U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

REPORT OF THE TWENTY-EIGHTH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

ATTENDED BY REPRESENTATIVES
FROM VARIOUS STATES

HELD AT THE NATIONAL BUREAU OF STANDARDS
WASHINGTON, D. C., MAY 31, JUNE 1, 2, AND 3, 1938

MISCELLANEOUS PUBLICATION M161

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Official photograph of delegates and guests attending the Twenty-eighth National Conference on Weights and Measures, assembled at the entrance of the East Building, National Bureau of Standards.

U. S. DEPARTMENT OF COMMERCE
HARRY L. HOPKINS, Secretary
NATIONAL BUREAU OF STANDARDS
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CAREY, L. C., Specialist in Package Standardization, Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C.
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MILLER, D. R., National Bureau of Standards, Washington, D. C.
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SMITH, RALPH W., National Bureau of Standards, Washington, D. C.
SOUDER, WILMER, National Bureau of Standards, Washington, D. C.

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Smith Meter Co.:
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Tokheim Oil Tank & Pump Co.: G. U. BRAKE, Sales Engineer, Fort Wayne, Ind.
Toledo Scale Co.:
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H. O. HEM, Chief Engineer, Toledo, Ohio.
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REPORT OF THE TWENTY-EIGHTH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

HELD AT THE NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C., MAY 31, JUNE 1, 2, AND 3, 1938

FIRST SESSION—MORNING OF TUESDAY, MAY 31, 1938

(The Conference was called to order at 11:00 a. m., by Dr. Lyman J. Briggs, President of the Conference.)

ADDRESS BY LYMAN J. BRIGGS, DIRECTOR, NATIONAL BUREAU OF STANDARDS, AND PRESIDENT, NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

In opening this Twenty-eighth National Conference on Weights and Measures I wish to review briefly some of the things that have taken place during the last year, which I think will be of interest to you.

During the past year our apparatus for testing vehicle scales has been in service in a number of States. I have been gratified by the response on the part of State and municipal officials regarding the visit of this apparatus to various States. We have had throughout your unfailing interest and cooperation. In return, I hope that the equipment has been useful to you in your activities toward the securing of permanent equipment for your own use. During the course of the Conference we will have several reports from various members of the Conference on their success in this regard.

The results of the work have only confirmed what you and we both felt would be the case, namely, that there was a great need for standardizing apparatus in the field of vehicle scales. The results of our work so far have indicated that on the average only about one in five scales is within acceptable tolerances.

The second matter which I wish to bring to your attention is the fact that we hope soon to have here at the National Bureau of Standards a suitable vehicle scale of our own. We have been negotiating for a 60,000-pound scale with a platform 40 feet long, to be installed on Van Ness Street near the powerhouse. That scale will be so installed, we hope, as to constitute a model in this respect and will give us an opportunity to see how well a scale of that kind can be maintained. We hope, also, to supplement this installation with another scale of a capacity of 10,000 pounds, which can be used in the calibration of 1,000-pound and other large weights. At the present time the only scale we have for this purpose is located in our master scale depot at Clearing, Ill.

Last year I presented to the Conference a draft of a proposed bill to fix the standards of weights and measures in the customary system of units. Hearings were held before the Committee on Coinage, Weights, and Measures subsequent to that presentation, and the bill

in a somewhat modified form is ready to be presented by that committee to the House.

The following amendment to the bill has been proposed:

"Provided, That nothing in this Act shall be construed to change any constants used in the computation of plane coordinates, elevations, or other map data."

That provision will allow all mapping to be carried on just as it has been in the past, without detracting in any way from the great advantages to be gained from the main provisions of the bill.

THE VIEWPOINT OF INDUSTRY CONCERNED WITH INTERCHANGEABLE MANUFACTURING TOWARD THE PROPOSAL TO STANDARDIZE THE INCH

By HERBERT B. LEWIS, *Brown & Sharpe Manufacturing Co.*

In discussing the subject of legally standardizing the United States inch, we are primarily interested in the House of Representatives bill H. R. 8974. In this bill the first three sections relate to standards of length, sections 4 to 7 relate to standards of mass, and sections 8 and 9 are concerned with volume. Inasmuch as we are discussing length standards, small variations in which do not have an appreciable effect upon volume, and we are not concerned with standards of mass, this discussion will relate only to the first three sections of the bill.

It is interesting to review briefly the background for standards in this country in order that we may appreciate in a greater degree the benefits which may accrue from the passage of such a bill as has been proposed.

Being British Colonies, we naturally used the standards of England until 1776, but upon the adoption of the Constitution of the United States, no change was made and we continued with standards previously used. Although the Constitution delegated to Congress authority to fix standards, Congress has seldom availed itself of the opportunity. In his presidential messages from time to time, Washington urged Congress to act under this constitutional provision, and the matter was repeatedly discussed, but practically no definite action has ever been taken. Various State legislatures have asked Congress for action in the interest of uniformity, without avail.

In 1790, Jefferson, then Secretary of State, proposed a standard of length, based on the length of a uniform cylindrical pendulum, beating seconds at sea level at 45 degrees north latitude, and in 1821, John Quincy Adams, then Secretary of State, urged Congress to fix the standards for this country, consulting with foreign nations and having in mind the future establishment of universal uniformity.

In 1830 the Treasury Department investigated the standards in use in the United States customs houses in the interest of uniformity in collection of customs. At that time Congress directed the Secretary of the Treasury to send a complete set of weights and measures to the Governor of each State, but no congressional action was taken to legalize these standards. However, most of the States adopted them, and they thus became legal standards.

During the period 1840 to 1880, accurate measure and standardization received its first real emphasis, due, in a great measure, to the work of Sir Joseph Whitworth. His work on standardization and interchangeable manufacture was based on gages of the end-measuring

type, which he was able to compare with a high degree of accuracy on a measuring machine of his own construction.

Great Britain presented the United States with "Bronze #11" in 1856. This was a standard yard at 61.79° F and was made of the same alloy as the British Imperial Yard, which is approximately 16 parts of copper, 2½ parts of tin, and 1 part of zinc. This was accepted as the standard yard for the United States by the U. S. Office of Weights and Measures and was used as such over a period of several years, although it was never adopted legally.

Congress, in 1866, took definite action relative to standards by passing the act of that year, which made it lawful to employ the metric system in this country. This act included a table of equivalents for converting from the English to the metric system.

In 1893 Mendenhall, who was then in charge of the United States Coast and Geodetic Survey, issued an order which was approved and promulgated by the Secretary of the Treasury. This order reversed the calculation of these equivalents by making the metric standards the base. This reversal of calculations resulted in a variation between the United States and the English length units. This variation was unimportant, except in the case of highly refined measurements.

Therefore, upon the authority of the Secretary of the Treasury, the International Prototype Meter was set up as the fundamental standard, and the yard was derived therefrom in accordance with the act of 1866, the conversion factor—1 meter equals 39.37 inches, exactly, or 1 inch equals 25.400051, approximately—being employed.

Up to this time no serious efforts were being made to provide legalized length standards in this country. This may have been a blessing in disguise since they might have been set up without due regard for the international aspect.

Definite and constructive action was begun when the United States, in collaboration with practically all of the other civilized countries in the world, combined in the formation of the International Bureau of Weights and Measures, the headquarters of which are in France, on territory which has been declared neutral by the French Government. About 50 years ago this Bureau made the International Standard Bar and a number of master bars. One of the master bars has been sent to each signatory nation, and during the period of about 50 years no appreciable changes that could not be accounted for have been noted. Thus, it is seen that there are in existence throughout most of the civilized world, standards of length which are in agreement, the one with the other. In view of the fact that the National Prototype Standards are, from time to time, returned to the International Bureau for recomparison, a comprehensive system is provided by means of which all standards can, either by direct comparison or by computation, be placed on the same basis. It is obvious that this is giving to the world a uniform standard of length and that the proposed bill recognizes this international standard of length as the master to which to refer, and officially confirms the part which the National Bureau of Standards has taken in connection with the International Bureau of Weights and Measures.

Because of the urge occasioned by the rapid growth of interchangeable manufacture, development of highly accurate gages and methods of producing and measuring them came rapidly.

It was recognized by industry that, from the point of view of foreign trade, precision-made products of one country must measure the same

in the country of the purchaser, as in the country of origin. In order that such a condition prevail, the base of all measurements must be one standard, and conversions from this must employ identical conversion factors.

Industry in 16 countries, including the United States and Great Britain, has adopted the conversion 1 inch equals 25.4 millimeters and thereby recognized the International Meter. In 1930 the British Standards Institution in Great Britain, and in 1933 the American Standards Association in the United States, adopted this relation. In view of the needs and action of industry in these two countries, it is reasonable to expect that the governments will adopt as legal the standards that have been adopted and in use by industry for a number of years.

The bill under discussion supplies industry in this country with a legal foundation for length measurements that agrees with the rest of the civilized world. Section 1 recognizes the International Meter, and section 2 legalizes the conversion ratio 1 inch equals 25.4 millimeters, which changes the Mendenhall inch of 1893 by about 2 millionths, bringing it into closer agreement with the legal inch of Great Britain. However, it has no effect upon industry whatever since industry of both countries has already adopted and is using it.

Today, industry uses gages, the gaging dimensions of which must be known to the order of millionths of ar inch. The most generally used, and probably the most reliable, means of making such measurements is the interferometer in which case users must know the exact length of the wave of the light used.

In section 3 this bill gives the value of the wave length of red cadmium radiation when determined under certain standard conditions specified by the International Committee of Weights and Measures. By leaving the specifying of conditions in the hands of the International Committee rather than setting forth its own specifications, the United States standards will be kept in international agreement by a group that is enabled to take advantage of developments in methods and equipment by changing standard conditions when benefits are to be gained.

The International Meter has never been officially certified in wave lengths of light, but in 1927, at the request of the National Bureau of Standards, the International Bureau reviewed a considerable number of tests and has established provisionally that the number of wave lengths of red radiation from cadmium in 1 meter is 1,553,164.13. It is felt at our National Bureau that this is a true value and that it can and should be used in defining the meter and the inch. In sections 2 and 3 of the proposed bill this is done, and it is felt that this country is going farther than any other in taking constructive action in furthering the standardization of units of length.

In summing up this discussion, the following appear to be the outstanding advantages that would result from the passage of H. R. 8974 from industry's point of view:

1. It puts our standards of length on a definite, permanent, and legal basis; it also brings them into agreement with those that have been internationally adopted.

2. It supplies an accurate, convenient, permanent, and easily reproducible United States inch.

3. It makes legal a convenient and easily applied relation between inches and millimeters.

(a) The conversion ratio has a small number of figures.

(b) It allows a gear ratio of 5 to 127 for metric screw-cutting on our lathes. By that I mean the gear ratio that will enable us to very easily cut metric screws on an American lathe.

4. Defining the inch in wave lengths of light is of great value and convenience in measuring and producing precision gages and parts used in interchangeable manufacture.

5. It legalizes what industry has been forced to adopt in the interest of foreign trade.

In view of the rapid developments in precision measurements during the past few years, there is every reason to believe that they will be carried forward in the future. It will be recalled that it was a comparatively few years ago that we changed our standard temperature from 62° to 68° F, which is universally accepted and used by industry.

This change had the effect of changing a 1-inch gage block approximately 35 millionths of an inch. This change was made easily at that time and caused comparatively no criticism, due, no doubt, to the fact that industry did not employ the highly developed measuring methods of today.

By similar reasoning it is clear that industry can, without serious disturbance, make the much smaller change proposed in H. R. 8974, and that the sooner the change is made the less will be the disturbance and the greater the advance toward definite international standards.

The CHAIRMAN. We are greatly obliged to you, Mr. Lewis, for this presentation of the matter of standardization from the standpoint of industry.

NOT IN THE BOOK

By O. E. BRENNEMAN, *Chief Deputy Sealer, Bureau of Weights and Measures, State of Ohio*

A famous pedagogue who lived long ago was often heard to say—"The place to begin to teach is where the book ends." This pedagogical maxim is applicable to weights and measures officials everywhere and is the theme of this discussion.

The handbooks which are used for guides in the different States are quite comprehensive; they contain the laws and regulations of the State pertaining to weighing and measuring devices, instructions to sealers, and a vast amount of information, but the solution of numerous problems which confront us in an official capacity is not written in any book and cannot be reduced to a formula or code, because each one is different, is often complex, and therefore is interesting.

The first topic to be presented for consideration is the much discussed and ardently wished for uniformity among the several States and among their subdivisions. There is almost unanimous agreement in the desirability of uniformity, and the border line cases which now cause so much perplexity and are so difficult to settle would be largely eliminated were we to have uniformity.

It is strange indeed that a weighing or measuring device which is deemed accurate and acceptable in one State or county should be considered inaccurate or undesirable in another when it operates just the same in either locality. It is possible to have uniform laws and regulations, but it is not probable that we will have them in the very

near future. State legislatures are not like machines which all operate on the same drive shaft. Regulations are promulgated by men who have unlike judgments of the relative importance of certain activities. Various sections of the country have different ideas and desires, and the only logical way to secure a reasonable degree of uniformity is by crystallizing sentiment in favor of certain generally needed laws in conferences such as this. The greatest lack of uniformity, however, is not in the laws and regulations but in the administration of the laws and regulations. Most State constitutions provide that a law must be uniform in its application to be constitutional and this is also the legislative intent of all the laws in the general code. However, in the actual administration of the law, it is far from uniform.

The point may be illustrated by citing two officials in adjacent jurisdictions. One is very conscientious and aggressive. He is in favor of a strict observance of the law. No technical or minor infraction is permitted to go unpunished. His condemning tags are much in evidence and his prosecutions numerous. He is a sort of Attila, before whom trembling violators bow the knee. He has a reputation as an active official.

The other official is a diametrically opposite type of man. He is just as conscientious and just as aggressive, but his philosophy of government and his mode of enforcement are different. He feels that if every law is strictly enforced, everyone will be indicted. With this attitude he is inclined to forget the minor and technical violations and is slow to prosecute or condemn.

With a multiplicity of types of service which an official can render, it is very difficult to place an equal emphasis on all his activities at the same time, so one will stress the thing that to him seems most important, and the other one will emphasize something else.

This difference in viewpoint and procedure is illustrated by two letters which were received the same day from two station operators. One complained that the pumps were tested too frequently; the other complained that they were not tested a sufficient number of times. One operated in a jurisdiction under a fee system; the other one did not.

How to secure uniformity of administration in the different counties of the State is not in the book but is a problem which must be solved in meetings of sealers' associations, schools for weights and measures officials, and the free exchange of ideas. One of the English kings said, "If I can not make two clocks run alike, how can I expect to make two men think alike?" A uniformity that takes away individuality and puts every one in a well-defined groove is undesirable, but a uniformity of administration in which the general procedure is similar in each county is highly desirable. A general program set up by the State can usually be carried out by the smaller subdivisions and thus correlate the activities of the group.

In recent months much attention and thought has been given to the size and weight of packages. The packages which give concern are those which, although they are labeled strictly according to law with the exact weight or volume printed on the label, usually in small print, are not of standard size; however, they approximate so closely the weight and size of the package in which the commodity is usually sold that they can readily be mistaken for standard-weight packages. A 15-ounce or a 7½-ounce carton of butter when displayed on a

counter is so similar to a 1-pound or ½-pound carton that the customer can easily fail to notice the difference. A paper ice-cream container made to retail at 10 cents is another example.

In one store 15 different sizes of fancy vinegar bottles were displayed on a counter, each one properly labeled. Panel bottles, round, square, and triangular bottles of infinite variety, shape, and size are displayed in colorful array before the customer and out of this conglomeration the housewife makes her purchase. Large cartons and smaller cartons, all containing exactly the same amount of the same commodity, add to the confusion, and the remedy is not in the book.

Some manufactures of cartons have been kind enough to consult the Bureau of Weights and Measures before placing an odd-size carton on the market, and a number of them have expressed a desire to confine the number of cartons they manufacture to a few standard sizes. They reason that they are able to sell a certain number of cartons in a given period of time and that the sale of any one size decreases in almost mathematical proportion to the number of sizes they sell. In the judgment of the writer this subject should be discussed in various interested groups and given publicity until some feasible plan is promoted to standardize packages and containers so that "he who runs may read." This is a problem which calls for the cooperation of manufacturers, retailers, weights and measures officials, and the consuming public.

This brings us to the next goal which is not in any book, and that is how to secure the cooperation of State and county officials, merchants, and the general public in the program. Laws are only enforced in the hearts of the people. A law or a program may not be 100 percent perfect either in theory or in the mechanics of its operation, but if it is popular and a great majority of the persons who are subject to its provisions feel that it has a benign influence on their business or social activities it is almost self-operative. Another law may be theoretically sound and yet be so unpopular that it is almost impossible to administer it.

It would simplify the problem if the solution could be reduced to writing and put in a book, but only suggestions can be made and the real solution must be found in the ingenuity of the local deputy sealer. Cooperation is always born of understanding and mutual interest. It is unfortunate that a deputy sealer is so busy he does not have time to explain his own business. A little visit and a few minutes spent in explaining what it is all about pay big dividends. Why not assume the attitude that manufacturer, dealer, customer, and official are all partners in this business of correct weight and measure? When we take them into our confidence cooperation will flourish like a green bay tree. It is amazing that so important a function of government has received so little publicity.

The catalog of any large public library will contain dozens or scores of books on the different divisions and activities of government and very few, if any, on weights and measures. Current magazines will carry articles of general interest about the work of certain departments and the newspapers are full of human interest events portraying the working relationship between the average citizen and his government. These, too, are usually silent on any subject relating to weights and

measures. How can the man on the street or out on the farm be expected to cooperate with something he does not know is in existence and of which he has never heard?

The main objective of the entire program is customer protection. Two factors are involved in securing this protection. One is the construction and accuracy of the mechanical device which is used in the transaction and the other is the integrity of the operator. Mechanical devices can be perfected and certain standards adopted for their construction. If they are constructed according to specifications and are properly installed and accurate, a seal is placed upon them so that the customer may have reasonable confidence in their accuracy.

This is a twice-told tale because it is all in the book, but the book makes no provision for sealing the operator. This is the major problem confronting us in reaching our objective of customer protection. Examples of the misoperation of a weighing or measuring device are much more numerous than those of defective equipment. Visit the marts of trade on a busy day and note the position in which the scales are placed and the manner in which they are operated. Many are within the letter of the law because the book says they must be placed within 3 feet of the customer and nothing shall obstruct the customer's view. Some modern glass show cases are quite high to permit the display of merchandise and when a computing scale is placed on top of the counter it is considerably above the eye level of the clerk and customer. In this position the reading on the dial is always in favor of the seller. In rush hours, commodities will be thrown upon the scale and quickly removed. At the instant the indicator has come to rest the clerk will name the price and lift the commodity from the scale. It would require sharp vision and familiarity with the chart to be able to read the indication in this rapid-fire order. Perhaps this practice is in keeping with the tempo and speed of modern business methods. No inference is intended that speed always means inaccuracy. It does make checking difficult from the customer's angle. Some stores have adopted the policy of calling both the weight and the price to the customer. This seems to be a very good custom. It has been encouraged by those interested in better trade practices and is meeting with public approval.

Human integrity is the only element in business that cannot be measured or relied upon. Persons who have been honest for years will sometimes go wrong—victims of the cross currents of human life. The machine can easily be adjusted or repaired. Adjusting the operator is not always such a simple task. An extended discussion of this important phase of the work would take us far afield into the realms of psychology and religion. Blessed is the weights and measures official who can instill into the minds of those whom he contacts a desire to always give a full measure, an accurate count, and an honest weight. This may sound quite abstract and general, but in our State in the past year we have stressed this very thing, and the results have been gratifying. In one county the sealer talked honesty at meetings; he stressed it in the newspapers; it was the subject of his conversation on the street. Like Cato of old, who went about the streets crying "Carthaga est delenda" until Carthage was destroyed, he really made the citizens of his county weight and measure conscious and that county is noted for its few violations. In this community four dealers sold chickens and turkeys by the piece. Two of

them began to sell by weight. They are in business today; the other two have quit business.

No claim is being made that all unethical practices will automatically vanish when a community is made weight and measure conscious. It will always be necessary to resort to the punitive provisions of the law in a few instances but not so frequently. We pay tribute to the honest merchants of America. There are thousands of them and only a few dishonest ones.

Another important phase of the work which cannot be found in the book is the means whereby each subdivision can secure adequate personnel and sufficient equipment to carry out the program in an efficient manner. Many counties are lacking in equipment and have no deputy sealer, or have a deputy who is only a part-time man and receives a very small compensation. This condition seems to be quite general in a majority of the States and it appears that the remedy lies in legislative procedure.

The entire problem is a problem of human relationship. It originated when barter or exchange began among primitive men. Back of each device is the story of the labor and the trials of the man who invented or constructed it. Back of every scale or pump is a human operator and back of every law is a human need for the protection which it affords, so this leads us to the logical conclusion that the rules and regulations are in the book, but the great problem of their specific and local application is not in the book.

ACTIVITIES OF THE NATIONAL SCALE MEN'S ASSOCIATION

By H. O. Hem, *President, National Scale Men's Association*

Mr. President, Conference members and guests, it is an honor to be given a place on your program representing the National Scale Men's Association. This organization is only about 4 years younger than the National Conference on Weights and Measures.

You have established and developed a worth-while institution of which we are all proud—the National Conference on Weights and Measures. I have attended several of your, or may I say, our Conferences, and each year I have felt the time is well spent and profitable. You have endeavored to bring about a uniform and accurate method for testing weighing and measuring instruments, which is a safeguard for the manufacturers and users of the devices as well as the public in general. Now, nearly all realize the necessity of having sealers of weights and measures as well as adequate equipment with which to test scales and measuring devices.

My topic is "Activities of the National Scale Men's Association." I believe most of you have heard and know as much about the activities of the NSMA as I do. You have heard several times before that the NSMA is composed of many men engaged in installing, repairing, and testing scales. Quite a number of the members are manufacturers of weighing equipment, some are shopmen, and a considerable number are sealers of weights and measures.

I might discuss the necessity for a scale men's association. In doing so, first, I would like to tell you something about scales before we had such an association and before we had any specifications for scales. As far as I know we then had no yardstick to measure anything by. We had no information as to what the carrying capacity of

a scale must be in order to be rated at a certain capacity, and in fact, no fiber-stress calculations were made on any of the component parts in scales. Many scales were made without any detailed drawings of the component parts; only some meager drawings were furnished for the installation of scales.

In 1880 and 1890, railway tracks scales were sold and installed as of 100-tons capacity; a main lever of such a four-section scale now would not be rated as of 20-tons capacity. The method the manufacturers usually pursued in designing a scale was to make a lever of such a size that it appeared to be sufficiently strong to carry an imaginary specified load. Breakage of levers was a frequent occurrence, but it was attributed to mysterious and unforeseen causes or hidden defects; however, in view of the excessive breakage, the levers were gradually increased in size. Can you imagine a four-section 80-ton railway track scale in which a cast-iron main lever weighed only 96 pounds? Yet, at one time levers of this weight were incorporated.

Most of the scales built had rigid platform bearings or the lever mechanism was suspended so that when the platform was disturbed all of the levers would swing and move, with the result that the knife-edges would get dull rapidly since the knife-edge changing position in the bearing increased the wear. In addition to this, there was an excessive load per lineal inch of knife-edge. In fact the main-lever load pivot in a 100-ton railway track scale was only about 5 inches or 5¾ inches in length—a load in excess of 10,000 pounds per lineal inch.

Between 1890 and 1900 I was in competition with other manufacturers on an inquiry for a large number of railway track scales. I suggested to the chief engineer of the company that he should not buy scales the way he would buy sugar and coffee. Merely specifying a 100-ton scale was not enough—the load on each main lever should be stated; the fiber stresses in the component parts of the scale should be known. I asked him if he would order a bridge calculated and built in this manner; if not, why should a mysterious scale be bought that way? (The scale was a mysterious mechanism because no one knew anything about it, and anyone who did know about it never told anyone about it.) The chief engineer then sent out requisitions for bids on scales requesting that the bidder submit detailed drawings of the component parts in the scales, and, if they had such information, fiber-stress diagrams for the various parts. I was on the job when the bids were opened and found I was the only one who had such information. The other competitors merely stated they had been in business a great number of years, that they were responsible concerns, and that they would guarantee their scales. The competitors argued against the scale I proposed to furnish, saying it required a pit 2 inches deeper than their scales; I maintained this was a benefit instead of a detriment, as larger angleworms could be employed as inspectors on account of the better chance to get under the scale.

At this time the sealers of weights and measures did not have much equipment for testing scales; only from 100 to 500 pounds of test weights were available with which to make a test of any kind of scale, possibly with the exception of some grain hopper scales.

In the next few years, between 1900 and 1910, considerable improvement was made in scales, especially railway track scales. Heavier scales and weighbridges were built, but even at this time sealers of weights and measures or scale inspectors had no adequate facilities for testing scales.

The Pennsylvania Railroad Co. was the first to use test cars for testing railway track scales. Subsequently, several railroads started to use improvised test cars, such as ordinary boxcars loaded with test weights. I know that one large railroad company even considered using a boxcar having a certain amount of test weights in each end in an effort to produce a known weight on each truck to serve as a short-wheel-base test car. The sealers of weights and measures know that the weights could not remain fixed. (Mr. Richard of the National Bureau of Standards will tell you why the method of testing a scale with half of a car or one truck will not work.) Now, you can understand why there is a necessity for the members of the National Scale Men's Association to exchange ideas and write rules and specifications.

The first scalemen to organize met in Minneapolis in 1910. They became known as the Northwestern Association of Scale Experts. C. C. Neale was elected president at this meeting. At the next annual meeting, held in 1911, the name of the organization was changed to the National Association of Scale Experts. In 1913 or 1914 another scalemen's organization, known as the Southern Scale Men's Association, sprang up. In 1916, as I remember, a joint meeting of these organizations was held and it was decided at this time to consolidate and to change the name to the National Scale Men's Association. Since that time meetings have been held each year. The National Scale Men's Association now has approximately 350 members and new members are being added. At the annual meeting held last March, 171 persons were present at the banquet and 300 at the Central Division Host Night.

The Central Branch is located in Chicago and has a membership of about 125, the Pittsburgh Division has a membership of about 30, the Southern Division has a membership of about 33, the Midwestern Division has a membership of about 20; the Northwestern Division, formerly called the Northwestern Scale and Measures Association, held a meeting in March 1938 and voted unanimously to become a local of the National Scale Men's Association.

I have looked over some of the papers given here in previous years by representatives of the National Scale Men's Association, and to refresh your memory, I may say that I found that some of the projects which have been described are as follows: Code of specifications for railway track scales for light industrial service; code of specifications for the overhaul and repair of large-capacity scales; standard test-report form; code of specifications for railway track-scale test-weight cars; code of specifications for motortruck scales; code for adequate test of motortruck or wagon scales (tentative); adequacy of material and process for scale pivots and bearings.

Briefly, the most important current projects are: Two-draft weighing on vehicle scales, motortruck scale-testing practice, and glossary of scale terms.

In relation to the last-mentioned project I wish to tell you that M. J. J. Harrison has a glossary of scale terms which he has compiled, and he has with him some copies for distribution. Mr. Harrison has provided a memorandum explaining the history of this project, as follows:

Earliest available records show a committee working on the matter in 1920—the committee consisting of C. A. Briggs (then of the staff of the National Bureau of Standards, more recently of the U. S. Department of Agriculture), C. J. Scrib-

ner (then of the Engineering Department of the C. B. & Q. R. R., now deceased), and J. A. Schmitz (of the Chicago Board of Trade). This committee of the NSMA actually took certain preliminary material which had been originated in the American Railroad Association (one of the predecessor organizations of the Association of American Railroads) about 1913 or 1914.

Because of a variety of circumstances, progress of the matter in the NSMA was for several years rather desultory, and it was not until 1936 that any great amount of publicity was given the matter. At that time, a list of some 141 definitions was presented to the Twentieth Annual Convention of the NSMA and published in the March 1936 issue of the Scale Journal. Following this publication, the NSMA editorial committee undertook an expansion of the list of definitions, and a succession of drafts was prepared, each more complete and detailed than its predecessors. By the time the next annual convention of the Association was held (in 1937), the number of definitions had increased to something like 640 or 650, and this material was distributed to the membership of the Association and a few other interested parties in mimeographed form.

In the meantime, the Association's editorial committee kept on with its work, and submitted at the 1938 convention still another draft, comprising some 890 definitions. Distribution of this material in March 1938, created so much interest that, when the NSMA was invited to make copies of its glossary available to the National Conference on Weights and Measures, the number of definitions had increased to approximately 1,210. These definitions are included in what has been designated as the "11th Draft", dated May 31, 1938, and consisting of 74 mimeographed pages.

The object in bringing this material to the attention of the National Conference on Weights and Measures is twofold. In the first place, the material is offered as information, and attention is called to the fact that it is fully realized that the definitions are still "tentative." In the second place, the assistance of the National Conference on Weights and Measures in making the document more nearly complete and correct is sincerely asked. Members of the Conference are requested to scan the glossary for omission of terms and meanings, and are invited to submit suggestions for additional terms and meanings to the NSMA. It will be appreciated if such suggestions can be sent direct to M. J. J. Harrison, Supervisor of Scales and Weighing, Pennsylvania Railroad Co., Altoona, Pa.

Copies of the "11th Draft" will be found at the Conference registration desk at the close of the current session and thereafter, and are, of course, free to the members of the Conference.

The National Scale Men's Association at the last meeting, raised considerable objection to the 0.4 of 1 percent tolerance for corner tests on motortruck scales and a committee met here a day or two ago with the Committee on Specifications and Tolerances of this Conference with a view to modifying the tolerance which was adopted here last year.

From the above I think you may conclude that the National Scale Men's Association is a worth-while organization. The various local groups are also doing much good in discussing problems which confront scalemen in all branches of scale work. Perhaps we are not getting along as fast as we should, because all the members and committees have different ideas and much of the same feeling toward each other as that which prevailed when Robert Owen said to William Allen in 1828 when they severed partnership, "All the world is queer, save thee and me, and even thou art a little queer." That is why it takes so much time to accomplish so little. Specifications for scales will never be finished. Conditions change too frequently, and new developments require new specifications. So we are here to stay.

The CHAIRMAN. You will recall that the subject of the labeling of incandescent filament lamps was up for a brief discussion last year, and it was indicated that the Conference desires more information on the possibility of labeling lamps, not only as to the power used but also as to the light emitted. Dr. Meyer of the Electrical Division of the Bureau will therefore discuss this subject.

LABELING OF INCANDESCENT-FILAMENT LAMPS

By J. FRANKLIN MEYER, *National Bureau of Standards*

An incandescent-filament lamp, for the purpose of this discussion, is an electric lamp in which the filament is heated to incandescence by the passage of an electric current. The filament is surrounded by a glass container which may be evacuated or which may be filled with an inert gas. The independent variable in the use of a lamp is the applied voltage and ordinarily lamps are designed to be operated on 110, 115, or 120 volts. Lamps are, however, obtainable for operation at 125 and 130 volts, and for certain purposes 220-, 230-, 240-, and 250-volt lamps are generally available. Lamps for low voltage purposes, that is, for train lighting, for "country-home" lighting, and for automobile and flashlight service are also made in very large quantities.

With a definitely applied voltage, let us say 115 volts, a lamp designed by the manufacturer to be operated at 115 volts takes a certain current, which when multiplied by the voltage, gives the wattage of the lamp; it produces a certain amount of light at a predetermined efficiency in lumens per watt, maintains its initial light output within a predetermined minimum percentage, and has an average life which is determined by conditions of use. The life of lamps ranges from a very short time to several thousand hours.

The problem before us today is how such a device should be labeled. It is now labeled volts and watts. The proposal to be discussed is whether the labeling should be as is now the custom, that is, volts and watts, or whether it should be labeled in volts and lumens; or volts, watts, and lumens; or volts, watts, and lumens per watt; or volts, watts, lumens, and life.

When incandescent-filament lamps first came on the market, and for about 25 years thereafter, lamps were labeled in volts and candlepower. Some of us recall the days when the label on an incandescent-filament lamp read, for example, 110 volts 16 candlepower. Soon after tungsten filament lamps came on the market, and it was found possible to manufacture lamps ranging in watts from 10 to 500 or more, manufacturers generally abandoned the labeling of lamps in volts and candlepower and began the system of labeling incandescent-filament lamps in volts and watts. During the last 25 years, continual improvements have been possible in the manufacture of tungsten-filament incandescent lamps and, for example, 60-watt lamps have changed in lumen output from 720 lumens in 1930 to 822 lumens in 1938, or in lumens per watt from 12.0 to 13.7.

Each year the manufacturers of lamps who have contracts with the Federal Government meet with members of the Procurement Division of the U. S. Treasury Department and engineers of the National Bureau of Standards, and a yearly supplement to the Federal specification for large tungsten-filament incandescent lamps is agreed upon. Practically each year increased lumens and lumens per watt are agreed upon in every size lamp in watts from 15, at the present time, to 1,500. Sometimes, as has been the case in the last year, two such changes are made in one contract period of 1 year, and very recently, on account of the introduction of the coiled-coil filament lamp of 50- and 60-watt sizes, changes of as much as 10 percent have been made at one time. Although the Federal specification for incandescent lamps is applicable only to Federal purchases of lamps, it, in effect, sets the standard for incandescent lamp manufacture in the United States.

In discussing lamps and lighting it is a platitude to say that lamps are purchased for the light they emit. Under the present system of marking lamps according to their volts and watts the purchaser buys a 40-watt lamp or a 60-watt lamp because he thinks he knows by experience that a 40-watt lamp or a 60-watt lamp, as the case may be, gives him approximately the amount of light he desires. He forgets or is not aware that in the period of the last 8 years the amount of light he receives from a 60-watt lamp has been increased from 720 lumens to 822 lumens, or approximately 14 percent.

Everyone interested in educating the consuming public relative to economy of lighting stresses the fact that on an average it costs about 10 times more for the energy to burn a lamp throughout its life than for the lamp itself, or in other words, it costs 10 times as much to get light out of a lamp as it does to purchase the lamp. Therefore, what the lamp user gets in light output for the money he pays for the energy to burn a lamp, which amounts to about 90 percent of his lighting bill, should receive his primary consideration. Under the present system of labeling lamps, however, no information is given to the purchaser of lamps to enable him to determine, if he so desires, how much light he is getting for what he spends for the energy to burn the lamps he buys.

Of course, this situation would be corrected by labeling lamps not only as to watts and volts, as at present, but also as to either lumens or lumens per watt, or both. The lumens-per-watt labeling would give the better description of the quality of lamps. Lamps might also be labeled as to average hours of life. The benefit to the consumer from such labeling of lamps appears obvious. However, there is one obvious disadvantage to such labeling of lamps. The quality of lamps is continually rising. This rise in quality results in periodic increases, and sometimes abrupt increases, in the lumens-per-watt rating of the lamps. When a lamp dealer replenishes his stock of any size of lamp, he would then, in general, have in stock lamps of different lumens-per-watt ratings. Also, different dealers, even of the same brand of lamps, would have lamps of a given size in lumens of different lumens-per-watt ratings. Would not this result in obsolescence of the lamps every time a rise in efficiency of light output is effected? If so, the cost of lamps might be forced up not only because the obsolete lamps would have to be discarded but also because of the expense of almost continually having return shipments of old lamps from the dealer to the manufacturer.

In the labeling of lamps, the question of tolerances on the labeled rating of the lamps must be considered. At present, lamps are labeled as to wattage and voltage. At labeled volts, the watts consumed by lamps, in general, do not exactly equal the labeled watts. Federal Specification W–L–101C and 1938 supplement A thereto, for example, allows a tolerance of plus or minus 3 percent in the watts consumed by most sizes of lamps for general lighting service. The tolerances in the Federal specification, however, are applicable only to Federal purchases and not to lamps on the open market. If this situation remains unchanged, labeling lamps as to lumen output would be deceptive because a manufacturer who deliberately allowed his lamps to consume more than the necessary watts could truthfully label his lamps with a high lumen rating. Besides, no tolerances on lumens are given in the Federal specification. The manufacturer is entirely unrestricted in his continuous efforts to give the purchaser

more lumens of light from a fixed number of watts. But even if lumen tolerances were available the lumen rating of lamps could be raised by taking advantage of the plus tolerance in watts. To obviate that difficulty the Federal specification applies a plus or minus tolerance to the lumens-per-watt declared rating of lamps. It further specifies that the rated hours of life of lamps apply to operation at rated lumens per watt. The labeling of lamps in lumens and hours life seems to require at the same time tolerances on the lumens per watt at rated volts and on the hours life at labeled lumens per watt.

The intrinsic value of an incandescent-filament lamp depends on four factors: (1) the initial wattage input, (2) the initial light output, (3) the maintenance of the light output throughout life, and (4) the life to failure. Only when all of these factors are known do we have a true basis for evaluation. These four items are specified in the Federal specification for incandescent lamps.

As just stated, lamps can be made to produce the correct lumen output merely by increasing the watts input. They likewise can be made to meet a requirement which includes both initial wattage input and light output by sacrificing the life. Also, lamps which will comply with the initial efficiency and life requirements but on which the maintenance of light output during life is very poor can be made by the use of what is known in the lamp industry as "sagging" wire.

The efficiency of incandescent lamps is continually improving, it being the exception rather than the rule when any size of lamp in watts does not have its efficiency improved during each current year. These continual efficiency improvements, although of minor significance when expressed in percentage, assume large proportions when expressed in cost of light. For example, on a lamp which consumes $3 worth of current during its life (which would be the case with the 60-watt lamp at 5 cents per kilowatt hour), a 1 percent improvement in efficiency is the equivalent of an additional 3 cents worth of light at no increase in cost.

The markings on lamps would, therefore, be subject to a continual revision in order to be effective from the standpoint of customer protection, or, on the other hand, if the lumen output were to be kept constant, the watts input must be continually decreased.

To mark all of the essential data for lamp evaluation on the lamp, particularly in view of the need for frequent revision, would probably tend to create confusion in the minds of the ordinary consumer. Large purchasers already have these data, either from the manufacturers' data books or by ascertaining what is considered a minimum acceptable standard by reference to Federal specifications.

Assuming that all pertinent data were marked on the lamp itself, the problem of insuring that lamps complied with such markings would be quite complicated. There are relatively few laboratories in this country which have the facilities and experience which permit accurate determinations of the lumen output of lamps. It would seem that the local or State supervision, such as is exercised by weights and measures officials, would be impractical.

If the marking is confined to only one element in lamp value, in addition to design volts, wattage input seems the most logical. Irrespective of what the consumer may receive in the way of light he can determine rather easily the watts input and the cost of operation.

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Conformity to wattage rating can be checked by many laboratories throughout the country.

The lamp industry in Europe, except in Germany and Great Britain, marks lamps in the sizes to supply a given lumen output or, as they prefer to express it, a given decalumen output. The lamps are of different performance characteristics from those of the lamps which are made for a given wattage consumption. For example, a 40-decalumen lamp designed for a 115-volt circuit consumes about 34 watts, if it is made in the latest coiled-coil construction. A 40-decalumen lamp designed for 220 volts consumes about 38 watts, if it is also in the latest coiled-coil filament construction.

The practice of making lamps for a given light output and letting the wattage vary according to the voltage for which they are designed is officially adopted in most European countries, and there is a tendency to go over to this practice more and more. These lamps are marked not only with the values in decalumen output for which they are designed but also in the equivalent wattage values.

Thus a consumer who prefers, for some reason or other, a single-coil-construction lamp can see from the values marked on it just how much extra energy he must pay for in order to have the characteristics of the single-coil construction, or a man who prefers to have an opal-bulb lamp may also know from the mark on the lamp just how much extra energy it requires to give the rated light output of the opal lamp as compared with the ordinary inside-frosted lamp.

The watt rating system is still in force in both Great Britain and in Germany, which are the two largest producers and greatest consumers of electric lamps. There is said to be a tendency toward the adoption of the decalumen rating system in Germany. In England there is no tendency in this direction. The British manufacturers and those parts of the industry which have studied the question are unanimously in favor of continuing the watt-rating system without any secondary equivalent marking. The situation in Germany, however, is that the manufacturers and the industries are in favor of the decalumen rating system and will probably adopt this when the new candle is adopted. The Hefner light unit is still in use in Germany. If lamps were rated in Hefner decalumens for Germany and in international decalumens in other countries of Europe, there would of course be a difference in the sizes, that is the decalumen rating, of the lamps. The German industry therefore has preferred to continue to use the watt-rating system up to the present time and will probably continue to use it up to the time when the new unit of light is officially in use all over the world, which it is anticipated will be the fact on and from January 1, 1940.

It is my understanding that in South American countries lamps are generally required by law to be rated in volts, watts, and lumens. In Brazil, for example, a 40-watt lamp will have three lumen ratings, depending on whether it is a 110-, a 120-, or a 130-volt lamp. As there seem to be no tolerances, the ratings must be largely a matter of guess, and it is difficult to see how they can be checked or the lamps evaluated.

The following arguments have been advanced for and against the present ratings in volts and watts.

The arguments for the present system, that is, volts and watts, are:

1. People are used to it and dislike changes.
2. The rating gives the user definite information as to the cost of operation of a lamp.

3. The watts are approximately constant throughout life.
4. Opal and colored lamps have the same ratings as clear lamps.
5. The better lamp gives the larger amount of light and has the longer life.
6. Watts are the logical unit in which to rate lamps, as the consumer pays for watts times hours.
7. Lumens and decalumens are new terms. Consumers are familiar with watts and with candlepower (in automobile lamps).
8. Lumens do not mean anything to the average user of lamps.
9. The user can check the watts or have it done. He cannot check lumens nor have it done except at a very few laboratories.
10. Lighting circuits can readily be designed if the watt ratings are known. Lumen ratings are useless in designing circuits. All rules of the National Electrical Safety Code are in amperes and volts, not in lumens.
11. The central station is guaranteed a fixed minimum load no matter how efficient lamps may become.
12. The central station load will not be decreased every time an improvement is made in lamps.
13. The customer benefits from increases in efficiency, because he gets more light for the same outlay.

The arguments for the lumen rating system are:

1. It seems logical to rate lamps for the light they produce.
2. It does not seem fair not to give the customer the benefit of reduced watts, when the light output is increased. He should have the same light output and lower energy consumption.
3. Spotty lighting results when lamps of different lumen output are used in the same room or factory.
4. The date of purchase of lamps would not be a matter of importance, because lamps would always have the same lumen output.
5. There is no definite relation between watts and lumens in different sizes.
6. It is easier for the maker of poor quality lamps to sell his product if rated in watts.

(At the conclusion of this paper, Dr. Meyer showed a number of lantern slides illustrating characteristics and properties of incandescent lamps, methods of labeling, progressive increases in efficiency, apparatus used in testing, and other matters of interest.)

DEMONSTRATION OF FUEL-OIL METER-TESTING EQUIPMENT OF THE CITY OF NEW YORK

By ALEX PISCIOTTA, *Director, Bureau of Weights and Measures, City of New York*

Mr. Chairman and gentlemen of the Conference: With the enormous increase in the consumption of fuel oil, consumers have asked us what protection we can afford them in this connection.

Up to the early part of this year, so far as fuel oil is concerned, we were able to give no protection at all to the public. We made no attempt to check fuel-oil meters or fuel-oil tanks. However, we finally secured a 50-gallon calibrating tank with which we started the checking of meters. Then we thought that instead of using this tank we would use the same equipment as the fuel-oil trucks use in making deliveries. So we procured a meter with an air eliminator and mounted it in a coupé; later we secured a second coupé with a

second unit of this kind, so that we now have three equipments. We are able to get around throughout the city faster and to make the necessary tests.

In checking a delivery we get as near to the point of delivery to the consumer as possible. The hose from the tank wagon goes to our meter and the oil is first pumped through this and then goes direct to the consumer's tank. At the end of the delivery we check the meter on the tank wagon against our meter.

Of course, there is a great deal of doubt in the minds of many people as to whether or not these meters are accurate enough and whether or not they supply evidence adequate to justify a prosecution in court when a shortage is found. So we proceed in this way: We calibrate our meters, if not every day at least every other day, with our 50-gallon tank. When we find a tank-wagon meter that is short when compared with our meter, we send the gas trailer to recheck the tank-wagon meter. If the latter is again found short—and we have found that in most instances the two tests correspond—then we are definitely assured that that meter is not correct.

