidence in his own behalf. He shall be paid a salary to be determined by the common council, said salary not to be less than \$—— a year, and no fee shall be charged by him or by the city for the inspecting, testing, or sealing or the repairing or adjusting of weights, measures, or weighing or measuring devices. Whenever the mayor and common council shall deem it necessary, one or more

⁵ See footnote to sec. 12, p. 144.

deputy sealers of weights and measures may be appointed to hold office under the same conditions as those specified for the sealer of weights and measures, and the salaries of such deputies shall be fixed as in the case of the sealer of weights and measures. All deputies appointed shall have the same powers and may perform the same duties as the city sealer, when acting under his instructions and at his direction. In those cities in which no sealer is required by the above, the county sealer of the county, if such an officer is required to be appointed by the provisions of this act, shall perform in said cities like duties and have like powers as in the county.

SEC. 14. Nothing in sections 12 and 13 of this act shall be construed to prevent two or more counties or a county and a city situated therein, each of which are required to appoint sealers under the provisions of this act, from combining the whole or any part of their districts, as may be agreed upon by the boards of county commissioners of the counties, or such board of the county and the mayor and common council of the city, with one set of standards and one sealer, upon the written consent of the State superintendent [commissioner] of weights and measures. A sealer appointed in pursuance of an agreement for such combination shall, subject to the terms of his appointment, have the same authority, jurisdiction, and duties as if he had been appointed by each of the authorities who are parties to the agreement.

SEC. 15. The county or city sealer of weights and measures shall forthwith, on his appointment, give a bond in the penal sum of \$1,000, with sureties, to be approved by the appointing power, for the faithful performance of the duties of his office.

SEC. 16. The board of county commissioners of each county and the common council of each city required to appoint a sealer under the provisions of this act shall procure at the expense of the county or city, and shall keep at all times a set of weights and measures and other apparatus as complete and of such materials and construction as the State superintendent [commissioner] of weights and measures may direct. All such weights, measures, and other apparatus having been tried and accurately proven by the State superintendent [commissioner], shall be sealed and certified to by him as hereinbefore provided, and shall be then deposited with and preserved by the county or city sealer as public standards for the county or city.

Whenever the board of county commissioners of such county or the common council of such city shall neglect for six months so to do, the county auditor of said county, or the city clerk [comptroller] of said city, on notification and request by the superintendent [commissioner] of weights and measures, shall provide such standards and cause the same to be tried, sealed, and deposited at the expense of the county or city.

SEC. 17. Where not otherwise provided by law, the county or city sealer shall have the same powers and shall perform the same duties within his county or city as are granted to and imposed upon the State superintendent [commissioner] of weights and measures by sections 8, 9, and 10 of this act.

SEC. 18. The county or city sealer shall keep a complete record of all of his official acts, and shall make an annual report to the board of county commissioners of the county or the mayor and common council of the city and an annual report duly sworn to, on the first day of ———, to the State superintendent [commissioner] of weights and measures, on blanks furnished by the latter; and, also, any special reports that the latter may request.

SEC. 19. The superintendent [commissioner] of weights and measures, his deputy, and inspectors, and the county and city sealers and deputy sealers of weights and measures, are hereby made special policemen and are authorized and empowered to arrest, without formal warrant, any violator of the statutes in relation to weights and measures, and to seize for use as evidence, without formal warrant, any false or unsealed weight, measure, or weighing or measuring device or package or amount of commodity found to be used, retained, or offered or exposed for sale or sold in violation of law.

SEC. 20. Any person who shall hinder or obstruct in any way the superintendent [commissioner] of weights and measures, his deputy, or inspectors, or any county or city sealer or deputy sealer of weights and measures in the performance of his official duties shall be guilty of a misdemeanor, and, upon conviction thereof in any court of competent jurisdiction, shall be punished by a fine of not less than \$20 or more than \$200, or by imprisonment in the county jail for not more than three months, or by both such fine and imprisonment.

SEC. 21. Any person who shall impersonate in any way the superintendent [commissioner] of weights and measures, his deputy, or inspectors, or any county or city sealer or deputy sealer of weights and measures, by the use of his seal or counterfeit of his seal, or otherwise, shall be guilty of a misdemeanor, and upon conviction thereof in any court of competent jurisdiction, shall be punished by a fine of not less than \$100 or more than \$500, or by imprisonment for not more than one year, or by both such fine and imprisonment.

SEC. 21a.⁶ It shall be unlawful to sell, except for immediate consumption on the premises, liquid commodities in any other manner than by weight or liquid measure, or commodities not liquid in any other manner than by measure of length, by weight, or by numerical count, unless otherwise agreed in writing by the mutual consent of the buyer and seller: *Provided, however,* That nothing in this section shall be construed to prevent the sale of fruits, vegetables, and other dry commodities in the standard barrel provided for in section 28; or of berries and small fruits in boxes as provided for in section 29; or of vegetables or fruits usually sold by the head or bunch in this manner: *Provided further,* That nothing in this section shall be construed to apply to foodstuffs put up in original packages.

⁶ In view of certain court decisions it is believed that this section should be amended by deleting the words, "unless otherwise agreed in writing by the mutual consent of the buyer and seller." This matter will be brought to the attention of the 1928 meeting of the National Conference on Weights and Measures.

For the purposes of this section the term "original package" shall be construed to include a commodity in a package, carton, case, can, barrel, bottle, box, phial, or other receptacle, or in coverings or wrappings of any kind, put up by the manufacturer, which may be labeled, branded, or stenciled, or otherwise marked, or which may be suitable for labeling, branding, or stenciling, or marking otherwise, making one complete package of the commodity. The words "original package" shall be construed to include both the wholesale and the retail package.

For the purposes of this section the term "commodities not liquid" shall be construed to include goods, wares, and merchandise, which are not in liquid form and which have heretofore been sold by measure of length, by weight, by measure of capacity, or by numerical count, or which are susceptible of sale in any of these ways.

SEC. 22. It shall be unlawful to sell or offer to sell any coal, coke, or charcoal in any other manner than by weight. It shall be unlawful for any person to deliver any coal, coke, or charcoal without each individual delivery being accompanied by duplicate delivery tickets on which shall be in ink or other indelible substance, distinctly expressed in pounds, the net weight or weights of coal, coke, or charcoal comprising the delivery, and the gross and tare weights from which each net weight shown is computed, with the name of the purchaser thereof, and the name of the dealer from whom purchased. One of these tickets shall be surrendered to the State superintendent [commissioner], his deputy, or inspectors, or a county or city sealer or deputy sealer of weights and measures, upon his demand for his inspection and this ticket or a weight slip issued by him when he desires to retain the original shall be delivered to the said purchaser of said coal, coke, or charcoal, or his agent or representative at the time of the delivery of the fuel; and the other ticket shall be retained by the seller of the fuel. When the buyer carries away the purchase, a delivery ticket showing the actual number of pounds delivered to him must be given to him at the time the sale is made.

