

# COMMERCIAL STANDARDS MONTHLY

BUREAU OF STANDARDS

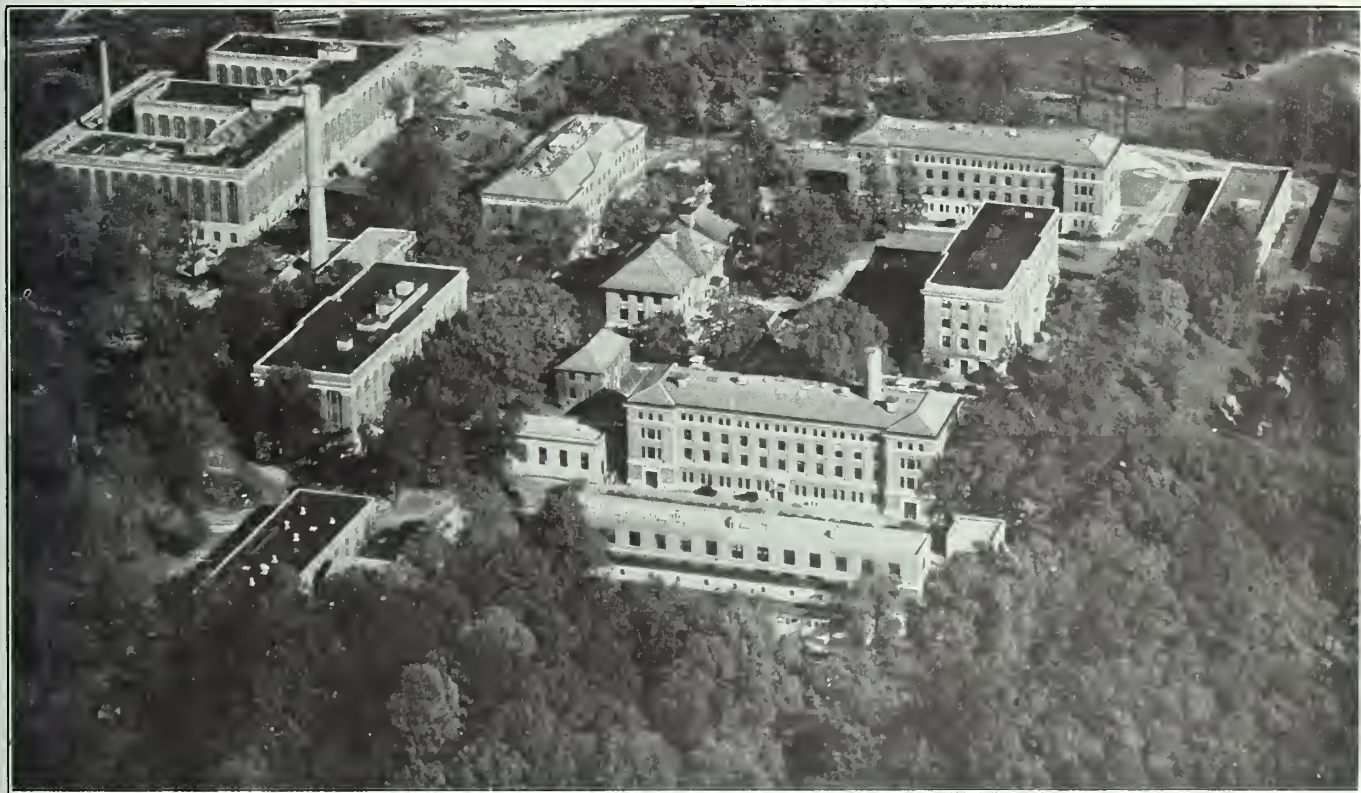
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*A Review of Progress in  
Commercial Standardization and Simplification*



AIRPLANE VIEW OF NATIONAL BUREAU OF STANDARDS

ISSUED BY THE NATIONAL BUREAU OF STANDARDS OF THE  
UNITED STATES DEPARTMENT OF COMMERCE, WASHINGTON, D.C., U.S.A.