Now, we have found to our satisfaction and perhaps to the satisfaction of the consumers, that the majority of the meters were delivering overmeasure rather than short measure. We have found very few shortages to date. As a result of our tests the companies have been more or less "meter conscious," and of their own volition they have been rechecking their meters. Thus the consumer has been given protection not only by the actual tests that we have made but by the increase in the number of tests of their facilities made by the companies. We have received wonderful cooperation from the fuel-oil people themselves and have many requests to check up their equipment, particularly the meters in their plants. We have done as much of this work as possible.

In New York City we have many independent dealers of fuel oil who have no plants of their own. They purchase the oil from regular oil companies and then they resell the oil. We found that most of those people lacked facilities to check their meters and they have called upon us to do so.

The equipment which we have brought down and will demonstrate is one of the meters mounted on a coupé; attached to that is our 50-gallon calibrating tank. We have been supplied with a tank loaded with No. 2 fuel oil to facilitate our demonstration, and we will try to answer as many questions as we possibly can.

We want you to realize that this is more or less of an experiment on our part, but we think that it is a step forward for the protection of the consumer.

The CHAIRMAN. The meeting will now proceed to witness the demonstration.

(At this point, at 12:48 p. m., the Conference witnessed the demonstration of the fuel-oil meter-testing equipment of the city of New York, and then took a recess until 2:20 p. m.)

Portable Equipment Used by the City of New York for Testing Fuel-Oil Meters

NBS Miscellaneous Publication M161

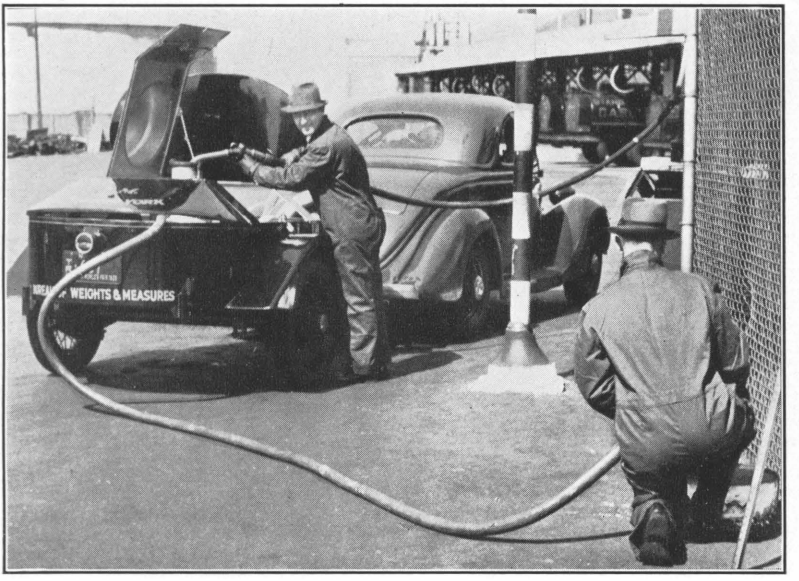

FIGURE 1.—*50-gallon standard measure.*

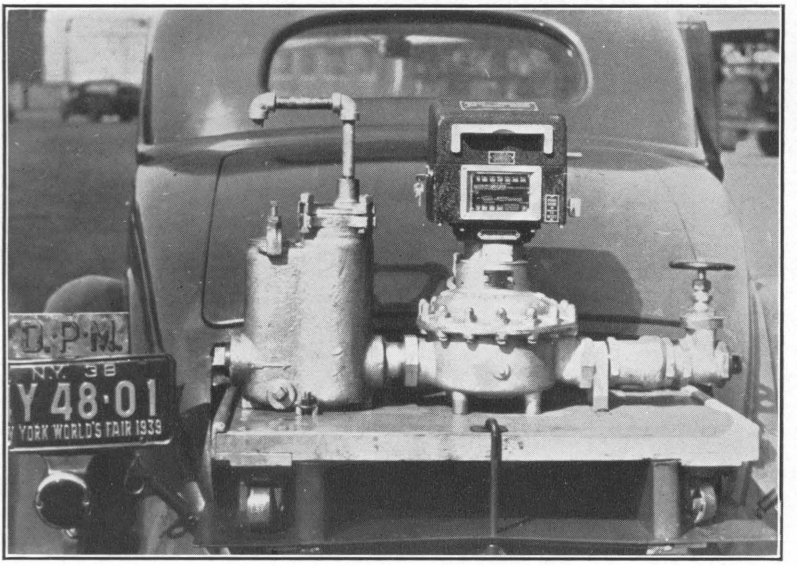

FIGURE 2.—*Meter standard and air eliminator.*

SECOND SESSION—AFTERNOON OF TUESDAY, MAY 31, 1938

(The Conference reassembled at 2:20 p. m., at the National Bureau of Standards, Dr. Lyman J. Briggs, President of the Conference, in the chair.)

ANNOUNCEMENT OF SPECIAL COMMITTEE

The CHAIRMAN. I wish to announce the names of the delegates who will serve on the Committee on Proposed Federal Legislation to Provide Assistance for the States in Administration of Weights and Measures Laws. The Conference will recall that this matter was under discussion at our meeting last year. Some time ago the Executive Committee voted that a committee be appointed for the consideration of this matter. The Committee will report back at the session on Thursday morning. The members of the Committee are as follows:

John P. McBride, Massachusetts, chairman.
Frank L. Hammon, Idaho.
Rollin E. Meek, Indiana.
J. H. Meek, Virginia.
Charles C. Read, New Jersey.
S. T. Griffith, Baltimore, Md.
W. P. Reed, Atlanta, Ga.

Other committees will be announced later.

DEMONSTRATION OF RECENT DEVELOPMENTS IN WEIGHING AND MEASURING APPARATUS, BY REPRESENTATIVES OF MANUFACTURERS

SECRETARY'S NOTE.—At this point several manufacturers brought before the Conference samples of apparatus embodying new design features and demonstrated them to those in attendance. Particular attention was given to the new features incorporated, the method of manipulation of the adjustments provided, and the answering of questions asked by members. As was the experience in former cases, it was found that many of the remarks made are of no value to a reader when a sample of the product is not before him and thus no good purpose would be subserved in printing such material here. Consequently, it has been omitted from the report.

It may be noted that such demonstrations as these, which familiarize the delegates with new apparatus, are of great interest and value to them. Attendance at the Conference is the only way in which advantage can be obtained from program features such as this. The delegates were duly appreciative of the efforts of the manufacturers who took part in this demonstration.

NEW VEHICLE-SCALE TESTING EQUIPMENT OF IDAHO

By FRANK L. HAMMON, *Director, Bureau of Weights and Measures, State of Idaho*

Mr. President and members of the Conference: It is really a pleasure to be in attendance at this, the Twenty-eighth National Conference on Weights and Measures, and I feel highly honored in having the privilege of presenting to you in technicolor a picture of our new large-capacity scale-testing equipment.

Idaho is known and recognized throughout the Nation as a great agricultural State, the foundation of which is 45,113 farms, cultivating

53,346,560 acres of land, mostly irrigated. Hence, the necessity for this large-capacity scale-testing equipment. This unit weighs approximately 21,000 pounds, with our baggage and a tank full of gasoline. The total test load available consists of thirteen 500-pound weights, three 1,000-pound weights, and ten 50-pound weights. The total cost of this equipment was $4,400. We were able to hold the cost down considerably by doing some of the lathe and forging work ourselves.

The truck has a 178-inch wheel base and is equipped with a specially built body and power winch of our own design, which differs in certain essential respects from any other equipment with which I am familiar. You will note from the picture that the truck is fully enclosed, giving adequate protection to our test weights under all kinds of weather and road conditions. You will observe also that our load is compact and equally distributed on the axles of the truck, with 90 percent of our pay load in front of the rear axle, giving the equipment excellent balance for road work.

The floor is covered with ¼-inch rubber belting, which efficiently prohibits slippage of our weights while in transit. The three rows of weights are held in alignment, while loading, by means of wooden guide rails. At the rear of the body floor a drop-leaf door of ¼-inch black sheet steel, 30 by 60 inches, allows the weights to be hoisted and lowered without projecting beyond the truck body. When the door is latched in traveling position, our dolly car is carried underneath it, with the tongue forward, the wheels serving as a door brace at the bottom of the rear body doors.

After testing some 500 large-capacity scales with this equipment, ranging in capacity from the 5-ton wagon scale to the 40-ton motortruck scale, we found that more than 30 percent of them did not weigh accurately in the commodity range. With our old equipment of 4,000 pounds, we were seldom able to test a scale beyond the weight of the empty vehicle used to convey the various commodities to market. We found that more than 50 percent of the wagon-type scales were faulty when used beyond their rated capacity for motortruck weighing (I mean, of course, motortruck loads). The owners of the various scales tested are more than pleased with our new equipment and are beginning to realize that a test load under 10,000 pounds is not sufficient to guarantee accuracy. The maintenance cost of this equipment, including fuel and oil for the motor while operating the hoist during our test operation, is approximately 10 cents per mile. I think this very reasonable when we take into consideration the weight of this equipment. Although Idaho is a small State in population, it is large in area, and it is not an uncommon thing for us to travel several hundred miles in the course of a week's work, and on several occasions we have traveled as far as 300 miles in a single day with this equipment.

The method pursued in testing a large-capacity scale by our Department is the same as outlined by the National Bureau of Standards in last year's conference report (page 128). In making a large-capacity scale test the errors are determined by means of small weights on the platform and not by the use of the fractional poises, except where the fractional poise is being tested. The scale is balanced at zero or starting load with a sufficient number of small test weights on the scale platform to exceed any errors likely to develop in the test, as, for instance, by placing 25 pounds of assorted small weights on the

platform. The balance of the beam is then carefully adjusted with the aid of the balance ball until an exact center balance is secured. The test load is then applied, as for instance, 1,000 pounds, the poise being set so that the reading is 1,000 pounds. The beam is then brought to a perfect center balance by adding to or taking from the small weights on the scale platform. From this change in the small weights on the platform, the error in the scale is accurately determined. The sensibility reciprocal of the scale during our test is determined by the same method.

In conclusion, may I state that as my picture is being presented, I will make the necessary explanations, and invite you to enter into any criticisms or discussions. This picture does not cover all of the details of a large-capacity scale test as conducted by our Department. However, it is sufficient to give you an idea as to how the test is made and how our equipment is operated.

(At this point Mr. Hammon displayed a motion picture of a test of a vehicle scale with the large-capacity scale-testing equipment described above. See figures 12 and 13, facing page 97, for illustrations of this equipment.)

PARKING METERS

By H. W. Bearce, *National Bureau of Standards*

In the appropriation Act for the District of Columbia, for the fiscal year 1939, there is a section under which the Commissioners are authorized to install parking meters. Section 11 of the Act reads as follows:

The Commissioners of the District of Columbia are hereby authorized and empowered, in their discretion, to secure and to install experimentally, at no expense to the said District, mechanical parking meters or devices on the streets, avenues, roads, highways, and other public spaces in the District of Columbia under the jurisdiction and control of said Commissioners, such installations to be limited to a linear footage not to exceed the total of the perimeters of four normally sized squares in such District; the said Commissioners are authorized and empowered to make and enforce rules and regulations for the control of the parking of vehicles on such streets, avenues, roads, highways, and other public spaces, and as an aid to such regulation and control of the parking of vehicles the Commissioners may prescribe fees for the privilege of parking vehicles where said meters or devices are installed.

The Commissioners are further authorized and empowered to pay the purchase price and cost of installation of the said meters or devices from the fees collected, which are hereby appropriated for such purpose, for the fiscal years 1938 and 1939, and thereafter such meters or devices shall become the property of said District, and all fees collected shall be paid to the collector of taxes for deposit in the Treasury of the United States to the credit of the revenues of said District.

Approved, April 4, 1938.

The selection, installation, and supervision of the parking meters above provided for will be under the direction of the Department of Vehicles and Traffic of the District Government, and that Department has requested the National Bureau of Standards to assist in the preliminary test and in the preparation of specifications.

Before going into the technical details and requirements of parking meters it might be well to consider briefly the advantages that may be claimed or reasonably expected to result from the installation of such meters. Obviously, the installation of parking meters will not provide any additional parking space on the streets. The use of meters may, however, tend toward a more efficient and equitable use

of the space available for parking, by discouraging overtime parking, and may serve as an additional source of revenue. These would seem to be the principal advantages. Whether or not these advantages, and any others that may exist, are sufficient to warrant the installation of parking meters, I am not in position to say. Offhand, parking meters would seem to be an advantage to the driver who observes established parking time limits and a disadvantage, or at least an inconvenience, to the driver who habitually disregards such parking time limits.

Objection is sometimes raised to the use of parking meters on the ground that there is grave danger of undue influence, fraud, and corruption in the selection of the type or make of meter to be installed. The National Bureau of Standards is in no way concerned with that aspect of the matter. We are concerned only with the features of design, construction, and operation of the meters themselves. The matter of selection must, as in other similar cases, be governed by the intelligence, experience, and integrity of those officials who are charged with that responsibility. Parking meters do not constitute an isolated case. Water meters, traffic lights, and traffic signs, to mention only a few items, must be purchased by the city government.

Turning now to the parking meters which are before you, it will be seen that they are, essentially, timing devices, supplemented by some sort of signal, or flag, which operates to indicate when the predetermined parking time has expired. They can, of course, be set by the authorities to give any desired parking times, for example, 30 minutes, 1 hour, 2 hours, etc.

The procedure in the use of parking meters is as follows: The driver who wishes to park drives his car into the designated space opposite one of these meters—if he is fortunate enough to find a space that is unoccupied—deposits a nickel in the coin slot, and turns the handle if the machine is manually operated. This sets the meter in operation. The time scale then indicates that he is entitled to park for 30 minutes, 1 hour, or for such time as has been fixed by the traffic department for that particular area. He then goes away about his business, hoping he will be able to get back before the time is up. If he does get back in time, all is well. If he does not, then the signal will show red, and he will be subject to penalty for overtime parking.

It will be easy for a traffic officer to observe the meter signals as he passes along the street or sidewalk, and to "tag" any cars that are parked overtime. This will tend to discourage overtime parking in restricted zones and thus will make for more equitable use of parking space.

If a parker uses only a part of the time for which he has paid, a second car may, at the option of the driver, use the remaining time without additional payment, or he may deposit his coin and thus be assured of the full parking time allowed. In the first case the city does not lose anything, since it has been paid for the full time. In the second case, it makes an extra profit, since a part of the time has been paid for twice.

A question as to the possible use of "slugs" instead of nickels has probably occurred to you. That possibility is pretty well guarded against by the fact that each coin or slug deposited in the meter is clearly visible in the coin window until the next coin or slug is deposited in the meter. It is not likely that many slugs will be used, in view

of the danger of detection and arrest for attempted fraud or false pretenses in obtaining service.

We cannot say at this time which of the meters submitted will be found most satisfactory in service as extensive service tests have not yet been carried out. We can, however, mention certain features or characteristics which should be given consideration in judging the relative merits of the several meters submitted. Among these the following should be included:

1. Accuracy of timing mechanism at all temperatures of use.
2. Dependability—freedom from breakdown or failure.
3. Ruggedness.
4. Protection against bad weather (rain, snow, sleet, and ice).
5. Visibility of indicating signal.
6. Ease of reading.
7. Ease of operation.
8. Adjustability for any desired time interval.
9. Accessibility for servicing.
10. Security—protection against tampering.
11. Material.
12. Workmanship.
13. Design and general appearance.

Of the meters submitted all except one are operated by some sort of conventional clock mechanism. The one exception operates on the hourglass or "water-clock" principle, that is, the time of flow of a quantity of liquid through an orifice.

Some have automatic coin counters, others have not. Whether coin counters are a desirable feature, or an unnecessary complication, is open to question. It may be noted that pay telephones usually do not have coin counters.

Some meters are mechanically wound by the operation of putting the meter into condition to register. Others are wound separately by the service man or by the coin collector. In the latter type all that the parker has to do is to drop in his nickel.

There is a wide variation in the apparent quality of the clock mechanisms. Some have the appearance of having been well designed and well built; others have more the appearance of the usual 69-cent alarm clock. However, from anything we know now, the alarm-clock type may serve the purpose as satisfactorily as the more expensive type. This can be determined by a suitable service test.

In a rather brief preliminary paper, such as this one, it is, of course, impracticable to include detailed specifications for parking meters. I should like, however, to mention, in terms familiar to every weights and measures man, two provisions which should be included in any specifications that may be written to cover parking meters:

1. All parking meters shall be of such design, construction, and materials that they may reasonably be expected to withstand ordinary usage without impairment of the accuracy of their measurement or the correct functioning of their operating or indicating parts.

2. All parking meters and all devices designed to be attached thereto and used in connection therewith shall be of such design and construction that they do not facilitate the perpetration of fraud.

One question which seems certain to arise, and which in fact has no doubt already arisen in some jurisdictions, is that concerning the

department in which the supervision and test of parking meters properly fall, as, for example, between the traffic department and the department of weights and measures. Do parking meters constitute a traffic problem, or are they measuring instruments that should be handled by the department of weights and measures? So far, as I stated in the beginning, the initiative, in the District of Columbia, has been taken by the traffic department. It is probable, however, that in some other jurisdiction the matter might be turned over to the department of weights and measures.

From what I have said it will be apparent that parking meters are a relatively new product so far as the National Bureau of Standards is concerned, and that we are not yet in position to specify in detail what constitutes a satisfactory meter.

The increasing use of parking meters in congested areas of cities throughout the country seemed to the Bureau to justify bringing the matter to the attention of the Conference. Any experience that any of you gentlemen may have had with parking meters will, I am sure, be of interest to the Conference.

In closing, I would like to give you just a few statistics and some conclusions in regard to parking meters. Parking meters are, of course, a rather new development, the first meters having been installed in Oklahoma City, Okla., in July 1935.

The use of parking meters has increased tremendously since that time, and there are now in use some 30,000 meters in the United States in cities ranging in population from about 20,000 to 300,000. Parking meters are little used in cities of less than 20,000 population, and in cities of that size there appears to be need for only a comparatively small number of meters.

An excellent summary of the parking-meter situation is contained in report No. 1892, which is based on data gathered by the New York State Bureau of Municipal Information. The report is dated March 25, 1938.

The report shows seven makes of meters in rather wide use. All seven are represented in the group before you. The prices range from $33 to $65 per meter, installed, with an average price of about $48. The most popular make costs about $58, installed.

The report referred to gives some interesting figures on cash receipts from parking meters. These run, usually, from 30 to 50 cents per meter per day. In the smaller towns the tendency is for receipts to run low, and in the larger towns, to run high.

A study of the report shows that there is a wide variation in the relation between population and number of meters installed. When expressed in terms of meters per 20,000 population the number is found to run from a minimum of 23 to a maximum of 490. The average for all cities of which I have record is 136 meters per 20,000 population. In a few cases it is probable that an excessive, or at least an unnecessary, number of meters have been installed, and in some cases the number has been reduced as a result of experience.

Comments contained in the report indicate that while, in general, the installation and use of parking meters is looked upon favorably by motorists, merchants, and traffic officials, this attitude is not universal. In some cases there has been considerable opposition, and in a few cases meters have been removed, as a result of continued opposition.

There are many interesting questions and answers contained in the report to which I have referred, but I shall not have time to take these up in detail. I will mention a few, however.

Question. Do parking meters reduce cruising of cars?
Answer. Yes, materially, 25 to 90 percent.
Question. Do meters speed up traffic?
Answer. Yes, noticeably.
Question. Do more cars find parking space?
Answer. Yes, 10 percent more; 100 percent more; four or five times as many.
Question. Is double parking time allowed for 2 coins?
Answer. Usually no; a few, yes.
Question. May unexpired time be used?
Answer. Yes, in nearly all cases.
Question. How many use unexpired time?
Answer. 10 to 80 percent; no record in many cases.
Question. How much time is allowed before penalty for overtime?
Answer. None; 5 minutes; 6 minutes; 10 minutes.
Question. What is the penalty for overtime parking?
Answer. Usually $1 for first offense; $2, $3, $5, and $10 (various) for subsequent offenses.
Question. Are meters accomplishing what makers claim for them?
Answer. Nearly all yes.
Question. Is your meter system satisfactory?
Answer. Nearly all yes.
Question. Is your meter system an unqualified success?
Answer. 50 percent yes; 10 percent no; 40 percent no reply.
Question. Has city been held liable for damages to parked autos?
Answer. No, in all cases.

Just to give an example of the general attitude of the public toward parking meters, I will quote the following taken at random from the above report:

The meters have regulated parking and reduced traffic congestion considerably. The all-day parker is now using the free-parking lots provided by the city, or has moved out farther from the downtown business section.

A survey of public opinion made by a businessmen's association, in rural areas, shows that approximately 75 percent were favorable to the installation of parking meters. Local business men who were originally antagonistic to the installation of meters are now practically unanimously in favor of them. There is now considerable interest in the installation of additional meters.

DISCUSSION OF ABOVE PAPER

Mr. QUINN. Mr. Chairman, is there any information available from the Bureau in regard to the parking meters?

Mr. BEARCE. So far we have run only the tests of the time mechanism. One thing that we need to know, of course, is whether they keep reasonably accurate time. They have now been turned over to another division, where they will be tested as to mechanical features. So far we have not had the time at the Bureau to do more than that. Our report will be made to the Director of Traffic of the District of Columbia, who expects to write purchase specifications—perhaps three or four different makes will be procured. The meters will be installed in the business section of the city and will be paid for from the receipts of the meters so that they will presumably not cost the District anything—the meters will pay for themselves.

Mr. C. P. SMITH. Mr. Chairman, what would prevent some one dropping in another nickel when the original period has expired?

Mr. BEARCE. I would say nothing, unless a traffic officer in the neighborhood saw this done, in which event the person would probably be penalized.

Mr. MARTIN. Mr. Chairman, is there not a possibility that the use of these parking meters would result in an obstruction of traffic?

Mr. BEARCE. As far as I know they are always installed on a standard like this (indicating). They are in a space 20 feet long; presumably the parking meter will be near the front end of the space so that the traffic officer driving by can look over the automobile and see the condition of the sign.

REPORT ON JOINT CONSIDERATION OF TOLERANCES FOR VEHICLE SCALES BY COMMITTEE ON SPECIFICATIONS AND TOLERANCES OF THE CONFERENCE AND SPECIAL COMMITTEE OF THE NSMA, PRESENTED BY F. S. HOLBROOK, CHAIRMAN OF THE CONFERENCE COMMITTEE

Mr. Chairman and gentlemen of the Conference: At the meeting of the Twenty-seventh National Conference on Weights and Measures a certain amendment was made under the heading "Scales: B. General Specifications, paragraph B–2w 'Shift Test of Scales.' " This amendment, in brief, increased the tolerance on a corner of a vehicle scale in use from 0.20 percent to 0.40 percent, subject, however, to the provision that the algebraic mean of the errors on the two corners at each end of the scale shall not exceed the regular tolerance applied to the end, 0.20 percent. The amendment was made after a study of the results obtained by the Bureau in its program of cooperative testing with the States, which indicated the desirability of the change.

This amendment has received considerable attention since its adoption, especially at the recent meetings of the Western Railroad Scale and Weighing Conference and of the National Scale Men's Association. At the latter meeting a resolution of disagreement with the Conference action was defeated, or laid upon the table, and the National Scale Men's Association appointed a special committee to confer with your Committee on Specifications and Tolerances in relation to this matter. This special committee of the National Scale Men's Association is composed of H. M. Roeser of the Streeter-Amet Co.; H. H. Alfrey, of the Chicago, Rock Island & Pacific Railroad Co.; Harry Mayer of the Chicago & Northwestern Railway Co.; C. W. Crowley of the Western Weighing and Inspection Bureau; and R. O. Rask of the Alton Railroad Co. This committee sat with your Committee on Specifications and Tolerances a day or two ago, and there was a free and full interchange of ideas in relation to the condition of vehicle scales in various parts of the country and expecially in relation to the results which might arise in connection with the tolerance to be applied in the case of corner tests on vehicle scales. A great deal of interesting and valuable information was thus developed.

After this meeting, your Committee on Specifications and Tolerances weighed the arguments advanced by the special committee of the National Scale Men's Association. It had been strongly urged by the special committee that the amendment made, might result in some cases in adversely affecting the character of repair work and might lower the standards of the scale repairmen. To guard against this, your Committee came to the conclusion that a further amendment to the tolerances for scales would be advisable, and consequently the following proposed amendment has been incorporated in the general report of your Committee on Specifications and Tolerances, which is now available. This amendment will be considered on

Friday morning, when the Committee report will be brought forward for the consideration of the delegates.

SCALES: A. GENERAL DEFINITIONS.

Add a new paragraph to be known as paragraph A–2q, to read as follows: NEW SCALES.—Scales which are about to be put into use for the first time or which have recently been put into use and are being tested for the first time by the weights and measures official. Scales which have been reconditioned or overhauled or which have been condemned for repairs by a weights and measures official and subsequently adjusted or repaired, shall, upon the first test thereafter, be construed to be "new" scales for the purpose of the application of tolerances.

This amendment would require the application to the scales in question of the tolerances for new scales. It seems to your Committee that this is a very desirable and logical step. The tolerances on new scales are smaller—basically one-half the value—than the tolerances on scales in use, in order that the new scale may remain within tolerance for a reasonable time after it is put into use, even though it may depreciate and become less accurate. It seems that scales in the class just mentioned—reconditioned, overhauled, repaired, and adjusted scales—might well be treated in the same manner. Specifically, in relation to vehicle scales, this would reduce the basic tolerance to one-tenth of one percent on end test and distributed load test and to two-tenths of one percent on corner test, if such test is made. It would also suspend the special minimum tolerances on vehicle scales in use and would provide that the usual minimum tolerance on new large-capacity scales shall control, namely, one-half the value of one of the minimum beam graduations in the case of beam scales, and one-half the value of one of the minimum graduations on the reading face in the case of automatic-indicating scales.

(Signed) F. S. HOLBROOK, *chairman*,
CHARLES M. FULLER,
JOSEPH G. ROGERS,
JOHN P. MCBRIDE,
GEORGE F. AUSTIN, JR.,
Committee on Specifications and Tolerances.

DISCUSSION OF ABOVE REPORT

The CHAIRMAN. Have you any questions you wish to ask Mr. Holbrook at this time?

Mr. ROESER. Mr. Chairman, I had a little conference while this report was being read. While we are very glad to have the consideration that has been extended us we still do not like those tolerances. We think that the tolerances should be smaller. That is what the scalemen need to assure you people of having good scales. Scales that need big tolerances should either be repaired or replaced.

(At this point, at 3:50 p. m., the Conference adjourned to meet at 9:30 a. m., Wednesday, June 1, 1938.)

THIRD SESSION—MORNING OF WEDNESDAY, JUNE 1, 1938

(The Conference reassembled at 9:50 a. m., at the Washington Hotel, Dr. Lyman J. Briggs, President of the Conference, in the chair.)

APPOINTMENT OF COMMITTEES

The CHAIRMAN. The Chair announces the appointment of the following committees:

Committee on Resolutions:

C. L. Klocker, Connecticut, chairman.
Gardner K. Heath, Maine.
Barnett Kanzer, New York.
C. E. Tucker, California.
Manon L. Fowler, Highland Park, Mich.
Howard C. Patton, Pittsburgh, Pa.
Erwin J. Rogers, West Allis, Wis.

Committee on Nominations:

O. E. Brenneman, Ohio, chairman.
W. S. Bussey, Texas.
A. J. Jensen, North Dakota.
John J. Levitt, Illinois.
William Foster, Springfield, Mass.
B. W. Ragland, Richmond, Va.
Gilbert S. Smith, Cape May County, N. J.

SURVEYING WEIGHTS AND MEASURES FROM THE CONSUMERS' VIEWPOINT

By D. E. MONTGOMERY, *Consumers' Counsel, Agricultural Adjustment Administration, United States Department of Agriculture*

Mr. Chairman, ladies, and gentlemen, the talk I want to make this morning is not only on the survey and its partial results, but I want to have a conference with you about what we are doing and what we are going to do to bring the valuable work that you are doing for the consumer to the attention of the consumers since they know very little about the services that you are rendering.

I suppose that the average consumer in the United States thinks that weights and measures officials exist everywhere. I tested it out. They said as a rule, "Yes, of course somebody is testing our scales and measures," despite the fact that there are large areas where there are no means provided for any enforcement whatever and other places where they are niggardly in their provisions for enforcement. Even where the enforcement is well carried out there is undoubtedly great difficulty in getting the necessary funds and difficulty in getting across to the consumer the enormous value of the work you are doing for them. That is explaining the background, for I want to make it clear where we come in the picture. We are engaged in the collection of data to be used in consumers' education.

Last year, as you will recall, the National Conference passed a resolution endorsing a project for a national survey of weights and measures administration. Our idea was to find out first what is being done and we wanted also to get a survey of what the legislative authorization for your work is in the different jurisdictions.

One difficult part about it is to get the negative angle. We are getting the information back from the areas where there is enforcement but we are going to have to devise means to find out about other places where there is no enforcement officer or where his work is so small that he does not want to put it on paper. We will have difficulty in getting this information by the questionnaire method.

We mailed out about 430 schedules and received back about 160, which probably is a pretty fair return, considering the amount of statistical data called for on the two schedules. This coverage is enough at least to give us a basis for the development of the results of this work, so that we have this preliminary material to give to the consumers to begin with, to get them interested in weights and measures work. I want to take this opportunity to express to you my sincere appreciation not only for your cooperation in filling in the schedules, but also for the very fine supplementary material relating to your work and your problems, such as pictures, reports, and stories of enforcement activities, which many of you supplied. Those are particularly valuable for consumers' work because they are interesting and dramatic, and we will use them in reporting on this project in the "Consumers Guide."

To date we have a partial summary of data obtained from various jurisdictions. This, however, covers only part of the material. I will refer to that later, but first let me quote from some of the letters we have received.

Here is one from a city in the South.

> We have little or no weights and measures law and no one seems to want one. My job has always been looked upon as a political one. You were never expected to do anything and were a fool if you did. However, since I took office early in 1937, I have tried to give honest, efficient service under the existing law. Maybe a word from you based on these reports would be of some help.

Another sealer in an eastern State, having a jurisdiction a thousand square miles in area with a population of 150,000, reports that he has only one assistant to help him cover that area.

A State director of markets says:

> It is estimated that there are over 100,000 scales and many other weighing and measuring devices in my State that have never been tested. From information available, indications are that an average of about 35 percent of these scales are inaccurate, the larger percentage of them weighing or measuring incorrectly for short weighing or short measuring the public.

Here is a report from another sealer.

> This county long ago established the salary of this office at $1,550. The State deducts for retirement $9.35 per month. This leaves $27.65 per week for salaries. The sealer has to provide his own transportation, meals away from home, gasoline, and car service. It has not been required in the past that the sealer devote more time than the work required and he must necessarily have other income. To cover this territory twice a year to merely test equipment and make such inspection as can be part of this routine will take about 12,000 miles of travel per year.

I think it requires no stretch of the imagination to conclude that this county cannot expect effective weights and measures supervision under the conditions described.

The sealer of a western city of over 100,000 population writes:

I realize the enclosed report is not what it should be but when I took this department over, it was badly run down and the equipment the merchants in this town used for weighing and measuring was in terrible shape. I am handicapped by lack of funds and equipment. The ground to be covered here really requires the services of three men. Besides this, the city ordinance is very weak. It will take a long time to get conditions in proper shape. The newspapers have given me very little cooperation and the city attorney does not seem to particularly want prosecutions.

Now, a word about the type of information we are getting from the survey that we are making now. The survey forms are now in process of tabulation and I hope that some time this fall we shall have some very interesting facts summarized and ready to report to you and to the consumers' clubs. In the tabulations which we prepared on the State of California, based on reports from that State, I want to point out some of the items that I think will be of real interest to the consumers. The first table of statistics covers the cost of weights and measures administration. We find, for example, in California that the cost per person for weights and measures protection ranges from 2 to 10 cents and the cost per establishment using weights and measures equipment was from $1.41 up to $6.31. That is an important fact to know, because of the situation that the consumers have very little knowledge as to what weights and measures protection actually costs them.

The second table has to do with the amount of work officials have to do. The statistics here give the relation of the size of the staff to the total population and the number of establishments. In some California jurisdictions, there is one staff member for every 22,000 of population, but in the jurisdiction that provides only 2 cents per person for weights and measures protection, one staff member was caring for a population of 148,000. Certainly this county needs to increase its expenditures for weights and measures and to enlarge its staff.

Other information deals with the percent of establishments visited and the number of visits to each establishment. For the jurisdiction that was spending only 2 cents per person only 78 percent of its establishments were visited. Another jurisdiction was only 82 percent covered. Other jurisdictions reported complete coverage. I suppose that means that they were visited at least once a year.

The remaining tabulations will deal with the condition of the different types of weighing and measuring equipment. One of the tables will summarize all kinds of scales, the total number examined, and the numbers that were approved without adjustment, approved after adjustment, condemned for repair, and confiscated. It will show, for example, that in one California county only 37 percent were approved without adjustment. In some other counties 50 percent, 68 percent, and 91 percent—the highest figure—were approved without adjustment. The State report shows that 61 percent of all the scales were approved without adjustment.

In regard to gasoline and lubricating-oil pumps, how many of those got by without adjustment? Well, we have some figures on that. In one county only 37 percent passed, in another county only 54 percent, in another county 72 percent, and so on to one county where the figure was 97 percent. That kind of information will come out of this

survey from all parts of the country, and will be put up in such shape that I hope and expect will interest the consumer.

I should like to use the remainder of my time for consideration of some of the ways in which we might cooperate to improve weights and measures protection for consumers. Our resources are so limited and the field is so broad that the only practicable way to proceed is to select certain projects where our efforts will do the most good and then to concentrate on them. I should like to suggest four projects for the coming year: First, the promotion of the use of standardized packages for consumer goods; second, improved practices for the selling of poultry; third, checking the methods of sale of gasoline; and fourth, an improved program of public education with regard to weights and measures affairs.

The thing that is most needed is to get a response from large numbers of consumers and that can be done through interesting dramatic stories of situations which you have found built around a fairly limited project, for example, the need of standardizing package goods.

Now, with regard to packaged goods, I think we sent each of you a letter from Alex Pisciotta of the New York City Bureau of Weights and Measures on the subject of the packaging of tea and bacon in odd-weight packages of 6 or 7 ounces instead of the usual ½-pound size. He also points out the use of the 3½-ounce instead of the 4-ounce, the use of the 7½-ounce instead of the 8-ounce package, and that these short-weight packages are being delivered to the consumers when they are asking for 1-, ½-, or ¼-pound packages. The consumers, however, are not acquainted with that. Perhaps if you will look into the matter during the year you can furnish us with material that we can use to get these facts across to the consumers and encourage them to make a particular drive on that question.

E. K. Strobridge, Sealer of Alameda County, California, stated, "In 1923 we checked olive-oil packaging and found 22 different sizes of containers ranging from 4 to 32 ounces in size." In his letter he went on to say, "Very much to my surprise, in making addresses to the senior classes in high schools, we found in asking students the number of ounces in a pound or a pint that they could not give the answer. This same condition existed in addressing the summer school classes which are largely attended by teachers. From my observation the general public as a whole does not realize how many ounces there are in a pint." You may be sure that we are going to let the consumers know that they need to brush up on their knowledge.

It is probably true, as S. T. Griffith, Sealer of Baltimore, says, "Probably no relief can be had locally unless concerted action is taken throughout the country." I do not know what action this body can take officially. If any action is taken we shall give it wide publicity. I wonder if it is feasible to have test purchases made in widely separated jurisdictions of the tea put up in 3½- and 7-ounce packages. These purchases would show if consumer deception is actually being practiced. The results could be collected and used for concerted action on a national basis.

L. J. Hoffman, City Sealer of Poughkeepsie, New York, in his letter on packaging suggested additional action, saying, "I would go one step further and suggest that the size of cans be also standardized." I should like to second that viewpoint. Mr. Warner talked to you

about the standardization of can sizes last year. As you know, there has been a bill introduced in Congress by Mr. Sauthoff, of Wisconsin, H. R. 6964, to reduce the number of can sizes to eight standard containers. Hearings were held on that bill, but it was laid over and no action was taken. However, any facts that you can give us showing the need for this type of legislation will be appreciated. I know you have no free money and free time usually available, but would it be possible for you to begin to make a record of this question of the variation in can sizes so that the need of such legislation, if there is a need, can be clearly demonstrated? Personally, I haven't any doubt in the world that there is a very great need because we have found that the consumer was up against an impossible problem of calculation to determine how much he was paying for the product, based upon the price and the contents of the cans. It was impossible to determine whether one can was worth more than another. Even if we only get a small amount of data from each jurisdiction, why even that will give the picture and show the consumer what he is confronted with and what the merchants are confronted with in selling brands in competition. And that information can be very well presented in a demonstration to Congress. In the past hearing at the United States Capitol evidence was put in the record by the can manufacturers' representatives that there were 258 different sizes of cans for fruits and vegetables.

Probably the sale of poultry is another subject on which we should try to concentrate some attention during this next year in order to get our story across to the consumer. That is indicated by the stories which we have received about the method used in selling poultry. Let me read you some of the correspondence that we have had regarding this.

Mr. Strobridge, Sealer of Alameda County, California, states the problem this way:

> One condition we have to deal with which is causing us lots of grief is the sale of poultry. When a woman buys a chicken it is slammed on the scale, weighed, and taken off, and then she asks to have it dressed, so there is no opportunity for the weight to be checked. We have shoppers making purchases from time to time and when purchasing a chicken the shoppers state that they intend to dress the chicken themselves. Then it is put back on the scale, weighed the second time, and on numerous occasions a new price is quoted.

John P. McBride, Director of Standards for the State of Massachusetts, says in a report:

> Complaints have been received, particularly in relation to poultry, to the fact that poultry originally purchased has been removed to a rear room for the purpose of dressing, and the ultimate delivery has not been the poultry originally selected.

In both New York and Chicago, dealers have been caught inserting lead plugs in the lower intestinal tract of poultry. In Dallas, Tex., one shop was found giving poultry a shot of sour mash with an automobile grease gun. In Milwaukee two weighted goose heads taped together to form a compact mass of feathers were palmed on and off the scale with every fowl weighed. It was estimated that these two goose heads were costing Milwaukee consumers about $20 on busy market days. Now, this evidence seems to indicate that consumers need to have special warning with regard to the purchase of poultry, and that weights and measures officials need to give very careful supervision to the selling of poultry.

Another matter that has come up for consideration in connection with the sale of poultry is the selling of dressed and drawn poultry

by the piece instead of by weight; the dressed and drawn fowl would be wrapped in Cellophane and a weight would be stamped on the package. However, it would be necessary that the birds be given a definite price. Thus certain tolerances would have to be allowed. In certain cases where the dressed and drawn fowls were purchased there was a variation of the actual weight from the weight marked on the Cellophane of as much as 3 ounces. The variation of the price per bird was as much as 10 percent, 3 cents a pound and more. Consequently, our idea was that this method of selling poultry was not a satisfactory one for the consumer. We want to know the exact weight and the exact price at the time of purchase in order that the purchaser can decide what to buy.

Now, what methods of education of the consumer are available to you? We have just prepared and put up here on the wall a large number of posters calculated to attract the consumers' attention. They all relate to weights and measures. We will have prepared and send to you a circular describing what these posters are and how they may be made available to you.

Another thing that can be done is to use moving pictures. A news review bring currently shown in first-run movie houses throughout the Nation devoted one-third of its program time to weights and measures. You may care to see this movie while you are in Washington. We were asked to give some help in the preparation of that picture and, of course, we did that. We got back a very enthusiastic report as to the reception that these pictures received. We will get a copy of this film.

There are now available two other motion pictures dealing with weights and measures. George F. Austin, Jr., Weights and Measures Inspector of Detroit, Mich., has a short film showing the activities of his department taken from a full-length movie on the services of the Detroit Municipal Government. Allen W. Corwin, Sealer of Allegany County, New York, has a two-reel movie on weights and measures.

A third method of educating the public on weights and measures affairs is by radio. A number of sealers sent in radio speeches with their questionnaires. Please send us copies of any of your future broadcasts. More sealers should use this method of reaching the consumers. The Consumers' Counsel Division in cooperation with the General Federation of Women's Clubs puts on a weekly 15-minute radio program over the Red Network of the National Broadcasting Co. We expect to devote several of these broadcasts to weights and measures affairs. If you so desire, I shall be glad to see that you receive copies of these broadcasts.

Newspapers and magazines are always ready to print interesting and worth-while stories. Many clippings of weights and measures stories have been sent into our office. Some of you have probably seen the story by Robert Littell in the March Readers' Digest, called "Weighed and Found Wanting." I hope that more magazines can be encouraged to carry similar articles.

I want to make one suggestion relative to your own annual reports as an educational device. Most of the reports sent in were largely statistical in nature and a general discussion, if any, was often presented in very formal language. If the form of your report is set by legal requirements, I wonder if a special report put up in a more interesting fashion could be prepared for public distribution? A

report giving the interesting high lights of the year's work in terms of consumer welfare is one of the best ways of winning public support. For instance, I have just been looking at the annual report that Mr. Fuller gets out. It is very attractively gotten up to interest the consumers in what they are doing, and I think that is extremely important. In his opening statement he gives some figures that will make consumers sit up and take notice. He says:

> When you learn that 38,731 scales and other weighing and measuring devices were found incorrect in Los Angeles this last year and were either adjusted to accuracy by our deputies, condemned for use until repaired and rebuilt, or condemned and confiscated or destroyed in this one year, it emphasizes the fact that if it were not for the constant work of this department, the loss to the consumer and, in some cases, to the merchants themselves, would be tremendous.
>
> The majority of high-priced merchandise is sold over computing scales. Of these 9,081 were found incorrect; 6,753 being adjusted to accuracy by our deputies; 2,247 condemned for use until repaired, rebuilt, and then sealed correct; and 81 condemned and confiscated.
>
> Twenty-two thousand, one hundred and eleven gasoline measuring pumps and meters were tested, nearly 15 percent, or 3,340, of them requiring adjustment or repairs before they could be sealed correct.

Facts like these printed in attractive form make consumers take an interest in weights and measures departments.

Mr. Fuller told me this morning that he is asked to spend a great deal of time addressing small groups, say of only 30 or so, and he hasn't the time, when he has so many other duties to take care of. We have in our organization throughout the country a large number of people who, from one angle or another, are known to be interested and active in consumers' work. I think in many places we can find you the people who would come to your office and get your story, popularize it, and carry it out to the groups with which they are working.

I don't think there is any doubt that where weights and measures protection is inadequate it is simply because the consumers do not know what can be done. First of all, they do not know what the hazard is that they are running when they do not have weights and measures enforcement. Then, they do not know to what extent weights and measures protection saves them from those hazards. And, thirdly, they do not know how very little money per person a year it costs to get that adequate protection. Now, that is the story that we are trying to get across to the consumers. Thank you.

DISCUSSION OF ABOVE SUBJECT

Mr. SPENCER. I am located in Oneida County, the exact geographical center of the Empire State. During the time that I have devoted to this work, which embraces about 14 years, I have spoken before almost all of the men's clubs, men's brotherhoods, churches, and lunch clubs not only in my own county but in three adjoining counties within a radius of 35 or 40 miles. The greatest trouble that I have found in weights and measures work is that the public whom we serve, know so much that is not true. Most of their information is misinformation.

Mr. Montgomery gives some figures on scales that were incorrect. He did not give us any figures as to whether those scales were cheating the customers or the merchants. Every man engaged in weights and measures work in this room knows that there is a goodly percentage of defective devices which are cheating the merchants and not the consumers. I hold no brief for the merchant, but I believe it is a fair

statement of fact that the merchant has been bedeviled enough by customers and other agencies. I know that the merchants in my territory in Central New York are trying to do an honest job and I believe they are entitled to credit. I have not failed in any particular to get a fine spirit of cooperation from my merchants when I approached them in a cooperative spirit.

If, as, and when, the Consumers' League of which Mr. Montgomery speaks does put out its publicity, I believe that what they do put out should be submitted to a few of the directors of the various States so that the information may be of a constructive nature rather than of a destructive nature and concise enough so that those purchasers of foodstuffs who will be interested may be able to grasp the complete details.

Take a can of tomatoes as an illustration. You can select three different brands, one selling at three cans for 25 cents, one selling at 12½ cents, and another selling at 15 cents. I dare say that if your merchant took the pains to explain the difference in the quality of the various packs, you would find that the 10-cent can was about half water, that the 12½-cent can was a little less than half water, and that the 15-cent can was a good solid pack and the cheapest buy. Much of the faultfinding on the part of the public is because of their own lack of knowledge and, in many instances, their own lack of desire to know.