SEC. 23. It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell, any commodity in package form unless the net quantity of the contents be plainly and conspicuously marked on the outside of the package, in terms of weight, measure, or numerical count: *Provided, however,* That reasonable variations or tolerances shall be permitted, and that these reasonable variations or tolerances and also exemptions as to small packages shall be established by rules and regulations made by the superintendent [commissioner] of weights and measures: *And provided further,* That this section shall not be construed to apply to those commodities in package form, the manner of sale of which is specifically regulated by the provisions of other sections of this act.

The words "in package form" as used in this section shall be construed to include a commodity in a package, carton, case, can, box, barrel, bottle, phial, or other receptacle, or in coverings or wrappings

of any kind, put up by the manufacturer, or, when put up prior to the order of the commodity, by the vendor, which may be labeled, branded, or stenciled, or otherwise marked, or which may be suitable for labeling, branding, or stenciling, or marking otherwise, making one complete package of the commodity. The words "in package form" shall be construed to include both the wholesale and the retail package.

SEC. 24. It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell, any commodity composed in whole or in part of cotton, wool, linen, or silk, or any other textile material on a spool or similar holder, or in a container or band, or in a bolt or roll, or in a ball, coil, or skein, or in any similar manner, unless the net amount of the commodity in terms of weight or measure shall be definitely, plainly, and conspicuously marked on the principal label, if there be such a label; otherwise on a wrapping, band, or tag attached thereto.

The words "spool or similar holder, container or band, bolt or roll, or ball, coil, or skein" shall be construed to include the spool or similar holder, container or band, bolt or roll, or ball, coil, or skein put up by the manufacturer; or when put up prior to the order of the commodity, by the vendor. It shall be held to include both the wholesale and the retail package.

SEC. 25. It shall be unlawful for any person to sell, or offer to sell, any butter or renovated or process butter or oleomargarine in any other manner than by weight. It shall be unlawful for any person to put up, pack, or keep for the purpose of sale, offer or expose for sale, or sell any butter or renovated or process butter, or oleomargarine, in the form of prints, bricks, or rolls, in any other than the following sizes, to wit, one-quarter pound, one-half pound, one pound, one and one-half pounds, or multiples of one pound. Each print, brick, or roll shall bear a definite, plain, and conspicuous statement of its true net weight, on the principal label, where there be such a label, otherwise on the outside wrapper thereof; such statement shall be in gothic type not less than one-quarter inch square.

The prints, bricks, or rolls referred to in this section shall be construed to include those prints, bricks, or rolls put up by the manufacturer or producer; or when put up prior to the order of the commodity, by the vendor.

SEC. 26. The standard loaf of bread shall weigh one pound, avoirdupois weight. All bread manufactured, procured, made, or kept for the purpose of sale, offered or exposed for sale, or sold, in the form of loaves, shall be one of the following standard weights and no other, namely, one pound, one-half pound, one and one-half pounds, or multiples of one pound, avoirdupois weight: *Provided, however,* That rules and regulations for the enforcement of the provisions of this section, not inconsistent herewith, shall be made by the superintendent [commissioner], and such rules and regulations shall include reasonable variations or tolerances, in excess and in deficiency, which may be allowed: *And provided further,* That the provisions of this section shall not apply to biscuits, buns, crackers, rolls, or to what is com-

monly known as "stale bread" and sold as such, in case the seller shall at the time of sale expressly state to the buyer that the bread so sold is "stale bread." When twin or multiple loaves are baked, the weights specified in this section shall apply to each unit of the twin or multiple loaf.

It shall be unlawful for any person to manufacture, make, procure, or keep for the purpose of sale, offer or expose for sale, or sell, bread in the form of loaves, which is not of one of the weights specified in this section within such variations or tolerances as may be fixed by the superintendent [commissioner] as provided herein.

SEC. 27. Bottles used for the sale of milk or cream shall be of the capacity of one-half gallon, three pints, one quart, one pint, one-half pint, and one gill. Bottles used for the sale of milk or cream shall have clearly blown or otherwise permanently marked in the side of the bottle the capacity of the bottle and the word "Sealed"; and in the side or bottom of the bottle the name, initials, or trade-mark of the manufacturer and a designating number, which designating number shall be different for each manufacturer and may be used in identifying the bottles. The designating number shall be furnished by the State superintendent [commissioner] of weights and measures upon application by the manufacturer, and upon the filing by the manufacturer of a bond in the sum of \$1,000, with sureties, to be approved by the secretary of state [attorney general] conditioned upon conformance with the requirements of this section. A record of the bonds furnished and the designating numbers and to whom furnished shall be kept in the office of the superintendent [commissioner] of weights and measures.

Any manufacturer who sells or offers to sell milk or cream bottles to be used in this State that do not comply as to size and markings with the provisions of this section shall suffer a penalty of \$500, to be recovered by the attorney general in an action against the offender's bondsmen to be brought in the name of the people of the State. Any dealer who uses, for the purpose of selling milk or cream, bottles purchased after this law takes effect that do not comply with the requirements of this section as to markings and capacity shall be deemed guilty of using a false or insufficient measure.

The superintendent [commissioner] of weights and measures, his deputy and inspectors, and county and city sealers and deputy sealers of weights and measures are not required to seal bottles for milk or cream marked as in this section provided, but they shall have the power to and shall from time to time make tests on individual bottles used by the various firms in the territory over which they have jurisdiction in order to ascertain if the above provisions are being complied with; county and city sealers of weights and measures shall immediately report violations found to the State superintendent [commissioner] of weights and measures.

SEC. 28. The standard barrel for fruits, vegetables, and other dry commodities other than cranberries shall be of the following dimensions when measured without distention of its parts: Length of

staves, twenty-eight and one-half inches; diameter of heads, seventeen and one-eighth inches; distance between heads, twenty-six inches; circumference of bulge, sixty-four inches, outside measurement; and the thickness of staves not greater than four-tenths of an inch: *Provided*, That any barrel of a different form having a capacity of seven thousand and fifty-six cubic inches shall be a standard barrel. The standard barrel for cranberries shall be of the following dimensions when measured without distention of its parts: Length of staves, twenty-eight and one-half inches; diameter of heads, sixteen and one-fourth inches; distance between heads, twenty-five and one-fourth inches; circumference of bulge, fifty-eight and one-half inches, outside measurement; and the thickness of staves not greater than four-tenths of an inch.

It shall be unlawful for any person to offer or expose for sale, sell, or ship any other barrels for fruits, vegetables, or other dry commodities, or to offer or expose for sale, sell, or ship any fruits, vegetables, or other dry commodities in other barrels than the standard barrels as defined in this section, or subdivisions thereof known as the third, half, or three-quarters barrel: *Provided, however*, That nothing in this section shall apply to barrels used in packing or shipping commodities sold exclusively by weight or numerical count: *And provided further*, That no barrel shall be deemed below standard within the meaning of this section when shipped to any foreign country and constructed according to the specifications or directions of the foreign purchaser if not constructed in conflict with the laws of the foreign country to which the same is intended to be shipped.