Vol. 7, No. 9



MARCH, 1931



# U. S. DEPARTMENT OF COMMERCE

R. P. LAMONT, Secretary

## NATIONAL BUREAU OF STANDARDS

GEORGE K. BURGESS, Director

### COMMERCIAL STANDARDS MONTHLY

S. F. TILLMAN, Editor

## DIVISIONS OF THE COMMERCIAL STANDARDIZATION GROUP

### DIVISION OF SIMPLIFIED PRACTICE, EDWIN W. ELY.

The division of simplified practice was formed in November, 1921, to provide a clearing house or centralizing agency through which the manufacturer, distributor, and consumer groups could meet to discuss their common problems and decide upon eliminations which would prove of mutual benefit to all concerned. The activities of the division are purely cooperative in character. It orders nothing; it dictates nothing; the initiative must come from business itself. It has no regulatory nor police powers to enforce adherence to the simplified-practice recommendations that industry develops under the auspices of the United States Department of Commerce. Its chief function is to serve as a neutral meeting ground for the purpose of bringing together producers, distributors, and consumers, whose aims are sometimes divergent and possibly antagonistic, and who would be unwilling to cooperate, except through some unbiased central agency. Following the approval of the tentative simplified-practice recommendation by a general conference of all interested elements thereof, the project is then presented to the entire industry by letter referendum for its approval and written acceptance, the publication and indorsement of the recommendation on the part of the Department of Commerce being dependent upon acceptance of the program by at least 80 per cent, by volume, of the manufacturers, distributors, and users concerned.

### BUILDING AND HOUSING DIVISION, J. S. TAYLOR.

The division of building and housing cooperates with business, technical, and professional groups in practically all its undertakings on building and housing. Its work to modernize building codes and to encourage improved standards for the quality of building construction promotes the practical application of the latest development in design and use of building materials. This division was also formed in 1921.

In furthering home ownership, an effort is made to develop an enlarged, steadier, more intelligent, and more discriminating demand for soundly built dwellings, the largest single class of buildings which the construction industries provide. The division also cooperates with many business and professional groups in efforts to distribute building activity more evenly throughout the year, and to secure less fluctuation from year to year. The work on city planning and zoning has in mind the broad objective of buildings made more useful because well located with respect to other buildings, a well-coordinated street system, and appropriate public works. Good city planning and zoning likewise encourages stability in land values and property uses, and thereby contributes to the demand for durable structures.

### DIVISION OF SPECIFICATIONS, A. S. McALLISTER.

The duties of the division of specifications are to promote and facilitate the use and unification of specifications. In doing so it carries on activities involving cooperation with technical societies; trade associations; Federal, State, and municipal Government specifications making and using agencies; producers, distributors, and consumers; and testing and research laboratories. The cooperation with technical societies and trade associations includes ascertaining the standardization and specification promoting activities of these organizations, and bringing to their attention the work being done by the commercial standardization group. The cooperation with governmental agencies and other consumers includes the bringing of Federal specifications and commercial standards to the attention of the maximum number of producers and the maximum number of users of commodities complying with these specifications and standards, thereby assisting in broadening the field of supply. The cooperation with producers involves the compilation and distribution of lists of manufacturers who have expressed their willingness to certify to purchasers, upon request, that material supplied by them on contracts based on certain Federal specifications or commercial standards comply with the requirements thereof. The cooperation with distributors involves bringing to their attention the benefits to be derived by them as both buyers and sellers from handling nationally specified, certified, and labeled commodities. The division prepares the directories of governmental and nongovernmental testing laboratories; the Directory of Specifications; and is working on an encyclopedia of specifications, the first volume of which, Standards and Specifications in the Wood-Using Industries, has been issued. It also aids in preparing the Standards Yearbook.

### DIVISION OF TRADE STANDARDS, I. J. FAIRCHILD.

The commercial standards unit, now known as division of trade standards, was created on October 1, 1927, for the purpose of aiding those industrial and commercial groups desiring to establish standards of grades, quality, or measurements for their products or their purchases on a purely voluntary basis.

