

Report of the  
Thirty-Eighth National Conference on  
Weights and Measures  
1953



U. S. Department of Commerce  
National Bureau of Standards  
Miscellaneous Publication 209

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# Report of the Thirty-Eighth National Conference on Weights and Measures

Attended by Representatives from Various States

Sponsored by the National Bureau of Standards  
Washington, D. C., May 19, 20, 21, and 22, 1953



National Bureau of Standards Miscellaneous Publication 209

Issued December 21, 1953





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W. K. TRIPPLE, Chief, City Bureau of Weights and Measures, Norfolk, Va.

C. J. WILLS, City Sealer of Weights and Measures, Portland, Maine

### STANDING COMMITTEES

(As constituted at the conclusion of the Thirty-eighth National Conference, the personnel and organization of each of the standing committees of the Conference are as reported below. As reported, the membership of each committee

\*Mr. Levy was unable to be present, due to illness.

reflects the appointments made by the President of the Conference, changes which have occurred from expiration of term or other cause, and the elections by the several committees of chairmen, and in one case secretary, for the ensuing year. The remaining term of office for each committee member, in years, is shown by the figure in parentheses following each entry.)

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- R. W. SEARLES, Deputy County Sealer of Weights and Measures, Medina, Ohio. (1)



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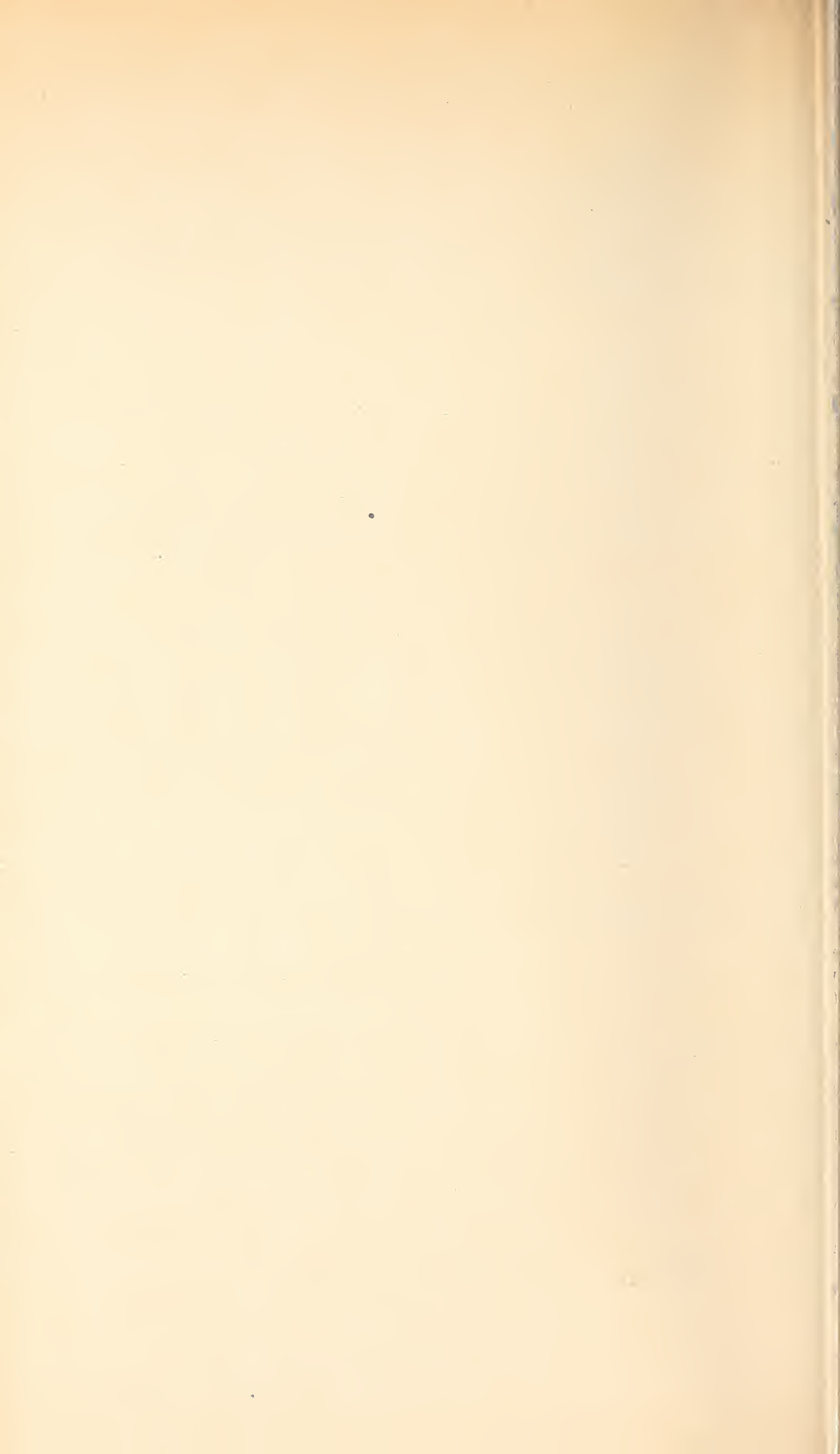
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## REPORT OF THE THIRTY-EIGHTH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

SPONSORED BY THE NATIONAL BUREAU OF STANDARDS, AND HELD  
AT THE WARDMAN PARK HOTEL, WASHINGTON, D. C., MAY 19, 20,  
21, AND 22, 1953

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### FIRST SESSION—MORNING OF TUESDAY, MAY 19, 1953

(A. V. ASTIN, President, and D. G. NELSON, Vice President, presiding)

The invocation was delivered by the Conference Chaplain, R. W. Searles, Deputy County Sealer of Weights and Measures, Medina County, Ohio.

#### ADDRESS BY HON. CRAIG R. SHEAFFER, ASSISTANT SECRETARY OF COMMERCE FOR DOMESTIC AFFAIRS

It is my privilege, in behalf of the Department of Commerce, to welcome this 38th National Conference to Washington.

Your varied membership contains representatives of government, science, and industry. Your endeavors go far back in history.

In fact, Moses is a charter member of your fraternity. For, in giving the law to the children of Israel, the Bible says, he declared: "Thou shalt have a perfect and just weight, a perfect and just measure shalt thou have that thy days may be lengthened in the land."

Yet with an experience dating back to antiquity, custodians of weights and measures are not content to rest on their laurels. One of the finest things about your group is that you are steadily improving services and continually seeking new developments in your important field.

As the Assistant Secretary of Commerce for Domestic Affairs, I am proud of the fine record of the National Bureau of Standards in weights and measures. You will find that the Bureau is always eager to help municipal, county, and state officials—and manufacturers, processors, and businessmen—with problems in this particular area of public service.

Right now some papers and magazines are describing the new Administration as a probusiness administration. It is that and more.

President Eisenhower has tapped the talents of the business community, as he has drawn into government executives from agriculture, labor, the professions, and other segments of society. They are working together as a team. They are endeavoring to decide each issue on the basis of what is best for all Americans.

Let me assure you that former businessmen in government have a genuine appreciation of the value of your particular services. The determination of quantity is basic to business. Often it is the method by which profit or loss is established. Whether a manufacturer is

buying steel by the ton or a drug firm is selling medicine by the grain, business depends upon the accuracy of measurement.

Your particular field always has been one in which science, business and government mingle. Society today is a projection of your experience—all three elements profoundly affect modern life.

However, there are some people who are antagonistic to business and who are trying to give the false impression that a probusiness administration necessarily must be an antiscience administration.

No accusation could be more inaccurate. Anyone who believes that misrepresentation has not even tried to ascertain the facts.

American business has always had a deep respect for science. It has employed science to improve production and to discover new materials, new technologies, and new ways of doing things out of which have come new and better goods, and, in many cases, new and lower prices so that markets could be broadened and the wants of more people satisfied.

In fact, the scientist's best friend is the businessman, in or out of government. For not only does business utilize science in industry and pay it well, but the taxes of business and the donations of business play a leading role in the support of governmental and institutional science.

Business and science are partners, working together to bring to mankind all the modern blessings of research, invention, and innovation. It is particularly fitting, therefore, that our Government has provided that the National Bureau of Standards operate within the Department of Commerce.

The total annual expenditures today for research alone are more than three and a half billion dollars. From measurement—your field—comes greater understanding in science. From the laboratories come weapons on which national security depends. But from the laboratories, too, are coming new ideas for peacetime progress and universal happiness.

Any person over 50 years of age was alive before a successful auto or airplane was developed. But the partnership of technology and industry has developed the automotive engine so well that it has produced the greatest economic impact in all history.

Who at the turn of the century could have foreseen the fabulous number of jobs about to be created in this country? Who could have foreseen the striking increase in the standards of living of the American people?

Today a million workers make autos or auto parts. A million and a half sell or service them. Three out of every four families in America own cars.

In comparison with the rest of the world our progress has been remarkable. Let us hope that our children will live to see the day when the standards of living in other countries rise to the level that we have attained.

This is capable of achievement, and the whole world will benefit, but if we permit, through lack of foresight, our standards of living to be lowered to the levels existing in other countries, we, in effect, will be guilty of a sin against the rest of the world.

The manner in which business and science have teamed up and worked together in this country throughout our history, and particularly since the turn of the century, has made possible a way of life



still unbelievable to many in far countries who have only heard about it and have never seen or enjoyed it.

Some may have the feeling that the gains in our standard of living have been purely materialistic, but walking hand in hand with materialistic gains have been notable gains in spiritual values. When we were a poor, struggling nation, our first thought was to better our position. That accomplished, the American people have never shirked when disaster struck at home or abroad.

This spirit of charitableness, coupled with our resources, has been exemplified by our prompt aid to famine areas, the Tokyo catastrophe, and to many others right down the years to the recent Winnipeg flood.

A purely materialistic population would think only of themselves, but the individual American, regardless of his political or religious faith, has helped all over the world when help was needed by the suffering. He has willingly dug down into his own pocket to do so, and if he had great wealth, he created or supported a foundation for doing the same thing on a larger scale.

The world of electricity and chemistry has been pouring out all sorts of new products in the last 15 years. These new inventions did not originate in garrets. The bulk of them flowed from laboratories financed by highly successful business.

One of the prime reasons why businessmen at all levels of government want more efficiency and less waste is so that, as taxes are lessened, more money can be diverted to support new explorations in science.

In the field of oil and petrochemicals, for example, we not only can expect improved cracking processes for fuels but all sorts of new developments in fertilizers, insecticides, fumigants, and weed-eradicators, so that eventually the one half of the world's population now on an inadequate diet may have more food. A full stomach is one of the best bulwarks against the spread of Communism.

This is only one area in which business is financing science in the operation of Aladdin's Lamp. This is one more proof of the ties that bind them.

I am proud to stand with my fellow businessmen who, in government and in private life, are doing their best to increase the efficiency of the Federal government and to build and sustain the economic health of America.

We want less government interference with legitimate business and fewer government burdens piled on taxpayers' shoulders. We want private enterprise given a better chance to exert its dynamic power.

This determination to encourage free, competitive enterprise is a noble motive, exercised in the interest of all the people. For economic prosperity means more jobs, more modern conveniences, more money for worthy causes, more national happiness, more tasks for weighing and measuring, more opportunities for science to progress beyond known horizons.

On the military strength, stemming from American economic might, are based the hopes of captives and the security of the free.

So, I gladly welcome you here today to listen to the experts, who will discuss the many problems of the halls of government, the laboratory and the market place. I welcome you as each contributes his special knowledge and wisdom in advancing our free nation.

Let this conference—this pooling of business, science and government talents—be symbolic of our generation, a partnership of dedi-

cated men and women seeking to make a better world for ourselves and our children.

(R. W. Searles, Conference Chaplain, conducted an appropriate memorial service for departed members.)

## REPORT ON THE ACTIVITIES OF THE NATIONAL BUREAU OF STANDARDS, BY A. V. ASTIN

I appreciate very much the opportunity of making a report on the activities of the National Bureau of Standards and hope to touch briefly on a few of the highlights.

The Constitution of the United States gives the Congress power to fix the standard of weights and measures and has assigned, in turn, to the Bureau responsibility for developing and maintaining the standards for physical measurement. There is no regulatory authority assigned with this responsibility. That has been reserved to the states and municipalities—the local governments which most of you represent. The Congress, however, assigned to the Bureau the activity of cooperating with the states in securing uniformity in weights and measures laws and methods of inspection. That authorization provides the primary justification for this national conference and for the other activities of the Bureau's Office of Weights and Measures of which your friend, Mr. W. S. Bussey, is the Chief.

The Bureau's work in the development of standards and physical measurements is an interesting and never-ending activity since standards must be provided in all areas of science and engineering where measurements are important. When the Bureau was established 52 years ago there were relatively few standards with which we were concerned. The very appreciable development and expansion of science and technology since that time is shown by the fact that there are now several hundred different standards that concern us, such as those in mechanics, atomic physics, electronics, and radio as well as the many branches of chemistry.

I would like to cite a few examples of recent achievements. In the microwave region of the radio frequency we have been concerned with standards for a variety of measurements. We have recently completed the development of a precise calorimeter which permits the accurate calibration of radio power measuring devices operating at frequencies of nine million cycles per second. We have also put into operation a new instrument for measuring the magnetic properties of materials in the radio frequencies.

In the heat measuring field we have been working to extend the standards for temperature measurements both for the very high and the very low temperatures. During the past year we have put into operation equipment and techniques for temperature measurements within a few thousandths of a degree of absolute zero.

Standards for color measurement provide an important and interesting field of investigation. Quite recently we provided a new set of improved color standards for the petroleum refining industry in an area where we had formerly been dependent on rather unsatisfactory standards which had to be imported from other countries.

Even in the older and more familiar standards areas, such as length and mass measurements, we are continually striving to improve the accuracy with which calibrations can be carried out. Last year I told you of work leading to the possible adoption of an optical

standard for length measurement. This fall there will be an important international meeting in Paris to ascertain some of the possibilities of this approach to a new international standard. In mass measurement there is a pressing need in many fields of science to have means of reliably weighing minute quantities of materials. We have developed a set of microweight standards with which masses of a millionth of a gram can be detected.

In order for the Bureau to carry out its work in developing new standards and improving old ones, it is necessary to conduct a strong basic research program. This program provides fundamental information on the properties of materials and methods of measurement from which the new standards and calibration techniques can be derived. Although the Bureau's initial primary purpose is the development and maintenance of the standards for physical measurement and the determination of physical constants and properties of materials, we have several additional important and substantial activities. These include the development of methods of testing materials, mechanisms and structures as well as conducting tests on such things for other Government agencies; the development of standards of practice, codes and specifications; the development of devices to serve special needs of other Government agencies; and the rendering of scientific and technical advisory services to other Government agencies. The bulk of the Bureau's current activities now falls in these latter categories.

Much of this work is classified security information and so it should not be discussed. I would, however, like to refer briefly to a few achievements in the non-standards field. Some very notable advances have been made in the field of semiconductor research. This is the area from whence that fascinating new tool, the transistor, stems. You have probably all read a great deal about this tiny device made of germanium which will do many of the jobs which ordinary radio tubes do and may ultimately lead to a widescale replacement of such tubes in the electronics industry. Since the transistor is very tiny and consumes minute quantities of power, the implications of this impending development are considerable.

There are, however, many difficulties in the further development and utilization of the transistor. The germanium has to be so carefully refined and treated that this may impose a serious limitation on the ultimate utilization of transistors. In our laboratories we have found that semiconducting materials with rectifying and transistor-like properties can be obtained from combinations of other metals, particularly combinations of indium and antimony. The possibilities of this type of development are very considerable since it opens up a wide range of new materials with interesting and perhaps better properties for possible utilization in electronics.

A new process for plating nickel was developed by the Bureau and is now being offered to commercial users by industry. Basic patents were issued to National Bureau of Standards chemists and assigned to the Secretary of Commerce. This process does not use an electrical current but depends entirely on chemical action. Coatings of uniform thickness can be applied to the insides of tubes and tanks, and in corners and sharp angles which are very difficult to cover by the usual electroplating techniques. A number of industrial organizations are now exploring extensively its commercial possibilities and its large-scale utilization.



Related closely to this, the Bureau has also developed a novel method of electroforming aluminum. This is particularly important for application to such things as waveguides which are used in the radar and microwave radio field.

Another NBS achievement has stemmed from its work on a major installation on Cheyenne Mountain, Colorado. There we have a number of transmitters located on a peak which rises abruptly above the Colorado plains. East of the mountain are a series of radio receiving stations extending as far as Arkansas. In observations taken from this set-up we are accumulating much new and important information on the characteristics of the propagation of radio waves in the very high frequency and ultrahigh frequency range. These are the frequency ranges which are used in your FM radio and television transmitters and receivers.

At the National Bureau of Standards we are very much concerned with the development of new and improved instruments, since instruments are the devices by which we study the properties of materials and by which we make calibrations. A notable instrument achievement from our laboratories in the past year was the development of a new type of ultrasonic flowmeter. Much work has been done over many years to measure the flow of liquids and gases through a variety of media. The new NBS method consists of directing sound waves through the flowing fluid and receiving the sound waves a short distance along the flow path with a barium titanate receiver. A barium titanate transmitter is also used to generate the sound waves. By rapidly converting the transmitter to a receiver and vice versa we can measure a change in velocity of the propagation of sound due to the velocity of flow of the liquid. This change in velocity provides an accurate measure of the flow of a fluid. Furthermore, it is not necessary to disturb the flow of the fluid by inserting an obstruction into the stream. The barium titanate transducers need not make direct contact with the fluid. It appears that this technique may have considerable utilization not only in the physical sciences but also in the biological sciences. Physiologists are interested in using this technique to study the properties of the flow of blood since with this instrument one can measure the velocity of flow in arteries and veins without penetrating them.

Last year I told you about the very successful operation of our large automatic high-speed digital computing machine. This was put into operation just about three years ago and for the past two and one-half years it has been on a 24-hour day, seven days per week schedule, solving a variety of problems of considerable importance to defense agencies and also for a number of basic research investigations. During the past year we have had regularly scheduled operation on another computing machine in our mathematical laboratories at the University of California at Los Angeles. The machine here at Washington is called SEAC, meaning Standards Eastern Automatic Computer; the one at Los Angeles is called the SWAC, meaning Standards Western Automatic Computer. When you visit our laboratories tomorrow, I think you will have an opportunity to see and inspect our SEAC.

Another type of relatively novel activity for a physical science laboratory is the utilization of modern statistical techniques in the design of experiments. We have a very strong statistical engineering laboratory. This staff is assisting us in many of the operations

throughout the Bureau, enabling us to get more and better data with less effort. The members of this statistical laboratory are very much concerned with some of the activities of interest to the members of this Conference and undoubtedly they have ideas, suggestions, and techniques which would be helpful to you in many of your operations.

Although the examples just given are but a small part of the total activities of the Bureau, I hope they are sufficient to give some illustration of the nature of our achievements during the past year.

You may be interested in a brief reference to the so-called vital statistics. Our total budgetary operation is at about a \$50,000,000 annual level. This is substantially what it was when I reported to you last year. This total budget includes 85 percent which comes to us from other agencies of the Government in payment for jobs which they want us to do for them. The remaining 15 percent, or around \$8,000,000, is provided directly to us by the Congress for our basic activities. Our current staff totals about 4,800. This represents an increase of about 300 over a year ago and this increase is mainly in our field stations and represents an effort to staff to the level requested by the defense agencies. About 4,000 of our staff are working here in Washington. The other 800 are in our field stations, the largest one being at Corona, California, which is about 50 miles east of Los Angeles. There we are doing work in applied electronics for the Department of Defense.

Last year I told you that we were getting ready to start construction of a major radio laboratory in Boulder, Colorado. Construction of this laboratory, which will cost about \$4,000,000, started last July and it is expected that it will be ready for occupancy about next March. Probably at this time next year the Bureau will be in the process of moving a substantial part of its radio engineering staff to that location.

Members of this conference are probably interested in the testing and calibration activities of the National Bureau of Standards. During the past fiscal year we completed over 300,000 individual tests and calibrations. Most of these were carried out for other Government agencies in connection with Government procurement, the largest single item being the sample testing of cement purchased by the Government. On this project we sampled some 15,000,000 barrels of cement and made tests from the samples selected.

Other representative examples of our testing and calibration services include tests on 4,500 light bulbs in connection with Government procurement and the calibration of 8,900 gage blocks. The latter were primarily for industry. Here it is interesting to point out that the gage block provides a basis for our mass production industry since these gages are used to insure the accuracy of dimensions necessary for the interchangeability of component parts. We also carried out over 1,800 calibrations on radioactive materials. Included in this were calibrations on about 860 radon samples taken from workers in radioactive plants. In addition, we distributed to other laboratories both in industries and universities some 33,000 standard samples. These are the materials whose accurately known chemical or physical properties provide a reference for control purposes in industrial operations.

Finally, I would like to report on some of the activities of the Office of Weights and Measures where we have attempted to fulfill numerous requests for assistance from members of this conference and others.

Following the adoption of a resolution by the 37th National Conference last year requesting the National Bureau of Standards to institute an investigation of methods of determining truck axle loads, steps were taken to initiate the work as quickly as possible in the hope that some progress could be made during the following year.

The first phase of the work, a survey of methods currently in use and under development, was undertaken. Members of our staff discussed the problem in motion weighing of vehicles and visited the installation for motion weighing on Shirley Highway in Virginia. Arrangements are currently being made to inspect several commercial installations and from these inspections and discussions by members of our staff we hope to conclude shortly the survey part of this investigation. Plans are now being made to increase our activities on this program and to carry out jointly with the Bureau of Public Roads and the trucking industry an active development program.

Since the 37th National Conference, we have lost the services of David V. Smith, Railroad Track Scale Inspector, who, after over 27 years of faithful service, retired because of physical disability on December 30, 1952. On October 6 Allen A. Williams reported for duty as a trainee in the railway track scale program. Mr. Williams' initial training was completed about a month ago, and he has been placed in charge of our testing equipment No. 2. Both of our track scale testing units now are operating on full-time schedules. Charles H. Oakley is in charge of Unit No. 1. Each of the 19 master track scales was calibrated at least once during the past year, and commercial track scales have been tested as time permitted. In many instances we have been gratified by the cooperation of State and local weights and measures officials in this program. We feel sincerely that considerable benefits to the Bureau, to the weights and measures officials, and to scale owners can be derived from such cooperation.

The Bureau has had a representative present at every State and Regional annual conference of weights and measures officials during the past year. Through these meetings we are able to maintain contact with the State and local officials and to keep informed as to the activities, progress, and requirements of the many jurisdictions. In addition we have made official visits to a number of State and local offices.

It is encouraging that improvement in weights and measures administration and enforcement throughout the Nation has continued during this year. Many jurisdictions have obtained additional and substantial testing equipment, and many States, counties, and cities have employed additional personnel. Legislative improvements have been made in several of the States.

Particular recognition goes to the State of Colorado where, on March 31, a comprehensive weights and measures law was signed by Governor Dan Thornton. The Colorado enactment is essentially the same as Form II of the Model Law on Weights and Measures, which is recommended by this Conference. We are very glad that Colorado is represented at this National Conference. I know all of you will want to become acquainted with the Colorado official who will be introduced to you during the roll call of the States.

An amendment to the Kansas Law was enacted. This amendment includes most of the package commodity sections of the Model Law.



The progress of the States in adopting the specifications, tolerances, and regulations for commercial weighing and measuring devices, as recommended by the National Conference and as published in NBS Handbook 44, has continued and is encouraging. Since the last Conference, four States have officially adopted these codes by promulgation and one by legislative enactment. These five States are Idaho, Illinois, New Hampshire, Washington, and Wisconsin. Twenty-one other States previously have adopted these requirements—they are Alabama, Florida, Georgia, Indiana, Kansas, Louisiana, Maine, Massachusetts, Michigan, Montana, Nevada, New Jersey, North Dakota, Oklahoma, Oregon, Pennsylvania, Texas, Vermont, Virginia, West Virginia, and Wyoming. This brings the number of States that have promulgated these provisions to 26, and leaves only 22 States and the District of Columbia that have not revised their codes since Handbook 44 was published in 1949. We hope that progress in this regard will continue and that these 22 States will join the effort toward uniformity.

The State of New Hampshire has promulgated another recommendation of this Conference. That is the Model Regulation for Package Marking Requirements, which was tentatively adopted by the Conference last year.

Two publications of importance to all weights and measures officials and to allied commercial interests have been issued by the Bureau since the 37th Conference. The Report of the 37th National Conference became available during April of this year, as NBS Miscellaneous Publication 206. All of those who registered at the 37th Conference have been sent copies of this report.

A major publication, which has been planned for many years, is now available for distribution. It is the Weights and Measures Case Reference Book, designated NBS Circular 540. A few copies are available at the registration desk for your inspection. This document can be purchased for \$1.25 from the Superintendent of Documents.

As the title implies, the case reference book is intended as an index to and digest of weights and measures decisions of record. The material is presented in lay language and furnishes condensed legal principles as expounded by the Courts. Weights and measures officials should find this new publication useful as a field manual. Information on any specific item in the book may be found through the comprehensive index. The case reference book was designed and composed as a ready guide to decisions cognate to certain definite and specific situations in weights and measures administration and enforcement. This new publication, used in conjunction with NBS Circular 501, "Federal and State Weights and Measures Laws," will furnish the official with extensive information in this field.

On the inside back cover of the program of this Conference you will find listed a number of weights and measures documents published by the National Bureau of Standards. These also are available for your inspection at the registration desk, where they may be either purchased directly or ordered for later delivery.

It is our desire to publish such material as is required by you, and as will be of definite assistance to you. We solicit your recommendations to this effect.

In order that we may continue to progress I would like to offer for your consideration and especially for the consideration of the various

standing committees, a suggestion as to extending the activity and effectiveness of these committees. The one additional component in possible committee activity which seems to be desirable is leadership in bringing about official adoption by the several States of committee recommendations. It is my belief that members of each standing committee could furnish this leadership. For example, the standing Committee on Legislation could study the various State laws, suggest amendments or revisions thereto, and work with the State administrators towards successful enactment of Conference recommendations. The Specifications and Tolerances Committee could increase its activity toward the encouragement of adoption by the States of the requirements recommended by the Conference. The Committee on Methods of Sale of Commodities could follow its recommendations to successful promulgation and enforcement in the several States. Activity of this nature would extend the benefits of committee research and recommendations.

In closing I extend to each of you an invitation to call freely on the National Bureau of Standards for assistance in the solution of your technical problems. We know that your work is of fundamental importance to the stability and strength of the Nation's commerce. Therefore, we are at your service. Please accept my sincere wishes for both profitable and enjoyable sessions during this 38th National Conference on Weights and Measures.

#### **REMARKS OF J. W. SAYBOLT, BUSINESS COUNSELLOR ON WEIGHTS AND MEASURES**

I wish to make just a comment or two which express my own thoughts and which I believe will be concurred in by practically everyone in this group.

Mr. President, I was first introduced to the activities of the weights and measures group in 1924 and at that time began a realization of the very deep importance and value of weights and measures work to the consumer, the seller, the manufacturer, the buyer, and to civilization as a whole, and I have endeavored in the 29 years following that date to add in a small way my efforts to publicizing, on the positive side, the value of the work of this organization.

The point which has appealed to me for a considerable length of time, for years, is the deep value to those who administer weights and measures to have the supreme—I use the word objectively—the supreme guidance of the intelligence, technical knowledge, understanding and loyalty of those gentlemen in the National Bureau of Standards. It is a matter of gratification to us that the Department of Commerce, represented by Mr. Sheaffer, and the Bureau, represented by its Director, guide and lead us in an intelligent propagation and formation of laws and regulations for the conduct of this work.

Custom over the years has indicated that the Director of the Bureau does not only become ex officio, but officially by elective action, President of this association. As this group carries on its work it is our hope that that situation will remain unchanged, and may I add in conclusion, Dr. Astin, that it is our hope that you will remain as President for many, many years to come.



## APPOINTMENT OF COMMITTEES

(The President made the following committee appointments:)

### COMMITTEES SERVING DURING THE 38TH NATIONAL CONFERENCE

*Committee on Nominations:* C. A. Baker, New York, Chairman; Nalls Berryman, Florida; E. R. Fisher, Rhode Island; J. T. Kennedy, District of Columbia; R. S. Ackerman, Minneapolis, Minn.; C. M. Fuller, Los Angeles County, Calif.; Tom Webb, Nashville, Tenn.

*Committee on Resolutions:* J. E. Mahoney, Maryland, Chairman; C. D. Baucom, North Carolina; M. O. Nickon, Dearborn, Mich.; J. M. O'Neil, Cambridge, Mass.; A. O. Oslund, Union City, N. J.; W. H. Roberts, Vigo County, Ind.; J. C. Goll, N. Dak.

### STANDING COMMITTEES

*Committee on Legislation:* Nalls Berryman, Florida, 5-year term, to succeed C. A. Baker, New York, whose term expired.

*Committee on Methods of Sale of Commodities:* E. C. Westwood, Salt Lake City, Utah, 5-year term, to succeed I. M. Levy, Chicago, Ill., whose term expired.

*Committee on Specifications and Tolerances:* R. D. Thompson, Virginia, 5-year term, to succeed J. P. McBride, Massachusetts, whose term expired.

*Committee on Trading by Weight:* G. L. Johnson, Kentucky, 2-year term, to succeed J. J. Levitt, Illinois, who retired and T. C. Beck, Oklahoma, 5-year term, to succeed J. H. Meek, Virginia, whose term expired.

*Committee on Weights and Measures Education:* C. A. Lyon, New Hampshire, 5-year term, to succeed J. T. Kennedy, District of Columbia, whose term expired.

### HONORARY LIFE MEMBERSHIP CARD PRESENTED TO RALPH W. SMITH

MR. LOUIS E. WITT: Last year the Thirty-seventh National Conference on Weights and Measures elected one of its prominent and longtime members to honorary life membership. This action was without precedent in the annals of the Conference, but the unusual award was conferred upon a distinguished and outstanding weights and measures man, Ralph W. Smith.

Mr. Smith's distinguished service to the National Conference on Weights and Measures and his lasting contributions to this body and to the weights and measures movement in general need not be recounted at this time since these things are well known to all present.

I am privileged to present to you, Mr. Smith, this engraved gold card, authorized by the Executive Committee, as evidence of your honorary life membership in the National Conference on Weights and Measures.

(Mr. Smith responded and expressed his appreciation for the honor so bestowed.)

### ROLL CALL OF STATES

The Chairman called the roll of States. Delegates from 39 States and the District of Columbia responded. Delegates and their ladies were introduced individually.

## ROLL CALL OF STATE AND REGIONAL WEIGHTS AND MEASURES ASSOCIATIONS

The Chairman called the roll of State and Regional Associations of Weights and Measures Officials. Representatives of all 19 Associations on record responded.

(Written reports from many States and Associations were duplicated and distributed at the Conference.)

(The Conference was recessed until 2 p. m.)

## SECOND SESSION—AFTERNOON OF TUESDAY, MAY 19, 1953

(R. D. Thompson, Vice President, presiding)

### PREPACKAGED FOODS

By G. F. AUSTIN, JR., *Deputy Sealer of Weights and Measures, Detroit, Michigan*

The importance of check-weighing or check-measuring packages of commodities, which are put up by the packer or merchant in advance of sale, is one phase of our activities, as weights and measures officials, which scarcely can be overestimated. It is true that much of this work is being done; however, it is also evident that many weights and measures officials pay very little attention to factory-filled packages of nationally advertised commodities. Perhaps the main reason for this is the somewhat perplexing problem which might arise as to how to obtain the necessary tare weights of the packages to facilitate the procedure. That is one of the things I will discuss.

It would seem that the initial approach to this subject should be to relate and put emphasis on one basic and pertinent fact. That fact is, in every jurisdiction throughout the country, there are literally thousands of manufacturers and packers of various types of commodities who, for one reason or other, are not included in the regular routine inspection itinerary of weights and measures departments. Mainly, this situation can be attributed to the very limited personnel to be found in most departments whose present numerous and important duties preclude doing extensive work in this particular field. However, it is somewhat obvious that, if each of us did take more time, we could cover this neglected field more efficiently and more economically than is the case presently. Actually, we would find dividends resulting therefrom. In supervising this matter at the source, we would find more adequate facilities and means for determining the tare weights for various packages. More packages could be examined with less effort and in shorter time. Then, too, each manufacturer or packer would be alerted more fully and frequently to any irregularities and to their responsibilities, insofar as weights and measures requirements are concerned. A united effort, using this approach to the problem, demands full consideration by each and every one of us. Remember that, if all departments cooperated effectively in this matter, we would not have to resort entirely to the more difficult way of accomplishing the desired end.

One field testing procedure involves an extremely laborious effort to obtain the vital preliminary information relative to the tare weights of millions of packages. In Detroit, we resort to both of these approaches and we do make a real effort in both directions.

When we plan to inspect manufacturers' packages in the retail stores, we start our preparations months in advance by collecting a

widespread assortment of cans, bottles, paper containers, etc. We obtain at least six or more containers of each commodity. The containers, when emptied, are used to establish an average tare schedule. Next, and of extreme importance, when we collect these containers and before establishing a mean or average weight of same, we make sure that each container is complete in every detail; that is, containers should be complete with closures; labels should be complete; the containers thoroughly cleaned, etc.

Proceeding from this point, consideration must be given to the material of which these containers are made. The metal containers lend themselves to the establishment of a mean tare weight, as do the paper containers. However, you will find that the glass containers' weights vary slightly more. These variations are not sufficient to invalidate their use for the checking purposes. Keep in mind that this type of survey should be predicated in most respects on the average, rather than on the individual unit weights. When you have established the list of mean tare weights for each of the containers on which you are able to get advance information, you then are ready to go into the field to make the survey.

As a starting point, in instances where the manufacturer or packer is not located in your jurisdiction, the most desirable place would be in the warehouses of the wholesale grocer or the chain store operator. There you are most likely to find an abundance of the commodities for which you already have an established list of mean tare weights. Ordinarily, you will find these people very cooperative and interested in your program, and many times they extend their interest to the point of opening up packages of commodities other than those you have on your prepared list, thereby enlarging the scope of your initial program and providing you with additional mean tare weights.