Mr. J. G. ROGERS. In the State of New Jersey we have a regulation that does not permit the sale of poultry by the piece. Now, there are certain packing industries which have come on the market with drawn and dressed poultry; they have a frozen product, furnished from a centralized point and wrapped in Cellophane. We modified our regulation for this reason: They do mark on every individual piece the net weight, and while there is a variation between the various units as sold for various prices, we do not think that there is any deception as to the price for the simple reason that the person has the opportunity of seeing exactly what he is getting. Now, there is a variation as Mr. Montgomery says of probably 3 or 4 ounces, but that necessarily has to be. Of course, in their newspaper advertising they state that the poultry is being sold at a unit of not less than a certain weight. Of course, the public is paying a greater price per pound, because all waste has been eliminated in the unit pieces. The housewife coming into the store will see a lot of this poultry on display, and she will pick out the pieces that weigh the most for the same money.

Mr. MCBRIDE. I rather subscribe to the theory enunciated by the gentlemen from New York that while publicity is a good thing it is well to know that some of the things that are being publicized today seem perhaps a little exaggerated. Now, we take a lot of pride in Massachusetts in the work that we do, and it seems to us that some of the publicity in regard to defective devices and practices should be identified to particular jurisdictions because it does more or less reflect on jurisdictions where weights and measures administration has been satisfactory and regulations have been properly enforced for some period of time.

The thought of acquainting the consumers with the necessity of proper protection is all right and is honestly motivated, but I do not think that it should be overdrawn, and I think it should be done with proper caution so that the public is not unduly alarmed.

Mr. PISCIOTTA. On the question of the sale of poultry by the piece, I think that we are going to get away from real weights and measures work if we do not insist that food products be sold by weight; poultry is a meat product, and it is my honest opinion that it should at all times be sold by weight. The consumer would hesitate to pay 40 cents a pound for a piece of frozen poultry if she realized that it was 40 cents a pound, but when you say that it is $1 for a piece, she does not determine what that piece is actually costing her by the pound and will buy it. We have the same situation in New York, where they are trying to sell squabs by the piece. Now, the butchers tell us that this is ridiculous to try to sell squabs at 85 cents a pound when they are able to sell them for 85 cents apiece. So, you see there is a way of getting around and deceiving the consumers to make them buy something that ordinarily they would not buy.

If we are going to try to bring people back to buying by the pound, then we should also try to stop any exception. If we have an exception of poultry and squabs, why we will have the butchers and packers coming in for other exceptions. Then all the work that we are trying to do will come to naught.

Mr. CROCKETT. I would at this time like to call to your mind a motion picture which did a great deal of harm in this country, because it portrayed every man in business as a crook. Now, we men in the weights and measures field know that there are plenty of honest men in business. We can do harm to the man who is trying to do an honest business if we are not careful.

We are running a consumers' education campaign in Baltimore. Now, Mr. Spencer says that some of the consumers do not want to find out. He probably is referring to some of the older folks. We educate the people—not necessarily men and women and fathers and mothers—but high school boys and girls who will be the future citizens. We have made many talks to them and we have told them that there are many men in business who are honest.

Mr. CULLEN. In Pennsylvania the question arose whether poultry should be sold by the piece or by weight. I took the matter up with the Attorney General of the Commonwealth and he decided that poultry must be sold by weight under the commodity law. We had a test case in Philadelphia and a defendant was fined $10 before a local justice of the peace. He took an appeal and the court sustained the ruling, so in Pennsylvania poultry must be sold by weight.

Mr. FULLER. Mr. Chairman, it is certainly necessary and essential in all our publicity that we emphasize the fact that this work is just as important for the protection of the honest merchant as it is for the protection of the public. In the motion picture spoken of there was an incident of throwing a turkey around. That was an actual case that occurred in Los Angeles. We arrested the manager and certain employees of the market and each one of them was convicted after having had a jury trial. I want to say that the honest merchants in town were very much gratified over the action that was taken and it had a mighty healthy effect.

Mr. GRAEFF. In the city of Baltimore we have an ordinance which states that live or dressed poultry must be sold and advertised by avoirdupois weight. There is no provision in regard to the sale of "game" and unfortunately squabs and ducks, having been designated as "game," do not come under the ordinance, and therefore are being sold by the piece.

Mr. KANZER. Within the last few days a circular letter was mailed from my office to every weights and measures official in the country and to all packers and dealers and dealers' associations. I will read the letter.

ADVERTISING AND SALE OF POULTRY

For some time, and recently more than ever, the problem of the advertising and sale of poultry has been brought to the attention of the Bureau from many sources—the packers, the retailers, the consuming public, and a great number of weights and measures officials. Complaints are being received daily by this Bureau calling for action.

The advertising of poultry, particularly with reference to the sale of chickens, has reached a confused and misleading state due to the numerous phrases used in the advertisements. Legal problems have entered with reference to each and every type of advertisement, legally difficult to solve.

The wording varies as follows (using 89 cents as a quoted price):

"89 cents each."

"Not less than 2 lbs. 3 oz.—89c."

"Dressed chickens, 89c each."

"Weight, when drawn, 2 lbs. 3 oz.—89c each."

"Weights 2 lbs. 3 oz. to 2 lbs. 9 oz.—89c each."

"Weight, after fully drawn, 2 lbs. 9 oz. and not less than 2 lbs. 3 ozs." etc., etc.

Evidently some of these are definitely against the regulations as now issued, but some contend their phrases are within the present regulations; at any rate, the consumer is becoming confused and the sale itself is confusing.

It is very desirable and necessary to have this matter clarified, and it is therefore suggested for the purpose of discussion that the following regulations be issued. (These regulations are not being issued, they are advanced solely to bring out a full discussion.)

This letter is being sent to all State weights and measure officials, the packing industry, the retail meat dealers, and other affected interests, and your name or association we consider as being vitally interested in this problem.

SUGGESTED REGULATIONS

1. Poultry shall be offered for sale or sold by net weight and the words "offered for sale" to include all advertisement through any medium.

* * * * * * *

3. Poultry shall be offered for sale, sold, or advertised at price per pound only.

It is now earnestly desired to get your reaction to this matter by correspondence, and please write to me in full giving your thought on this problem. Later, a conference will be called of all interests affected by this ruling, at which time definite rules and regulations will be drawn up for the guidance of the industry and the public. It might be necessary to have added legislation on this problem, and it is expected this conference will determine this point.

Your constructive advice and criticism are requested and I seek your cooperation to clarify this problem.

BARNETT KANZER,
Director, Bureau of Weights and Measures.

Circular Letter 6, May 23, 1938.

Mr. ENGELHARD. There are other phases of Mr. Montgomery's paper which deserve a lot more consideration than this one of drawn and dressed poultry. One of these points was very well presented by the gentleman from New York. We do not want to make the consumer feel that every time he walks in any merchant's place of business he has to look out for himself. In my jurisdiction—Middlesex County, New Jersey—every merchant depends on honest business and has plenty of worry to take care of his overhead. He wants to keep his trade and get new trade if he can, and there is every incentive for him to give honest weight and measure and retain his customers. We are becoming educated to the extent that a lot of the housewives have their own scales and check purchases. If a woman buys four

dollars worth of merchandise per week in a store and she finds one or two of the items that she buys are short, and then finds this situation a second time, that merchant has not gained four cents by cheating—he has lost a four-dollar-a-week customer. I submit that the merchant will do everything possible to keep his customers and stay in business.

Mr. MONTGOMERY. I am quite surprised that this controversy has developed, because I did not think my remarks would be construed as a drive against the merchant. I thought that we could develop the subject so that through the merchants' associations and through other associations and groups we could build up a demand from the consumers for proper weights and measures enforcement. When a merchant cheats he will have an advantage until his competitors do likewise, and thus you have the dishonest merchant dragging down the whole group. The honest merchant has as much interest as the consumer in seeing that there is a standard established and that the standard is enforced. I quite agree with everything that was said about the necessity of keeping the merchant in the picture. I do not think there is any question but what we can get the honest merchant to back up this consumer drive and back up the work you people are doing.

Mr. LEONARD. I believe that selling poultry stamped with the net weight is the fairest way of giving the consumer an opportunity of getting what is paid for, and it also protects the man that sells it. If a person buys a chicken and it is weighed and afterwards cleaned and cut up, how is any weights and measures man going to detect incorrect weight? On the other hand, if a lady buys and pays for a chicken marked 4 pounds, 7 ounces, and afterwards discovers that she has only a 4-pound chicken, why then you have a case. I believe in stamping net weight on poultry.

Mr. O'KEEFE. I think that you gentlemen are losing sight of the program as projected by the Consumers' Counsel. Why don't you furnish the Consumers' Counsel with data about the packers who are sending out slack-filled packages and so forth, and that information can then be disseminated?

LICENSING OF SCALE MECHANICS

By W. S. BUSSEY, *Chief, Division of Weights and Measures, State of Texas*

Mr. President, members of the Conference, and guests: The subject of proper control and adequate supervision over persons and firms engaged in the business of repairing weighing and measuring devices and selling used devices, has become a very common topic of conversation in weights and measures circles throughout the country, and the law-making bodies in several jurisdictions, have already taken the initiative to enact regulatory measures along this line.

The National Conference was favored last year, with a splendid paper presented by Alex Pisciotta, of New York City, explaining their ordinance on this subject, which provides a licensing system for those so engaged, and telling us of some of the benefits resulting therefrom. A few of the other jurisdictions have followed in the footsteps of New York City, by enacting similar laws, while others have become interested to the point that widespread investigations concerning the subject have been conducted, hoping to devise some means to successfully cope with the bad situation that is more or less prevalent all

over the Nation. Some of these investigations have been quite broad in their scope and much worth-while information has been derived therefrom. The experiences of officials in those jurisdictions where such laws have already been enacted, have also provided many valuable ideas, concerning the subject. And I am thoroughly convinced, that some very constructive work can be and is being done along this line.

There is no doubt but that the necessity for such regulations is present in practically every jurisdiction in the United States. However, conditions will probably vary in the different localities and the need for such regulations in Texas, is probably greater than in those jurisdictions covering a smaller area. For it is a fact that the vast area of our State does provide a very fertile field for the operations of the unscrupulous "fly-by-night" or "gyp" scale mechanic. It might be possible in some of the smaller jurisdictions to handle all weights and measures inspections, condemnations, releases, etc., entirely in accordance with the letter of the law, but this is a physical impossibility in Texas, and it is no doubt the case in numerous other States. We, therefore, feel a very urgent need for some sort of control over this unwholesome condition, that more confidence and dependence might be placed in the repairman.

The business of supplying weighing and measuring devices and repairs thereto, to the people of this Nation, by virtue of its importance to commerce and industry, should be a highly respected profession. But such is not the case in our State. Yes, we have some fine men in the business, but we have others who are not and they are tearing down, faster than the good men can build up. You know it is much easier to wreck than to build. We have men engaged in this business who are anxious, and are striving hard, to put the business on the high plane that its importance rightly demands. I believe that we, as weights and measures officials, should do our part to help them with the job.

We in Texas, like to discuss our problems with our neighbors. We appreciate receiving the wise council and advice of our weights and measures associates in other jurisdictions, as well as of the equipment manufacturers and the representatives of other industries who are so vitally interested in what we are doing. Bearing these things in mind and realizing the importance of the subject and the intricacies involved in the proper solution thereof, the Texas Weights and Measures Association appointed a committee of seven members representing the weights and measures fraternity and the scale industry to investigate the subject of "Licensing Scale Dealers and Mechanics" and report back to our third annual conference, which was held in Dallas, Tex., on May 4 and 5 last. This committee devised the idea of preparing and sending out a questionnaire, to various interested parties, not only in Texas, but throughout the Nation. A splendid response was received from this questionnaire, and the overwhelming majority favoring such legislation was almost unbelievable. In fact, only three negative answers were received and one of these was with certain reservations. Of the three, only one was from a person actively engaged in a business which would be directly affected by such regulations and not one of the three answered the questions as prepared by the committee, but each wrote a letter, stating that he was opposed to such legislation.

Based upon the information furnished by the questionnaire, the committee prepared a most enlightening report, mimeographed copies of which are available at the secretary's desk for those who may desire them. In studying this report, you will see that it was the opinion of the committee that mechanics should be licensed; that they should be classified according to the types of scales which they were qualified to repair; and that they should be required to stand a practical, common-sense examination. The committee did not feel that the licensing of dealers was necessary, as they believed that the sale of new devices could best be controlled through "type approval" and that the sales of used devices do not reach sufficient proportions in Texas to require special legislation. Also, they believed that the used-device business would be handled largely by licensed mechanics anyway.

Our association also appointed a committee to investigate the subject of licensing gasoline-pump dealers and mechanics, which committee was also composed of seven members and represented the weights and measures fraternity, the pump industry, and the oil industry. Although this committee did not go into the subject as deeply as did the scale committee, they did make a very good report, copies of which are also available at the secretary's desk. It was the opinion of this committee, that it would not be practical at this time to license either pump dealers or mechanics in Texas.

In closing, let me emphasize that, judging from the results of the questionnaire sent out by our scale committee, there is not the slightest doubt that such legislation is needed and is also wanted by practically everyone who is interested, directly or indirectly, all over the Nation. Take a copy of this committee report, read it, study it. If you were mailed one of the questionnaires and neglected to fill it out and return it, do so when you get home. We are still anxious to secure all possible information and ideas, preparatory to drafting a bill to be introduced at the next session of our legislature. If you did not receive one of the questionnaires, write us a letter anyway and express your views on the subject; we will appreciate it greatly. I thank you.

DISCUSSION OF ABOVE SUBJECT

Mr. J. G. Rogers. I want to say that New Jersey has just passed such legislation. I have the finished product in my hand. We think a whole lot of it. It is a product of a great deal of study and there is no question but what there were a great many angles that had to be worked out. We found it absolutely necessary to have such legislation adopted as the situation in New Jersey was getting out of hand. Unqualified mechanics were operating in New Jersey to the decided detriment of merchants and were very troublesome. The new legislation among other things sets up a provision that mechanics shall undergo a technical examination in order to establish their qualifications to do equipment repair and installation work, and they must be licensed under the act to operate. We believe that this new bill gives full coverage and authorizes proper regulatory requirements, and it will be fully enforced.

I want to say that before we got this act adopted we had to overcome quite a number of obstacles. The utilities men were opposed to it because they thought that we should not have jurisdiction over their equipment mechanics and we believed the same thing. As the act is

drawn it does not interfere with them. Also in private industry, factories may have a battery of scales and their own maintenance department. Of course, we contend such mechanics are under the direct control of the factory employer and are therefore not within our jurisdiction. The law is primarily aimed at the mechanic who goes around as a business or a part of a business directly engaged in the sale or repair of used devices or installation of such devices. It does not apply to anyone who sells new devices.

Incidentally, I might state that in the presentation of this act for passage we also presented a brief which covered the subject very thoroughly and particularly discussed the case where devices were taken in trade for new equipment and then were sold without being properly repaired and thus were put back in commercial use. In this act there are some very definite provisions covering that. The act provides for a $25 fine on the firm and a $5 fine on the mechanic.

A particularly good feature of this act is the provision for an examination by a board of competent examiners, which the mechanic must undergo in order to get his license. He does not have to pass a general examination for all types of equipment—although he may do so if he thinks he is qualified—but he can be licensed for a certain type of equipment.

I want you to know that this law passed without a dissenting vote. It was signed by the Governor without any objection or any question being raised about its merits. The benefits of the act appear to be very obvious to everybody.

The CHAIRMAN. Gentlemen, since our meeting last year the administrative staff of the U. S. Department of Commerce has been enriched by the addition of Richard C. Patterson, Jr., as the Assistant Secretary of Commerce. Mr. Patterson is an engineer by profession; he is deeply sympathetic with and appreciative of the work which you are doing, and he has kindly consented to address you for a few moments. I take great pleasure in presenting to you Mr. Patterson, Assistant Secretary of Commerce.

ADDRESS BY HON. RICHARD C. PATTERSON, JR., ASSISTANT SECRETARY OF COMMERCE

Before leaving Washington several days ago Secretary Roper requested that I extend his best wishes and cordial greetings to you who are attending the Twenty-Eighth National Conference on Weights and Measures. He regretted deeply that a previous engagement in New Orleans made it impossible for him personally to attend your meeting again this year. As those of you who have attended previous Conferences well know, the Secretary is thoroughly appreciative of the value to business and the American public of the program you have undertaken. It is certain, therefore, although absent, he will be keenly interested in the report of the proceedings of this Conference.

Speaking for myself, I have so recently assumed my duties in the Department of Commerce that I hesitated to appear upon your program as a Government official. It seemed somewhat presumptuous to assume that one who had been in Federal Government service for such a brief period could present anything of value to you who have had many years of experience in important administrative positions of State, city, and county governments. However, I have

welcomed this opportunity to learn something about the character of your organization and the qualifications of the men composing it.

Dr. Briggs has informed me that you are engaged in the administration of weights and measures laws involving the testing of machines and mechanisms used in the commercial determination of measured quantities of goods. It was explained to me that you are profoundly interested in the details of construction of such apparatus. This knowledge you find essential in assuring the user of the apparatus and the consumer with whom he is dealing that the machine, when approved, will accurately function as intended. Equally essential, I am told, are reasonable safeguards against any manipulation of the device for the purpose of defrauding the purchaser of commodities.

Finally, it appeared that among your invited guests are many who design and supervise the construction of measuring machines. With these facts before me I no longer hesitated to accept the invitation to speak to you, since, as a trained engineer, I could be assured that I would be among friends.

In studying the activities of the National Bureau of Standards with respect to the maintenance of standards of weights and measures, I am particularly interested in the relationship between this Bureau and agencies which you represent. We in the Department of Commerce recognize, first of all, that we share with you a joint responsibility in perfecting the means of attaining a reasonable degree of exactness in day-to-day commercial transactions. No matter how carefully our primary national standards are developed and maintained, they are of little practical value unless properly observed by those who use them. In this phase of the work our Federal Government agency occupies a position that is essentially one of coordination. This forum is provided so that by free exchange of ideas and experience, the representatives of State, county, and city agencies may develop a uniformity in local practices which will adequately serve our national requirements. Without such uniformity our modern methods of production and Nation-wide distribution of goods, manufactured or processed by a single corporation, would not be feasible.

In organizing this forum, however, we do not seek to impose uniform procedures from a central authority. Our responsibility is to coordinate the activities of the agencies you represent and to cooperate with you in serving the needs of business and the consumer which become more exacting as science progresses.

From the viewpoint of the business executive the maintenance of our standards and the development of more exact measuring equipment is a service which provides some of the tools essential to production and distribution. We are constantly seeking new refinements and improvements which will make these tools more useful. In referring to this service I would like to quote a brief portion of a talk which I gave at the Boston Conference on Distribution. This excerpt appeared in October 1935, in Domestic Commerce, a publication of the Department of Commerce, and reads as follows:

> I think it ought to be clear that the job of American business is only half done when we have created new products or made old products better. There is the equally important job of creating new appreciations or lifting the level of the old appreciations. Our equipment is really the passport to a new way of life. The more we desire that way of life, the more we will want to possess the equipment that makes it possible. We will not only want the equipment. We will want the very latest model of it. Thus, the things that people buy from business can be

very largely measured in terms of the values they desire from life. I do not believe that we will ever get to the place where we will cease to see a better and richer life ahead of us. But if we should get to that place we would then cease to buy many of the things that put that life within our reach.

Therefore it is a business fact of major importance that, during these recession years, there has been an increase in what I might call the quality-aspirations of the American people. People have not bought so many of the things with which those aspirations can be satisfied. But that has been due to a falling off in income. It has not been due to any falling off in desire. That, I think, is important. Perhaps the American standard of living has declined. I am convinced that any such decline is temporary. It is temporary because it is not a part of the American make-up to be satisfied in such a situation. One characteristic of our people is their irrepressible desire for something better.

I have not changed my viewpoint since I wrote that 3 years ago.

The maintenance and observance of constant standards is not only a service to business at home but to those engaged in foreign trade as well. Just as we have a monetary basis which bears a definite measurable relationship in terms of gold to the currency of other countries, we must also have standards of weights and measures which can be similarly related. To the scientist or engineer the definition of our pound and inch in terms of the metric system is regarded as essential to the orderly progress of scientific knowledge. To those engaged in foreign trade, however, these relationships constitute a basis for equitable commercial dealings.

This is significant because we are now engaged in promoting our trade with other nations as one of the means of restoring normal business activity. The annual observance of Foreign Trade Week has just been concluded. During this period we have observed an increasing interest among business executives in the opportunities for expanding our markets abroad. Export statistics for many industries show that the Reciprocal Trade Agreement program has already been instrumental in reducing tariff barriers and other restrictions sufficiently to permit a greatly enlarged volume of foreign shipments. While the volume of our trade with other countries last year was approximately 30 percent below the peak of 1928 and 1929, the total value of our exports and imports was almost six and one-half billion dollars.

With the decline in domestic business activity our export trade has been providing a livelihood for a larger proportion of our population than at any time since the early Twenties. The automobile industry, machine tools, aircraft, and even the textile industry are this year steadily expanding the ratio of their exports to domestic sales. Thus, our foreign trade helps to sustain employment and purchasing power and is of benefit to us all.

Although we do not usually regard the enforcement of accurate weight and measure standards as a part of the foreign trade program, I believe you will agree that our cooperative efforts should be based on a recognition of the increasing importance of this phase of business. It should be evident that, in preserving the exactness of our measurements, we engender further confidence among foreign purchasers in the integrity of American business methods, and thereby assist in developing markets abroad for our agriculture and industry.

The CHAIRMAN. Mr. Patterson, the conference is deeply indebted to you for this. We wish very much that you might stay with us, but we understand that you have another engagement. I know everyone here wishes me to express to you our thanks.

(At this point Vice President Rollin E. Meek assumed the chair.)

PAPER MEASURE-CONTAINERS

By S. T. GRIFFITH, *Chief, Division of Weights and Measures, City of Baltimore, Md.*

Most weights and measures officials have at some time in their work been confronted with the problem of paper measure-containers. What disposition they have made of the same, except in the instance of a few States, is not a part of the records of this Conference. In perhaps one-half dozen jurisdictions certain types only of paper measure-containers have been officially approved for use as measures and given the State's serial number, which is required to be imprinted on said paper measure-containers.

The use of paper containers in the handling and dispensing of food products has increased so rapidly in the past few years that it is very evident some recognition and action should be taken by this National Conference, when such paper containers are designed and may be used in trade as measures. Thus, it would appear that uniformity throughout the country is most desirable.

There is no doubt that the economy and facility in the promotion of business is greatly enhanced by this very popular and inexpensive medium. Those concerns engaged in the handling of food products, particularly, find the use of paper measure-containers speeds up their business, increases their sales, and provides a consumer demand not usually accorded when only paper wrappings or trays are employed. The low cost and the quickness of handling, together with the easy disposition of the empty container, appeals to both the merchant and the customer.

The paper measure-container has naturally evolved from the paper drinking cup, which all of us have known for many years. It was probably the first paper container manufactured to hold liquids for public consumption. Since that time, a little more than a decade ago, this cheap and flimsy paper cup has been developed by the manufacturers, until now we have nearly 100 different kinds of paper containers, some of which are strong enough to bear the weight of a man. These paper containers are found to be very practical in the handling of liquids or solids. The evolution of the paper container has developed as the needs of trade required, or as the ingenious manufacturer could find new fields for its use. The application of this convenient paper measure-container to new purposes has progressed until today there is hardly any field in the purveying of either liquids or solids which cannot be handled fairly successfully in paper measure-containers.

In many jurisdictions where no official action has heretofore been taken, the supervision of their employment has probably followed the same procedure as in Baltimore, Md. There, we have required the merchant to provide himself with a legal measure for liquids and an approved scale for solids, and the theory is that the liquid measure conforming to our present national specifications, and the approved scale, would be used in determining the quantity of either the liquid or solid which would then be transferred into the paper container.

I say theory, because in practice I am quite sure most of us will agree that even though a merchant has the proper liquid measures and scales, he does not use them when employing paper measure-containers, but he does use the paper measure-container direct for the ascertainment of a quantity. This is a common practice in merchandising.

This being a fact, it would seem necessary that weights and measures officials should find a way to control their use as measures. How this shall be accomplished is not immediately apparent to your speaker. There are many ramifications involved and many conditions to be considered both as to the use of said paper measure-containers and the effect on the manufacturers of this article. Regulations for paper measure-containers for milk, cream, etc., seem to be covered in our milk-bottle specifications when that type of paper measure-container is used; and where the milk-bottle specifications are not applicable, regulations and specifications have already been suggested to the Conference Committee on Specifications and Tolerances.

To explain further the need of this regulation of paper measure-containers, may I invite your attention to the numerous samples which are here on display. You can readily see the different shapes, sizes, and designs that are now in common use. It is very evident from the many odd sizes in which these paper measure-containers are manufactured, that some simplification and standardization of sizes should be attempted; this, of course, should be done in cooperation with the paper measure-container industry.

It is suggested that if the Conference Committee on Specifications and Tolerances cannot handle this matter a special committee be appointed to study the paper measure-container and report back to this Conference at our next annual meeting with recommendations as to specifications and regulations for the use of paper measure-containers.

DISCUSSION OF ABOVE SUBJECT

Mr. McBRIDE. We have a law for the approval of containers if used for measures, which covers the quarts, pints, and half pints. The practical difficulty is that many of these things are eligible for use under the law which permits the sale of food in package form and the size of such container cannot be controlled if it is marked with its net contents. I think we have a very practical difficulty in regard to it; perhaps we can overcome that difficulty by framing a law to the effect that certain commodities must be sold by measure. That would seem to be the only avenue that would be open toward controlling sizes.

Mr. KANZER. A conference was held in New York City which we attended together with 15 or 20 paper manufacturers. The question arose as to whether containers made of paper and fiber do come under the regulation for the standard sizes. We took the position that they did. Immediately individual specifications were sent out for criticism and approval. The only criticism raised so far relates to the size of the markings on the containers.

ABSTRACTS OF STATE REPORTS [1]

ALABAMA

By H. S. HOLLOWAY,[2] *Chief, State Division of Weights and Measures*

Mr. Holloway stated that the inspections of vehicle scales made in the State by the National Bureau of Standards equipment had demonstrated the need of a heavier State-owned unit; this would probably be provided shortly. He mentioned that many small independent coal mines did not own scales and were not complying with the State law,

[1] For convenience of reference these reports have been assembled and arranged in alphabetical order.
[2] This report was read to the Conference by E. W. Pinnell, State Inspector of Weights and Measures.

although some steps had been taken which had improved the situation somewhat.

CALIFORNIA

By C. E. Tucker, *Chief, State Division of Weights and Measures*

Mr. Tucker noted the continued growth of weights and measures activities in the State and stressed several changes made in the State law. A gasoline and oil substitution act was adopted. A very constructive amendment to existing law involved the inclusion in civil service of all weights and measures officials; other amendments included a new legal definition for a deceptive container, and the strengthening of the public weighmaster act.

CONNECTICUT

By C. L. Klocker, *State Inspector of Weights and Measures*

Mr. Klocker noted the increase to five in the number of sealers of weights and measures employed by the State government. A new law requires wholesale sales of petroleum products by vehicle-tank compartment or by meter. Important new apparatus procured included a large-capacity scale-testing equipment and a truck upon which are mounted two 500-gallon tanks designed for the test of large-capacity bulk meters and vehicle-tank meters.

DISTRICT OF COLUMBIA

By George M. Roberts, *Superintendent of Weights, Measures, and Markets*

Mr. Roberts reported a substantial increase in appropriations for the coming fiscal year to take care of present work together with a new appropriation to enable his department to determine the quality of gasoline and lubricating oils sold. He described difficulties encountered with truckers who brought in coal from the mines for direct sale to consumers and the steps taken and contemplated to control this situation.

FLORIDA

By Howard E. Crawford, *Inspector of Weights and Measures, City of Jacksonville*

Mr. Crawford reported that there had been no change in State weights and measures laws; the work done by the State was largely confined to the test of gasoline pumps. Referring to Jacksonville, he stated that special attention had been given to the elimination of the sale of packaged goods not marked with their contents or short in weight or measure, sometimes as much as 25 percent.

GEORGIA

By S. H. Wilson, *State Oil Chemist*

Mr. Wilson reported that there had been no opportunity to enact any general State weights and measures legislation since no regular session of the legislature had been held in the last year. However, at a session devoted to State reorganization, the gasoline inspection work had been transferred from the jurisdiction of the Comptroller General to that of the Department of Revenue.

IDAHO

By FRANK L. HAMMON, *Director, State Bureau of Weights and Measures*

Mr. Hammon reported the acquisition by his bureau of an adequate large-capacity scale-testing equipment which had proved to be very satisfactory. He noted that requests had been received for demonstrations and tests outside the State; one large sugar company operating in Idaho and adjoining States had offered a large fee if the State Bureau would undertake to test their large-capacity scales located in adjoining States.

ILLINOIS

By JOHN J. LEVITT, *Superintendent, State Division of Standards*

Mr. Levitt reported that experience had demonstrated the economy and efficiency of the large-capacity scale-testing equipment procured by the State 2 years before; this had been found satisfactory in every respect. He stressed the fact that tests could be made expeditiously, the average time per test being less than 25 minutes. The weights, and the industrial truck used as a standard weight, had been found to be very constant.

INDIANA

By ROLLIN E. MEEK, *Chief, State Bureau of Weights and Measures*

Mr. Meek reported that Indiana had kept pace with the Conference by adopting all codes of specifications and tolerances and amendments thereto, so that the codes now in effect in the State were identical with those of the Conference; this had been found to be advantageous to proper supervision. He alluded to preparations which had been made to secure new and adequate general weights and measures legislation during the coming year.

MAINE

By JAMES A. BOYLE, *Sealer of Weights and Measures, City of Portland*

Mr. Boyle reported that Maine was obliged to operate under a very limited budget. However, it had been found possible to establish and equip nine test stations throughout the State with standards reasonably adequate for the testing of large liquid measures and meters. An effort had also been made by the State to see to it that local sealers were equipped with proper standards for general testing purposes.

MARYLAND

By S. T. GRIFFITH, *Chief, Division of Weights and Measures, City of Baltimore*

Mr. Griffith said that little progress had been made in State-wide weights and measures enforcement activities in many years. He reported a resolution passed by the legislature for the appointment of a committee to survey weights and measures conditions throughout the State and to report back to the legislature. However, since the resolution carried no funds to defray the expenses of the committee, the appointments had not been made.

MASSACHUSETTS

By JOHN P. MCBRIDE, *Director, State Division of Standards*

Mr. McBride said that in his State there could not be found any accumulation of false or condemned devices and expressed the opinion that when a law has been enforced for years any such accumulation

would be difficult to justify. He stressed the importance of the sale of fuel oil in his State and noted that the State equipment for the test of large-capacity meters, now included a 1,000-gallon test tank.

MICHIGAN

By Leo V. Card, *Director, State Bureau of Foods and Standards*

Mr. Card reported that State employees were about to be protected by the provisions of a strict civil-service law and that it was believed this would do much to strengthen the department. He also said that an additional large-capacity scale-testing equipment had been procured by the State and that shortly a portable outfit for testing vehicle-tank compartments and large-capacity meters would be put into service.

MISSOURI

By Louis G. Waldman, *Commissioner of Weights and Measures, City of St. Louis*

Mr. Waldman reported that he had put a model State law on the subject of weights and measures in the hands of the Governor, and that the latter had expressed the thought that some action might shortly be taken by the State in this connection. Mr. Waldman also said that the St. Louis department had been charged with the duty of supervising the quality of coal brought into the city for sale.

NEW JERSEY

By Joseph G. Rogers,[3] *Assistant State Superintendent of Weights and Measures*

Mr. Rogers reported the passage of new laws designed to regulate the sale of "bootleg" coal by requiring a certificate of origin and the licensing of vendors of coal; to regulate the sale of liquid fuels by providing in general that sales be made by meter; and to require the licensing of weights and measures equipment mechanics. He also mentioned a survey concerned with the proper methods of merchandising propane and butane.

NEW YORK

By Barnett Kanzer, *Director, State Bureau of Weights and Measures*

Mr. Kanzer reported that he had inaugurated a campaign toward the repeal of laws fixing weights per bushel since these were antiquated and unenforceable. He described efforts which were being carried on to solve the problem of shortages in packaged meats shipped from packers to retailers. He also stated that he was contacting various organizations in an attempt to coordinate efforts toward uniformity in various weights and measures endeavors.

NORTH CAROLINA

By C. D. Baucom, *State Superintendent of Weights and Measures*

Mr. Baucom reported that the State had procured equipment for testing electricity, gas, and water meters. This work was not to be in lieu of tests made by utility companies; no attempt was to be made to test all of these devices, but referee tests would be made

[3] Mr. Rogers made this report at the request of Charles C. Read, State Superintendent of Weights and Measures.

when the customer was not satisfied with the test made by a utility. He stated that a large-capacity scale-testing equipment would shortly be procured.[4]

NORTH DAKOTA

By A. J. JENSEN, *Chief State Inspector of Weights and Measures*

Mr. Jensen reported that confiscation of faulty apparatus was largely replacing criminal prosecutions and fines in his State with the result that considerable success was being obtained in the replacement of inadequate and obsolete apparatus by up-to-date devices. He also said that the State was negotiating for the purchase of two large-capacity scale-testing equipments each designed to carry 5,000 pounds of standard weights.

ANNOUNCEMENT

Mr. MCBRIDE. The Committee on Proposed Federal Legislation to Provide Assistance for the States in Administration of Weights and Measures Laws had a meeting last night but reached no final conclusion. We extend an invitation to all delegates who are interested in this subject to present themselves at an open committee meeting to be held in Parlor D, Washington Hotel, this evening. The meeting will be in session from 5:30 until 7:00 o'clock, and we will be glad to receive any of the delegates who have any ideas on the subject that might help the Committee in reaching a conclusion.

(At this point, at 1:11 p. m., the Conference took a recess until 2 p. m.)

[4] At the conclusion of his report, Mr. Baucom introduced Mr. Shankle, Chief of the State Gasoline and Oil Inspection Division, which division has been charged with the enforcement of all regulatory measures concerning the transportation, quality, and quantity of petroleum products. Mr. Shankle described the results obtained in the testing of measuring devices for these products.

FOURTH SESSION—AFTERNOON OF WEDNESDAY, JUNE 1, 1938

(The Conference reassembled at 2:24 p. m., John J. Levitt, Vice-President of the Conference, in the chair.)

ABSTRACTS OF STATE REPORTS—Continued

OHIO

By O. E. BRENNEMAN, *Chief Deputy Sealer, State Bureau of Weights and Measures*

Mr. Brenneman reported the passage of an act placing all weights and measures officials in the State under the provisions of the retirement law. He mentioned that as a start toward the adequate testing of large-capacity scales the State had procured an equipment carrying 5,000 pounds of 50-pound weights; he said this equipment was useful in reaching scales inaccessible to heavier equipments having facilities for mechanical handling of weights.

OREGON

By ARDEN A. REED, *Deputy State Sealer of Weights and Measures*

Mr. Reed reported on the method adopted to obtain State-wide inspection of weights and measures, a difficult problem since the area of the State is very great, and the agricultural industry, which ranks first in importance, is divided into several districts widely separated by mountain ranges. He said that for enforcement purposes the State was divided into four districts, each having one district sealer and such deputies as were necessary.

PENNSYLVANIA

By C. J. P. CULLEN, *Director, State Bureau of Standard Weights and Measures*

Mr. Cullen reported the passage of two laws: The first required the sale of all fruits and vegetables by weight except when in original standard containers, thus abolishing the use of dry measures, as a result of which 5,000 had been condemned in Philadelphia and Pittsburgh; the second required the weighing and proper branding of all coal mine cars, 90 percent of the cars weighed having been found to be incorrectly marked.

RHODE ISLAND

By EDWARD R. FISHER, *Chief, State Bureau of Weights and Measures*

Mr. Fisher expressed the appreciation of the State for the tests made on large-capacity scales by the National Bureau of Standards equipment; he hoped that the State would shortly procure facilities of its own to conduct such tests. He said that the law required that all vehicle tanks in use be tested and sealed by his bureau; because of the small area of the State this work could readily be done.

TENNESSEE

By TOM WEBB, *Sealer of Weights and Measures, City of Nashville*

Mr. Webb expressed appreciation to the National Bureau of Standards for its cooperation in furnishing its large-capacity scale-testing unit for work in Nashville. He expressed the hope that as a result his city might be able to procure a similar equipment next year.

TEXAS

By W. S. BUSSEY, *Chief, State Division of Weights and Measures*

Mr. Bussey reported a substantial increase in appropriations, resulting in increases in salaries and in additions to personnel and equipment. He cited difficulties encountered in relation to packaged goods, semisolid products often being so marked in terms of "ounces" that it could not be ascertained whether weight or volume was intended. It was hoped that through cooperation with the Federal authorities this situation could be cleared up.

VERMONT

By H. N. DAVIS, *Deputy State Commissioner of Weights and Measures*

Mr. Davis reported that the law recently passed requiring that persons selling or repairing used weighing and measuring apparatus be licensed, is working out satisfactorily. He said that the National Bureau of Standards large-capacity scale-testing unit had been well received in the State by both scale operators and the public and that the results had demonstrated the necessity of such an equipment for an intelligent test of such scales.

VIRGINIA

By J. H. MEEK, *Director, State Division of Markets*

Mr. Meek reported the advancement of weights and measures activities. The testing of scales had increased materially, a plan having been adopted whereby the State was making tests in various jurisdictions not having local sealers, compensation being received from these jurisdictions. Under a new law, compensation for State inspections requested by commercial agencies could be received when there was no local sealer to perform the service.

WEST VIRGINIA

By S. M. MILLER, *State Inspector of Weights and Measures*

Mr. Miller reported considerable difficulty, especially in the country districts, with old and badly worn commercial equipment; however, this apparatus—especially mine scales, other scales, and gasoline pumps—was rapidly being replaced. He mentioned that the National Bureau of Standards large-capacity scale-testing unit was conducting tests in the State at that time and was doing very fine work on scales which the State was not equipped to handle properly.

WISCONSIN

By GEORGE WARNER,[1] *Chief State Inspector of Weights and Measures*

Mr. Warner reported that a reorganization of State departments and commissions was in process. Although a complete report on this could not be given, it was contemplated that the weights and measures inspectional work would be consolidated with other such work in one bureau and that each inspector would do several kinds of inspectional work. It was thought that by this method such work could be done more efficiently and economically.

REPORTS OF REPRESENTATIVES OF STATE ASSOCIATIONS OF WEIGHTS AND MEASURES OFFICIALS

At this point brief reports of the activities of State associations were presented as follows:

California Sealers' Association, Charles M. Fuller, Sealer of Weights and Measures, Los Angeles County.

Indiana Association of Inspectors of Weights and Measures, Cleo C. Morgan, Sealer of Weights and Measures, city of Gary.

Massachusetts Association of Sealers of Weights and Measures, Walter W. Gleason, State Inspector of Standards.

Michigan Association of Weights and Measures Officials, George F. Austin, Jr., Supervising Inspector, Bureau of Weights and Measures, city of Detroit.

New Jersey Association of Weights and Measures, Charles C. Read, State Superintendent of Weights and Measures.

New York State Association of Sealers of Weights and Measures, R. D. Spencer, Sealer of Weights and Measures, Oneida County.

Pennsylvania Association of Inspectors of Weights and Measures, C. J. P. Cullen, Director, State Bureau of Standard Weights and Measures.

Texas Weights and Measures Association, R. L. Fullen, Chief, Division of Weights and Measures, city of Dallas.

Virginia Weights and Measures Association, B. W. Ragland, Chief, Bureau of Weights and Measures, city of Richmond.

GENERAL CONSIDERATION OF SUBJECTS OF INTEREST AND QUESTIONS BROUGHT UP FOR DISCUSSION BY OFFICIALS

The ACTING CHAIRMAN. We want every one to feel free to express his opinions on subjects brought up under this heading, because out of this discussion we all hope to get some very good information.

INTERSTATE SHIPMENTS OF INCORRECT USED APPARATUS

Mr. W. P. REED. Recently, I went to a salvage house that had been established a short time before in Atlanta and found 13 used scales in the place; all of them had to be condemned. I found that these came from Washington, D. C. and from Jacksonville, Fla. I told the proprietor that he would have to have them repaired so that they would pass inspection before he could sell them. He said, "What if I sell these to someone outside of the State?" I said, "If sold before they are corrected, I want to know where they go and wherever you ship

[1] This report was read to the Conference by Erwin J. Rogers, City Sealer of West Allis, Wis.

them I will notify that inspector." So he immediately had those scales repaired, and I approved them.

I think it would be a good policy if we would work more cooperatively with each other and when we know that scales such as the above are being shipped out of our States, we should notify the inspector of the State to which they are being shipped. I have not heard of that being done but I do intend to do it in regard to all scales that are shipped out of Atlanta.

Unfortunately, Georgia has become the dumping ground of incorrect scales, weights, and measures from States which have good laws. I have found that out in this instance cited above. I think if we cooperate and notify each other of such apparatus being shipped from one State to another, that we would soon stop that practice.

STANDARDIZATION OF PACKAGES

Mr. PISCIOTTA. The standardization of packages of commodities is a subject which deserves a great deal of thought not only from the point of view of protection to the consumer, in whose welfare we should be most vitally and primarily interested, but also that of the retail dealer and businessman himself.

At last year's Conference, George Warner, of Wisconsin, delivered a very interesting paper on the standardization of packages of canned goods. Mr. Warner's paper dealt with the subject of metal cans in standard dimensions for each capacity. Certain specified capacities in terms of standard liquid measure were the only ones to be permitted. I am sorry I was unable to attend the hearing and register in favor of this bill. This was certainly a big step in the proper direction.

A proposed law for the city of New York deals with the standardization of packages and containers of certain specified staple commodities commonly and usually sold by avoirdupois weight. Weights and measures officials have for many years tried to educate the consumer to buy in terms of weight, measure, or numerical count. They have tried to discourage the buying of "ten cents worth" or a "quarter's worth." We have tried to make it the usual thing for a purchaser to obtain correct weight. Much legislation has been put into effect in many States, and local jurisdictions, and through the U. S. Food and Drug Act in the entire country, relative to the marking of the net contents on containers. All of these are fine—all are necessary. However, a new method of cheating the consumer—because that's what it really is—is rapidly developing. To bring this to the attention of the weights and measures officials in all jurisdictions is the purpose of this discussion.

For generations common staple commodities have been purchased by our mothers and grandmothers by the pound. Business methods are changing now and with the growth of chain stores, self-service stores, and the packaging of food products in general, the sale of commodities which are weighed by the retailer is fast disappearing and the sale by package is becoming the vogue. Competition is very keen in this class of business and has resulted in unfair practices and in all sorts of misleading and deceptive packages, all at the expense of the consumer.

For example, coffee has always been bought by the pound; everybody asks for a "pound" of coffee, or in some cases, for "½ pound." Through competition, in trying to meet or to beat the price of the other

fellow, what do we find? I have here a 7-ounce package, an 8-ounce can, a 13-ounce can, a 14-ounce can, a 15-ounce can, and a 16-ounce can of coffee. There is no more justification for the packing of coffee in these odd sizes than there is for the packing of tea in a 3-, 3½-, or 7-ounce package. Yet this is being done also. I have these two packages [indicating], which look practically alike when you put them by each other. Now, you will be surprised to learn that while they look alike, one is slightly larger than the other, and if you examine them you will find that the smaller one contains 16 ounces and the larger one, which is not packed tight, contains only 14 ounces of coffee.

I think something should be done to protect the consumer. It is all within the law, because the package is correctly marked with the net contents, but we know that the housewife rarely looks at the marking on the label and often does not even know how many ounces there are in a pound. Certainly many housewives do not know whether 3½ ounces equal a quarter of a pound or not. Many of the retailers who sell these products every day do not know that these packages do not contain a pound and seem very much surprised when we tell them. Where this practice will stop no one knows, unless something is definitely done about it right now to stop it.

Inspectors from my office can go into almost any grocery or delicatessen store in New York City and ask for 1 pound of any of these brands of coffee or ½ pound of a certain brand of tea and the shopkeeper will invariably hand them one of these packages with no explanation (and often with no knowledge) that the quantity is not as requested.