SEC. 29. It shall be unlawful to sell or offer to sell any berries or small fruits in any other manner than by weight, or in the containers described in this section. It shall be unlawful to procure or keep for the purpose of sale, offer or expose for sale, sell, or give away baskets or other open containers for berries or small fruits, holding one quart or less, or to procure or keep for the purpose of sale, offer or expose for sale, or sell berries or small fruits in baskets or other open containers, holding one quart or less, of any other than the following capacities, when level full: One quart, one pint, or one-half pint, standard dry measure.

SEC. 29a.⁷ The term "ton" shall be understood to mean a unit of 2,000 pounds, avoirdupois weight. The term "cord," when used in connection with wood intended for fuel purposes, shall be understood to mean the amount of wood which is contained in a space of 128 cubic feet, when the wood is ranked and well stowed and one-half the kerf of the wood is included. All contracts concerning the sale of goods shall be construed in accordance with the provisions of this section.

SEC. 30. Whenever any commodity is sold on a basis of weight, it shall be unlawful to employ any other weight in such sale than the

⁷ This is a new section which is not given in Bureau of Standards Handbook No. 1; the incorporation of this section in the model law was approved by the Twentieth National Conference on Weights and Measures.

net weight of the commodity; and all contracts concerning goods sold on a basis of weight shall be understood and construed accordingly. Whenever the weight of a commodity is mentioned in this act, it shall be understood and construed to mean the net weight of the commodity.

SEC. 31. Any person who, by himself or by his servant or agent, or as the servant or agent of another person, shall offer or expose for sale, sell, use in the buying or selling of any commodity or thing, or for hire or award, or in the computation of any charge for services rendered on the basis of weight or measure, or in the determination of weight or measure when a charge is made for such determination, or retain in his possession, a false weight or measure or weighing or measuring device, or any weight or measure or weighing or measuring device which has not been sealed by the State superintendent [commissioner], or his deputy, or inspectors, or by a sealer or deputy sealer of weights and measures within one year, or shall dispose of any condemned weight, measure, or weighing or measuring device contrary to law, or remove any tag placed thereon by the State superintendent [commissioner], or his deputy, or inspectors, or by a sealer or deputy sealer of weights and measures; or who shall sell or offer or expose for sale less than the quantity he represents of any commodity, thing, or service, or shall take or attempt to take more than the quantity he represents, when, as the buyer, he furnishes the weight, measure, or weighing or measuring device by means of which the amount of any commodity, thing, or service is determined; or who shall keep for the purpose of sale, offer or expose for sale, or sell any commodity in a manner contrary to law; or who shall violate any provision of this act for which a specific penalty has not been provided; or who shall sell or offer for sale, or use or have in his possession for the purpose of selling or using, any device or instrument to be used to or calculated to falsify any weight or measure, shall be guilty of a misdemeanor, and shall be punished by a fine of not less than \$20 or more than \$200, or by imprisonment for not more than three months, or by both such fine and imprisonment, upon a first conviction in any court of competent jurisdiction; and upon a second or subsequent conviction in any court of competent jurisdiction he shall be punished by a fine of not less than \$50 or more than \$500, or by imprisonment in the county jail for not more than one year, or by both such fine and imprisonment.

SEC. 32. The word "person" as used in this act shall be construed to import both the plural and singular, as the case demands, and shall include corporations, companies, societies, and associations.

The words "weights, measures, or (and) weighing or (and) measuring devices," as used in this act, shall be construed to include all weights, scales, beams, measures of every kind, instruments and mechanical devices for weighing or measuring, and any appliances and accessories connected with any or all such instruments.

The words "sell" or "sale" as used in this act, shall be construed to include barter and exchange.

TEXT, FORM NO. 1

Sections 1 to 5, inclusive, are identical with sections 1 to 5, inclusive, respectively, of Form No. 2.

Section 6 is identical with section 7, Form No. 2.

SEC. 7. When not otherwise provided by law the State superintendent [commissioner] shall have the power, and it shall be his duty to inspect, test, try, and ascertain if they are correct, all weights, measures, and weighing or measuring devices kept, offered, or exposed for sale, sold, or used or employed in proving the size, quantity, extent, area, or measurement of quantities, things, produce, or articles for distribution or consumption purchased or offered or submitted for sale, hire, or award, or in computing any charge for services rendered on the basis of weight or measure, or in determining weight or measure when a charge is made for such determination; and he shall have the power to and shall from time to time weigh or measure and inspect packages or amounts of commodities of whatsoever kind kept for the purpose of sale, offered or exposed for sale, or sold or in the process of delivery, in order to determine whether the same contain the amounts represented, and whether they be offered for sale or sold in a manner in accordance with law. He shall at least twice each year and as much oftener as he may deem necessary see that all weights, measures, and weighing or measuring devices used are correct. He may for the purpose above mentioned, and in the general performance of his official duties, enter and go into or upon, and without formal warrant, any stand, place, building, or premises, or stop any vendor, peddler, junk dealer, coal wagon, ice wagon, delivery wagon, or any person whatsoever, and require him, if necessary, to proceed to some place which the State superintendent [commissioner] may specify, for the purpose of making the proper tests. Whenever the State superintendent [commissioner] finds a violation of the statutes relating to weights and measures, he shall cause the violator to be prosecuted.

Sections 8 and 9 are identical with sections 9 and 10, respectively, of Form No. 2.

Section 10 is identical with section 11, Form No. 2, *except* that "sections 8, 9, and 10" should be read "sections 7, 8, and 9."

SEC. 11. The superintendent [commissioner] of weights and measures, his deputy and inspectors, are hereby made special policemen, and are authorized and empowered to arrest, without formal warrant, any violator of the statutes in relation to weights and measures, and to seize for use as evidence, without formal warrant, any false or unsealed weight, measure, or weighing or measuring device or package or amount of commodity found to be used, retained, or offered or exposed for sale, or sold in violation of law.

SEC. 12. Any person who shall hinder or obstruct in any way the superintendent [commissioner] of weights and measures, his deputy,

or inspectors, in the performance of his official duties shall be guilty of a misdemeanor, and upon conviction thereof in any court of competent jurisdiction shall be punished by a fine of not less than \$20 or more than \$200, or by imprisonment in the county jail for not more than three months, or by both such fine and imprisonment.

SEC. 13. Any person who shall impersonate in any way the superintendent [commissioner] of weights and measures, his deputy, or inspectors, by the use of his seal or counterfeit of his seal, or otherwise, shall be guilty of a misdemeanor, and upon conviction thereof in any court of competent jurisdiction, shall be punished by a fine of not less than \$100 or more than \$500, or by imprisonment for not more than one year, or by both such fine and imprisonment.

Section 13a is identical with section 21a, Form No. 2, *except* that "section 28" and "section 29" should be read "section 20" and "section 21," respectively.

Sections 14 to 18, inclusive, are identical with sections 22 to 26, inclusive, respectively, of Form No. 2.