For the purpose of this survey, the use of an over-and-under type scale with  $\frac{1}{16}$ -oz graduations on the chart is recommended. Another suggestion would be to have some specially-prepared report forms for this type work, similar to figure 1. This form contains columns for such information as name of commodity, trade name, name of manufacturer, content marking, weight of container, whether the container is made of glass, tin, cardboard or paper, place of inspection, and also a column to indicate whether the content statement is correct as to form. From time to time, you may find it desirable to take your

COM- MODITY	TRADE NAME	NAME OF MANUFACTURER	CONTENT MARKING	WGT. OF CONTG.	Date SIZE OF CONTAINER or in inches	G. T. C.	PLACE OF INSPECTION	CON- TENT STATE- MENT
A								
O								
S								
A								
O								
S								
A								
O								
S								
A								
O								
S								

FIGURE 1.



over and under reading from the chart in the units of  $\frac{1}{16}$  oz,  $\frac{1}{8}$  oz, or  $\frac{1}{4}$  oz; so, for the purpose of recording such information, a space is provided at the extreme left-hand side. The need for the use of one or the other of these units is predicated principally on the utility of such information when computing the average weights of the packages. Directly opposite this space, there are three lines provided to record the variable for each unit checked. One line "A" for the approved, one line "O" for those overweight, and one line "S" for those that are shortweight. At the far end of these lines, you will find a column to indicate the number of units checked in each of the categories, "Approved," "Over," and "Short." The end space is also used to record the "average" finding on those particular packages. One column, you will observe, is headed "G," "T," "C." These letters were used for the sake of brevity. They represent the material of which a particular container is made—glass, tin, and cardboard or paper, respectively.

In addition to this phase of our special program activities relating to prepackaged merchandise, there are five other principal phases:

The checking of prepackaged meats, frozen foods, wholesale meat deliveries, wholesale packages of fruit and vegetables, and packaged milk in cartons.

The prepackaged meat problem, like that of frozen foods, is of fairly recent vintage, dating back but a few years. It is interesting to recall that, in the early stages of this development, when prepackaged meats were making their bow, the industry made great demands for shrinkage tolerances. In the course of events that followed, a poll was taken on this subject by a weights and measures official. The replies definitely indicated that all city and by far the majority of State and county weights and measures officials were opposed to the establishment of such tolerances. In addition, supporting our general idea in this matter, we were fortunate in having a representative from the National Association of Retail Grocers address our 35th National Conference. This man made the following remarks in the course of his talk:

Most of you in session here are quite naturally interested in prepackaged perishables from your own perspective of weights and measures. While I realize that I am "sticking my neck out" by dealing with this phase of a subject on which you are so well informed, nevertheless I am going to air some of my views and reveal certain weaknesses prevalent under this new method of packaging. May I say in advance, however, that, while our store has its own share of problems, prepackaging and otherwise, the following are not among them:

(1) *Short weight and overcharging.*—The "bugaboos" can be largely overcome by first fixing prices a cent or two per pound higher and allowing  $\frac{1}{4}$  oz. for shrinkage, provided needs beyond two days are not anticipated.

(2) *Tare allowance.*—Some merchants apparently overlook the fact that only the net contents can be priced to the consumer. They should be reminded otherwise.

(3) *Proper refrigeration of smoked meats.*—There is a tendency to display these atop the case or in mass floor displays, with a resultant shrinkage of 10 percent or more in a matter of days. This practice should be discouraged. All smoked meats except those of old cure should be kept under refrigeration.

These announced opinions represent some of the early answers to the frantic demands of industry for shrinkage tolerances. Time has proved this was not the real answer to the situation. Since then, as you no doubt have observed, great forward strides have been made by the packers of these commodities. They have eliminated most of the difficulties which were present at the beginning of this

figure 2.

[illegible]

FIGURE 2.

the merchant maintain a better control over the weight situation.

into a chaotic situation.

Other problems in this same field are meats and poultry in cans. This matter, which borders on the subject of short weight, frequently is brought to our attention, and, here, reference is made to the volume of liquid, in the form of gravy or meat juices contained in such packages, and included in the net content declaration. This particular matter was discussed on a limited basis at one of our previous Conferences, and a statement was made by Mr. Queen of the Food and Drug Administration as follows:

No regulations have been promulgated under the Federal Act stipulating allowances that will be made in the "labeled weight and the actual drained chicken weight on whole chicken" in which a liquid substance has been used as a packing medium. We would regard the use of an excessive amount of such a packing medium in canned whole chickens as an adulteration and amenable to the general adulteration provision of the Federal Act. . . . In the case of whole chicken in gravy, when labeled as such, we would not object to a declaration of the combined weight of the chicken and gravy as the net weight of the packaged product. Such a product would, of course, be subject to the considerations noted above in respect to adulteration. In accordance with Food Inspection Decision 144, issued May 11, 1912, we hold that the chicken should, as nearly as is practical, fill the container, and that the gravy should occupy only the space that would otherwise be unfilled.

Problems of this kind, no doubt, will plague us for some time, but this mention is made of the canned meats and poultry simply to illustrate one of the many complicated situations prevalent in connection with the prepackaging of foodstuffs. In this respect, it is hoped that the development of closer controls will make for considerable improvement and thereby lessen this particular difficulty. Frozen foods, in many respects, also need our close supervision, and, with the cooperation of the Food and Drug Administration, it is quite likely that most of these varied problems will be diminished considerably.

The check-weighing of wholesale meat deliveries is done in the shipping rooms of the packers and jobbers, and, in addition, on deliveries being made from delivery trucks which have established routes. Much of this weighing is done on the customer's scales at time of sale.

Fresh fruits and vegetables in bags, crates, and boxes are check-weighed at the large fruit and vegetable terminals, and also in the warehouses of the large grocery outlets. For this purpose, we have a five-foot folding tripod with detachable lifting arm having a leverage ratio of 3 to 1, a 100-pound,  $\frac{1}{4}$  pound-graduation, dial scale with a hook attached, and a few feet of rope.

Packaged milk in cartons also receives our close attention. We have devised a rather unique procedure by which to handle this matter, which will be brought to your attention later in the program, when another speaker will present a paper on the subject.

The percentage of time allotted to any of the various phases of our special project investigational work depends principally on the conditions which we find to prevail from time to time.

In the course of this talk, I have attempted to cover the whole field of prepackaged commodities. Now, and in conclusion, I would like again to focus your thoughts on one of the initial items, the matter of the factory-filled packages of nationally advertised commodities, by taking the liberty of repeating what I term to be the quintessence of this subject; namely, if each of us did take more time in the check-weighing and check-measuring of manufacturers' pack-



aged commodities in the factories or packing plants, we could save an enormous amount of time and trouble, and indirectly accomplish this Herculean task more efficiently and economically.

MR. MUNDY: In my jurisdiction we find it most difficult to determine the tare weight of any particular package without opening the package and thus reducing the profit of the merchant whose establishment we are checking. I feel that our attention should be focused upon some definite policy with regard to tare weights of containers and that this policy should be recommended by this Conference.

In Virginia, one of our problems concerns smoked meats. I believe that hams and bacons should be packed in cases and that the tare weights should be indicated on the outside of such cases.

MR. J. M. GALLOWAY: In Indiana, our greatest problem seems to be items packaged at the retail store. Much of this difficulty is caused by the large turnover of labor in these retail outlets. I believe one solution to the retail problem would be an extensive educational and training program, participated in by all personnel who actually pre-pack and label food items.

MR. THOMAS: All weights and measures men are very much interested in this problem. Since it is a matter of concern to all of us, I believe a general discussion on methods of procedure would be beneficial.

MR. MUNDY: In the City of Richmond we endeavor to check-weigh prepackaged goods in a comprehensive manner; in fact, during the past year we weighed more than 73,000 packages of merchandise. We have discovered that a merchant cannot prepackage goods adequately and accurately on a conventional computing scale. Our method of operation in this field includes the weighing of the items, the finding of the tare weights, and the proving of the net contents.

MR. SLOUGH: We must realize that the average super market has from 50 to 80 thousand packaged items in the store. Many of these items are not packaged locally and those too should be checked. One method of operation under a limited budget would include the careful weighing—gross, tare, net—of every food item purchased for consumption by weights and measures officers and their families. A department employing six people would cover the field fairly well during 1 year.

#### REPORT OF COMMITTEE ON TRADING BY WEIGHT, PRESENTED BY J. FRED TRUE, CHAIRMAN

Your Committee on Trading by Weight has made a survey of the States to try to find out how much interest and how much opposition there is in the trading by weight movement. We find that a number of States have no interest in a change, also that a number of States have been on a weight basis for several years. A number of items which have a legal weight per bushel are always weighed, and the term bushel is used to indicate a given amount of weight. There are some items which actually are sold by the bushel measure. In these cases, the bushel is used as a measure.

We sent a letter to each State inquiring about the interest in their jurisdiction, also asking them to check the legal weights of a number of items, such as the farm grains, which move in volume. We made no attempt to check every item, because some of the items are not important to most of the States.

The following quotation is from the Agriculture Research Administration of the United States Department of Agriculture, Washington, D. C.:

*Unit of Measure.* In the interest of economy and greater uniformity in the handling of grain, an effort should be made to measure the merits and evaluate the problems involved in shifting trade in grain from "bushels" to 100-pound units. The investigation should include a study of legal obstacles, institutional changes, and statistical data adjustments required in event such change was instituted.

Following are statements received from various States:

**ALABAMA:** There is a definite trend in Alabama to get away from the bushel and use weight instead. The majority of sales and a considerable number of the quotations on the products shown on your list are by weight instead of the bushel. When the bushel is abandoned entirely and weight alone employed, it will be much better for all of us, as there are quite a few varying weights per bushel among the States.

**ARIZONA:** In reply to your letter of March 12, the State of Arizona uses weight instead of dry measure in the sale of all commodities.

**CALIFORNIA:** The California law provided for weights per bushel for the following: flax seed, oats, rye, wheat, Indian corn (shelled), barley, and buckwheat.

**GEORGIA:** You ask in your letter if there was a move in Georgia to do away with the bushel measure and use weight instead. If there has been any move to this effect, it has not been brought to my attention.

**IDAHO:** The State of Idaho already has done away with the bushel measure and uses the weight system entirely.

**ILLINOIS:** There seems to be no interest in our State to do away with the bushel and use weight instead.

**INDIANA:** I do not believe there is much widespread interest in Indiana to do away with the established weight per bushel. About the only exception would be in the case of ear corn. Grain dealers frequently express the opinion they would like to see this provision eliminated from the law and that all sales be made on the basis of hundredweight. For some reason or other, they have not introduced a bill, to my knowledge, which would repeal the weight-per-bushel provisions for ear corn.

There is nothing in our law which prevents the buying and selling of commodities, for which bushel weights have been established, on a hundred-weight basis. In fact, many of the commodities listed are now sold on a hundredweight basis. Notable among these are corn meal, middlings, salt, etc. In some sections of the State ear corn is being bought and sold on a hundredweight basis.

**LOUISIANA:** In reply to your letter of March 12, regarding the bushel or dry measures in this State, beg to state that with a very few exceptions practically all commodities are sold by weight.

**MAINE:** At the present time, as far as we know, there is no effort to do away with the weight by bushel in this State.

**MARYLAND:** This is to advise that the legal weight per bushel of the various commodities were repealed when the new weights and measures law was enacted by the General Assembly in 1950. Such legal weights were not re-enacted.

**MASSACHUSETTS:** Our law provides that all fruits, nuts, vegetables, and grain shall be sold at retail by avoirdupois weight or numerical count unless the same are contained in original standard containers.

**MICHIGAN:** Your letter of March 12 asked, "Is there any interest in your State to do away with the bushel and use weight instead?" Speaking for Michigan, there is some sentiment for selling such commodities by weight instead of by the bushel. I think it would be a very desirable objective for our Conference.

**MINNESOTA:** In reply to your inquiry relative to any movement or interest displayed in Minnesota to sell by weight in place of volume, the answer is in the affirmative.

The enclosed bushel list is indicative of this fact. All commodities appearing on this list must be sold by weight when bushel reference is made. For example, if one were to purchase a bushel of potatoes, there must be sixty (60) pounds delivered; of tomatoes, the weight shall be fifty (50) pounds.



It follows then, that insofar as reference to the bushel or fraction thereof, the weight as given on the bushel list must prevail; therefore, the bushel has lost its identity and said commodities must be sold by weight.

NEW HAMPSHIRE: I am definitely in favor of doing away with the bushel and selling entirely by weight.

NEW JERSEY: With the exception of certain seeds, New Jersey long ago abandoned the use of dry measures for quantity determinations in relation to fruit and vegetable commodities.

NEW YORK: Formerly Section 190 of the New York State law set up a list of weights per bushel for a number of commodities, but in 1939 this Section was repealed and a new Section 190 was enacted which reads,

Sec. 190. Sales of fruits, vegetables, grains and nuts. Except when sold in the original container, fruits, vegetables, grains and nuts shall be sold at retail by avoirdupois weight or numerical count.

NEVADA: \* \* \* dry measure, such as bushel, peck, etc., is not or never has been used as a basis of measurement in the sale of any commodities, to my knowledge. In lieu thereof, such products are sold by weight, or in some cases, numerical count.

OHIO: You may be interested in knowing that the Sealers' Association is sponsoring a Bill which would delete the weight per bushel of ear corn and corn meal.

We would like to have gone further and included wheat and oats but the grain industry feels that the custom of buying and selling by the bushel of these two grains is still too imbedded to make this change now.

OREGON: As Oregon laws do not permit sale by bushel weights we are not returning your mimeographed copy of legal weights.

PENNSYLVANIA: I am very much interested in eliminating the use of dry measures in the State of Pennsylvania; however, up to the present time we have not been able to have our laws changed to this effect. Until such time as we can convince the General Assembly that this is the worst method of sale for dry commodities, we must permit the use of dry measures.

SOUTH CAROLINA: In reply to your question if any interest is being taken in this State to abolish the bushel measure, we have given the matter some consideration, but so far our General Assembly has not repealed this Section of the law.

UTAH: Our weights and measures law does not establish legal weights per bushel of any commodity.

Any commodity which is in an enclosed package is required to be labeled with the net weight in the package.

The bushel, however, is used a great deal in sale of fruit and vegetables, established by common practice for many years. I do not know of any expressed interest toward doing away with the use of the bushel in this respect and replacing therefor the use of weight.

VIRGINIA: I have your letter of March 12 in regard to the Committee on Trading by Weight, and hope that the Committee will be maintained. It seems to me we should work along the lines that we have been and develop new ways of bringing about these changes.

It might be beneficial if those in charge of the inspection of grains and those in charge of weights and measures would cooperate in the formation of an association to discuss the benefits of trading by weight. I am offering this as a suggestion for your report.

I insist that a committee still continue to work on this matter, as I believe it is a worthy cause, even though the ultimate objectives will take many years.

VERMONT: With reference to your inquiry regarding interest shown in this State to the doing away with the so-called "dry measure," we have drifted away from the use of dry measure in nearly all transactions in this jurisdiction. Of course, the table of equivalent weights is used to some extent, but there is practically no use of dry measure as such.

WASHINGTON: I have filled in a few items that are required in our State; however, the interest here is very keen to do away with the bushel and use weight instead.

WISCONSIN: There is no interest in this State to do away with bushel weights at this time. However, I strongly suggest that we get away from bushel weights on such items as apples, peaches, pears, etc., which are packed in standard containers.

It does not appear logical that we require 44 pounds of apples in a standard bushel when it is impossible to get this weight into the standard basket when all varieties, sizes, and ages of apples are concerned.

We recommend that the Committee be continued to give encouragement and help to this movement wherever possible. Trading by weight has many advantages. We feel that all State departments should encourage trading in all commodities by weight.

MR. KALECHMAN: I believe our first work in this direction should be with the U. S. Government. Merchandise packed in a standard bushel container must be sold as a bushel, regardless of weight. In the State of Connecticut if a bushel is packed in any other container, it must, of course, be sold by weight. I think that the U. S. Government should be asked to cooperate with this Conference toward a goal of selling by weight only.

MR. TRUE: A bushel by volume may weigh anything, depending upon the commodity. Some States require that a bushel or basket of apples weigh 48 pounds. As you know, many times it is difficult to get 48 pounds of apples into a standard bushel container. In selling by volume the method of packing is very important.

MR. BLICKLEY: Since different varieties of apples weigh differently, it would be almost impossible to set a true weight per bushel for all varieties of apples.

MR. GRAY: The State of Nebraska has a law requiring 48 pounds to the bushel for apples. I think many States have similar laws. We found it difficult to enforce this requirement until we got a legal opinion from our City Attorney that, regardless of the fact that the apples were in a U. S. standard bushel marked "1 U. S. Standard Bushel," the State requirement was not met unless the basket contained 48 pounds of apples. Based on this opinion we instituted proceedings against one retailer and, after many hours of consultation they agreed that they would stamp on each basket the minimum weight of the apples contained.

(The Report of the Committee on Trading by Weight was adopted by the Conference.)

## PRE-PACKAGED-ICE-CREAM MEASURE-CONTAINERS

By D. H. WILLIAMS, *International Association of Ice Cream Manufacturers*

The matter of a weights and measures problem in the half-gallon ice cream container became apparent about two years ago. At that time, sealers of weights and measures found it very difficult to measure the volumetric capacity of the half-gallon rectangular container due to the variety of dimensions and the bulge in the face panels of these containers found in commerce. In addition, it was found by subsequent displacement measurements that the actual volume of ice cream in over 400 half-gallon packages tested from 119 to 129 cubic inches, the liquid half gallon being 115.5 cubic inches. This variation in contents not only fell outside the tolerances of the proposed code, but it contributed to a texture quality defect in the ice cream caused by the container's distortion inducing overrun variations.

At the 36th National Conference on Weights and Measures a resolution was passed, as you recall, that this carton, a measure-container, should be filled without apparent distortion. A distortion problem was created by the inherent properties of container design which allowed a natural bulge in the face panels of the container.

The Simplified Practice Committee of the International Association of Ice Cream Manufacturers and representatives of the Paraffined Carton Association went to work to see what could be done to resolve this distortion factor. It should be made clear at the outset that this problem was investigated jointly by the three interests, the ice cream industry, the carton industry, and the National Conference through its Committee on Specifications and Tolerances. Basically, the half-gallon container was an industry problem, to be worked out by the industries involved, with the assistance of the National Conference. The approach was a lengthy series of displacement tests. Half-gallon containers, filled with hardened ice cream, were immersed in cold brine and the displacement measured volumetrically. This displacement procedure, while recognized by Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists, was not acceptable to weights and measures officials, since it was not adaptable for use by sealers in the field.

Our problem then was two-fold. We had to develop a test which regulatory people could use under field conditions to determine accurately the volumetric contents of the container, and carton dimensions would have to be agreed upon which would provide a tolerance for the degree of bulge in the face panels. A later development, with which you are not so directly concerned but which facilitates your work nevertheless, was the standardization of container sizes to a limited number. The latter phase of the work has progressed to the point where the Commodity Standards Division of the Department of Commerce has distributed a proposed Simplified Practice Recommendation for two styles only of rectangular half-gallon containers. Already, several hundred acceptances for this proposal have been received from the industry, and the latest word received from the Commodity Standards Division indicated that no disapprovals had been received.

To return to the original problem, Mr. Holmes, and Dr. Skelton of the Ice Cream Association devised a type of caliper instrument with which they measured hundreds of assembled empty cartons to determine the average bulge or distortion due to assembling the carton. At this point conferences were held with the Specifications and Tolerances Committee for their guidance and approval. Acting on their recommendation that these cartons be tested by filling with water while under support, a formula was developed which could be used to determine the dimensions of a supporting collar or form that would take into consideration a tolerance for normal distortion in the container due to assembling. The formula agreed upon was that the inside dimension of the supporting form is based on center-of-score to center-of-score measurement, plus two thicknesses of stock, plus  $\frac{1}{16}$  inch.

Using this formula, our industry committee made up sample cartons and proceeded to test them by filling with water. This procedure was adopted by the 37th National Conference last year and is written up and illustrated in the printed Report of the 37th National Conference which all of you have seen by now. Once the testing procedure was accepted, adjustments in carton height could be made so that the volumetric contents fell within the tolerances prescribed in the Tentative Code for Pre-Packaged-Ice-Cream Measure-Containers. These adjustments were made where necessary and the result, with standardization as the ultimate objective, was the development of



the number 1 or "Squat" type and the number 2 or "Tall" type rectangular half-gallon container. The dimensions of these two containers are, respectively:

No. 1.  $3\frac{1}{2} \times 4\frac{13}{16} \times 6\frac{7}{8}$  inches.

No. 2.  $3 \times 5 \times 7\frac{19}{32}$  inches.

Both of these containers have a cubic capacity sufficient, under the conditions of the test approved by the 37th National Conference, to fall within the tolerances prescribed by the Conference, and published as correction sheets to the National Bureau of Standards Handbook 44.

The inside dimensions of the restraining forms for use with the two styles of containers, if the containers are made of board having a thickness of 0.024 inch, are, respectively:

No. 1.  $3\frac{39}{64} \times 4\frac{59}{64} \times 4$  inches.

No. 2.  $3\frac{7}{64} \times 5\frac{7}{64} \times 6$  inches.

Arrangements have been made by representatives of the Paraffined Carton Association to have the restraining forms fabricated and made available to weights and measures officials who wish to purchase them. Quotations for these forms are available from Mr. Raynor Holmes, Bloomer Brothers Company, Newark, New York. Mr. Holmes is in the room today and will be available for any questions you may wish to direct to him either now or at the conclusion of the meeting.

In just a very brief summary I want to review the progress which was made in developing a satisfactory half-gallon rectangular ice-cream container.

1. Normal distortion, i. e., that due to assembly of the container, was determined.
2. A test procedure was agreed upon.
3. Formula was developed for the determination of the dimensions of the supporting collar or form.
4. Container dimensions were determined from statistics taken from the volumetric testing of hundreds of containers.

Finally, we have offered a standardization of two containers to the industry. Individual acceptances from the ice cream and carton industries, and weights and measures officials over the country are being received at the Department of Commerce today. As a result of this work we feel that we have gone a very long way in assuring uniformity of contents and fair measure in the half-gallon rectangular container.

(Mr. Holmes commented on the development and availability of restraining forms to be used in testing pre-packaged-ice-cream measure-containers.)

## PAPER MILK CONTAINERS

By D. M. TURNBULL, *Deputy Sealer of Weights and Measures, Seattle, Washington*

The typical weights and measures department of our average American community is confronted with a great variety of complex problems. Often, because of limited personnel, it is necessary to employ certain so-called short cuts in the field of supervision. The weights and measures official must inspect the many and varied types of weighing and measuring devices and must also maintain a constant surveillance over the countless products that are packaged and sold by weight or measure. He must, of necessity, devise methods of control by spot check that are both speedy and effective, as it would

be patently impossible to inspect each individual commodity in his jurisdiction.

Changes in American methods of merchandising quite often necessitate changes in our weights and measures approach. Years ago one would have believed that the milk bottle, long an institution, was an irreplaceable article in our daily living. Now, and with all indications of staying, the paper container, or carton, is supplementing the bottle in the delivery of milk. What no doubt has proved to be a vast improvement in the industry has at times presented a somewhat difficult problem to the weights and measures official. The transparent glass milk bottle presented a comparatively minor problem, as all the inspector had to do was see that each approved bottle was filled to the proper level—generally  $\frac{1}{4}$  inch below the cap seat. Each bottle was, in effect, a liquid measure in itself; but, with the paper container, a sealed unit, there is no “fill line.” Thus the question: “How can I determine whether this carton of milk contains full measure?”

This question has assumed national importance. Jurisdictions throughout the country now are asking the same question and are trying to find a satisfactory method of constant measurement control of this vast industry.

The gravimetric system is a practical answer to the problem of checking dairy products prepared and sold in paper containers. This method simply establishes the weight of a commodity sold by liquid measure. Check-weighing is done in the field and has proved to be an excellent means of control in our work in Seattle. When the inspector goes into a grocery store for the purpose of checking the computing scales, he can check-weigh a number of cartons of milk quickly and thereby employ a constant supervision of the industry, and still not spend an excessive amount of time in so doing.

We use the following sample form in recording the weights of each firm's products in the various sizes marketed:

Commodity	Weight of Container	Liquid Test Measure and Slicker	Net Weight of Commodity	Gross Weight of Commodity

In the first column under "Commodity" we list each product in its various sizes, and on our keenly-sensitive even-balance scales we establish the weight of each size container, making sure to include the small tab used as an opening device by some manufacturers. We then weigh the liquid test measure and slicker plate by balancing off against accurate test weights on the opposite platter. The scale then being in balance, we fill the test measure with the commodity involved and again bring the scale to balance by adding weights to the other platter, the amount of weight added being the net weight of the

commodity. The weight of the container and tab added to the net weight of the commodity gives us the gross weight to be used in the field. This figure is checked once again by actually "balancing off" a container holding the exact liquid measure against test weights. For purposes of accuracy, all weights are determined very accurately. However, in the field, merchants' scales often are used and when, perhaps, it is not possible to read closer than a quarter ounce, we find it satisfactory to read the scale plus or minus.

At this point it might be well to stress the importance of using extreme care in the entire procedure of gravimetric checking. Precision should be exercised in the process of determining the commodity weights. The inspector must watch constantly for changes in design or weight of the material used in the paper container. These changes could be made by the manufacturer without notification. The maker of the container conceivably could alter the weight of his product using more or less wax in the coating which, by changing the tare weight, would change the gross weights arrived at by calculations in the laboratory.

The inspector also must be alert to recognize variations of butterfat content which would cause slight differences of weight in establishing his net commodity weights. He must also establish these weights under constant temperature—taking into account expansion of the butterfat content of the commodity he is weighing. Changes of this nature, if not recognized by the inspector, would make his method of constant measurement control worthless.

Whenever it becomes necessary to correct discrepancies found in the field through the courts, there is but one course to follow. The product must be proved short liquid measure, weight no longer being a factor. Evidence of short weight in a charge of short measure very likely would not be admitted in the courts. In the event a large stock of a certain dairy product was found exorbitantly short by gravimetric check, a representative number of containers could be checked against certified liquid measures. If this test bore out the gravimetric result, the evidence doubtless would be admitted as proving the entire lot short measure. This case is comparable to a short weight delivery of coal. The inspector can determine the cubic content of the bin and, knowing the number of cubic feet in a ton of that particular coal, can come very close to computing the weight deficit. However, in presenting a case in court, the burden of proving short weight rests on the inspector. Obviously that would necessitate actually weighing the coal in question.

The gravimetric system of check-weighing is a ready method of indicating a condition and as such has proved invaluable to the official in his effort to protect the buying public.

MR. SAYBOLT: From a tolerance standpoint, it seems to me that paper milk containers should be required to maintain the same degree of accuracy as are glass milk bottles.

MR. CRAWFORD: The only truly accurate way of determining the quantity of contents in a paper milk container is through a volumetric test.

MR. HOWARD: In Miami, Florida, we have found that we can control the volumetric content of paper milk containers by checkweighing them. We have obtained the tare weights of the cartons from the manufacturers and have determined the weight of the milk ourselves.

MR. J. P. LEONARD: I believe the place to control this problem is



in the plant where the containers are filled. One principal cause of short measure is overspeeding the filling machine.

MR. ARRANDALE: I would like to inquire as to the possibility of requiring and enforcing "fill line" provisions on paper milk containers.

MR. CRAWFORD: It would be impossible to put a mark on a container and enforce that mark as a fill line when such container is not rigid and is not constructed to be a measure.

MR. ANDRE: I think our prime purpose is to see that the consumers get a full quart of milk. I would like to say for our company, and I think the paper container industry generally, that we are willing to operate within reasonable tolerances.

MR. KELLOGG: I believe milk cartons are filled at about 50° F. I would like to know whether or not temperature changes are accounted for in these checking procedures.

MR. TURNBULL: Since the coefficient of expansion of butterfat is only 0.00064, any expansion or contraction would be negligible.

MR. WALTON: In Dallas, Texas, we have taken the attitude that the paper milk container is merely a container and that the machine itself is the measuring device. We have no specifications, tolerances, or regulations dealing specifically with milk filling machines, but we do consider them to be measuring devices and we endeavor to regulate them accordingly. In the early history of milk in paper containers one of the greatest difficulties was caused by leaking cartons. That condition has been improved, and we now have very little trouble with short measure resulting from leaking cartons. We believe it is impossible to consider the paper container as a liquid measure. As you know, the carton bulges after it has contained milk for any length of time.

We require that paper milk containers be properly labeled just as any other packaged food item.

MR. MUNDY: Mr. Walton, how do you handle a complaint from a housewife who claims that she has received short measure in a paper milk container?

MR. WALTON: We make a volumetric check on the contents of the carton in question. If a shortage is found, we determine the code on the particular carton—a code which informs us as to the date that that carton was filled. We then go to the retail outlets and endeavor to locate other cartons with identical code. These cartons are checked gravimetrically in the retail store. We check the cartons filled on the particular day and also those filled the previous day and the day following. If any shortage is found, we go directly to the creamery and attempt to determine there what caused the shortage.

### HIGHWAY TRUCK WEIGHING

By J. E. NICHOLAS, *General Manager, Indiana Motor Truck Association, Indianapolis, Indiana*

I propose to put before you one of the trucking industry's greatest problems of the present time. How can there be accurate and uniform weighing of trucks nationwide? This is the problem of America's second largest industry, second only to agriculture, with one of ten pay checks now coming from the trucking industry. Trucks are moving 75 percent of the freight tonnage moved in this country.

Let's face the problem of highway truck weighing. In Indiana over 900,000 trucks are weighed annually by the State Police Depart-

ment alone. Our State Police Department has adopted the best known techniques for truck weighing through cooperation with our Division of Weights and Measures and our Highway Department. They have seen to it that State-owned platform scales were properly installed in Indiana.

Overloaded vehicles are now running less than 0.8 percent and most of these violations are of minor axle-weight overloading resulting from misloading, shifting of cargo, or error in scales at the point of loading where the vehicle was checked before going onto the highway.

We find that there are hundreds of commercial scales in our State where the approaches are not proper for multiple-draft weighing and I am sure the same conditions that exist in our State exist in many other States, and mind you—merchandise is bought and sold daily over these scales and every time a purchase or sale is made somebody receives improper weight. These are the scales that grains, feeds, and coal are bought and sold over day after day. And, these are the same scales, available in every community, that are often used for checking motor vehicles before they go out on the highway. We often find that even new scales installed for weighing trucks by the multiple-draft procedure are inaccurate.

It is time that uniform methods were adopted in the various States for the weighing of motor trucks and more specifically—multiple-draft weighing. Over the years standards for single-draft weighing have been established and well received. Research papers on multiple-draft weighing of motor trucks, with some very basic recommendations, were delivered as far back as the 28th National Conference on Weights and Measures on June 2, 1938, by C. L. Richard of your National Bureau of Standards.

Mr. Richard's paper showed that errors as great as 3.2 percent were possible when the approaches to scales were not of zero grade. He also showed that such things as brakes being applied while the vehicle was being weighed seriously affected the obtaining of true weights. If the report of Mr. Richard had been heeded and the States had adopted standards for multiple-draft weighing installations and standards for single-draft weighing installations, the opinion of many people would be greatly changed concerning scales and their use.

Actually I think the American public and the American businessman are being cheated by not having scales approved in two brackets. One classification of scale should be that where the approaches are not of zero grade. This type of scale should be approved only for single-draft weighing. Another classification should be that where the approaches are of zero grade and the scale properly installed. This scale, and this scale only, should be approved for multiple-draft weighing, if the American public is to be treated fairly.

Now let me get into the subject of weighing trucks on loadometers. Following this paper is a copy of a communication from Captain Kermit E. Lewis to Arthur M. Thurston, Superintendent of the Indiana State Police. The subject of this report is: "Weighing Techniques For Specially Designed Trailer Equipment." This particular piece of equipment was a tandem of very rigid nature and contained a load of acid. The more rigid the vehicle the greater the chance for error.

Let me say that experience shows that less rigid vehicles weighed by a single pair of loadometers under one side and then under the other



side of the vehicle will just give you a lesser amount of error because of a lesser amount of torsional pressure delivered to the rear wheels of the semitrailer resting on two scales.

Those present at this experiment were representatives of the State Highway Department, State Police Department, trucking company owning the truck, Standard and Sinclair Oil Companies and Dr. R. G. Sturm, a physicist of Purdue University.

What brought about this investigation was that weighing with two loadometers upset simple arithmetic. We knew what the tandem tractor-trailer unit weighed empty. We knew the volume of the load of acid and therefore the weight of it. We added the weight figures and the gross was under the legal limit. Yet, the unit was seized by State Police, using two portable scales, because it was 7,000 pounds overweight, according to them. We showed the State Police our arithmetic so they agreed to an investigation. And the result of that is this report attached. We found out not only what was wrong but we also learned that the error is less when four loadometers are used instead of just two. The error in this case, with only two loadometers, was 10 percent. With four loadometers, the error was within the 0.5-percent tolerance.

This report has been circulated by various national groups since November 1, 1949, yet I understand there are States that are still improperly using the loadometer. Drivers are being convicted in courts today for being a very few pounds over the weight law and there is a serious doubt in my mind if they actually are overweight.

We in the trucking industry, big and little operators alike, expect to be regulated. But, we feel we have the right to expect that all the machinery used in this regulation, whether it be a law or an administrator, or even the weighing scales, be fair and be exact. and that procedures and practices be uniform.

November 1, 1949

From: Kermit E. Lewis, Staff Captain.

To: Arthur M. Thurston, Superintendent.

Subject: Weighing Techniques for Specially Designed Trailer Equipment.

Superintendent, on Oct. 4, 1949, Lieutenant Smith, Marion Lawless of the State Highway Commission and myself went to the Lafayette Post to witness and supervise the test weighing of an acid truck that was owned by the Ecoff Trucking Company. Present at the weighing were Mr. David Ecoff, owner of the Ecoff Trucking Company, his attorney, Mr. Genther, representatives of the Standard and Sinclair Oil Companies, and Dr. Rolland G. Sturm, a physicist from Purdue University, who did the over-all job of supervising the weight check. This weighing demonstration was conducted to determine if our normal weighing techniques were accurate when using two loadometers, weighing first one side of a tandem group, then the other, then adding the sum of these two weights to determine the weight of the tandem group.

We have had several recent discussions with Mr. Ecoff and arranged this test weight because it has developed that the weights obtained by the use of the two loadometers and the techniques heretofore described were not consistent with the weights registered upon platform scales.