To show you how the packers of these commodities try to evade putting up their products in proper size packages, I wish to give you the following illustration: I called in the manufacturers of several brands of coffee which were being packed in these odd-size containers. They tried to convince me that it was impossible to obtain from the can manufacturer a can even a fraction of an inch higher than the one they were using, claiming that such a can would collapse and that therefore vacuum-packed coffee was physically restricted to a 15-ounce or smaller can. As I was rather skeptical, I called in the leading can manufacturers, and in order to protect their customers, I suppose, they told me the same thing. But they did not know that I had made a separate investigation in the meantime and had procured a can which was higher and which would contain a full pound. This can, incidentally, was made by one of the same manufacturers who tried to persuade me that it could not be done. When they were confronted with the evidence they had to admit that they can manufacture almost any size can ordered but that they can only sell what their customers specify.

In the packaging of dried peas, beans, rice, etc., the wholesalers who put these up argue that they purchase millions of containers of a standard size and use the same package for different kinds of commodities. They claim that a standard-size box will contain a full pound of yellow split peas but only 15 ounces of green split peas and 14 ounces of lima beans, etc. By using only this standard-size box and purchasing them in very large quantities, they argue there is a great saving which is passed on to the consumer.

I have samples of the same size box containing the same commodity and the three boxes indicate different weights. This shows that their

argument is absolutely false. As a matter of fact, one concern uses the same size box and puts a pound of rice in one, 15 ounces in another, and only 14 ounces in another. Perhaps this concern would say these are three different kinds of rice, but I have with me here these same kinds put up by competitors who manage to get all the different kinds in 1-pound packages of the same size.

Let me show you a notice [2] that is being sent out by a large distributor to the retailer, which will indicate the trend of thought in this "modern merchandising." Of course, this particular notice refers to pound packages only, but I suppose they have a similar notice for the odd-size packages.

I have with me a number of standard-size boxes of different large distributors grouped together by commodity to show you the variation in the way these are packed. The following schedule shows these variations:

Variation in labeled weights of comparative packages

Commodity	Net contents in ounces, as put up by distributor—					
	A	B	C	D	E	F
Green split peas	15	16	16	16	16	16
Pea beans	14½	[a] 14 / [a] 16	16	16	16	16
Red kidney beans	14½	13	16	16	16	16
Lentils	16	16	16	16	16	16
Barley	14½	16	16	16	16	16
Marrow beans	14½	13	16	16	15	16
Farina	13	[b]	16	14	14	14
Yellow split peas	16	16	16	16	16	16
Lima beans	14	13	[b]	16	14	16

[a] Two different weights—identical packages.
[b] Does not pack this commodity in a comparative package.

To the customer, all of these boxes look alike—they seem to be the same size. In fact, the smaller looking box often contains the larger quantity.

I have packages of rice in capacities of 12, 14, 15, and 16 ounces. These must be very confusing to the purchaser, particularly when one distributor, as I said before, puts three different quantities in what looks to be the same size box.

Here are two boxes of zwieback [indicating] made by competing concerns; both packages look to be about the same size, but one is marked 6 ounces and the other 5¾ ounces. Look at these boxes of prepared cereal [indicating]; both are the same size, but one is marked 10 ounces and one is marked 9 ounces. A good example of what is being done is these two packages of soap powder [indicating]. They appear to be the same package, but one is marked 19 ounces and the

[2] The notice referred to is as follows:

CAUTION

Mr. Retailer:

These packages contained ONE FULL POUND when packed. But due to a natural shrinkage, they may not weigh a pound now.

Offer them to customers BY THE PACKAGE, not by the pound—otherwise you may be subject to a fine for misrepresentation.

DISTRIBUTOR, Inc.

other 21 ounces. Actually, upon measurement, one is larger than the other, but the purchaser could never tell the difference unless they were shown together. You can see, therefore, that all the alibis and explanations are merely excuses. It is a question of continually fooling the public—and making the housewife think she is getting a bargain when she is paying just as much or more for a lesser quantity.

For centuries, spaghetti and macaroni have been sold only by the pound. Competition became very keen when, instead of being sold loose, this commodity was put up in packages. One firm came out with a 15-ounce package, although until it did so, all manufacturers, without any exception, were packing a full pound. Another firm found this competition was interfering with its business and decided to go one better, so it put out a 14-ounce package. The packages were so similar in construction, design, and label that for a long time, even the dealers who were selling them were offering them as 1-pound boxes. When I called in the distributors and wholesalers, they produced bills and accounts showing that they were selling them to the merchants and billing them for so many pound boxes, although for 6 months the package had been reduced to 14 ounces.

One of the most common practices of this kind is the packing of sliced bacon in 3- and 6-ounce packages which are readily sold for a quarter or a half pound. At a conference of the packers of this commodity, they agreed to discontinue this and to a large extent we have eliminated this practice in New York City. There was no law compelling them to do this, but they voluntarily agreed to do it. However, we still find some brands packing a 3- and 6-ounce size.

Our city has a large Jewish population, and the sale of matzos, particularly at the Passover season, is very large. Formerly, this was put up in 5-pound packages. Through progressive reduction in quantity for some years, due to strong competition, the quantity had shrunk to 4 pounds 9 ounces and was so marked on the container, although the trade still called them "fives" and billed them as 5 pounds at so much per pound, or sometimes as five "units" at so much per unit. This Department has been trying to break up this practice for a long time, so last year, during the holiday season, my inspectors made a drive on the small retailer. So general was their opinion and so deficient was their knowledge as to the actual contents of matzo packages, that we were able to obtain over 1,100 violations in 1 week just by going into small retail stores and asking for 5 pounds of matzos. It is no wonder that the shopkeeper and consumer were confused—here [indicating] are two packages of matzo meal. They are the same size, yet one contains 14 ounces and the other, 1 pound. When the retailer protested that it was the manufacturer's fault, we advised him to complain to the manufacturer. This was successfully accomplished at considerable expense to the packer, and the result was that this year the packages contained 5 pounds.

Another thing I would like to bring before this Conference is the fact that the net contents is not marked on containers of smoking tobacco. The tobacco people claim that the revenue stamp is a label which complies with the requirements as to marking the contents. The brewers claim just the opposite; they argue very forcefully that the revenue stamp indicates the quantity of beer on which they have paid the tax and is not to be taken as an indication of the actual contents. Here are two large businesses operating under the same Federal law with two directly opposite arguments.

With all the fancy labels on a can of tobacco, I fail to see why everything is included except the net contents. I have included a provision to this end in this local law.

I am including in my proposed law a provision also that ice cream be sold by avoirdupois weight only in specified size containers.

I have brought with me for distribution, copies of the proposed law which I have prepared for New York City, and although I understand fully that it will meet with opposition, I feel confident of its passage. Organizations of retail grocery and delicatessen stores are supporting this measure and are anxious for its adoption. They do not want to be confused any longer. The legitimate dealer wants to give 16 ounces to the pound and he deplores this practice of odd weights.

I have extra copies of this proposed law. Before its introduction it may be revised to meet criticism and opposition. I would appreciate any suggestions from any one at this conference so that I may have the benefit of your reaction to this measure. You will notice that all commodities are not included. That is because I want to pave the way with these items, and if we are successful in having these commodities packed in standard containers, others will subsequently follow.

I want to take this opportunity to express to Mr. Holbrook and the staff of the National Bureau of Standards our very great appreciation of their help and cooperation that we have received. I feel that we have been very fortunate in getting all the information we sought. I feel that as a result of these conferences of weights and measures our work has become much easier. I receive almost daily correspondence from officials in all parts of the country. I correspond steadily with them. We feel that the correspondence and the meeting in these conferences of the weights and measures officials from all parts of the country are of great benefit to all of us, and at any time you think we can be of any assistance to you, I want you to feel free to write us and we will do what we can to help you.

Mr. BOYLE. I have found that inaccuracy exists between advertised weights and distributed weights and that they sometimes differ by an ounce or more. The independent grocers may order things in certain sizes and when they come the items may be in a smaller size. There is no doubt in my mind but that they are misrepresented. On one occasion I wanted to get some cod-liver oil, and when I asked the price I was told that it was 87 cents a pint. I said I did not want such a large quantity, and then I was told that a half pint was 47 cents. I paid for a half a pint and when I got home I saw that it was marked very plainly "6 ounces." The larger bottle was marked "16 ounces."

Mr. BODENWEISER. Mr. Chairman, I would like to ask a question of Mr. Fuller of California. Millions of packages of raisins, apricots, and other dried fruits are sent out throughout the United States from California and they used to be marked "one pound." Now these packages are marked "11 ounces" and "15 ounces", although in many cases the packages are the same size as before. I wonder if you could give us any reason for that?

Mr. FULLER. I presume that when there was an increase in price, instead of raising the price per package they packed a smaller amount in the package and labeled it that way. Of course, under the present law it is legal to do it.

Mr. BODENWEISER. Our State superintendent of weights and measures is empowered to make regulations under our State law. I

am wondering if it would not be possible under that power to make regulations in respect to the contents of the packages to take care of that situation. If we wait for the Federal Government to rectify this I think most of us will be buried before it will be done. Considering what the gentleman from New York City stated to us, things are getting worse instead of better. Packages are marked 15 ounces which were formerly 16 ounces; supposedly "8-ounce" packages hold 6½ ounces or less. You can find candy in "2-pound" boxes holding only 1 pound with a layer underneath that is absolutely empty.

I have two packages of dried fruit here [indicating]. One is marked 12 ounces, one 10 ounces. If you put the two of them together you will find that they are exactly the same size. The public is being deceived.

Mr. RAGLAND. Mr. Chairman, this is a matter of very great importance. I endorse what my friend from New York has said. I have been trying for many years to have a stop put to these practices. But I have been saying to the housewives that containers should be properly marked. That is important. But size is more difficult to regulate. When one buys a can of coffee, it depends on the grind of that coffee and its handling whether the can is full or not full. Now, in that connection is it wise to make a concern make different sizes of cans for different grades and grinds of coffee because some of the packages will not be full? I am more interested in the net weight at the time of the delivery to the customer so that the customer gets a pound for every pound he is supposed to have. We insist on actual net weight of 16 ounces to the pound at the time of the delivery.

Mr. PISCIOTTA. Mr. President, in New York we have a State law requiring packages to be marked and as long as they are marked nothing can be done to require standard sizes directly. But indirectly we have had many manufacturers comply in this way: Our inspectors go in a store, name a certain brand of product, and ask for 1 pound of that product. The merchant takes a package off the shelf and does not know or does not care about the marking. Thus we often get short measure. We then give a summons. Now, you must understand that we are not trying to make trouble for the poor merchant, but through him we compel the manufacturer to comply. Little dealers all over the city complain to the manufacturer of his faulty packages which are giving them trouble; if he wants to keep their trade he must give them pound or half-pound sizes, otherwise they will not handle it. As a result, without having any right to compel the manufacturers to do it, in that manner it is possible to force the manufacturers to put their goods on the pound or half-pound basis. We did it with spaghetti and macaroni.

Mr. TUCKER. California is very much in sympathy with the presentation made. We have endeavored to have passed what is known as the slack-fill act, but our wings were clipped at the last session. We found upon investigation that only four States had a slack-fill act. We will endeavor to correct that evil brought out—if it is considered an evil—on our return to California.

The ACTING CHAIRMAN. The purpose of this discussion today is to get together on some sort of a standardization bill. I think our friend from New Jersey is a little hard on the United States Government by suggesting it is entirely a Federal problem. The purpose of these conferences is for us to bring out these different ideas and to agree among ourselves on what we want. I know that the National Bureau of

Standards will do everything it can to help in this work, but until we know what we want, they cannot very well take action on it.

Mr. BAUCOM. Mr. Chairman, I believe that in North Carolina we are in a little better position than most of the States under our act. This covers everything sold, requires that any commodity in package form shall have the weight plainly and conspicuously marked thereon on the outside, and then empowers the Department of Agriculture to make rules and regulations. However, we run into the interstate commerce on that and that is where we have difficulty. I believe that the several departments should stipulate that the weight must be plain and conspicuous. Now, if we could get marks on the package which are actually plain and conspicuous—whether 14 ounces or whatever it was—we could get somewhere.

Now, there is one thing, however, that I do do. If I find that short-weight original packages are coming into our State, why we tell the merchant that if he sells these he does it with full knowledge that they are short and then we will prosecute him. Then he either sends them back or proceeds to make some adjustment about it. That seems to me to be about the only way in which we can get back at somebody who is shipping in from out of the State. I also write to the official in the jurisdiction from which the packages come and tell him I found certain packs short or improperly labeled. That official has the power to step in and stop that manufacturer and he does that. I remember one instance where I had some stuff coming in from Richmond. I wrote Mr. Ragland and within 24 hours they had it properly marked. We have the regulations and the law to take care of all trouble arising inside the State.

Mr. FULLEN. Mr. Chairman, we had a case in Texas that was based on the shipment of sauerkraut from New York State. Those cans were labeled 15½ ounces; they held approximately 13½ ounces. We held up 37,000 cans and we got $75 of New York money down in the city of Dallas. They claimed that there had been a mistake made in handling the labels. Competitive cans were marked 13½ ounces and held approximately 14 ounces when filled.

We have found 12 national distributors of food products putting out semisolid products labeled in ounces without specifying whether liquid measure or weight was meant.

Mr. GRIFFITH. There is no doubt in my mind that this problem of deceptive packages is one of the vital problems of every weights and measures official. There is a presumption of fraud. The Federal Government itself for over a decade has been struggling under the U. S. Food and Drug Act trying to do just what New York City is now attempting. I do hope that New York can put it over; it would be an entering wedge for the various States to follow suit.

We all know that when a commodity package is correctly marked with the weight or measure of its contents we haven't anything to do with the package other than that. Now, when we step into the picture and try to regulate the size, shape, or contents of the package itself, we are traveling down the same road the food and drug people have been traveling for many years. I know the tremendous pressure that has been brought to bear upon Congress by manufacturers who have unlimited funds. When they find that they can sell 15 ounces for as much as 16 ounces, thus making 16⅔ percent before the product moves out of their plant, they are going to try to continue to do that. Thus there is a tremendous opposition to the regulation of packages.

I will do anything that is possible for me to do to assist New York City in getting its bill through by supplying them with exhibits, examples, and specific cases.

In Baltimore we too had our attention called to dereliction on the part of a number of our manufacturers. It has not been more than 6 weeks since a New Jersey man wrote to us in regard to a local firm putting out certain packages not properly marked or not marked at all. We endeavored to cooperate and I believe we did get that straightened out. We are very vitally interested in full weight at all times.

Mr. MORGAN. You will find that bar soap varies in size. I notice that a leading manufacturer puts out the same kind of soap in bars of two sizes, differing in weight by 2 ounces. If you do not see the two together you will not notice the difference. Because merchants were complaining I checked up as to the soap that was being put out by the chain stores on special sales and I found that the soap was 2 ounces lighter than presumably the regular soap sold on regular days.

Mr. MCBRIDE. I want to compliment Mr. Pisciotta for the effort he put into this problem. He has undoubtedly developed this subject after a great deal of work in the city of New York and he has made a survey which has proven very interesting. I think the subject is a very broad one and the effort is worth while and merits success.

I would like to offer a motion that a committee be appointed to look into the matter of remedying this situation and to determine which way may be best adapted to accomplish that purpose.

(The motion was seconded, the question was taken, and the motion was agreed to.)

Mr. HOLBROOK. Before we close this discussion on the standardization of packages and the necessity of a Federal law, I think it would be well for the Conference to recall that there is already a bill before Congress in relation to canned fruits, vegetables, and milk.

You will remember that last year George Warner, of Wisconsin, had a very interesting exhibit, and that he and Congressman Sauthoff, of Wisconsin, talked before this body, the latter having introduced a bill which the former sponsored. Some 2 or 3 months ago that bill—H. R. 6964—came up for hearing before the Committee on Coinage, Weights, and Measures of the House of Representatives and at this hearing, which lasted 2 full days, Mr. Warner and others valiantly attempted to get a favorable report. In view of this, I asked Mr. Warner to follow up this subject at the present Conference. Unfortunately, he was unable to be here, but he has sent in a prepared statement which I think should be read at this time. Mr. Warner says [reading]:

The Twenty-seventh National Conference on Weights and Measures last year endorsed H. R. 6964, and I wish to thank the members of the Conference who so ably and generously gave of their time and talent in writing and contacting members of the Committee on Coinage, Weights, and Measures and their various congressional representatives. I would suggest to the members of this, the Twenty-eighth National Conference, who have not already done so, to write to the Committee on Coinage, Weights, and Measures, House of Representatives, and endorse the principle of bill H. R. 6964.

The Committee on Coinage, Weights, and Measures held a hearing on this bill on March 15 and 16, 1938, and the writer, representing the Agricultural Board of Wisconsin, appeared in favor of the bill.

I believe that the Conference is quite familiar with the provisions of the bill which in short would standardize cans for fruits and vegetables and canned milk and would outlaw about 60 odd-sized cans for fruits and vegetables that are now on the market. This is our first opportunity to analyze the opposition to the bill; heretofore we have heard only favorable comment in regard to the principle of the bill; now, however, we have an opportunity to meet the objections offered by the opposition to the bill.

With the verbiage eliminated, the hearing brought out two opposing views: Standardization of fruit and vegetable and evaporated milk cans was not openly opposed, but whether it was to be accomplished by voluntary cooperation or made mandatory by Federal law was really the question at issue. No justification for a large number of cans with only 1 or 2 ounces difference in capacity was given by the opposition to the bill.

It was clearly established that under present conditions there is no way to compel the discontinuing of the use of cans that a voluntary committee recommends be discontinued; in fact, there is evidence to show that some cans that were eliminated in recent years died a natural death because the dealer could not sell them. The satellites around some of the others increased greatly, and for that reason more different capacity cans are continually coming on the market. Five or six groups making cans have not voluntarily agreed to make only certain sized cans, and the more than 3,000 canners themselves cannot agree on any certain set of can sizes, therefore voluntary agreements in this group seem impossible. On the other side of the picture all consumer groups represented at the hearing were agreed that can sizes should be on the basis of liquid measure and in a limited number of sizes.

The picture is a little different in the case of cans for evaporated milk. It is not contended that there are too many cans now used for evaporated milk, but the bill would make the cans a little larger than they are at present. You will recall that the family size can for evaporated milk formerly held 16 ounces avoirdupois, and that it was reduced to 14½ ounces avoirdupois in about 1931. The present bill would increase the size of this can to 1 pint, which would be approximately the same size as the can used prior to 1931. The 6-ounce avoirdupois can would be increased in size to a half-pint liquid measure. The reason given at the hearing for cutting the size of the 16-ounce avoirdupois can to 14½ ounces was to hold the retail price to 10 cents or under; however, when the price of milk dropped, the can size was not increased. I wonder if anyone would want a short quart of fluid milk delivered to his door when the price of milk went up, or a large quart when the price went down.

The opposition to the bill relating to fruits and vegetables would have us believe that cans are made to fit the product instead of the product being prepared to fit the can. If the former were true, we would have the cans changed with the seasons, and if that were true, why would it be necessary to have a change in prices yearly? Before the advent of weight laws standardizing loaves of bread, it was the bakers' practice to juggle the weight and not the price, because price is easily apparent to the purchaser but weight is not. Apparently, the opposition to this bill want to juggle both the weight and the price.

I believe that if the weights and measures officials in their various jurisdictions would contact the individual canners and enlist their aid in making known their wishes to the Committee on Coinage, Weights, and Measures, it would materially assist that committee in properly recommending the bill to Congress for passage.

I may say that Mr. Warner has supplied a number of copies of the statement and they are on my desk for those who desire them.

Mr. CARD. I would like to say a few words about mandatory inspection. We have just completed a year of mandatory inspection, with the cooperation of the Federal department, on approximately 5,000,000 bushels of potatoes. We have supplied probably more than 5 percent of all of the potatoes going into commercial channels in the year. Now, we believe you must have unified effort between the Federal and the State departments, and I will give you a specific example of what that will accomplish. About 4 weeks ago I had some conversation with officials of the Department of Agriculture in Washington relative to the movement out of Michigan of sweet potatoes. It has been the practice in Michigan to move sweet potatoes labeled with a tag to the effect that they were certified;

under our existing mandatory code we forbid the use of these tags. We found in some cases that the dealers conceived the idea of mailing the tags and putting them on at destination. I took it up with the Department of Agriculture and in less than a week I had it straightened out, and eliminated all that trouble. As I say, if you are getting any shipments that you do not think are up to standard, notify us and we will stop them at once. All the potatoes sold out of Michigan are sold by weight.

Mr. DEVRIES. Mr. Chairman, we have packages such as spaghetti and potatoes coming on the market at so many pounds or ounces "when packed." Now, I would like to know if any of the States recognize that marking. You find shortages in these packages and it does confuse the person buying them. It gives the storekeeper a chance to say that there was full weight in there when it was packed.

Mr. GRIFFITH. Mr. Chairman, I would like to say that the question the gentleman just propounded is largely controlled by the State net-weight law. In Baltimore the law says that the commodity shall be sold by net weight. The Appellate Court has construed it to mean net weight at the time that the sale is made.

Mr. DAVIS. Last week I had a can marked "one United States gallon," which was 16 cubic inches oversize. The result of that is that when 1 gallon is placed in the can there is an air space on top. In the case of maple syrup such an air space will have a tendency to make the syrup crystallize in the can. We have encountered maple syrup put up in cans holding not more than 221 cubic inches that presumably should hold a gallon. This matter of standardization is very important in regard to the handling of maple products; unless the can is standard all kinds of difficulties arise.

(At this point, at 5:15 p. m., the Conference adjourned to meet at 10 a. m., Thursday, June 2, 1938.)

SECRETARY'S NOTE.—On the evening of Wednesday, June 1, 1938, a get-together entertainment session was held in the ballroom of the Washington Hotel for the delegates and visitors and their families. Motion-picture films "Precisely So," "Materials," and "A Coach for Cinderella" were shown by courtesy of the Chevrolet Motor Division of General Motors.

Light refreshments were served, and dancing was enjoyed.

FIFTH SESSION—MORNING OF THURSDAY, JUNE 2, 1938

(The Conference reassembled at 10:10 a. m., at the National Bureau of Standards, Dr. Lyman J. Briggs, President of the Conference, in the chair.)

TWO-DRAFT WEIGHING OF MOTOR-VEHICLE LOADS

By C. L. RICHARD, *National Bureau of Standards*

(NOTE.—The following address was illustrated in part by demonstrations with small models of motor vehicles and with accessory apparatus, in combination with a scale. These demonstrations, in general, were of the same character as those which had formerly been made in the laboratory and which are reported upon in the paper as demonstrations I, II, III, and IV, and they showed the same character of results as those reported upon.)

The weighing of motor vehicles in two drafts, or "two-draft weighing" as the practice may be called, is an expedient which is commonly adopted when the wheel base of the vehicle to be weighed exceeds the platform length of the scale to be used. Fundamentally, the practice consists in weighing individual or combination axle loads, adding the results, and accepting their sum as the total weight of the vehicle.

As a convenient method for weighing materials in transit, the practice has found widespread adoption and is of increasing prevalence. This is an inevitable consequence of some developments which have characterized growth of the motor-transport industry during the past 2 decades. The consistent trend toward the use of longer wheel base trucks, and the increasing use of tractor-trailer combinations have combined to place in modern traffic many vehicles which cannot be accommodated on the platforms of many of the vehicle scales in service. To judge from experience with comparable conditions in the past history of rail-transport weighing, when for more than 50 years the primary problem was to provide track scales of sufficient length to accommodate rolling stock of constantly increasing lengths, there seems to be little probability that the current situation, respecting the inadequacy of motortruck scale lengths, may find early remedy. Rather, it may be anticipated that continuing development and expansion of motor transportation will increasingly create occasion, if not necessity, for resort to the two-draft method of weighing vehicles. This statement is made with due regard for the limitations which various jurisdictions have imposed on vehicle lengths, wheel loads, etc.; the dual-wheel and tandem-axle features of modern motortrucks and the adoption of trailer or semitrailer principles illustrate how readily the motor-transport industry may adapt itself to the requirements of imposed regulations.

It is in order, therefore, to consider critically this two-draft method of weighing vehicles, to investigate its potentialities and limitations, and to determine whether or not, as a method of weight determination, it conforms to accepted standards of dependability. To do so will be the purpose of the ensuing discussion.

As a basic premise upon which discussion may be founded it will be said that, within the limits of its capacity and sensitiveness, a modern

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motortruck scale of proven accuracy may be expected to indicate correctly the weight of a two-axle motortruck when both axle loads are on the scale platform; also, it may be expected to indicate with considerable accuracy the weight of each axle load placed on the platform. However—and this is the important consideration—if a portion of the weight on either axle shifts to the other axle during the weighing procedure, it follows that the value derived by adding the two indicated weight values will not be the true weight of the entire vehicle. That is to say, weighing the individual axle loads of a vehicle, adding the results, and assuming that their sum truly represents the weight of the whole, presupposes that the load on each axle remains constant during the entire weighing procedure. This latter condition, as will be shown presently, is one which obtains only under certain favorable and rather uncommon circumstances.

It follows from the foregoing that investigation of the subject and search for potential sources of error in the practice of two-draft weigh-

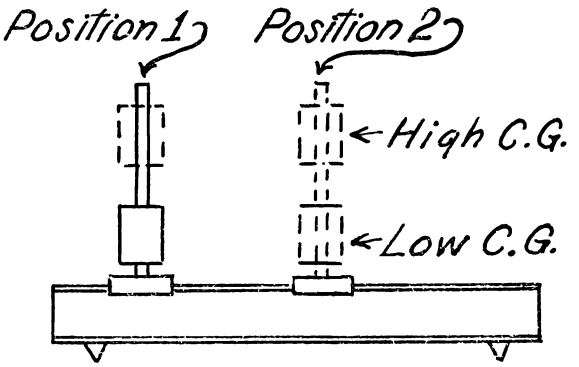

FIGURE 3.

ing should focus not on the scale proper but on elements or factors external to it. These may be (1) the gradient or level of the scale approaches upon which one axle load may rest while the other is being weighed; (2) the vehicle or vehicle combination and certain component parts of either; (3) the nature and distribution of the load; and (4) accidental or other shifts of load forces.

Study of the manner and degree in which these various factors may cause error in the two-draft weighing of an actual motor vehicle was carried on in part by theoretical analysis and in part by laboratory experiment with small simplified models of motor vehicles. It should be understood that although the conclusions developed by theoretical analysis apply generally to actual motor vehicles, the results of the experiments conducted with the vehicle models may not be so directly applied; they should, in the absence of corroboratory evidence obtained by experiment with actual vehicles, be interpreted in a general qualitative sense rather than in a quantitative one.

The first factor to be considered is that of scale approaches which are not in the plane of the scale platform. This is a condition very frequently encountered in weighing motor vehicles, the approaches either sloping upward to the scale platform level or being somewhat below that level. (Instances where either or both of the approaches lie above the level of the scale platform are relatively infrequent and

will be disregarded in this discussion except to state that the effects of such conditions would be opposite to those introduced by the usual low approach conditions.)

Figure 3 illustrates a model employed in experimental study of the effects which may be introduced by low scale approaches. It consists of a simple beam of light weight, fitted with knife-edge supports near its ends, to the upper flange of which may be clamped, at any position, a threaded rod which carries a vertically adjustable mass. (In essential respects the model embodies the elementary features of a two-axle motortruck, the beam representing the chassis and body, the knife-edges representing the axles, and the detachable material representing a load of variable height and location.) By mathematical analysis it can readily be demonstrated that the weight of any rigid system, illustrated by the model, is equal to the sum of the normal reactions at the supports, and that the normal reactions change as either support is raised or lowered; if the angle which the beam makes with the horizontal is small, then the amount of this change is proportional directly to (1) the weight of the system, (2) the height of

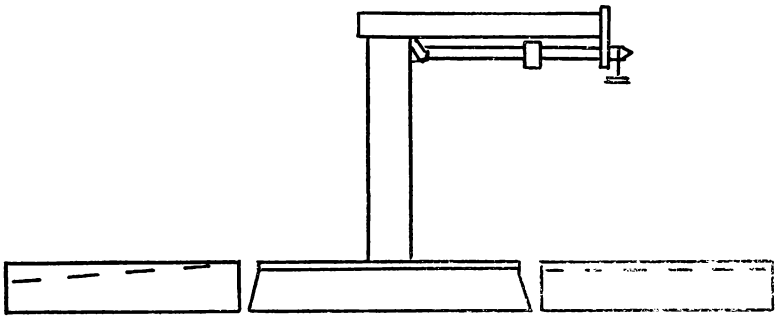

FIGURE 4.

the center of gravity above the plane of support, and (3) the vertical distance through which either support is raised or lowered, and is proportional inversely to the square of the distance between the supports.

Some of the principles just stated may be demonstrated experimentally with the model of figure 3 and with the weighing scale of figure 4. It will be seen that the model is too long to be accommodated on the platform of the weighing scale. However, if the right-end support of the model is placed on the scale platform and its left support on an approach level with the scale platform (illustrated by full line), the normal reaction at the right end may be measured by the scale indication. The normal reaction at the left end may then be measured under similar conditions, and the sum of the two indications will correctly represent the weight of the system. If now the approaches are modified to lie below the scale platform level (illustrated by broken lines) and the weighings repeated, the indicated value of each reaction will be found to have changed and the sum of the indications to be less than the true weight of the model. The amount of change, as previously stated, will be proportional to the amount by which the approaches lie below the scale platform level.

The results of some experimental determinations made in the laboratory with this apparatus are reported below as demonstration I.

In these, and in most of the later experiments, for simplicity of manipulation, inclined approaches were not used, but "low" approaches, level but in a plane below that of the scale platform, were utilized, as shown by the broken line at the right of figure 4. The true weights of the beam employed, when unloaded and when loaded, were separately determined to be 4.77 and 9.62 pounds, respectively. In the tabular results, "Position 1" and "Position 2" designate two different positions of the load—that is, of the threaded rod and its vertically adjustable mass—with respect to the knife-edge supports of the beam.

DEMONSTRATION I.—REACTION CHANGES CAUSED BY CHANGES IN PLANE OF SUPPORTS

1. Beam unloaded.

   a. Approaches level with scale platform.

Left-end reaction	2. 58 lb.	
Right-end reaction	2. 19 lb.	
	4. 77 lb.	True weight of beam.

   b. Approaches ½ inch below plane of scale platform.

Left-end reaction	2. 57 lb.	
Right-end reaction	2. 18 lb.	
	4. 75 lb.	Apparent weight of beam. Error −0.02 lb, or −0.4 percent.

2. Beam loaded, position 1, low center of gravity.

   a. Approaches level with scale platform.

Left-end reaction	6. 13 lb.	
Right-end reaction	3. 49 lb.	
	9. 62 lb.	True weight of loaded beam.

   b. Approaches ½ inch below plane of scale platform.

Left-end reaction	6. 06 lb.	
Right-end reaction	3. 42 lb.	
	9. 48 lb.	Apparent weight of loaded beam. Error −0.14 lb, or −1.5 percent.

3. Beam loaded, position 1, high center of gravity.

   a. Approaches level with scale platform.

Left-end reaction	6. 12 lb.	
Right-end reaction	3. 50 lb.	
	9. 62 lb.	True weight of loaded beam.

   b. Approaches ½ inch below plane of scale platform.

Left-end reaction	6. 02 lb.	
Right-end reaction	3. 40 lb.	
	9. 42 lb.	Apparent weight of loaded beam. Error −0.20 lb, or −2.1 percent.

4. Beam loaded, position 2, high center of gravity.

   a. Approaches level with scale platform.

Left-end reaction	4. 28 lb.	
Right-end reaction	5. 34 lb.	
	9. 62 lb.	True weight of loaded beam.

b. Approaches ½ inch below plane of scale platform.

Left-end reaction	4. 18 lb.	
Right-end reaction	5. 24 lb.	
	9. 42 lb.	Apparent weight of loaded beam. Error −0.20 lb, or −2.1 percent. (Note.—Same as Case 3.)

On the basis of theoretical consideration, it is to be anticipated that when a two-axle truck is weighed by the two-draft method,[1] the effects which will be contributed solely by conditions of approach alinement may be summarized as follows:

1. There will be no error in the derived weight value if the approaches are level with the scale platform.

2. If either or both of the scale approaches, whether inclined or level, are below the plane of the scale platform, the derived weight value will be less than the true value in all cases in which the center of gravity lies above the plane of the axles.

3. If either or both of the approaches, whether inclined or level, are below the plane of the scale platform, the error for a truck of given

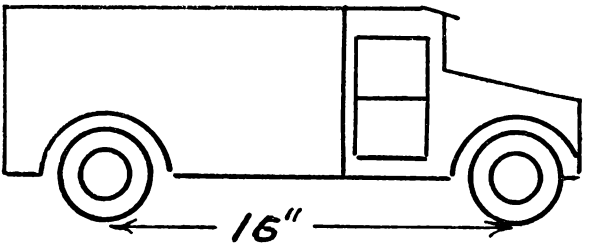

FIGURE 5.

wheel base will be in proportion to the height of the center of gravity above the axles; if the center of gravity lies below the plane of the axles, as it may in the case of a truck with "underslung" body, the error will be of opposite sign; if the center of gravity happens to lie in the plane of the axles there will be no error.

4. If either or both of the approaches are level but below the plane of the scale platform, the error for a truck of given weight, other things being equal, will be greater with a short wheel base truck than with a long wheel base truck; conditions will largely be reversed in the case of inclined approaches.

5. For given conditions of truck position, loading, and wheel base, the amount of error will be in proportion to the gradient of the approaches or to the amount by which the approaches are below the plane of the scale platform.

6. In any case the amount of error will be independent of the load distribution on the axles so long as this remains unchanged during both weighings.

To illustrate some of the effects which low scale approaches may have upon the derived net weight of a motor-vehicle load when the

[1] It is assumed that the front wheels of the truck will be run onto the scale platform for the first weighing, and that for the second weighing the truck will then be advanced until the front wheels are off the platform and on the approach at the opposite end.

gross and the tare weights are obtained by the two-draft method of weighing, some of the experiments of demonstration I were duplicated with a small model of a two-axle truck (see fig. 5). The model represents generally the features of a conventional motortruck, except that it is without chassis springs, power plant, and power-transmission elements. The material used to load the truck during the experiments consisted of a metal block so designed that the height of its center of gravity above the axle plane could be changed readily. The weight of the empty truck was 8.61 pounds; the weight of the loaded truck was 18.08 pounds.

Experimental data for the gross and tare weighings of the truck model are presented as demonstration II.

DEMONSTRATION II.—EFFECTS OF LOW APPROACHES ON WEIGHING OF TRUCK BY TWO-DRAFT METHOD

1. Truck empty.

   a. Approaches level with scale platform.

Front-end weight	3. 67 lb.	
Rear-end weight	4. 94 lb.	
	8. 61 lb.	True tare weight of empty truck.

   b. Approaches ½ inch below plane of scale platform.

Front-end weight	3. 62l b.	
Rear-end weight	4. 91 lb.	
	8. 53 lb.	Apparent tare weight of empty truck. Error −0.08 lb, or −0.9 percent.

2. Truck loaded, low center of gravity.

   a. Approaches level with scale platform.

Front-end weight	4. 63 lb.	
Rear-end weight	13. 45 lb.	
	18. 08 lb.	True gross weight of loaded truck.

   b. Approaches ½ inch below plane of scale platform.

Front-end weight	4. 53 lb.	
Rear-end weight	13. 35 lb.	
	17. 88 lb.	Apparent gross weight of loaded truck. Error −0.20 lb, or −1.1 percent.

3. Truck loaded, high center of gravity (same load).

   a. Approaches level with scale platform.

Front-end weight	4. 65 lb.	
Rear-end weight	13. 43 lb.	
	18. 08 lb.	True gross weight of loaded truck.

   b. Approaches ½ inch below plane of scale platform.

Front-end weight	4. 50 lb.	
Rear-end weight	13. 28 lb.	
	17. 78 lb.	Apparent gross weight of loaded truck. Error −0.30 lb., or −1.7 percent.

The significance of the data of demonstration II becomes apparent when these are interpreted in terms of the net-weight values which

would be derived from the gross- and tare-weight values obtained under differing conditions of approach alinement. For example, it is evident that the following tare- and gross-weight values might have been obtained with the model under certain conditions:

From demonstration II, items 1 and 3.

Approach alinement		Observed weight, in pounds	
1st draft	2d draft	Tare	Gross
(a) Level	Level	8.61	18.08
(b) Low	Level	8.56	17.93
(c) Low	Low	8.53	17.78

Since the above weight values for tare and for gross might have been obtained under differing conditions, the derived net-weight values might conceivably be any of the following and in error by the percentages indicated.

Approach alinement		Derived net weight	Error	
Tare	Gross			
		Pounds	*Pound*	*Percent*
(c)	(a)	9.55	+0.08	+0.8
(b)	(a)	9.52	+.05	+.5
(a)	(a)	9.47	.00	.0
(c)	(b)	9.40	−.07	−.7
(b)	(b)	9.37	−.10	−1.1
(a)	(b)	9.32	−.15	−1.6
(c)	(c)	9.25	−.22	−2.3
(b)	(c)	9.22	−.25	−2.6
(a)	(c)	9.17	−.30	−3.2

In addition to the effects which may be contributed solely by low-approach conditions and which already have been discussed, the weight value derived by the two-draft weighing of a motortruck may be influenced by certain secondary factors which include: (1) Load shifts occurring between the weighings of the individual drafts and caused either through change in the relative positions of an axle and the truck body or through changes in position of the transported load; (2) the use of brakes, transmission gears, or wheel chocks to hold the truck wheels on an inclined approach; (3) differences in the positioning of the truck wheels on an inclined approach. The results of some incidental experiments performed with the motortruck model to illustrate the probable effects of some such secondary factors are presented as demonstration III.

DEMONSTRATION III.—SECONDARY EFFECTS CONTRIBUTED BY MISCELLANEOUS CONDITIONS

1. Truck loaded, gross weight 18.08 lb. Level approach.
   a. Front wheels of truck moved from different directions to definite position on scale platform.
   Direction of motion when stopped:

	Indicated weight of front end	
Forward	4. 65 lb	------
Backward	------	4. 52 lb
Forward	4. 63 lb	------
Backward	------	4. 49 lb
Forward	4. 59 lb	------
Backward	------	4. 55 lb
Mean indication for given direction	4. 62 lb	4. 52 lb
Difference due to direction (mean)	0. 10 lb	(max) 0. 16 lb
Difference in percent of gross load	0. 6%	0. 9%

   b. Load shifted ¼ inch forward between drafts.

Front-end weight before load shift	4. 64 lb
Rear-end weight after load shift	13. 25 lb
Apparent gross weight	17. 89 lb. Error −0.19 lb, or −1.1 percent.

2. Truck loaded, gross weight 18.08 lb. Approach sloping upward to scale platform level at 3-percent gradient.
   a. Front wheels on scale, rear wheels at different positions on inclined approach.

Position of rear wheels	Indicated weight of front end
1. 2 inches from scale deck and chocked	4. 43 lb
2. 8 inches from scale deck and chocked	4. 29 lb
Difference due to change of position on grade.	0. 14 lb, or 0.8 percent of the gross weight.

   b. Front wheels on scale, rear wheels on inclined approach, 8 inches from end of scale.

Method of holding truck	Indicated weight of front end
1. Rear wheels chocked	4. 42 lb
2. Front wheels chocked	4. 51 lb
3. Rear wheels braked [1]	4. 31 lb

   c. Rear wheels on scale, front wheels on inclined approach, 8 inches from end of scale.

Method of holding truck	Indicated weight of rear end
1. Front wheels chocked	13. 48 lb
2. Rear wheels chocked	13. 53 lb
3. Rear wheels braked [1]	13. 45 lb

With regard to the data of demonstration III and to the question of their being applicable to actual circumstances of motortruck weighing, it will be repeated that the experimental data are offered as general qualitative illustrations and are not to be applied directly in quantitative terms. In the former sense they suggest certain probable secondary sources of error or variation when a truck is weighed by the two-draft method, namely:

[1] To simulate the effects introduced by braking one pair of wheels to hold a truck on an inclined approach, holes were drilled through the rear wheels of the model and a slender rod inserted through these holes to transmit to the frame the force exerted by the wheels.

1. The indicated weight of either draft may vary according to the direction from which the truck wheels are applied to the scale platform. In the case of the model employed, the variations are attributed to slight shifts of the axles in their bearings; although the axle bearings of a motortruck are so designed that identical shifts are highly improbable, it is conceivable that shifts of the body relative to the axles may occur, as spring shackles, bolster connections, and axle yokes become worn.

2. Shifts of the load within the truck body, caused by starting or stopping the truck after weighing the first draft, may contribute error to the derived weight value.

3. When the scale approaches are inclined upward toward the level of the scale platform, the amount of error caused by the approach alinement condition will be less when each axle load is weighed with the other axle load as near as practicable to the scale platform, thus reducing to a minimum the amount by which the "off-scale" wheels lie below the plane of the platform. (The conclusion stated is predicated upon consistent weighing performance of the scale regardless of the position of the load on the platform.)

4. Chocking the truck wheels to hold them on an inclined approach, although in theory this should not affect the reaction at either axle, may cause weight variations because of induced minor changes in the relative positions of axle and truck body.

5. If the rear wheels of a truck rest upon an inclined approach and are braked while the front wheels are being weighed, the indicated weight value will be affected by the resulting change in the front axle reaction.

Some other secondary sources of error and variation which have not been investigated experimentally but which may be mentioned are: Engagement of the truck transmission gears and clutch to hold the truck on an inclined approach while either draft is being weighed, operation of the truck engine and clutch during the weighing of either draft, and increased spring deflection and tire compression at one end of a truck when the other end is being weighed on a scale with inclined approaches.

Another factor which was not investigated experimentally, and which it is believed may be the cause of very considerable errors, is the probable constraint of scale parts as the scale platform is thrust toward one end and held in this position by the application of brakes or chocks to the off-scale wheels.

To summarize consideration of the secondary factors and their probable effects it may be stated that the errors or variations which they may cause will be independent of those contributed by the previously discussed low-approach conditions. The extent to which the former may combine with the latter to produce compound errors of considerable magnitude is a matter of serious concern. The probability that the effects of various factors may be so mutually mitigative as to produce no appreciable error seems too vague to warrant serious consideration.

To conclude discussion of two-draft weighing so far as motortrucks are involved, it will suffice to say that the evidence indicates the practice to be generally unreliable as a method for accurately determining the weight of motortruck loads.

In the case of the tractor-semitrailer unit, there are two methods which may be employed to establish a tare or gross weight value for

the combination by the two-draft weighing procedure. What may be denominated as method 1 is to weigh the front tractor wheels in one draft, and the trailer and rear tractor wheels in the other draft. What may be denominated as method 2 is to weigh the entire tractor in one draft and the trailer wheels in the other draft.

On the basis of theoretical consideration, it is to be anticipated that when the approaches are level with the scale platform, the two methods will yield substantially the same total weight value. It would appear, however, that under the circumstances prevailing in many commercial installations, method 1 is the preferred procedure, for the indicated weight values will not be materially affected by changes in the trailer-axle reaction such as would be caused, for example, by a shift in the position of the load within the trailer body, and they will not be so seriously affected by approaches which are not in the plane of the scale platform, for the major portion of the total load, resting on the middle and rear axles, will be weighed while level on the scale platform.

Experimental investigation of factors which may affect the weighing of tractor-trailer combinations by the two-draft method was confined to some experimental study with a small model of a semitrailer combination (see fig. 6). The model consists of a two-axle tractor which

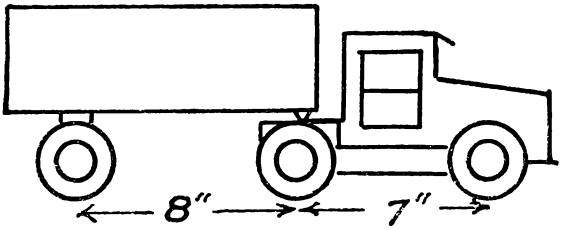

FIGURE 6.

draws and partially supports a one-axle trailer. The two units comprise a three-axle vehicle with a so-called "fifth-wheel" bearing located above and slightly forward of the middle axle. Experiments generally similar to those performed with the truck model were conducted, but no experimental study was made to determine the effects which might be introduced by braking either unit of the combination. The resulting data, presented below as demonstration IV, illustrate (1) the two methods by which a semitrailer combination may be weighed in two drafts, (2) the manner in which the weighing, by either method, may be affected by change in the axle-load distribution, and (3) the effects which may be introduced by low approaches.