The division functions only at the direct request of the industry concerned. Its procedure is similar to that of the division of simplified practice, except that at least 65 per cent of the industry, by volume of annual production, must accept the commercial standard in writing before it is published by the Department of Commerce. A certification plan is applied on request as a means of increasing the effectiveness of such standards. Provision is made for regular revision of the standard through the appointment of a standing committee to consider periodically any necessity for revision of the standard, in order that it may be kept constantly compatible with progress in the industry.

Except where otherwise indicated, for further information address

**BUREAU OF STANDARDS**

WASHINGTON, D. C.

# COMMERCIAL STANDARDS MONTHLY

## *A Review of Progress in Commercial Standardization and Simplification*

VOLUME 7

WASHINGTON, D. C., MARCH, 1931

NUMBER 9

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### AN INVITATION TO VISIT THE NATIONAL BUREAU OF STANDARDS

A cordial invitation is extended to all citizens interested in scientific progress to visit the laboratories of the National Bureau of Standards when in Washington. A personally conducted trip is organized at 2.15 p. m. daily except on holidays. Special trips for groups may be arranged at other times by writing to the bureau in advance. The bureau's illustrated Visitor's Manual may be had for the asking. This lists the work in progress and gives an airplane view of the ensemble and a brief statement of typical discoveries and inventions which have been notable, basic contributions to radio, aviation, and other modern arts and industries.

An interesting fact in the growth of the bureau is the steady increase in the number of visitors. From all over the world experts come to see the work in progress in many specialties. Not alone the experts but in growing numbers many of our people visit the bureau from a public-spirited desire to acquaint themselves with its research work. All visitors—from the newspaper men, who have called the bureau a "house of wonders," to the specialists, who use its services—are welcome, for it is their bureau in a very real sense. They are the owners of the business and its beneficiaries. The annual per capita cost of 2 cents which the average citizen pays toward the operation of the bureau yields return sometimes a hundredfold or a thousandfold. How science turns wastes into profits, increases the useful life of materials, adds new efficiencies to industry, advances new arts, such as aviation and radio, by research and discovery—these are to be seen first-hand in the scientific and technical laboratories of the bureau.

GEORGE K. BURGESS, *Director.*



# Italy Forms New Standardizing Agency

*New Organization Created  
to Further Standardization Work in Italian Industries*

**T**HE ITALIAN STANDARDIZATION COMMITTEE for Mechanical Industries has been organized into a general standardizing body under the name of "Ente Nazionale per l'Unificazione nell'Industria," whose by-laws have been approved by Royal Decree No. 1107, under date of July 18, 1930, according to information received from Assistant Trade Commissioner John M. Kennedy at Milan, Italy.

This society has been formed under the auspices of the "Confederazione Generale Fascista dell'Industria Italiana" (Italian General Fascist Confederation), which had considered for some time the importance of standardization in the technical and industrial field as a form of modern science necessary for industrial progress and national economy.

Anxious to give proper organization and greater development to Italian standardization activities, the industrial confederation sponsored the formation of a new society which would cover all industrial branches and have a recognized position among the industrial national organizations; consequently, the industrial confederation decided to merge and enlarge the scope of the former General Committee for Standardization in Mechanical Industries, formed in 1921 by the Mechanical Industries National Association.

The new Italian standardization body has been officially recognized in accordance with the corporative system which rules all Italian productive activities, and this recognition will guarantee regular and efficient cooperation between Government departments, producers, and other interested groups.

As a consequence of the formation of the new standardizing body, Italian activities in the standardization field have received a character of organic unity comparable with the standardizing bodies of other countries. This unity will be an essential factor for rational and profitable work.