At the test, the truck weighed was a tank semitrailer designed especially for carrying acids. The tank is made of  $\frac{3}{8}$ -inch armor plate and was loaded to capacity in such a manner that no surging of the acid fore and aft was possible. The results of the tests and techniques used are as follows:

#### USING TWO LOADOMETERS

Two loadometers were placed under each wheel of the steering axle and the following weights recorded:

Right steering wheel.....	3, 800
Left steering wheel.....	3, 580
Making total for steering axle.....	7, 380

Next only two loadometers were used and our normal operation procedure followed in weighing the truck. First we placed two loadometers underneath the right wheels on the drive tandem group and the following weights were recorded:

Right front.....	8, 960
Right back.....	9, 250
Total.....	18, 210

Next the two scales were removed from underneath the right wheels and placed under the left tandem drive wheels and the following weights recorded:

Left front.....	8, 120
Left back.....	8, 275
Total.....	16, 395

Therefore:

Right side of drive tandem.....	18, 210
Left side of drive tandem.....	16, 395
Total weight of drive tandem.....	34, 605

Using same technique the trailer tandem axle weights are recorded as follows:

Right front trailer tandem.....	8, 670
Right back trailer tandem.....	9, 320
Total weight of trailer tandem.....	17, 990

Left front trailer tandem.....	8, 780
Left back trailer tandem.....	8, 565
Total weight of trailer tandem.....	17, 345

Therefore:

Right side of trailer tandem.....	17, 990
Left side of trailer tandem.....	17, 345
Total.....	35, 335

Therefore the total over-all gross weight using the two loadometer technique is:

Steering axle.....	7, 380
Drive tandem group.....	34, 605
Trailer tandem group.....	35, 335
Gross weight.....	77, 320

#### USING FOUR LOADOMETERS

Using four loadometers placing one under each wheel of the tandem groups. The following weights recorded:

Steering axle remains constant at 7,380 lbs.

#### DRIVE TANDEMS

Left front drive tandem.....	7, 440
Left back drive tandem.....	7, 070
Total.....	14, 510

Right front drive tandem.....	8, 245
Right back drive tandem.....	8, 430
Total.....	16, 675

Therefore:

	14, 510
	16, 675
Total for drive tandem.....	31, 185

#### TRAILER TANDEM

Left front trailer tandem.....	7, 845
Left rear trailer tandem.....	7, 355
Total.....	15, 200
Right front trailer tandem.....	8, 280
Right rear trailer tandem.....	7, 895
Total.....	16, 175

Therefore:

	15, 200
	16, 175
Total tandem axle.....	31, 375

Therefore:

Steering axle.....	7, 380
Drive tandem group.....	31, 185
Trailer tandem group.....	31, 375
Gross.....	69, 940

#### USING 50 FOOT PLATFORM SCALES

The truck was then driven to the city scales in Lafayette and the following weights recorded:

Gross weight.....	70, 260
Steering axle.....	7, 680
Steering and drive tandem.....	38, 880

Therefore:

Gross.....	70, 260
	-38, 880
Trailer tandem.....	31, 380

There was one observation, that was noted, there was a very slight variation in the weights noted when the vehicle was driven forward upon the scales and the weights recorded in comparison to the weight recorded when the vehicle was backed upon the scale. This variation was slight enough, however, to be negligible; also there was a very slight variation in the weights recorded when the vehicle was driven upon the scales and the brakes released. This weight difference at any time did not vary more than 15 pounds. These unusual variations in weight were explained by Dr. Sturm as being caused by friction in the unusual rocker arm type spring suspension and the shifting fore and aft of the center of gravity.

Many extremely interesting points were noted in these weighings; for instance, we took the gross weight of 70,260 pounds as determined by the city scales, subtracted from it the weight of the steering axle plus the tandem drive group of 38,880, which left us the indicated weight of 31,380 pounds for the trailer tandem group.

The weight of the trailer tandem group as determined by the four loadometers was 31,375 pounds, making only a difference of 5 pounds between the weights of our loadometers and the weights by platform scales.

The conclusions that can be drawn by this series of tests are these:

1. The loadometer itself is an extremely accurate scale. This is further borne out by the attached laboratory tests made on a loadometer by Purdue University.

2. When weighing trucks constructed as these acid trucks are, accurate weights cannot be determined by our normal weighing techniques whereby only two loadometers are used under one side of the vehicle at a time.

3. Loadometers can be used to accurately weigh these special type pieces of equipment or any type vehicle if four loadometers are used or if the loadometers are recessed within the pavement so there will be no deviation from the horizontal roadway surface.

4. The weights obtained by platform scales and the use of our loadometers are comparable for all practical purposes.

TABULATION OF WEIGHTS EMPLOYING VARIOUS WEIGHING TECHNIQUES

	Steering axle	Drive tandem	Trailer tandem	Gross
Using 2 loadometers first on one side, then the other.....	*7,380	34,605	35,335	77,320
Using 4 loadometers one under each tandem wheel.....	*7,380	31,185	31,375	69,940
Axle at a time on platform scales.....	7,680	31,200	31,380	70,260

\*NOTE: Steering-axle weight obtained by using two loadometers, one under each wheel.

MR. BAUCOM: Mr. Nicholas, would you recommend that the use of loadometers in highway weight enforcement be prohibited?

MR. NICHOLAS: We have found that the latest type loadometer, when properly used, indicates weights sufficiently accurate for enforcement purposes. In many places they are not properly used. If loadometers are placed under the wheels on one side of a vehicle, that weight recorded, and added to the weight obtained by placing loadometers under the other side of the vehicle; inaccuracies will result.

MR. REESE: One of the principal requisites for accurate axle-weight determinations seems to be level scale approaches. This is an area where weights and measures officials can be of assistance, and I believe firmly that level scale approaches should be required.

I would suggest further that cooperation among the enforcement agencies of the various States should be such that a weight ticket obtained in one State would be honored in other States. This would save time both for the trucker and for the enforcing officers.

MR. RICHARD: I believe we may break down this discussion of highway vehicle weighing into two categories. Weights and measures officials are particularly interested in one aspect and that is commercial weighing. The highway weight enforcement officials have interest in the other aspect, axle weights and overloading of highways. Surely no one considers a loadometer or a similar device as a commercial weighing device. They have an accuracy characteristic generally of 1 percent as compared with  $\frac{2}{10}$  percent for commercial scales. I would recommend that highway-weight enforcement officials take into consideration this possible error.

MR. LEITHAUSER: The 37th National Conference on Weights and Measures adopted a resolution recommending that a study be made by the National Bureau of Standards in cooperation with the U. S. Bureau of Public Roads, the trucking industry, and others into the various causes and amounts of discrepancy in axle-load weighing. We know these discrepancies occur, even on accurate scales. As weights and measures officials we should be interested in determining why.

We have no sympathy for truckers who deliberately overload and damage our highways, but, at the same time, we would not want to see truckers prosecuted under conditions which they cannot control.

MR. NICHOLAS: I want to assure you that the trucking industry favors further research on this subject.



MR. CHRISTIE: In New Jersey, since 1942, we have been working toward having all commercial vehicle scales meet minimum requirements as to approaches. A number of these approved scales have been used in tentatively determining axle loads. Our weight enforcement officials allow a 5-percent tolerance.

We believe that one of the principal reasons for many load-limit prosecutions is the effort of the truckers to take full advantage of this 5-percent tolerance. We have experimented with 6, 4, and 2 loadometers employed to weigh the axles on a single vehicle. When two loadometers are used, one under each wheel of an axle, the errors developed are well within 2 or 3 percent and always favor the trucker. This method of axle-load determination has been demonstrated before the trucking industry.

We believe that our weight control operations have benefited many truckers. We have been able to show them how to load their vehicles more efficiently and thus increase their pay loads.

MR. R. E. MEEK: When the highway weight enforcement program was first instituted in the State of Indiana, I recommended that the weighing be done on scales sufficient in size to weigh the trucks as one unit. I was informed that all surveys made by Purdue University, by the engineers of the State Highway Commission, and by others had indicated that the predominant damage to State highways was done by overloaded axles rather than by overloaded trucks. Out of some 7,000 prosecutions in Indiana last year only about 200 of them were on a gross over-weight basis.

During the past year we tested 87 axle-load scales. The performance of these devices under test was well within tolerance. In addition to known-load tests we made many special weighings on axles. Variations on successive weighings of the same axle ranged from zero up to 350 pounds. As a result of these tests I am convinced that if the trucker would attempt to load only to the allowable axle-load limit, he would not be subject to prosecution. Most generally truckers find themselves in trouble only when they attempt to take advantage of the enforcement tolerance.

The Indiana Motor Truck Association has done an excellent job of educating its members. During the year 1949 between 25 and 30 percent of the trucks weighed in Indiana were in violation; whereas, during this past year less than 1 percent were in violation. This is a splendid improvement, and it exemplifies what can be done through a cooperative effort of a trade association and enforcement agencies.

MR. NICHOLAS: Our effort among our members has been a campaign of education. We endeavor to check every arrest notice and to find the exact reason therefor. We have found that the great majority of weight violations during the past year were violations of axle-load limit on the drive axle of the tractor. In many cases we believe that this overloading on one axle is caused by a shifting of the cargo.

MR. POWELL: I want to verify the statements made previously that loadometers will give correct weight indication only if they are used properly. This Conference has recommended that when these portable devices are regularly used in pairs, each weigher of each such pair shall be appropriately marked to identify them as weighers intended to be used in combination. In pairs, loadometers must be used one under each wheel of a single axle, never under two wheels on one side of a vehicle.

MR. TATE: In reply to Mr. Leithauser's comment I would like to say that the National Bureau of Standards has begun an investigation such as was recommended by the resolution and further that we hope to expand this investigation during the coming year, provided, of course, funds are available.

The reaction of an axle and tires against a roadway is not a simple problem of weight but involves the configuration of the roadway and the rigidity of the truck body as well. As has been brought up previously the grade of the approach to a scale is of vital importance. In order to determine correctly the weight of a motor vehicle, all wheels of the vehicle must be on the same level. If you raise the wheels of only one axle on loadometers, your measurement may differ considerably from the true weight of the axle.

MR. GEHRINGER: Equipment is not the only element of correct axle-load determinations. There is also the matter of operators learning to use that equipment. We know that there are many inherent features in motor trucks which cause changes in axle weights. For example, some changes are caused by shifts in shackles and parts of the chassis assembly.

We also know that drivers of trucks are able to cause definite changes in axle weights. Experimentally we have asked drivers of large semi-trailer units to make an effort to cause shifts in axle weights, and we have found instances where changes as high as 1,000 pounds can be caused by the method of applying the brakes and by slipping the clutch. Operators of scales must know just how loads are to be applied and must also see that they are applied in that manner.

The scale industry is willing to cooperate with the truckers and with the State enforcement agencies in order to correct some of the difficulties which arise in the determination of axle weights.

(General comments on the subject were made by Mr. Baucom, Mr. Boyle, and Mr. Campbell.)

(The Conference adjourned, to reconvene at 10 a. m. Wednesday, May 20, 1953.)

### THIRD SESSION—MORNING OF WEDNESDAY, MAY 21, 1952

(A. V. ASTIN, President, and J. FRED TRUE, Vice President, presiding)

#### FLOUR WEIGHTS

BY HERMAN FAKLER, *Vice President, Millers' National Federation, Washington, D. C.*

At some time or other in your normal daily routine, you have all likely found sacks of flour in stores or warehouses which did not conform to the stated weight on the package. At times they may have been overweight but in other instances they were underweight. You may have been obliged to take action in some instances. That is a part of your responsibility—to take whatever steps are required to protect the consumer, the manufacturer, or both. You may have wondered, at times, as to the integrity of flour millers if you encountered what appeared to you to be an unreasonable number of short weight packages.

In many respects wheat flour is a strange commodity. It has an irritating capacity to gain or to lose moisture. We say irritating because it is this characteristic that is responsible for most of our common problems associated with maintaining apparent full weight in flour packages. We shall elaborate on this later. Before doing so

you may be interested in some background information on the actual physical process of packing flour.

The package represents the channel through which flour flows from mill to consumer. It must be sanitary, protective, economical. It must contain proper, full weight of product to assure honest value to the eventual user. Simple statements these, yet the attainment requires comprehensive effort on the part of the miller. In a broad sense there are two major considerations associated with the accomplishment. The first, the actual preparation of the flour package, is directly under the supervision of the miller and is his responsibility. The second relates to the storage conditions to which flour may be subjected after leaving the mill. This is most always beyond the control of the miller and is usually not his responsibility. Let us give a bit of thought to each phase.

Flour mills have automatic equipment and have established programs designed to assure proper weight of each package at the time flour sacks are filled. The tare weight for the specific package has been determined in a precise manner. This includes tare weights for coupons, inserts, tape seal or any other items forming a part of the final package. The packing supervisor adjusts his full package weight accordingly. It is his responsibility to make sure that each and every package is full net weight when packed within reasonable and practical limits.

Improper package weights can occur through faulty operation of mechanical equipment, errors in machine adjustment or the effect of the human element, careless or inadvertent. Flour mills attempt to eliminate all these errors through the use of automatic check weighing equipment and, in some instances, through employment of full time weight checkers. Such an individual is assigned the task of checking the weight of packages being delivered from each packing line whenever operating. He usually works independently of the packing department and is directly responsible to the plant superintendent.

We should like to elaborate on the manner in which a weight checker operates in many mills. At regular hourly intervals he selects several consecutive packages from a packing line. Each is weighed separately. The average weight of these control packages is recorded. These data enable those responsible to quickly appraise the reliability and accuracy of the packing operation. As long as the average package weights remain within specified control limits, no scale adjustment is made on the particular packaging line. Immediate correction is made when a weight falls outside the control limit. Whenever adjustments are made, immediate additional weight checks are taken in sufficient number to make sure the correction is adequate.

The range in the weight of the packages is also recorded. This is equally important. For a packaging operation to be considered as satisfactory it must meet requirements as to both average and range in weights. An examination of mill files of permanent packing records will show package weights within control limits and on the heavy side in weight.

We mention these details only to illustrate how flour millers handle this important operating problem. We feel that these programs of controlled checking provide adequate protection against those factors contributing to improper package weights.



Let us now consider the second phase of the flour packaging problem having to do with conditions of storage. After leaving the mill proper, flour may be held in warehouses or stores with a wide range of environment. Temperatures and humidity may vary greatly. Flour reacts quickly to either or both. Flour is hygroscopic. It readily takes on or loses moisture, depending on the atmospheric conditions to which it is exposed. Moisture change would reflect directly in corresponding weight changes.

Many studies have been made covering various aspects of this particular property of flour. Package size, type of container, length of storage time, are some of the factors studied in this connection. One of the most comprehensive and practical independent investigations was carried out by a group of cereal chemists at the University of Minnesota in 1942.<sup>1</sup>

For this experiment a common lot of flour was packed in 5-, 10-, and 24½-lb sacks, paper and cotton, and stored in air conditioned cabinets, where the temperature and humidity could be closely and accurately controlled. Levels of relative humidity were maintained at 36, 45, 59, and 72 percent, each at a temperature of 70° F.

At this point I should direct attention to the fact that this study was conducted prior to the time the flour milling industry, in cooperation with weights and measures officials throughout the country, worked out and put into effect a uniform schedule of flour package weights. This accounts for the use of the 24½-lb package. The industry is thoroughly convinced that the schedule of flour package sizes now in universal use is definitely in the public interest, and the industry wishes to acknowledge your cooperation in bringing about this result.

The original weight of the various bags of flour was carefully measured, and the moisture content of the flour accurately determined. After 3 days of storage in the several cabinets, package weight and moisture content was again determined. Thereafter at weekly intervals this process was repeated throughout the full storage period of approximately 10 weeks.

This study brought out a number of pertinent observations. They are of special importance to millers responsible for flour packing and to you enforcement officials responsible for appraising the true weight value of this particular commodity where it becomes available to the consumer. The experiments revealed that flour weights respond sharply to changes in relative humidity. In general, flour, as normally packed, will lose weight unless the relative humidity of the storage atmosphere is 60 percent or more. If over 60 percent, flour will gain weight. If under, it will lose. The rate of change is more rapid during the first few days of storage.

If the storage period is sufficiently long, the flour will approach a leveling-off point though it never becomes absolutely constant in weight. The degree of change depends on the initial moisture content of the flour to a large extent in addition to the relative humidity of the storage area.

Weight changes were more rapid for cotton than for paper bags and for the smaller size packages. As the storage period was extended, there was a tendency for weight to equalize regardless of size or type of container.

<sup>1</sup> Anker-Geddes-Bailey, Cereal Chem. 19:128-150, 1942. A study of the Net Weight Changes and Moisture Content of Wheat Flour at Various Relative Humidities.

Thus, you can see that if it were possible to maintain each warehouse or each grocery store at a relative humidity of 60 percent, at least as far as the flour storage area is concerned, we would have little occurrence of apparent short weight in flour packages. We could anticipate little change in moisture content of the flour and therefore little change in flour weight.

If relative humidity were maintained at 72 percent, a gain in weight would take place. After one week under such conditions a 5-lb package of flour would gain about  $\frac{3}{4}$  ounce in net weight. The same package stored at 45-percent relative humidity would lose about  $1\frac{1}{8}$  ounce after exposure of one week. At 36-percent relative humidity the net weight loss would be a little over  $1\frac{3}{4}$  ounces, after a like storage period.

From all of this we can see that flour rarely, if ever, remains the same in actual weight over a period of time. Relative humidity is more often under than over 60 percent. For this reason you are more apt to encounter apparent weight shortages rather than overages in your examination of flour packages. It also explains the greater prevalence of such finding in the winter season, or on those occasions when the heating of space indoors prevails. Conversely, there is less apparent underweight during the summer months when high humidity is the rule.

This study brought out another major point. Although flour will lose moisture as well as regain it, the rate of loss is much more rapid than the rate of regain. This phenomenon has not been completely explained as yet, but this is one of the reasons why we previously referred to this peculiar property of flour to fluctuate in weight as an irritating characteristic.

We understand that experiments of a similar nature have been conducted by Federal Food and Drug Administration officials, and that their findings agree substantially with those obtained by the University of Minnesota scientists. Although the government data are not available for distribution, we understand any state or city weight enforcement official may have access to this information at field offices.

Assuming flour weight loss is accounted for by evaporation loss occasioned by factors beyond control, this does not solve your inspection problem. You may well ask these direct questions of the flour miller.

1. Since the miller assuredly knows his package will most likely lose weight before it reaches the consumer, why doesn't he overpack in anticipation of such loss? It would be impossible to predict how much to overpack, since he could only prophesy full net weight at destination by preparing for the extremes of temperature and humidity. No guarantee could be made, since flour continually changes in weight. There is also the question of the legality of deliberately packing packages that are substantially overweight. In addition if this were made mandatory the cost to the consumer would be increased. In effect, we would merely be forcing the consumer to purchase a larger unit of flour, which would still be subject to the same potential evaporation changes. It is your responsibility as well as ours to avoid any course of action which would deliberately raise prices. From another viewpoint if it were mandatory to overpack in anticipation of flour being shipped to areas where weight loss would be anticipated, it should be equally permissible to underpack for

shipping to areas, such as our seaboard, where weight gain is a reasonable probability.

2. Why not pack flour in a moisture proof container? This could be done, but it is not practical, and the cost to the consumer would be prohibitive. Again we are not adequately protecting Mrs. America if we deliberately increase the price of flour, which would be one result of such a course of action. In addition, we do not believe it is good practice to pack flour in a completely airtight container. Some aeration of flour enhances its baking properties. This desirable maturing action, as we call it, is possible in the present types of container. There is also the danger of mold developing when freshly milled flour is packed in an airtight package.

3. Why not reduce the moisture content of flour at the time of milling to minimize any further loss later? Couldn't the miller grind wheat that is lower in moisture content?

We select wheat on the basis of the quality of the finished flour it will produce. Its moisture content is incidental and entirely dependent on the whims of nature. Actually, reasonable variations in the amount of moisture in the wheat are unimportant. All mills try to maintain a certain range of moisture in the wheat as it comes to the grinding rolls preparatory to conversion into flour. There is one reason for this, and one reason only. The object is to so condition the wheat that the most complete separation of flour and branny material can be made. Usually this means the miller adds some water to "temper" the wheat, as the process is called. After so doing, the wheat is permitted to stand in tempering bins for a certain period of time, usually 8 to 10 hours. This permits the water to penetrate the branny portions of the wheat berry. This toughens these layers of the berry so that they will flake off rather than shatter. This makes possible a more complete separation of the endosperm or starchy material we know as flour. If this separation is not complete we get a flour that is specky in appearance, dark in color, possibly inferior in baking quality, and may not meet the Federal definitions and standards of identity for flour.

It is true that the more moisture that is added to the wheat, the higher the moisture content of the flour is apt to be. However, we are limited in the amount of moisture that can be added and still permit a satisfactory milling job. Too much moisture will make it difficult, if not impossible, to accomplish the necessary sifting within the mill. Clogging and gumming up of the extremely fine silk bolting sieves will take place. It is necessary therefore to stay within narrow limits of moisture content in both wheat and flour. The Federal Government recognizes this in its establishment of a limit of 15 percent moisture content for wheat flour. Freshly milled flour is usually around 13.5 to 14.5 percent moisture.

We have not as yet mentioned the one point which resolves most of the associated weight problems. If a bag of flour is full net weight when it leaves the mill and enters channels of interstate commerce, that bag will always give the consumer full food value when purchased, regardless of any apparent change in weight which may have taken place. The only qualification is that there be no loss of product due to leakage or spillage. You need only be concerned with this in your program of weight inspection. Assurance on this one point will automatically protect consumer and manufacturer alike. Let me repeat. Barring loss due to leakage or spillage, a



bag of flour having full weight at the time it is packed and leaves the mill will always give the consumer full food value regardless of apparent change in weight due to moisture variation. This is a most important point in our discussion.

Why is this true? For this simple reason. When flour is prepared for baking, it is combined with water or some form of liquid. If a specific parcel of flour has lost moisture, it will be possible to add an equivalent amount of liquid when it is used. The homemaker makes this adjustment automatically without knowledge or concern of cup weight or moisture content of the flour. There is no loss whatsoever due to the flour itself having become drier. It is the solid matter or dry material in flour that determines its value as far as weight alone is concerned. That value will always remain the same relatively as the original net weight.

This factor is recognized by our Federal Government in its regulations covering weight of flour packages. Reasonable variations in weight are permitted if they fall into one of two classifications:

1. Those which occur in good manufacturing practice and which cannot reasonably be avoided.

2. Those which occur because of exposure to condition which may occur in good distribution practice.

The first of these applies specifically to the manufacturing and packaging of flour and does not involve evaporation loss. Variations at the time of packaging must be as often above as below the stated net weight of the package and the average weight of all packages must be as much as the declared weight for a single package. Unreasonable shortages, or overages, are not permitted. This arbitrarily prohibits deliberate overpacking or underpacking.

The second point applies specifically to the problem of evaporation loss. It recognizes that such losses will occur to some extent even in good distribution channels, but that normally the changes take place after the product is no longer under control of the manufacturer.

There are differences between the various State laws or regulations governing flour package weights. Most States follow the pattern of Federal interpretation. Some spell out specific tolerances on a weight or a percentage basis. All are subject to interpretations made by State or local authorities.

Since most all flour travels in interstate commerce, it follows that a majority of flour millers must produce a product which conforms to Federal regulations and those of many, if not all, States. The flour miller is, therefore, vitally interested in the State interpretations of weight regulations.

We believe it would be of fundamental advantage if enforcement officials in all States would adopt and follow a uniform set of interpretations and procedures. We further believe that this can be accomplished effectively within existing statutes. To do so would make your inspection more efficient and provide more protection to the public. With this in mind we should like to propose that this Conference consider four suggestions, constituting a uniform procedure for checking the weight of flour packages.

1. Concentrate check weighing of flour at primary points of distribution, where large quantities of flour are available. Mill, wholesale, and chain warehouses, and other jobbing outlets are examples. City and county weights and measures officials located in smaller communities would probably not have the same opportunity in this

regard as would enforcement officials at State levels. Therefore, it would appear desirable to suggest that local officials consult and cooperate with their respective State officials.

2. Follow the Federal regulations and procedures, and make allowance for reasonable weight variations.

3. Arrange to obtain accurate moisture analyses of representative samples of any questioned flour stocks.

4. Promptly notify the mill involved when the weight of its flour stocks is questioned. In order to coordinate activities within a State it would appear to be in order to suggest that, in addition to notifying the mill involved, the city and county officials might wish also to notify their State officials.

By concentrating your check weighing of flour packages to warehouse stocks, you would greatly simplify and extend the effectiveness of your control over this problem. Warehouse stocks represent the largest concentrations of flour within your jurisdiction. Package weights and storage conditions are easily checked at such points. You, as enforcement officials, could effectively control a much greater volume of material, and prevent short-weight packages from reaching either the retail store or the eventual consumer.

Details of the procedures followed by the Federal Food and Drug Administration are set forth in the official regulations for the enforcement of the Food, Drug and Cosmetic Act, as well as in administrative procedures. As indicated to you in a paper delivered before your Conference on May 25, 1949, by Mr. John L. Harvey, Associate Commissioner of the Food and Drug Administration, data are available to you as cooperating enforcement officials and may be examined by you at any of their offices.

You may rightly ask how you, as enforcement officials, can distinguish between a legitimate weight change caused by moisture variation and one which is actually short weight, deliberate or accidental. Gentlemen, there is only one final infallible method. This requires that an accurate moisture analysis be made of the flour in question. With this information available, it can be easily determined if the flour package contained full weight when it left the mill.

We realize that you cannot analyze the moisture content of flour on the spot as you make your weight checks. We do suggest, however, that you arrange to get this information whenever your inspection discloses a lot of flour that you consider as unreasonably short of weight. It may be possible for you to have a moisture analysis made by your own local or State laboratory. Flour mill laboratories would be glad to provide this service at your request. Should you desire it, mill records would readily be disclosed to you showing moisture content of a specific lot of flour at the time it left the mill, or any other pertinent information you would like that we have available.

We strongly urge and request your favorable consideration of these suggestions and the adoption of the four recommendations we have made.

To this end, may we suggest that a committee be created by the President of this Conference, this committee to consist of three weights and measures officials to be appointed by him and three representatives of the milling industry to be appointed by the Millers' National Federation. Further, we suggest that the President request that a representative of the Federal Food and Drug Administration be designated by the Commissioner of that agency to serve as a consultant

to the committee, and that the Chief of the Office of Weights and Measures, National Bureau of Standards, also be requested to serve as a consultant to the committee.

Finally, we suggest that the President of this Conference designate one of the three weights and measures officials appointed to the committee to serve as its chairman and to see that the committee formulates resolutions to be presented to the 39th National Conference on Weights and Measures for action.

I want to acknowledge the collaboration in the preparation of this paper of four members of the industry, O. W. Galloway of Pillsbury Flour Mills, O. A. Oudal of General Mills, John T. Lynch of International Milling Company, and C. E. Joyce also of Pillsbury.

MR. G. B. SMITH: As a result of many complaints, we have instituted several investigations into net weights of flour packages. In 1949, at the request of representatives of the flour industry, a regulation was drafted and promulgated in the State of Michigan. The regulation is very similar to the Federal Food, Drug, and Cosmetics Act.

Early this year, and again as a result of many complaints, we check-weighed 146 packages of flour and found not one of the 146 packages contained full weight. These were 10-pound packages and only three packages grossed at the declared net weight. The gross weight of all other packages was less than the labeled net weight.

My recommendation for a solution to this problem is for the flour mills to overpack in a sufficient amount to allow for normal shrinkage.

MR. WATSON: Mr. Fakler has made it clear that the moisture content of flour is an important part of the problem of packing the commodity and of insuring correct weight. It might be worthwhile to consider an agreement whereby net weight at time of packing would be allowed. I would like further to offer for your consideration the possibility of a Federal inspection service at the mills, accompanied by a 100 percent checkweighing of the packages.

MR. FAKLER: The labeling of "weight when packed," if recognized by State enforcement officials, would solve our problems. Because of Federal regulations we are required to have full net weight in each package when it enters interstate commerce. The flour, with 14 percent moisture content, is full net weight when it leaves the mill. Our flour packages are checkweighed at the mill. You, as enforcement officials, are at liberty to check the mill records at any time. We have absolute moisture and weight records of every package of flour that leaves the mill.

MR. BAUCOM: I would like to offer the suggestion that packages of flour be labeled with both the net weight and the moisture content. With this information a weights and measures enforcement official easily could determine whether or not the package contained full weight when it left the mill.

MR. AUSTIN: I will make a motion that the President of this Conference appoint a committee to study this problem of flour weights and report back with specific recommendations to the 39th National Conference on Weights and Measures. The committee is to consist of three weights and measures officials, one of whom is to be appointed as Chairman, and three representatives of the milling industry, to be selected by the Miller's National Federation. A representative of the Federal Food and Drug Administration and the Chief, Office of Weights and Measures, National Bureau of Standards, are to be designated as consultants to the committee.



(The motion was seconded, and, on a standing vote, was carried 67 ayes as against 39 noes.)

(Additional general comment on this subject was made by Mr. Campbell, Mr. Rhein, Mr. Fakler, Dr. Astin, Mr. Bussey, and Mr. O. W. Galloway.)

## AUTOMATIC PACKAGE WEIGHING MACHINERY

By W. A. SCHEURER, *President, National Scale Men's Association, Columbus, Ohio*

As the new president of the National Scale Men's Association, I deem it an honor and a privilege to represent our splendid organization at this Conference, and I take this opportunity to greet you on behalf of our membership. Our annual convention at Atlanta, Georgia, two months ago was one of the finest and most enthusiastic meetings of scale men and weights and measures officials ever held by our group.

I feel, as I am sure all members of the National Scale Men's Association feel, that we can, and should, work very closely with the National Bureau of Standards and weights and measures departments in the various States in matters relating to scales.

Scales are one of the most important necessities of a progressive civilization, yet one of the most neglected.

I shall discuss some of the new techniques rapidly gaining favor in high-speed automatic check-weighing. When we consider the value of consumer-size packages sold by weight at something like \$8,000,000,000 per year, we begin to realize that this is a very important segment of our economy.

During the past several decades, many of the functions of the independent storekeeper have been replaced by prepackaging at the factory level. Years ago, the storekeeper purchased his product by weight, in bulk form. The cracker barrel and the bean bag provided an adequate means of displaying the product. He weighed the quantity desired by the retail customer over a manual scale and packaged it in paper bags. This method of merchandising in a relatively uncomplicated era had its advantages and disadvantages. But regardless of its advantages, it was destined for discard when mass production and increasing competition forced the merchant to improve his method of displaying his wares. The functions of display, weighing, and packaging already have been taken over by factory packaging and distribution through self-service supermarkets.

For the most part, the functions performed by prepackaging and self-service not only are more efficient than comparable functions carried out by the storekeeper, but also are more convenient for the customer.

The increased efficiency of machine packaging and self-service has resulted in a very significant decrease in the cost of exhibiting the product to the ultimate consumer. Tremendous strides have been made in the packaging field, and the trend continues as more and more products are prepared for distribution in package form. In addition, many new products, such as frozen foods, factory formulated cake mixes, and aerosols, have resulted from the increased acceptance of this form of distribution.

Where products are packaged at high speed, it is difficult to achieve weight accuracy comparable to that achieved by weighing over a manual scale. Automatic equipment, capable of guaranteeing accurate weights at speeds comparable with packaging machines, has been available only for a relatively short time. As a consequence, due to

the lack of such necessary equipment, there has been a tendency to overlook this important aspect of the distribution function.

Everyone will agree that the filling machine which is so accurate it needs no checkweigher would be a highly desirable piece of equipment. Better filling machines will appear as techniques are developed. Every filling machine is capable of doing a filling job with a certain degree of efficiency. The need for a checkweigher can be likened to the need for a micrometer in machine tool operation. The better the lathe, the closer we attempt to hold tolerances, and we accomplish this by measuring the turned parts with the micrometer. Likewise, the better the filling machine, the closer we should hold weights and tolerances. The fact that more accurate machine tools are available does not mean that micrometers are less in demand. Actually, the reverse is true, because it is just as important to keep a good machine operating at its best as it is to keep a poor machine operating at its best.

For a number of reasons, there has been a tendency to overlook weight errors in packages produced on high speed filling lines. When discussing tolerances, some packers refer to such vague terms as "good commercial tolerance" and "average weight of 24 cartons should equal printed net weight on each carton," etc. We believe that high speed packaging, prior to the time 100-percent automatic check-weighing became a reality, was entitled to broad usage of the term "tolerance." Today, however, there are fast and efficient means of determining the weight of each carton, and means for keeping filling machines in control. I am sure that everyone in this group will agree that high speed and accuracy generally are opposed to each other; yet accurate weights are critically important, not only to the customer, but also to the producer. Practically all of the materials which the processors buy are bought by weight. Inadequate control of the weights of the outgoing product can mean the difference between operating at a profit or at a loss.

The following statement was made by one of the speakers at the 22nd National Packaging Conference and Exposition in Chicago last month, "Important packaging executives are generally agreed that the control of fill is one of the most serious questions they face. There can be no compromise on weight standards; the economic loss from overfill in industry can run into the millions, and the hazards of underfill are obvious."

Now, since there is ample evidence that packaging executives know that there is a serious problem in packaging, and that both underfill and overfill are hazards, why do they not solve the problem by giving correct weights? All too few packers have any real knowledge of the weight variation in their outgoing product. They may kid themselves into believing that they have accurate weights, or that their weight control measures are adequate. Most packers, however, feel a little uncomfortable and uncertain when the subject of weight tolerance of the outgoing product is mentioned. To date, the greatest emphasis in packaging has been placed on increasing speeds. A great deal of thought has been given to increasing the speed of packaging machines. Whenever a group of packaging men sit down to compare notes, 99 percent of the conversation is devoted to bragging about production speeds. When a man says his line is running at 120 per minute, or 300 per minute, he feels quite sure of himself. He can see the speed at which the line is running, and can measure its

output. He is much less sure of himself when he discusses weight tolerance, and will give some vague figure which has no basis in fact.

The weight tolerance of the outgoing product is a ticklish subject. Unaccounted loss of product is a sore point. When face to face with the problem, and since they are unaware of an adequate solution, many processors seem to feel that, if they simply ignore the problem, it will go away.

Why has the packer had no real knowledge of the weight variation in his outgoing product? The reason is simply this. Until very recently there has been no means of readily and continually measuring weight variations; consequently, the assumption that everything was in control.

Please mark that I said, "Until very recently." With today's marvelous mechanical and electronic developments, there is no longer any necessity of this uncertainty regarding weight control. Mr. Arthur Sanders, Executive Secretary of the National Association of Scale Manufacturers, says, "Check-weighing of packages to insure weight protection in continuous flow of packaging operations is a must." This requirement has encouraged the development of specialized scales with predetermined weight characteristics for repetitive weighing. To facilitate this, numerous developments have come about in this century, developments which are designed to fit the particular need of the operation, varying between check-weighing a few heavy packages an hour to many light cartons a minute. Manual "spot checking" with special scales is the practice with many processors, but this necessarily causes a break in the continuity of high speed package movement in production plants.

At the other extreme, equipment for *100 percent automatic check-weighing* is a more recent development of the American scale industry. For accurate shell loading in the war, mechanical scales were teamed with electronic control for automatic continuous flow check-weighing. This development has provided an important recent contribution to the handling of materials, and has received world-wide recognition.