SEC. 19. Bottles used for the sale of milk or cream shall be of the capacity of one-half gallon, three pints, one quart, one pint, and one gill. Bottles used for the sale of milk or cream shall have clearly blown or otherwise permanently marked in the side of the bottle the capacity of the bottle and the word "Sealed"; and in the side or bottom of the bottle the name, initials, or trade-mark of the manufacturer and a designating number, which designating number shall be different for each manufacturer and may be used in identifying the bottles. The designating number shall be furnished by the State superintendent [commissioner] of weights and measures upon application by the manufacturer, and upon the filing by the manufacturer of a bond in the sum of \$1,000, with sureties, to be approved by the secretary of state [attorney general] conditioned upon conformance with the requirements of this section. A record of the bonds furnished and the designating numbers and to whom furnished shall be kept in the office of the superintendent [commissioner] of weights and measures.

Any manufacturer who sells or offers to sell milk or cream bottles to be used in this State that do not comply as to size and markings with the provisions of this section shall suffer a penalty of \$500, to be recovered by the attorney general in an action against the offender's bondsmen to be brought in the name of the people of the State. Any dealer who uses, for the purpose of selling milk or cream, bottles purchased after this law takes effect that do not comply with the requirements of this section as to markings and capacity shall be deemed guilty of using a false or insufficient measure.

The superintendent [commissioner] of weights and measures is not required to seal bottles for milk or cream marked as in this section provided, but he shall have the power to and shall from time to time make tests on individual bottles used by the various firms in the State in order to ascertain if the above provisions are being complied with,

Sections 20, 21, 21a, and 22 are identical with sections 28, 29, 29a, and 30, respectively, of Form No. 2.

SEC. 23. Any person who, by himself or by his servant or agent, or as the servant or agent of another person, shall offer or expose for sale, sell, use in the buying or selling of any commodity or thing, or for hire or award, or in the computation of any charge for services rendered on the basis of weight or measure, or in the determination of weight or measure when a charge is made for such determination, or retain in his possession, a false weight or measure or weighing or measuring device, or any weight or measure or weighing or measuring device which has not been sealed by the State superintendent [commissioner], or his deputy or inspectors, at his direction, within one year; or shall dispose of any condemned weight, measure, or weighing or measuring device contrary to law, or remove any tag placed thereon by the State superintendent [commissioner], or his deputy or inspectors, at his direction; or who shall sell or offer or expose for sale less than the quantity he represents of any commodity, thing, or service, or shall take or attempt to take more than the quantity he represents, when, as the buyer, he furnishes the weight, measure, or weighing or measuring device by means of which the amount of commodity, thing, or service is determined; or who shall keep for the purpose of sale, offer or expose for sale, or sell any commodity in a manner contrary to law; or who shall violate any provision of this act for which a specific penalty has not been provided, or who shall sell or offer for sale, or use or have in his possession for the purpose of selling or using, any device or instrument to be used to or calculated to falsify any weight or measure, shall be guilty of a misdemeanor, and shall be punished by a fine of not less than \$20 or more than \$200, or by imprisonment for not more than three months, or by both such fine and imprisonment, upon a first conviction in any court of competent jurisdiction; and upon a second or subsequent conviction in any court of competent jurisdiction he shall be punished by a fine of not less than \$50 or more than \$500, or by imprisonment in the county jail for not more than one year, or by both such fine and imprisonment.

Section 24 is identical with section 32, Form No. 2.

TEXT, FORM NO. 3

Sections 1 to 5, inclusive, are identical with sections 1 to 5, inclusive, respectively, of Form No. 2.

SEC. 6. The State superintendent [commissioner] of weights and measures, or his deputy, or inspectors, at his direction, shall at least once in five years try and prove by the office standards all standard weights, measures, and other apparatus which may belong to any county or city, and shall seal such when found to be accurate by stamping on them the letter "—" and the last two figures of the year with seals which he shall have and keep for that purpose.

The State superintendent [commissioner], or his deputy, or inspectors, at his direction, shall inspect all standard weights, measures, and other apparatus used by the counties and cities at least once in two years, and shall keep a record of the same. He, or his deputy, or inspectors, at his direction, shall at least once in two years visit the various cities and counties of the State for this purpose and in order to inspect the work of the local sealers, and in the performance of such duties they shall have the same powers as the local sealer of weights and measures. The superintendent [commissioner] shall issue from time to time regulations for the guidance of county and city sealers, and the said regulations shall govern the procedure to be followed by the aforesaid officers in the discharge of their duties.

Section 7 is identical with section 7, Form No. 2.

SEC. 8.⁸ There shall be a county sealer of weights and measures in each county, who shall be appointed by the board of county commissioners from a list to be furnished by the civil-service board and under the rules of such board where such board exists; otherwise he shall be appointed by the board of county commissioners to hold office during good behavior, and shall not be removed, discharged, or reduced in pay or position except for inefficiency, incapacity, conduct unbecoming an employee, or other just cause, and until he shall have been furnished with a written statement of the reasons for any such contemplated removal, discharge, or reduction, and shall have been given a reasonable time to make written answer thereto; nor shall such removal, discharge, or reduction be made until the charge or charges shall have been examined into and found true in fact by the board of county commissioners or a committee which such board may appoint for this purpose, at a hearing, upon reasonable notice to the person charged, at which time he may be represented by counsel and offer testimony of witnesses or any other evidence in his own behalf. He shall be paid a salary determined by such board, said salary not to be less than \$—— a year, and no fee shall be charged by him or by the county for the inspecting, testing, or sealing, or the repairing or adjusting of weights, measures, or weighing or measuring devices. Whenever the board of county commissioners shall deem it necessary, one or more deputy sealers of weights and measures may be appointed to hold office under the same conditions as those specified for the sealer of weights and measures, and the salaries of such deputies shall be fixed as in the case of the sealer of weights and measures. All deputies appointed shall have the same powers and may perform the same duties as the county sealer when acting under his instructions and at his direction.

SEC. 9.⁸ There shall be a city sealer of weights and measures in cities of not less than 25,000 population, according to the latest official State or United States census, to be appointed by the mayor from a list to be furnished by the civil-service board and under the rules of such board where such board exists; otherwise he shall be appointed by the mayor, by and with the advice and consent

⁸ See footnote to sec. 12, p. 244.

of the common council, to hold office during good behavior, and shall not be removed, discharged, or reduced in pay or position except for inefficiency, incapacity, conduct unbecoming an employee, or other just cause, and until he shall have been furnished with a written statement of the reasons for any such contemplated removal, discharge, or reduction, and shall have been given a reasonable time to make written answer thereto; nor shall such removal, discharge, or reduction be made until the charge or charges shall have been examined into and found true in fact by the common council or a committee which they may appoint for this purpose, at a hearing, upon reasonable notice to the person charged, at which time he may be represented by counsel and offer testimony of witnesses or any other evidence in his own behalf. He shall be paid a salary to be determined by the common council, said salary not to be less than \$—— a year, and no fee shall be charged by him or by the city for the inspecting, testing or sealing, or repairing or adjusting of weights, measures, or weighing or measuring devices. Whenever the mayor and common council shall deem it necessary, one or more deputy sealers of weights and measures may be appointed to hold office under the same conditions as those specified for the sealer of weights and measures, and the salaries of such deputies shall be fixed as in the case of the sealer of weights and measures. All deputies appointed shall have the same powers and may perform the same duties as the city sealer when acting under his instructions and at his direction. In those cities in which no sealer is required by the above the county sealer of the county shall perform in the said cities like duties and have like powers as in the county.