In the by-laws of the new Italian standardizing body are fixed the dispositions ruling its functions, similar to those already adopted by the former Standardizing Committee for Mechanical Industries. Standardization projects will be developed through preparatory studies by the technical committees of the body, which are a central technical committee, various technical committees, and a general secretary. These committees will prepare the standard projects which, before their final approval, will be submitted to a general conference (public inquiry) directed to elicit comments and observations from all interested parties; in this manner the committees will be in a position to examine all the numerous and various practical needs of the industry.

A council of directors will govern the body, and to this council will be deferred the final examination of the proposed standards, and the decisions on their acceptance. The formation of the new society and its organization in the Italian corporative system will have considerable influence in an organic effort to assist national industries.

# PRECISE CONTROL OF DIMENSIONAL STANDARDS IN THE FORD MOTOR CO.

## Best Results Obtained When Uniform Temperature Is Maintained for Adjusting and Inspection Rooms and for the Gages

By C. E. JOHANSSON, Engineering Laboratory, The Ford Motor Co.

In the early stages of the automobile industry, parts were made to fit certain master gages or templates rather than to specific dimensions, and were interchangeable only in a limited way. However, the demand for more accurate work and fully interchangeable parts, together with the fact that parts had to be manufactured in widely separated plants, made it necessary to manufacture the parts to specific dimensional standards.

The manner in which the precise control of the dimensional standards have been accomplished, and the methods and means which are used therefor at the Ford Motor Co. will be described and set forth in this article.

Quite early in my research work, in the art of measuring dimensions of length, I came to the conclusion that in comparison with earlier practice it should be, with necessary means, only slightly or perhaps no more difficult to manufacture parts on a mass production basis to dimensional standards with close limits without increasing the cost or decreasing the speed. This has now been proven at the factory where in the production of the current model car, dimensional standards with limits of one ten-thousandth part of an inch are specified and maintained on several parts, and yet the production has been as high as 9,000 cars per day.

The foundation for all precision measurements of length for our company is the Johansson combination block gages. The use of these standards makes possible the manufacture of gages, tools, and fixtures to specific dimensions and gives the inspectors a positive method of determining at any moment, their condition, which is very important, as, one gage worn to the point where it does not check the specified limits properly may mean, in a 1-hour run, several thousand defective automobile parts, stopping the operation

of the assembly line or retarding the production activities of some branch in a distant part of the world. All close limit gages are, therefore, checked every day and many as often as once every four hours.


The gage blocks are manufactured with the following degree of accuracy: Working set  $B \pm 0.000008''$

(eight-millionths inch); inspection set  $A \pm 0.000004''$  (four-millionths inch); laboratory set  $AA \pm 0.000002''$  (two-millionths inch) per block up to 1 inch and per inch of length on longer blocks. This allows a wear limit on B blocks of 0.000002 to 0.000018 inch; on A blocks of 0.000002 to 0.000010 inch, and on AA blocks of 0.000001 to 0.000005 inch.

The inspection of working gages for wear is made with special size, standard design, Johansson gage blocks. These blocks are mounted with special design holders, in units of three, representing the "minimum," "maximum," and "wear limit" sizes. The wear limit size on female gages has been determined as the sum total of the maximum limit plus 20 per cent of the total limit or difference between the maximum and minimum sizes.

These special size gage blocks are checked for size with Johansson combination block gages, of which, approximately 200 sets are in constant use at the River Rouge plant. An average of 10 of these are sent each week to the engineering laboratory at Dearborn for inspection and, if necessary, replacement by the Johansson division.