The important recent contribution to which I refer is the electronic checkweigher for packaged commodities. The Selectrol automatic, electronic checkweigher provides a means for controlling the weights of outgoing packages. It forms an integral part of the package conveyor line, and consequently does not interrupt the normal flow of production.

The Selectrol automatically weighs each package as it moves along the conveyor, and rejects those packages which are outside the desired tolerance limits. The rejected packages then can be trimmed to the correct weight and returned to the conveyor line. A single Selectrol, plus one girl, can provide absolute assurance of package-weight accuracy. In addition, it continuously polices the process for unwanted trends in variation. An increase in the percentage of rejects on either the underweight or overweight side is an immediate indication of the presence of a trend, and calls for corresponding adjustment in the filling machine. In a normal packaging operation, at least 8 manual checkweighers would be required to perform a similar function, with less accuracy and much less speed in detecting unwanted trends in variations.

I have used the term "trends," and it may not be entirely clear what are trends, and how important they are in packaging. Also, at this point you may be wondering why we cannot gather data on pro-



duction line accuracy by ordinary hand-weighing or with a "spot check."

Manual, spot check-weighing, which is the means of weight control most generally used by processors, leaves much to be desired. First, it never will assure that every package produced is within the desired weight tolerance. Second, at modern packaging-line speeds, anything other than a very spotty check-weighing results in excessive labor costs. Third, manual operation is subject to the human error. Any highly routine operation, such as manual check-weighing, is extremely subject to such human errors as are caused by fatigue, inexperience, or indifference.

In addition, manual operation is unlikely to provide adequate or accurate information to supervisors so that corrective action can be taken. Most persons naturally are reluctant to report a condition that might adversely reflect on the ability of a fellow employee. Fourth, the very nature of the causes of package-weight variations are such that adequate control can be achieved only when an appreciable portion of the total production is checked. The cost of providing adequate check-weighing by manual methods generally is considered to be excessive.

Now, to explain trends, there are many factors which cause package weights to vary. Typical of these are:

1. Changes in density of the product.
2. Adjustment of the filler.
3. Uncertainty in the cut-off of the filler.
4. Variations in amount of product in the filler hopper.
5. Changes in the flow characteristics of the product.

All of the above factors fall into either one of two categories:

1. A random or pure chance pattern. These factors cause the weight to vary rapidly, and result in weight variations between consecutive packages. This pattern of random variations is characteristic of a particular product and packaging process. In general, it can be controlled only through machine design and maintenance.

2. Trends. These factors cause variation in the weight of consecutive groups of packages, rather than consecutive individual packages. Variations in density of product, between top and bottom of a hopper, is a good example of this type of cause of variations.

To control the weights of packaged products, it is important to distinguish between these two types of variations. The human operator making sporadic spot-check weighing has difficulty in distinguishing between the two types of variations, since the random variations are superimposed upon the trends. The human check-weigher is guided only by experience and intuition. As a result, they actually may control the process in the wrong direction at any particular instant, and surely will have difficulty in detecting trends until they are of appreciable magnitude. Any packaging process can be controlled to that weight tolerance dictated by the random variation. Proper control of the filling machine can eliminate the trends with a consequent appreciable reduction in both the over-all weight tolerance and the loss of product through overflow.

The Selectrol automatic, electronic checkweigher provides the outstanding features of (1) 100 percent check of outgoing package weights with assurance that 100 percent of the packages are within the correct weight tolerance, (2) speedy detection of trends in package weight

variations, (3) no disruption in the continuous flow of the product on the packaging line, (4) no variation in the weight quality level because of fatigue or human error, and (5) assurance to the processor of confidence with respect to package weights.

Many remarkable developments have been made in packaging machinery, both in increasing the production speed and in increasing the filling accuracy. The perfect filling machine, however, probably never will be built. I suppose a perfect filling machine would be one which would operate indefinitely at any desired speed, and with no variation in package weights. Although filling-machine manufacturers will continue to press toward that goal, it is unlikely that such an ideal will be achieved. As a result, some means of assuring the processor of weight quality always will be needed. The Selectrol automatic, electronic checkweigher has been developed to fill this need.

We believe a short description of the mechanics of the Selectrol weighing system will be of interest to this group.

In the Selectrol system, the weighing element is reduced to the simplest possible mechanical device. It is simply an even-balance 1:1 ratio weighing lever. No mechanical means is provided for observing the magnitude of the lever motion. The usual indicating system would be unsatisfactory, since Selectrol instruments usually must be operated at high speeds. Consequently, the lever system is designed in such a manner that it becomes a mechanically-resonant structure whose natural resonant frequency, or rate of free oscillation, is slightly in excess of the maximum operating speed for which the unit is designed. A factor in the resonant frequency is the total mass applied to the weighing member, and, obviously, this includes the weight of the object being weighed. Reduced to simple terms, this means that, if a particular unit is designed for 100 weighings per minute, the total mass of the movable system of the scale is calculated for its moment of inertia. Sufficient reactance is applied as a restoring force to cause the weighing member to oscillate, when perfectly balanced, at a slightly higher rate than 100 complete cycles per minute.

Neglecting damping factors such as air resistance and friction, the structure adheres to all basic laws pertaining to resonance. Thus, the time required for any one oscillatory cycle is always identical to the other, regardless of the respective magnitudes of the two observed cycles. Proof of this may be observed by the use of a simple pendulum. If a long pendulum is moved from its dormant perpendicular position by an angle of 20 degrees and released, the time required for it to swing to the opposite extreme of its travel, reverse its direction, and return, will be found to be identical to the time required if the displacement is only 10 degrees. In the case of a pendulum, the restoring force is, of course, the pull of gravity; consequently, the actual mass employed does not affect the frequency of oscillation, since the restoring force varies directly with the weight of the mass. However, if a restoring force other than gravity is utilized, the mass becomes a variable factor as regards frequency.

Gravity never is used as the restoring force in modern weighing instruments except for applications where speed is not an important factor. Most commercial weighing of predetermined mass utilizes a structure comprising an even-balance weighing member with a limited lever travel, and, for the restoring force, a pair of high-grade calibrated spring-members. The system balances to the zero or null

point if identical masses are applied to the weighing members and the springs are not a factor. If there should exist a slight inequality between the two masses, the difference is absorbed by a change in dimension of the restorative springs and is indicated by a suitable dial. This makes possible a faster-operating scale and the system has been developed to a high degree.

Incidentally, it is interesting to note that, while many users of weighing equipment are prejudiced against spring scales in general, practically all industrial equipment utilizes some form of spring for the restoring medium. The use of a resonant structure, called a tuning fork, is used as a frequency standard in tuning musical instruments. This is an example of an extremely accurate device and is, in effect, a tuned spring. The most accurate clocks and watches ever built depend upon the constant unchanging action of a spring exerting a force in opposition to a so-called balance wheel.

Selectrol instruments utilize the same principle. In order to make the weighing system respond rapidly, relatively stiff springs are used. This results in much less lever movement per unit of weight than normally occurs with conventional scales.

At this point I want to stress that less deflection per unit of weight does not mean a less accurate scale. As a matter of fact, percentage error due to friction is reduced as movement is reduced. In speaking of accuracy or sensibility reciprocal of the ordinary scale, we generally refer to movement of an indicator that can be read by an operator; thus, we are limited, insofar as maximum lever speed is concerned, by ability of an operator to detect movement visually.

As far as the Selectrol automatic checkweigher is concerned, there is no advantage in providing a dial that can be read by an operator, except for the purpose of setting up the machine initially. A high order of magnification must be provided for this purpose, and electrical means are required for operating weight-selection mechanism.

There are many methods of accomplishing magnification of the small motions involved. Mechanical means are ruled out because of the friction they would necessarily add to the system, and also for the added inertia. Optical magnification would be more advantageous, but it generally is not desirable, since photoelectric means would be required in addition to a precise optical system. Such an arrangement would be satisfactory for a very elementary sort of device, but, when several selection circuits are required, the system becomes difficult to adjust.

Electronic magnification eliminates completely all disadvantages of the aforementioned systems and, in addition, offers many other advantages. Magnification of any degree is possible from the same component parts. A voltage can be developed that is proportional to weight circuits. This voltage can also be used to operate the visual balance indicator, and the indicator may be placed at any convenient location. Since the interpreting means is converted into electrical values whose magnitude is proportional to the weighing member's position, frictionless electrical damping of lever oscillation becomes possible.

This last feature is of great importance, since it allows the mechanical weighing member to be operated at its critically damped point. This means the scale lever is able to reach a state of equilibrium in the shortest possible time. Travel of  $\frac{1}{4}$  cycle and over will be practically eliminated.



The electronic circuits of a Selectrol represent a simple, straightforward application of electronics. A vacuum tube oscillator is employed, and is so arranged that its frequency will vary in accordance with weigh-lever displacement. Weigh-lever displacement simply changes the capacity of the oscillator's tuned circuit. The varying frequency signal is fed to a conventional F. M. (frequency modulation) detector circuit, very similar to that employed in the ordinary F. M. radio receiver. The output from the F. M. detector circuit is a d-c voltage that is used for operating the electrical indicator, the electrical damping circuit, and weight classification relays. Conventional vacuum-tube amplifiers and voltage-regulating means are employed. Variations in tubes, aging of component parts, etc., have no effect upon operation of the equipment, since routine operating adjustments compensate for these effects.

(Mr. Scheurer showed and explained a short moving picture and a number of lantern slides which demonstrated the operation of automatic package weighing machinery.)

### PROBLEMS IN LIVESTOCK WEIGHING SUPERVISION

BY C. L. RICHARD, *Supervisor of Scales and Weighing, Livestock Branch, Packers and Stockyards Division, U. S. Department of Agriculture*

In the year 1921 Congress enacted a Federal stature, known as the Packers and Stockyards Act, which authorized the Secretary of Agriculture to supervise and regulate the marketing of livestock at public stockyards of major size. Enforcement of the Act was delegated to the Department's Livestock Branch which I represent. Since livestock, particularly slaughter livestock, is universally sold by weight, many marketing supervision problems relate directly to the weighing facilities and weighing practices employed at the regulated markets. In accordance with your Conference Secretary's request I shall discuss the problems inherent in the Federal program of livestock weighing supervision.

Last year the average American consumed some 145 pounds of meat in the form of beef, veal, pork, lamb, and mutton. Most of it, consumed in the home, was purchased throughout the year in small amounts at retail markets. It was purchased by weight and, allowing for the possible effects of the traditional "butcher's thumb", was weighed correctly because (1) a local inspector of weights and measures had tested the retail market scales and had certified them as accurate, (2) the meat was weighed in the presence of the purchaser and (3) if there were doubts regarding the weight the purchaser could have his purchase check-weighed or reweighed.

Last year too, so that each of us might have our 145 pounds per capita share of the national meat supply, the farmers and ranchers of the 48 states produced and sent to market for slaughter well over one hundred million cattle, calves, hogs, sheep and lambs. For that crop of meat animals they collected a cash revenue of approximately nine billion dollars, a greater amount than was received for any other product of their agriculture. The year's entire production of slaughter livestock was sold by weight—by live weight, on the hoof. It was sold in individual lots ranging from a single lamb of 50 pounds live weight to a group of fattened steers weighing over 30,000 pounds. Having mentioned reasons why the meat consumer's retail purchases were weighed correctly, it is appropriate to consider what protection

and safeguards were provided for the individual farmers of the nation when they sold their livestock, by weight, at market.

There are three types of market outlet through which farmers may dispose of livestock intended for slaughter. The first consists of 66 terminal stockyards which are located at cities of major size and at which more than half of all livestock is marketed. These are public markets where livestock is consigned to commission firms who act as the farmers' selling agents. Sales to packers or other buyers are negotiated by "private treaty" which means that each prospective buyer, in turn, inspects the animals and makes his offer of price. When agreement is reached on price, the animals are weighed and their weight is recorded on a scale ticket to form the basis of financial settlement. Weighing and weight recording are performed by employees of the terminal stockyard companies, except that, in the State of Minnesota, by special provision in the Federal statute regulating public stockyards, they are performed by State employees.

The second type of outlet for the farmer's livestock consists of some 2,100 Auction Markets which are located at rural trading centers in 47 of the states. At these, most of which operate one day each week, livestock is received and sold at public auction in a sales ring where packers and other buyers openly offer competitive price bids. Weighing of the livestock, by employees of the auction market operator, may either precede or follow the sale negotiation.

The third type of market outlet is made up of some 1,200 packing plants or packer's buying stations located in all the states. To these the farmers transport or send their livestock, in small lots, for direct sale to the packer. The sale price is negotiated on the basis of current market quotations, following which the livestock is weighed by the packer or his employee to complete the transaction.

From the information presented thus far it will be appreciated that orderly and equitable marketing of livestock, dependent upon impartial and accurate weighing of several hundred thousand drafts during the year, at over 3,000 market outlets, on hundreds of scales, requires effective and comprehensive regulation of the market scales and their operation, if each individual producer of livestock is to receive the benefits of correct weighing and weight recording. This is particularly true because the farmer, unlike the retail purchaser of meat, generally cannot be present during the weight determination and because, in case of doubt regarding weight, a draft of livestock ordinarily cannot be identified and reweighed after it has passed from the scales to the holding pens containing other livestock. Moreover, livestock is weighed under adverse conditions, because the dead load on the scale platform changes continuously and necessitates frequent correction of the zero balance, if the derived weight values of livestock loads are to be sufficiently accurate.

It may be said with confidence that at none of the markets supervised by the Department do the actual weighing facilities—the livestock scales—constitute a problem. No other class of large capacity scales has better accuracy potentials than the 800 scales which are employed at the supervised terminal and auction markets. Each of these is tested at least twice during each year and each is required to be accurate within a basic tolerance of 1.5 pounds per thousand. Moreover, each scale is tested with standard weights to its full working capacity and at each thousand pound load stage. This is a more comprehensive and thorough test than is required by other agencies

or for other large capacity scales in commercial weighing service. It is satisfying to be able to inform you that some 80 percent of all the tests conducted under our supervision each year prove the scales to be within tolerance and, indeed, some 72 percent of the scales are found to be accurate on the occasion of each test made during the year. It is worthy of comment too that about 70 percent of all scales at our markets are provided with approved-type indicators as aids to correct balancing, elimination of disturbance effects and full visibility of zero or load balance. It has been our experience that extremely few instances of incorrect weighing are due to deficient livestock scales. On the contrary, as has been discovered repeatedly in our investigations, it is the weighing and weight recording practices of weighers which are responsible for incorrect weight values either through carelessness or through deliberate intent to defraud.

All of the 66 terminal stockyards in the first-mentioned category of markets and 262 of the 2,100 auction markets in the second category operate under direct supervision of the Federal Department of Agriculture. No direct supervision is exercised over weighing at packing plants or packer buying stations, although Federal regulations do provide that "packers shall maintain and operate their livestock scales so as to insure accurate weights." I shall defer my discussion of terminal market supervision problems until later and proceed now to discuss weighing conditions at auction markets and packer plants under Departmental supervision with special reference to methods for detecting and preventing common faults in weighing service at markets in those latter groups.

At most auction markets each livestock lot is weighed immediately after it leaves the sale ring and weighing must be completed rapidly to prevent congestion and delay in the ring. Although the average farmer is usually present to watch the bidding on his livestock he seldom observes the weighing, not realizing that the benefit of a favorable sale price is lost if weighing is not performed with care and impartiality. Incorrect weighing at these markets develops from the weigher's haste, carelessness or negligence and his consequent failure to regularly correct the scale zero balance, to allow the weigh-beam or dial indicator to attain equilibrium before reading or recording the weight, and to make certain that animals or persons off the scale are not in contact with the platform stock rack or gates. Aside from these instances of inadvertent weighing inaccuracies, there are occasional instances when a weigher, although presumably disinterested in the sale transaction, may be influenced to favor a neighbor, friend, or relative buying livestock at the auction. It is regrettable too that throughout the livestock marketing industry there prevails an insidious doctrine that, in weighing livestock, the buyer is entitled to the "break of the beam", a principle which, if permitted to persist, would work to the injury of the farmer-producer on each draft weighed. It is also known that some auction market operators, desirous of attracting buyers to their market, intimate that weighing of livestock will be controlled to favor the buyer, and there is reason to believe that such operators have instructed their weighers accordingly.

Weighing at packer establishments, because there is less need for rapid operation of the scales, is less subject to negligence and carelessness in zero balancing and in weight determination. Moreover, the farmer or his representative may be present during the weighing. However, because the weight determination is made by the packer or



by his agent and because the average farmer is not familiar with scale operation, there are ever present opportunities for taking advantage of the latter. One method observed is to balance the empty scale with the weighbeam at the bottom of the trig loop and balance the load with the beam at the top, a manipulation which can deprive the farmer of ten pounds of weight. Another method, less common but equally effective with type-registering weighbeams, is to insert the ticket in the poise slot before balancing the load, a manipulation which also causes light weight indication and record.

The core of the Department's weighing supervision functions is a rigid code of weighing instructions which each weigher of livestock is required to observe and which specifies in full detail requirements for balancing, for weighing, for weight recording and for careful and impartial performance of all duties. Special agents of the Department make occasional undisclosed observations of weighing to ascertain if weighers violate instructions. When deliberate fraud is suspected a previously weighed lot of livestock may be consigned to a market and the sale weight will be compared with the previously obtained true weight. Where conditions are favorable, a surprise visit to a market for check-weighing of livestock already weighed may be arranged. When evidence of fraud is obtained formal action is taken against market operators or packers and they are required to discharge the weighers involved. For first offenses or where violations are inadvertent, weighers and their employers are warned, instructed and placed on notice that they will be prosecuted for future lapses.

It is at the terminal markets where the bulk of the nation's livestock is marketed that problems of weighing supervision and control require special attention. This is due, in part, to the fact that as many as 30 scales may be in operation at one time and, in part, to the fact that livestock speculators who patronize these markets include some unscrupulous individuals who may seek to influence weighers to favor them either by light-weighing their livestock purchases or by over-weighing their livestock sales. Weighers at these markets, pursuant to regulations, are rotated from scale to scale at regular intervals to prevent developments of close relations with parties buying and selling livestock and various other means are taken to insure impartiality in weighing service. Despite these precautions, however, it has happened occasionally that a weigher and a speculator conspire to defraud a buyer or seller of livestock by incorrectly recording the weight of a livestock draft. Usually this is accomplished by the weigher moving the poise of a type-registering weighbeam to the position he desires before printing the scale ticket.

Because the information will illustrate the manner and degree in which livestock weighing fraud may be perpetrated unless appropriate measures of surveillance, detection and investigation are employed, I may now describe the results of a major investigation program which we were obliged to conduct during the past three years to discover and eliminate an organized conspiracy of fraudulent livestock weighing at one terminal market where fraudulent weighing constituted a million-dollar-a-year "racket".

At this market, there was reason to believe, certain weighers were habitually issuing scale tickets bearing false weight values to favor speculators selling livestock to packers. Since detection and proof of the practice could not be accomplished by ordinary measures it was necessary, with the cooperation of the stockyard officials, to install,

unknown to the weigher or to others, special devices to record secretly the true weight of each livestock draft. At the end of each week the weights recorded by the device were compared with the weights registered by the weigher on scale tickets and the differences recorded and analyzed. The results of some typical data will now be shown to you, and I commend them to your study for they represent data which you have not seen before, a realistic record of what may transpire in a scale house when a weigher is alone with his conscience.

As a result of the information developed by the investigation, all weighers involved were discharged, the conspiring speculators were barred from the market and formal administrative action was taken to prevent their continued operation. I may also assure you that measures have been taken to prevent development of similar conspiracies at other markets.

The instances of incorrect weighing which have been described or illustrated represent extreme examples and are by no means generally typical. It would be incorrect and unfair to suppose that careless or prejudiced weighers compose a majority, that most market operators or packers are dishonest or that all speculators are without sound trading ethics. Nevertheless, as examples of conditions which could develop in the absence of effective supervision they illustrate why state and local weights and measures officials should not be content simply to test livestock scales but also should adopt measures for making certain that weighing is performed correctly.

(At appropriate points in his discussion Mr. Richard showed and explained several lantern slides of charts which demonstrated the actual performance of individual weighers at livestock markets.)

## PROBLEMS IN LIVESTOCK WEIGHING

BY R. D. THOMPSON, *Supervisor, Weights and Measures Section, Department of Agriculture and Immigration, State of Virginia*

I feel that the livestock weighing problem is equally as much a State and local responsibility as it is a Federal problem.

Since the beginning of the local or country livestock auction market some twenty-five years ago, there has been a rapid and widespread growth of these facilities throughout the nation. The livestock industry itself has become a major one, producing, from meat and meat animals, 29 percent of the national farm income in 1951. This amounted to 11 billion, 308 million dollars.

A large percentage of the livestock which at one time moved through terminal markets is now being bought by packers at country markets. As Mr. Richard has told you, the United States Department of Agriculture has supervision over a limited number of the auction markets.

This leaves the responsibility for correct scales and proper weighing practices at most markets with the State and local governments. Inasmuch as weights and measures enforcement at the State level, in a majority of States, is vested in departments of agriculture, it would seem only natural that the weighing at auction markets would receive the attention which it merits.

Attention has been given auction markets in Virginia for a considerable number of years, during which we have provided State weighmasters on a voluntary basis at some auction markets. This method has been satisfactory and has, we feel, rendered a valuable service.

However, it is certainly not the complete solution to the problem. During the past two years, we have done considerable check-weighing at auction markets. When this was first started, some rather amazing results were brought to light.

Livestock at auction markets in Virginia and in many southern States is sold on a basis of "in weights." A normal shrinkage is to be expected, and buyers make their purchases with this in mind. On a 200-pound veal calf, for instance, the anticipated shrink in a period of eight hours would be approximately 8 pounds. Most of this shrink takes place in the first three or four hours. We have established this figure by check-weighing a number of pens of veal calves at various markets. In some markets, we found the shrinkage as low as  $\frac{3}{4}$  of a pound in 8 hours, and, in at least two instances, a gain was noted rather than the normally anticipated shrink. This resulted in the Commissioner of Agriculture revoking the license of one market, and in a lengthy court case, on which we have not yet received a verdict.

I want to mention here the splendid cooperation and assistance which we receive from the Packers and Stockyards Division of the U. S. Department of Agriculture. For a number of years, we have tested the scales under their supervision, both at auction markets and packing plants, forwarding scale test reports to them. When we needed help with this particular situation, they came through. Mr. D. L. Bowman of their staff observed the weighing in an undercover capacity, and both he and Mr. Richard were key witnesses in our court case. Cooperation among Federal, State, and local officials will help solve many similar problems.

Regardless of how the court case turns out, weighing practices at the majority of Virginia markets certainly have improved, and recent checks show little cause for criticism.

Our men, in some instances, only recheck individual animals which have just been weighed, or check on scale balance, the use of loose balance materials, and other common infractions which may be found.

You may inquire as to the incentive to short-weight of an auction market, which operates on a commission basis. The answer is that pressure from buyers to hold shrink down and thus increase the dressing yield is more or less common and constant. If one market yields to this pressure and short-weighs calves, for instance, 5 to 10 pounds, it will be able to get a better price per pound, which will attract producer trade. Competing markets who may want to operate honestly are more or less forced to follow the same line in order to meet competition.

Declining prices on cattle provide a further incentive to the buyer who may seek short-weight as a means of insuring his profit against another drop in the market. The producer is caught in the squeeze between falling prices and short-weight practices.

Mr. Richard has termed their findings in one large terminal market as a million-dollar racket. Similar rackets over the entire country would run into many millions.

We, as weights and measures officials, often come here and quibble over problems of popcorn and popsicle proportions and insist on  $\frac{1}{4}$ -ounce graduations on prepackaging food scales, yet we permit livestock, such as individual veal calves, lambs, and hogs, to be weighed over scales with a 5-pound minimum graduation. Admittedly, the 5-pound graduation on livestock scales is well established



and may be satisfactory for weighing large drafts of animals. However, on individual animals in the lighter weights, such as lambs, veal, and hogs, a 1-pound graduation would certainly seem essential. I feel that those of us who are agriculturally minded should give this serious consideration, and make an effort to bring such a change into practice.

While it is my understanding that, in a large part of the United States, livestock is sold at auction on "out weights" rather than "in weights," the opportunity and incentive for fraud still exists, and the problem of correct weighing remains of importance.

The testing of scales of all kinds is an important and worthwhile part of our service. Yet, if we permit these correct scales to be used fraudulently, we are not accomplishing the results for which our respective agencies are created and supported. We must not forget that the producer and intermediate handlers, as well as the ultimate consumer, pay their share of the tax load.

It would appear highly desirable to try to bring the weighing at these markets out into the light, where it could be observed by all interested parties. The scale houses should be so constructed that the weighmaster could be observed by both producers and buyers. It should also be constructed so that the weighmaster can see both ends of the stock rack on the scale.

The use of type-registering weighbeams and balance indicators or automatic-weight recorders should be encouraged. Signs might well be posted encouraging the interested parties to observe the weighing.

Just how much of this should be done by regulation and how much by persuasion or salesmanship, I am not prepared to say. However, it presents a challenge which should be met on the State level in the manner which seems most appropriate.

In my opinion, the problem of livestock weighing is one that merits the careful attention of every State department of weights and measures in the nation.

MR. BAUCOM: You spoke of the voluntary weighmaster program; I would like to hear more of that activity.

MR. THOMPSON: Our plan has been to furnish weighmasters who are on the State payroll to such markets as request them and reimburse the State for their salaries. The State charges the market a certain amount per day for the services of each man. We feel that we have better control over the men who actually are on the State payroll than we have over those who are merely licensed by the State.

As I mentioned in my paper, we do not believe that this completely answers the problem, since it is operated on a voluntary basis. Since the program is voluntary, it might possibly be participated in only by those markets who are particularly anxious to do an honest job.

### ELECTRONIC SCALES

BY GEORGE F. GRAHAM, *Assistant Director of Sales, Streeter-Amet Company, Chicago, Illinois*

The electronic or load-cell scale is relatively a newcomer in the field of weight determination. However, the wide variety of applications that have been made using these interesting instruments attests its versatility, accuracy, and dependability.

A survey of actual applications demonstrates that, when properly applied and correctly maintained, load-cell determination has an

accuracy well within the order of magnitude of the tolerances recommended by the National Conference on Weights and Measures. The high degree of adaptability inherent in electromechanical load-cell systems enhances their merit for many difficult installations. Like all other careful processes, certain safeguards and preferential practices should be adhered to if good performance is to result.

It is not within the province of this paper to discuss basic concepts of electronic systems nor to dwell on many of the more technical aspects of these devices. However, before entering into discussion of individual applications, certain comments appear to be in order.

Electronic or load-cell systems for weight determination are suitable for either commercial or industrial applications.

There have been a wide variety of load-cell weighing installations. Some of them are of commercial nature; a much larger number have been sold for other industrial applications where the tolerances and specifications set forth in Handbook 44 do not apply. Examples of these would be certain crane scales, hopper scales, or other installations where the scale was not being used in trade, but only for intra-plant operations. The accuracies and characteristics of these scales should not be confused with a load-cell scale that has been sold and installed for commercial applications.

Load-cell systems have been applied to nearly every type of weighing problem that is suitable for conventional scale systems. A sizeable number of applications have been made that would be very difficult to accomplish with lever-type units. Many times, the small space required of load cells, as compared with the large space requirements of levers, is very advantageous.

Railway track scales lend themselves to the new type of installations, since, wherever very heavy capacity scales are involved, the load cell offers definite economic advantages.

High speed weighing of motor trucks is becoming prominent as an adjunct in highway weight control. In this field, the load-cell instrument presently appears to be predominant.

Because of their relatively small size, and remote recording features, load-cell crane scales are becoming very popular, and seem to fill a void that formerly existed in weight determination.

Tank and hopper scales are a natural application for the load cell. The cell works equally well in tension or compression, and the installation of cells usually presents fewer problems than any other type of load- or weight-determining system.

Testing methods are similar to those normally used for conventional units. The best way to test any scale is to load the weigh-bridge or other load-receiving element with successively increasing small increments of weight, and determine if the response of the weight-determining instrument is correct.

As is the case with lever mechanisms, corner tests of load platforms, center and section tests should be made, and tests of the sensitivity and repeatability should not be neglected. In passing, it should be noted that the sensitivity of load-cell units is usually very good.

Load-cell instruments are peculiarly adapted to control other functions, such as batching, computing operations, or any operation that is desirable to control by weight. The weight information is already in the form of electrical values, and, as such, is readily usable. Further, since most load-cell systems have, as an integral portion thereof, servo systems capable of accepting a signal from the cell and

using it with the application of a desired amount of power, a freedom of operation exists that is not inherent in the lever systems where all the power used to perform work or extra functions must be subtracted from the weighbeam and, to that extent, introduce possibility of error.

Remote recording is inherent in most electronic systems. Full-figure printing is available with load-cell systems.

Temperature changes within normal operating limits do not affect the load cells adversely.

Unfortunately, there has been some confusion in connection with load-cell scales with regard to the presence of temperature sensitivity and zero drift. In many applications, these features are either of no great importance or may be eliminated; therefore, many noncommercial scales have been sold and have been in operation for years that do show a marked temperature sensitivity and zero drift. However, a load-cell scale that is installed for commercial applications should be expected to maintain good weighing characteristics over all normal operating temperatures. Also, its zero-drift characteristics should be negligible. Normally, these would not be more than those encountered by the accumulation of dirt on a conventional truck or any other platform-type scale.

A load-cell scale is a precision mechanism. Overload or abuse can hurt these scales, as well as the conventional mechanical units.

It should be remembered that the load-cell scale is affected by poor weighbridges, binds, bad installation, misalignment, poor fittings, etc., in exactly the same manner as a mechanical system. In certain load-cell applications, errors arising from causes exclusive of the load cell and connected recording systems are responsible for errors accredited to the new weighing methods.

While load-cell scales generally can be furnished to conform to performance specifications and to meet the requirements of normal commercial operation, there are design specifications or design considerations that have been incorporated into purchasing or acceptance specifications that do not cover the field of load-cell scales or are not applicable thereto. For instance, it means little to a load-cell scale that the allowable pivot or bearing load is 5,000 pounds per linear inch, or that the main levers must clear the bottom of the pit by so many inches. On the other hand, those portions of the specifications pertaining to tolerances, type of deck, type of construction, clearances, checking members, etc., are in most cases applicable in either lever systems or load-cell scales. This would indicate that careful consideration should be given to the possible revision of existing specifications with an emphasis towards broader application and interpretation, but without reducing many characteristics that are desirable for an operating or performance consideration.

Tare provision, multiple ranges or drop weights, zero adjustments, etc., can all be accomplished by load-cell systems.

Visual indicators and/or printers usually are incorporated in the new units.

Whereas, earlier load-cell units were of manual-balance type, most modern types are of the automatic servo variety. Among the earliest type of load-cell applications, are to be found manually balanced systems for determining load on aircraft axles, tank-weighing systems, material-testing units, platform scales, and crane scales.



An understanding of the application limitations and advantages of load cells presupposes a general understanding of the method of operation involved. Many varieties of load cells have been developed. These are capable of a varying degree of accuracy; therefore, applications should be made with the limitations or peculiar advantages of the particular type of cell in mind.

Generally speaking, there are available hydraulic load cells of several varieties which can operate visual indicators directly or, in connection with electrical components, control printers, or remote functions. These comments apply equally to the pneumatic type of load cell. Certain technical people have high regard for these two types of transducers. Material-testing machines have been developed around the use of hydraulic and/or pneumatic functions usually in connection with some form of electric actuating circuitry.

A wide variety of electrical or mechanical-electrical transducers are on the market. The fundamental concepts of the several types are of considerable interest, and all weights and measures men will undoubtedly familiarize themselves sooner or later with the several systems and their practical and theoretical advantages and/or limitations.

In brief, most systems consist of a load-receiving element which is so designed that an electrical signal proportional to applied weight is created. Some transducers generate sufficient signal strength to control indicating mechanism without amplification. Others generate a signal strength requiring a high degree of amplification. The signal developed by the transducer or load cell is used to operate a balancing component, so that, when a steady state is reached, the system is in balance. At this steady-state position, weight indicating or recording is effected.

A few of the more typical installations which have been made with systems not based on the use of levers include railway track scales, platform scales, high-speed truck scales, tank and hopper scales, and crane scales.

These units all comply with the fundamental requisite of any weight-determining device. In appearance, they may be vastly different, and, in fact, the flexibility of use and application may be, and usually is, dissimilar. However, tolerance specification, methods of testing stability, and readability all follow the pattern of conventional units.

It should be emphasized that the newest and the latest type of load-cell scales are completely different in design, construction, and accuracy than many of the earlier ones. Therefore, the present scales should not be judged by facts and rumors about scales that have been in service for some time or that have been sold for industrial applications.

While on the subject of testing, it might be well to state that the best way to test any scale seems to be to load it in reasonable increments to full capacity. No good short cuts seem to apply either to electronic or lever devices.

One interesting feature that should be mentioned with regard to electronic scales is that one instrument (recorder or visual indicator) can serve more than one load unit or scale. The recorder is simply switched from one scale to another, electrically. Or, it is equally possible to have several scales, not mechanically connected, working

as a integrated weighing device, with a single recorder. Many electronic recorders are full-figure printers, and, of course, are entitled to the extra tolerance allowance of 1/2 minimum graduation.

Summarizing, the applications of electronic units have proven somewhat more flexible and equally as accurate and dependable as lever scales. They require, in most instances, only a reasonable degree of maintenance, and can, under certain circumstances, function well where conventional systems fail.

This new type of device is suitable for many problems of weight determination difficult to solve with levers. Testing procedures are substantially identical with present practices.

(Mr. Graham showed and explained a number of lantern slides depicting various components and installations of electronic scales.)

(The Conference was adjourned, to reconvene at 10:00 a. m., Thursday, May 21, 1953.)

(During the afternoon of Wednesday, May 20, informal tours of the laboratories of the National Bureau of Standards were participated in by the delegates.)

(On the evening of Wednesday, May 20, an informal party was held at the Wardman Park Hotel, the Conference headquarters, for those attending the Conference.)

## **FOURTH SESSION—MORNING OF THURSDAY, MAY 22, 1953**

(J. FRED TRUE, Vice President, Presiding)

### **REPORT OF THE COMMITTEE ON WEIGHTS AND MEASURES EDUCATION, PRESENTED BY CHARLES MORRIS FULLER, CHAIRMAN**

Your Committee on Weights and Measures Education has enjoyed a year of contacts with a typical cross section of weights and measures officials, located in all parts of the country. These officials were selected mostly from those who were cooperative when we made our previous study on budgetary procedures.

The idea of developing a training and study course, based on handbooks issued by the National Bureau of Standards is not a new one. It has been discussed over the years. Certain things, however, had to be given due consideration. The preparation of a book or manual for the course would be a full time assignment for some highly qualified person.