DEMONSTRATION IV.—TWO-DRAFT WEIGHING OF SEMITRAILER COMBINATION

Applied load	Indicated weight in pounds
1. Approach level; trailer empty. Combined tare weight 6.30 pounds.	
Front tractor wheels	1. 50
Trailer and rear tractor wheels	4. 76
Tare weight by method 1	6. 26
Both tractor wheels	3. 89
Trailer wheels	2. 41
Tare weight by method 2	6. 30

Applied load	Indicated weight in pounds
2. Approaches level; trailer loaded. Combined gross weight 15.77 pounds.	
Front tractor wheels	1. 49
Trailer and rear tractor wheels	14. 26
Gross weight by method 1	15. 75
Both tractor wheels	6. 32
Trailer wheels	9. 42
Gross weight by method 2	15. 74
3. Approaches level; same load on trailer.	
Front tractor wheels	1. 49
Front tractor wheels (load shifted ¼ inch forward in trailer)	1. 49
Change due to load shift	0. 00, or 0.0 percent of gross.
All tractor wheels	6. 32
All tractor wheels (load shifted ¼ inch forward in trailer)	6. 65
Change due to load shift	0. 33, or 2.1 percent of gross.

4. Approaches ½ inch below plane of scale platform.

	Tare	Gross
Front tractor wheels	1. 54	1. 61
Trailer and rear tractor wheels	4. 74	14. 22
Values by method 1	6. 28	15. 83
All tractor wheels	3. 81	6. 12
Trailer wheels	2. 03	9. 40
Values by method 2	5. 84	15. 52

NOTE.—The differences between tare weights and between gross weights, as determined by the two methods (items 1 and 2 above), are considered to be attributable to accidental shifts of the axles or of the "fifth-wheel" bearing of the model.

The data for items 1, 2, and 3 in demonstration IV are seen to corroborate reasonably the theoretical conclusions for the case of approaches level with the scale platform.

The effects which low-scale approaches may have upon the tare- and gross-weight values when either method of weighing is employed are illustrated by the data of item 4 in demonstration IV. It will be obvious from analysis of the data, that the derived net weight of the model load value might vary, as indicated below, according to the method by which the gross- and tare-weight values were obtained. (In this connection, it may be mentioned that, under conditions of actual practice, the tare and gross weighings may be performed on different scales, on different days, and by different parties.)

From demonstration IV, item 4.

Weighing method	Indicated weights		Derived net weights
	Tare	Gross	
	Pounds	*Pounds*	*Pounds*
Tare by 1, gross by 2	6. 28	15. 52	9. 24
Tare by 1, gross by 1	6. 28	15. 83	9. 55
Tare by 2, gross by 2	5. 84	15. 52	9. 68
Tare by 2, gross by 1	5. 84	15. 83	9. 99

Since the true net weight of the load was 9.47 pounds, it is indicated that, depending upon the circumstances under which the tare and gross weights were derived, the value obtained for the net weight might be in error by amounts ranging from −0.23 to +0.52 pound, or from −2.4 to +5.5 percent.

Unquestionably, the fundamental conclusion to be drawn from the studies reported upon herein is that the two-draft method of weighing vehicles is too fraught with elements of uncertainty to be a satisfactory means for determining the weight values of transported loads.

Certain measures, whereby the errors contributed by some of the conditions which have been studied may be eliminated or minimized, suggest themselves. For example, in weighing trucks on scales with inclined approaches, the wheels resting on the approach should be as near as practicable to the scale platform. Care should be taken to prevent shifts of load between draft weighings. On inclined approaches the vehicles should be held by chocks rather than by brakes or gears. If either approach to a scale is level with the scale platform, both drafts should be weighed at that end of the scale. Semitrailers should be weighed while disconnected from their tractors; this may be accomplished by supporting the front end of the trailer either on the drop wheels provided or upon some other suitable object. If it be entirely impracticable to disconnect the semitrailer from its tractor, the weighing should be conducted according to method 1; that is, the front tractor wheels should be weighed in one draft, and the trailer and rear tractor wheels should be weighed in the other draft. However, these measures will necessarily be of merely palliative character and of limited effectiveness. Ultimate remedy will lie in provision of scales of sufficient length to allow single-draft weighing of all vehicles. Next in order of practicability and effectiveness as a remedial measure will be provision, at each end of the scale, of approaches having permanent level alinement with the scale platform.

To conclude it will be said that parties or agencies to whom this subject is of direct interest should undertake to collect, by independent investigation under actual conditions of practice, information which may supplement this preliminary study and which will indicate the extent to which the conclusions suggested by theory and experiment are applicable to practical circumstances.

Mr. JENSEN. Your opinion in regard to weighing these long trailers and trucks is that it is almost an impossibility to secure a proper weight by making a two-draft weighing; in other words, you would not advise weighing them that way.

Mr. RICHARD. I personally would not.

Mr. BAUCOM. What are we going to do about it?

Mr. RICHARD. One solution that has been suggested is to use the drop-wheels on trailers so equipped. The tractor can be disconnected and the weight of the trailer alone can be taken.

The CHAIRMAN. The next paper describes the methods which the Bureau employs in testing and inspecting vehicle scales, as a result of the somewhat gradual development since this work was started. This paper will be presented by Mr. Horton, the engineer in charge of the Bureau Vehicle-Scale Testing Unit. Following Mr. Horton's remarks Mr. Crouch, the other engineer on duty with this unit, will make running comments during the showing of the moving picture film illustrating the test of vehicle scales by the Bureau. This is the equipment which you saw in operation last year.

METHOD OF TEST AND INSPECTION OF VEHICLE SCALES DEVELOPED BY THE NATIONAL BUREAU OF STANDARDS

By C. F. HORTON, *National Bureau of Standards*

The method employed in testing scales with the Vehicle-Scale Testing Unit of the National Bureau of Standards is being set out herein, since it is felt that the subject of test methods in the case of this type of scale is one of increasing importance. Many States and local jurisdictions are acquiring equipment utilizing an adequate test-weight load, and such equipment should be used to the best advantage.

The Bureau method has been developed over a period of time with the object in view of demonstrating the type of test best adapted for an accurate and thorough check of the performance of a vehicle scale, under such loads and with such distributions of load as are likely to be encountered in service. Necessarily, the number of such loads applied during a test must be limited to an essential minimum in order that an excessive amount of time will not be taken for each test.

Preliminary inspection of scale.—In testing vehicle scales with a large load of heavy test weights, and especially when a heavy strain load is used in combination with these, it is, of course, important to make certain that the scale to be tested is sufficiently strong to stand the total load to be applied during the test. If there is doubt that the foundation, weighbridge structure, or lever system may be strong enough to stand a test to the rated capacity of the scale, it is best to inspect these parts before making the test, and if necessary, then so to limit the applied load that the scale will safely support it.

Testing equipment.—The National Bureau of Standards Vehicle-Scale Testing Unit consists of a three-axle dual-tired tandem-drive motortruck of approximately 40,000 pounds maximum gross weight, carrying 15 1,000-pound test weights, two sets of smaller weights, and the tools and accessories necessary in the operation of the equipment. The 1,000-pound weights are handled three at a time by a horizontal-boom crane, fully power-operated by power take-off from the truck engine. After the weights are unloaded from the truck, they are handled by means of a conventional two-wheel rubber-tired cart, which can be easily manipulated on a smooth and level surface by one man.

One of the small sets of weights carried as part of the equipment is a set totaling 100.5 pounds, including three 20-pound, two 10-pound, two 5-pound, four 2-pound, two 1-pound, and one ½-pound weights. This set of weights is used on the scale platform for determining scale errors by the balancing-weight method, the first step in the test of a vehicle scale being to place 50 pounds of these weights on the platform and then to balance the scale with all indicating elements set at zero. This permits the determination of errors throughout a range of plus or minus 50 pounds, by manipulation of the balancing weights. On most vehicle scales, except automatic-indicating scales having 20-pound minimum graduations, or very insensitive beam scales, errors are determined with the balancing weights to the nearest pound.

The other small set of weights is a set of Monel-metal counterpoise test weights. The counterpoise test weights are used on the weigh-beam counterpoise hangers during the regular test of beam scales designed for use with removable counterpoise weights. The counterpoise weights supplied with the scale are then checked for accuracy by means of an equal-arm, portable balance sensitive to ½ grain. The

counterpoise test weights are specially adjusted to one-fifth class C tolerances for this purpose.

General test procedure, 0 to 15,000 pounds.—The normal procedure in testing a beam scale of 20-ton motortruck capacity is this: First, the zero-load balance of the scale is noted; 50 pounds of balancing weights are then placed on the platform, and the scale is rebalanced with all indicating elements set at zero. The zero-load sensibility reciprocal is then determined by adding the required number of small weights to the platform. The 1,000-pound weights are then lowered in groups of three to the platform, readings generally being taken at 3,000, 9,000, and 15,000 pounds. The weights are applied as nearly symmetrically as is practicable with respect to the longitudinal center line of the platform, so as to give a balanced end test. Next, the test weights are shifted to an approximately distributed load over the platform, usually this being most conveniently accomplished by shifting eight test weights down to the second end of the scale, leaving seven weights at the first end. After taking a reading at this load, an SR determination is also made. Then the remaining test weights are shifted down to the second end of the scale, and a reading is taken at 15,000 pounds; readings are also taken at 9,000 and 3,000 pounds as the test weights are removed from the platform and placed in such positions, in groups of three, that they may readily be loaded into the test truck.

A reading is taken on the main bar of the weighbeam at all of these loads, and in addition, readings are taken on the tare bar, if the weighbeam is equipped with a tare bar, at two points, preferably at or near capacity of the tare bar, and at some intermediate load. For a tare bar of a capacity of 15,000 pounds or more, the points at which readings are usually taken are 3,000 and 15,000 pounds.

If the scale has a fractional bar of 1,000-pound capacity (or 990 pounds, as is usually the case if the scale has a type-registering weighbeam) the fractional poise is checked directly against a 1,000-pound load on the platform. Scales having 500-pound fractional poises are checked at any of the regular test loads by checking the main fractional poise against a main-bar notch, and the tare fractional poise against a tare-bar notch.

General test procedure, strain load.—After the test weights are removed from the scale the zero balance is checked; then the empty test truck is driven on the scale for a strain load. No attempt is made to use the test truck as a standard test-weight load, since large variations in its weight will occur, because of variations in the quantity of gasoline in the tanks, dirt on the wheels and chassis, tire wear, and change in the amount of baggage. The test truck is used simply as a heavy strain load, and its only change in weight during a strain-load test will be due to the amount of gasoline consumed in reversing the truck on the scale, and in loading the test weights into the truck. The weight of gasoline consumed during these operations is accurately determined by running the engine on gasoline drawn from a special 22½-pound capacity compartment built in one of the regular gasoline tanks. This compartment is equipped with a gage glass calibrated in pounds, so that the total amount of gasoline consumed during the strain-load test is readily determined by the difference in the gage readings taken at the beginning and at the end of this test. The weight of gasoline consumed in this procedure is from 3 to 5 pounds in most cases.

On scales of 20- to 24-foot platform length, the test truck is balanced out in two positions, with the rear axle at either end of the scale. With the empty truck balanced out as a strain load on the scale, the test weights are then loaded into the truck, thus, in effect, reapplying the 15,000-pound test-weight load to the scale, which carries the total load on the scale up very close to its capacity of 20 tons. The scale error at this load, that is, the error of the scale in registering the net load of 15,000 pounds which has been added to the strain load, is determined. An SR reading is then taken, then the truck is reversed on the scale and the reading for scale error with the rear axle at the other end of the scale is taken.

On scales over 24 feet in length and less than 34 feet in length, it is desirable to make strain-load tests with the rear axles as near the center of the platform as possible, in addition to the two spots with the rear axle at each end of the platform. In such tests, the truck is balanced out in four different positions, as follows: First, with the truck rear axle at first end of scale; second, with the truck moved forward until the front axle is at the second end of the scale, at which position the rear axle will be at some point intermediate between the center of the scale and the first end of the scale; third and fourth, these same two relative positions of the truck, respectively, except that the truck is reversed.

On scales with platform lengths of 34 feet or longer, it is possible to place the rear axles at the center of the platform, hence only three positions are utilized for the strain load, right, left, and center. The "center" position strain load may be made with the front of the truck either to the right or left. It is important, however, that for all strain-load observations, the truck be placed in as nearly as practicable the same positions loaded as it was when balanced out in the various positions empty.

The strain-load test with rear axle at or near the center of the platform of long-platform scales is particularly valuable in finding the source of errors of such scales as have defects in weighbridges, faulty weatherguard installations, and, in some cases, faults in the lever system also.

Since a platform length of at least 20 feet is required for the test truck, it is not used as a strain load on scales having a platform length of less than 20 feet. In such cases, any available heavy short-wheel-base truck is utilized, the weights being loaded on the scale either with the crane or by means of the handling cart. A scale with insufficient overhead clearance for the test truck requires a similar procedure, though the crane cannot of course be used for reapplying the test weights.

At the conclusion of every test the zero balance is checked.

Modification of procedure for automatic-indicating scales.—On automatic-indicating scales of the dial type, the above procedure is modified in several ways. In order to check the accuracy of the dial mechanism adjustment throughout the range of the dial, it is necessary to add the test weights to the platform one at a time up to the dial capacity, taking readings at each of these loads. The first unit weight is then checked, after which test weights are added in increments equal to the dial capacity, thus checking each unit weight up to the available test load of 15,000 pounds. The strain load is then applied, and the test weights are loaded into the test truck, also in increments equal to the

dial capacity, thereby checking all unit weights, so far as practicable, directly against test weights on the platform.

On beam-type scales equipped with automatic-indicating devices, the testing procedure is the same as with the usual beam-type scale, except that a reading of the device, as well as a beam reading, is taken at every load within the capacity of the device, the device serving simply as a balance indicator in the case of all readings taken on the beam.

Modification of procedure for wagon scales.—Wagon scales are usually tested with the test weights only, strain loads not ordinarily being required. Wagon scales are never tested with an end loading exceeding 50 percent of the capacity of the scale. For convenience in handling the weights in groups of three, the end loading utilized on a 20,000-pound wagon scale is generally limited to 9,000 pounds. In no case is the total test load carried materially beyond the rated capacity of the scale, even though in the case of some wagon scales the motortruck loads weighed in service on these scales have far exceeded the motortruck ratings, and in some instances even the wagon ratings.

Inspection.—Whenever practicable, after each test, a complete inspection of the scale is made. In this inspection, the general condition of the lever system, foundation, weighbridge structure, and foundation for the indicating elements is checked; inspection is made for dirty, worn, or rusted pivots and bearings, binds of any kind, out-of-plumb connections, out-of-plumb bearing assemblies, loose levers, loose or incorrectly positioned fulcrum stands, incorrectly alined ball-check plates, out-of-level levers, loose extension arms on torsion levers, and close clearances at any part of the scale. Of course, any accumulation of foreign matter in the pit is noted. The weighbeam assembly is checked to see that it is rigidly mounted, this being especially important on scales of the automatic-indicating type or those equipped with an automatic-indicating attachment. The weighbeam assembly is checked for level, for cleanliness, particularly of the notches and poises, for worn or battered poises and stops, for worn notches or pawls, and for a weak or broken pawl spring in the main poise.

In each inspection the performance of the scale, as shown by the test, is kept in mind since this, of course, aids in finding the faulty conditions which adversely affect the weighing performance of the scale. The strain-load test is frequently of particular value in indicating faulty conditions of the pivots and bearings, faulty foundations, faulty weighbridge structure, and, especially on automatic-indicating scales, weak or sagging foundations for the indicating elements.

Field records.—All test observations are recorded on a test-record form. An inspection-record form is used for recording all essential data about the scale, its make, type, capacity, capacities of the various indicating elements, platform size, type of lever system, type of foundation, as well as any faulty conditions found during the inspection.

General considerations.—For the efficient operation of a vehicle-scale test truck such as the one operated by the National Bureau of Standards, two men are required. With this equipment it is usually possible to make the complete test of a 20-ton motortruck scale in approximately 1 hour. Smaller scales require much less time for the test, usually from 25 to 45 minutes if a strain-load test is not required.

These periods of time do not, of course, include the time required for a complete inspection in the scale pit, which will require an additional period of from 10 to 30 minutes. The time required for a pit inspection is largely determined by the accessibility of the lever system. Unfortunately, at the present time there are relatively few vehicle scales which have what could be called satisfactory accessibility.

Safety considerations are of prime importance in operating a large-capacity scale-testing equipment. Caution should always be exercised in handling heavy test weights. Special attention is exercised to see that no one gets too close to, or under, the test weights, and to see that no one stands between them and the side of a building or other fixed object while they are being handled by the crane. The tackle bar used for hoisting three weights at a time is so arranged that it is not necessary to touch the hooks with the hands when engaging or disengaging the weights—this is an important safety measure, since it minimizes the possibility of injury to the fingers or hands. "Safety First" is a watchword which, perhaps needless to say, is always followed.

(Following the presentation of the above paper, there was shown a motion picture of the test of a vehicle scale by the National Bureau of Standards Vehicle-Scale Testing Unit. During the running of this film, Ralph W. Crouch, Jr., a member of the staff of the Bureau, made appropriate explanations.)

DISCUSSION OF ABOVE SUBJECT

Mr. JENSEN. I would like to ask if it would be possible for you to give us copies of the blank forms that are used in the field so that we might use them as models in making our field tests.

Mr. HOLBROOK. I think that can be arranged.

Mr. BAUCOM. How long does it take to test a large scale, say of about 20 tons?

Mr. CROUCH. It takes from 1 to 1¼ hours.

Mr. HARRINGTON. How much time is given to the last inspection?

Mr. CROUCH. Quite a bit.

Mr. ALFREY. Do you use your last check on balance in calculating your error?

Mr. CROUCH. We have not been doing so.

Mr. FULLEN. Where a scale is not balanced or where it has been tampered with, you would tie it up and prosecute? Would you require that it be repaired?

Mr. CROUCH. The only thing we can do is to report conditions to the State man. It is up to him to decide whether to tie it up.

Mr. WOODLAND. You do not make any routine inspections for a State?

Mr. CROUCH. No.

The CHAIRMAN. Gentlemen, a number of you have met these young men in your various jurisdictions, and you have extended to them every courtesy. I would like to express my appreciation of that tact at this time. They are going on with this work, and during the course of the next year I hope that a number of additional officials will get acquainted with their work in their own States.

REPORT OF COMMITTEE ON PROPOSED FEDERAL LEGISLATION TO PROVIDE ASSISTANCE FOR THE STATES IN ADMINISTRATION OF WEIGHTS AND MEASURES LAWS, PRESENTED BY JOHN P. McBRIDE, CHAIRMAN

Gentlemen: Your Committee met on May 31 and after consideration and discussion agreed to ask interested members of the Conference to appear at an open meeting of the Committee to be held from 5:30 to 7 p. m., on June 1, to offer suggestions and comments to assist your Committee in arriving at the basis of its report.

On June 1 your Committee held an open meeting in accordance with the decision to receive comments.

After further consideration and discussion your Committee unanimously adopted a motion to request the Conference to continue this Special Committee for another year to enable it to secure more complete information from the several States in order to report fully to the Conference at the next regular annual session in 1939.

(Signed) JOHN P. McBRIDE, Massachusetts, *chairman*,
J. H. MEEK, Virginia,
ROLLIN E. MEEK, Indiana,
CHARLES C. READ, New Jersey,
W. P. REED, Atlanta, Ga.
FRANK L. HAMMON, Idaho,
S. T. GRIFFITH, Baltimore, Md., *acting secretary*.

DISCUSSION OF ABOVE REPORT

Mr. HOLBROOK. Mr. McBride, could you tell us in brief what the bill is all about? It was printed in the last Conference report, but some delegates may not have it in mind.

Mr. McBRIDE. The bill proposes that the Congress shall appropriate a sum of money and that allocation of certain sums shall be made to the several States which may qualify to receive that money. One of the qualifications would be that the States would themselves appropriate an amount of money equal to what they might expect to be allocated to them. The determination of the eligibility of the States to participate would be by the Secretary of Commerce in accordance with a procedure set out in the bill. Several conditions were set up: The participating States would have to have a State weights and measures law, they would have to be active in enforcing it, and the guide of conduct would be the specifications, tolerances, and regulations as adopted by this Conference if and when the specifications so adopted were approved and published by the National Bureau of Standards.

The bill provides that the method of voting at this Conference will be determined on a population basis with a minimum voting right to each State of three votes; for each additional million of population a State would have one additional vote.

In brief, I think that covers the salient features of the bill.

Mr. CULLEN. Mr. Chairman, I wish to make a motion that the Committee be continued for another year, with thanks for the work they have done.

(The motion was seconded, and the question was called for.)

The CHAIRMAN. You have heard the motion. I am going to ask for a rising vote. Those in favor of this motion please rise. The secretary will please count the number voting.

Mr. HOLBROOK. May we have tellers on this, Mr. Chairman?

The CHAIRMAN. I will appoint Edward R. Fisher of Rhode Island, and Arden A. Reed of Oregon, to act as tellers.

Mr. CULLEN. Is there any necessity of counting the vote with such a great number standing?

The CHAIRMAN. Will the opposition please rise? No one rising, the motion is unanimously carried.

REPORT ON THE TESTING OF VEHICLE SCALES BY THE NATIONAL BUREAU OF STANDARDS IN COOPERATION WITH THE STATES

By RALPH W. SMITH, *National Bureau of Standards*

The National Bureau of Standards inaugurated its program of vehicle-scale testing in cooperation with State and local weights and measures officials in November 1936. For somewhat detailed accounts of the purposes of this program, of the Bureau's testing unit, and of the general plans under which the work is carried on, reference may be made to the Reports of the Twenty-sixth and Twenty-seventh National Conferences on Weights and Measures.

A year ago there was presented to the National Conference a report upon the results of the Bureau's tests of vehicle scales, covering the period from the beginning of the work to May 19, 1937. During that period, cooperative testing schedules had been completed in five States—Virginia, North Carolina, South Carolina, Georgia, and Florida.

With this present report on the vehicle-scale testing service of the Bureau, it is proposed to inaugurate a series of reports, to be issued in succeeding years, each of which will summarize results in this field from the beginning of the service, and will include such analysis, comments, and recommendations as may be considered timely and appropriate. It is believed that this plan will provide more informative data than separate reports on each year's work, because the work will continually be prosecuted in new territory and hence the results of one year's testing will never be directly comparable with the results of another year's work, as would be the case were the same territory being covered year after year. The present report, therefore, is concerned with a study of the results of the Bureau's tests of vehicle scales for the period November 1936 to May 1938, and related matters.

Testing schedules have been completed in 16 States—Virginia, North Carolina, South Carolina, Georgia, Florida, Maryland, Delaware, Rhode Island, Maine, New Hampshire, Vermont, New York, Alabama, Mississippi, Louisiana, and Tennessee. The cooperating officials have been officers exercising full or limited weights and measures powers in all but two of the States enumerated; in Mississippi and in Louisiana the Governors designated the State Department of Agriculture and the Department of State Police, respectively, as the cooperating agencies.

Some few State-owned scales were tested in Connecticut and New Jersey, and a few Federal scales were tested in Massachusetts and Pennsylvania; no commercially owned scales were tested in these four States, since the States were already, or were about to be, equipped with adequate testing equipment of their own, and no work by the Bureau's unit was needed.

There have now been made well over 1,000 tests of vehicle scales. Of this number, 46 tests have been of scales owned by the Federal Government. Arrangements are made to test, with the Bureau's equipment, Federally owned vehicle scales located in the territory traversed; since, however, such tests are not included in the State schedules and the scales are not subject to supervision by weights and measures officials, data on these tests are not included in this report.

It should be stated that a very few scales have been tested twice, and that for statistical purposes each such retest has been treated as though made on a scale not previously tested.

This report, then, is concerned with a study of the results of tests made by the Bureau on scales owned by States, cities, towns, counties, and commercial agencies. The number of tests involved is 967. Of these 967 scales, 433 scales, or 45 percent, were of the wagon type, and 534 scales, or 55 percent, were of the motortruck type; 205 scales, or 21 percent, were equipped with dials or with automatic-indicating devices having a substantial weighing range; 27 scales, or 3 percent, were equipped with over-and-under indicators carrying weight graduations; and the total of the two groups having automatic indication of weight of whatever extent comprised 232 scales, or 24 percent of those tested.

Accuracy.—Statistical data are presented in the table which follows, scales being separated first upon the basis of their type, and second upon the basis of ownership or principal use. The mean percentage errors are computed from maximum percentage errors developed in the tests, regardless of the size or position of the test-weight load. Scales are classified as accurate or inaccurate upon the basis of the tolerances adopted by the National Conference on Weights and Measures for used scales which, in general, may be said to be ± 0.20 percent, applied to errors of the scale indications with respect to the standard-weight loads used.

TABLE 1.—*Vehicle-scale test results, November 1936 to May 1938*

Type, ownership, or use	Number tested	Found accurate		Found inaccurate		Numerical mean of maximum percentage errors
		Number	*Percent*	*Number*	*Percent*	
Wagon scales	433	76	17.6	357	82.4	1.41
Motortruck scales	534	138	25.8	396	74.2	1.04
State, city, town, or county	67	13	19.4	54	80.6	.68
Coal or coke	582	125	21.5	457	78.5	1.16
Cotton or cotton products	129	35	27.1	94	72.9	1.38
Farm products, including fruit and sugarcane	62	18	29.0	44	71.0	.33
Scrap materials	56	6	10.7	50	89.3	2.18
Stone, sand, or gravel	16	2	12.5	14	87.5	1.93
Public weighing	9	2	22.2	7	77.8	.88
Miscellaneous	46	13	28.3	33	71.7	1.16
Total	967	214	22.1	753	77.9	1.20

Table 1 discloses that of the 967 vehicle scales covered by this report only about 2 out of 9 were found to be accurate, and that the mean of the maximum percentage errors of all of these scales was 6

times the basic tolerance allowable. Less than 1 out of 5 of all wagon scales were accurate, the mean percentage error of this group being about 7 times the basic tolerance; of the motortruck scales only 1 out of 4 were accurate, the mean percentage error of this group being more than 5 times the basic tolerance. In the case of scales used for particular purposes, as many as 7 out of 8 were found inaccurate in each of 2 groups, and the mean percentage error of one of these groups was nearly 11 times the basic tolerance.

Test data are presented graphically in figure 7, the graph being divided into two parts. On the upper portion of the graph are

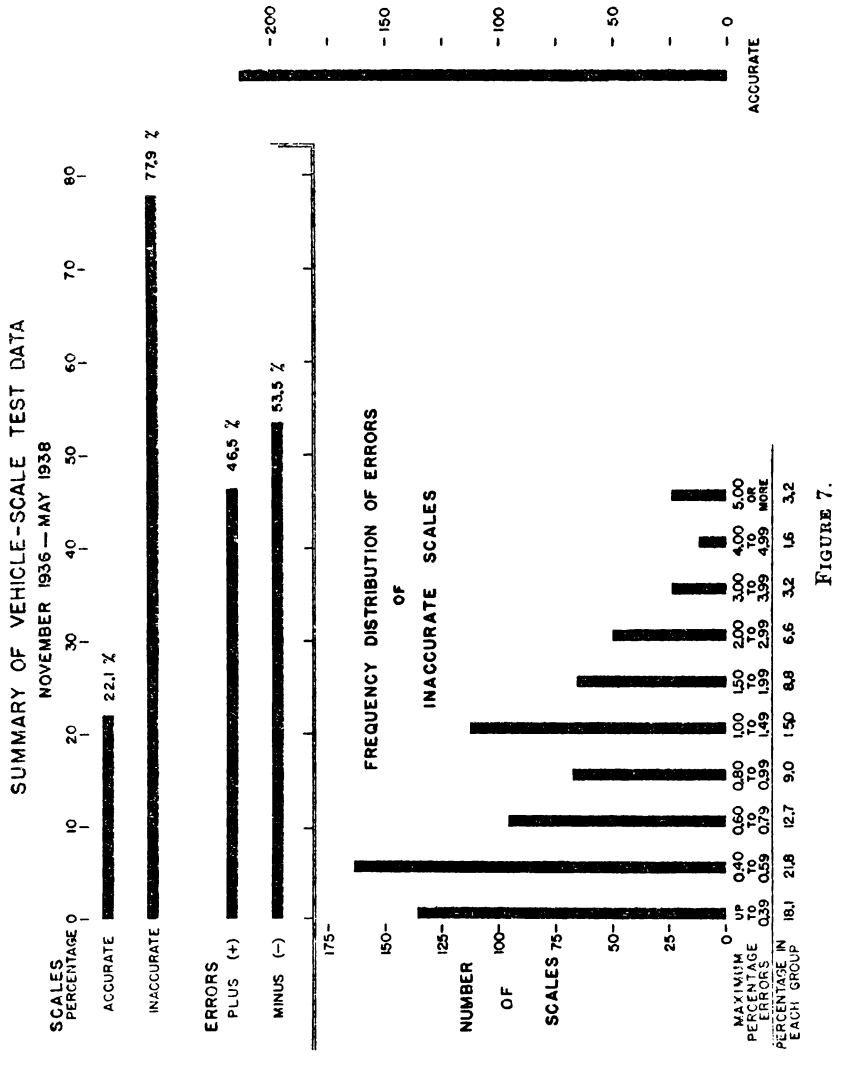

FIGURE 7.

shown percentages of scales found accurate and inaccurate and the percentages of scales having plus and minus errors; the latter data show that there was no significant difference in the numbers of scales found to be overweighing and underweighing. In the lower portion

of the graph, maximum errors found on inaccurate scales have been classified on the basis of their magnitudes; in general, the frequency of errors is shown to decrease as their size increases. The scales found accurate are plotted at the extreme right of the graph for purposes of comparison with the error-distribution plot.

The scales reported upon above include 20 scales found to have maximum errors in excess of 5 percent of the applied test-weight loads; these errors range from 5.5 to 59.70 percent. If these 20 scales were to be disregarded because of their abnormally large errors, and if the mean errors were to be recomputed for the groups affected, the mean of the maximum percentage errors would be reduced as shown in table 2.

TABLE 2.—*Numerical mean of maximum percentage errors*

Type, ownership, or use	All scales	Excluding 20 scales having abnormally large errors
	Percent	*Percent*
Wagon scales	1.41	1.01
Motortruck scales	1.04	.71
State, city, town, or county	.68	.68
Coal or coke	1.16	.88
Cotton or cotton products	1.38	.71
Farm products, including fruit and sugarcane	.83	.71
Scrap materials	2.18	.92
Stone, sand, or gravel	1.93	.93
Public weighing	.88	.88
Miscellaneous	1.16	1.06
Total	1.20	.84

An analysis of the test results discloses that weighbeams were found to be inaccurate in the case of more than one-fourth of the scales tested. These inaccuracies include faulty agreement among the several bars of a weighbeam on scales not utilizing counterpoise weights, inaccurate weighbeam indications independent of scale ratio errors on scales utilizing counterpoise weights, and inaccuracies of weighbeams subordinate to dials.

There were tested 112 scales which utilized counterpoise weights, such scales comprising 12 percent of the total number tested. These scales utilized a total of 599 counterpoise weights (exclusive of some weights designed for use on scales of low multiple), of which 247 weights, or 41 percent, were found to be accurate, 77 weights, or 13 percent, were found to be heavy, and 275 weights, or 46 percent, were found to be light.

Sensitiveness.—There were 729 scales, or 75 percent of the total, to which SR requirements were applicable. Of this number, 7 scales, or 1 percent, were found to be in neutral or unstable equilibrium, 334 scales, or 46 percent, were not sufficiently sensitive, and 388 scales, or 53 percent, were found to have sensibility reciprocals within the prescribed limits.

Zero-load balance.—Early in the testing program, it was decided to record the amounts, if any, by which scales were found out of balance at zero load. Such data are available on 925 scales. In 25 instances, or 3 percent, scale operators were found to be using one of the weighbeam poises to effect zero balance of their scales; although these scales

were seriously out of balance when the poises were returned to zero, they have been considered, for record purposes, to have been in balance as found. However, 271 scales, or 29 percent of those for which data are available, were found out of balance at zero load by amounts in excess of 5 pounds, and these zero-balance errors ranged up to a maximum of 1,020 pounds. It should be noted, however, that in some 12 instances, scales more or less seriously out of balance had not been in use for some time prior to the tests; if these scales be excluded from consideration, the maximum zero-balance error found was 265 pounds.

Loads weighed.—Many and serious instances of overloading of scales have been disclosed. There appears to be little appreciation on the part of scale operators of suitable limitations on the sizes and character of vehicle loads weighed on their scales, particularly when the scales are of the wagon type. It is very well recognized by scale manufacturers that wagon scales should not be used for the weighing of motortruck loads in excess of 60 percent of their nominal capacities, and many wagon-scale weighbeams are marked to show this limitation. Yet the overloading of wagon scales with respect to this criterion has been recorded in the case of 63 percent of the 433 wagon scales tested, or 273 scales; 69 scales, or 16 percent, have been subjected to motortruck loads equalling the "wagon" capacities of the scales, and motortruck loads in excess of nominal "wagon-scale" capacities have been reported in the case of 20 scales, or 5 percent of the wagon scales tested. Maximum overloading was reached in the case of a 12,000-pound scale used for weighing 18,000-pound motortruck loads.

The weighing on motortruck scales of motortruck loads in excess of the nominal scale capacities has been reported in 32 instances, or 6 percent of the motortruck scales tested.

The Bureau's test of a wagon scale conforms to the method of use contemplated by the scale manufacturer and does not disclose the weighing results which follow when the scale is subjected to large motortruck loads. Quite naturally in the test of any scale, the scale is not loaded beyond its nominal capacity. It follows that the Bureau is without information as to the magnitude of the errors which may have developed under the conditions of overloading discussed above.

Following the adoption by the National Conference in 1937 of the regulation to the effect that vehicle scales should not be used for the weighing of loads of less than 1,000 pounds, there were recorded the minimum loads being weighed on the scales tested. Such data are available for 340 scales. It was found that 157 scales, or 46 percent of those reported upon, were being used to weigh loads of less than 1,000 pounds; on 111 of these, or 33 percent of the total, the minimum loads weighed were 100 pounds or less. The smallest load recorded was 10 pounds, reported in two instances.

Results of inspection.—The inspection of scales, particularly as to conditions in the pits, continues to be an essential element of every test conducted by the Bureau's testing unit whenever such inspections can be made. Unfortunately, poor accessibility to the lever system, or the presence of an excessive amount of water or foreign matter in the pit, or a combination of these conditions, not infrequently makes it impracticable to conduct a proper inspection of the scale parts in the pit, or entirely precludes such inspection. Either no pit inspection at all, or only partial inspection, could be made in the case of 105 scales, or 11 percent of those tested.

Before the presentation of a summary of the faulty conditions of installation and maintenance disclosed by the inspections of vehicle scales, mention might be made of a few of the unusual conditions which have been found. In two instances, water has been found in weighbeam poises. A weighbeam load bearing steel was installed upside down. Two scales constructed with wooden levers were encountered. The lead seal of approval of the weights and measures official had been affixed to the main weighbeam poise of one scale. A balance-ball assembly had lost motion equivalent to a platform load of approximately 130 pounds. The truss post of a trussed main lever was entirely disengaged and was lying on the bottom of the pit. In the repair of a broken lever, the nose-iron had been welded to the lever. A weighbeam faceplate was incorrectly marked, the indication "11,000" appearing between the indications of "8,000" and "10,000." An overhanging "track" had been mounted on a scale platform for the purpose of weighing long vehicles on a short scale. A lever system was so badly out of alinement that the extension-lever tip pivots would not remain on their bearings. A cardboard shim, used in the poise slot to improve the weight impressions of a type-registering weighbeam, was regularly left in position, thus making the poise heavy. A unit weight and the dial at capacity were found out of agreement by 100 pounds.

Proceeding now to a statistical consideration of faults of installation and maintenance, three conditions may be said to be definitely associated with installation, namely, accessibility, pit drainage, and scale approaches, while many other faulty conditions reported may be caused primarily or partially by poor installation and may be partly caused or may be aggravated by poor maintenance. Percentages given below are based, whenever this is considered justified, upon the total number of scales tested; in other cases, the percentages are based upon the number of scales to which the condition under consideration is applicable or on which the particular condition could be determined.

Accessibility to the scale parts in the pit for purposes of inspection and maintenance is reported for all but three of the scales tested. Conditions are reported as "bad" for 18 scales, or 2 percent; as "poor" for 198 scales, or 21 percent; as "fair" for 398 scales, or 41 percent; as "good" for 338 scales, or 35 percent; and as "very good" for 12 scales, or 1 percent.

Scale lever systems were installed below the surface of the ground in 954 instances. No provision had been made for pit drainage, or it could not be determined that such provision had been made, in the case of 554, or 58 percent, of these installations.

Approaches to scales, which should be smooth, straight, and in the plane of the scale platform for a reasonable distance from each end of the scale, were reported as "rough" in 79 installations, or 8 percent, and as "curved" in 174 installations, or 18 percent. Disregarding "slight" inclines, 473 scales, or 49 percent of those tested, were found to have one or both of the approaches inclined to the scale platforms, the approach in most cases sloping upward to the platform; in 157 of these cases, or 16 percent of all scales tested, the gradients were 5 percent or more, the maximum incline reported being 30 percent.

Water was found standing in the pit, or the pit drain was reported clogged, in the case of 163 scales, or 17 percent. Scale pits were dirty

in 405 cases, or 44 percent; in many cases the accumulations of dirt, coal, or other foreign matter were sufficient to cause interference with the lever systems, and in some instances one or more levers were literally buried.

The structural steel in the pit has been found to be rusting in the case of 258 scales, or 29 percent.

No provision had been made for protection against corrosion of the pivots and bearings of the lever system in the case of 411 scales, or 44 percent of the scales on which this condition could be determined, and in the case of 51 additional scales, or 5 percent, only a part of the pivots and bearings were protected.

The pivots and bearings were found to be rusting or dirty or both in the case of 444 scales, or 50 percent. Pivots and/or bearings were found to be worn in the case of 165 scales, or 19 percent. Undoubtedly there were many instances of badly worn pivots and bearings which were not reported, because of the impracticability, under prevailing pit conditions, of determining the actual state of these parts. Pivots were found to be displaced from proper position on their opposing bearings in the case of 129 scales, or 15 percent. Pivots or bearings were reported to be broken in 13 instances, 2 cases of missing pivots were reported, and there were numerous instances in which the anti-friction plates were found to have been broken off.

Bearing assemblies or connections, including beam rods, were found to be out of plumb in the case of 358 scales, or 40 percent. Levers were reported to be out of level in the case of 227 scales, or 26 percent. There was actual interference with elements of the lever system in the case of 112 scales, or 13 percent; a like number of cases were reported in which clearances around elements of the lever system were inadequate. Faults associated with lever stands or with supports for suspended levers were reported in the case of 52 scales, or 6 percent. Faults associated with lever foundations were reported in the case of 36 scales, or 4 percent. Levers, lever extension arms, or T bearings were found to be loose in the case of 32 scales, or 4 percent. One broken lever was found in service, and several instances of defective weighbridge girders were reported.

Faults associated with the platform checking means were reported in the case of 108 scales, or 12 percent. Clearances between scale platform and coping were found to be either too large or too small on 311 scales, or 32 percent. Repairs were needed on the platforms of 212 scales, or 22 percent. Surface alinement between scale platform and coping was faulty in the case of 96 scales, or 10 percent.

The weighbeam parts of 229 scales, or 25 percent, were found to be dirty, rusting, or tarnished. Mechanical faults associated with weighbeam assemblies, such as worn or missing poise pawls, battered zero stops, defective trig loop assemblies, etc., were reported in the case of 163 scales, or 18 percent. Weighbeam or automatic-indicating elements were found to be loosely or insecurely mounted in the case of 143 scales, or 16 percent. Clearances were inadequate around beam rods in 55 installations, or 6 percent. Many weighbeams were found to be out of level, that is, not horizontal when the weighbeam tip was at the center of the trig loop. Seven instances of interference with a weighbeam were reported.

Interferences in automatic-indicating mechanisms were reported in the case of 50 scales, or 22 percent of the number equipped with

automatic-indicating elements. The indications were partly illegible or otherwise faulty in the case of 17, or 7 percent, of the scales which were essentially "automatic-indicating" scales. Six instances of mechanical faults associated with unit-weight mechanisms were reported.

NEWLY INSTALLED MOTORTRUCK SCALES

By F. S. Holbrook, *National Bureau of Standards*

The program of vehicle-scale testing being conducted by the National Bureau of Standards in cooperation with the States has developed certain facts in relation to newly installed motortruck scales which are so extraordinary as to merit most careful study by all the manufacturers and installers of vehicle scales and by all the officials in charge of the administration of weights and measures laws in the United States.

Dates of installation.—Among other data obtained by the Bureau inspectors are the dates of installation of scales tested, whenever this information can be procured. A number of scales tested are reported to have been installed very shortly after the date at which the type of scale known as the motortruck scale, as distinguished from the wagon scale, first came on the market, in 1912 or 1913. Motortruck scales have been encountered that are reported to have been installed in every year since that date to the present time. Naturally many of the older scales have not received proper maintenance throughout the years. Thus, whether through age or through failure on the part of the owners properly to care for them or as a result of both factors working in unison, many of these scales are in bad condition.

However, in the last several years a large number of new motortruck scales have been installed. Apparently many were sold in 1934, 1935, 1936, and 1937, and thus many of the scales tested had been installed during these years. As a result, the average age of the motortruck scales tested is not as great as might be supposed. At one stage of the investigation it was determined that the average age of motortruck scales tested to that date was some 8 years. It would be supposed that the accuracy of the scales recently installed would tend to offset the inaccuracy of scales installed many years ago. In the case of very recent installations, even if the owner were failing properly to maintain his scale, this would have a very much less marked effect on its mechanical condition and its accuracy than in the case of older installations. It was decided then, that it would be of value to determine the accuracy of motortruck scales installed only shortly before they were tested by the Bureau equipment.

For this purpose data were computed on scales installed in the same calendar year, and in the calendar year preceding the year in which they were tested by the Bureau equipment. The average age of scales of the first group would be about 6 months, of the second group about 18 months, and of the combined groups somewhat over 12 months. It was found that there were involved 71 scales, or some 13 percent of the motortruck scales tested, enough to make the results of value; 23 scales, or some 4 percent of the motortruck scales tested, were in the first group and 48 scales, or about 9 percent, in the second.

Accuracy.—The test data on the accuracy of newly installed motortruck scales are given in the following table:

Date of installation	Number of scales	Accurate		Inaccurate		Mean of maximum percentage errors
		Number	*Percent*	*Number*	*Percent*	
In same year as test	23	4	17.4	19	82.6	0.67
In year preceding test	48	15	31.2	33	68.8	.54
Total	71	19	26.8	52	73.2	.58
All remaining motortruck scales	463	119	25.7	344	74.3	1.11

The figures indicate that of motortruck scales tested by the Bureau in the same calendar year as that in which they were installed—an average period of some 6 months having elapsed since installation—about one motortruck scale in six was found to be accurate within prescribed tolerances; the mean error of these scales was almost 3½ times the basic tolerance.

Of the motortruck scales tested in the calendar year following that in which the scale was installed—these scales would have averaged some 18 months in service—something less that one motortruck scale in three was accurate, the mean error of these scales being more than 2½ times the basic tolerance.

Of the combined groups—installed on the average somewhat more than 12 months prior to the test—about one scale in four was accurate and the mean maximum error was some three times the tolerance.

The figures just given are to be compared with the general accuracy of the remaining motortruck scales, the figures for which are appended to the table above. The almost unbelievable conclusion is demonstrated that insofar as percentage of scales accurate is concerned, the new installations are not substantially better than the general average installation. Only when the figures representing the mean of maximum errors are compared are the new installations found to be substantially more accurate than the old. The mean error for the former group is 0.58 percent, or approximately one-half the mean error of 1.11 percent for the latter.

Some figures in relation to SR's may be of value. It is found that of 50 newly installed scales to which the SR requirements were applicable, 28 scales, or 56 percent, complied with the appropriate requirement for scales in use; the remaining 22 scales, or 44 percent, did not so comply. Of the 15 scales in this group which are classified as accurate, 11 scales, or 73 percent, complied with the requirement; of 35 inaccurate scales, 17 scales, or 49 percent, complied. In the case of the accurate scales, those not complying exceeded the maximum value allowed by an average of 5.5 pounds; the average excess of 17 inaccurate scales was 10 pounds, 1 inaccurate scale being in unstable equilibrium.