When a gage block in the working set (eight-millionths inch accuracy) shows wear of more than 10 millionths (0.000010 inch) of an inch, under its normal measuring value, it is discarded and replaced with a new gage block of the same nominal size. In other words, the working sets of Johansson gage blocks used

<div style="display: flex; justify-content: space-between;"> <div>  <p><b>CERTIFICATE of INSPECTION</b> on <b>JOHANSSON GAGE BLOCKS</b> Issued by <b>C. E. JOHANSSON, Inc.</b> Division of <i>Ford Motor Company</i> Engineering Laboratory DEARBORN, MICH.</p> </div> <div> <p><b>ACCURACY</b> (At 65° Fahrenheit) A = .00002 inch AA = .00001 inch B = .000008 inch per block up to one inch and per inch of length on longer blocks.</p> </div> </div>							
PROPERTY OF <b>FORD MOTOR COMPANY ROUGE PLANT WITT INSP.</b>				<div style="display: flex; justify-content: space-between;"> <div> <p>SET No. <b>1-B</b> SERIAL No. <b>739</b> DATE <b>10-16-1929</b></p> </div> <div> <p>10"</p> </div> </div>			
SPECIFIED SIZE	ACTUAL SIZE	Variation From Specified Size	Recommended Replacements Accuracy B A	SPECIFIED SIZE	ACTUAL SIZE	Variation From Specified Size	Recommended Replacements Accuracy B A
0.050"	0.K.			0.131"	0.K.		
0.100	0.K.			0.132	0.K.		
0.1001	.100085	.000015	X	0.133	0.K.		
0.1002	0.K.			0.134	0.K.		
0.1003	.100285	.000015	X	0.135	0.K.		
0.1004	0.K.			0.136	0.K.		
0.1005	0.K.			0.137	0.K.		
0.1006	0.K.			0.138	0.K.		
0.1007	0.K.			0.139	.139985	.000015	X
0.1008	0.K.			0.140	.139988	.000012	X
0.1009	0.K.			0.141	0.K.		
0.101	0.K.			0.142	0.K.		
0.102	0.K.			0.143	0.K.		
0.103	.102385	.000015	X	0.144	0.K.		
0.104	0.K.			0.145	0.K.		
0.105	.104385	.000015	X	0.146	0.K.		
0.106	0.K.			0.147	0.K.		
0.107	.106388	.000012	X	0.148	.147388	.000012	X
0.108	.107380	.000020	X	0.149	.148385	.000015	X
0.109	.108385	.000015	X	0.150	0.K.		
0.110	0.K.			0.200	0.K.		
0.111	0.K.			0.250	.249988	.000012	X
0.112	.111385	.000015	X	0.300	0.K.		
0.113	0.K.			0.350	0.K.		
0.114	0.K.			0.400	0.K.		
0.115	0.K.			0.450	0.K.		
0.116	0.K.			0.500	.499985	.000015	X
0.117	0.K.			0.550	0.K.		
0.118	0.K.			0.600	0.K.		
0.119	0.K.			0.650	.649985	.000015	X
0.120	0.K.			0.700	0.K.		
0.121	.120385	.000015	X	0.750	0.K.		
0.122	0.K.			0.800	0.K.		
0.123	0.K.			0.850	0.K.		
0.124	0.K.			0.900	.899985	.000015	X
0.125	.124983	.000017	X	0.950	0.K.		
0.126	0.K.			1.000	.999980	.000020	X
0.127	0.K.			2.000	0.K.		
0.128	0.K.			3.000	0.K.		
0.129	0.K.			4.000	0.K.		
0.130	0.K.						

THE MEASUREMENTS ARE TAKEN IN THE CENTER OF THE MEASURING SURFACES.  
Gage Blocks marked O. K. are within original accuracy at 65° F.

INSPECTED BY: **ATLIE JANSSON**

REMARKS: **X NEW BLOCKS = 19 pcs.**

C. E. JOHANSSON, Inc.  
Division of  
*Ford Motor Company*  
*C. E. Johansson*



on the current model car are kept accurate within ten-millionths of an inch, and when they exceed that limit, they are discarded.

The accompanying picture is the reproduction of a certificate of inspection which illustrates how the working set B of Johansson gage blocks is inspected and kept within the limit of ten-millionths inch accuracy. These sets are used to check and ascertain dimensions of length on gages, tools, and fixtures in the tool and inspection departments and to certify the accuracy and setting of amplifiers, micrometers, and measuring instruments throughout the factory.