The National Bureau of Standards already has issued many valuable publications for the purpose of disseminating authentic information and promoting uniformity in weights and measures enforcement. We felt, therefore, that it would be the logical agency for the job.

Mr. W. S. Bussey, Chief of the Office of Weights and Measures, stated that, if a training and study course would be of real value, his office might be willing to undertake the project. They would have to be convinced beyond any reasonable doubt that there is an actual demand and need for such a course. It would be of little value unless the department heads really used it and followed up with thorough examinations. It would have to be used extensively if the effort and expense were to be justified.

This explains why one hundred of you received personal letters requesting your frank opinions on the subject.

Your answers to the letters speak well for the caliber of men who are engaged in this essential work of protecting the American public.

They evidence careful study, thought, and interest. We were able to understand just how useful the proposed course would be in your jurisdictions, and your reasons for arriving at those conclusions.

The majority of answers agreed that the idea, itself, is good: "a manual as proposed would be of invaluable assistance";—"a very fine thing, especially for some States where the personnel are not able to attend meetings or participate in the National Conference";—"one of the best ideas that has been advanced in weights and measures in quite some time";—"would be especially valuable in States having relatively new weights and measures laws";—"could be used by new inspectors during their training period, or by old inspectors to refresh themselves on methods of technique";—"both practical and worthwhile and there should be a big demand for such a course";—"would be a forward step";—"great possibilities if presented right";—"a course covering the rudiments and functional experiences of all devices that officials come in contact with, is needed very badly."

A general feeling was expressed that the manual should be clear and concise; written in plain, simple language without too many technical terms; and "with short, meaty chapters followed by questions."

Emphasis was placed on the part that the National Bureau of Standards should take: "definitely of the opinion that the NBS in Washington is the only Bureau in a position to put such a project into effect";—"would be accepted by a large number of weights and measures officials";—"the more it approached the nature of a correspondence course with a series of examinations composed and preferably graded by one person or group to be designated by the National Bureau, the more effective and valuable it would become."

An opposite view regarding examinations was taken by one official, who said, "While I believe most of our local inspectors would study the manuals, I am afraid many of them would endeavor to side-step examinations. Speaking for myself, I have taken several State merit examinations and, as a result, have gotten to the place where they prove distasteful to me. The reason may be attributed to unnecessary worrying prior to the examination. I mention unnecessary worrying, due to the fact that I have never met with any difficulty in making satisfactory grades."

Another suggestion was made that the course should be slanted at career supervisors who would be the trainers for the inspectors working in their departments. In this case, it would be assumed that the supervisor had a basic knowledge of weights and measures when he was promoted. The course would include information from the Bureau on the technical aspects of the work; such as modern methods, short cuts, and new formulas for testing. It would develop his skill in leadership, in improving work methods, and in teaching others. Emphasis would be given to his responsibilities to his subordinates, superiors, the consumer public, and the vendor, including the sellers of weighing and measuring equipment. As a part of this course, there would be classroom instruction of two or three weeks' duration, conducted by the National Bureau of Standards in Washington, D. C., the expense of travel and per diem to be borne by the jurisdiction involved. "This would be a bold step and could be accomplished only through proper selling contact on the part of Bureau representatives, assisted by those of us in the field who subscribe to the program."



Civil Service Commissions would welcome an authoritative manual as an aid to them in setting up examination procedure. It also would answer the question as to where men interested in taking civil service examinations could gain a comprehensive insight into the work entailed.

Up to this point, we have concentrated on the educational value of the proposed manual and course of instruction. Equal consideration must be given to the practical side. Would it be used enough to justify the effort and expense involved in preparing it? Your Committee has not forgotten that several years ago it labored to prepare a comprehensive list of questions and answers covering the field of weights and measures operations. The comparatively small number of requests for copies was very discouraging.

Undoubtedly, the use of the course would be affected by the probable tenure in office of the officials and inspectors—whether they are career men under civil service, or political appointees who hold the position for only a short time. In some places they are appointed from year to year and could not be expected to take much interest in an educational program.

Half of the officials who believe that it is a good idea expressed themselves as doubtful if it would be widely used. Here are some of their comments:

There is already existent in Handbooks 37 and 45 about all the fundamental knowledge that can be contained in printed form. Frankly, I am doubtful as to whether or not it would be utilized to a sufficient degree.—(Head of a leading State department who has also had many years of experience on Conference committees.)

It is my honest opinion that very few departments would use a publication of this type unless their program and budget included a trainee program.—(Head of a large and progressive county department.)

I have reason to question the end result value of such an extensive effort. The splendid material which is now available provides adequate information.—(Head of one of our largest city departments who has also had much committee experience.)

Definitely a waste of time. The majority of officials do not care to spend too much time studying.—(No beating about the bush by this State chief.)

(Another head in a large State also was outspoken.)—I would not want to be committed to the use of such a training course. In fact, I wonder if any of them would even bother to go through an extension course that would require any of their own time, and I wonder if we would be criticized for taking time for such study while in the employment of a governmental agency.

(This State chief sums up his opinion as follows:)—There is a definite need for the training of weights and measures enforcement officers throughout the United States, but, until such time as the persons who are engaged in this work feel the need for such education in order that they may perform a better service, the creation of a training program may be labor lost. We have too many persons who are well satisfied with their present inadequate efforts, or who have accepted the position as a weights and measures enforcement officer and are carrying out the work following what might be given as a rude description, "following the lines of least resistance."

To get adults employed by cities, counties, and States interested enough in their work and future to put in the extra time necessary to accomplish such a course would be a miracle.—(The breezy comment of a State chief.)

Frankly, I feel that at the present time, the response would not be any greater than it was for the list of questions and answers.—(A veteran of many years as a State leader.)

Other heads of large city departments had this to say: "Enthusiastic about the idea, but doubtful about the use. How much of a demand there would be, I cannot say."—"The work and expense would not be justified. Both handbooks issued by the National

Bureau of Standards are adequate. Good judgment and common sense, plus the instructions contained in the handbooks, should be sufficient to enable the official to perform his duties satisfactorily."—"My honest opinion is that it would not be worth the time or effort demanded for such an undertaking."—"This is to express my objective doubts about the project. The proposed manual would not be widely and properly used by most officials."

We could go on and quote many similar expressions. It should also be noted that 29 percent of the total number did not even answer the letters which were personally written them. This negative response would seem to indicate a total lack of interest in the project, so far as they are concerned.

On the other hand, we were assured by 27 percent of those contacted that they would definitely use the course in their own jurisdictions:

I wish to assure you that such a manual would be used by this division. Any arguments which might be advanced with regard to the non-use of the manual might very well have been advanced against the other publications referred to in your letter. I think now that NBS Handbooks have been published and put to good use; we all can agree that they have proven of great benefit and that it would be extremely difficult to get along without them. Undoubtedly, the result would be the same if the proposed manual is written and published.—(The chief in a large midwestern State.)

I will see to it that everyone of our inspectors takes advantage of this opportunity if favorable action is taken on the proposition. The benefits obtained by the people and the inspectors will be greater than anything attempted to improve and make weights and measures inspection uniform throughout the United States.—(An active southern State.)

As far as this department is concerned, it would be accepted, and we have about 50 State sealers of weights and measures.—(Another large midwestern State.)

I heartily endorse the idea and will certainly use it in this office.—(A southern city.)

I asked my deputies how many would be willing to attend a course of this kind on their own time, and their answer was a unanimous "yes."—(A western county.)

We could continue with more opinions, both for and against the project. The foregoing, however, gives you a pretty complete picture. Your Committee believes that the proposed handbook or manual would be a valuable addition to our present textbooks. It would provide the means for a training and study course. It would promote uniformity in enforcement. But it probably would be used by not more than one out of four officials and inspectors.

These facts are submitted without further comment. The final decision about undertaking the job must be made by the National Bureau of Standards.

Your Committee prepared another questionnaire which had to do with assistance by the National Bureau of Standards to weights and measures officials. Copies of this were sent to all officials who answered our first letter.

Some of the desired services are as follows:

1. Provide field personnel to work, in an advisory capacity, with State and larger local jurisdictions. These men should be qualified to instruct and demonstrate proper methods of testing any weighing or measuring device.

2. Make surveys and offer suggestions for improving the service in the different States.

3. Encourage ownership and use of NBS Handbooks.

4. Increase attendance at the National Conference by aiding officials to get authorization and support of their governing bodies.

5. More promptness in calibration of standards submitted to the Bureau.

6. Develop an approval seal with good adhesive and non-fading qualities.

7. Establish a clearinghouse for interstate problems and complaints.

8. Encourage the organizing and expanding of State and regional associations and conferences.

9. A continuous study of current conditions, with the ratio of personnel to population in mind. This information to be issued in bulletins to aid officials in obtaining adequate personnel and equipment.

10. Put on a two- or three-day meeting in each State that would tell the complete story of weights and measures work. Demonstrate methods of testing with actual equipment. A federal exhibit to be used at State fairs would be valuable.

11. Stimulate the various departments by a survey and evaluation of their work. Issue certificates of approval where deserved.

12. Set up an experimental school at State and local conferences where the inspectors would make actual tests of both old and new equipment. They would then make out inspection sheets showing why the equipment was either sealed or condemned. These sheets would be collected and graded by the National Bureau of Standards.

13. A training course for sealers of weights and measures.

14. Expand program of railroad track scale testing. Notify the sealers far enough in advance so that they could plan to be present at tests.

15. Encourage the Federal Education System to prepare and distribute (especially to schools) movies showing the value and necessity of this work. Also a film for weights and measures personnel.

16. A consumers' educational program aimed at the housewife.

17. Impress on State officials the importance of revising and bring up to date, annually, their specifications and tolerances.

18. Increased effort in promoting, through letters and personal visits to key members of State legislatures, the creation of weights and measures laws, and the setting up of weights and measures departments in those States that do not have such laws or departments.

19. Encourage the enforcement of current weights and measures laws in the respective States, as well as suggesting additional laws of a uniform nature concerning subject matters that are common to interstate exchange.

Everybody was unanimous in desiring the Bureau to continue all of its present services without any curtailment.

Among the subjects which officials would like to have presented at State conferences by staff members, are many relating to the Bureau, itself, such as: organization and functions, services offered, current programs, accomplishments and objectives of the National Conference, illustrated talks on material in the NBS Handbooks. Staff members could preside over panels or discussion groups on problems of field inspectors; the proper relationship of the inspector to repairmen; unusual problems encountered and methods devised to correct conditions or violations; and current problems as they come up from time to time, such as liquefied petroleum gas and farm milk tanks. If possible, talks should be applicable to weights and measures problems or interests of the locality represented by the conference.

Staff members would be in a position to tell about the progress achieved in various jurisdictions and what the other States are doing,



so that the delegates could benefit by experiences and methods that had proved successful elsewhere. Talks should be practical, not technical, and presented with visual aids whenever possible.

The development of electronic scales is a timely suggestion. The sale of ice cream by net weight is still a live issue, as is the consideration of other commodities sold in an improper manner, such as pickles and pickle products by liquid measure. More about the metric system and its adoption is desired.

Detailed methods for the handling and inspection of prepackaged commodities would be a welcome subject that would arouse much discussion. Many officials stressed the importance of talks that would promote uniformity, both in testing and inspection methods, and in specifications and tolerances.

Judging by the requests received, the Bureau will need an added budget appropriation for publications and printed matter. The officials would like to see the Monthly News Letter revived. They would like bulletins covering the latest types of testing equipment, with plans and specifications; bulletins on new kinds of weighing and measuring devices, with approved methods of testing same; an annual list of all sealers in the United States; an up-to-date glossary of scale, pump, and meter terms; and a digest of complicated court cases.

Handbooks could be revised and enlarged to include specifications and tolerances, as well as questions and answers, chapter by chapter for H37 and H45, and code by code for H44. Booklets should be provided to replace some of those that are out of print; for example, Circular 3, "Design and Test of Standards of Mass." A manual for new or untrained inspectors is needed. This could be similar to those used in Canada to prepare an applicant for taking an examination for inspector. It should not be as technical as the handbooks, but would explain proper methods of doing a correct job. A series of press releases, perhaps one every week, would stimulate the interest of the public.

The last suggestion hits at a vital problem—how to awaken the interest of the people to the importance of getting full weight and full measure for their money. It is a paradox that at this time, when prices are at an all-time high, the buying habits of so many are at an all-time low.

Most of you read the article, "Ask the Price! Watch that Scale!" which appeared in Good Housekeeping magazine a couple of years ago. The editors of this national publication felt that this was a subject of more than passing concern. After consulting the Office of Weights and Measures at the National Bureau of Standards, they sent a staff writer, Elsie McCormick, from one end of the country to the other, meeting officials and gathering facts from her own observation.

When the article finally was written, it had a subheading which asked the pertinent question, "Would you like to reduce your present food bills by 6 percent without cutting down either the quality or quantity of your provisions?" She estimated that American women lost over a billion dollars a year in not being efficient food shoppers—in failing, mostly through carelessness and indifference, to get full weight for their money.

It was written in an entertaining manner and related many interesting episodes to illustrate the conclusions reached. But how many of the three million subscribers to Good Housekeeping (and several

times that number of readers) remember those facts today? What is more important, how many put into practice the suggestions offered that would result in saving real money for the family budget?

Nothing can take the place of personal contacts through the medium of speaking engagements. From personal experience, gained during the past few years by delivering an address, "How to be a Smart Buyer," before nearly three hundred women's clubs, men's service clubs, and other organizations, the Chairman of this Committee has had the opportunity of learning their value. The results obtained have been more than worth the time, effort, and night work required.

There must be an actual demand from the people, themselves, if we are to have improved weights and measures conditions. Many years ago, the National Bureau of Standards made a survey in California. It revealed that short weight, false scales, and tricky practices were costing the consumers huge sums of money. Those facts were given wide publicity and aroused the people to action. Any time it can be shown that they are being robbed of part of their living by underhanded methods of short weight and short measure, people are going to demand that something be done about it. A constitutional amendment, establishing laws and State-wide enforcement was submitted to the voters in California, and passed by an overwhelming majority.

The Office of Weights and Measures well might consider ways and means of effectively arousing the public, especially in backward States and communities, to a realization of how much this lack of weights and measures protection is costing them in dollars and cents. The establishment of a Speaker's Bureau for this purpose would be a worthy project.

#### **REMARKS OF A. T. McPHERSON, ASSOCIATE DIRECTOR, NATIONAL BUREAU OF STANDARDS**

We at the National Bureau of Standards are very glad to have the nineteen suggestions developed by Mr. Fuller and his committee, and we will give each and every one of them serious consideration. Two major problems confronting the Bureau necessarily will limit the amount of service that can be rendered under present circumstances. One problem is the increasing demand from many quarters for a variety of new standards and additional services, and the other is an anticipated reduction in appropriations, which is part of the Government-wide action to alleviate the tax burden and balance the National Budget.

It is gratifying to note, however, that some of the items mentioned have already been receiving consideration. For example, the calibration of weights is practically current and the backlog of other standards awaiting calibration has been reduced considerably. Currently the greatest delay is about six months and is on the calibration of volumetric standards. In the over-all calibration and testing program, involving about 320,000 items a year the average time at the Bureau is between one and two months, including the time required to do the work.

The Bureau welcomes the opportunity to participate in local and regional weights and measures conferences, but participation is limited by the fact that only Mr. Bussey and Mr. Jensen are available for this activity. In order better to serve the local and regional

officials, these men must spend considerable time at the Bureau keeping in touch with the widely varied work done by 4,800 other members of the staff so as to bring pertinent new ideas and new developments to bear on practical problems encountered in the field. One such new development is exemplified by the application of statistical engineering to the calibration of gasoline pumps. This is described in a paper by Youden and Jensen, which Dr. Youden will present later in this Conference.

The small but important problem of a durable seal, mentioned by Mr. Fuller, probably can be solved through the use of information developed at the Bureau for another purpose.

As to the Educational Program, the Bureau has made very effective use of motion pictures for presenting the results of its dental research. Through a series of color film—now five in number—dentists all over the world have been able to see and learn new techniques involved in mechanical restoration. A film showing the flow of water in transparent plastic pipes has greatly aided the acceptance of a plumbing code. Films for training inspectors or for other educational purposes can readily be developed if financial support can be provided.

The Bureau, of course, is not responsible for the enforcement of current weights and measures laws in the respective States, but it has lent its encouragement to such enforcement in a very tangible way through a number of publications, the latest of which is the *Weights and Measures Case Reference Book* to which your attention already has been called.

We will be guided by your suggestions and we solicit your further recommendations. Perhaps we shall be able to report to you at the 39th National Conference and describe the progress we have made on your requests.

#### TECHNICALITIES IN WEIGHTS AND MEASURES COURT CASES

BY J. A. MURPHY, *Assistant Deputy Attorney General, State of New Jersey*

A technicality has been well defined as a microbe which has gotten into the law and given justice the blind staggers. A technical error or a technical objection is one which does not go to the substance of the issues or the substantial rights of the parties involved. It is addressed to form rather than substance, but may well constitute the difference between successful prosecution and failure. Many of these errors or the grounds for objection arise from carelessness or lack of care in testing or inspection, in preparing complaints for violations, in preparing for trial and in testifying at trial.

How many enforcement officers make a detailed, comprehensive, and complete report of their investigation or inspection immediately after it is made and while the details are still fresh in mind? Too much reliance is placed on memory. In view of the number of inspections made, there is bound to be some confusion in the facts of some of them. This is a constant place of attack by the trial lawyer. He will ask for a description of the place. It is a minor matter and may not be important. Generally it is not, but, if he can lead a witness into contradiction, it is one nail he has driven and will be used to reflect discredit on other testimony.

Does the report disclose the name of the defendant? Suppose it is a partnership? What if it is a trade name? Is it a corporation? If it is not the individual who is responsible, then the wrong person



may be named as the defendant and the complaint will be dismissed by the court.

Where was the inspection made and where did the violation occur? If an inspection is made in Municipality A and it discloses a violation in Municipality B, the action should be brought in Municipality B where the cause of action accrues. This has also been a cause for objection and dismissal of complaints for violations. Jurisdiction over the subject matter of a cause of action is very important. It cannot be conferred by the consent of the parties, and, unless the action is brought in a court which has jurisdiction, the case must be dismissed. An individual may consent to the jurisdiction of the court over his person, but he may not consent to having a case tried in a court which has no authority to hear or determine that case.

Another source of attack is the sufficiency of the complaint. Most statutes, in defining an offense, make any one of a number of things a violation of that statute and use the disjunctive term "or" in stating them. For example, a statute may require the net quantity of the contents of an article of food in package form to be plainly and conspicuously marked on the outside of the package. It usually provides that no person shall distribute or sell or expose for sale, or have in possession with intent to distribute or sell, any article of food in package form, unless the net quantity of the contents be plainly and conspicuously marked on the outside of the package in terms of weight, measure, or numerical count. This statute may be violated in any one of five ways, distribution, sale, exposure for sale, possession with intent to distribute, possession with intent to sell. As a general rule, the offender is in violation of more than one provision. The purpose of the complaint is to acquaint the offender with the violation for which he is responsible. Many times the complaint alleges the violation in the disjunctive. It follows the words of the statute. It is generally true that, in charging a statutory offense, it is sufficient to lay the charge in the words of the act, without a particular statement of facts such as will bring the accused within its operation, but it is not sufficient if the disjunctive term "or" is used. A defendant would never know whether he was accused of distribution, or of sale, or of exposure for sale, or of possession. He would not be able to properly prepare his defense. Such a complaint is too vague and indefinite, and has, on occasions, been dismissed for this reason. You need not, however, just pick out one of the provisions and only allege that as a violation. You may allege them all, but you need only prove one. You must, however, change the disjunctive "or" to the conjunctive "and" in so doing. The general rule is that, where an offense may be committed by doing one of several things, they may be grouped together by using the conjunctive "and" where "or" occurs in the statute and so charge the defendant with having committed them all, and a conviction may be had on proof of any of these things without proof of the commission of the others.

Another target of attack in the complaint is the sufficiency of the allegation in a complaint where the doing of an act without a license constitutes a violation of a statute. It is not the act itself which constitutes the violation, but it is the performance of that act without a license. The complaint must allege not only the act, but also the fact that the defendant is without a license. Failure to allege the defendant has no license makes a complaint defective and subject to

dismissal. This would appear to be an omission that would seldom occur, but nevertheless it has happened too frequently.

On many occasions the defendant has been previously convicted of other violations. Most statutes impose a greater penalty for repeated offenders, but, in order to obtain a judgment for the higher penalty, the fact of prior conviction should be alleged in the complaint. Failure to allege such prior conviction has prevented the court from imposing the greater penalty and has permitted such offenders to get off with a light one. Where the complaint fails to allege the prior conviction, objection has been successfully made by counsel to any judgment other than for a first offense.

Many statutes provide for a minimum and maximum monetary penalty which may be imposed by the court for violation of a statute. The discretion, within those limits, is placed in the court. The complaint, however, should request judgment for the maximum amount; otherwise, the court will have no opportunity to exercise its discretion. If the prayer of the complaint is for the minimum, the court will impose only the minimum. The facts of the case may justify a greater penalty, but the court will be bound by the relief asked.

Another main point of attack is the method of inspection or testing. This is particularly important, because the judge is not an expert, nor may he even be conversant with weights and measures work. Especially is this true where anything mechanical is involved and where technical words are used in explanation. It is also true where new devices are used. One example is the loadometer which is, as you know, a wheel-load weigher and is specially adapted to determining the wheel loads of vehicles on highways. One of the first questions raised is their accuracy. How were they tested to determine their accuracy? Where was the vehicle weighed? Was it on a highway? What was the grade of the road? Would the grade or angle of the road cause or increase errors in the device? How many loadometers were used? Are four more accurate than two? Were they used on both sides of the vehicle or only on one side? Was the vehicle kept level by chocks or blocks placed under the wheels? If not, did this increase the angle so as to cause error? Which loadometers were used? How were they identified? What care was given the devices? If any reflection can be made on the method of testing, then the accuracy can seriously be questioned, too.

The identification and preservation of evidence is another bone of contention which is often worried by a lawyer. It is particularly vulnerable where the evidence has been in the possession of more than one person. An attempt is always made to show it is not the same. Very pointed and pertinent questions are asked regarding its identity, its storage, who handled it, and who had access to it, in order to show that it is not. Identification is very important. It may be made by the serial number being noted in writing by all parties. A more accurate method is by using a sticker and having each person who has had custody initial the sticker. Confusion in identity of the evidence where it has been in the possession of more than one person, all of whom must testify regarding it, is many times a source of embarrassment, and too often a cause of failure in prosecution.

There is another source of attack which is directed to a basic and vital part of weights and measures. That is the questionability of the accuracy of your standards and of the standards used in making tests in the field. In order to prove a case involving weight, you must



show that the weighing was done on scales which were accurate. You must, therefore, show these scales were tested by standards that are correct. These working standards, of course, are compared with the State standards in order to determine their accuracy, and are corrected, if necessary, so that they are accurate. The question, however, is not directed to the accuracy of the standards used for the test, but is directed to the accuracy of the State standards which were used for comparison and correction. It is, therefore, necessary for you to show the State standards have been certified as required by the State statute. All the laws of the States require State standards to be submitted once every certain number of years, generally ten, to the National Bureau of Standards for certification. Have you had occasion to examine this certification closely? Is it a certification? Is it not many times only a report? Is this report many times a refusal to certify rather than a certification? Does it not state many times that the set of weights submitted does not conform to National Bureau of Standards specifications for weights of a certain named class in that a certain weight or weights in that set are in error by more than the tolerance for the weight or weights of those denominations? What is the result? There has been a refusal of certification. Refusal not only of the erroneous weights, but also of the correct ones, for the report is a rejection of the entire set of weights. It is true that the result of the test with the margin of error is incorporated in the report. It is true that you may compensate for this error in correcting your working standards, but the objection is directed to the failure of certification of the State standards, that they do not comply with the law in that they have not been certified as required by the law and, therefore, may not be used as a standard of comparison for the testing and correction of the working standards. It is almost impossible to explain to, much less convince, a court that this report of the National Bureau of Standards should be considered as a certification. You may argue that it is only a question of words, but words are the principal tools of lawyers and judges. They are to lawyers what a scalpel is to a surgeon, or a slide rule to an engineer. There is a magic in words. A difference in the mere form of words may make a difference in law. If A lends money to B upon an agreement to pay interest of 5 percent, but, if it is not paid promptly, then he has to pay 6 percent, the 6 percent is invalid as constituting a penalty. However, if A and B had agreed the interest would be 6 percent, but, if paid promptly, it would be 5 percent, then it would have been valid.

The State law requires certification and uses that specific term. A set of weights is submitted to the National Bureau of Standards for certification in conformity with the law, and you receive back a report. Have you complied with your law? Are your weights certified? Once the questionability of the standards is raised, the procedure is then to attack the care with which they are kept. Where they are stored; who has access to them; are they under lock and key; who has the key; where is it kept; are they transported about; were they dropped or damaged in any way? These and numerous other questions of similar character are interposed if one wedge can be driven regarding their accuracy.

All of these objections are purely of a technical nature. They do not go to the merits of the question or the substance of the issues.



Yet any one or a number are often sufficient either to dismiss a case or discredit the evidence and raise the question of its sufficiency with the end result that the court feels there is not enough certainty in the proof. Carefulness in inspection and testing, proper identification and preservation of evidence, painstaking preparation and careful analysis all along the way are of greater importance than brilliant presentation because the former insures the latter.

DR. MCPHERSON: When the legal distinction between reports and certificates was pointed out during a court case and thus was brought to the attention of the Bureau, prompt action was taken. Records of past calibrations of State standards were studied, and, where they seemed appropriate, supplementary certificates were issued to give the standards legal validity. In the meantime we reviewed the statutes of the several States and, guided by the requirements stipulated therein, we now endeavor to prepare documents which are legally valid.

I would suggest that upon your return to your respective jurisdictions you examine the documents which have been issued by the Bureau with regard to your standards. If you or your legal advisors have any suggestions as to revisions, please let us know.

#### REPORT OF THE COMMITTEE ON LEGISLATION, PRESENTED BY MILES A. NELSON, CHAIRMAN

(SECRETARY'S NOTE.—The text of the Model Regulation for Package Marking Requirements, which was adopted by the Conference, is not included in this publication. Upon request, the full text of the Regulation is available from the Office of Weights and Measures, National Bureau of Standards, Washington 25, D. C.)

The Committee on Legislation submits this report covering matters referred to it by the 37th National Conference on Weights and Measures and other matters from other sources.

#### TOBACCO LABELS

Referred to the Committee by the 37th National Conference was the question as to whether or not the content indications on Federal Internal Revenue tax stamps serve adequately to fulfill the Model Law requirement for net content declarations on packages and cans of tobacco. The Committee is of the opinion that all packages and cans of tobacco should bear a plain and conspicuous net weight declaration. Under no circumstances should there be any special privilege granted to the tobacco industry or to any other industry on the net contents requirement. The Committee not only makes this recommendation with regard to packages of tobacco, but it goes further by recommending that packages of all commodities be required to bear a proper net contents declaration.

Your Committee feels that the objective of obtaining a plain and conspicuous net weight declaration on packages and cans of tobacco could be attained by a revision of the internal-revenue stamp. Therefore, your Committee recommends that the Secretary of this Conference confer with officials of the Bureau of Internal Revenue and see what can be done to revise the internal-revenue stamp so that it clearly, plainly, distinctly, and conspicuously indicates the true net weight of containers of tobacco, and report the conclusions to this Committee.

The second matter that was considered by the Committee was the standardization of packages. This subject was referred to the Committee by the President of the Conference last year for further study and report. It has been a subject that has been under consideration for several years.

Your Committee feels that the standardization of packages is a very desirable objective, but it is felt that such an objective cannot be obtained at too rapid a rate, especially when so many phases of industry itself cannot seem to agree as to the course that should be followed. It is thought by the Committee that the proper approach would be first to attempt to work toward standardization with some individual phases of industry and that it is still a subject that deserves further study without any specific recommendation from the Committee at this time. Your Committee recommends that it be allowed to retain this matter for further study and consideration.

#### SALE OF PICKLES

The Committee on Legislation was requested to consider the recommendation that was adopted by the 32nd National Conference in 1946 to the effect that pickles should be sold on a drained net weight basis, or by numerical count. Your Committee feels that this is a matter for further consideration by the Conference Committee on Methods of Sale of Commodities. We have been informed that the item is on the current agenda of that Committee. We feel that any action by the Legislation Committee must await further recommendations by the Commodity Committee and subsequent actions by the Conference.

#### MODEL REGULATION FOR PACKAGE MARKING REQUIREMENTS

The 37th National Conference tentatively adopted the Model Regulation for Package Marking Requirements which was offered by your Committee last year. During the ensuing year, this matter has been studied by the Committee and no further recommendations on the subject have been received. We believe that this is a regulation which will serve admirably as a model for State promulgations. It follows closely the wording of that part of the Federal Food, Drug, and Cosmetic Act which regulates package marking. Your Committee recommends final adoption of the Model Regulation for Package Marking Requirements.

#### LABELING OF CERTAIN PREPACKAGED FOOD COMMODITIES

One other matter in connection with the labeling of certain prepackaged foods was given considerable thought and study by the Committee. There seems to be a need for some further information to be required on such prepackaged food products as cheese, meat, fish, poultry, meat products, produce, and the like that are packaged in advance of sale in random, non-standard sizes, either by processor, distributor, or retailer, and which are offered for sale with the total price indicated on the package.

Several city ordinances and proposed city ordinances on this matter have been referred to the Committee for study. The matter also has been a subject of discussion at some weights and measures conferences and meetings. Some legislation appears desirable to prevent possible misrepresentation or misinterpretation of the unit

price, or in computing the total price, when packages bear only the net weight and the total price. The Committee feels that all ordinances and regulations, which thus far have been adopted or proposed, fall short of accomplishing the desired goal.

Your Committee recommends that it be allowed to retain this matter for extensive study and consideration to the result that possible amendments to the Model Law may be necessary. The Committee is desirous of receiving copies of existing and proposed laws, ordinances, and regulations on this matter, and, in addition, suggestions from all persons who have possible solutions.

(After general discussion by Mr. Rogers, Mr. Baucom, Mr. Nelson, Mr. Bussey, Mr. Meek, and Mr. Blickley, the Report of the Conference Committee on Legislation was adopted by the Conference. This action included final adoption of the Model Regulation for Package Marking Requirements.)

(Mimeographed copies of the Model State Law on Weights and Measures can be obtained, upon request, from Office of Weights and Measures, National Bureau of Standards, Washington 25, D. C.)

### REMOTE GASOLINE PUMPS

BY WILLIAM B. JOHNSON, JR., *Manager of Sales, Erie Meter Systems, Inc., Erie, Pennsylvania*

Last year at the 37th National Conference, the remote control gasoline dispensing system was an important subject, as a number of such installations had been made in many parts of the country, and there was a question in the minds of some weights and measures officials as to whether such systems would dispense gasoline and meet the accuracy requirements.

Actually, remote control systems are not new. They have been used for many years in limited quantity. Those systems used a gear or vane type pumping unit with air-eliminator chamber installed near the underground tank. In some cases, the air eliminator was installed in the dispenser cabinet on the island. This required a return line from the air eliminator back to the underground storage tank.

Due to the change in characteristics of gasoline made to accomodate the present day automobile, it is necessary to install the gasoline pump near, or the remote control pumping unit in or near, the underground storage tank, in order to dispense gasoline satisfactorily. The recent trend toward larger service-station serving areas is a strong influence in the use of remote control pumps, as it is easier to push gasoline long distances than it is to pull it. It is also difficult to pull gasoline at high altitudes and in extremely hot locations; therefore, the push system or remote control system is the most satisfactory in such places.

A year ago, only one gasoline pump manufacturer had advertised to any extent a remote control system. That company was the Erie Meter Systems, with which I am affiliated. Our system featured a submerged turbine pump with built-in air eliminator, in order to dispense gasoline within the tolerances. During the past year, several pump manufacturers have announced similar systems, some using submerged pumps, others using positive or gear type pumping units.

The increase in use of remote control systems is, I am sure, responsible for my being on your program today, as your association officials feel that you should be familiarized with this new system in order to better perform your jobs.



## IMPORTANT FEATURES OF THE REMOTE CONTROL SYSTEM

1. The proper elimination of air from the system is very important to maintain accurate measure. Air eliminators installed in or near the tank, or in the dispenser on the island, will perform this function satisfactorily. The air eliminator must have sufficient capacity to take care of empty tank conditions.

2. The system must be kept full of gasoline at all times through the use of check valves or foot valves.

3. Provision for relief of pressure built up due to the expansion of gasoline when temperature increases is very necessary.

So that you can visualize just how a remote control gasoline dispensing system operates in comparison with the conventional gasoline pump, I have prepared two charts which contain the principal features of the systems.

The conventional gasoline pump contains a motor-operated pumping unit with air eliminator which pulls the gasoline from the storage tank through a pipe which extends from the inlet side of the pumping unit to the bottom of the storage tank. In order for this system to work well, it is necessary to have a valve in the pipe line which keeps the entire system full of gasoline at all times. The valve can be either a foot valve located on the end of the pipe in the bottom of the tank, or it can be a check valve in the line directly above the tank, or it can be a vertical check valve located in the pump cabinet directly below the pumping unit. After the pumping unit pulls the gasoline from the underground storage tank, it pushes the gasoline through the meter, recording the quantity dispensed in both quantity and value.

The pumping unit in the remote control system is located in the tank, or near the tank, and pushes the liquid through a pipe line to the dispensing cabinets on the island. These dispensing cabinets contain a check valve and strainer, a manually operated shut-off valve, a meter, and the Veeder-Root clock which records the quantity and value of each sale. The dispensing cabinet in all cases has the same outward appearance as a conventional gasoline pump and is operated in exactly the same manner. When the hose nozzle is removed from the hanger and the starting lever is operated, it turns on a switch in the dispensing cabinet which starts the motor on the remote control pump. The pump then pushes the liquid through the pipe line, through the meter and visigage, and out through the nozzle into the customer's tank. Several dispensers may be connected to a remote control pump. Each dispenser is equipped to either start or stop the motor on a remote control pump.

The most important part of a remote control system to a weights and measures official is the operating accuracy. The most important factor influencing the accuracy is the elimination of air from the system, particularly in such cases where the tank runs dry and permits air to get into the suction line below the check valve. By putting a check valve directly on the discharge side of the remote control pump, a solid column of liquid is retained in the discharge line from that point all the way through the system to the nozzle. As a safety factor, some manufacturers provide an additional check valve directly below the meter in the dispensing cabinet. When the tank is run dry and air is admitted into the suction pipe below the check valve, it is necessary that this air be eliminated after a supply has been put into the storage tank and the system put back into operation.