The general figure of 56 percent of newly installed scales complying with SR requirements may be compared with the similar figure for all remaining motortruck scales; this figure is 53 percent.

While few of the accurate scales were so recently installed as definitely to put them in the class of "new" scales, it will be of interest to determine how many of them complied with the requirements for

new scales. It is found, then, that of 19 scales listed as accurate only 6, or some 32 percent, were within the manufacturers' tolerance or tolerance on new scales, while 13, or 68 percent, were not within this tolerance. Seven, or 44 percent of the 16 of these scales to which the SR requirement was applicable, complied with the SR requirement for new scales; the remaining 56 percent did not. Finally, only 2 scales, or 12.5 percent of these 16 scales listed as accurate, complied both with the SR and tolerance requirements applicable to new scales.

Condition of scales.—The general accuracy figures, the general condition surrounding the installations, and the condition of specific scales very recently installed prove beyond peradventure that a great many new motortruck scales are being turned over to their owners in improper and inaccurate condition. This is a severe indictment of the interests responsible for the installation of motortruck scales. It is believed that the manufacturers of the scales turn out from the factory a satisfactory product. While this is a necessary and indispensable contribution toward satisfactory conditions, it by no means tells the whole story. If in the installation of the scale the original accuracy is destroyed, the fact that, as manufactured, the scale was an excellent one is of little consolation to the purchaser who is furnished with an inaccurate weighing machine installed in the pit. It is apparent that until conditions such as these shall have been rectified, there is no logical basis for the slightest hope that a satisfactory accuracy of motortruck scales in use can be realized.

It is not intended to be suggested by the above that every new scale is subject to serious installation faults. It is emphasized, however, that in far too many cases inexpert installation is demonstrated by inspection. Several specific examples may be cited.

The following faulty conditions were found on inspection of a scale which had been installed only about 4 weeks prior to the time the Bureau inspectors visited it. The trig loop at the tip of the weigh-beam was installed in reverse position. The beam rod was considerably out of plumb. Two main load-bearing assemblies were out of plumb. A main-lever fulcrum stand was improperly installed; it appeared that the anchor bolts had not been correctly positioned and that these had been bent to bring the fulcrum stand into approximately correct position, as a result of which the stand was not plumb. This stand was also improperly grouted and had a bearing on the foundation equivalent to only about half the area of the base of the stand. As a result the main lever was thrown out of proper position and there was interference between the tip of the lever and the tip connection. The maximum percentage error on this scale was +0.89 percent.

In the case of another scale turned over to the purchaser not more than 6 weeks before the test was made, the following conditions were reported: Main levers and the transverse extension lever were loose. A main fulcrum stand was not anchored, being neither bolted nor grouted to the pier. Another fulcrum stand was mounted on a board placed on top of the foundation pier, and the stand was out of plumb. The connection at the tip of a main lever was out of plumb. Two anchor bolts for one of the check elements were missing. Parts were improperly positioned, as a result of which main bearings were displaced from proper position on their opposing pivots and were interfering with the main levers. The beam rod was slightly out of plumb.

One corner of the scale platform was approximately ¾ inch below the level of the coping. The weighbeam shelf was not rigidly mounted. The maximum percentage error on this scale was +1.08 percent.

The next scale to be cited had been in use 1 week. Main levers and a reversing lever were somewhat out of level. Clearances between scale platform and coping were inadequate. Under load, there was a tendency for the weighbridge so to shift its position that under a 15,000-pound load at the left end of the scale there was slight interference between scale coping and scale parts. The foundation for the weighbeam assembly was not rigid and the weighbeam shelf was very loosely mounted. The maximum percentage error on this scale was found to be −0.33 percent.

There is now to be considered a scale in use some 8 months. In this case inspection disclosed that the transverse extension lever was improperly mounted, as a result of which there was probaoly some interference around the fulcrum pivots. One main lever appeared to be improperly positioned, causing interference in the connection at the tip of the lever. This scale had a maximum percentage error of −1.12 percent.

The next scale was installed about 4 months prior to the Bureau test. It was found on inspection of the scale that this had been well installed except that two main load-bearing assemblies were badly out of plumb. This condition was so bad that when a 15,000-pound load was applied to the right end of the scale, this caused the platform to shift to the near side into contact with the coping; when this load was removed the scale platform returned to its former position. This condition was undoubtedly caused by improper positioning of parts. At the conclusion of the test there was a zero balance change of +20 pounds. The maximum percentage error in this case was +0.30 percent.

Another scale had been in service about 4 weeks. Before the test was started the weighbeam balance ball assembly was raised in an effort to reduce the SR of the scale to a value within the prescribed limit; this adjustment, however, only reduced the SR from 20 to 15 pounds at zero load, and at a 15,000-pound load the scale was found to have a 20-pound SR. The maximum allowable SR was 10 pounds. The following faulty conditions were found upon inspection: Wood supports had been utilized between lever stands and concrete foundation piers. Two main levers were loose. Main levers and the transverse extension lever were somewhat out of level. The connection at the tip of one main lever was badly out of plumb. There was some interference around three of the main load bearings. The beam rod was somewhat out of plumb. Old planking had been used for the scale platform and this was rough. Approaches to the scale were rough. A maximum percentage error of −0.57 percent was found.

There is now encountered a scale the installation of which had just been completed. It was found upon inspection that the beam rod was slightly out of plumb and that both of the weighbeam extension levers were badly out of level. The nose iron of the transverse extension lever appeared to have been moved from the position determined by the factory sealing operation, apparently in an effort to plumb the connection between the transverse extension lever and the first weighbeam extension lever. The second weighbeam extension lever had been broken and temporarily repaired. Other levers in the pit were

slightly out of level and one load-bearing assembly was somewhat out of plumb. Before the application of the strain load the scale was found to have shifted its zero balance by −15 pounds; it was rebalanced before the test was continued. At the conclusion of the test a further balance shift of −16 pounds was noted. During the progress of the test the weighbeam balance ball assembly was raised to the upper limit of its travel, thus reducing the SR of the scale from 20 to 14 pounds on a gross load of approximately 30,000 pounds. The maximum allowable SR was 10 pounds. The maximum percentage error was +0.45 percent.

The next scale had been in use 8 months. The following faulty conditions were found on inspection: The main levers were out of level. At one end of the scale, parts were not properly alined and there may have been interference resulting from this condition. The transverse extension lever was improperly mounted, with possibility of interference around the fulcrum pivots of this lever. The weighbeam shelf was not rigidly mounted and was out of level, and in consequence the weighbeam assembly was also out of level. The maximum percentage error developed was +0.67 percent.

The next scale had been installed about 9 months. It was found on inspection that the lever foundations were in bad condition; at one point the concrete was broken and crumbling badly. A main lever and the weighbeam extension levers were out of level. One main load bearing assembly was out of plumb. Loose balancing material was found in use at both the butt and the tip of the weighbeam to effect the zero balance of the scale. The approach at the left end of the scale was sharply inclined to the scale platform and the concrete surface was in bad condition. At the conclusion of the test the scale was found to have shifted its zero balance by +35 pounds. Before the test was started the weighbeam balance ball assembly was raised to the upper limit of its travel; this resulted in reducing the SR from 20 to 15 pounds at zero load. The maximum allowable SR on this scale was 10 pounds. The maximum percentage error determined was +0.37 percent.

The last scale to be mentioned was installed by a city, as a public scale, 9 months before the test. To correct this scale, which had a maximum percentage error of −0.24 percent, the following steps were taken: The connection at the tip of one main lever was brought into proper vertical alinement, a loose main lever was tightened, the weighbeam balance ball assembly was raised in an effort to reduce the SR of the scale, the fractional weighbeam poise was adjusted, and nose-iron adjustments were made.

In order that it may be perfectly clear that the above 10 scales do not represent some unusual condition in some particular section of the country, it may be said that the scales in question were located in nine different States. Three of the scales were automatics, the remaining seven being beam scales. Five each were of straight-lever and torsion-lever type of construction. Six of the scales were installed by manufacturers' representatives; of the remaining four, two were said to be installed by "contractors," one by a "local scale man," and one by "owner." The average period elapsing since installation of all of these scales was slightly over 4 months. The numerical average of the maximum percentage errors was 0.60 percent—three times the basic tolerance allowable.

Remedies suggested.—In view of the facts which have been detailed it should be apparent that it is imperative that fundamental and thoroughgoing improvements be effected if present conditions are to be corrected. Two concomitant remedial steps are offered for consideration.

First, adequate official inspections and tests must be provided for and they must be promptly and unrelentingly carried out and applied to all new installations. Inspections might well begin during the progress of the work; upon its completion a final complete inspection and a thorough acceptance test should be made so that the purchaser can be assured that the new scale has been properly erected and is weighing accurately before the purchase contract can be considered as complete. In ordinary cases involving contracts the old legal maxim of "Caveat emptor"—"let the buyer beware"—may be applicable; the buyer must satisfy himself as best he can that he has procured that which he has contracted for and must suffer if he fails to do so. However, scales to be used for commercial purposes may be said to be in a quasi-public status. Inasmuch as the owner may be liable to criminal prosecution for the use of a weighing machine not conforming to the official standards set up, there is certainly a moral responsibility on the State to protect the purchaser from unwitting violation of the law.

Second, the interests responsible for installations must be built up to a very much higher plane of efficiency than appears to obtain at present. It cannot be too strongly emphasized that a thorough house cleaning is in order. When the installation is made by the manufacturer it behooves him to make certain that the care exercised in the production in the factory will not be nullified by careless or inexpert work on the job. When the installation is made by the buyer or by a local scale man the responsibility is divided and it is not so easy to suggest how matters can be improved—but improved they should be. Perhaps the situation could be ameliorated by the passage of laws requiring the licensing of scale installers and repairmen, a subject which has recently had considerable attention from scalemen. A proper law intelligently administered might be found helpful in improving workmanship in both of the instances mentioned above. Additional safeguards come to mind. The manufacturer, it seems, might furnish with each scale detailed general and special instructions as to installation to guide the man on the job, whether or not this man is his employee, the employee of the owner, or an independent contractor. He might furnish a booklet containing suggestions as to proper maintenance to assist the owner to keep his scale in satisfactory condition, and he should emphasize the importance of this. Finally, he would furnish a worth-while service if he would carefully check over the completed job, whether it is his responsibility or that of another, and follow it up until assured that everything is in order.

The two remedial procedures mentioned above should be pushed forward at the same time. Neither the one nor the other can confidently be depended upon to secure the results desired. The inspection and test by the official cannot of itself be sufficient in the very nature of things. It is not the function of the State to install scales; the State is charged only with the duty of seeing to it that they are correctly and accurately installed. Even if general improvement in

installation practices is brought about, this will not insure accuracy in the case of any particular job; moreover, it cannot be determined what success is being attained by the second agency without the interposition of the first. Faulty installations will still be encountered; moreover the installer will not ordinarily have the sufficient load of test weights to enable him authoritatively to certify that the scale is weighing accurately at all points. Public policy and efficiency both demand that an adequate testing equipment and a competent certification of accuracy be furnished by the government authorities.

Mr. A. A. REED. Mr. Chairman, I have come a long way to attend this Conference, principally for the purpose of getting the information that has just been given. I hope to be able to report to Oregon some of the things that have been developed here, and I believe that the other States that have not yet been visited by your heavy-duty equipment will need the assistance that you are giving at this time. It is our duty, particularly in this case, to convince the legislators that these conditions described actually exist and that in our State they need improvement. In about 6 months our legislature will meet, and I wonder if it would not be possible to have this Conference report so that our committees might be benefited.

Mr. HOLBROOK. Mr. Chairman, we will get it out as early as possible.

PROGRESS MADE TOWARD PROCURING ADEQUATE VEHICLE-SCALE TESTING EQUIPMENTS

REMARKS OF C. L. KLOCKER, INSPECTOR OF WEIGHTS AND MEASURES, STATE OF CONNECTICUT

Mr. Chairman and fellow delegates, I will try to show you the perfect field test equipment. We have copied it in large part from the National Bureau of Standards unit and we are very much indebted to Mr. Horton and Mr. Crouch who happened to come through our State about the time we had it built and who gave us some very good ideas for the equipment. The motion picture shown by the National Bureau of Standards illustrates exactly the way our truck operates. Our truck is a three-axle truck, both rear axles being driven. We have five speeds ahead, and although we have very steep hills we have never used the low gear. In the lockers, or compartments, in the rear we have twenty 50-pound weights, 10 in each, making in all 1,000 pounds in 50-pound weights. In another compartment [indicating] we carry our equipment.

We carry eighteen 1,000-pound weights. The legislature contemplated last year raising the gross weight allowed on the highways from 40,000 to 50,000 pounds. If they do this, we can arrange to carry additional 1,000-pound weights to make the gross weight of our truck 48,000 pounds. The chassis weighs about 14,500 pounds and the crane weighs about 4,500 pounds.

Now, I think we made one mistake; this is in regard to the wheel base which is 190 inches. This is somewhat too long; you can get it on an 18-foot platform but you cannot get it on a 15-foot platform. Then in the back we made another mistake. You will want all the room you possibly can get between the back of the truck and the end of the boom. If we had more clear space here it would be a great deal of help. With this crane we must turn the weights sideways before we can set them on the platform.

FIGURE 8.—*General view of the large-capacity scale-testing equipment of the State of Connecticut.*

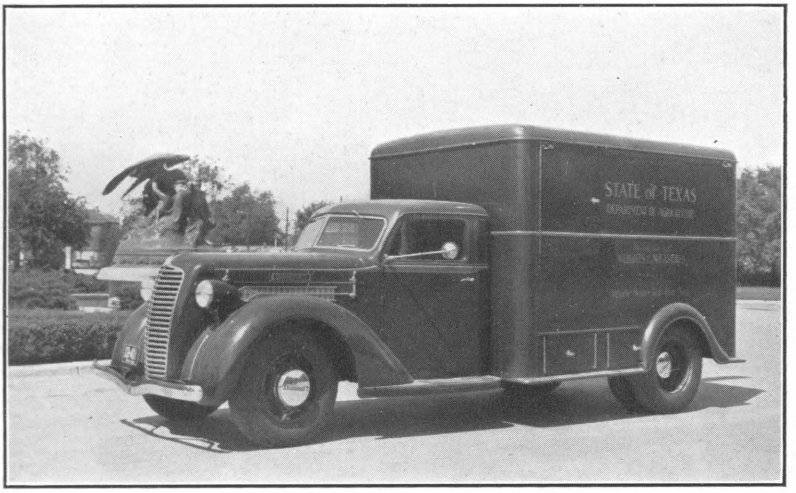

FIGURE 9.—*General view of large-capacity, scale-testing equipment of the State of Texas.*

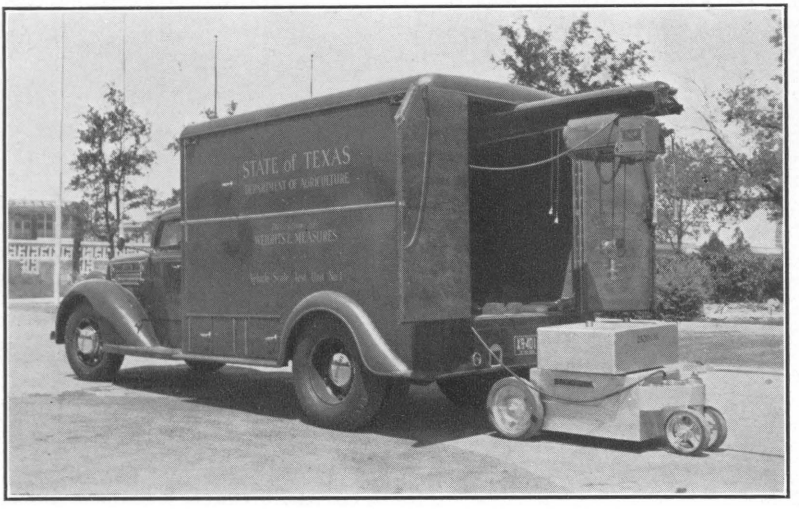

FIGURE 10.—*Another view of Texas equipment, showing hoist and weights.*

If any of you people are interested and want any more information on this equipment I will be glad to send it, if you will write me.

Up to the present time we have tested over 600 scales. This does not mean rechecking; it means first tests. The last time I figured, about 55 percent of the scales were all right. We have a tolerance of 2 pounds per 1,000 pounds.

(During the presentation of the above paper, several lantern slides picturing the equipment being described were exhibited by Mr. Klocker. See fig. 8.)

The CHAIRMAN. Thank you very much, Mr. Klocker, for these suggestions concerning your experience. This is very helpful.

PAPER OF J. E. LILES, INSPECTOR OF WEIGHTS AND MEASURES, STATE OF TEXAS

Mr. President, members of the Twenty-eighth National Conference, and guests: For several years, it has been the desire of the Division of Weights and Measures in Texas, to secure more adequate equipment, for testing vehicle, and other large-capacity scales. Naturally, there was the problem of securing a sufficient appropriation to obtain such equipment, and largely through the efforts of our Chief, W. S. Bussey, the Forty-fifth Texas Legislature passed an emergency appropriation bill, providing $10,000 for this purpose, which luckily, was the amount requested.

After making a careful survey, it was decided to build two units, each to carry a test load of 6,000 pounds, consisting of two weights of 2,500 pounds each and 20 weights of 50 pounds each. This limit was set for the reason that in Texas the net highway pay-load limit is 7,000 pounds, and the gross highway load limit is 22,000 pounds for pay load and truck. However, all equipment was designed to carry a maximum test load of 8,500 pounds, therefore, an additional 2,500-pound test weight can be added at any time.

Another problem confronted was that of additional personnel to operate the trucks, and, as we had one man already assigned to similar duties, on a smaller truck which was to be replaced, the legislature saw fit to allow only one additional inspector. It then became necessary to design and build equipment that could be successfully and efficiently operated by one man. Hence, it was decided to obtain units that would be completely electrically operated, and such are the units that I will briefly describe, with the aid of a few slides.

In describing the slides it was stated that the trucks are of 3-ton capacity with 156-inch wheelbase.

A 5-kilowatt, 230-volt direct-current gasoline-engine-driven universal generator plant is mounted in the extreme front of the truck body and used to generate the power to operate the various pieces of equipment. Two doors provide ventilation for the power plant. There are separately fused circuits for each piece of equipment, the hoist, the test-weight car, and a motor.

The wheel base of the test-weight car is 47 inches, the rear axle tread is 30 inches, and the front-axle tread is 9 inches. The weight is almost equally distributed between the front and rear axles. The motor is a 2-hp, gear reduction, totally inclosed motor, having a speed of 1,750 revolutions per minute, to 41 revolutions per minute on the output shaft. It drives through a flexible coupling, to a differential. The speed of the test-weight car is approximately 35 feet per minute.

Head room in the body was one of the important factors to be considered. The hoist is of 2,500-pound capacity, and operates on a 7-inch I-beam, permanently mounted in the truck body. The in-and-out travel of the hoist, is accomplished by an arrangement of roller-chain and sprocket drive, powered by a motor sus-

pended above the power plant. This motor is a ½-hp. gear-reduction motor, and the arrangement allows an in-and-out speed of approximately 25 feet per minute.

The test-weight car and attached weight is sealed at 2,500 pounds, and a rectangular top weight is also sealed at 2,500 pounds, giving a total test load of 5,000 pounds. With the use of the 50-pound weights, a known test load of 6,000 pounds can be had.

The I-beam extends 46 inches beyond the rear of the truck body, allowing ample room for loading and unloading the weights. There is a hood over this extended I-beam, and when the equipment is not in use, this hood is completely closed.

A remote-control starting switch is provided for the power plant, at the rear of the truck body, accessible from the ground. Another one is mounted on the instrument panel of the plant. Also, the in-and-out travel of the hoist is controlled by pull cords, accessible from the ground, or from any point in the truck body. An extension cord of 110 feet is provided to supply power to the test-weight car. This cord is made up in two 55-foot sections, and under ordinary operating conditions only one section is used. The control for the test-weight car is located in the steering handle and consists of a spring-loaded forward and reverse switch, thus making it necessary for the operator to keep the desired button depressed while the equipment is in operation. If the handle should be jerked out of his hand, or anything else should happen unexpectedly, the circuit would be automatically broken, and the car would stop immediately. The hoist has a variable-speed switch, pendant-cord control. All control switches are spring loaded, as a safety feature.

The specifications and design were compiled by members of the Texas Weights and Measures Division. Each piece of equipment was purchased on separate bids, and the complete units were assembled by members of the division. By following this procedure, and by using standard-stock parts throughout, the total cost of the two units amounted to only $8,000, or $4,000 each.

We run corner tests on all scales. On scales of 10-ton capacity or over, we run both a 2,500- and a 5,000-pound corner test. We also make a build-up test, using the motortruck as the strain load, adding the 5,000-pound test load, making a total of approximately 16,000 pounds. On scales of less than 10-ton capacity, we make a 2,500-pound corner test and a 5,000-pound end test. We only use the 50-pound test weights on vehicle scales when we deem it necessary.

The two units have been in operation since September 15, 1937, and to date over 600 scales have been tested by each. We have had no mechanical trouble whatever with either unit. I have with me some of the report forms which we use; also some additional photographs and other descriptive matter, which I shall be glad to show any of you who care to see them. I thank you.

REMARKS OF CHARLES M. FULLER, SEALER OF WEIGHTS AND MEASURES, COUNTY OF LOS ANGELES, CALIFORNIA

Mr. Chairman and gentlemen, I shall describe our equipment very briefly. It consists of a motortruck and a steel trailer. In the motortruck we carry 4,000 pounds of 500-pound test weights and 2,500 pounds of 50-pound test weights together with the customary small weights. The feature of this outfit is the use of the steel trailer as a known weight. This trailer is sealed to 20,000 pounds and is mounted on a 7-foot wheel base.

Now, when we first come to the scale we utilize the trailer and run it over the platform thereby determining whether the scale is very much out of tolerance, indicating that repairs are needed. If so, it is not necessary to make a more extended test. Otherwise we go on with further tests using the weights mentioned. When occasion arises we can leave the trailer and get around with the small weights

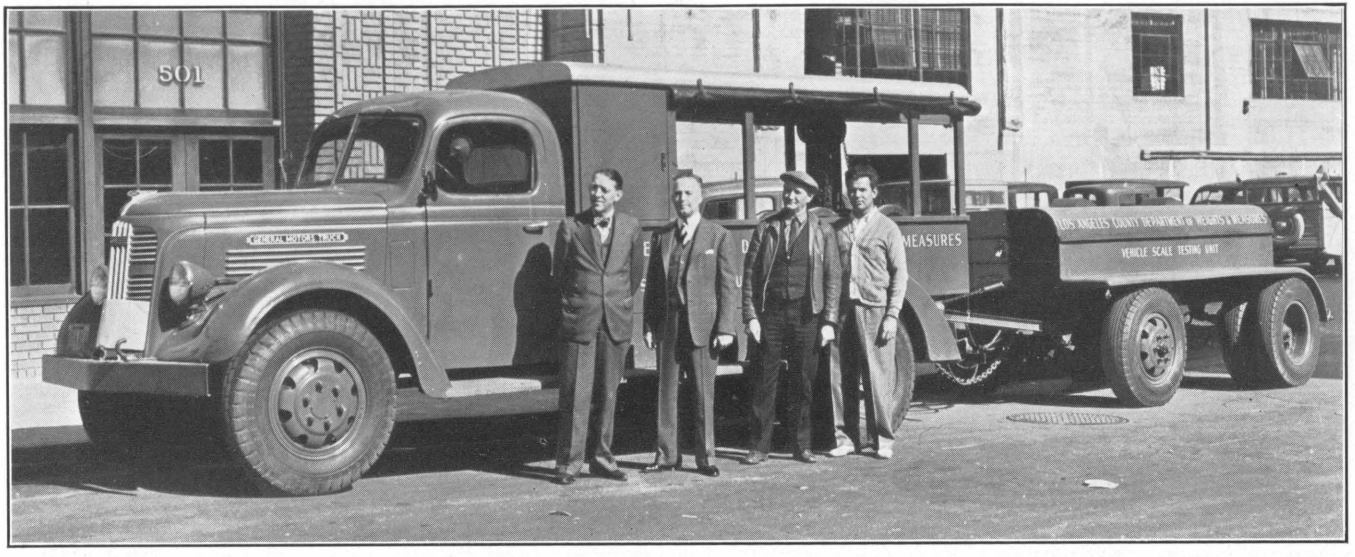

FIGURE 11.— *General view of large-capacity scale-testing equipment of Los Angeles County, California, showing steel trailer standardized at 20,000 pounds.*

FIGURE 12.—*General view of large-capacity, scale-testing equipment of the State of Idaho.*

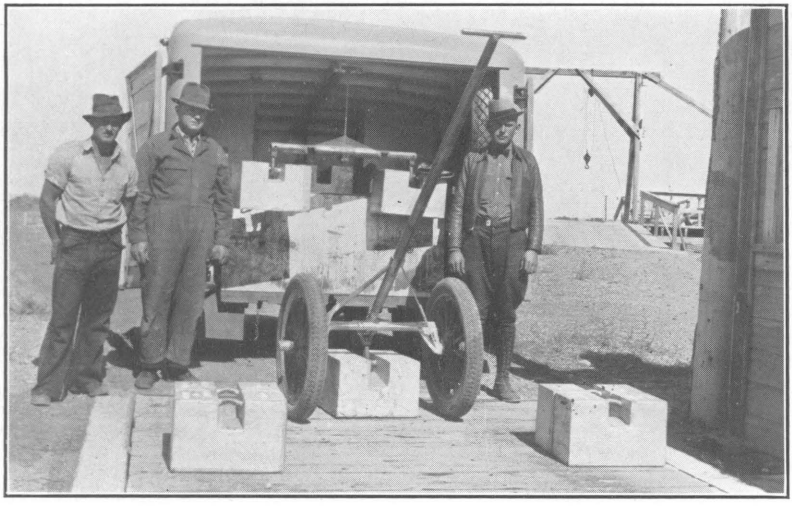

FIGURE 13.—*Another view of Idaho equipment, showing hoisting equipment, weights, and weight-handling cart.*

for testing scales other than motortruck scales. This heavy-duty truck equipment has been in use about 2 months, and we find it a veritable lifesaver in covering the field efficiently and with economy. Thank you.

(During the presentation of the above paper a lantern slide picturing the equipment being described was exhibited by Mr. Fuller.)

The CHAIRMAN. The time for adjournment having arrived, I am going to request that you allow me to defer the remarks of Mr. Baucom and Mr. Kanzer, who are also scheduled to speak on this general subject, until tomorrow morning when we will have plenty of time available.

(At this point, at 1 p. m., the Conference took a recess until 2 p. m.)

SIXTH SESSION—AFTERNOON OF THURSDAY, JUNE 2, 1938

TOUR OF THE LABORATORIES OF THE NATIONAL BUREAU OF STANDARDS

(The afternoon session of the Conference consisted in the visit to various laboratories of the National Bureau of Standards, particular attention being devoted to the Division of Weights and Measures. Special demonstrations were given in the laboratories, designed to illustrate the character and scope of their activities. In order to make the tour of maximum interest and helpfulness, the delegates and guests of the Conference were divided into small groups, each being in charge of a member of the staff of the Bureau.)

SEVENTH SESSION—MORNING OF FRIDAY, JUNE 3, 1938

(The Conference reassembled at 9:30 a. m., at the Washington Hotel, W. S. Bussey, Vice President of the Conference, in the chair.)

The ACTING CHAIRMAN. The meeting will now be in order.

I am happy to announce that we have a very distinguished guest with us this morning, and I want to ask my good friend Rollin E. Meek, of Indiana, to introduce to the Conference the Honorable Henry F. Schricker, Lieutenant Governor of the State of Indiana.

Mr. MEEK. Mr. Chairman and fellow delegates, I take great pleasure in introducing my superior, Lieutenant Governor Henry F. Schricker.

Mr. SCHRICKER. Mr. President, and members of the Conference: I certainly do not want to interfere with your program this morning or offer any excuses for my absence at previous meetings; we let Mr. Meek look after the business. We appreciate the great work you are doing and are especially interested in it. We are proud of Mr. Meek's service in our State and we are grateful for the honor that comes to him from time to time in having a place in your official family. We, who want to serve the people, appreciate the security that is thrown around our people by the services rendered by the department of weight and measure in every State. Under the Constitution, Congress was given the power to fix the standard of weights and measures in this country, so at the very beginning of this Nation we recognized the importance of weights and measures. You are engaged in that business. I congratulate you on your devotion to that duty and look forward to even greater service from you. Thank you.

The ACTING CHAIRMAN. Thank you, Governor Schricker. I am sure we all appreciate having you present on this occasion and the interest you have shown in weights and measures administration in your State; we know that that influence will reach far beyond the borders of the Hoosier State.

PROGRESS MADE TOWARDS PROCURING ADEQUATE VEHICLE-SCALE TESTING EQUIPMENTS—Continued [1]

REMARKS OF C. D. BAUCOM, SUPERINTENDENT OF WEIGHTS AND MEASURES, STATE OF NORTH CAROLINA

Mr. President, and gentlemen of the Conference, I will cut my remarks down to just one or two points.

We are developing and there will be delivered to us in the next 30 days a test outfit with 11,000 pounds of weights. The weight of the truck will be about 9,500 pounds, making a total gross weight of 10 tons. This is to be delivered in the State fully equipped and demonstrated to our satisfaction for a little less than $3,500.

This will be a one-man operated outfit. All of the controls for the power operations will be accessible to the operator standing on the

[1] For the preceding material under this heading see p. 94.

ground at the side. We know this outfit is the only one of its design anywhere. We will be glad to go into details with any of you who may be interested in purchasing one, after we get back to the office. I thank you.

PAPER OF BARNETT KANZER, DIRECTOR, BUREAU OF WEIGHTS AND MEASURES, STATE OF NEW YORK

I prepared my paper yesterday afternoon. It is fairly lengthy and I will have to apologize for its length. I know we are pressed for time and yet I know there are some thoughts that I think should be developed and explained, so you will excuse me.

In early February, for the first time in New York State, a request was made by me to my commissioner that $25,000 be appropriated for the purchase and use of a vehicle-scale testing equipment. Neither the commissioner nor anyone else whom I later contacted knew at first what I meant as they had not seen such an equipment. It was necessary to produce pictures.

My next step was to show the necessity of such an equipment. There were only 4 weeks left before the legislature adjourned. Quick action was necessary. The idea was sold to the Commissioner and my other supervisors, a bill had to be drawn in the Bill Drafting Bureau, the staff of the Director of the Budget was convinced and then the senators and assemblymen, and then final steps were taken to be sure the Governor was correctly advised of the necessity of such appropriation. As you know, this was a year of economy and an item of $20,000, which had no direct revenue-producing features, was very closely scrutinized.

In about 3 weeks I was given definite assurance of the passage of the appropriation. I then became somewhat bold and advised the Director of the Budget that I would return next year to ask for at least two more such test trucks and possibly three or four more to include two smaller-size trucks. To me it was a question of mental arithmetic. Figuring on the basis of 1,500 to 1,800 scales that could possibly be tested in a year by one truck, and with a probable number of over 8,000 scales, it would either take 5 years to make one round of tests or preferably have five trucks make one test per year.

At the present time I have not all the details of the truck. It will be ready, I hope, for our 32d annual convention at Buffalo, N. Y., July 19–21, to which you are all invited. You see we in New York State have had four more annual conventions than has the National Conference.

All I can say is that the truck will be the "last word." The experience of other States and their own criticisms of their own equipments were fully noted. I want to say at this time that I am deeply indebted to every State, city, and county that helped encourage me and give me every detail requested. The National Bureau of Standards was also very helpful, and I appreciate the assistance and advice given by all.

In the rough, there will be 20,000 pounds of weights (18,000 lb in rows of three 1,000-lb weights and 2,000 lb in smaller weights). The height will not exceed 9 ft 3 in. and will probably be a few inches lower. It will be completely power-driven with a silent hoist. It will be of the open type, with the cab back of and not over the engine. Two men will go with the equipment.

However, in my elation and happiness at the service to be given the public by our Bureau by such a truck, a discordant note has crept in within the last 2 months and more so within the last 24 hours. My enthusiasm is somewhat dimmed.

To begin with, I attended the National Scale Men's Convention at Chicago in March. I desired general information and specific information from expert scalemen on specifications and tolerances for vehicle scales. Even before I reached Chicago I had received some mail asking for my opinion of the relative merits of 0.2 of 1 percent and 0.4 of 1 percent tolerances. I replied, naturally, that I myself was looking for information and light.

Well, at the convention it seemed to me as though resolutions were being brought up here and there on the floor about 0.2 of 1 percent and 0.4 of 1 percent tolerances and a lot was being said about the inaccuracy or danger resulting from the National Conference adopted tolerances. Being ignorant of it all and groping in the dark I decided, after a great part of the session had been used up in talks and resolutions, to introduce my own resolution that a committee be appointed to discuss the proposition with the experts at Washington. This resolution was passed and such a committee appointed.

It seemed to me as if I had just arrived at the first session here when I heard something about another set of tolerances to replace those adopted last year and followed by a number of States. Of course, New York State, not having such an equipment, had adopted no such specifications and tolerances.

Well, I naturally want to help the 13,000,000 people in New York State and to use my equipment to the best advantage. Instead, some confusion was creeping in. A specification called 2q something, with a subbase, I think, was read. I paid close attention, but to the best of my knowledge I heard something that spoke of tolerances being 0.1 of 1 percent and 0.2 of 1 percent in one instance, and 0.2 of 1 percent and 0.4 of 1 percent in another instance, and some changes if the scales were new scales or old scales, and about certain corner tests and, in such instances, a mean error or algebraic mean error then was to be determined.

I do not desire to be critical, certainly not personally critical; I am expressing my feelings and reactions and seeking advice and information. I also have in mind the ability of the average weights and measures official working in the field.

Then all of a sudden I heard a voice saying "We are not satisfied—we are not getting what we want," and something was then said about a Friday session, etc. The man next to me whispered in my ear that the dissatisfied man was a well-known scale expert. At any rate, I was getting confused.

Here was I who had just publicized the fact that the State had made progress in appropriating $20,000 for a device and I wanted to make public how I was to make tests of the scales in my State. I found myself bewildered. Questions arose in my mind when is a scale "new." I once was told that if a new automobile was run around a block it became a used car. Was a scale in the same category after running my own test truck on it for test? I had heard that the tolerances on new scales were different from those for old scales, about one-half as much, and that that also applied to repaired scales.

Then, what happened yesterday? Mr. Holbrook gave an interesting and instructive analysis of tests made on new scales, and what did we hear? (I hope I have my figures right. I wrote them using the reflected light of the screen.)

Scales tested that were installed in the year of test—in some instances just installed, and in some instances installed a week to 8 months before—were found inaccurate to the extent of 19 out of 23, or an 82.6-percent inaccuracy, whereas scales installed within the year previous showed 33 inaccurate out of 48 tested, or an inaccuracy of 68.8 percent, nearly 14 percent better than the new scales; the accuracy of 463 scales installed prior to this showed an inaccuracy of 74.3 percent, 8 percent better than those installed within a year and only 6 percent worse than those installed in the year preceding the year of test.

I could not then fathom the reason for permitting the tolerance on a new scale to be one-half that for an old scale. Something appeared wrong or unexplainable to me. I was left out in the cold and the enthusiasm for my new equipment took a decided drop. Why did I have $20,000 of the taxpayer's money spent on a new testing equipment? Why should I condemn old incorrect scales to have them replaced by new, still more incorrect scales? Mr. Holbrook further advised us that many of these new installations had errors two to five times the tolerance. That was all bewildering to me. It did not look good in print; yet the truth must be told; it is a severe indictment of someone or something. If all the efforts in condemning old scales will only bring worse results, I had some tall explaining to do in New York State.

Then I remembered, too, that in my State, and I think in most States, the law permits an error of 30 pounds per ton on coal deliveries and 150 pounds for 5 tons of coal. That brought me back to the apparent inconsistency with the differences of opinion as to 0.2 of 1 percent or 0.4 of 1 percent tolerances.

Well, gentlemen, I am soon to have my new vehicle-scale testing equipment. I want to go ahead and use it. The equipment proper, costing about $13,000, must not lie idle. As yet I do not know what is the exact number or subnumber or subletter of that which refers to tolerance. I wonder if I can forget corner tests and just make an end test, or must I be stuck in a corner? Please advise me how I can advise the 250 weights and measures officials in my State (some of whom get the munificent sums of $100 to $500 a year) how to compute the mean error as against a plain or real error, especially if some of them have little, if any, education. I feel that on the average we have the equal of any State in the Union (Mr. Ralph Smith told us of the weights and measures official who put a lead seal on a weigh-beam). Then, above all things, how shall the weights and measures official make the best approach to a coal merchant when he has to advise him that his scale is all right in every way, except that the sensibility reciprocal is either too large or has some other defect that needs improvement or jacking up? I am going to be very proud of my beautiful vehicle-scale testing outfit, and I want to send out my men with definite instructions for testing such scales. I do not want to confuse them, the public, or owners of scales with a conglomeration of words and terms such as 0.1 of 1 percent, 0.2 of 1 percent, 0.4 of 1 percent, new or manufacturers' or newly repaired or old-scale toler-

ances, tolerances for scales with or without ratio, that is, with or without removable weights, tolerances for scales with good or bad corners, mean errors or algebraic mean errors or not so mean errors, sensitiveness with or without its reciprocal, etc., etc. Please simplify these matters for me. What shall I do when experts cannot agree?

The National Bureau of Standards is the greatest institution of its kind in the world. We in America are proud of it. The personnel is of the highest; I also feel that but for a few instances they are far underpaid for their great ability. I have sought and will seek more often in the future their technical and scientific advice. They have always been ready to help me. What I am making a strong and urgent plea for is that they in some way put forth an edition or simplification of the specifications and tolerances so that the average weights and measures official as we know him will understand readily. I assure them and you that although I am a college graduate having specialized in a scientific mechanical course with a B.S. degree, I find difficulty in digging through a maze of varied tolerances for scales under varying conditions and other similar type specifications.

I wonder if it is not possible to do this? I am not critical. I hope I am making a constructive suggestion, helpful for us who have to go out and test scales, weights, and measures and then have to explain to the average merchant what specification or tolerance has been violated so that he will understand what we are saying in the "language of the street." I sincerely and earnestly offer the cooperation of the State of New York.

Mr. HOLBROOK. Mr. Chairman, what Mr. Kanzer is going to do in the case of sealers of weights and measures who do not understand the meaning of a value expressed as tenths of a percent I am sure I do not know, because in this event they certainly will have difficulty in testing vehicle scales, or in fact, any kind of scales. I think if we could sit down with Mr. Kanzer that we could get some of these matters that trouble him very well straightened out. Because of the fact that he has not had a vehicle-scale testing equipment up to the present time he apparently has not studied the regulations of the National Conference in that respect.

REPORT OF COMMITTEE ON SPECIFICATIONS AND TOLERANCES' PRESENTED BY F. S. HOLBROOK, CHAIRMAN, AND DISCUSSION THEREON

Gentlemen: Doubtless you all know that since our last meeting the National Bureau of Standards found it possible to publish the codes of specifications, tolerances, and regulations adopted by the National Conference on Weights and Measures. This new publication is known as National Bureau of Standards Handbook H22, Specifications, Tolerances, and Regulations for Commercial Weighing and Measuring Devices. It supersedes Miscellaneous Publication M85 published in 1929. For the first time in some 9 years we now have the codes complete in one publication. This should greatly clarify the requirements and should thus facilitate our enforcement work.

Your Committee desires to report on several minor editorial changes which were made in the text of the codes of specifications, tolerances,

and regulations of the National Conference on Weights and Measures in the reprinting of these codes in this Handbook.

The wording adopted at the Twenty-seventh National Conference, for "Scales—General Specifications, par. B–2w, Shift Test of Scales" was modified to some extent in order to improve the phraseology without changing the meaning of the requirement.

In relation to tolerances for large-capacity scales, it has always been understood that provisos 1, 2, and 3 referred only to scales in use. Before the general rewriting of the scale specifications 2 years ago this fact was clearly brought out. After the rewriting of the specifications in the new form the language did not so clearly indicate this fact. Therefore, for the sake of clarity, it was decided to add the words "in use" so that there might be no misunderstanding of the requirements.

In our tables of tolerances for scales the heading "load" was defined as "The amount of weight on the load-receiving element of the scale." In the usual strain-load test the actual load on the scale platform consists of a strain load, the value of which is not definitely known, and of test weights, the values of which are accurately known. In making a strain-load test the weight of the unknown strain load is balanced out and the tolerance values thereafter applied are those for loads representing the amounts of the test weights added to the platform. In view of this, it appeared that the word "load" in the table headings would be more accurately defined were the word "known" to be used to qualify the word "weight" so as to make the definition read, "The amount of known weight on the load-receiving element of the scale." This will assist the inspector to select the proper tolerance values to be applied. In the opinion of the Committee the meaning was not altered by this change and consequently the material was so printed in H22 in the footnotes to tolerance tables Nos. 2, 3, 4, 5, and 6.

Your Committee believes that these were the only editorial changes of enough importance to warrant their being brought to your attention.

Your Committee recommends that the codes as printed in National Bureau of Standards Handbook H22 be formally adopted by the Conference as the official codes of the Conference to date.

With respect to the resolution adopted by the Twenty-seventh National Conference on Weights and Measures directing your Committee on Specifications and Tolerances to review the specifications for small-capacity spring scales, your Committee would report as follows:

Consideration has been given to reports from a number of sources outlining difficulties experienced with the scales in question, which it appears are usually encountered in the case of scales of inexpensive construction designed primarily for the use of peddlers and hucksters. An examination has been made of samples of this type of scale as made by a number of manufacturers, and your Committee is of the opinion that there is need for improvement in the construction of many scales at present on the market. It appears to your Committee, however, that the situation can be very materially improved, and perhaps adequately controlled, by the vigorous enforcement, by weights and measures officials, of existing specification and tolerance requirements without the necessity of adding to the specifications detailed requirements as to design, materials, and methods of fabrication. The particular specifications which your Committee recommends be invoked

in this relation are General Scale Specification paragraphs B–2b(1) and B–2u. The former paragraph embraces the general requirements for strength, permanency, and maintenance of accuracy, and reads as follows:

A scale shall be of such design, construction, and materials that it will support a load of its full nominal capacity without the development of undue stresses or deflections in the parts, and that it may be expected to withstand normal usage without undue impairment of its accuracy or the correct functioning of its operating or indicating parts; it shall be reasonably permanent in its adjustment and shall repeat its weight indications correctly.

The second paragraph referred to deals with the facilitation of fraud, and reads as follows:

A scale shall be of such design and construction that it does not facilitate the perpetration of fraud.

Your Committee further believes that much will be accomplished toward the weeding out of unsatisfactory scales of the type under discussion if the tolerances are strictly observed in the tests made, including, of course, the application of the manufacturers' tolerances in case the scales being tested fall in the category of new scales.

A further recommendation of your Committee in this relation is that wherever it is possible to do so under existing authority, the weights and measures official test and inspect scales of the class under consideration while these are in the hands of the local scale dealer, and before they have been purchased by the intended user. If this be done, the official will be able to keep out of the channels of trade all scales which fail to meet the requirements on initial examination. In addition to this direct result, it is believed that the elimination of faulty apparatus at its local source will be a strong incentive for the local scale dealer to stock scales, the large majority of which may reasonably be expected to receive the approval of the weights and measures official.

If the official is at present without authority to examine apparatus in the hands of a dealer, before this has been sold for commercial use, it is recommended that consideration be given to the advisability of appropriate steps to secure that authority so that the plan outlined above may be followed.

If it be found that the vigorous enforcement of the two specification paragraphs cited and of the appropriate tolerances fails to correct the present evils caused by poor design and cheapened construction of certain small-capacity spring scales, the Committee on Specifications and Tolerances will then be prepared to reopen the matter of a stiffening of the specification requirements.

Certain detailed amendments, which are in your hands, in the codes of specifications, tolerances, and regulations are recommended for adoption.

Respectfully submitted.

(Signed) F. S. HOLBROOK, *chairman*,
CHARLES M. FULLER,
JOSEPH G. ROGERS,
JOHN P. McBRIDE,
GEORGE F. AUSTIN, Jr.,
Committee on Specifications and Tolerances.