SEC. 10. Nothing in sections 8 and 9 of this act shall be construed to prevent two or more counties, or a county and a city situated therein, from combining the whole or any part of their districts, as may be agreed upon by the boards of county commissioners of the counties, or such board of the county and the mayor and common council of the city, with one set of standards and one sealer, upon the written consent of the State superintendent [commissioner] of weights and measures. A sealer appointed in pursuance of an agreement for such combination shall, subject to the terms of his appointment, have the same authority, jurisdiction, and duties as if he had been appointed by each of the authorities who are parties to the agreement.

Sections 11 and 12 are identical with sections 15 and 16, respectively, Form No. 2.

SEC. 13. When not otherwise provided by law the county or city sealer shall have the power and it shall be his duty within his county or city to inspect, test, try, and ascertain if they are correct, all weights, measures, and weighing or measuring devices kept, offered, or exposed for sale, sold, or used or employed within the county or city in proving the size, quantity, extent, area, or measurement of quantities, things, produce, or articles for distribution or consumption purchased or offered or submitted for sale, hire, or

award, or in computing any charge for services rendered on the basis of weight or measure, or in determining weight or measure when a charge is made for such determination; and he shall have the power to and shall from time to time weigh or measure and inspect packages or amounts of commodities of whatsoever kind kept for the purpose of sale, offered or exposed for sale, or sold or in the process of delivery, in order to determine whether the same contain the amounts represented, and whether they be kept, offered, or exposed for sale or sold in a manner in accordance with law; he shall at least twice each year and as much oftener as he may deem necessary see that all weights, measures, and weighing or measuring devices used in the county or city are correct. He may for the purpose above mentioned, and in the general performance of his official duties, enter and go into or upon, and without formal warrant, any stand, place, building, or premises, or stop any vendor, peddler, junk dealer, coal wagon, ice wagon, delivery wagon, or any person whatsoever, and require him, if necessary, to proceed to some place which the sealer may specify, for the purpose of making the proper tests. Whenever the county or city sealer finds a violation of the statutes relating to weights and measures, he shall cause the violator to be prosecuted.

SEC. 14. Whenever the county or city sealer compares weights, measures, or weighing or measuring devices and finds that they correspond or causes them to correspond with the standards in his possession, he shall seal or mark such weights, measures, or weighing or measuring devices with appropriate devices to be approved by the State superintendent [commissioner] of weights and measures.

SEC. 15. The county or city sealer shall condemn and seize and may destroy incorrect weights, measures, or weighing or measuring devices which, in his best judgment, are not susceptible of satisfactory repair; but such as are incorrect and yet, in his best judgment may be repaired, he shall mark or tag as "Condemned for repairs" in a manner prescribed by the State superintendent [commissioner] of weights and measures. The owners or users of any weights, measures, or weighing or measuring devices of which such disposition is made shall have the same repaired and corrected within such reasonable period as may be specified by the county or city sealer, and they may neither use nor dispose of the same in any way, but shall hold the same at the disposal of the sealer. Any weights, measures, or weighing or measuring devices which have been "condemned for repairs," and have not been repaired as required above, shall be confiscated by the sealer.

Sections 16 to 19, inclusive, are identical with sections 18 to 21, inclusive, respectively, of Form No. 2.

Section 19a is identical with section 21a, Form No. 2, *except* that "section 28" and "section 29" should be read "section 26" and "section 27," respectively.

Sections 20 to 30, inclusive, are identical with sections 22 to 32, inclusive, respectively, of Form No. 2.

Appendix III.—SCHEDULE OF WEIGHTS AND MEASURES STANDARDS AND EQUIPMENT¹

STANDARDS AND EQUIPMENT FOR A STATE DEPARTMENT

The model State law on weights and measures requires that a State department shall have a complete set of State or primary standards, which are the highest reference standards of the State, and that a complete set of copies of these standards shall be provided as the secondary or office standards of the department. This plan should be followed, for by this arrangement excessive use of and wear on the reference standards is prevented, and their integrity as standards—their accuracy—is preserved. The active State office should also have additional standards of the values which are very frequently used for relatively coarse work; these “working standards” will then serve as a protection to the secondary standards, which may be reserved for determinations demanding relatively high precision.

All of the items listed below should be procured if possible. However, it is recognized that considerations of economy or lack of the necessary funds may render it inadvisable or impossible to purchase at one time all of the standards and equipment necessary for a fully equipped office. The information given in the parenthetical notes under the headings for different classes of standards and equipment may be used as a guide in making necessary curtailments of this character.

It should also be pointed out that specifications for primary State standards are drawn upon the theory that these standards will be used as intended; that is, that they will be used only as reference standards and for special determinations where the highest precision is demanded. For this reason they are not well adapted for general testing. If it is quite out of the question for the State to secure at once both primary and office standards, and if any considerable

¹ For a general discussion of this subject, see chapter 14.

amount of testing is contemplated, it is therefore recommended that standards suitable for general use as office standards be purchased as the first set to be secured, with the understanding that complete primary or reference standards are to be secured at the earliest practicable subsequent date.

WEIGHTS

"STATE" OR PRIMARY REFERENCE STANDARDS

Avoirdupois.—One set, 50 pounds to $\frac{1}{32}$ ounce, as follows: 50, 20, 20, 10, 5, 2, 2, 1 pounds, 8, 4, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{32}$ ounces. Bureau of Standards class A.²

(When economy must be practiced, the second 20-pound weight may be replaced by a 10-pound weight, or the second 20-pound weight may be dropped from the list given.)

Troy.—One set, 10 ounces to 1 pennyweight, as follows: 10, 5, 2, 2, 1 ounces, 10, 5, 2, 2, 1 pennyweights. Bureau of Standards Class A.²

Apothecaries'.—One set, 1 ounce to 1 scruple, as follows: 1 ounce, 4, 2, 1 drams, 2, 1 scruples. Bureau of Standards class A.²

(Weights of the troy set may be used for values above 1 ounce in the apothecaries' system, since troy and apothecaries' ounces are identical.)

(If necessary, the purchase of troy and apothecaries' weights may be postponed until testing in pharmacies, jewelry stores, etc., is to be undertaken.)

Grain.—One set, 20 grains to 0.05 grain, as follows: 20, 10, 5, 2, 2, 1, 0.5, 0.2, 0.2, 0.1, 0.05 grains. Bureau of Standards class A.²

Metric.—One set, 10 kilograms to 1 milligram, as follows: 10, 5, 2, 2, 1 kilograms, 500, 200, 200, 100, 50, 20, 20, 10, 5, 2, 2, 1 grams, 500, 200, 200, 100, 50, 20, 20, 10, 5, 2, 2, 1 milligrams. Bureau of Standards class A.²

(When economy must be practiced, this set may be omitted until the testing of metric weights is to be undertaken. If weights to be tested do not exceed 1 kilogram—druggists' metric weights for use on counter scales seldom exceed this value—the weights listed above 1 kilogram may be omitted.)