The submerged turbine pump and the submersible motor and pumping unit combination, both of which are installed in the bottom of the storage tank, are equipped with a small copper-tube return line which dispels any accumulation of air in the system, and the remote control pump located directly above or near the storage tank is equipped with an air eliminator comparable to the air eliminator in a conventional gasoline pump. When using such a pump, it usually is customary to equip the dispensing units with an air eliminator and install a return line from the air eliminator back to the tank, in order to eliminate any air in the system and maintain the accuracy required by the weights and measures codes.

MR. BAUCOM: I believe the term "remote gasoline pump" is incorrect and incomplete, since that term does not accurately and adequately describe these devices. I think these submerged pump systems are very good. Through proper placement of a number of pressure valves we are able to prevent the possibility of any air getting into the fuel line. In addition, this system enables a station operator to place his storage tank at some distance from his retail dispensing devices. This, I believe, will prevent many mistakes, such as dropping the wrong fuel into a storage tank.

MR. BOUCHER: Did I understand you, Mr. Baucum, that a submerged pump made an air eliminator unnecessary?

MR. BAUCOM: With this type system there is air elimination, but the conventional type of air eliminator is not necessary.

MR. W. B. JOHNSON: I would like to add to Mr. Baucum's comments by saying that the submerged-type turbine pump will not pump air. The impellers do not come in contact with the side walls of the pump housing; therefore, they cannot pump air. Admittedly, it is possible to get air into the system, and means have been provided to eliminate such air before it reaches the meter.

If the tank runs empty, the liquid in the column from the submerged pump to the tank outlet will drain back into the tank and air then will enter this portion of the system—up to the check valve. We have installed a quarter-inch copper tube that runs from the highest point in the turbine-pump system, just below the check valve, back into the tank. This tube runs on the outside of the pump-column housing. When the column is full of air and the tank is loaded full with gasoline, the air is trapped between the top of the gasoline level and the check valve at the top of the column. When the pumping unit is activated the liquid pushes the air up to the check valve, and since it cannot be build up enough pressure to open the valve, the air is pushed out through the copper tube and back into the tank. The column of liquid will not compress the air to a sufficient pressure to open the check valve, therefore, air cannot get into the system beyond this check valve.

MR. HEASLIP: Is it not true that the specifications of Handbook 44 call for an air eliminator "or other effective means?"

MR. JOHNSON: That is correct. Many tests have been conducted on these devices by company technicians and by weights and measures officials. All persons who have participated in these tests have been completely satisfied that the system described will eliminate air.

MR. TURNBULL: Does this system provide a proper interlock for each individual meter?

MR. JOHNSON: The interlock operates in exactly the same manner as on a conventional pump. The numerals on the register must be

returned to zero before the mechanism will allow another transaction to start.

(Additional general comment on the subject was made by Mr. Baucom, Mr. Boucher, Mr. Johnson, Mr. Schellenberger, Mr. R. E. Meek, Mr. Reese, Mr. Kirk, and Mr. Fraser.)

(The Conference was recessed until 2:00 p. m.)

## FIFTH SESSION—AFTERNOON OF THURSDAY, MAY 21, 1953

(R. D. THOMPSON, Vice President, presiding)

### REPORT ON THE PROPOSED INTERNATIONAL CONFERENCE ON LEGAL METROLOGY

BY E. C. CRITTENDEN, *Consultant, National Bureau of Standards*

Last year at the Thirty-Seventh National Conference, Mr. Bussey arranged for a brief account of pending proposals to establish an international conference which would be in many respects similar to your National Conference. (See Report of the Thirty-Seventh National Conference on Weights and Measures, 1952, pages 19-20.) During the year, definite progress has been made on this subject, and I am pleased to have this opportunity to tell you about it.

While the project is primarily European, we in this country have some interest in it, particularly at this time when our Government is trying to promote economic development in the countries of Western Europe. Freedom of trade among those countries would help to attain more effective use of their resources, and a reasonable degree of uniformity in the regulation of weights and measures is one condition favoring free exchange of goods.

As was reported last year, this project was launched by a formal diplomatic conference called by the French Government in 1937. It was then agreed that a permanent international organization would be worth its cost, and that it should be distinct from the existing International Bureau of Weights and Measures, which deals with basic standards rather than commercial practices. To mark this distinction the new organization was at first called International Conference on Practical Metrology; later this was changed to Legal Metrology.

A Provisional Committee was appointed in 1937 to prepare detailed plans for the organization, but the war and other calamities prevented the completion of this task for 15 years. Finally a meeting of the reorganized Provisional Committee was held in Brussels, Belgium, October 2 to 4, 1952. It included members from 15 countries: Austria, Belgium, Czechoslovakia, Denmark, France, Germany, Great Britain, Mexico, Netherlands, Poland, Sweden, Switzerland, the U. S. S. R., the United States, and Yugoslavia, and from the International Bureau of Weights and Measures. Representatives from Argentina, India, and Italy were also appointed, but for various reasons were unable to get to the meeting.

In preparation for the meeting, the officers of the Provisional Committee had prepared a draft of a treaty to set up the proposed permanent Conference. As a result of full discussion of this draft at the 3-day meeting, various amendments were adopted, and a revised draft is now out for final comment by members of the Committee. The revised statement of reasons for the creation of the new organization (translated) is as follows:



The International Conference on Legal Metrology has as its principal objects:

(1) to form a center of documentation and information; in the first place, on the different national services concerned with the control of measuring instruments which are, or may be, subject to legal regulations; in the second place, on the instruments themselves from the point of view of conception, construction, and use;

(2) to publish the texts of the legal requirements for measuring instruments and their use in force in the different countries, with such comments regarding laws and administration as are necessary for full understanding of the requirements;

(3) to study, with a view to unification of methods and regulations, those problems of metrology, either legislative or administrative, which are of interest internationally;

(4) to develop a model law and set of regulations on measuring instruments and their use;

(5) to develop a typical plan for the organization of a service to control the use of measuring instruments;

(6) to determine the qualities which are necessary and sufficient as a basis for international approval of a type of measuring instrument; and

(7) to promote relations between the metrological services and laboratories of the countries joining in the Convention.

Questions regarding legislation or administration applying to a particular country are excluded from the scope of the Conference unless that country expressly requests that they be considered.

The member countries agree to furnish the Conference with such documentation in their possession as they believe will be useful for the attainment of the purposes set forth above.

The organization proposed to carry on the work thus outlined would include three levels, being very similar to the General Conference on Weights and Measures which has under it the International Committee and International Bureau of Weights and Measures. The top authority would be an International Conference to which any country desiring to join the organization could send delegates. The Conference would meet at 6-year intervals. Its real working agency would be an International Committee consisting of 20 members elected by the Conference. These members would be men actually serving in the weights and measures services of their respective countries or having active official relations with such services. They would serve for a 6-year term, provided that they remained in weights and measures work. The Committee would meet at least once each two years, and could appoint subcommittees to carry on specific projects between sessions.

The third level in the organization would be a permanent International Bureau or Central Office to provide secretarial service, to collect and distribute documents and other information and to perform other necessary services under the direction of the International Committees.

All of this activity would of course cost some money. Up to the present time funds for general operating costs have been provided by the French government. When the organization gets into regular operation annual costs are estimated at about 100,000 gold francs, which is equivalent to \$32,670. It is proposed that costs be shared

among member countries on the basis of population. There would be four groups of member countries to pay shares as follows:

Group	Range of population	Shares
1-----	Up to 10 millions-----	1
2-----	10 to 40 millions-----	2
3-----	40 to 100 millions-----	4
4-----	Above 100 millions-----	8

If the United States joined, it would of course fall into group four. A hypothetical budget has been set up, based on membership by 18 of the countries which have been represented in the preliminary discussions. This budget would call for the payment of about \$5,000 per year by the United States.

As the next step in this project it is expected that the French government will submit the proposed treaty to all other national governments. If then no radical changes in the draft are proposed, the French government will presumably issue formal invitations to a full-scale diplomatic conference to act on the treaty. The most likely date for such a conference is now September or October of 1954.

The questions with which the proposed organization is intended to deal are of considerable potential importance because they would affect the manufacture and sale of instruments used for weighing and measuring commodities and also the practices followed in packing commercial commodities and in specifying quantities. A reasonable degree of uniformity in the requirements established by various countries would obviously be advantageous for international trade, and if the work of the Conference is carried on successfully, it would eventually have much influence in furthering such uniformity. In the beginning, however, the plan would be to collect and publish information about the requirements and practices of the different countries, rather than to attempt to change those in force in any country.

For the United States it would certainly be difficult to take an effective part in the detailed technical work of the Conference. The most obvious source of difficulty is the fact that we have no national administration of weights and measures. Even in the states, the weights and measures services often do not cover some measuring devices which the European services usually do control, such as gas, electricity, and taxi meters. Another basic difficulty is that nearly all the prospective member countries use the metric system of units, and of course any agreement to pack commodities or specify quantities in simple multiples of those units would be entirely unacceptable in this country.

On the other hand, it might be worth the cost in time and money to keep in touch with the new organization in order to safeguard American interests. For example, our participation might prevent the adoption of regulations too favorable to the use of metric units or imposing undue costs upon our exporters of agricultural or of manufactured products. When the proposal is formally presented to our Government, it will be the duty of the Department of State to weigh these considerations and make a decision, subject to Congressional approval, as to whether the United States will join in the new undertaking.

**REMARKS OF WALLACE R. BRODE, ASSOCIATE DIRECTOR,  
NATIONAL BUREAU OF STANDARDS**

(Dr. Brode outlined the editorial policy of the Bureau as it affects weights and measures publications. He stated that the printed reports of the National Conference were edited carefully in order that only useful reference material be included. The National Bureau of Standards Editorial Committee, of which Dr. Brode is Chairman, screens proposed publications and endeavors to assist in making available those documents that will be truly beneficial. Examples of recent weights and measures publications of the Bureau are Circular 501, Federal and State Weights and Measures Laws, and Circular 540, Weights and Measures Case Reference Book.)

**REMARKS OF MRS. KATHRYN M. SCHWARZ, NATIONAL BUREAU OF  
STANDARDS**

(Mrs. Schwarz recounted the preparation and contents and described methods of use of National Bureau of Standards Circular 540, Weights and Measures Case Reference Book. Mrs. Schwarz stated that a suggested method of using the new publication, as well as general information on its composition are to be found in the preface and introduction of the book.)

**REPORT OF THE COMMITTEE ON METHODS OF SALE OF  
COMMODITIES, PRESENTED BY J. G. ROGERS, CHAIRMAN**

Your Committee on Methods of Sale of Commodities submits its report to this Conference.

The field of items in our commercial and industrial systems remaining for consideration has narrowed considerably since the inception of this Committee back in 1940. In the intervening years there has been such exhaustive treatment given to many essential subjects in our commercial structure, by way of recommendations for proper methods of sale, that we have come to a point where there is very little that is new. This report, therefore, mainly contains items that were considered but not given final action at past Conferences, and others that, by requests made to the Committee, have been reopened for review. Some in this latter class that were recommended for further consideration had been so definitely concluded at past Conferences that there seemed to be little point in reviving them. They are not included in what we now offer.

There is only one item that is new in the list of those we are presenting at this time. It is, however, a highly important one, because of its nature, developments in distribution and sale, and the place it is taking commercially by reason of its expanding use in agricultural pursuits.

Outside of this, your Committee received nothing in the way of proposals or recommendations on any new subject, either from those within our Conference group or from those in commercial or industrial enterprises. We do not, however, attribute this to indifference or lack of interest in the work of this Committee as related to Conference affairs, but rather to the fact, as indicated in the foregoing, that there has been a very wide coverage of essential commodities in what already has been done, through actions of the Conference, to regulate methods of sale in pursuance of the recommendations we offered as a result of our studies and observations on each specific issue that received our attention. Of most concern now is whether the various State jurisdictions activate by law or regulation the recommendations when adopted by the Conference. The promotion of uniformity is highly desirable in weights and measures affairs, and this is only made possible through



coordinated effort to establish uniform requirements in all States. Changes in laws or regulations frequently are necessary in order to carry out what the Conference determines to be the proper methods or procedures to be used in the barter and sale of commodities. Quick action is not always possible in making such changes nor in placing something new on the statute books, but no concerted action by our group should be forgotten. Where legislation to conform is needed, there should be persistent effort to obtain it, in the interest of improving the general weights and measures structure of operations. The following items are presented now for the consideration and appropriate action of this Conference.

1. *Anhydrous Ammonia and Other Liquid Chemical Fertilizers with Pressure Characteristics*—Shall be sold by avoirdupois net weight, provided, however, that, when maintained in liquid form with temperature corrected to 60° F, it may be also sold by liquid volume, based on the United States standard gallon of 231 cubic inches, its multiples and binary submultiples.

Delivery tickets shall be provided, in duplicate, containing the date of sale or delivery, the name and address of the seller and the buyer, the trade name and description of the product, and the net weight expressed in terms of avoirdupois pounds and/or fractions thereof, or the liquid volume expressed in terms of the United States gallon and/or fractions thereof, as determined.

When the product is sold and delivered in containers or in package form, it shall be sold by net weight only, and said container shall be plainly marked in a permanent manner with tare weight, and, attached to each container, shall be a tag on which the net weight of the contents is declared.

(As recommended in the Committee Report, this item listed 68° as the reference temperature. This temperature figure was amended from the floor to 60° F and accepted by Committee Chairman Rogers.)

NOTE: In this, we are dealing with a subject that is comparatively new to the weights and measures field of endeavor. The expanding use, in agricultural channels, of liquid chemical fertilizers of the classifications comprehended in this item dictates the need for setting up proper quantity control at the official regulatory level with all possible dispatch. In this event the situation will not get out of hand, as it did with liquefied petroleum gas, with which these fertilizers have comparable relationship because of their gaseous pressure characteristics.

Our recommendation is confined to the quantitative phase with which it is the main prerogative of this Conference to deal. In the development of legislation to cover fully all essentials entailed, other phases such as quality, grade, storage, transportation, distribution, equipment, and safety factors, should, and probably will, be given full consideration by the various State jurisdictions in setting up their laws and regulations to govern these fertilizers.

Evidence of the necessity for safety provisions is found in the fact that anhydrous ammonia contains 82 percent nitrogen by weight and is a substance that vaporizes at minus 28° F and exerts a pressure of 114 pounds per square inch at 70° F and 200 pounds per square inch at 100° F. The time for regulatory action on these liquid chemical fertilizers is *now*. This we recommend.

MR. WOODWARD: Since the reference temperature of 60° F, vapor pressure corresponding to 93 pounds per square inch, is standard in the industry, and since all published tables since the beginning of the industry in 1928 are corrected to 60° F, I would suggest that the Committee recommendation be amended to read "with temperature corrected to 60° F."

MR. BAUCOM: Although the reference temperature of 68° F was arrived at in North Carolina after consultation with representatives from the Grange, the Farm Bureau, the Department of Agriculture, and the Board of Agriculture, I am willing to recommend that we amend the Committee report according to Mr. Woodward's suggestion and thus be in line with current industry data.

MR. J. T. KENNEDY: Although I subscribe in general to the Committee recommendation, I feel that that part which has to do with the furnishing of delivery tickets is, in general, beyond the scope of this particular committee.

(After additional general comments by Mr. Woodward, Mr. Rogers, Mr. Baucum, Mr. Morgan, and Mr. Kennedy, the Committee recommendation, as amended, was adopted.)

2. *Inert Liquid Fertilizers*—This item was retained by the Committee for further study.

(The Committee Report made the following recommendation: "Shall be sold by volume based on the United States standard gallon of 231 cubic inches, its multiples and binary submultiples, or by avoirdupois net weight.")

(Following the introduction of this item, considerable discussion ensued. Comments by Mr. Woodward, Mr. Thomas, Mr. Brenton, and Committee Chairman Rogers brought out that the item title was not sufficiently definitive and that temperature should be stipulated when pressure is the determining factor of a recommendation.)

(Upon a motion from the floor, the Conference voted that this item be retained by the Committee for further study.)

3. *Preheated Fuel Oils*.—Shall be sold by determined net weight or by volumetric measurement based on the United States standard gallon of 231 cubic inches, its multiples and binary submultiples, the said measurement to be corrected to 60° F.

When sold on the basis of volumetric measurement, determined by the certified capacity of a vehicle tank compartment, the vehicle tank compartment and the piping shall be so designed and constructed and shall be so mounted upon the vehicle that complete delivery shall be made from any compartment through the delivery faucets.

(As recommended in the Committee Report, the second paragraph of this item read as follows: "When sold on the basis of volumetric measurement, determined by the certified capacity of a vehicle tank compartment, the fuel tank and the piping shall be so designed and constructed and shall be so mounted upon the vehicle that complete delivery may be made from any compartment through the delivery faucets." This wording was amended upon motion from the floor to read as above.)

NOTE: In 1946 the 32d National Conference on Weights and Measures adopted a recommendation of this Committee which read as follows:

*Preheated Petroleum Products*. Should be sold by determined net weight, and serialized delivery tickets containing proper information as to quantity, and identification of the seller and buyer should be issued to the purchaser and a copy retained by the dealer.

The Committee further recommends in this connection that in jurisdictions having weighmasters, official certification be required on the prescribed tickets.

The subject of preheated oils thereby was treated in a general way, such treatment including oils of all classifications whether intended for use as fuels or for other purposes, as, for instance, preheated asphalt oils so extensively employed in road maintenance operations.

Notwithstanding the action already taken, the subject was reopened at the 36th National Conference in 1951 with specific reference to fuel oils, and, by vote of that body, was referred back to the Committee on Methods of Sale of Commodities for further study and report.



Our further explorations over the past two years have produced little to change our views as first presented. The sole purpose in this, as with other issues, is to find the safest, simplest, and most determinative way in which a commodity should be sold. The nature of the oils under consideration is such that, when they are sold by volumetric measurement, inconsistencies in quantity values are quite pronounced because of the variable factors of temperature changes, viscosities, and specific gravities. All of these variables have their effect and must be taken into consideration in arriving at quantitative determinations based on the 60° F. reference temperature employed by the petroleum industry. The process lacks the simplicity that is to be found in the weight method of determination, which, in our considered opinion, best can serve the interests of all concerned.

The industry probably will demur at the proposed change in methods, but is it any more unreasonable to require a dealer in liquid fuel to provide himself with a scale than it is for a dealer in solid fuel? However, the proposal entailed in our recommendation would not impel this. It would require representation by weight, and the scale would be the safety factor for the purveyor. The dealer would be charged with the responsibility of assuring weight accuracy, whether his determinations were made by conversion from volumetric measurement or by actual weighings. The change in methods probably would affect the wholesale level more than it would the retail level as presently constituted. Many retailers now combine the sales of liquid fuels and solid fuels in their enterprises. The prevailing competitive fuel situation has compelled this in numerous instances; consequently, such dealers are equipped with scales and would be little affected by the change.

There recently have been some experimentations at the wholesale level of the industry in the metering of preheated oils. This, of course, necessitates the heat-jacketing of meters for workability. A member of this Committee participated on one of these initial operations where comparisons of volume with weight were made. The results of quantity determinations by measurement and by weight in this project, while not in agreement, were not too far apart, and metering would, therefore, appear to have favorable possibilities. This was a bulk station operation where metering was feasible by reason of the facilities and type of installation provided. The method, if it finds general adoption within the industry, probably will be confined at present to such locations and installations. Metering of preheated oils from tank trucks at the retail level is quite another thing, and would appear to present greater problems and difficulties. Safety factors in relation to auxiliaries for the heating of meters must be considered among other things which may militate against the use of meters for these oils at this level of the trade.

In consequence of the further consideration that has been given this subject and that nothing has been offered this Committee to discredit the soundness of our recommendation as adopted by a former Conference, we maintain it in substance and principle and advocate that it stand as a completed action of this body. At the same time, we realize, of course, that there may be meritorious future developments to justify an altered opinion, but, until these transpire, we believe that the weight method of sale for preheated fuel oil and other oils in this category should be invoked.

(The Committee recommendation, as amended, was adopted.)

4. *Peat Moss*—Shall be sold on the basis of cubic contents, and packages shall be marked in terms of cubic feet and/or cubic inches.

There shall be an allowable tolerance in cubic content not to exceed 3 percent of the stated package volume. Packages shall be marked with the name and address of the producer or packer.

NOTE: This controversial subject is another holdover from the last Conference, when an initial attempt was made to formulate recommendations that would establish proper regulations as to methods of sale for this commodity.

The original thought of this Committee was that we could treat the subject of peat moss in a general way and with a single recommendation. In further exploring the subject, it became apparent that this is not feasible, due to the various classifications of the substances that are marketed under the general term "Peat Moss." In our considered opinion, this is, in many instances, a misnomer by reason of the fact that many of the products represented and



sold as such are really not a moss at all, but other types of decomposed or semicarbonized vegetation, such as sphagnum peat, sedge peat, hypnum peat, leaf mold, and humus top soil. What we have really dealt with in our proposed method of sale is the peat which is a true moss derivative and which, under its proper definition, is the only one to which the designation "peat moss" properly applies.

MR. SWECKER: I am appearing here by the direction of the executive secretary of the American Rose Society, an organization having its headquarters in Harrisburg, Pa., with 13,000 members throughout the United States. Members of the American Rose Society are very much interested in this subject because they use a very large quantity of peat moss in the growing of roses. Nearly all of these members are amateur rose growers but they use peat moss in large quantities.

In the interest of rendering its members a service, the American Rose Society would like to urge the National Conference to make a thorough study of the methods in question in order to arrive at a standard method of sale which will assure fairness in measure to the consumer and not unfairly burden the seller. We are not at this time in a position to recommend a method of sale but we do wish to invite the attention of the Conference to the great variation in the character of the several methods. This variation is, in itself, sufficient reason to preclude the application of any known single method of selling all of these products in like manner to the so-called Michigan peat moss, which is vastly different in character and chemical reaction from each of several other products known as soil sponge, etc. It is our opinion that these products are humidified peats, capable of typical reactions within the soil which are associated commonly with humus particles when intimately co-mixed with the soils.

The origins of these products differ, as do the degrees of decay. Thus are created properties which will not enable all of the products to be sold in one single method. The American Rose Society, therefore, does recommend that the National Conference on Weights and Measures first establish definitions and standards of identity for the various peat products known to commerce and then provide for their sale by methods appropriate to the specified product. We do suggest that perhaps the products commonly sold as peat moss, peat humus, sphagnum peat, German peat, etc., could be identified by the nature of their origin. For instance, certain of the foregoing are known to be peat derivative products. Others are known to be of sphagnum origin, and still others are a type of processed peat.

It appears at this time feasible to identify the various peat products. When such identification is established, it further appears practical to stipulate methods of sale for the several products. I regret that I was not informed of the hearing by this committee earlier this week and did not have an opportunity to appear there and present the views of the American Rose Society. We feel that the general treatment in this way of the general subject of peat moss is not adequate to deal with the various types of peat moss that are customarily sold.

MR. M. T. GRAHAM: As a matter of record, the Federal Trade Commission has specified the rules for marking all peat products, and they must be marked "Peat Moss" or "Peat Moss Sphagnum." Peat moss is a peat formed in the decay of sphagnum moss, etc. The market product is peat moss and must be so marked. That is part of the Federal Trade Commission's directive.

As a matter of practice, we are suggesting that these products be sold on a cubic measure basis.

MR. J. T. BELL: We produce and sell about a million bales of peat moss a year. Peat moss can be compressed anywhere from 2, to  $3\frac{1}{2}$ , to 1, and, when you release the pressure or when it comes out of the bale, it resumes approximately 70 percent of its original volume. However, due to the different methods of processing, the amount of resiliency varies. We have decided to sell it by measure. However if anyone else wants to sell by weight, there is nothing to stop them. To give fair measure to the customer, they should also indicate the volume. It is the volume that counts, and not the weight. A bale of dry peat moss weighing 100 pounds could be increased by wetting up to 800 or 900 or 1,000 pounds. I suggest very strongly that the motion be adopted as recommended by the Chairman.

MR. SWECKER: One gentleman spoke of the Federal Trade Commission's requirements that each package of peat moss be labeled as to origin. Average rose growers who order a bale of peat moss or a bag of peat moss simply specify a bale or bag of peat moss and pay no attention to the origin of the product. Nevertheless, the origin does have a great deal to do with whether you are getting your money's worth. I notice one thing more about this provision. It states that peat moss shall be sold on the basis of cubic content; packages shall be marked in terms of cubic feet and/or cubic inches. I don't know what that means. Does that mean compressed content or loose content? How are you going to determine how much loose content you are going to have? It would not seem to me to mean a great deal because you could make your bag or bale of peat moss any size you want according to how much the product is compressed, how loose it is, or how much moisture it has, and it would seem to me this method would not give the customer much protection.

MR. ROGERS: Don't you believe that competition will pretty well take care of that? The buyer will decide that the next time he buys he is going to shop around and find a place that will give him a more compact article. It is difficult to establish this ratio pressure.

MR. SWECKER: I am in favor of some kind of control, but I don't believe this is going to solve the problem at all.

MR. BELL: I would like to say that we have studied this problem at great length and perhaps if anyone should know whether the problem can be solved completely we should. We could not find a complete solution to the problem. The only thing we can do is this, if we have a bale of peat moss which measures 7 cubic feet in the bale the customer gets 7 cubic feet at least. In our case we feel we give them more because it usually expands to about 40 cubic feet, but in any case we give the customer what he has bought, namely 7 cubic feet of peat moss.

(The Committee recommendation was adopted.)

5. *Rope (all types and classifications)*—Shall be sold by standard net weight or linear measure. When packaged in any manner, the package must be marked with the weight or linear measure of the rope, the weight to be either the net weight or the gross and tare weights.

NOTE: A slight furor was caused recently by a proposed Federal specification to accept gross weight as the basis of sale for sisal rope. The negative reaction of the weights and measures authorities of the various States seems to have been quite positive in relation to this.

The 31st National Conference in 1941 adopted a recommendation of the Committee on Methods of Sale of Commodities that twine and cordage should be sold by standard net weight or linear measure. Rope would seem to fall quite definitely within that category, but, in order to clarify this and to remove all question or doubt, this Committee now recommends the foregoing.

(The Committee recommendation was adopted.)

6. *Seeds (agricultural, horticultural, and floricultural)*—Shall be sold by avoirdupois net weight, and, when in package form with contents exceeding  $\frac{1}{4}$  avoirdupois ounce, the net quantity shall be declared on the container.

NOTE: This recommendation generalizes on the seed subject to include all classifications. The 33rd National Conference of 1947 took action on garden seeds and grass seeds under these specific designations as presented in Items 8 and 9 of this Committee's report of that year. Your Committee now deems it advisable to expand the recommendations as to proper methods of sale in order to remove all doubt of our intentions and to be consistent in relation to quantity regulation for seeds of all kinds. Representations that reached the Committee from various sources within the seed trade since our original action was taken on this issue influenced our reconsideration and the consequent proposal we now offer.

This recommendation is designed principally to eliminate the so-called "gross for net" method of sale for seed which has been a long prevailing custom, mainly employed at the wholesale level. Under this method, the retail dealer pays for the bag or other container at the price of the seed. When there was a parity in values between the container and its weight in seed, "gross for net" was accepted by the retailer with little if any objection. Conditions have changed. Seed prices have gone soaring. The value of the seed as compared with the container is now far out of balance, and the retailer strongly demurs because of the appreciable losses he sustains through the method of sale imposed upon him. With exceptions that are repressed by weights and measures supervision as they arise, there is little difficulty experienced at the retail level, where sale by net weight is now the prevailing custom. It should prevail in all segments of the industry. Wholesalers cannot justifiably be excepted, regardless of their handling problems of preparation, storage, and packaging. Their problems are common to all engaged in enterprises dealing in products of the soil. Equity in seed transactions straight through from the wholesaler to the consumer can only be established and maintained by a uniform method of sale based on a sound and ethical principle of trading, which in this instance is the net-weight method that we recommend.

There is another phase of the seed situation that may require specific treatment. This relates to the trade in small packages, which this Committee will further explore with the purpose of reaching conclusions as to whether the minimum of  $\frac{1}{2}$  ounce, as prescribed under general net-weight requirements to define what constitutes a package entitled to exemption from marking, should be reduced, and also whether another method of marking should be invoked for certain seeds that have values greater than gold.

(The Committee recommendation was adopted.)

7. *Pickles and Pickle Products in Package Form*—Shall be sold by drained net weight.

(The Committee Report contained the recommendation "PICKLES (cut, chopped, or viscous) should be marked by volume or drained net weight." This recommendation was amended on motion from the floor.)

(Following the presentation of this item, considerable discussion was entered into by the delegates. Comments and explanations developed the amendment which was offered by Mr. Blickey. Mr. Rowe stated that the regulations of the Federal Food and Drug Administration provided for sale of pickles by drained weight as well as by volume, and further that, under the Food, Drug, and Cosmetic Act, all such declarations of content must be accurate and in terms which are understandable to consumers.)

(The Committee recommendation, as amended, was adopted.)



## 8. *Ice Cream*

NOTE: It was recommended to this Committee that this subject be revived. Our original recommendations for methods of sale of ice cream and related frozen products are of record as having been adopted by the 32nd National Conference in 1946. References to this subject are to be found in Item 2, page 28 of the printed report of the Conference for that year.

This Committee has nothing further to add in this connection at this time other than the observation that progress has been slow in establishing sale-by-weight for such commodities. Notwithstanding this, there has been a decided trend in various areas, on the part of dealers at the retail level, to adopt this method of sale for bulk ice cream. They seem to have taken the matter into their own hands, even without laws or regulations to compel them. This, however, apparently has had no effect upon the major ice cream interests, who continue to oppose weight legislation for their products.

Our purpose of including this topic again is, therefore, in deference to the opinion of Conference members that this subject should be kept alive because of its importance as a commercial issue.

(The Report of the Committee on Methods of Sale of Commodities, as amended, was adopted by the Conference.)

(The Conference was adjourned, to reconvene on Friday, May 22, 1953, at 9:30 a. m.)

## SIXTH SESSION—MORNING OF FRIDAY, MAY 22, 1953

(F. M. GREENE, Vice President, presiding)

### REMARKS OF ROBERT WILLIAMS, SEALER OF WEIGHTS AND MEASURES, NASSAU COUNTY, NEW YORK

(Mr. Williams explained the operation and described the advertising of certain "frozen food plans." He stated that price-per-pound advertising of large portions of beef is sometimes misleading because of losses in trimming and preparing the meat. Mr. Williams explained that a customer might purchase a quarter of beef weighing a certain number of pounds at a price which seemed to be well below the retail price. Upon receipt of the meat, the customer learned by weighing the packages that the quantity delivered was substantially less than was represented. This loss was explained by the vendor as being due to trimming—an explanation difficult to refute or to check.

Three successful prosecutions of operators of the plans were related by Mr. Williams, who stated further that a plan of buyer education through public speaking is effective against dealers who would make false advertising claims.)

### PERFORMANCE OF INSPECTORS AND GASOLINE PUMPS

By W. J. YODEN and M. W. JENSEN, *National Bureau of Standards*

The immediate result of any tests or scientific research is a group of numbers. The value of the data thus obtained depends upon the proper interpretation of these numbers. The Statistical Engineering Section of the National Bureau of Standards is frequently asked to give statistical consideration to data obtained in a very wide variety of tests and experiments.

At the direction of the 37th National Conference on Weights and Measures the Specifications and Tolerances Committee designed and planned a series of tests on retail gasoline dispensing devices. The survey included full-flow tests on drafts of 1, 5, 10, and 15 gallons, and 5-gallon per minute tests on 1-, 5-, and 10-gallon drafts. Members of the Office of Weights and Measures of the Bureau have interpreted for the Committee the data obtained in the survey. Important portions you will find in the Tentative and Final Reports of the Committee. This paper discusses some of the difficulties that arise

in the interpretation of these data and suggests a method of reaching a conclusion.

The analysis of any group of measurements consists of searching for facts in the data. A statistician will make statements which, though puzzling to the layman, have definite meanings in statistical computations. For example when a man tells you that he has delivered 5 gallons of gasoline into the tank of your automobile, he means that the quantity is, for all practical purposes, 5 gallons. If he said that he had delivered 1,155 cubic inches, there is the implication that the volume is, to the nearest cubic inch, 1,155 cubic inches.

A statistician has at his disposal various formulas and techniques. He uses these to make certain predictions as to the behavior of numbers.

Since the 5-gallon draft is the normal test on gasoline pumps, we have analyzed the results of the 5-gallon full-flow portions of the special tests. Such an analysis is of importance, even though the tests have taught us that a pump can be within tolerance on the 5-gallon test and still fall outside the limits on a different size delivery.

Our formulas tell us that a normal distribution of measurements should furnish us with results which are predictable. In the case of a group of 923 measurements with a scattering or spread such as was obtained on the 5-gallon tests, we can predict and the data confirm, that, 2 out of 3 of the tests will be within 4 cubic inches, 19 out of 20 of the tests will be within 8 cubic inches, and 99 out of 100 of the tests will be within 10 cubic inches.

These predictions are based upon a computed "standard deviation"—a term familiar to some of you and a term that others of you might want to learn about.

These statements give a picture of the kind of scatter commonly exhibited by physical measurements. The term "scatter" will be used a number of times in this discussion, and in order that we may have a common understanding of it, suppose you consider what happens when a large number of pennies are tossed at a line. Of course, most of the coins will come to rest near the line, but some will bounce or roll and stop some distance on either side of the line. Obviously, the greater the distance from the target line, the fewer pennies we would find. This is an example of "scatter" as we use the term.

Table 1 shows a tabulation of the results of the 923 5-gallon tests obtained during the special survey. By simple computation we learn that the average error for all of the 923 pumps, on a 5-gallon test at full flow, is  $-1.4$  cubic inches. This average error is computed by adding up all of the gage readings, taking due notice of the signs, and dividing that total by the number of pumps.

When we apply the standard statistical formula to this data we learn that these measurements do behave as we have predicted, so we are justified in considering them in search of further information.

The principal purpose of the special tests was to learn the performance characteristics of these devices, with regard to legal tolerances. Another look at our table 1 and we find that all but 62 pumps performed within the current tolerance of  $\pm 7$  cubic inches on 5 gallons. It appears obvious that, if a smaller tolerance on a 5-gallon test is to be imposed, more of these pumps would be rejected. Only

a reduction in the scatter of the measurements can prevent an increase in device rejection.

We have determined that the grand average of our 5-gallon tests was  $-1.4$  cubic inches. This indicates that the pumps must have been adjusted to a slight minus delivery, and it could be advanced that a change in tolerance would lead to the disappearance of this minus tendency.