Mr. HOLBROOK. I move that the Codes of Specifications, Tolerances, and Regulations as printed in the National Bureau of Stand-

ards Handbook H22 be formally adopted by the Conference as the official codes of the Conference to date.

(The motion was seconded.)

The ACTING CHAIRMAN. You have heard the motion made and seconded. Is there any discussion?

[SECRETARY'S NOTE.—At this point a question in relation to tolerances on corner test of vehicle scales was raised and a motion was made to change the tolerances, as an amendment to the motion to adopt the codes as printed in National Bureau of Standards Handbook H22 as the official codes of the Conference to date. After some debate, the amendment was withdrawn to be renewed when the subject of vehicle scales should have been reached in due course in the consideration of the report of the Committee. In the interest of clarity the material has been rearranged somewhat so as to present at one place in this report the arguments in relation to tolerances on vehicle scales. See page 115.]

Mr. O'KEEFE. This particular book has been printed and distributed. Why are we voting on it?

Mr. HOLBROOK. Because, while it has been distributed by the Bureau, this Conference has not as yet officially adopted it.

The ACTING CHAIRMAN. The question is upon the motion to adopt Handbook H22 as the official handbook of the specifications and tolerances of this Conference. Each official delegate is entitled to vote upon this subject and we will ask for a rising vote.

(The question was taken and the motion was agreed to.)

Mr. HOLBROOK. I will now read that portion of the report of the Committee which deals with the amendments to the codes of specifications, tolerances, and regulations of the Conference proposed by the Committee.

You will note that certain portions of the specifications are underlined; this indicates nonretroactive material. [Reading:]

SECTION ON VEHICLE TANKS

Specification No. 5, under the heading "Vehicle Tanks," reads as follows:

5. FILL OPENINGS AND INDICATORS.—*The minimum dimension of the fill opening shall be 10 inches.* An indicator shall be provided within the fill opening of each compartment; *this indicator shall be permanently attached to the shell of the compartment* and shall be located approximately midway between the ends of the compartment. The indicator shall be so designed that it will clearly, distinctly, and unmistakably define the height to which the compartment must be filled in order to contain its marked capacity, *and the surface upon fill of the compartment shall be so reduced in area that the change in height of the liquid surface at the index of the indicator equivalent to the volume representing the tolerance on the compartment capacity shall in no case be less than 0.04 inch.* If this indicator is adjustable it shall be so constructed that it can be sealed in such a manner that its position cannot be changed without destroying or mutilating the seal.

Amend this specification to read as follows:

5. FILL OPENINGS AND INDICATORS.—*If the fill opening is circular its minimum effective diameter shall be 5⅝ inches, or if other than circular, it shall have an equivalent minimum effective area (24.85 square inches): Provided, however, That the fill opening shall be of such size that it can readily be determined whether or not the compartment has been properly filled or completely emptied, as the case may be, and that the attachment of the seal can be readily accomplished when such sealing is required by the terms of this specification.* An indicator shall be provided within the fill opening of each compartment; *this indicator shall be permanently attached* and shall be located approximately midway between the ends of the compartment. The indicator shall be so designed that it will clearly, dis-

tinctly, and unmistakably define the height to which the compartment must be filled in order to contain its marked capacity, *and the change in height of the liquid surface at the index of the indicator equivalent to the volume representing the tolerance on the compartment capacity, shall in no case be less than 0.04 inch. An adjustable indicator and any removable part to which any indicator may be attached shall be so constructed that it or they can be sealed in place in such a manner that their position cannot be changed or that they cannot be removed without destroying or mutilating the seal or seals.*

This provides that where the fill openings are circular the minimum effective diameter shall be 5⅝ inches—nominally 6 inches—or shall have an area of 24.85 square inches, which is computed from the diameter of 5⅝ inches.

Last year the Conference adopted an amendment made from the floor, fixing the minimum dimension of the fill opening at 10 inches. The argument advanced for the increase in the size was to insure that the indicator might be readily sealed in place. Officials have succeeded in sealing the indicators in place in the case of tanks which have the standard openings, usually called the 6-inch opening and the 8-inch opening. It seems improper for this Conference to specify a dimension that is going to destroy a line of standardized openings for the mere ease of sealing, an operation which occurs perhaps only once a year or even less frequently than that.

Another amendment to this specification made last year was that the indicator be attached to the shell of the compartment. In order to attach an indicator to the shell the indicator usually must be made excessively long, and attached horizontally, with the result that it may be bent, usually downward. It seems that the indicator should be allowed to be attached to any part of the vehicle tank provided that that part of the tank, if removable, be sealed in place so that the height of the indicator cannot be changed or it cannot be removed without breaking the seal. In this event the situation is effectively controlled. The remainder of the changes in the specification are intended merely to improve the language.

Mr. KANZER. I said earlier this morning that I wondered if we could not get at these things in a little plainer way so that the weights and measures officials out in the field could understand them. During the last year we had a specification requiring that the diameter of circular openings be 10 inches. That proved very successful but now we propose changing that and I question if it should be changed. I do not know how that 5⅝ inches was derived; maybe there is some very technical reason for it. But why not specify a 5-inch opening? The opening may have an equivalent minimum area of 24.85 square inches. I do not know who will go to the trouble to determine what the effective area will be. Why cannot it be made some plain figure like 25 square inches? I know that the area of a circle 5⅝ inches in diameter equals 24.85 square inches, but for the sake of clarity we can specify 24 inches. Then we come down to the change in the height equivalent to the volume representing the tolerance; this shall not be less than 0.04 inch. I do not know of any way that an official ordinarily can determine 0.04 of an inch; he can determine a sixteenth, I think. Therefore, I make a general suggestion without offering a resolution. I think that it should be discussed whether we cannot possibly get into the hands of a weights and measures official something that he understands. If we get it in simple terms I think that we can work more effectively with it.

Mr. RAGLAND. Mr. Chairman, last year at this Conference I suggested this amendment that the minimum dimension of the opening be 10 inches. The Conference approved of it, and I carried it home to my people and my legislature enacted it into a law and therefore a change here will not affect me in my own jurisdiction. I visited the big oil industry in my jurisdiction and presented them with the code and said, "If there is anything in this code that does not suit you, I would be glad to have you tell me of it and will consider it." Up to the present time no oil company has made any request for a change.

Mr. GRIFFITH. Mr. Chairman, this amendment to the present code requiring a minimum fill opening of 10 inches, which was adopted at the last National Conference, is not retroactive. It does not affect any tank trucks in use prior to the adoption of the 10-inch requirement, but on new equipment it was necessary for the tank truck manufacturers to make their opening 10 inches. Mr. Ragland has cited the physical reason for it. There are others. I doubt if there is any one man in this room—or I will even include the ladies—who could put their hands through a five and a fraction inch opening and seal an indicator properly and securely.

Now, this is of great importance to facilitate your work, because if you are not able to seal properly and securely you might as well not put seals on at all. A 10-inch hole requirement has met with no serious objection by any of the tank-truck manufacturers through the eastern part of the country and some in the west; tank-truck manufacturers from Missouri did write us immediately after the adoption of this code. It seems to me that to reduce the 10-inch dimension would be a step backward. While Mr. Holbrook may not think that the ease and facility of our work is of much importance, I would like to have the opportunity of having the deputy inspector in my office who handles that work tell you some of the practical and actual conditions involved.

Now, to reduce the dimension to 5 inches also presents this difficulty: Everybody knows you can see more through a larger hole than you can through a smaller one. In order to determine how much liquid is in the tank you should have as much visibility as possible particularly when you want to see the bottom of the tank. Now, since this present requirement is not retroactive, but only applies to the new trucks, I think we should absolutely retain it for the advantages of the weights and measures officials in their work.

Mr. BAUCOM. Down in my State we have some two hundred 4,000-gallon tanks operating, and a good many of them are of the single-compartment type. It would be absolutely impossible for the operator to know when that tank is full if you had a 3-inch nozzle in a 5-inch hole. I feel that perhaps it should be amended and I do not know just exactly what should be done and I will not say, but I will address my remarks to that 0.04 inch. Do you know what that means? On an ordinary 4,000-gallon tank truck the tolerance allowed is 16 gallons of gasoline. It is just plumb ridiculous to say that we can determine that that tank truck holds so many gallons when you have 16 gallons represented by 0.04 of an inch, 400 gallons to the inch. I think it should be changed. It might be large enough in some instances now. The truck owner hauls that gasoline at so much a gallon. We get a tax at so much a gallon. If he can haul gasoline and make an error of 16 gallons on each load that means that much for him. If you take

200 truck loads a day with a 16-gallon loss in 4,000, you can see how much money that will run into in a day. In that case, they would be protected in short measuring under the State seal. I do not believe in turning that over to them as casually as that. I believe that should be increased from 0.04 of an inch to possibly 0.4 of an inch, or we might leave it up to the Specifications and Tolerances Committee to work it out closer. Everybody knows that every tank in North Carolina must have a 10-inch opening. I think the figures might be made different on tanks of different capacities but for large-capacity tank trucks, 10-inch openings are satisfactory.

Mr. FULLER. Mr. Chairman, in regard to the present amendment, the minimum 5⅝-inch effective inside diameter is in fact a 6-inch pipe opening, and I might say that we have many of those in use at the present time which are calibrated and sealed and give every satisfaction. Remember this is a minimum requirement and remember also that it applies not only to larger sizes but also to compartments having capacities of 150 to 200 gallons. The amendment further gives us all authority we need and if the design of the tank-wagon compartment is such that we cannot effectively calibrate it with a smaller opening then a larger opening may be required. We should not go on record as saying that where a smaller opening will give satisfaction you must have a 10-inch opening. We must be reasonable in these things and this is comprehensive enough to cover any situation which may arise.

Mr. ENGELHARD. The gentleman spoke of 0.4 of an inch. Frankly, I have a decimal scale in my kit, but I do not use it. I doubt very much whether in actual practice we could figure out what 0.4 of an inch is. I think it should be changed to ⅜ or 0.375 of an inch. There is very little difference there.

Mr. LEITHAUSER. Could we require that an indicator shall be so designed that it shall correctly and unmistakably indicate the point to which the compartment must be filled in order to contain its marked capacity within the tolerance as applied, and then do away with all of those fractions of an inch?

It is very desirable to have a 10-inch opening so that we can look in and see what is inside. When there is a 6-inch opening you cannot see in. I have known cases where 200 gallons stayed up in the front end of the truck where they had a 6-inch opening on a 1,500-gallon tank.

Mr. HOLBROOK. Mr. Chairman, there is already in the specification the requirement that the indicator must clearly and unmistakably define the height of filling but that is not a definite direction to the manufacturer because every weights and measures official might have a different opinion.

It seems that some of the members are talking about tolerances already established, which are not now in question. It is the opinion of the Committee that 0.04 of an inch is an amount which can be readily observed by anyone. If we attempted at this time to change this figure from 0.04 inch to 0.4 inch I do not know what we would do to the vehicle-tank industry.

Now, as to the fill openings: The diameter of the standard fill openings are 5⅝ inches and approximately 8 inches, a little less. Can indicators be sealed in these openings? Mr. McBride, of Massachusetts, Mr. Rogers, of New Jersey, Mr. Austin, of Detroit, and Mr.

Fuller, of California, are approving these tank wagons in their jurisdictions. They have been sealing the indicator in the openings. In the opinion of the Committee past experience has proven definitely that they are sealable. That being so it seems to me that we should be satisfied. Gentlemen, I strongly urge against destroying a standard line of apparatus for the mere ease and convenience of the occasional act of a weights and measures official.

Now, as to visibility: The language provides that the fill opening shall be of such size so that it can be readily determined whether or not the compartment has been properly filled or completely emptied, as the case may be. In a case of a very large tank the required size of the opening should be greater than the minimum specified.

Mr. KANZER. Mr. Chairman, I do not think that we are consistent in the way we change these specifications. We have in the first part of the section said, "If the fill opening is circular, its minimum effective diameter shall be 5⅝ inches, or if other than circular, it shall have an equivalent minimum effective area (24.85 square inches)." Mr. Holbrook clearly says that we shall, if possible, give a manufacturer some indication as to how he shall construct any device. That is correct. However, in the same breath they indicate that they are not so very sure of themselves because they go on and qualify it. Now, if the specified opening takes care of the situation, I cannot see the need for that qualifying clause. If the specified opening is not right, then let us have it corrected. The point is that in the specification we set a certain arbitrary, as I put it, combination of figures that we find sooner or later does not work out and then we put qualifying phrases around it to protect it. The very fact that we propose changing it from what we had it last year, 10 inches, shows that very clearly.

I think if you specified 5 inches or 6 inches the weights and measures officials could understand that. Perhaps 0.04 of an inch is a proper distance, but I shall not have it that way. I will tell the weights and measures officials to make it ⅜ or ½ or 1/16, but I will give it in those terms that the men can understand. I do not expect my weights and measures officials to test a tank with a micrometer. If you are going to have tolerances and specifications for the manufacturers' guidance, let us make them manufacturing requirements and let us give to the weights and measures officials something that they can enforce in a practical manner.

Mr. Holbrook honestly says that he does not think that the weights and measures officials are facing a hardship. That is his thought. However, the weights and measures official has thousands of things to do. He is annoyed by a multiplicity of things and he wants to have specifications in such terms that he can readily do the work. You must remember that we have a certain grade level of these weights and measures officials and they are receiving a certain salary—in a number of cases a minimum one. These are laboratory scientific figures. I do not question their accuracy but I do question the possibility of the enforcement of these figures in fractions. So, therefore, I come back to my original thought; wherever possible let us make a certain specification, if necessary, for the manufacturers and then a specification in simple terms for the weights and measures officials. If that is done I will raise no objection but I certainly think that we should have a set of specifications that can be used out in the field by our men.

Mr. HOLBROOK. Mr. Chairman, I think Mr. Kanzer does an injustice, doubtless unintentional, to the average weights and measures official when he suggests that they cannot measure in fractions of an inch. As to the argument that 10 inches was adopted last year, this was proposed from the floor of the Conference and it was adopted without due consideration being given to how it might affect a stabilized line of apparatus. Gentlemen, I think such a thing may often occur when there is proposed from the floor of the Conference a figure which is more or less taken out of thin air and which cannot be studied. An injustice may thus be done to the manufacturers of weights and measures equipment.

The figure, 5⅝ inches, is proposed because it is standard in the industry and because it is understood that it has been found to be satisfactory in the past. Then 24.85 square inches is used because that is the area of a circle having a diameter of 5⅝ inches. We cannot change mathematics; we might say 25 square inches or 24 square inches but we can not disturb a mathematical fact. If the weights and measures officer can determine that the area is 24 square inches or if he can determine that the area is 25 square inches, he can just as easily determine that the area is 24.85 square inches, because if he computes his formula accurately that is the answer he will get.

These changes were recommended only after they had received very careful consideration by the Committee on Specifications and Tolerances and I think that you will grant they are experienced men. Specifically in recommending that the figure 10 inches be reduced to the figure 5⅝ inches, the opinion of the Committee is that we are correcting a mistake which was made by the Conference last year due to the fact that the members did not have the opportunity fully to consider the issue at hand.

Mr. BAUCOM. I move that this be referred to the Committee for further study and that they report back next year.

(The motion was seconded.)

Mr. DAVIS. Mr. Chairman, I would like to ask whether these specifications are being written for the manufacturer or for the people who are paying the inspectors? If there is an opening large enough so that the inspector can easily and readily get his tools into it to seal it, money is being saved for the State or the municipality for whom he is working. If you ever tried to read and see the filling point in one of these small openings you would know how hard it is to do it. I certainly am not in favor of too small an opening, and I think a 5-inch diameter opening is too small.

Mr. KANZER. Mr. Chairman, I want to correct one thought that may have arisen from my remarks as to what I think of the intelligence of weights and measures officials. I have the greatest respect for the weights and measures officials. I work with them constantly every day. I think they are the hardest working type of Government officials today. They are far better than the general type of officials as I know them and I would not have anyone read into my remarks any thought that I spoke in any derogatory fashion. I am faced with the fact—and so is every other State official—that you can only get a certain number of what we would call technical men for weights and measures officials and you cannot rise higher than the general level.

Mr. A. A. REED. Mr. Chairman, I want to ask whether or not this 10-inch opening is retroactive.

The ACTING CHAIRMAN. My understanding is that it is nonretroactive.

Mr. A. A. REED. Mr. Chairman, before you put the motion to refer the proposed amendment back to the Specifications and Tolerances Committee for another year, I would like to have it understood that we are not voting on the merits of the proposed amendment itself but that we are voting as to whether or not we will refer it back for further consideration.

The ACTING CHAIRMAN. The proposition is to refer it back to the Committee for consideration and further report next year; in the meantime the specification will remain in its present status.

Mr. STROOP. Mr. Chairman, I am a representative of the American Petroleum Institute. So that you will know where the recommendations came from, I want to make it clear that these proposals originated with the operating men in the petroleum industry—our automotive transportation division.

Mr. HOLBROOK. There was a series of amendments proposed to this code, including some eight or ten amendments, I think. The Committee on Specifications and Tolerances gave careful consideration to each amendment in turn. We thought that three or four out of approximately ten, were proper and necessary and recommended these. Six or seven other amendments which were proposed by the industry were not considered to be desirable and no changes were recommended in those cases.

Mr. LEITHAUSER. In regard to accessibility for sealing of these trucks, while it may be true that you have only to do it once in a while, nevertheless we have perhaps 800 trucks in the city of Baltimore so you can see what the problem amounts to.

(The question was taken, and the motion was agreed to.)

Mr. HOLBROOK (reading):

Specification No. 12 reads as follows:

12. RETURN OF INDICATING ELEMENT TO ZERO.—*Meters installed on vehicle tanks shall be so designed and constructed that the indicating element used to tally sales and deliveries to individual purchasers or to indicate the amount delivered when any portion of the cycle or stroke has been completed shall be returnable readily to a definite and clear zero indication before the next delivery is begun. Means shall be provided to prevent the indicating element from being returned beyond the zero graduation. The indicating element may be advanced only by the mechanical operation of the device itself: Provided, however, That the device may be cleared by advancing the indicating element, but in this event the indication shall be obscured and remain obscured, until the zero is reached.*

Amend this specification by adding at the end thereof the following words:

Provided, however, That an element designed for predetermining the amount of a delivery to be made shall not be construed to be an indicating element when such predetermining element is clearly differentiated from the indicating element so that it will not be mistaken therefor.

It has not been understood in all cases in the past whether a predetermining delivery element on a meter was a proper device under the code of specifications as it stands at the present time. The Committee is of the belief that such a device, if properly constructed, is an entirely proper device.

(The amendment as proposed by the Committee was duly adopted.)

Mr. HOLBROOK (reading):

14. DISCHARGE LINES.—If the unit be designed for discharge by gravity, the discharge line shall be as short as practicable and there shall be no shut-off valve at its discharge end. If the unit be designed for discharge by means of a pump, the discharge line shall be of the wet-hose type with a shut-off valve at its discharge end, and immediately adjacent to this discharge valve there shall be installed a spring-loaded check valve so adjusted that drainage of the discharge line will automatically be prevented. When two or more compartments discharge through a manifold and the discharge lines are equipped with independently-operable discharge valves, the construction shall be such that deliveries shall be accurate whether or not more than one of the valves are partially or wholly open.

Amend this specification to read as follows:

14. DISCHARGE LINES AND DELIVERY HOSE.—If the unit be designed for discharge by gravity, the delivery hose shall be as short as practicable and there shall be no shut-off valve at its outlet end. If the unit be designed for discharge by means of a pump, the delivery hose shall be of the wet-hose type with a shut-off valve at its outlet end, and immediately adjacent to this valve there shall be installed a spring-loaded check valve so adjusted that drainage of the hose will automatically be prevented. When two or more compartments discharge through a manifold and the discharge lines are equipped with independently-operable discharge valves, the construction shall be such that deliveries shall be accurate whether or not more than one of the valves are partially or wholly open.

The Committee feels that the only effect of the change in the specification is improvement in phraseology. Apparently there has been a misunderstanding as to what constituted the discharge line and what constituted the delivery hose.

Mr. KANZER. Mr. Chairman, I suggest that the words "spring-loaded check" be removed from the specification. I do not ask that as a matter of avoiding trouble with mechanical devices but simply as a matter of good specification writing.

Mr. GRAEFF. Perhaps Mr. Kanzer has overlooked the fact that the omission he suggests would allow the use of a manually-operated valve, only, which is something which we want to guard against.

(The specification as proposed by the Committee was duly adopted.)

Mr. HOLBROOK (reading):

Add a new regulation to be known as Regulation No. 2 and to read as follows:

2. When a vehicle tank is used as a measure, the vehicle shall stand upon a level surface during the filling of the compartments; during a delivery, the vehicle shall be so positioned as to insure complete delivery whenever the delivery is such that a compartment should be completely emptied.

The Committee is of the opinion that when a vehicle tank is used as a measure it should be filled when in a level position and when it is emptied it should be in such a position that the compartment will completely drain. The requirement in regard to delivery merely calls to the attention of the person making it that when there is a grade involved it is often necessary so to position the vehicle tank that there will be complete drainage.

(The regulation as proposed by the Committee was duly adopted.)

Mr. FULLER. Mr. Chairman, before we leave the subject of vehicle tanks, I ask the privilege of bringing up one matter which is of a great deal of importance to all of us. I refer to our present Specification No. 9, "Piping," which has always been highly controversial and which was adopted 3 years ago by the very close vote of 32 to 28.

[SECRETARY'S NOTE.—The specification in question reads as follows:

"9. Piping.—Vehicle tanks equipped with control or emergency valves shall have such valves at the lowest point of outlet from each compartment, and the capacities of such compartments shall be construed as not including the capacity of the piping leading therefrom."]

By correspondence, and also by talking with a great many of you here, I find an unfortunate situation exists in that practically half of the jurisdictions follow the specification and gage vehicle tanks with pipe lines empty, and the other half gage them with pipe lines full, because they firmly and sincerely believe that method is the proper one.

At our conference in California last fall we gave this matter a great deal of consideration. We proposed the following amendment to this [reading]:

9. Piping.—Vehicle tanks equipped with control or emergency valves shall have such valves at the lowest point of outlet from each compartment and the capacities of such compartments may be determined as including or as not including the capacity of the piping leading therefrom. Such marking as is provided for under Specification No. 10 of this Code shall indicate whether the measured capacity has been determined as including the capacity of the piping leading therefrom or as not including the capacity of the piping leading therefrom.

In other words, it is optional with the sealer in his jurisdiction as to whether he shall require that piping be excluded or included. You do not put him in the position in which some of them are now, of adopting regulations which are contrary to these regulations. Gentlemen, it certainly is evident to you that when there is such a close division of opinion, when 28 men who are doing practical work in the field believe one way and 32 believe the other way, there is merit in both methods. I do not believe in adopting a National code for use throughout the entire country which is of such a character that half of the men in their own jurisdictions are not enforcing it. This proposal gives every protection needed.

Mr. STROOP. As all members of this Conference know, we had a very interesting session 3 years ago when this action was taken as referred to by Mr. Fuller. You perhaps recall that the American Petroleum Institute Committee on Automotive Transportation recommended that the tanks be calibrated with the discharge pipes filled. We are still of the opinion that that is the method which should be used.

Recognizing that we cannot hope to sway this Conference to our way of thinking, I desire on behalf of our committee to support the proposal which Mr. Fuller has made, thus leaving it with our men in the field to talk the matter over with the sealers of weights and measures in various jurisdictions without prejudice, to find if we can have our operating difficulties simplified in that particular State by so calibrating our tanks.

Mr. RAGLAND. Mr. President, I am indeed unfortunate. I know of no man who attends this Conference that I have a higher regard for than Mr. Fuller, but I was father of this requirement and, gentlemen, to be consistent with my good friends, how can you change this specification when New Jersey and Massachusetts by State laws say that tank wagons with pipe lines full shall not run over the roads? Gentlemen, we are not unreasonable. If the capacity of the pipe line is included in the capacity of the compartment, the driver can close the valves when he fills the tank wagon; he robs the customer of what should be in the line.

Mr. J. G. ROGERS. I do not want to take issue with Mr. Fuller and I will not, except to say that it is against the safety laws of our State to have vehicles go over the roads with lines filled. I will, moreover, say that we consider the compartment to be the measure and not the auxiliary pipe. I have always contended that where anything else is included there is always a possibility of mistake either intentional or otherwise. It is also a safety feature.

This has been a controversial question down here for a number of years. If you gentlemen will refer back to the minutes of the early Conferences you will find that we originally had in the code the measurement of these tanks with the lines empty. That was about 10 years ago. Then we made the change when we found that there were some that wanted the lines included in the calibration, and this prevailed for probably 2 or 3 years. Then we went back again to the calibration with the lines empty. The subject seems to have been settled; you gentlemen have gone on record on two out of three occasions that the calibration should be done with the lines empty, and I am sticking to it on that principle alone. It is purely a weights and measures matter.

Mr. FULLER. Mr. Chairman, in order that there may be no misunderstanding, I would say that this proposed amendment makes it optional. It does not propose to change the laws of States where they have decided on the present method; but it will allow the rest of us in any other section who find the method of calibration with line full to be practicable to adopt that method without going contrary to the National code. In many large jursidictions they are gaging vehicle tanks in this manner and they will continue to do so. I have been a practical man in the weights and measures field for over 25 continuous years and nobody can say that I ever advocated any amendment in principle unless I entirely believed that it was right and just.

Mr. BAUCOM. Mr. Chairman, I move that the amendment proposed by Mr. Fuller be adopted.

Mr. J. G. ROGERS. These regulations and specifications are merely recommended for adoption by the several States. If California finds itself in difficulty it need not adopt this paragraph. If you include the pipe line as part of the capacity you are directly inviting fraud and are thereby defeating the purposes of weights and measures administration. You might as well consider the capacity of the spout as part of a measure. I hope you will vote "no."

(The question was taken, and the motion was lost.)

SECTION ON SCALES

Mr. HOLBROOK. We now come to the section on scales [reading:]

SCALES—GENERAL DEFINITIONS.

Add a new paragraph to be known as paragraph A–2q, and to read as follows:

A–2q. NEW SCALES.—Scales which are about to be put into use for the first time or which have recently been put into use and are being tested for the first time by the weights and measures official. Scales which have been reconditioned or overhauled or which have been condemned for repairs by a weights and measures official and subsequently adjusted or repaired shall, upon the first test thereafter, be construed to be "new" scales for the purpose of the application of tolerances.

As was reported the other day, the special committee appointed by the National Scale Men's Association had a joint meeting with the Committee on Specifications and Tolerances of the National Conference in relation to the tolerance on vehicle scales. One of the arguments advanced by the National Scale Men's Association Committee was that the present tolerances were such that the standards of the scale repairmen might not be maintained.

This amendment in effect provides that all scales which have been reconditioned or overhauled or which have been condemned for repair by weights and measures officials shall be subjected to the tolerances for new scales. In other words, repaired vehicle scales will take the tolerance of 0.1 percent when the load is on the end of the platform and 0.2 percent when on a corner. After careful consideration it seems to the Committee on Specifications and Tolerances that this amendment does much to meet objections raised to the tolerances on vehicle scales which were adopted last year.

You will remember that only 22 percent of the vehicle scales so far tested by the National Bureau of Standards were found to be accurate, and some 78 percent were found to be inaccurate when the present tolerances for used scales were applied. If this amendment is adopted the tolerance hereafter applicable to repaired scales will be one-half or less of the tolerance applied by the Bureau in its investigation.

(The definition as proposed by the Committee was duly adopted.)

Mr. ROESER. There is a group present representing certain interests, both manufacturing and industry. We have come a long way in this period of severe economic distress and have stayed at the hotels for a week to present an issue.

In order that there may be no confusion about it, I would like it to be understood that this amendment just adopted in no way affects this issue, which is that we do not want a 4-pound-per-thousand tolerance on any scale. It is the opinion of scalemen that where an error of that magnitude is found the scale either needs repairing or replacement. The whole situation would be clarified in the eyes of Mr. Kanzer and everybody who has to do with the maintenance and operation of scales, if you would wipe out this multitude of requirements and require that the error on a vehicle scale under any load should not exceed 2 pounds per 1,000 pounds. Manufacturers can build scales under the terms of that requirement and they can be maintained within that tolerance. It is not proper for me to make a motion on the floor of the house, but I would like to see somebody who is qualified offer a requirement that would permit a tolerance of 2 pounds per 1,000 pounds on the test of a vehicle scale so that we scalemen will know where we stand.

Mr. ENGELHARD. It is my understanding that a tolerance of 0.20 percent is allowed on a corner of a new scale. However, when we find vehicle scales in use, out in the open, exposed to the weather and subject to abuse, and to wear and tear, and to accumulations of dirt, we will tolerate 0.40 percent on a corner. Actually, I do not condemn scales which develop errors in test of 0.50 percent. I believe that with improvements in metallurgy and machine tool design, it is practical to build weighing and measuring devices well within 0.20 per-

cent, and so I do not approve of increasing the tolerance beyond 0.20 percent on new devices.

Mr. LEVITT. Mr. Chairman, 2 years ago I came before this Conference and suggested a change in tolerance on motortruck scales because of the fact that we had made a survey of some 200 scales within a radius of 100 miles of the city of Springfield and had found that a large majority of those scales were not within 0.20 percent. I felt like some others that the requirements were a little too rigid and I recommended that the tolerance be liberalized.

Immediately after that we bought a heavy-duty test equipment outfit. I found after our first trip around, that when the repairmen and the manufacturers realized that they had to have proper installation and proper maintenance, it was possible for them to keep a scale within 0.20 percent. I want to say this morning that I was wrong a few years ago when I suggested liberalizing the tolerance and I don't see any occasion for the Conference to take a backward step. If we cannot go forward I do not think we should go backward, and I would like to see the tolerance restored to 0.20 percent.

Therefore, Mr. Chairman, I would like at this time to make a motion that this Conference change the specifications and tolerances for motortruck scales so that a maximum of 0.20 percent on used scales will be allowed and so that the tolerance on new or repaired scales will be one-half of that tolerance, or 0.10 percent. I do this simply because I think it is for the best interest of the weights and measures officials and of the scale manufacturers. I know that the difficulty in maintaining tolerances is largely because of the fact that the repairmen have a tendency to liberalize them. I know from experience that certain pump repairmen and operators, knowing that the tolerance is 7 cubic inches on 5 gallons, do not adjust pumps to zero error but set them 5 cubic inches minus to take advantage of the tolerance. I do not think that there is any representative here who would take advantage of a tolerance like that, but we do know of people in the field who are doing it.

(The motion was seconded.)

[SECRETARY'S NOTE. For the benefit of the reader it may be said that the motion proposed was directed to the amendment of "Scales—General Specifications—Par. B-2w, Shift Test of Scales," the applicable portion of which reads as follows:

"A scale having four main load bearings shall give results accurate within tolerance when a load of one-quarter capacity or less is placed so that its center of gravity lies as nearly as may be over any one of the main load bearings, * * * and when a load of one-half capacity or more is so placed at the center of any quarter of the platform, * * * Provided, however, That in the case of a vehicle scale, the tolerance to be applied to the results on the corner shall be twice the tolerance which would otherwise be applied, but the algebraic mean of the errors on the two corners at each end of the scale shall not exceed such regular tolerance."

The regular tolerance on the end of a vehicle scale in use is 0.20 percent, on a new or overhauled vehicle scale, 0.10 percent. The proviso increases these tolerances to 0.40 and 0.20 percent, respectively, under the conditions set out. The motion then, contemplated the repeal of that portion of the above specification, which starts with the words "Provided, however."]

Mr. HOLBROOK. Mr. Chairman, last year the Conference adopted a maximum tolerance of 0.40 percent,this tolerance to be applied, with certain important limitations, on the corner of a vehicle scale only. The arguments in favor of the adoption of this tolerance are summar-

ized in a letter written some time ago, and I would like to read this in part. [Reading:]

I would point out first in this connection that the tolerances adopted by the National Conference are intended for the use of regulatory officials of the States and cities and counties in passing upon the suitability for continued use of weighing and measuring equipment which is under their official control. * * * the only effect of the tolerances to which objection is being taken, would be to permit to remain in service, insofar as official control is concerned, certain scales which would otherwise be rejected, if and when corner errors of certain magnitudes are developed in the test.

I would mention next that there were made available to the National Conference Committee the results of the extensive series of tests of vehicle scales conducted by the Vehicle-Scale Testing Unit of the National Bureau of Standards during the 6-month period preceding the 1937 meeting of the National Conference. A study of these data disclosed that under the original tolerance provisions, some scales would be rejected on the results of the corner tests but that these same scales gave reasonably good performance in other respects. It should be borne in mind in this connection that an individual corner of a motortruck scale is usually not susceptible of a nose-iron adjustment; only the end can be adjusted without grinding the pivots to change lever ratios, an operation which should only be attempted in a shop. It seemed, therefore, that these scales would be unnecessarily penalized, were the original tolerances to be retained.

A very important consideration in this relation, in the opinion of the Committee, is this: In the regular commercial use of a vehicle scale, it is entirely impracticable for the vehicle load to be concentrated on one corner of the platform. In practically all cases the load on any vehicle axle is reasonably well distributed between the two ends of the axle, and the relation between wheel treads and platform widths is such that each corner at either end of the scale bears approximately one-half the load at that end. It follows that if the algebraic mean of the errors on the two corners at one end of the scale is within the original tolerance, the liberalization with respect to individual corner errors will not to any material extent adversely affect the weighing performance of the scale in regular use. In this relation I might cite the National Conference definition of a Vehicle-Scale: "A vehicle scale is a large-capacity scale designed to be used to determine the weight of a motortruck or wagon, loaded or unloaded." It is probably these considerations which have influenced the very considerable sentiment which is growing up to the effect that in the routine test of a vehicle scale the corner test be discontinued and that only an end test be made, except in special circumstances.

The provision requiring the algebraic mean of the errors to be within the regular tolerance is so important that I feel I should interpolate a few words in that regard. The tolerance on the end of a vehicle scale in use is 0.20 percent. The tolerance on an end of a vehicle scale which is new or repaired is 0.10 percent. The tolerance of 0.40 percent on an individual corner of a scale in use is a maximum and is only allowed when the algebraic mean of the errors on the two corners at the end in question is within 0.20 percent. We feel that the tolerance is well under control in that when the axle load of a vehicle is on the end of a scale the weight is necessarily distributed between the corners. [Reading:]

We do not wholly subscribe to the theory that reducing tolerances always results in improvement; when the tolerance is reduced to such an extent that it is very difficult or impossible of rigid enforcement, it is likely to be replaced by the judgment of the person testing, which usually results in increasing the errors which will be allowed. Moreover, it is not infrequently the case that the testing equipment and methods employed are inadequate to develop the errors which are present in the equipment tested. The tolerances adopted by the National Conference are intended to be strictly applied as written, upon the results of an adequate test. When so applied, it is believed that the present tolerances of the National Conference for vehicle scales will not be conducive to the development of reprehensible practices in scale maintenance and will not be found to be prejudicial to the interests of any agency concerned with commercial weighing.

Once again, I desire to interpolate. Your action this morning has already very considerably stiffened the requirement on scales which have been reconditioned, overhauled, or repaired. [Reading]:

On the contrary, the modification of the tolerances for corner tests of vehicle scales is one of several modifications recently made, with the view of harmonizing tolerance requirements with actual conditions which exist, not for the purpose of continuing in service scales which are "inaccurate," but to the end that the tolerances may be applied in all cases with the assurance that unwarranted rejections will not be made. In this connection, as a practical matter, it may be said that even after the modifications in tolerances, from 70 to 80 percent of the scales tested by the vehicle-scale testing unit of the National Bureau of Standards were found not to be accurate, a situation which seems to indicate that the tolerances are not too liberal.

Some time ago we analyzed the results of tests on all vehicle scales made by the Bureau equipment from the beginning of the work up to January 1, 1938, to determine the practical effect of the amendment made at the last Conference. It was found that 766 tests on vehicle scales had been made in 16 States and in the District of Columbia. Corner tests were made in the case of 161 of the scales tested. Of these scales only five, or 3 percent, were found which were within tolerance after the doubling of the tolerance on corner results but which would not have been within tolerance before the amendment of the shift test specification.

Now, the question is of enough importance to take the time to analyze the results of these five tests.

(Mr. Holbrook then analyzed the test results of the five scales in question. The performance of these under test by the National Bureau of Standards is detailed in the following. The results starred (*) would not be within tolerance under the requirement of paragraph B–2w before amendment of the Twenty-seventh Conference.)

TEST RESULTS

20,000-LB SCALE. MINIMUM GRADUATION, 2½ LB.
(TEST 196)

Element under test	Test load		Error	
	Position	*Pounds*	*Pounds*	*Percent*
Lever system (ratio)	Left near corner	3,000	0	0.00
Do	Left far corner	3,000	−3	−.10
Do	Left end	6,000	−1	−.02
Do	do	9,000	−3	−.03
Do	Right near corner	3,000	−2	−.07
Do	Right far corner	3,000	−6	−.20*
	(Algebraic mean of errors		−4	−.13)
Do	Right end	6,000	−4	−.07
Do	do	9,000	−6	−.07
Do	Distributed	15,000	−9	−.06

10,000-LB SCALE. MINIMUM GRADUATION, 2 LB.
(TEST 617)

Weighbeam	Right near corner	2,000	−10	−0.50*
Do	Right far corner	2,000	0	.00
	(Algebraic mean of errors		−5	−.25)
Do	Right end	3,000	−5	−.17
Do	do	5,000	+1	+.02
Do	Left near corner	2,000	−2	−.10
Do	Left far corner	2,000	+2	+.10
Do	Left end	5,000	−3	−.06
Do	Distributed	10,000	+1	+.01

TEST RESULTS—Continued

8,000-LB SCALE. MINIMUM GRADUATION, 2 LB.
(TEST 619)

Element under test	Test load		Error	
	Position	*Pounds*	*Pounds*	*Percent*
Weighbeam	Right near corner	2,000	−7	−0.35*
Do	Right far corner	2,000	−3	−.15
	(Algebraic mean of errors		−5	−.25)
Do	Right end	1,000	−5	−.50
Do	do	4,000	−3	−.08
Do	Left near corner	2,000	0	.00
Do	Left far corner	2,000	−5	−.25
Do	Left end	4,000	0	.00
Do	Distributed	8,000	+10	+.12

12,000-LB SCALE. MINIMUM GRADUATION, 2 LB.*
(TEST 624)

Weighbeam	Left near corner	3,000	+6	+0.20
Do	Left far corner	3,000	+2	+.07
Do	Left end	1,000	−3	−.30
Do	do	6,000	+10	+.17
Do	Right near corner	3,000	−10	−.33*
Do	Right far corner	3,000	+2	+.07
	(Algebraic mean of errors		−4	−.13)
Do	Right end	5,000	0	.00
Do	do	6,000	+2	+.03
Do	Distributed	12,000	+17	+.14

25,000-LB SCALE. MINIMUM GRADUATION, 5 LB.*
(TEST 763)

Weighbeam	Left near corner	3,000	−12	−0.40*
Do	Left far corner	3,000	+5	+.17
	(Algebraic mean of errors		−3.5	−.12)
Do	Left end	9,000	−15	−.17
Do	Right near corner	3,000	−10	−.33
Do	Right far corner	3,000	0	.00
Do	Right end	10,000	−15	−.15
Do	Distributed	15,000	−25	−.17

* An automatic-indicating device was attached to this scale; the indications of this device are not included in the results given.

Mr. HOLBROOK (continuing): Now, gentlemen, on account of these errors on corners—outside of the tolerance before the amendment of par. B–2w but inside tolerance as a result of the operation of the amendment—would you condemn those scales? In our opinion you would not. We do not believe that there is a weights and measures official in the United States who would believe that it was a proper exercise of his official duties to condemn such scales as those. Moreover, if you did so we think that you would be doing a very grave injustice to the merchants maintaining those scales. These are five of the scales constituting the 22 percent of the scales which were found to be accurate, and so reported yesterday. Does the Conference want to put those scales out of the accurate and into the inaccurate classification? We think not. As conditions are found the

owner may well be operating one of the most accurate scales in his community. Whether or not you put the proposed amendment "in the book" as Mr. Brenneman would say, and thus put the scales just discussed in the inaccurate class, we do not believe there is a weights and measures official here who would follow the proposed tolerance and condemn these scales. Yet the tolerances and specifications should be so written that we should be able strictly to enforce them without doing an injustice to anyone.

Mr. LEVITT. Two corners on one side of the scale might each be −0.4, on the other side +0.4 percent. Now, you might drive your motortruck on as close to one side as possible and you will get one weight; if you drive this same motortruck on as near the other side as possible you will get a different weight. That is what I have found from experience. Now, why not have side tests instead of end tests?

Mr. HOLBROOK. We believe in an end test because we insist that when a vehicle is put upon a platform it must of necessity rest on both corners at one end of the scale. There is, we grant, a possibility of getting a slight variation in certain cases through driving as near one side of the scale as possible in the one instance and as near to the other side of the scale as possible in the other instance, but it seems that if that expedient were to be adopted by the user to produce errors, you could proceed against the merchant for fraud.

Mr. LEVITT. There is nothing to prevent him from driving to one side of the scale or the other; I do not believe I could prosecute him.

Mr. HOLBROOK. To my way of thinking, on a platform 9 or 10 feet wide, no considerable error will be caused by driving a vehicle either to the one side or the other. The tread of the motortruck is such that any differences in weight will be small.

The Committee, last year, devised this specification as a result of tests. Upon reviewing the matter this year the Committee feels that it did better than it knew at the time, in recommending this tolerance to the Conference. The Committee is wholly of the opinion that the tolerance is a reasonable and proper one and that a decrease in tolerance would cause the weights and measures official to do an injustice to some merchants who are operating vehicle scales.

Mr. HARRISON. Mr. President, in supplementing Mr. Holbrook's remarks, I would like, if you please, to make my position perfectly clear.

I appear before you at this time as a delegate and representative of the Engineering Division of the Association of American Railroads. That Association, as far as I know, is the largest single user and testing agency for scales of the class which you have been discussing. The Engineering Division of the Association of American Railroads is whole-heartedly in accord with the present specifications and tolerances of the Conference and in the name of that division I ask you not to reverse them at this time.

Mr. KANZER. Mr. Chairman, it is getting quite late in this session and I think we will arrive nowheres; I feel that those who favor one side will not give way to those who are on the other side. It occurs to me then, after hearing the discussion—and I know nothing about the matter at all—that everybody agrees on one matter, namely, on end tests there should be a tolerance of 0.2 percent, or 2 pounds a thousand. When the error is over 2 pounds per thousand on an end test, then the scale is incorrect. On a corner test, however, one side thinks the tolerance should not be greater than 2 pounds per thousand,

the other 4 pounds. Why can't we get together and see if we cannot work it out this way:

Resolved that the tolerance on scales should not exceed 2 pounds per thousand; that on vehicle scales the usual corner test of platform scales need not be made; instead in addition to the test up to the capacity of the scale the test vehicle shall be driven centrally on the scale with the rear axle near one end and then near the other end. When the test indicates that the error is in excess of 2 pounds per thousand, there shall be an additional test made on each corner of the scale.

I think by that we have covered both sides of the question. We will have added tests for those who want them for the purposes of repairs.

Mr. ALFREY. I represent the Rock Island Railroad. From my own experience we are having no trouble in keeping scales that are in operation well within the tolerances of 2 pounds per thousand. I believe one of the arguments for increasing those tolerances is the fact that many of the vehicle scales are being badly overloaded; in other words, light wagon scales are being used for motortrucks. In testing track scales in the early days we had somewhat the same condition. Some thought we could not weigh accurately. We are doing it fairly well. One of the difficulties we had was that we had track scales in service which did not rate more than 60 tons on which 100- and 125-ton cars were being weighed, and those scales were included in the reports that are annually made by the National Bureau of Standards.

Now, another thing. The amendment suggested by Mr. Holbrook will help, but let us not overlook the fact that not 1 scale in 25 tested is a new scale or a recently shop-repaired scale. The ordinary scales that you test or that we test are scales that have been in service for some time. Therefore, simply cutting the tolerance in half on a shop-repaired scale is not going to remedy the situation as far as I can see.

Mr. Holbrook mentioned a few minutes ago that scales are not designed so that you can make any adjustment upon any corner. I cannot conceive of any condition that would produce an error of 0.4 percent on a scale. A scale with such an error does not need adjustment, it needs something besides adjustment; it needs taking out. I reiterate that as far as I can see there is no occasion whatever for scales being left in service that ordinarily produce an error of 4 pounds per thousand on any corner. Contrary to the views expressed here, that does cause a considerable weighing error. In Oklahoma, where we weigh wheat in large quantities, there was a scale that was well within the tolerance of 0.2 percent, still the shippers were complaining because one scale would not check with the others closely enough. We do have scales which we can expect to weigh closer than that. The question before the Conference involves the vast agricultural area which is the great user of scales.