Carat.—One set, 10 carats to 0.01 carat, as follows: 10, 5, 2, 2, 1, 0.5, 0.2, 0.2, 0.1, 0.05, 0.02, 0.02, 0.01 carats. Bureau of Standards class A.²

² For a description of these requirements, see Bureau of Standards Circular No. 3, "The Design and Test of Standards of Mass."

(Since the international carat equals 200 milligrams, this set may be omitted, necessary tests being made with metric weights according to the relation given.)

OFFICE STANDARDS

Each set of reference weights should be duplicated in secondary weights—office standards—conforming to Bureau of Standards class B requirements.²

WORKING STANDARDS FOR OFFICE USE

Whenever commercial scales and weights are to be tested in the State office, working standards, in the necessary variety and conforming to Bureau of Standards class C requirements,² should be provided. All demands will ordinarily be met by a duplicate set of "working standards for field use" (see below); however, as to large weights, it will not usually be necessary to provide more than twelve 50-pound weights for office use.

WORKING STANDARDS FOR FIELD USE

Avoirdupois.—Special standards of 500 or 1,000 pounds each (or possibly 2,000 or 2,500 pounds each) in combination with special "dollies" or small trucks standardized at definite amounts corresponding to the value or a multiple of the value of the weights used, the combination comprising a total known load of from 3,000 to 8,000 or 10,000 pounds, all of which are carried in a specially equipped automobile truck, are strongly recommended for use in testing large-capacity platform scales. Details on this type of equipment are being developed by the Bureau of Standards.

Forty (or more) 50-pound cast-iron test weights.

Set of grip-handled weights, 20, 20, 10, 5 pounds or 25, 10, 10, 5 pounds.

Set of weights, 2, 2, 1 pounds, 8, 4, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$ ounces.

One 1-pound flat cylindrical slotted weight, diameter about 4 inches.

Set of weights, 20, 10, 5, 2, 2, 1, $\frac{1}{2}$ grains.

All of these weights should conform to the requirements of Bureau of Standards class C.²

Troy.—Set of weights, same denominations as specified for primary standards. Bureau of Standards class B, or class C adjusted to class B tolerances.²

² For a description of these requirements, see Bureau of Standards Circular No. 3, "The Design and Test of Standards of Mass."

Apothecaries'.—Set of weights, 1, 1 ounce, 4, 2, 2, 1, $\frac{1}{2}$ drams, 2, 1 scruples, 10, 5, 2, 2, 1, 0.5, 0.2, 0.2, 0.1, 0.05 grains.³ Bureau of Standards class B, or class C adjusted to class B tolerances.²

(The troy and apothecaries' sets, respectively, may be omitted only until such time as the testing of equipment in jewelry stores and pharmacies is to be undertaken.)

Metric.—If a large number of weighing scales of relatively large capacity graduated in the metric system are to be tested, it may be found advisable to procure a supply of 20-kilogram cast-iron test weights, the necessary number of such weights depending upon the capacities of the scales in question. In this event a set of weights, 10, 5, 2, 2, 1 kilograms, and another set, 500, 200, 200, 100, 50, 20, 20, 10, 5, 2, 2, 1 grams, 500, 200, 200, 100, 50, 20, 20, 10 milligrams may also be supplied. However, ordinarily such large metric scales as may be encountered can be tested by utilizing weights in the customary system, making the necessary conversions to determine the proper metric indications. When supplied, all of the metric weights listed should conform to the requirements of Bureau of Standards class C.²

If only the metric weights in pharmacies are to be tested, two sets of weights will be required, the first to consist of 1 kilogram, 500, 200, 200, 100, 50, 20, 20, 10, 5, 2, 2, 1 grams, Bureau of Standards class C² for use in testing counter-scale weights (these may occasionally be encountered), and the second to consist of 20, 10, 5, 2, 2, 1 grams, 500, 200, 200, 100, 50, 20, 20, 10, 5, 2, 2, 1 milligrams, Bureau of Standards class B, or class C adjusted to class B tolerances,² for use in testing prescription scales and weights.

CAPACITY MEASURES AND GRADUATED GLASSWARE

"STATE" OR PRIMARY REFERENCE STANDARDS

CAPACITY MEASURES—United States Liquid.—One set, 1 gallon to $\frac{1}{2}$ gill, as follows: 1 gallon, $\frac{1}{2}$ gallon, 1 quart, 1 pint, $\frac{1}{2}$ pint, 1 gill, $\frac{1}{2}$ gill. In conformance with Bureau of Standards requirements for State reference standards.⁴

(The $\frac{1}{2}$ -gill measure may be omitted only if glass graduates are not to be tested, or if such testing is to be carried on exclusively in the office and the burettes specified below are provided.)

² For a description of these requirements, see Bureau of Standards Circular No. 3, "The Design and Test of Standards of Mass."

³ The two 1-ounce weights are duplicated to facilitate the test of even-arm prescription scales having the usual capacity of 1 ounce, or 30 grams.

⁴ These requirements will be furnished upon request by the Bureau of Standards.

United States dry.—One set, $\frac{1}{2}$ bushel to $\frac{1}{2}$ pint, as follows: $\frac{1}{2}$ bushel, 1 peck, $\frac{1}{2}$ peck, $\frac{1}{4}$ peck, 1 quart, 1 pint, $\frac{1}{2}$ pint. In conformance with Bureau of Standards requirements for State reference standards.⁴

(Dry measures above 1 quart need only be procured by those States still permitting the commercial use of dry measures. The 1-quart 1-pint, and $\frac{1}{2}$ -pint standards will be used in testing berry baskets.)

Metric.—One set, 1 liter to $\frac{1}{2}$ deciliter, as follows: 1 liter, 5, 2, 1, $\frac{1}{2}$ deciliters. In conformance with Bureau of Standards requirements for State reference standards.⁴

(Metric capacity measures need only be procured by those States in which such measures are in commercial use, or in which metric glass graduates are to be tested; if the testing of glass graduates is to be carried on exclusively in the office and the burettes specified below are provided, the $\frac{1}{2}$ -deciliter measure may be omitted.)

OFFICE STANDARDS

CAPACITY MEASURES.—The set of reference United States liquid-measure standards should be duplicated in office standards conforming to Bureau of Standards requirements for measures of this class.⁴ Measures of this class should also be provided in the following capacities: 5, 4, 3, and 2 gallons.

CYLINDRICAL GLASS GRADUATES—United States.—One set, 32 fluid ounces (1 liquid quart) to 60 minims, as follows: 32, 16, 8, 4, 2, 1 fluid ounces, 120, 60 minims.

(When economy must be practiced, graduates over 4 fluid ounces may be omitted.)

Three cubic-inch graduates as follows: 35, 10, 3 cubic inches.