For the purpose of our study we can remove the minus tendency merely by adding 2 to each of the cubic-inch figures. This has the effect of shifting the data along the scale without disturbing the scatter. After adding the 2 cubic inches to each figure,  $-7$  becomes  $-5$ , and so on until  $+3$  becomes  $+5$ . Considering a limit of  $\pm 5$  cubic inches, we add the pumps beyond our adjusted  $\pm 5$  and find that we have 103 devices with errors greater than  $\pm 5$  cubic inches—rather more than 1 pump in 7, or more precisely 15.4 percent.

This would be a high rate of rejection, and the problem that confronts us is the possibility of reducing this percentage. Various opinions may exist as to the solution of the problem. The data in table 1 will not, by themselves, supply the answer.

Suppose we consider for a moment a large number of pumps, all adjusted as carefully as possible to zero error. Once these pumps are sealed certainly no one will maintain that all the pumps are exactly right. Indeed, if the manufacturers, or service personnel, possessed any special device for measuring a 5-gallon delivery without error, this device would be adopted by weights and measures personnel. As a matter of fact, the service men copy the equipment and methods of the inspectors. If the pumps could be set precisely at zero and if the inspection tests were without error, then we might expect that the vast majority of the pumps, now spread over 14 cubic inches in table 1, would be bunched in around zero and  $\pm 1$  cubic inch. How does the observed scatter come about? How much of it is attributable to the setting, and how much to the testing of the pump?

TABLE 1. *Tabulated results of 5-gallon, full-flow portion of special tests on retail gasoline pumps*

Cubic inches	Number of devices	Cubic inches	Number of devices
0	110	+1	49
-1	78	+2	74
-2	133	+3	13
-3	76	+4	36
-4	116	+5	20
-5	49	+6	20
-6	69	+7	4
-7	14	+8	6
-8	18	+9	4
-9	7	+10	6
-10	8	+11	0
-11	3	+12	2
-12	1	+13	0
-13	0	+14	1
-14	0	+15	1
-15	1	+16	1
-16	1	+17	2



It would seem plausible enough to expect that the larger share of the responsibility rests upon the servicemen in their adjustments than on the natural wear of the device. If the adjustment error can be reduced, the scatter of the data should be likewise reduced; but it must be admitted that pumps cannot be set more accurately than they are tested. If this were possible, surely the inspectors would adopt the methods of the servicemen.

We are led to a simple method of attacking the problem. If we can determine the scatter that arises in testing, we know that at least an equal amount must be present in the setting, or adjusting, of the pumps. What is observed in table 1 is the combined scatter from both adjusting and testing. If we can separate the scatter arising in testing the pumps, we may attribute an equivalent additional scatter to the servicing.

Most people probably have some opinion of the accuracy of the inspection tests. The measurements can be recorded to the nearest cubic inch, and inspectors have no trouble in repeating a 5-gallon test and getting results that differ by no more than 1 cubic inch. However, this by no means reveals the real errors due to inspection. It is easy to get two readings from the same pump to agree closely when they are taken in immediate succession. Here we have the same operator, the same temperature, and the same test measure. What we need is the error between tests when a pump is visited and tested independently by different inspectors, at different times, with each inspector using his own field measure. That is exactly what happens when an inspector checks a pump, set earlier by another man with different equipment. It is unreasonable on the face of it to expect the service adjustment to agree more closely with the inspector's test than inspectors can agree among themselves.

To obtain an idea of how much of the errors are chargeable to inspection, a small project was undertaken by the National Bureau of Standards, in cooperation with the Department of Weights, Measures, and Markets, of the District of Columbia. Four teams of two men each were formed, each team having a Bureau man and a District of Columbia man. These four teams tested six different gasoline pumps, using standard procedure for 5-gallon tests at full flow. Each of the two men on a team conducted a 5-gallon, full-flow test independently and each read his gage independently; however, the two men on a team used the same field standard. The 48 tests were repeated by the same teams, on the same six pumps, 3 days later. The entries in table 2 show, for each of the 96 readings, the number of cubic inches over or under zero error on the individual 5-gallon tests.

There are 16 readings for each of the 6 pumps. The bottom row of the table shows that the readings for four of the pumps were spread, from lowest to highest, over 4 cubic inches; the readings for the other two pumps differed as much as 3 cubic inches. The setting of the adjustments of the pumps cannot be held in any way responsible for this scatter in the readings, because all 16 readings were taken on the same pump and over so short a time that no sizable mechanical change in the device should be expected.

What should not be forgotten is that there must inevitably exist a variation in the actual setting of a pump of at least the magnitude shown by this scatter among the readings for any one pump. Put another way, an attempt is made to set pumps to deliver the correct values. There will be some differences in the values actually set.

TABLE 2. *Gage readings, in cubic inches, on 5-gallon, full-flow drafts—special NBS-D.C. gas-pump project*

[6 devices, 8 inspectors, 2 days]

	Gasoline pumps					
	1	2	3	4	5	6
<i>Tuesday p. m.</i>						
Inspector A .....	-1	+2	0	0	0	0
B .....	-3	0	-1	0	+1	0
C .....	0	+2	0	+2	+2	+2
D .....	-1	+2	0	+2	-1	+2
E .....	+1	+2	+1	+2	+3	+1
F .....	-1	+1	-1	+2	+2	0
G .....	-1	0	-2	-1	+1	+1
H .....	-3	+1	-2	+1	0	-1
<i>Friday a. m.</i>						
Inspector A .....	-2	+1	0	-1	+1	-1
B .....	-3	0	0	0	0	0
C .....	-1	+4	0	0	+1	+2
D .....	+1	+3	0	+1	+2	+1
E .....	0	+3	-1	+2	0	+2
F .....	0	+3	0	+2	+2	0
G .....	-1	+1	0	-1	+1	+1
H .....	-1	+2	0	+1	+1	-2
Spread of readings .....	4	4	3	3	4	4

An inspector tests a pump which is, in fact, off by some amount; and therefore the result of a test on the device includes not only the error in setting or adjusting but an additional error of the inspector who conducted the test.

It is easy to identify in these data some of the principal sources of error: Each man drew a total of 60 gallons from the same 6 pumps. The averages for the men per 5-gallon delivery are as follows:

Team	Field standard	Error for test—	
		1	2
1	A	-0. 08	-0. 50
2	B	+1. 17	+1. 00
3	C	+1. 33	+0. 83
4	D	-0. 08	-0. 25

It is clearly the case that men on the same team agreed very well and that there are larger differences between men on different teams. The two men on a team used the same field measure and ran their tests at nearly the same time; thus the difference between teams is explained as the slight differences among the gage settings on the standards, combined with the slight changes in the pumps, hose expansion and the like. There is very little difference between the days. The 48 readings made on Tuesday afternoon showed an average per five gallons of  $+\frac{1}{2}$  cubic inch, as against the Friday morning readings, which indicated an average of  $+\frac{1}{2}$  cubic inch. Time did not permit a schedule that would include a pronounced shift in temperature.

From one point of view the table appears to indicate that these devices can be operated and tested within very small limits. Here are 96 readings, and only one as large as +4 cubic inches. All readings are within  $\pm 5$  cubic inches. It happens, however, that all 6 pumps were very close to being correct. How do we know this? There are 16 readings on each pump, and the pump *average* taken for the 8 men, 4 standards, and 2 days, in large part, has lost much of the scatter due to testing, because these 16 measurements tend to compensate one another. The averages per five gallons for the 6 pumps, for 80 gallons drawn, are -1.0, +1.7, -0.4, +0.8, +1.0, and +0.5.

Notice that the first pump, with its adjustment off, in fact, by only one cubic inch was charged as being off by 3 cubic inches in 3 of the 16 tests on it.

No one would be satisfied to assess the contribution of test measures, temperature, operators or devices, on the basis of just four test measures, two different times and eight men used in this study. A few repetitions of this or a similar program in different parts of the country would supplement the extensive data on pumps obtained in the special survey and in this small project, and thus permit us to estimate just how accurately we can expect gasoline pumps to be adjusted and tested.

In the absence of adequate information many will rely on personal experience and observation. Disagreements will arise because men have different experiences and place their own interpretations upon their experiences.

One way to handle any question without involving personalities is to put the question to someone not connected with the issue. This sounds fine until it is pointed out that a person with no acquaintance with the problem probably is unqualified to answer the question. If he is qualified, he probably has some personal interest in the question. There is a way out of this dilemma. The question may be framed in abstract terms and then put to the disinterested party.

Suppose we could obtain a firm estimate of the accuracy of testing. It would suffice to know, for example, the average difference between the readings on the same pump when visited at different times by two inspectors each using his own test measure. This information could be obtained by arranging for each of 100 pumps to be visited separately by 100 pairs of inspectors.

We don't know what this average would be, so let's call it X cubic inches. We know that the average error in setting a pump must be at least as large as the average error in testing.

Now for the question; and you can put it to any qualified statistician in the country and get the same answer every time. The question is: Suppose this average difference between readings is 1, 2, or 3 cubic inches, for each of these values, what percent of the devices would yield readings (obtained by the inspectors) that fall outside the tolerances of five cubic inches, seven cubic inches, or any other value? The answers to this question are tabulated below in table 3. Once you know the testing error you will be able to select the proper line in the table and come to a decision regarding the choice of tolerance limits.

The table shows that when the average difference is small nearly all the readings stay within the listed tolerances. As the testing error increases, more and more of the devices will appear to be outside the tolerance. Remember that these percentages outside the



TABLE 3. *Entries show the percentage of devices that will fall outside various tolerances, depending upon the accuracy of testing*

Average difference in cubic inches between readings of two inspectors	Percentage of devices that will fall outside the limits of			
	$\pm 2\frac{1}{2}$	$\pm 3\frac{1}{2}$	$\pm 5$	$\pm 7$
1 cubic inch.....	4.6	0.5	0.0	0.0
2 cubic inch.....	31.6	16.3	4.6	.5
3 cubic inch.....	50.6	35.2	18.4	6.2

limits do not include devices that fall outside because of wear, gross blunders in setting or testing, or through tampering by the owner. It is up to you to decide how often it is reasonable and proper to require the reservicing and retesting of pumps in which none of the last-mentioned causes are operative.

MR. AINSWORTH: Dr. Youden, on the basis of table 2 data, could you estimate an average between inspectors?

DR. YODEN: This is the sort of question that is proper to address to a statistician. Before I answer, may I state that the average difference between two inspectors will be one thing, whereas the average difference between the lowest and highest of a number of inspectors will be greater. Any estimate that I make at this time would be approximate. There might be two cubic inches, more or less, between two inspectors. More evidence would be necessary before I could make a definite prediction. I am quite confident that the result would fall within the limits of table 2.

MR. AINSWORTH: Would you be willing to limit the number to 1 to 3 cubic inches?

DR. YODEN: That would be my estimate.

MR. AINSWORTH: On the basis of the data that you examined, how much variation between readings on a single meter could you expect from one inspector?

DR. YODEN: I believe that successive readings made by one individual using one test measure on one meter would repeat within one cubic inch. Available data has supported that.

MR. AINSWORTH: Have we any data which would inform us as to the variation in successive tests on a single meter—variations chargeable to the meter itself?

DR. YODEN: This is something which probably could be answered out of the experience of people who work with these devices. I would expect some variance in the device itself. Among other things which might affect the accuracy of the device are temperature effects on the liquids and hose expansion as related to pressure and rates of flow. There is a position in this particular device where current inherent limitations will impose a barrier to legal performance requirements. There is not much point in requiring a device to test more accurately than it can maintain itself over a period of time.

MR. BAUCOM: Am I right in assuming that this study is based on human error?

DR. YODEN: Human error from two sources are an element to be studied in the establishment of legal tolerances. One person must set the device; he will not set it exactly correct. An inspector then tests the device; he also will err to a certain extent. The combination of these two errors will push a certain percent of the devices beyond the tolerance limits if those limits are too tight.

**REPORT OF THE COMMITTEE ON SPECIFICATIONS AND TOLERANCES,  
PRESENTED BY J. P. McBRIDE, CHAIRMAN**

Your Committee has held no general meetings during the year. There have been several occasions upon which two or more members of the Committee found it possible to get together for the purpose of discussing Committee problems. A meeting, held in Boston on October 23, 1952, was attended by Messrs. John P. McBride, Rollin E. Meek, and W. S. Bussey, and by representatives of the American Petroleum Institute and the Gasoline Pump and Meter Manufacturers Associations. The principal purpose of this meeting was to discuss problems relative to liquefied petroleum gas. Some of the details concerning the special gasoline pump survey also were discussed. Your Committee has continued to function through correspondence, not only among its members, but with representatives of affected industries, and with Conference members. This correspondence has covered various matters pertaining to specifications, tolerances, and regulations for commercial weighing and measuring devices. This Report, therefore, represents Committee conclusions in relation to matters referred to it by the 37th National Conference on Weights and Measures, and to those being brought to the attention of the Committee from other sources.

**LIQUEFIED PETROLEUM GAS**

Among the several items which have been referred to the Committee is the matter of appropriate specifications and tolerances for liquid-measuring devices used in the commercial quantity determination of liquefied petroleum gas. This has been a most difficult problem, and it is with exceeding regret that your Committee reports no substantial progress. It had been hoped that, as a result of the special meeting held in Boston, definite progress would be made.

The need for additional research and development in this field was pointed out by members of your Committee to industry representatives during the Boston meeting. The Committee feels that the need is to develop not only more accurate, but more simple and practical means for testing LPG measuring devices. To date, it has not been possible to get any such program of research and development under way.

Your Committee feels that it is the joint responsibility of industry and weights and measures administrators to develop the proper equipment and methods for testing commercial weighing and measuring devices. With this principle in mind, your Committee recommends that the 38th National Conference on Weights and Measures go on record as requesting that the meter manufacturing and petroleum industries, the National Bureau of Standards, and the various State and local departments of weights and measures cooperate in providing the necessary research and development in this field, in order that practical and accurate equipment and methods for testing these important devices might be developed. Until this is done, it is most difficult, if not impossible, for your Committee to prepare the necessary and proper amendments to the H44 code for liquid-measuring devices.

**WHEEL-LOAD SCALES AND AXLE-LOAD SCALES**

Your Committee has received several inquiries pertaining to the proper tolerances to be applied to wheel-load and axle-load scales

used in connection with the enforcement of highway load-limit laws. It was pointed out that currently the H44 scale code is not thoroughly clear on this point and that there was a possibility of several different interpretations. It might be interpreted that paragraph T.2.3.1. and table 9 would be applicable, or it might be interpreted that paragraph T.2.3.2. would be applicable, and possibly some people might contend that paragraph T.2.3.3. should apply. Insofar as your Committee knows, all weights and measures officials have been applying Paragraph T.2.3.2. Your Committee is in agreement with this interpretation, and, in order to make the code unquestionably clear and to avoid any possible misinterpretation, we offer the following recommendations to this Conference:

#### SCALE CODE

Amend paragraph D.1.11. to read as follows:

D.1.11. WHEEL-LOAD WEIGHERS AND SCALES; AXLE-LOAD SCALES.—Devices intended solely for official use in the enforcement of traffic and highway laws.

D.1.11.1. WHEEL-LOAD WEAHER.—A compact, portable scale specially adapted to determining the wheel loads of vehicles on highways.

D.1.11.2. WHEEL-LOAD SCALE.—A scale, installed in a fixed location, having a load-receiving element specially adapted to determining the wheel loads of highway vehicles.

D.1.11.3. AXLE-LOAD SCALE.—A scale, installed in a fixed location, having a load-receiving element specially adapted to determining the combined load of all wheels on any single axle of a highway vehicle.

Amend paragraph T.2.3.1. to read as follows:

T.2.3.1. FOR LARGE-CAPACITY SCALES EXCEPT LIVESTOCK, COAL-MINE, VEHICLE, WHEEL-LOAD, AXLE-LOAD, AND FREIGHT SCALES, WHEEL-LOAD WEIGHERS, AND RAILWAY TRACK SCALES.—Basic maintenance tolerances for large-capacity scales except livestock, coal-mine, vehicle, wheel-load, axle-load, and freight scales, wheel-load weighers, and railway track scales, on under-registration or on over-registration, shall be as shown in table 9; basic acceptance tolerances shall be one-half the basic maintenance tolerances.

Amend the caption of table 9 to read as follows:

TABLE 9.—Maintenance Tolerances for Large-Capacity Scales, Except Livestock, Coal-Mine, Vehicle, Wheel-Load, Axle-Load, and Freight Scales, Wheel-Load Weighers, and Railway Track Scales

Amend paragraph T.2.3.2. to read as follows:

T.2.3.2. FOR LIVESTOCK, COAL-MINE, VEHICLE, WHEEL-LOAD, AXLE-LOAD, AND FREIGHT SCALES.—Basic maintenance tolerances for livestock, coal-mine, vehicle, wheel-load, and axle-load scales, and for scales used exclusively in determining charges for freight transportation, on under-registration or on over-registration, shall be  $1\frac{1}{2}$  pounds per 1,000 pounds of test load on ratio tests and 2 pounds per 1,000 pounds of test load on weighbeam, reading-face, and unit-weight indications; basic acceptance tolerances shall be one-half the basic maintenance tolerances.

(The recommendation of the Committee was adopted.)

#### FARM MILK TANKS

The 37th National Conference on Weights and Measures directed the Committee on Specifications and Tolerances to prepare a tentative code on farm milk tanks. In drafting this code, the Committee has kept in mind certain basic principles. First, this is a weights and measures code, not a sanitary code. Those agencies and persons who are interested in the sanitary phase of this equipment have been consulted, and effort has been made to avoid anything which would conflict with current or contemplated sanitary requirements.



It must be understood that this code will become a part of National Bureau of Standards Handbook 44. The provisions of the general code in that handbook are applicable to farm milk tanks just as they are to other specific codes in the handbook.

For the consideration and action of this Conference, we present the following tentative code for farm milk tanks:

#### TENTATIVE CODE FOR FARM MILK TANKS

##### A. APPLICATION

A. 1. This code applies to farm milk tanks, as defined, only when these are used, or are to be used, under an express contract between the producer and the purchaser and on the premises of the producer, for the commercial measurement of milk or other fluid dairy product. If such measurement is accomplished by means of a fluid meter, this code does not apply; in such case the meter shall be subject to the applicable provisions of the code for liquid-measuring devices.

##### D. DEFINITIONS

D. 1. FARM MILK TANK.—A unit for measuring milk or other fluid dairy product, comprising a combination of (1) a stationary tank, whether or not equipped with means for cooling its contents, (2) means for reading the level of liquid in the tank, such as a removable gage rod or a gage tube, and (3) a chart for converting level-of-liquid readings to gallons, or such a unit in which readings are made on gage rod or gage tube directly in terms of gallons. Each compartment of a subdivided tank shall, for purposes of this code, be construed to be a "farm milk tank." (These units are variously known commercially as "farm bulk milk tanks," "farm cooling tanks," "farm holding tanks," and "producers tanks.")

##### S. SPECIFICATIONS

S. 1. DESIGN. (See also S. 2.4.)

S. 1.1. LEVEL.—A farm milk tank shall be in normal operating position when it is in level. The tank shall be equipped with suitable special means by which this level can be determined and established, such as a permanently attached two-way or circular level, a plumb bob, leveling lugs, or the like; or the top edge or edges of the tank shall be so constructed throughout as to provide an accurate reference for level determinations.

S. 1.2. DISCHARGE VALVE.—A farm milk tank shall be equipped with a discharge valve through which the tank may be completely emptied when the tank is in level.

S. 1.3. GAGE-ROD BRACKET.—If a farm milk tank is designed for use with a gage rod, a substantial metal gage-rod bracket shall be rigidly and permanently attached to the tank. The bracket and rod shall be so designed that, whenever the rod is placed in engagement with the bracket and released, the rod will automatically seat itself at a fixed height and will hang in a vertical position with a clearance of not less than 3 inches between the graduated side of the rod and the tank wall which it faces.

S. 2. INDICATING MEANS.

S. 2.1. GAGE ROD.—A gage rod shall be of metal and shall be of suitable and rigid design. When seated on its bracket, the rod shall not touch the bottom of the milk tank. The rod shall be graduated throughout an interval corresponding to at least the upper one-half of the tank capacity.

S. 2.2. GAGE TUBE.—If a farm milk tank is designed for use with a transparent gage tube, such tube shall have an inside diameter of not less than  $\frac{1}{2}$  inch and shall be open at its top end. At the inlet end of the tube there shall be a shut-off valve. Immediately adjacent to the tube there shall be permanently mounted a graduated metal scale extending throughout an interval corresponding to at least the upper one-half of the tank capacity. The graduated scale shall be so designed and mounted as to reduce parallax to a minimum.

S. 2.3. SPACING AND WIDTH OF GRADUATIONS.—On a gage rod or gage-tube scale, the spacing of the graduations, center to center, shall be not more than 0.0625 ( $\frac{1}{16}$ ) inch and not less than 0.03125 ( $\frac{1}{32}$ ) inch, and the graduations shall be not less than 0.005 inch in width. (See also G-S. 4.2.3. and G-S. 4.3.)

S. 2.4. VALUES OF GRADUATIONS.—On a gage rod or gage-tube scale, the graduations may be designated in inches and fractions thereof. In this case there shall be provided for each such rod or scale and each of the farm milk tanks

with which it is associated, a gallonage chart showing values in terms of gallons corresponding to each graduation on the rod or scale. If a rod or scale is associated with but one farm milk tank, in lieu of linear graduations, values in terms of gallons may be shown directly on rod or scale. Graduation designations shall increase from the bottom upward. The value of a graduated interval (exclusive of the interval from the bottom of the tank to the lowest graduation) shall not exceed 1 gallon for a tank of a capacity of 500 gallons or less, and shall not exceed 2 gallons for a tank of a capacity of more than 500 gallons.

S. 3. GALLONAGE CHART.—A gallonage chart shall show values at least to the nearest  $\frac{1}{2}$  gallon for a farm milk tank of a capacity of 500 gallons or less, and at least to the nearest 1 gallon for a tank of a capacity of more than 500 gallons. All letters and figures on a chart shall be distinct and easily readable, the chart shall be substantially constructed, and the face of the chart shall be so protected that its lettering and figures will not tend easily to become obliterated or illegible.

S. 4. INSTALLATION.—A farm milk tank shall be rigidly installed in level without the use of removable blocks or shims under the legs. If the tank is not mounted permanently in position, the correct position on the floor for each leg shall be clearly and permanently defined.

S. 5. IDENTIFICATION.—A farm milk tank and any gage rod and gallonage chart associated therewith shall be mutually identified, as by a common serial number, in a prominent and permanent manner.

## N. NOTES

N. 1. CALIBRATION.—Farm milk tanks shall be originally gaged and officially tested "to deliver."

N. 2. TESTING MEDIUM.—Water shall be used as the testing medium in gaging and testing farm milk tanks.

N. 3. GAGE-TUBE READINGS.—All gage-tube readings on a farm milk tank, whether during gaging, testing, or commercial use, shall be made to the top of the meniscus of the liquid in the tube.

N. 4. APPROVAL SEALS.—When a farm milk-tank installation is officially tested and approved, the gage rod and the gallonage chart, if these elements are utilized, as well as the tank itself, shall be suitably marked to indicate such approval.

## T. TOLERANCES

T. 1. MINIMUM TOLERANCE VALUES.—On a particular farm milk tank, the maintenance and acceptance tolerances applied shall be not smaller than one-half the value of the minimum graduated interval on the gage rod or gage-tube scale.

T. 2. BASIC TOLERANCE VALUES.—Basic maintenance and acceptance tolerances on under-registration and on over-registration shall be as shown in Table 1.

TABLE 1. *Maintenance and Acceptance Tolerances for Farm Milk Tanks*

Indicated gallonage	Tolerance
	<i>Gallons</i>
500 or less.....	$\frac{1}{2}$
501 to 1,000, incl.....	1
1,001 to 1,500, incl.....	$1\frac{1}{2}$
1,501 to 2,000, incl.....	2
Over 2,000.....	$2\frac{1}{2}$

## R. REGULATIONS

R. 1. LEVEL CONDITION.—A farm milk tank shall be maintained in level.

(An amendment was offered from the floor to change S. 2.3. SPACING AND WIDTH OF GRADUATIONS, to read "On a gage rod or gage-tube scale, the spacing of the graduations, center to center, shall be 0.03125 ( $\frac{1}{32}$ ) inch." This amendment was defeated and the recommendation of the Committee was adopted.)

## RECOMMENDATIONS OF THE SOUTHERN WEIGHTS AND MEASURES ASSOCIATION

Your Committee received from the Southern Weights and Measures Association three recommendations as follows:

1. We recommend that paragraph N. 1.2. on page 66 of Handbook 44, Testing Drafts for Wholesale Liquid-Measuring Devices, be amended by changing the word "should" to "shall" in the last sentence on page 66.
2. We recommend that paragraph S. 10.3. on Vehicle Tank Calibrations be amended to allow the use of more than one indicator.
3. We recommend that the tolerances on Wholesale Liquid-Measuring Devices be re-examined with the viewpoint of reducing the tolerance, both maintenance and acceptance, on metering systems delivering 100 gallons or more a minute.

In regard to the first recommendation, your Committee had this matter for consideration prior to the 37th National Conference. The Committee went so far as to include this same recommendation in the Tentative Report. However, after looking further into the matter and determining the availability of proper testing equipment in the various jurisdictions, this recommendation was deleted from the Committee's Final Report. Your Committee has made a nationwide survey on this point during the current year. Questionnaires were mailed to all State offices and to the larger city and county offices. Replies were received from 36 States, the District of Columbia, and Honolulu. Replies were received also from approximately 60 city and county departments. Nine States and the District of Columbia reported that they did possess adequate equipment for testing all wholesale liquid-measuring devices in their respective jurisdictions for one minute at full flow. Seven cities and counties reported that they have the necessary equipment for this purpose. This means simply that only nine States and the District of Columbia, plus seven cities and counties, in the entire United States, would be qualified to test legally all of these devices in their jurisdictions, were this recommendation adopted universally. It is the feeling of your Committee that, in those jurisdictions which do have the equipment to test all meters in accordance with this recommendation, it makes no difference whether or not the change is adopted. If a jurisdiction does have proper equipment, they will use it, whether or not this word is changed from "should" to "shall." On the other hand, those jurisdictions which do not possess this type of equipment could not conduct legal tests on devices which their respective laws direct that they shall test at least once each year. Your Committee is sympathetic to the thinking that prompted this recommendation; however, it is felt that present equipment does not justify the amendment. Therefore, the Committee recommends no action in this regard.

The second item recommended by the Southern Weights and Measures Association, pertaining to more than one indicator in a vehicle-tank compartment, has been submitted to the Conference previously and rejected. When the matter of recognizing vehicle-tank compartments as commercial measures of capacity was first suggested to the Conference, back about 1916, the Conference was hesitant. Many hazards are prevalent in connection with the use of these devices as measures. After much discussion and several years of investigation and consideration by the Committee on Specifications and Tolerances, a vehicle-tank code was adopted by the Conference. For the 29th National Conference in 1939, a proposal to allow more than one



indicator was prepared by the Committee. This was promptly rejected by the Conference.

There are a number of sound and logical reasons for limiting vehicle-tank compartments to one capacity only. At best, a vehicle-tank compartment is a crude measuring device. A vehicle tank is portable, and obviously it will not remain always in the same position of level. The springs on the truck or trailer involved, and various conditions of loading, also contribute to varying the conditions of level. The sensitivity and readability of these devices are not ideal. Vehicle-tank indicators necessarily must be placed inside the fill opening, and well below the top thereof. The greater the distance from the top of the fill opening to the indicator, the more difficult it is to read the liquid level; and the less sensitive the device. When multiple indicators are used, it is difficult, if not impossible, to comply with the sensitivity requirements in Paragraph S.10.4. of the vehicle-tank code. Also, there is always an opportunity for confusion and possible fraud when multiple indicators are used in these compartments. Your Committee does not feel that it is good weights and measures practice to allow the use of more than one indicator in a vehicle-tank compartment.

It has been pointed out that the use of multiple indicators in vehicle-tank compartments makes it possible for tank operators to comply with State highway load-limit laws. Your Committee feels that there are sufficient means available to tank operators to achieve this necessary goal under present regulations. This can be done in any of several ways. The tank can be so constructed that it can be operated with a certain compartment or compartments empty when the heavier liquids are being transported. Another very good way to cope with this situation is to employ meters to determine the quantity, and, therefore, not depend upon compartment calibration.

Your Committee is cognizant of the fact that several jurisdictions allow multiple indicators in vehicle-tank compartments. It is unfortunate that this could not have been avoided. Your Committee recommends that this Conference go on record as requesting the American Petroleum Institute to discourage, through its various members, the use of more than one indicator in a vehicle-tank compartment, and to urge that the present code be adhered to. The Committee has heard of instances where as many as four indicators have been allowed. Suggestions have been made for as many as eight indicators in a single compartment. Your Committee does not feel this is proper.

The Committee recommends no action on the recommendation.

The third recommendation of the Southern Weights and Measures Association, relative to a possible reduction in tolerances for wholesale liquid-measuring devices, has been given very careful and serious consideration. The Committee feels that it is inappropriate to recommend to this Conference a further reduction in the tolerances for wholesale liquid-measuring devices. As you are aware, the tolerances for these devices were reduced approximately 50 percent by the 34th National Conference in 1949. These reduced tolerances were a part of the codes as published in NBS Handbook 44. Furthermore, the survey which the Committee made relative to the proposed amendment in Paragraph N.1.2. proves conclusively that only a small percentage of the jurisdictions are equipped properly and adequately to do a thorough and complete job of testing wholesale liquid-measuring

devices. This is an additional reason why further reductions should not be recommended at this time.

Your Committee believes that there is a widespread lack of understanding of the purposes and uses of established tolerances for weighing and measuring devices. We all agree that tolerances are essential. It is impossible to attain perfection; however, the establishment of tolerances does not attest that all commercial equipment in a jurisdiction will be in error to the extent of the maximum tolerances provided. These tolerances merely establish the line of demarcation between "legal" and "illegal" equipment. If a device performs within the established tolerances, then its continued use is "legal." If it is in error in excess of these tolerances, it becomes an "illegal" device, and its continued use is prohibited by law. It should be the aim of every weights and measures official, device owner or operator, and maintenance mechanic to see that commercial weighing and measuring devices are maintained at as near zero error as is practicable, regardless of what the established tolerances may be. When repairs and adjustments are found necessary, it should be the constant aim to adjust each device to as near zero error as is practicable. Your Committee feels that, if all jurisdictions will thoroughly test wholesale liquid-measuring devices in accordance with the test procedures outlined in National Bureau of Standards Handbook 45, and apply the tolerances which are now provided in Handbook 44, this situation will be well under control and no further tolerance reductions would be necessary at this time.

#### GASOLINE PUMP TOLERANCES

The Southern Weights and Measures Association made a recommendation to your Committee prior to the 37th National Conference relative to an amendment to that portion of Table 1, Tolerances for Liquid-Measuring Devices, applying to retail devices. This recommendation was carried over for further study after extensive hearings immediately prior to the 37th National Conference.

During the months immediately following our last Conference, discussions were held with representatives of both the gasoline pump and petroleum industries. Special tests were designed and special report forms drawn. The cooperation of selected weights and measures officials from geographically representative areas of the country was solicited and received. Both the tests and the areas for testing were approved by both industries. It was agreed that designated representatives of the American Petroleum Institute and the Gasoline Pump Manufacturers Association would be present to participate in and observe all tests.

The tests required drawing a minimum of 95 gallons from each device, and were so designed that each draft at each rate of flow was repeated at least once, and that the results from these repeat drafts were required to verify the original results within stipulated and strict deviations.

The tests included both full-flow and five-gallon-per-minute drafts at 1, 5, and 10 gallons, and full-flow drafts at 15 gallons. All field standards employed were carefully calibrated immediately prior to the special tests.

Just over 1,000 gasoline pumps, of all makes, and of representative ages and conditions, and dispensing various brands and grades of products, were tested in locations representative of the temperature

and other climatic variations of the United States. The Committee is indebted to the many weights and measures officials, representatives of the industries, and gasoline service station operators who cooperated in this comprehensive survey.

The results of the tests were compiled, tabulated, and pictured graphically in the Office of Weights and Measures, National Bureau of Standards. Some of the most significant information is given below.

Since a very large majority of the testing of retail gasoline pumps is done at the 5-gallon draft, a detailed analysis was made of the 5-gallon tests. Considering only the 5-gallon tests both at full flow and at 5 gallons per minute, the following results were noted:

93.3 percent of the pumps tested were within the *current maintenance* tolerance at 5 gallons, full flow.

92.7 percent were within the *current maintenance* tolerance at 5 gallons, 5 gpm.

81.7 percent were within the *proposed maintenance* tolerance at 5 gallons, full flow.

80.3 percent were within the *proposed maintenance* tolerance at 5 gallons, 5 gpm.

While 7.3 percent of the devices tested were outside current maintenance tolerance on the 5-gallon test, 23.4 percent were outside the tolerance when all tests are considered. This indicates that approximately two out of every three pumps outside the tolerance at 1, 5, 10, or 15 gallons would have been sealed as correct if only a 5-gallon draft were employed.

The following information was derived from a study of all tests:

28.7 percent of the pumps tested were within the *proposed acceptance* tolerance on all drafts and at both rates of flow, although, as far as is known to the Committee, the maintenance tolerance would be applicable on all tests.

31.7 percent were within *current acceptance* tolerance on all tests.

69.2 percent were within the *proposed maintenance* tolerance on all drafts and at both rates of flow.

76.6 percent were within *current maintenance* tolerance on all drafts and at both rates of flow.

An additional analysis was made of the pumps which showed an error of 7 cubic inches on the 5-gallon test. Thirty-nine pumps were in this group, of which 29 (74.4 percent) were outside the *current maintenance* tolerance of 12 cubic inches on the 10-gallon test.

As a result of these special tests, two things became quite apparent. The gasoline pump used in retail trade has inherently two separate and distinct errors. (1) It has an initial error which occurs every time a draft is started with the register at zero. This error is not adjustable by means of the normal adjusting element. (2) It has a ratio or multiplying error which is definable as a certain error per gallon and which repeats and accumulates with the number of gallons in a draft. This error is adjustable by means of the normal adjusting element. These two unknown factors which affect the accuracy of the device can be determined by carefully conducted tests employing test drafts of at least three different quantities.

In a majority of instances, the initial error, which is not adjustable by means of the normal adjusting element, was in excess (over delivery). Since it is necessary to take up any existing play or loose-



ness and backlash in the various gearings before the register starts recording gallonage, this is to be expected.

This survey also revealed that the ratio error, which is adjustable by means of the normal adjusting element and which is reasonably controllable, was predominantly in deficiency (under delivery).