Mr. PISCIOTTA. Mr. Chairman, I believe this question is such that it requires a great deal of time and study. I would propose—not for the purpose of limiting the discussion but that we better understand this matter—that that matter be referred to the Tolerance Committee to determine whether or not any changes should be made in the tolerance.

(The motion was seconded.)

Mr. LEVITT. Mr. Chairman, isn't there a motion before the house? I do not know a lot about scales but I would like to have an expression of opinion from the boys who are out in the field engaged in that

work; I would be perfectly willing to go along with the majority. I would like to have a vote on it to see where we stand.

The ACTING CHAIRMAN. We have a motion before the house, Mr. Pisciotta; do you offer your motion as an amendment?

Mr. PISCIOTTA. I would make my motion as an amendment, but if Mr. Levitt objects to that and wants action taken at this Conference without further study, I will withdraw it.

Mr. LEVITT. I would still like to have a vote upon the motion, and then in turn Mr. Pisciotta's motion could be taken up.

Mr. PISCIOTTA. Under the circumstances, I withdraw the motion and ask for the question.

The ACTING CHAIRMAN. The question is upon the original motion to amend the tolerance on vehicle scales by reducing the maximum tolerance on corner tests on used scales from 0.40 percent to 0.20 percent, and similarly, on new scales and repaired scales, to reduce the maximum tolerance from 0.20 percent to 0.10 percent.

Mr. HARRISON. Before the question is put, may I have a word?

(The question was called for.)

The ACTING CHAIRMAN. There seems to be objection, Mr. Harrison.

Mr. HARRISON. Very well.

(The question was taken, and the motion was lost.)

Mr. PISCIOTTA. I now resume my motion that the matter be referred to the Committee on Specifications and Tolerances.

(The motion was seconded, the question was taken and the motion was agreed to.)

Mr. HOLBROOK (reading):

SCALES—TOLERANCE TABLES 2, 3, and 4.

Amend the reference appearing in brackets immediately below the main table heading to read as follows:

(See also paragraphs A–2q, B–2w, and B–2x.)

That is purely a formal amendment. The attention of the reader is called to the fact that new paragraph A–2q should be read before the tolerances are applied.

(The amendment as proposed by the Committee was duly adopted.)

Mr. HOLBROOK (reading):

SCALES—TOLERANCES FOR PERSON WEIGHERS.

Amend paragraph J–7 to read as follows:

J–7. FOR PERSON WEIGHERS.—For the tolerances on person weighers see paragraph J–1.

That amendment is to correct an error which occurs in Handbook H22. The tolerances referred to now are the tolerances for small-capacity scales. A person weigher should, of course, take the tolerances for large-capacity scales.

(The amendment as proposed by the Committee was duly adopted.)

SECTION ON LIQUID-MEASURING DEVICES

Mr. HOLBROOK. In the report of the Committee distributed Tuesday it was stated that one or two matters were still under consideration. The amendment we are about to propose was decided upon after the report was distributed. This should be considered with

very great care, because you have not had the customary 48 hours to consider it [reading]:

LIQUID-MEASURING DEVICES.

Add a new regulation to read as follows:

5. RATE OF FLOW.—The installation of a wholesale device shall be such that the rate of flow through the device will not exceed the rated capacity of the device; if necessary, effective automatic means for flow regulation shall be installed.

Now, wholesale meters are being installed in various localities. A meter may be on an individual line or it may be installed on one outlet of a complicated system of lines. The meter is usually labeled with the maximum rate of flow which the manufacturer believes should be allowed if the meter is to be properly protected. It has been pointed out to the Committee that in certain installations there may be two or three or more outlets which may be operated simultaneously or individually. There may be a common pump to supply all of those lines. If the pump is operated at full capacity with all the lines open, each meter may not deliver more than the rated capacity; if, however, during the operation the meter or meters on one or two individual lines are cut off while one meter remains in use, then such a pressure may be developed that the flow of gasoline through that meter may be very much in excess of its rated capacity. It is for conditions such as these that this regulation is proposed.

Mr. ENGELHARD. Mr. Chairman, we all believe that is a right-good common-sense practical amendment, but I do not like the wording "if necessary"—it could be "when found necessary." I might think it was necessary, but others might say that it was not necessary.

Mr. HOLBROOK. It might be changed to read "if necessary to accomplish this purpose, effective automatic means for flow regulation shall be installed." With the consent of my Committee, I propose that amendment.

Mr. ENGELHARD. I believe that would be satisfactory.

Mr. GRIFFITH. If the movement of the liquid through the meter exceeded the rated capacity, it would be apparent on the face of it that it is necessary to control it.

(The regulation, as proposed to be amended, was duly adopted.)

Mr. HOLBROOK. That concludes the report.

Mr. ROGERS. Mr. Chairman, I move that the report of the Committee on Specifications and Tolerances be adopted in its entirety, with the amendments as made at this meeting.

Mr. ENGELHARD. Mr. Chairman, I do not think the report has gone far enough. I think the Committee on Specifications and Tolerances has overlooked the necessity for clamping down on the rather liberal tolerances which are now granted upon bulkhead meters. We have had quite a discussion this morning as to whether or not you should cut the tolerances on scales from 0.40 percent to 0.20 percent, and yet in the case of bulkhead meters the tolerance on 50 gallons is 50 cubic inches, which means 0.43 percent, and that is altogether too much. The Committee should study this subject further with a view to reducing that.

Mr. BAUCOM. I might say I could not accept that large a tolerance. As a matter of fact the manufacturers guarantee their meters within

0.10 percent, if operated as directed. We have adopted their advertising and their guarantee and put that into our specifications.

The ACTING CHAIRMAN. I want to ask that Vice President C. J. P. Cullen please come forward and take charge of the meeting at this point.

(Thereupon, Mr. C. J. P. Cullen, Vice President, assumed the chair.)

PROMOTING CONTESTS

By B. W. RAGLAND, *Chief, Bureau of Weights and Measures, City of Richmond, Va.*

My experience in weights and measures work has caused me to seek the answer to several very important questions arising in connection with its administration, since it seems to me that we must have these answers before we can hope to have our work assume its rightful place in the scheme of government.

I have often wondered why it was, that the work attempted by weights and measures officials was so little appreciated. I have seen States support, both morally and financially, their other protective bureaus, such as fire, police, drugs, and food, and at the same time neglect the Bureau of Weights and Measures. Yet this bureau is of vital importance and offers protection to the pocketbooks of the housewives, merchants, and manufacturers of our Nation. Why should it remain unnoticed except in rare instances; and why does this apparent neglect seem of such little importance to the consuming public? Is it because so many of our weights and measures officials spend all of their time in technical supervision of weights and measures devices?

How often have I noticed in many State conferences the effort expended in discussion concerning the tolerances and specifications covering fabric-measuring devices, milk bottles, liquid-measuring devices, scales, and every other known device. We seem to be sticklers for these things, and all of us have our particular schemes and lose much valuable time advancing our ideas appertaining to all types of equipment. We require manufacturers making various types of weights and measures devices sold in our jurisdiction, to meet the requirements in the most minute detail, putting them at times to great trouble and expense, and sometimes acting in an arbitrary way. When the manufacturer has perfected the desired device, we usually stop there.

Why is it that you visit so many jursidictions and find merchants selling commodities from tomato cans, wooden measures, bad pumps; find there is no enforcement of law and no support for the official; find that the bureau is unknown to merchants and afraid to do anything in opposition to a politician's wish? When we note this apparent lethargy of so many bureaus, we cannot expect the public to have a very exalted opinion of us or our work. At times I have been ashamed to be known as a weights and measures official.

Knowing these facts to be true, I decided to try and sell weights and measures to the people of Richmond and show them our real worth and value. Realizing that clerks and service-station operators need to know the law and its requirements, I thought of a contest as a means to promote this knowledge.

We therefore conducted a contest for the grocery clerks, and went on the air and released to the newspapers of the city, the following:

There was shown, recently, a picture built upon the activities of a certain weights and measures bureau. This picture created much interest, which was reflected in the number of inquiries received by the local weights and measures bureau.

These inquiries and complaints convinced the bureau that many mistakes are made by men in our stores and other places of business, due to the fact that the clerks are not informed as to rules and regulations promulgated by the weights and measures bureau.

Feeling as we do, we are going to sponsor an educational program which will, in a measure, remove this objectional handicap. A contest will be conducted by the bureau, consisting of questions relative to weights and measures work with which the clerks should be familiar. We are going to open this contest to the grocery clerks first, and then will conduct a similar one for the service-station operators and attendants. The League of Housewives will probably sponsor a similar program for the housewife in the city.

The clerk submitting the best paper will receive twenty dollars ($20), the second best, ten dollars ($10), and the third best, seven dollars and fifty cents ($7.50). We would be pleased if all grocery clerks in the city would enter this contest.

A similar contest was conducted along the same lines for the service-station attendants; questions were asked relating to their particular work. Some original and humorous questions were injected to add further public interest. This contest was sponsored by the Brodie, Neptune, and Pittsburgh Meter Companies. A picture of the successful contestants and a résumé of the contest appeared in our daily newspapers. Complimentary articles appeared in the Consumers News, Consumers Guide, Pender's Triangle, The Food Field Report (the official newspaper of the Food and Drug Industry), Meat Merchandising, The Commonwealth, Reader's Digest, Petroleum News, and the Scale Journal (the paper we love and ought to support). A poster was published by the Toledo Scale Co. carrying the story of this contest and its findings. Letters were received from Canada, Brazil, and numerous other foreign countries, from Puerto Rico, and from many States in the Union. I have here on the desk, the magazines noted above, which I will be glad to have you review at your leisure.

The local results were amazing, and far beyond our fondest anticipation. Our office was swamped with complaints, and calls came in from various parts of the city, both from housewives and merchants seeking information. The chief of the bureau received more invitations to speak than he was able to accept. They came from the Richmond First Club, the Housewives League, Sunday school forums, businessmen's organizations, and the like. We appeared before as many of these organizations as possible, stressing each time, the value to our people of the Bureau of Weights and Measures, and the savings resulting from its activities. We endeavored to prove that we were ever watchful of the pocketbook of the housewife. We investigated hundreds of complaints, which were settled in the office. Forty-eight cases were taken to court with the result that we secured 47 convictions, and but one dismissal. Two cases were appealed; in one case the conviction was sustained by the court; a dismissal resulted in the other.

One of the results of increased interest is demonstrated in that our housewives are now requiring wet wash to be weighed at the front door when it is collected, and when it is returned, by the laundry-

man; laundrymen are appealing to us to approve scales suitable for this purpose. The value of the campaign is further evidenced by the fact that our city council has amended old laws and enacted new laws without a dissenting vote, the recommendation of the bureau being accepted as sufficient. As a result, all weighmasters in the city have been transferred to this bureau, and all weighing and measuring devices must be approved by the bureau before installation.

We realize that knowledge is power and if we of the weights and measures world are to become a powerful organization, we must put this knowledge of our efforts over not only to merchants but also to the consuming public; we must sell our wares to the judges, politicians, and those in authority, and let them know that the public is behind the bureau so that they will give it the proper support and reinforcement.

Let the public speak! And with this support, there is no limit to the heights that we may attain. We will be in such a position that the powers-that-be will see our strength and be afraid not to give us our rank with the other great protective bureaus. An editorial appeared recently in the Roanoke World-News, Roanoke, Va., which beautifully expresses the thought I wish to leave with you. I quote one paragraph:

"Some time ago the city of Indianapolis appointed an inspector of weights and measures. And instead of being content to draw his salary, this lad took his work seriously. As a result, certain types of merchants are after his scalp, but the housewives of Indianapolis have rallied to his support. It would now be political suicide to interfere with his work."

Gentlemen, in closing, I want to say that we do not in any sense of the word overlook the fact that these technical matters of which I speak are a vital and important part of our work, for we have in our organization highly trained technicians who perform a necessary service. But they are only parts of the machine, and other parts are equally vital if the whole machine is to function efficiently. Only when the whole machine is operating smoothly are we in a position to furnish the public the protection which it has the right to demand. When we fully furnish that service, then we can proceed to sell to the public the value of the bureau. We feel, in our work, that it is essential to follow through; that it is much better not to see a violation if we are not going to take action, as a threat unexecuted is dangerous If you know that you are right, act, be master of the situation, never leave a job incomplete!

Be a neccssity to others,
Let no man be a necessity to you.

REPORT OF COMMITTEE ON NOMINATIONS, PRESENTED BY O. E. BRENNEMAN, CHAIRMAN, AND ELECTION OF OFFICERS

Mr. Chairman, and members of the Conference: The Nominations Committee is making its report out of regular order at the suggestion of the chairman.

It was the unanimous opinion of your Committee that the number of vice presidents should be increased from four to six, the first four to be selected from State department heads, the remaining two positions to be filled from county or city officials. We, therefore, respectfully submit the following:

For President, Dr. Lyman J. Briggs; Vice Presidents, W. S. Bussey, Rollin E. Meek, Charles C. Read, C. E. Tucker, B. W. Ragland, Howard E. Crawford; Secretary, F. S. Holbrook; Treasurer, George F. Austin, Jr.

For members of the Executive Committee, James A. Boyle, Charles H. Bulson, A. J. Jensen, H. N. Davis, S. T. Griffith, C. L. Klocker, James O'Keefe, Frank L. Hammon, C. J. P. Cullen, George M. Roberts, Edward R. Fisher, John P. McBride, Louis G. Waldman, George Warner, W. P. Reed, and William C. Witfoth.

(Signed) O. E. BRENNEMAN, Ohio, *chairman.*
A. J. JENSEN, North Dakota.
WILLIAM FOSTER, Springfield, Mass.
JOHN J. LEVITT, Illinois.
GILBERT S. SMITH, Cape May County, N. J.
B. W. RAGLAND, Richmond, Va.
Committee on Nominations.

(It was moved and seconded that the report be adopted, the question was taken, and the motion was agreed to. Accordingly, the gentlemen nominated by the Committee on Nominations were duly elected to the respective offices.)

DIMENSIONAL METHOD OF TESTING CONTAINERS FOR FRUITS AND VEGETABLES

By L. C. CAREY, *Specialist in Package Standardization, Bureau of Agricultural Economics, United States Department of Agriculture*

The proposal to amend the regulations under the Standard Container Act of 1928 to authorize the use of the dimensional method of testing containers was submitted to the Secretary of Agriculture on December 10, 1935, in the following words:

* * * The purpose of this amendment is to authorize the use of the dimensional method of testing baskets as to their compliance with the Standard Container Act, supplementary to the bulk-for-bulk method now prescribed in the regulations.

This matter has been carefully studied for more than 2 years, and has been discussed in detail with the National Bureau of Standards, Department of Commerce. As a result of this study we are convinced that, as compared with the bulk-for-bulk method and in its application to veneer packages, the dimensional method is of equal or greater accuracy, that it is thoroughly practical, and that its optional use will facilitate the administration and enforcement of the Standard Container Act through simplifying and expediting the examination of samples in the Washington office. Moreover, unlike the bulk-for-bulk method, the dimensional method may be applied in the field or factory, thus affording a greater opportunity for service, and a larger measure of direct regulation.

The act fixes the standard sizes of hampers, round stave baskets and splint baskets, and directs the Secretary of Agriculture to prescribe such tolerances as may be necessary to allow for variations occurring in the course of manufacturing and handling. The proposed special and specific method of applying tolerances to splint baskets seems to be necessary because of the peculiar conditions under which such baskets are manufactured and prepared for commercial use, and because of which neither of the usual methods of capacity determination is satisfactory. The type of handle commonly used almost invariably either constricts or expands the basket, often reducing or increasing the capacity beyond the tolerances established for and generally suited to other types. There is a greater opportunity and hence more tendency for the material in these baskets to warp than in other types of containers; and the common practice of bundling these baskets with one end of one basket inserted in one end of another basket further distorts them. For these reasons, as delivered to the trade, splint baskets seldom reflect the care and precision the manufacturer may have exercised in making them.

In order to make proper allowance for these factors, it is proposed to standardize those factors which determine size and over which the manufacturer has control—namely, the basket material which determines the depth and bottom dimensions of the basket, and the forms over which the baskets are made which determine the top dimensions—and to base compliance with the requirements on adherence to such standard form and material specifications. Our investigations indicate that enforcement on this basis would be entirely effective and adequately serve the purposes of the Standard Container Act.

Pursuant thereto, effective January 1, 1936, the regulations under the Standard Container Act of 1928 were amended to read as follows:

Except as hereinafter provided, for the purpose of ascertaining whether a container is within the tolerances established by these regulations, it shall be tested by the bulk-for-bulk test, as described in Miscellaneous Publication No. 75, or by the dimensional method which consists in taking the dimensions of the container and from these computing the capacity.

The exception referred to relates to square-braid splint baskets for which in the regulations standard splint baskets, standard splint basket material, and standard splint basket form specifications are set up together with appropriate dimensional tolerances. Similar specifications for Diamond Weave baskets have been developed and are being tried out preparatory to their incorporation in the regulations.

Subsequently, effective September 1, 1936, the regulations under the act of 1916 were amended to authorize capacity determination by the dimensional method. Under this act we believe Climax baskets could and should be handled as splint baskets are handled under the other act, namely, on the basis of conformity to the specifications set forth in the act, supplemented only by one additional specification, namely, inside vertical depth. No doubt this will eventually happen.

Early and preliminary considerations.—The idea that baskets for fruits and vegetables could and should be tested by the dimensional method is much more than 2 or 3 years old. Of my own personal knowledge, the machine makers and some basket manufacturers have so contended from as far back as 1928, and, as a matter of fact our Bureau has always used it in conjunction with the bulk-for-bulk method to determine the net, effective capacity of hampers constructed with the inside top hoop set down to accommodate the cover. But even that operation required a calculating machine properly to handle the fractional measurements. And right there, I suspect, was one chief reason why no one could get enthusiastic about developing a dimensional method. Fractions on the one hand, and curved, irregular contours on the other, particularly in round stave baskets, were for a long time discouraging obstacles.

I believe it may be said that the wish and desire to apply the dimensional method to baskets became a possibility with the discovery, first, of a suitable method for computing the capacity of a round-bottom basket, and second, a practical method of handling fractional measurements—through the device of cubical equivalents. Credit in both instances goes to Martin Storey, a laboratory assistant who has something of a natural flair for figures and a penchant for finding an easier way or a short cut to an assigned objective.

However, as not one of us was a true scientist, the technique was developed, not in accordance with a well-defined plan of procedure, but largely by the trial and error method pursued over a period of several years, and not altogether from choice. It was developed as

a matter of necessity to provide a check against bulk-for-bulk tests, at that time the only basis for judging the adequacy or sufficiency of specifications submitted for approval as required by the Standard Container Act, and which in several instances had proven to be not altogether reliable. Beginning in 1928, hundreds of such specifications had been submitted, and on the basis of rapeseed tests, they had been approved, first tentatively, and then finally when substantiated by at least one subsequent test. The memory of those years will linger for a long time, as manufacturers patiently and cooperatively strove for final approval, or gave up in disgust. During that time, our faith in the fairness and practicability of the bulk-for-bulk test for veneer packages became badly shattered.

First formal proposal—August 1934.—However, it was not until August 25, 1934 that the proposal to adopt the dimensional method was first formally presented to the chief of our Bureau, in substantially the following words:

> Submitted herewith for consideration is a proposition, which, if approved, will involve changes in the regulations under the Standard Container Act. The Solicitor states that such a change is permissible if approved administratively.
>
> Some of the advantages envisioned by the proposed plan are: 1. Universally applicable—in the field as well as in the laboratory; 2, provides manufacturers with a test they can apply themselves and removes an existing alibi; 3, provides a more positive objective for field work from the standpoint of service, education, and cooperation; 4, provides a definite basis for detecting violations on the spot; 5, removes from testing the vagaries incident to warping and other factors more or less beyond the control of manufacturers; 6, encourages the designing of baskets on straight lines; and 7, expedites rendition of reports, and reduces the manual labor now required to prepare and test baskets.
>
> The present bulk-for-bulk method of testing baskets has been employed for 17 years and has served a great purpose. The administration and enforcement of the standard container acts and all that has been accomplished in the standardization and simplification of baskets has been through the application of such tests. Nevertheless, it is generally conceded that the method has certain disadvantages.

Disadvantages of the Bulk-for-Bulk Method

Baskets are commonly tested with rapeseed of which a cubic inch contains approximately 3,500 seeds. The cracks and openings in baskets must be closed in some manner so that tests may be made with this medium, and for this purpose gummed-paper tape is used. The openings range in size from mere slits in berry boxes to openings 2 or 3 inches wide and 24 inches long in 1½-bushel hampers. Rightly or wrongly, but inevitably, baskets are rebuilt or built up in our laboratory preparatory for testing, so that in many instances it would be difficult for a manufacturer to recognize his product.

The gummed tape is applied as smoothly and evenly as possible, but certain inequities and inconsistencies in the resultant tests are unavoidable. Where the veneer is warped or sometimes in poorly constructed baskets, the interstices or depressions are of such nature that, reinforced with gummed tape they accommodate a certain volume of rapeseed, whereas normally they would accommodate no portion of the product commonly packed in the basket. In such instances the rapeseed tests show capacities somewhat larger than the actual effective capacity.

On the other hand, when the larger openings are bridged over with tape, the resultant tests may show capacities larger or smaller than the actual effective capacities, depending on whether the tape dries taut or slack. There have been instances where the rapeseed tests, in the light of the inside dimensions of the baskets, could be explained or understood only by reference to the warped condition of the staves or to some other similar capricious phenomenon. In such instances, even though no mechanical adjustment consistent with preponderant manufacturing practice or recognized specifications may be suggested, the manufacturer cannot be given a clear bill. He is simply asked to try again. Thus in the manufacture of standard sizes of certain types of baskets the element of luck or chance is not altogether lacking.

This—to the extent that it obtains—is unfair to the manufacturer and detracts from the dignity and force of administrative and enforcement efforts; and, to the

extent that it is recognized by the industry, it has probably contributed to the feeling prevalent in some quarters that there may be something a little incongruous in the idea of testing with rapeseed containers destined as carriers of apples, cabbage, and spinach.

* * * Besides this, there is the additional fact that tests such as are prescribed cannot be made at the factory unless a manufacturer possesses somewhat elaborate equipment. There is considerable merit to the contention that a manufacturer has no way of knowing whether his baskets are of proper size except to send samples to Washington. When he starts operations after a shut-down, or even after minor repairs have been made, he must either submit samples to our laboratory and wait for a report, or proceed to manufacture, "shooting in the dark."

Our work in the field fails of maximum effectiveness for the same reason, namely, because tests must be made with rapeseed. A basket on the market or in a factory may have all the appearances of being undersize—actual measurements of it may definitely indicate that it is an illegal container for fruits and vegetables, yet under the regulations it may not definitely be pronounced so until it has been tested with rapeseed. While such tests are being made the manufacture and sale of the questionable baskets may go on for several days.

Assuming that the field man stays on until a report on the samples is received and that he sees that an adjustment is made in the basket—does he know that the proper adjustment has been made? Not by any means. There must ensue another submission of samples and another period of waiting for a report.

Is there an alternative—a more expeditious and practical method?

Five years of work in connection with the approval of specifications under the Standard Container Act, together with some little research into the practical application of those specifications seems to indicate that there is. And, as opposed to the present method of testing which involves special equipment, the proposed plan requires only simple tools—a straight edge, a rule, a pair of inside calipers, and a pair of dividers. The same detailed measurements that are now taken of all samples, and the present schedule of tolerances are used.

Conference with National Bureau of Standards.—The proposal was immediately recognized by our Bureau as having some merit, but it was not until the following summer (1935) that we were authorized to confer with the National Bureau of Standards. Here the proposition was examined with characteristic care and precision, and reported on under date of July 23, 1935.

It hardly seemed possible that anything could be wrong in so many different ways, but particular exception was taken to the differences in the capacities of individual baskets by the two methods, which in 30 of the 94 bushel baskets considered ranged from 10 to 35 cubic inches. The Bureau said:

> It is considered probable that the differences between results secured from the two methods under consideration are largely to be accounted for by reason of the irregular shapes of the baskets. Such irregularities cannot, it would appear, be evaluated by any practical dimensional method. The differences resulting from this cause are therefore inescapable, and if their magnitude is dangerously great, it follows that the dimensional method is not satisfactory for testing work.

This conclusion was, of course, inevitable, if for veneer containers the bulk-for-bulk test could be assumed to be "a standard method of acknowledged accuracy," as it is for dry measures. Concerning this, we pointed out that as defined in National Bureau of Standards handbook "dry measures and baskets used as dry measures shall be made of metal, well-dried wood, or composition, or similar suitable material, and shall be of sufficient strength and rigidity to withstand ordinary usage without becoming materially warped, bent, dented, distorted, or otherwise damaged."

Round stave baskets and other veneer packages for fruits and vegetables are not in this category. Their characteristics are the very antithesis of the qualities enumerated. One of the prime requisites

of fruit and vegetable containers is that they shall be cheap, and they are usually constructed with that thought foremost in mind. They are not made of well-dried wood or similar material. Some part of every basket is green wood, and some baskets are constructed entirely of that material, rotary cut, fresh from cooking vats. Strength and rigidity are largely secondary considerations, and warping and distortion are so generally characteristic as to be noted usually only in their absence.

Since most veneer packages lack in some degree the qualities required of containers to which the bulk-for-bulk method of testing is applicable, it follows that when such packages are tested by that method the accuracy of the results may be seriously questioned. Our investigations seem clearly to show its fallibility in this field, and that it furnishes no consistently accurate, constant, or reliable standard with which to compare the sufficiency of an alternate method.

Among the variable factors which render capacity determination of veneer packages by the bulk-for-bulk method an unreliable index of true capacity are (1) contour of the top, (2) contour of the bottom, and (3) the human equation.

Under 1, contour of the top: Other things being equal a basket with a level top will test approximately the same regardless of the position in which it is struck off. The capacity of a "sway-back" basket, that is, one having two relatively high sides opposite two relatively low sides, will vary with the position in which the basket is struck off. In one instance, a basket struck off from low side to low side tested 1 bushel minus 23 cubic inches; struck off from high side to high side, the capacity was 1 bushel minus 2 cubic inches, a difference of 21 cubic inches. Quartering positions gave different results.

Under 2, contour of the bottom: In one instance a basket with characteristic warped bottom was sealed by bridging the openings, and again by following the openings. The difference in capacity was 9 cubic inches.

The human equation was shown to contribute as much as 7 cubic inches to the fallibility of the bulk-for-bulk test.

Assuming then, that the capacity of a round stave basket is relatively constant, it appears that by the bulk-for-bulk method of testing the capacity may vary with the position in which the basket is tested (21 cu in.) with the manner in which it is sealed (9 cu in.) and with the individual making the test (7 cu in.). These factors might combine to give a cumulative variation of 37 cubic inches. From this it seems clear that the capacity of a round stave basket as determined by the bulk-for-bulk test cannot be presumed to be conclusive; that at best it can be considered only a close approximation; and since several results are possible several questions arise: Should baskets be subjected to more than one bulk-for-bulk test, and if so, how many, and which result could and should be considered official?

Actual change in size.—But investigations disclose that the capacity of a round stave basket is not constant, being subject to wide changes due to shrinkage and related factors. One lot was observed for 34 days. In that time the capacity changed 55 cubic inches by computation and 63 cubic inches by bulk-for-bulk test. Another lot in 25 days changed 44 cubic inches by computation and 45 cubic inches by volumetric test. And this seems further to indicate that the capacity

of a round stave basket as determined by either method is at best only a close approximation, depending upon, in addition to the factors above referred to, the age of the basket and perhaps also the conditions under which it has been preserved.

Dimensional method not infallible.—But neither method is fool- nor factorproof. The data which seem so clearly to show the volumetric method to be less than perfect disclose somewhat similar weaknesses in the dimensional method. That the capacity of individual baskets as determined by this method by different operators is likely to vary in appreciable amounts cannot be denied. But it seems significant that any results by that method are likely to agree very closely with some one of the several possible results by the volumetric method.

The suitability of the dimensional method for testing veneer packages may well be predicated on that point. Throughout the investigations, and in our routine service work in the field since adopting the new method, the net findings, that is, whether the containers are within or outside of the established tolerances, have been practically, if not 100 percent, identical. Thus far we are convinced of the practicability of the dimensional method; that the administration and enforcement of the standard container acts have been made much more effective, and the opportunity for service widely expanded. There has been no adverse criticism, but rather only commendation from those with whom we work and try to live.

I want to close this over-long discussion by saying that the use of the dimensional method in no way alters or affects the procedure in cases in which prosecution is contemplated. It has never been considered safe to predicate a prosecution on the test of a single sample or a single lot of samples. In questionable cases the containers are subjected to tests by both methods and the findings of each used to substantiate the other. The advantage of being able to do this was demonstrated in the only case in which any substantial defense was offered. The court asked if the findings by the volumetric method could be substantiated by any other method. Our witness replied that to his satisfaction he could do so by the method we have been discussing. The court was satisfied.

Concerning the application of the method and the administration of the standard container acts, all of the interesting details cannot be touched upon in a discussion of this kind. Some of the suggestions made by Mr. Smith and Mr. Holbrook relative to the application of tolerances have not as yet been acted upon, but they have not been lost sight of, and will receive attention in due time. I have said that neither the bulk-for-bulk nor the dimensional method is foolproof, and we are still very much engrossed in perfecting and standardizing the technique of measuring baskets as a means of minimizing error due to the human equation. We are also developing and promulgating standard specifications as a means of simplifying manufacturing practices, whereby the administration and enforcement of container legislation are, themselves, automatically simplified.

I might say, Mr. Chairman, that we have prepared a mimeographed circular which we have called "The Dimensional Method of Testing Containers for Fruits and Vegetables as to the Compliance with the Requirements of the Standard Container Acts." Copies of this mimeographed circular are available here and anyone that desires a copy may have it.

CALIFORNIA GASOLINE AND OIL SUBSTITUTION ACT

By C. E. TUCKER, *Chief, Division of Weights and Measures, State of California*

Mr. President, delegates, and visitors: It is with a sense of gratitude and deep appreciation that I accept the privilege of addressing you on the California Gasoline and Oil Substitution Act, and I will thank you to bear with me, for I fully realize my limitations in doing justice to this very important subject. I cannot, of course, deal with it from a professional or even a theoretical standpoint for want of personal special application. I must, therefore, deal with it from experience, regarding it as a practical unit of service in the great constructive work in which we are engaged.

The inspection of petroleum products is by no means new legislation. It is nearly as old as the industry itself. As a matter of fact, inspection laws are about the earliest form of State regulation. No doubt you recall when gasoline was considered a bothersome by-product and when crude oil from which the gasoline content had been removed was worth a premium price. The passing of laws requiring the inspection of kerosene became necessary. The inspection, as records show, was a simple flash test. The purpose of this inspection was to prevent the sale of and to protect the purchaser from a commodity for lighting purposes having too low a flash point to be safe.

As far back as 1862, Zachariah Allen, a chemist of Providence, R. I., reported on experiments undertaken at the instance of the Rhode Island Fire Insurance Co. From physical tests it was determined that the temperature of oil in lamps varied between 71° and 79° F. It was very conclusive from these tests that a safe illuminating oil from petroleum was possible, provided it did not contain any of the more volatile fractions.

The Nation-wide awakening to the realization of the importance and practical use of illuminating oil brought about a Federal law in 1867 forbidding the adulteration of illuminating oil with naphtha and specified a fire test (open cup—old type) of 110° F. As is generally the case, with the passing of years and change of trade conditions, the advocation of new regulations or specifications caused controversies, and the law was declared unconstitutional because it usurped the police powers of the State. Following this, many of the States enacted oil-inspection laws providing inspectors' tests and standards for kerosene.

In 1880, 21 of the 38 States had oil inspection. It has been said many of the laws went to the extreme, and in some instances required a flash point of almost twice that of kerosene which was being burned in Europe without danger.

With the advent of the automobile, gasoline became the principal and more valuable product, and the only purpose which there could be for kerosene inspection was to prevent inadvertent mixture. Oil departments then broadened the inspection laws to include gasoline, but as this could not be justified upon a basis of safety, and there was no other basis, the inspection of gasoline for quite a number of years became a farce.

In 1925, California adopted its first oil regulation dealing with lubricating oil. In 1929, California approved through its legislature the first Gasoline and Oil Substitution Act, setting forth standards of quality and provisions dealing with branding and labeling of gasoline

and oil. The enforcement and general supervision of the act was placed under the jurisdiction of the State Department of Agriculture, Division of Weights and Measures. Mixing and adulteration were prohibited and sealing authority was delegated to enforcement officers when tests disclosed violations of quality standards. However, because of weakness in the law, officials were hampered in enforcing it. Particularly was this true in the rebranding of gasoline. Furthermore, State agents had no specific inspection authority in the matter of rebrands.

In 1933, an abortive attempt was made to fix the responsibility for inferior products that had been rebranded by requiring the manufacturer's name to be on the pump. The amendment was never accepted as enforceable, and in 1937 it was left out of the new legislation, known as the Wagy Bill, of that year, and based upon experience this bill was accepted as being more workable and effective by all who were concerned with it. The new bill is what we might call a substitution and antifraud act and a fair-trade act combined. Its principal fair-trade features are its requirements that names of brands must be displayed, that reclaimed motor oil and "no brand" gasoline or motor oil must be identified as such, and that actual selling prices must be posted by means of signs of a certain character, deceptive and misleading advertising signs being outlawed. The new measure thus removes unsightly chiseling gasoline signs throughout the State; the price indicated on the signs must be limited to twice the size of the name of the gasoline advertised.

The California Gasoline and Oil Substitution Act stipulates what motor fuel must be in order to be sold as gasoline. This specification, while technical, contains requirements guaranteeing to the public that the physical properties contained therein are such as to assure an efficient and reliable motor fuel to be used in the propulsion of an automobile. This not only prevents unfair competition but is a safety measure. The rebranding of both gasoline and motor oil is effectively regulated, and the requirements are not considered too severe for any person to observe. A dealer, or distributor, is prohibited from selling a rebranded product without written authorization of the original refiner or manufacturer. The authorization must be attached to each invoice and be constantly open for inspection by duly authorized persons. When products are changed from one brand to another, the tank or other container must first be emptied and no other product placed in the container until the tank or pump has been labeled with the brand of the new product in such a way as to comply with the provisions of the law.

It is believed that the new law aims a death blow at inferior motor oils palmed off on the car owners as satisfactory lubricants at cheap prices. In not a few instances such oils have been found to be crankcase drainings, although California has for many years carried laws on its statute books intended to forestall such practices. Under the provisions of the act no reclaimed crankcase drainings or used oil of any kind may be sold unless each container is plainly marked "Reclaimed Motor Oil" or "Reclaimed Lubricating Oil." Any misrepresentation as to the quality of the oil or the identity of the refiner and/or the manufacturer is punishable by heavy fines.

The act provides that in the case of every tank truck, tank trailer, tank wagon, or semitrailer having separate outlets for each individual

compartment, there shall be a metal tag, plate, or label for each outlet faucet or valve, on which shall be displayed in letters not less than ½-inch in height the name of the particular product in that particular compartment; on this same tag, plate, or label there must also appear in letters not less than ½-inch in height the brand, trade name, or trade-mark of such product or the words "No Brand."

The California Gasoline and Oil Substitution Act is a self-supporting function. Its revenue is obtained by a license figured at $1 per pump for each and every pump used to dispense, at retail, any motor fuel for use in an internal combustion engine. Motor fuel means any product, namely, gasoline, distillate, diesel fuel, butane, etc., which may be used as a fuel in an internal combustion engine. Service stations and garages selling to automotive equipment, air fields selling to aircraft, and marine stations selling to watercraft are included. The license covers the fiscal year July 1 to June 30.

The Division of Weights and Measures has 13 gasoline and oil inspectors working out of branch offices located in Sacramento, San Francisco, Los Angeles, and Fresno. Each branch office is under the jurisdiction of a State inspector. We also employ two graduate chemists, who with our regular inspectors are under the direct jurisdiction of a general supervisor at Sacramento. These men have been well schooled and are familiar with the arts and sciences of petroleum products. All selections are made from a civil service list.

In addition to the State Division of Weights and Measures, the Los Angeles and San Diego County sealers, Messrs. Fuller and Bruschi, sponsor gasoline and oil laboratories in charge of graduate chemists who cooperate with the State division.

In conclusion I may say that we have here copies of a résumé in which we have made our own interpretation as to each provision of the California Gasoline and Oil Substitution Act, which is chapter 547, Statutes of 1937. We will be glad to have you help yourselves to these.

REPORT OF COMMITTEE ON RESOLUTIONS, PRESENTED BY C. L. KLOCKER, CHAIRMAN, AND ADOPTION OF RESOLUTIONS

APPRECIATION TO DIRECTOR AND STAFF OF THE NATIONAL BUREAU OF STANDARDS

Whereas Dr. Lyman J. Briggs, F. S. Holbrook, R. W. Smith, and their able and efficient staff have extended valuable assistance and guidance to this Conference, of which the Conference is highly appreciative: Therefore be it

Resolved, That this, the Twenty-eighth National Conference on Weights and Measures, does hereby record its grateful appreciation to the above-named gentlemen.

APPRECIATION TO MANAGEMENT OF HEADQUARTERS HOTEL

Whereas the management of the Hotel Washington has done everything within its power to make our present meeting the success which it has been: Therefore be it

Resolved, That this, the Twenty-eighth National Conference on Weights and Measures assembled at the Hotel Washington in Washington, D. C., this 3d day of June, 1938, does express its warmest appreciation and thanks to the management of the said hotel for the careful provisions made for our meeting; and be it further

Resolved, That the secretary of the Conference be instructed to transmit a copy of this resolution to the management of the Hotel Washington.

IN MEMORY OF DECEASED MEMBERS

Whereas during the past year we have lost through the plan of Divine Providence several members of this Conference; and

Whereas our association with these departed members has been an inspiration to us to continue with greater determination toward the ideals set by them; Therefore be it

Resolved, That we, of the Twenty-eighth National Conference on Weights and Measures, hereby record this expression of sincere sorrow at the loss of these members.

APPRECIATION TO THE PRESS AND TO THE SCALE JOURNAL

Whereas the press of the city of Washington has been generous in reporting the activities of our present meeting; and

Whereas the Scale Journal has been likewise generous in giving advance notices of our present meeting; Therefore be it

Resolved, That this, the Twenty-eighth National Conference on Weights and Measures, does hereby record its appreciation to the press of Washington and to the Scale Journal.

APPRECIATION OF COOPERATION

Whereas the Chevrolet Division of General Motors has been generous in the displaying of their moving picture covering the activities and growth of the Chevrolet motor car; Therefore be it

Resolved, That the Twenty-eighth National Conference on Weights and Measures hereby records this expression of sincere thanks and appreciation for their cooperation.

ENDORSEMENT OF PROPOSED BILL TO FIX THE STANDARDS OF WEIGHTS AND MEASURES OF THE UNITED STATES

Whereas our President, Dr. Lyman J. Briggs, has called to our attention a proposal to fix the standards of weights and measures of the United States; and

Whereas this Conference is of the opinion that the proposed bill should be adopted and passed by this Congress; Therefore be it

Resolved, That this, the Twenty-eighth National Conference on Weights and Measures, does hereby fully endorse the proposed bill as reported to the Conference by Dr. Briggs, and does urge its passage; and be it further

Resolved, That copies of this resolution be transmitted by our Secretary to the appropriate committees of Congress.

APPRECIATION TO OFFICIALS COOPERATING

Whereas the Governors and the county and city officials of the various States, through their manifest interest in weights and measures work, have made it possible for their respective jurisdictions to be represented at this, the Twenty-eighth National Conference on Weights and Measures; and

Whereas such cooperation and attendance have in a most practical way furthered uniformity in regulations for the various jurisdictions and have otherwise assisted the general good of the work; Therefore be it

Resolved, That this, the Twenty-eighth National Conference on Weights and Measures, does appreciate such practical cooperation and does make this resolution a part of the record of its meeting.

ENDORSEMENT OF PROPOSED FEDERAL LEGISLATION FOR STANDARDIZATION OF PACKAGES FOR CANNED FOODSTUFFS (H. R. 6964)

Whereas our attention has been formally called to certain needed legislation with reference to the standardization of packages for canned foodstuffs; and

Whereas Hon. Harry Sauthoff, Member of Congress from Wisconsin, has introduced in the Congress a bill, known as H. R. 6964, which is intended to accomplish the necessary control of this matter in a manner consistent with the beliefs of this Conference; Therefore be it

Resolved, That this, the Twenty-eighth National Conference on Weights and Measures, does hereby record its hearty endorsement of the bill known as H. R. 6964; and be it further

Resolved, That a copy of this resolution be transmitted by our Secretary to both the Committee on Coinage, Weights, and Measures, and the Hon. Harry Sauthoff.

ENDORSEMENT OF PRINCIPLE OF GENERAL STANDARDIZATION OF PACKAGED GOODS

Whereas we have knowledge of the benefit which would accrue from a standardization of all packaged goods; Therefore be it

Resolved, That this, the Twenty-eighth National Conference on Weights and Measures, does hereby record its sincere belief that a general standardization of packaged goods is greatly to be desired, and does direct its Executive Committee to consider ways and means of accomplishing this.

(Signed) C. L. KLOCKER, Connecticut, *chairman*,
MANON L. FOWLER, Highland Park, Mich.,
GARDNER K. HEATH, Maine,
BARNETT KANZER, New York,
ERWIN J. ROGERS, West Allis, Wis.,
HOWARD C. PATTON, Pittsburgh, Pa.,
C. E. TUCKER, California,
Committee on Resolutions.

Mr. GRIFFITH. I move the adoption of the report of the Committee on Resolutions and in doing so I wish to add a word in connection with the last resolution. Mr. W. S. Frisbie, of the Food and Drug Administration of the Department of Agriculture, who is interested in the proposed Food and Drug Act informed me this morning that the bill has finally passed the House; having already passed the Senate, it is now in the hands of a conference committee, to ratify the measures that we are endeavoring to enforce on package goods. I am quite sure you are all glad to hear that information.

The ACTING CHAIRMAN. We do appreciate the information you have given us, Captain Griffith. It will be a great help to each of our States to have the cooperation of the National Government, and now we will be able to get somewhere.

(The report as presented by the Committee was duly adopted.)

REPORT OF THE TREASURER, GEORGE F. AUSTIN, JR.

Receipts:		
Balance on hand June 1, 1937		$510. 33
June 2, 1937. Dues, 1937 Conference		194. 00
June 2, 1937. Accrued Interest		7. 38
Total receipts		$711. 71
Disbursements:		
June 2, 1937. Receipt book	$2. 00	
June 16, 1937. Bus service in connection with trip to Annapolis, 1937 Conference	179. 40	
June 16, 1937. Telephone service	. 90	
June 16, 1937. Clerical, mimeographing, and messenger service	30. 00	
Total disbursements		212. 30
Balance on hand June 1, 1938		$499. 41

(Signed) GEO. F. AUSTIN, JR., *Treasurer.*

(The report as presented by the Treasurer was duly accepted.)

Mr. HOLBROOK. Mr. Chairman, I make a motion that the usual expenses of the Conference be authorized to be paid as heretofore.

(The motion was seconded, the question taken, and the motion was agreed to.)

The ACTING CHAIRMAN. We now have unfinished business.

Mr. CRAWFORD. Mr. Chairman, the scalemen have an insignia which they wear on their coat lapels. It is an idea of mine that many of you will agree that we should have an insignia of a similar

nature, and I believe it would be one more move in the cause of weights and measures. I would like to make a motion that we have an insignia designed and that it be made available to the members of the Conference at cost.

Mr. HOLBROOK. Mr. Crawford, would you not prefer to have a greater number of the members present, to consider that? Would it not be a good idea to bring that up on the floor next year?

Mr. CRAWFORD. That will be perfectly satisfactory to me.

The ACTING CHAIRMAN. Is there any further business? If not, a motion to adjourn is in order.

(A motion was made and seconded that the Conference adjourn, the question was taken, and the motion was agreed to.)

(Thereupon, at 1:56 p. m., the Twenty-eighth National Conference on Weights and Measures adjourned sine die.)

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