Metric.—One set, 1,000 milliliters⁵ (1 liter) to 10 milliliters, as follows: 1,000, 500, 250, 100, 50, 25, 10 milliliters.

(When economy must be practiced, metric graduates above 100 milliliters may be omitted.)

All graduates should conform to Bureau of Standards requirements for precision graduated glassware.⁴

⁴ These requirements will be furnished upon request by the Bureau of Standards.

⁵ The term "milliliter" is used herein to designate the one-thousandth part of the liter; this is also commonly known as the cubic centimeter or "cc." The latter is not an accurate usage, as the units are not exactly equal, but the difference is of no consequence in this connection, and therefore the terms may be used interchangeably, although the former is to be preferred.

BURETTES—United States.—Three minim burettes as follows: 1020 minims, subdivided to 5 minims; 250 minims, subdivided to 2 minims; 125 minims, subdivided to 1 minim. In conformance with Bureau of Standards requirements.⁴

Special 1-pint bulb burette for testing milk bottles, made according to the design of the Bureau of Standards.⁶

(When economy must be practiced, the special bulb burette may be omitted.)

Metric.—Three milliliter burettes as follows: 100 milliliters, subdivided to $\frac{2}{5}$ milliliter; 50 milliliters, subdivided to $\frac{1}{10}$ milliliter; 10 milliliters, subdivided to $\frac{1}{20}$ milliliter. In conformance with Bureau of Standards requirements.⁴

(It will be very advisable to provide the regular burettes if the testing of glass graduates is to be carried on in the office.)

WORKING STANDARDS FOR FIELD USE

CAPACITY MEASURES—United States Liquid.—Set of special measures with graduated transparent face or tube near top to permit errors to be read directly, as follows: 5, 4, 3, 2, 1 gallons.

(When strict economy must be practiced, the 4-gallon and 2-gallon measures may be omitted; if further elimination is absolutely necessary, the 3-gallon measure may be omitted.)

Set of measures, as follows: 1, $\frac{1}{2}$ gallon, 1 quart, 1, $\frac{1}{2}$ pint, 1, $\frac{1}{2}$ gill. This set may be of conical shape throughout, or the measures from 1 quart to $\frac{1}{2}$ gill, inclusive, may be cylindrical and nested.

(When strict economy must be practiced, the 1-gallon and the $\frac{1}{2}$ -gallon measures may be omitted. The $\frac{1}{2}$ -gill measure may be omitted only if glass graduates are not to be tested in the field.)

Metric.—Metric measures, except glass graduates, will seldom be encountered in field work, and arrangements may usually be made to test in the office any found in use. For the field testing of metric glass graduates, the following will be required: 1 liter, 5, 2, 1, $\frac{1}{2}$ deciliters. These may be conical or nested.

GRADUATED GLASSWARE—United States.—One 1-fluid-ounce cylindrical glass graduate of small diameter, subdivided to $\frac{1}{4}$ dram; a cylindrical glass graduate, either 120 minims subdivided to 5 minims, or 10 millimeters subdivided to $\frac{1}{5}$ millimeter.

⁴ These requirements will be furnished upon request by the Bureau of Standards.

⁶ A drawing of this burette will be furnished upon request by the Bureau of Standards.

(The second graduate specified may be omitted only if glass graduates are not to be tested in the field.)

Metric.—One 20-milliliter⁷ or 25-milliliter cylindrical glass graduate of small diameter. (Either the 120-minim or the 10-milliliter graduate prescribed above is suitable for determining errors on graduates graduated in either the customary or the metric system.)

(This graduate may be omitted only if glass graduates are not to be tested in the field.)

All of the measures and graduates specified above should conform to Bureau of Standards requirements for field standards.⁴

LENGTH MEASURES

"STATE" OR PRIMARY REFERENCE, AND OFFICE STANDARDS

United States.—One 1-yard bronze line standard.

(When economy must be practiced, the 1-yard standard may be omitted.)

One 100-foot steel tape.

Metric.—One 1-meter bronze line standard. One 30-meter steel tape.

(Metric length measures need only be procured by those States in which such measures are in commercial use. If but one metric length measure is to be procured, the 30-meter tape should be selected.)

All of the measures specified above should be in conformance with Bureau of Standards requirements for State reference standards.⁸

FIELD STANDARDS

One steel tape, with zero graduation on tape, 25 feet, subdivided to $\frac{1}{8}$ inch.

(When strict economy must be practiced, a 6-foot tape may be substituted for the 25-foot tape.)

One fabric testing tape (for use in testing fabric-measuring devices) 12 yards in length, conforming in material and design to the recommendation of the Bureau of Standards for tapes of this character.⁹

⁴ These requirements will be furnished upon request by the Bureau of Standards.

⁷ See footnote 5, p. 263.

⁸ For a description of these requirements, see Bureau of Standards Circular No. 332, "The Testing of Line Standards of Length."

⁹ For a description of these requirements, see Bureau of Standards Miscellaneous Publication No. 51, "Report of the Fifteenth Annual Conference on Weights and Measures," p. 93.

One folding, brass-bound 2-foot rule.

One dry-measure gauge.

(The dry-measure gauge need only be procured where dry measures are still permitted in commercial use.)

EQUIPMENT

OFFICE EQUIPMENT

Balances.—Four even-arm balances having suspended pans, the last three listed to be inclosed in glass cases, as follows:

CAPACITIES	SENSIBILITY RECIPROCAL ¹⁰
50 pounds or 25 kilograms.	1 grain or 60 milligrams.
5 pounds or 2 kilograms.	0.02 grain or 1 milligram.
4 ounces or 100 grams.	0.01 grain or 0.5 milligram.
$\frac{1}{4}$ ounce or 5 grams.	0.001 grain or 0.05 milligram.

Relative to the purchase of balances, the following quotation is made from the paper entitled "Testing standards of mass (office standards and test weights)," to which reference is made in chapter 14:

"A study of this [list of balances] makes it at once evident that the 5-pound and 4-ounce balance overlap to a large extent. This gives two balances for the region in which there are usually the largest number of weights to be tested—an arrangement that has several advantages. The two smallest balances also overlap somewhat, so that if difficulty is found in procuring a satisfactory $\frac{1}{4}$ -ounce or 5-gram balance it may sometimes be advisable to procure an assay balance even if it has a capacity of only 1 or 2 grams (about one-sixteenth ounce).

"It is convenient to have a rider on all except the largest balance, and to have the balances so made that the zero of the rider scale is directly over the central knife-edge and the riders can be used on both sides of the beam. Riders in either metric units or in grains may be used on any balance arranged for use with a rider. If the rider is in grains and if the rider scale is so graduated and so numbered that hundredths of the value of the rider can readily be obtained on each side of the central knife-edge, as is usual, the rider for the 5-pound balance would preferably be of 1 grain, in which case hundredths of a grain would be indicated. The rider for the 4-ounce balance of similar construction would be one of 0.1 grain, thus indicating hundredths and thousandths of a grain. A corresponding rider for the smallest balance would be one of 0.01 grain,

¹⁰ The clear interval between the graduations on the graduated scale or arc shall not be less than 0.04 inch.

indicating thousandths and ten-thousandths of a grain; but these very small riders are very frail, although frequently used on assay balances, and unless close attention needs to be given to the very small office standards, it will be well to have a rider of 0.1 grain on the smallest balance also, in which case it will give the same indications as on the 4-ounce balance mentioned.