The composite or average of all the devices tested deliver, at full flow, plus  $\frac{1}{2}$  cubic inch at one gallon, minus  $1\frac{1}{4}$  cubic inches at 5 gallons, minus 4 cubic inches at 10 gallons, and minus 6 cubic inches at 15 gallons.

A hearing was held on Monday preceding the Conference. None of the 49 persons in attendance, representing the petroleum industry, the equipment manufacturers, and Conference members, spoke in favor of adopting the recommended change in tolerances.

One of the points stressed at the hearing was that, if officials adhered to the present code and also observed the expressed meaning of adjustment as set forth in G-R.4., satisfactory results could be accomplished under the present code. G-R.4. states, in part, "Whenever equipment is adjusted, the adjustments shall be so made as to bring performance errors as close as practicable to zero value."

The significance of the word "tolerance" also was discussed, and it was stipulated by the representatives of industry that they would direct their efforts, in their maintenance programs, to effect adjustments to as near zero as is practicable, whenever adjustments are made. It is the feeling of the Committee, from the data obtained, that this practice should be adopted in all States. If this practice were universal, satisfactory results would be attained under the current table of tolerances.

One point made at the hearing was in relation to test procedure. It was stated that, under certain conditions, tests should be made on drafts of different quantities. In addition to the normal five-gallon test, tests of one gallon, ten gallons, and possibly larger quantities, should be included. This is in line with the test procedure as outlined on pages 136 and 137 of NBS Handbook 45, as well as with the amendment adopted by the 37th National Conference to the Code for Liquid-Measuring Devices, N.1.2., Testing Drafts.

Your Committee recommends no change in Tolerance Table 1 of the Code for Liquid-Measuring Devices.

(The Report of the Committee on Specifications and Tolerances was adopted by the Conference. This action included adoption of amendments to the scale code and a tentative code for farm milk tanks. These will be printed as Correction Sheets to National Bureau of Standards Handbook 44 and may be obtained, upon request, from Office of Weights and Measures, National Bureau of Standards, Washington 25, D. C.)

## **REPORT OF THE NATIONAL CONFERENCE COMMITTEE ON RESOLUTIONS, PRESENTED BY JOHN E. MAHONEY, CHAIRMAN**

### **IN RECOGNITION OF AND APPRECIATION FOR THE LEADERSHIP OF DR. A. V. ASTIN**

Whereas, the National Bureau of Standards, under the direction of Dr. Allen V. Astin, has continued to render inestimable service and assistance to weights and measures officials and to allied business and industry; and

Whereas, the unique and outstanding progress in this vital component of our American way of life could not have been realized without such service and assistance, and

Whereas, Dr. Astin, like his predecessors, since the founding of the National Bureau of Standards in 1901, has exhibited keen interest and objective consideration of problems relating to weights and measures supervision; and

Whereas, the service of the National Bureau of Standards to weights and measure administration throughout the Nation has been outstanding during Dr. Astin's administration; Therefore, be it

*Resolved*, That this, the 38th National Conference on Weights and Measures does express its confidence in and appreciation to Dr. Astin.

#### **APPRECIATION TO OFFICE OF WEIGHTS AND MEASURES OF THE NATIONAL BUREAU OF STANDARDS**

Whereas, W. S. Bussey, Chief, and Malcolm W. Jensen, Assistant Chief of the Office of Weights and Measures, and their able and efficient staff have extended valuable assistance and guidance to the 38th Conference, for which the Conference is very grateful; Therefore, be it

*Resolved*, That this, the 38th National Conference on Weights and Measures, does appreciate such cooperation and assistance from the Office of Weights and Measures, National Bureau of Standards, and wishes to make this resolution a part of the records of this Conference.

#### **APPRECIATION TO THOSE PARTICIPATING IN PROGRAM**

Whereas, various committees, speakers, and individuals have given generously of their valuable time and efforts to make the 38th National Conference on Weights and Measures a success; Therefore, be it

*Resolved*, That the 38th National Conference on Weights and Measures does hereby record its grateful appreciation to all who have contributed to the success of the Conference.

#### **APPRECIATION TO COOPERATING OFFICIALS**

Whereas, the governing officials of the various States, counties, and municipalities, through their manifest interest in weights and measures work, have made it possible for their respective jurisdictions to be represented at this 38th National Conference on Weights and Measures; Therefore, be it

*Resolved*, That this, the 38th National Conference on Weights and Measures, does appreciate such cooperation and assistance and wishes to make this resolution a part of the records of this Conference.

#### **APPRECIATION TO MANAGEMENT OF HEADQUARTERS HOTEL**

Whereas, the management of the Wardman Park Hotel has done everything within its power to make our Conference a success; Therefore, be it

*Resolved*, That this, the 38th National Conference on Weights and Measures does express its warmest appreciation and thanks to the management of said hotel for their cordial hospitality and cooperation during our meetings; be it further

*Resolved*, That the Secretary of this Conference transmit a copy of this resolution to the management of the Wardman Park Hotel.

#### **APPRECIATION TO THE PRESS, RADIO, AND THE SCALE JOURNAL**

Whereas, the press and radio of the City of Washington have been generous in reporting the activities of our present meeting; and

Whereas, the Scale Journal has likewise been generous in publishing news and advance notices of our present meeting; Therefore, be it

*Resolved*, That this, the 38th National Conference on Weights and Measures, does hereby record its appreciation to the press and radio of the City of Washington and to the Scale Journal.

#### **APPRECIATION TO WASHINGTON BASEBALL CLUB**

Whereas, the Management of the Washington Baseball Club of the American League did furnish tickets for the baseball game to the members of this Conference; Therefore, be it

*Resolved*, That this 38th National Conference on Weights and Measures go on record showing our appreciation for this fine gesture, and furthermore, be it

*Resolved*, That our Secretary send the Washington Baseball Club a letter of appreciation from this Conference.

#### **ON INVESTIGATION FOR ACCURATE DETERMINATION OF AXLE LOADS ON HIGHWAY VEHICLES**

Whereas, the 37th National Conference on Weights and Measures recommended an extensive and scientific investigation into the entire field of testing axle loads to devise a method for accurately obtaining a determination of such loads,

Whereas, a method of accurately obtaining a determination of axle loads is vitally needed, and

Whereas, for fully ample and just reasons, no more than organizational plans and procedures for the study were developed during the past year; Therefore, be it

*Resolved*, That this 38th National Conference on Weights and Measures recommends and urges the National Bureau of Standards, in cooperation with the States, The U. S. Bureau of Public Roads, and the trucking industry, to complete the extensive and scientific investigation into the entire field of testing axle loads in order to devise a method of accurately obtaining a determination of such loads.

#### APPRECIATION TO INDUSTRY

Whereas, the representatives of industry by their support of the National Conference contribute materially to the accomplishments of the Conference, and

Whereas, the support from industry also expedites understanding and clarification of mutual problems; Therefore, be it

*Resolved*, That this, the 38th National Conference on Weights and Measures, expresses its recognition of and appreciation for the cooperation of industry and its manifest interest in developing adequate weights and measures administration.

#### APPRECIATION OF PUBLICATIONS

Whereas, the dissemination of weights and measures information and education is a field in which commercial publishing interests have not entered to any extent; and

Whereas, printed information and education is a necessary element in the efficient progress of any governmental function; and

Whereas, the personnel of the Publications Section of the National Bureau of Standards have been untiring in their efforts to make available, with both accuracy and dispatch, such printed material on this subject as is indicated essential; Therefore, be it

*Resolved*, That this, the 38th National Conference on Weights and Measures, does acknowledge and appreciate such aid and assistance, and wishes to make this resolution a part of the records of this Conference.

#### ON CONSOLIDATIONS OF WEIGHTS AND MEASURES ACTIVITIES WITH OTHER ACTIVITIES OF GOVERNMENT

Whereas, weights and measures supervision is both a responsibility of government and a protector of the people; and

Whereas, the technical requirements of weights and measures inspection are such as to demand continued study and attention; and

Whereas, it is known to this body that occasional efforts are being made to consolidate weights and measures administration with other inspectional activities of government; and

Whereas, this activity is of a special and technical nature and does not lend itself to combination with other diversified inspection activities; and

Whereas, the benefit of weights and measures supervision, both to consumers and to businesses and industries allied with the activity, is reduced by such consolidations; Therefore, be it

*Resolved*, That this the 38th National Conference on Weights and Measures desires to go on record as opposing such consolidations which are designed for economy but tend to bring about inefficiency through the loss of specialization and technical advance.

#### ON FUNCTION OF STANDING COMMITTEES OF CONFERENCE

Whereas, the several standing committees of the National Conference on Weights and Measures do much research and develop many worthwhile recommendations which are adopted by this Conference, and

Whereas, the eventual promulgation and enforcement of these recommendations by the several States, counties, and cities is most important to uniform and efficient weights and measures administration, and

Whereas, the President of this Conference has suggested that the activities of the several standing committees be expanded to include the furnishing of necessary leadership in bringing about the official adoption and enforcement of Conference recommendations, Therefore, be it

*Resolved*, That this, the 38th National Conference on Weights and Measures, go on record as authorizing the several standing committees of the Conference to include the furnishing of leadership as one of their regular functions.



Whereas, it is acknowledged by all that audio-visual aids are of supreme benefit in all fields of education; and

Whereas, both efficiency and true value of adequate weights and measures supervision are dependent upon education both of participating personnel and of the consuming public; and

Whereas, this is a problem nation-wide in scope and best solved by nation-wide consideration; Therefore, be it

*Resolved*, That this, the 38th National Conference on Weights and Measures, recommends and solicits the Federal Government, through its National Bureau of Standards, consider undertaking and instituting a project of planning, preparing, and making available to the several State weights and measures officers a series of motion pictures, in color and sound, said motion pictures to cover such topics as "Precision Calibration of Standards," "Value Versus Cost of Adequate Weights and Measures Supervision," "The Consumer's Interest in Weights and Measures Administration," "The National Bureau of Standards," and the like.

(Signed) JOHN E. MAHONEY, *Chairman*,  
C. D. BAUCOM,  
J. C. GOLL,  
M. O. NICKON,  
J. M. O'NEIL,  
W. H. ROBERTS,  
*Committee on Resolutions.*

(The report of the Resolutions Committee was adopted by the Conference.)

## REPORT OF THE NATIONAL CONFERENCE TREASURER

May 1, 1953

Balance on hand May 1, 1952----- \$1, 014. 03

### RECEIPTS:

May 23—Registration fees—1952 Conference 334	
at \$5.00-----	\$1, 670. 00
Interest accrued, May 1, 1952, to May	
1, 1953-----	16. 71
	<hr/>
	1, 686. 71
Total-----	<hr/>
	2, 700. 74

### DISBURSEMENTS:

May 20—23, 1952—	
Expenses of 37th National Conference-----	1, 506. 29
	<hr/>
Balance on hand May 1, 1953-----	1, 194. 45

(Signed) GEORGE F. AUSTIN, *Treasurer.*

(The report of the Treasurer was adopted by the Conference.)

## REPORT OF THE NATIONAL CONFERENCE COMMITTEE ON NOMINATIONS, PRESENTED BY C. A. BAKER, CHAIRMAN, AND ELECTION OF OFFICERS

The Committee submitted the following nominations for office in the National Conference to serve during the ensuing year, or until such time as their successors are elected.

### OFFICERS

*For President:* A. V. ASTIN, Director, National Bureau of Standards.  
*For Vice Presidents:* GEORGE F. AUSTIN, JR., of Detroit, Mich.; JAMES E. BOYLE, of Maine; FRANK M. GREENE, of Connecticut; J. ROY JONES, of South Carolina; JAMES W. REESE, of Iowa; ANTHONY C. SAMENFINK, of Rochester, N. Y.  
*For Secretary:* W. S. BUSSEY, National Bureau of Standards.  
*For Treasurer:* J. P. MCBRIDE, of Massachusetts.

## EXECUTIVE COMMITTEE

*For members of the Executive Committee:* S. H. CHRISTIE, of New Jersey; J. F. CORRIGAN, of Rhode Island; R. L. FLANAGAN, of Oklahoma; ARTHUR FORREST, of Claremont, N. H.; J. W. D. HARVEY, of Georgia; H. E. HOWARD, of Miami, Fla.; G. L. JOHNSON, of Kentucky; O. A. KIRKLAND, of Texas; A. J. MAYER, of Louisiana; J. I. MOORE, of North Carolina; H. J. McDADÉ, of San Diego County, Calif.; W. H. ROBERTS, of Vigo County, Ind.; S. H. SEIGHMAN, of Pennsylvania; W. K. TRIPPLE, of Norfolk, Va.; C. J. WILLS, of Portland, Maine.

(Signed) C. A. BAKER, *Chairman*,  
NALLS BERRYMAN,  
E. R. FISHER,  
J. T. KENNEDY,  
R. S. ACKERMAN,  
C. M. FULLER,  
TOM WEBB,

*Committee on Nominations.*

(The report of the Committee on Nominations was adopted and the officers were elected unanimously.)

(R. W. Searles, Chaplain, closed the meeting with prayer, and the Thirty-seventh National Conference on Weights and Measures adjourned at 11:30 a. m.)

## MEETING OF THE EXECUTIVE COMMITTEE OF THE CONFERENCE

Immediately following adjournment of the 38th National Conference on Weights and Measures, a meeting was held of the newly elected Executive Committee and the chairmen of the standing committees. Present at this meeting were eight of the nine officers, ten of the sixteen Executive Committee members, four of the five chairmen of standing committees, and the Conference Chaplain. The meeting was presided over by the Conference President, Dr. A. V. Astin.

Among the decisions reached by the Executive Committee were the following: The 39th National Conference will be held May 17-21, 1954. These five days will include a full day of committee hearings on Monday, two sessions on Tuesday, one session on Wednesday (this session to be held at the National Bureau of Standards and to be followed by afternoon tours of the Bureau laboratories), two sessions on Thursday, and one session on Friday.

The Sheraton-Park Hotel (formerly Wardman Park Hotel) was selected as the headquarters for the 39th National Conference.

The entertainment, both for the delegates and their ladies, will be approximately the same as during the past several years.

Detailed arrangements for the Conference were left to the Conference Secretary.

It was decided that Monday of the Conference week should be made a definite and formal part of the meeting. This day will be used by the various standing committees for hearings on subjects of interest to the group. All agreed that participation in these hearings by weights and measures officials and others is both desirable and beneficial.

An additional suggestion was made that the East Building Auditorium on the grounds of the National Bureau of Standards be retained for discussions on Wednesday afternoon. If such arrangements can be made, these discussions will be participated in by those delegates who do not wish to take part in the tour of the Bureau and by members of the Bureau staff.

The Executive Committee expressed the hope that all persons who attended the 38th National Conference will address comments concerning same to the Conference Secretary, Mr. W. S. Bussey, Office of Weights and Measures, National Bureau of Standards. Whenever possible, these comments should include suggestions for the program of the 39th National Conference. Matters for consideration by any of the several standing committees also should be submitted early.

Rollin E. Meek of Indiana, who served as Attendance Chairman of the Executive Committee for the 38th National Conference, gave a report on the activities of the Committee in this regard. Mr. Meek was commended both for his efforts and the results obtained therefrom.

J. Roy Jones of South Carolina was appointed Attendance Chairman for the 39th National Conference.

# PERSONS ATTENDING THE CONFERENCE

## DELEGATES—STATE, CITY, AND COUNTY OFFICIALS

### ALABAMA

State..... W. C. BEATTY, Inspector of Weights and Measures, Clayton.

### ARIZONA

State..... DICK FRANK, State Inspector of Weights and Measures, State Office Building, Phoenix.

### CALIFORNIA

State..... JAMES E. BRENTON, Chief, Bureau of Weights and Measures, Department of Agriculture, Mull Building, Sacramento.

#### County:

Alameda..... WILLIAM A. KERLIN, Sealer of Weights and Measures, 333 Fifth Street, Oakland.

Los Angeles..... CHARLES M. FULLER, Sealer of Weights and Measures, 3200 North Main Street, Los Angeles.

San Diego..... HERBERT J. MCDADE, Sealer of Weights and Measures, 1480 F Street, San Diego.

### COLORADO

County: Denver..... HARRY N. DUFF, City and County Sealer of Weights and Measures, 4328 York Street, Denver.

### CONNECTICUT

State..... FRANK M. GREENE, Chief, Division of Weights and Measures, Food and Drug Commission, State Office Building, Hartford.

FRANK J. DELANEY, State Inspector of Weights and Measures.

#### County:

Fairfield..... WILLIAM E. SHEEHY, Sealer of Weights and Measures, County Court House, Bridgeport.  
ERNEST R. WILSON, Deputy Sealer of Weights and Measures.

Hartford..... FRED E. MCKINNEY, Sealer of Weights and Measures, County Building, 95 Washington Street, Hartford.

JOSEPH J. FANELLI, Deputy Sealer of Weights and Measures.

New London..... DONALD A. FRASER, Sealer of Weights and Measures, Salem.

Tolland..... WILLIAM F. MASINDA, Sealer of Weights and Measures, West Willington.

#### City:

Bridgeport..... LOUIS SNOW, Sealer of Weights and Measures, 925 Main Street.

Hartford..... NATHAN KALECHMAN, Sealer of Weights and Measures, Municipal Building.

Manchester..... WINSTON S. C. TURKINGTON, Sealer of Weights and Measures, 137 Pearl Street.

### DISTRICT OF COLUMBIA

Department of Weights, Measures, and Markets  
300 Indiana Avenue NW.  
Washington

District..... J. THOMAS KENNEDY, Director.  
JAMES G. DANCE, Deputy Director.  
JOHN M. BOUCHER, Supervisor.



District----- G. STUART REEDER, Supervisor.  
 J. T. BENNICK, Inspector and Investigator.  
 WALTER W. BRANDT, Inspector and Investigator.  
 LEO F. BROOKS, Inspector and Investigator.  
 WILLIAM T. BRUNSON, Inspector and Investigator.  
 WALTER R. CORNELIUS, Inspector and Investigator.  
 LEO A. GNOTTA, Inspector and Investigator.  
 FENTON C. HARBOUR, Inspector and Investigator.  
 WILLIAM H. JENNINGS, Inspector and Investigator.  
 THEODORE B. MIDDLETON, Inspector and Investigator.  
 RALPH A. MONTGOMERY, Inspector and Investigator.  
 BERNARD A. PETTIT, Inspector and Investigator.  
 FRANCIS M. WARNER, Inspector and Investigator.  
 WOODROW W. WELLS, Inspector and Investigator.

#### FLORIDA

State----- NALLS BERRYMAN, Supervisor, Weights and Measures Division, Department of Agriculture, Nathan Mayo Building, Tallahassee.  
 WILLIAM H. FRAYS, State Inspector of Weights and Measures, 1427 Park Circle, Tampa.

City:  
 Jacksonville----- HOWARD E. CRAWFORD, Inspector of Weights and Measures, 431 West Eighth Street.  
 Miami----- HARVEY E. HOWARD, Supervisor of Weights and Measures, Department of Public Welfare, P. O. Box 1861.

#### GEORGIA

State----- H. W. STRIPLIN, Supervisor, Division of Weights and Measures, Department of Agriculture, State Capitol, Atlanta.  
 LAWRENCE W. HENRY, State Weights and Measures Inspector.  
 JOHN W. D. HARVEY, Assistant Chemist, State Oil Laboratory, Department of Revenue, 524 State Office Building, Atlanta.

#### ILLINOIS

State----- LOWELL D. ORANGER, Superintendent, Division of Foods, Dairies, and Standards, 160 North LaSalle Street, Suite 1600, Chicago.  
 MERRILL M. EMERICK, Assistant Superintendent, Division of Foods, Dairies, and Standards, Springfield.

City: Chicago----- IRVINE M. LEVY, Sealer of Weights and Measures, 608 City Hall.  
 FRANK J. FITZGERALD, Deputy Sealer of Weights and Measures.

#### INDIANA

State----- ROLLIN E. MEEK, Director, Division of Weights and Measures, Board of Health, 1330 West Michigan Street, Indianapolis.  
 JOHN M. GALLOWAY, Deputy State Inspector.

County:  
 Grant----- REUBEN C. PARKS, Inspector of Weights and Measures, Court House, Marion.  
 St. Joseph----- BERT S. CICHOWICZ, Inspector of Weights and Measures, 5718 Grant Road, South Bend.  
 Vigo----- WILLIAM H. ROBERTS, Inspector of Weights and Measures, Court House, Terre Haute.

City:	
Fort Wayne.....	JAMES A. HILGEMANN, Deputy State Inspector of Weights and Measures, 301 South Clinton Street.
Gary.....	CLEO C. MORGAN, Sealer of Weights and Measures, City Hall.
Indianapolis.....	HARRY H. BRUNNER, Supervising Inspector of Weights and Measures, City Hall.
Terre Haute.....	JOHN T. HARPER, Inspector of Weights and Measures, City Building.

#### IOWA

State.....	JAMES W. REESE, Supervisor, Division of Weights and Measures, Department of Agriculture, Des Moines.
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#### KANSAS

State.....	J. FRED TRUE, State Sealer, Weights and Measures Division, Board of Agriculture, 915 Harrison Street, Topeka.
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#### KENTUCKY

State.....	GEORGE L. JOHNSON, Director, Division of Weights and Measures, Department of Agriculture, New State Capitol, Frankfort.
City*: Louisville.....	VERNON HERBERT, Investigator, Division of Weights and Measures, City Hall.
	THOMAS HESTER, Investigator, Division of Weights and Measures.

#### LOUISIANA

State.....	A. J. MAYER, Director, Division of Weights and Measures, P. O. Box 4292, Capitol Station, Baton Rouge.
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#### MAINE

State.....	JAMES A. BOYLE, Deputy State Sealer, Bureau of Weights and Measures, Department of Agriculture, State House, Augusta.
City: Portland.....	CHARLES JAMES WILLS, Sealer of Weights and Measures, 389 Congress Street.

#### MARYLAND

State.....	DR. PAUL E. NYSTROM, Chief, State Department of Markets, University of Maryland, College Park.
	JOHN E. MAHONEY, Superintendent of Weights and Measures, State Department of Markets.
County:	
Baltimore.....	FRANK J. VITTEK, Chief Inspector of Weights and Measures, 25 Susquehanna Avenue, Towson.
	GEORGE A. KLEIN, Assistant Inspector of Weights and Measures.
Montgomery.....	A. MORTON THOMAS, Director, Department of Inspection and Licenses, Court House, Rockville.
	WILFORD ELLIS DAYHOFF, Inspector of Weights and Measures.
City:	
Baltimore.....	GEORGE H. LEITHAUSER, Senior Assistant Superintendent, Division of Weights and Measures, 1106 Municipal Building.
	EDWIN E. JAFFA, City Inspector of Weights and Measures.

**MASSACHUSETTS**

State.....	JOHN P. MCBRIDE, Director of Standards and Necessaries of Life, Department of Labor and Industries, 194 State House, Boston. T. J. DACEY, State Inspector of Weights and Measures, Worcester.
City:	
Arlington.....	JAMES J. DOLAN, Sealer, Weights and Measures Department, Arlington Town Hall.
Cambridge.....	JOSEPH M. O'NEIL, Sealer of Weights and Measures, Municipal Building.
Chelsea.....	FREDERICK J. RYAN, Sealer of Weights and Measures, 88 Parkway.
Medford.....	JOHN J. CAREW, Sealer of Weights and Measures, City Hall.

**MICHIGAN**

State.....	MILES A. NELSON, Chief, Bureau of Marketing and Enforcement, Department of Agriculture, 725 State Office Building, Lansing. CLYDE O. COTTON, Supervising Inspector of Weights and Measures.
County: Washtenaw.....	GEORGE P. SMITH, Sealer of Weights and Measures, Court House, Ann Arbor.
City:	
Dearborn.....	ALEXANDER STACY, Administrative Assistant to Mayor, City Hall. JOHN JAY HUBBARD, Administrative Assistant, 7055 Mead Avenue. MITCHELL O. NICKON, Superintendent Department of Licenses, Weights, and Measures, 4731 Korte Street.
Detroit.....	HAZEN L. FUNK, Commissioner and City Sealer, Department of Purchases and Supplies, Bureau of Weights and Measures, 740 Elmwood Avenue. GEORGE F. AUSTIN, Jr., Deputy Sealer. WILLIAM B. HEASLIP, Supervising Inspector. JOHN T. DANIELL, Inspector. JAMES H. HITCHINGS, Inspector. CHARLES D. MARSDEN, Inspector. VICTOR F. STEINHART, Inspector.
Grand Rapids.....	OTTO SKODSHOLM, Sealer of Weights and Measures, 301 Market Avenue S. W.
Lansing.....	WALTER M. SAXTON, City Sealer and Market-master, 333 North Cedar Street.
Muskegon.....	B. T. SULLIVAN, City Sealer of Weights and Measures, City Hall.
Pontiac.....	WALTER A. BAERWOLF, Sealer of Weights and Measures, 8 North Perry Street.

**MINNESOTA**

State.....	WARREN CZAIA, State Inspector of Weights and Measures, 325 South Third Street, Minneapolis. MELVIN C. ILSTRUP, State Inspector of Weights and Measures. RUDOLPH E. THALIN, State Inspector of Weights and Measures.
City: Minneapolis.....	RUSSELL S. ACKERMAN, Superintendent, Department of Licenses, Weights, and Measures, City Hall.

**MISSISSIPPI**

State.....	ADLIA MORGAN, Director of Petroleum Taxes, Office of Vehicle Comptroller, Jackson.
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# MISSOURI

State..... L. C. CARPENTER, Commissioner, Department of Agriculture, Jefferson City.  
AL E. HARD, Administrative Assistant.  
City: University City..... D. J. ALMON, General Inspector, City Hall.

# NEBRASKA

City: Omaha..... WILLIS W. GRAY, Chief Inspector of Weights and Measures, Department of Public Affairs, Room 100 City Hall.

# NEVADA

State..... E. L. RANDALL, Department of Weights and Measures, Public Service Division, P. O. Box 719, Reno.

# NEW HAMPSHIRE

State..... CLEMENT A. LYON, Director, Division of Markets and Standards, Department of Agriculture, Concord.  
ALFRED H. DITTRICH, Chief Inspector, Bureau of Weights and Measures, Division of Markets and Standards.  
City: Claremont..... ARTHUR FORREST, Sealer of Weights and Measures, 45 Hanover Street.  
Manchester..... FERNAND A. GENEST, City Sealer of Weights and Measures, 180 Franklin Street.

# NEW JERSEY

State..... JOSEPH G. ROGERS, Superintendent, Division of Weights and Measures, Department of Law and Public Safety, 187 West Hanover Street, Trenton.  
ARCHIE T. SMITH, Assistant Superintendent.  
SAMUEL H. CHRISTIE, Senior Inspector.  
JOSEPH A. MURPHY, Assistant Deputy Attorney General, Department of Law and Public Safety, State House.  
County: Bergen..... MICHAEL J. SANTIMAURO, Superintendent of Weight and Measures, 66 Zabriskie Street, Hackensack.  
ERNEST E. DAWSON, Assistant Superintendent of Weights and Measures.  
Burlington..... PAUL F. NUNN, Superintendent of Weights and Measures, Centerton Road, Masonville.  
Camden..... ALBERT C. BECKER, Superintendent of Weights and Measures, City Hall, Camden.  
Cumberland..... ALFRED LIRIO, Superintendent of Weights and Measures, Court House, Bridgeton.  
WINFIELD K. THOMPSON, Assistant Superintendent.  
Gloucester..... MARTIN J. CAULFIELD, Superintendent of Weights and Measures, Westville Road, Almonesson.  
Mercer..... RALPH M. BODENWEISER, Superintendent of Weights and Measures, Court House, Trenton.  
Morris..... DEL G. NELSON, Superintendent of Weights and Measures, Court House, Morristown.  
Passaic..... WILLIAM MILLER, Superintendent of Weights and Measures, Administration Building, Paterson.  
Union..... JAMES M. DIETZ, Superintendent of Weights and Measures, Court House, Elizabeth.

City:	
Bayonne.....	WALTER FLYNN, Superintendent of Weights and Measures, 469 Boulevard.
Clifton.....	FELIX J. SANDRI, Superintendent of Weights and Measures, City Hall.
Englewood.....	LEONARD DERIENZO, Superintendent of Weights and Measures, City Hall.
Garfield.....	CHARLES BENANTI, Municipal Superintendent of Weights and Measures, Police Building, Somerset Street.
Jersey City.....	JOHN S. BURKE, Superintendent of Weights and Measures, City Hall.
Passaic.....	PAUL DEVRIES, Superintendent of Weights and Measures, P. O. Box 663. JOSEPH SHAW, Assistant Superintendent of Weights and Measures, Municipal Building.
Paterson.....	JOSEPH P. LEONARD, Superintendent of Weights and Measures, 115 Van Houten Street. WILLIAM J. KEHOE, Assistant Superintendent of Weights and Measures.
Union City.....	ALFRED O. OSLUND, Superintendent, Department of Weights and Measures, Palisade Avenue and 38th Street.

#### NEW YORK

State.....	CLEMENT A. BAKER, Director, Bureau of Weights and Measures, Department of Agriculture and Markets, State Office Building, Albany.
County:	
Genesee.....	GLENN A. PULLMAN, Sealer of Weights and Measures, 19 Buffalo Street, Bergen.
Monroe.....	EARL D. HUBBLE, County Sealer, Department of Weights and Measures, Room B, 1400 South Avenue, Rochester.
Nassau.....	ROBERT WILLIAMS, Sealer of Weights and Measures, Old County Court House Annex, Mineola. WILLIAM KIRK, JR., Assistant Sealer of Weights and Measures.
Niagara.....	HENRY C. HULSHOFF, Sealer of Weights and Measures, 17 High Street, Lockport.
Oswego.....	LELAND M. FLOWER, Sealer of Weights and Measures, Lycoming.
City:	
Binghamton.....	HARRY A. LASON, Sealer of Weights and Measures, 60 Robinson Street.
Lackawanna.....	JOHN J. SERES, Sealer of Weights and Measures, 84 Rosary Avenue.
Rochester.....	ANTHONY C. SAMENFINK, Sealer of Weights and Measures, Department of Commerce, Rochester Food Terminal.
Yonkers.....	S. JOHN DIMASE, Sealer of Weights and Measures, City Hall.

#### NORTH CAROLINA

State.....	C. D. BAUCOM, Superintendent, Weights and Measures Division, Department of Agriculture, 415 Agriculture Building, Raleigh. JOHN I. MOORE, Supervisor. CHARLES E. DOLAN, Inspector of Weights and Measures. S. M. WOOLFOLK, Inspector of Weights and Measures.
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#### NORTH DAKOTA

State.....	J. C. GOLL, Chief Inspector, Weights and Measures Department, Public Service Commission, Bismarck. EARL W. WILCOX, Inspector of Weights and Measures, P. O. Box 1515, Jamestown.
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## OHIO

State.....	V. D. CAMPBELL, Deputy State Sealer, Division of Foods and Dairies, Department of Agriculture, Room 710 State Office Building, Columbus.
County:	
Clinton.....	HAROLD E. MORRIS, Deputy Sealer of Weights and Measures, 610 N. Mulberry Street, Wilmington.
Medina.....	ROBERT W. SEARLES, Deputy Sealer of Weights and Measures, Court House, Medina.
City:	
Akron.....	ROBERT K. SLOUGH, Sealer of Weights and Measures, 102 Municipal Building.
Cincinnati.....	WILLIAM E. G. RHEIN, Superintendent, Markets, Weights and Measures, Market House, Sixth and Plum Streets.
Lorain.....	GABOR TOTH, Sealer of Weights and Measures, 3019 Caroline Avenue.

## OKLAHOMA

State.....	T. C. BECK, Assistant Director, Marketing Division, Board of Agriculture, 122 Capitol Building, Oklahoma City.
	R. L. FLANAGAN, Supervisor of Weights and Measures.
City: Oklahoma City.....	CLARENCE M. FOWLER, Inspector, 507 Municipal Building.

## PENNSYLVANIA

State.....	JOSEPH F. BLICKLEY, Director, Bureau of Standard Weights and Measures, Department of Internal Affairs, Capitol Building, Harrisburg.
	SPENCER H. SEIGHMAN, Assistant Director.
	JAMES R. REDCLIFT, Senior Inspector of Weights and Measures, Box 109, Shenandoah.
City:	
Erie.....	PAUL F. WATSON, Inspector of Weights and Measures, City Hall.
Philadelphia.....	JAMES J. POWERS, Supervisor, Bureau of Weights and Measures, Room 306 City Hall.

## RHODE ISLAND

State.....	EDWARD R. FISHER, Sealer of Weights and Measures, Department of Labor, State House, Providence.
	JAMES F. CORRIGAN, Deputy State Sealer of Weights and Measures.
City: Cranston.....	ARMAND E. RENZI, Sealer of Weights and Measures, 14 Tulip Circle, Garden City, Cranston.

## SOUTH CAROLINA

State.....	J. ROY JONES, Commissioner, Department of Agriculture, P. O. Box 1080, Columbia.
	CARL H. STENDER, Assistant Commissioner.
	ALEX H. GIBERT, Director, Bureau of Inspection.
	LOWRIE M. BEACHAM, Field Representative, Department of Agriculture, P. O. Box 432, Spartanburg.
	CARL S. HOGUE, Field Representative, Department of Agriculture, P. O. Box 1080, Columbia.

## TENNESSEE

City:	
Memphis.....	C. S. MEEHAN, Inspector of Weights and Measures, 590 Washington Street.
Nashville.....	TOM WEBB, Sealer of Weights and Measures, 300 Demonbreun Street.



## TEXAS

State.....	JOHN L. CLARK, State Inspector of Weights and Measures, Division of Weights and Measures, Department of Agriculture, State Office Building, Austin.
	O. A. KIRKLAND, Inspector of Weights and Measures, 3422 West Jefferson Boulevard, Dallas.
City:	
Dallas.....	J. D. WALTON, Supervisor, Weights, Measures, and Markets, 311 City Hall.
Houston.....	ROBERT OLIVER DEVILLIER, Deputy Sealer of Weights and Measures, City Hall.

## UTAH

City: Salt Lake City.....	EDWIN C. WESTWOOD, Sealer of Weights and Measures, 118 East First Street.
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## VERMONT

State.....	GEORGE E. CARPENTER, Supervisor, Division of Weights and Measures, Department of Agriculture, Montpelier.
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## VIRGINIA

State.....	J. H. MEEK, Director, Division of Markets, Department of Agriculture and Immigration, 1200 East Main Street, Richmond.
	R. D. THOMPSON, Supervisor, Weights and Measures Section.
	J. A. ROSEN, State Inspector of Weights and Measures, 3126 Lamb Avenue, Richmond.
	C. F. WINGFIELD, State Inspector of Weights and Measures, 202 Hanover Avenue, Ashland.
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