“In the metric system the corresponding riders would be, respectively, 100 milligrams, indicating down to 1 milligram; 10 milligrams, indicating milligrams and tenths of a milligram; and either the same as the latter or 1 milligram, indicating tenths and hundredths of a milligram.

“If such riders are not furnished when the balance is purchased, it will often be worth while to purchase them, care being taken to see that they are of the proper shape to fit the particular balance on which they are to be used.

“Metric riders may be used in testing avoirdupois weights by having a table of the tolerances converted into metric units, and vice versa.

“Two different riders for the same balance are seldom advisable because of the trouble of changing and the danger of confusion.

“When balances are needed only for checking test weights, it will not be necessary to secure all four of the balances mentioned above. On the contrary, in State offices in which very large numbers of test weights must be checked, it may be advisable to have extra balances specially suited to this work and reserved for this work alone. It is impossible to discuss such variations in a general paper of this sort, and advice in such cases should be based on a full knowledge of a large number of details.

“May I interject two practical suggestions in regard to buying balances. (1) Do not specify that the two arms of the beam must be equal to an extremely high degree of accuracy. Plan on eliminating errors due to slight inequality of arms by the short substitution method of weighing outlined a little later in this paper. This may save much in cost or in other troubles of buying. (2) However, always specify that the balance must be reliable; that is, that it must repeat its results within the required degree of accuracy when repeatedly arrested and released with any proper load on the scale pans, or when the weights on the pans are removed and replaced, or are placed slightly away from the center of the scale pans. It is not intended by this to require that the zero point and the sensitiveness be constant from day to day, nor to require a constant sensitiveness for different loads. Reliability does require, however, that certain qual-

ities of construction be present without which a balance is useless for accurate work."

Length comparator.—For very accurate comparisons of standards of length, not greater than one meter, a "comparator" will be found necessary. These instruments are usually built to order under the specifications of the purchaser. Upon request, the Bureau of Standards will furnish proper specifications for this piece of apparatus.

(This equipment is not usually needed by a State department of weights and measures.)

Tape-testing devices.—For those offices in which steel tapes are to be tested, some apparatus for facilitating the comparison of the standard and the tapes under test will be found indispensable. This apparatus may be of simple and inexpensive form; thus, brass plates equipped with clamps to hold the tapes at one end and with simple tension devices at the other, may be set into a level floor at appropriate distances, this device enabling the standard and the tape under test to be compared directly with each other. No great precision can be expected in such a test, however. If higher precision is desired, recourse may be had to a bench standard. This latter device will give very much better results and is much more convenient than the former, but is also much more expensive. It consists of a straight steel bar which has the various lengths to be tested marked upon it. Micrometer microscopes and other accessories are provided for when such a standard is installed. As in the case of comparators, this apparatus is built to the order of the purchaser, and the Bureau of Standards will furnish proper specifications upon request.

(This apparatus is one of the last items to be considered in equipping the office.)

Hopper funnel.—When two dry measures which will both hold water are to be compared with one another, water will be found to be the best testing medium. When one will not hold water, however, the testing medium must be some dry commodity; rapeseed is probably most satisfactory for this purpose. When a dry commodity is employed a hopper funnel becomes a necessity in order to obtain a proper test. This is a piece of apparatus consisting of a hopper for holding the testing medium used, connected with a delivery spout which can be opened and closed at will, and a base for supporting the measures.

(This need only be procured by those States still permitting the commercial use of dry measures.)

Thread-measuring reel.—For determining the length of cord, thread, etc., in large quantities, as in balls or skeins or on spools, etc., a thread-measuring reel is very useful. This instrument is made in various forms, but consists primarily of a revolving wheel of known circumference, with a device to indicate the number of revolutions of the same.

(There will usually be only limited use for this apparatus.)

FIELD EQUIPMENT

Balances.—One portable 10-pound even-arm balance with suspended pans, having an SR of 1 grain.

One portable 1-ounce even-arm balance with suspended pans, having an SR of 1 milligram.

(The purchase of the 1-ounce balance may be postponed until testing in pharmacies or jewelry stores is to be undertaken.)

Miscellaneous.—Inside and outside calipers, seals, seal press, sealing clamp, record forms, and tools such as screw drivers, pliers, wrenches, hammer, level, etc., are required.

Substantial carrying cases are necessary for the transportation of standards and equipment.

STANDARDS AND EQUIPMENT FOR A COUNTY OR CITY DEPARTMENT

The requirements for a large and active county or city department may be nearly as extensive as those for a State, especially when such a county or city is located in a State without an active State department or in which the State department is not fully equipped as recommended heretofore.¹¹ However, as a rule a county or city will not find it necessary to have standards and equipment of the highest grade, since the demands for testing work made upon it will, in general, be one step lower in the scale of accuracy than in the case of the State which must be able to calibrate office standards for the cities and counties within its borders, work which the city or county will not, of course, be called upon to do.

OFFICE STANDARDS

Large counties and cities.—These jurisdictions should have office standards similar to those specified heretofore for State secondary or office standards.

¹¹ See chapter 14 for discussion of the verification of local standards where this work can not be performed by the State department.

Medium-sized counties and cities.—Office standards are desirable but less necessary than in the case of the large jurisdictions. These may be similar to those specified heretofore for State secondary or office standards, or they may be a selected group of carefully adjusted and protected working standards.

WORKING STANDARDS FOR OFFICE USE

Large and medium-sized counties and cities.—These offices should maintain a set of working standards in addition to the field equipment, in sufficient variety to handle all tests to be made in the office. Such work ordinarily includes the following classes of commercial equipment: Weighing scales, weights, liquid measures, glass graduates, dry measures (if allowed in use), berry baskets, and linear measures.

EQUIPMENT FOR OFFICE USE

The office of a county or city having a set of office standards should also be equipped with at least two balances, preferably the 50-pound and the 5-pound balances, as specified for the office of the State department; in any event, the 50-pound balance should be provided. These balances may have the same sensibility reciprocals as those specified for State office equipment, and in the case of the smaller balance this is recommended on account of the increased work which will be required of this balance when only two are furnished. The 50-pound balance will be satisfactory, however, if its sensibility reciprocal does not exceed 200 milligrams.

As to the other equipment previously described for the State office, the comparator may always be omitted from the equipment of the county or city office, and it will be only rarely that the local office will find it necessary to install a tape-testing device; the thread-measuring reel will be of occasional use only; and the hopper funnel need only be provided in those jurisdictions still permitting the commercial use of dry measures.

STANDARDS AND EQUIPMENT FOR FIELD USE

The requirements are the same as for similar work performed by the State department.