The set A, with an accuracy of four-millionths of an inch, is inspected and kept within a limit of six-millionths of an inch. These sets are used to check and ascertain dimensions of length on gages, tools, and fixtures that have exceptionally close limits and to make sure that they are within the specified limits of accuracy.

The laboratory set AA with an accuracy of two-millionths of an inch is kept within the limits of three-millionths of an inch. This set is used at the River Rouge plant to check and set measuring machines and other fine instruments that are used in the factory-gage inspection department.

When a gage block in the inspection sets wears more than six-millionths of an inch under its nominal measuring value and the wear is less than ten-millionths of an inch, it is used to replace a worn gage block of the same nominal size in a working set. The same procedure is followed with worn gage blocks in the laboratory sets where blocks with more than three-millionths inch and less than six-millionths inch wear under the nominal size are placed in the inspection sets.

#### Uniform measuring temperature.

During the time between the years 1896-1906, while working out the details and methods on my first sets of combination block gages, I discovered that it was very important to maintain a constant temperature when adjusting and measuring the block gages. It was also determined that the best results were obtained with a temperature of 20° C. (68° F.) in the adjusting and inspection rooms.

As my block-gage sets became better known and in more general use in different manufacturing plants, I

urged, in order to get better results, that parts or gages to be measured be brought to the same temperature as the block gages and this temperature to be 20° C. (68° F.). In cases when limits on parts were not too close and the above ideal condition could not be obtained, means should at least be provided for bringing the parts and gages to the same temperature.

The exceptionally close limits specified on the present model car were such that it was found difficult or nearly impossible to get the desired results on the more important parts, such as piston pins of hardened steel, pistons of aluminum, connecting rods made of steel and bronze, due to the difference in metals and the different coefficients of expansion.

To overcome these difficulties our company then followed a method heretofore used only for adjusting and measuring high-grade precision gages and tools, namely, measuring in constant-temperature rooms. At the River Rouge plant there were constructed four rooms inclosed by double walls. These rooms were placed in the production line, and conveyors moved in and out of the room carrying parts to be measured. The temperature of these rooms is maintained at 68° F.; and parts are kept in the room long enough to take the same temperature before they are inspected. With the erection and operation of these constant-temperature rooms, all difficulties on measurements of length were eliminated and specified sizes can now be maintained to precise dimensions.

The difficulties overcome can be better understood from data on experiments before the constant-temperature rooms were installed and put in operation. It was found that 13° F. added to the normal temperature of 68° F., a total of 81° F., increased the size of the connecting rod 10/100,000 inch, the piston 20/100,000 inch, and the piston pin 10/100,000 inch, and a total temperature of 90° F. increased the size of the connecting rod 14/100,000 inch, piston 33/100,000 inch, and piston pin 15/100,000 inch.

By using the latest and most modern measuring instruments with the Johansson combination block gages as the foundation measurement, in constant-temperature rooms at 68° F., it is now possible to maintain and control the dimensional sizes of machine parts with utmost precision.

## AROMATIC RED CEDAR CLOSET LINING

### Published Pamphlet on Commercial Standard Now Available

Large quantities of poorly manufactured cedar lining with excessive amounts of sapwood have heretofore been put on the market and purchased by the unsuspecting buyer. With the future of the industry in mind, the more progressive elements, through their organization, the Aromatic Red Cedar Closet Lining Association, recently sought the cooperation of the National Bureau of Standards in establishing uniform grading rules for their product which could be used for the guidance of all manufacturers and as a basis of honest value for the purchaser.

The commercial standard, Aromatic Red Cedar Closet Lining, CS26-30, represents the culmination of effort on the part of the manufacturers, through the cooperation of the National Bureau of Standards, to

establish high standards of quality in the production, sale, and use of this product. The standard covers closet lining made only from genuine aromatic red cedar (*Juniperus virginiana*), and includes requirements as to width, thickness, minimum length, matching, heartwood requirements, and permissible defects.

In addition, several paragraphs of the text are devoted to the manufacturers' recommendations for the construction of a cedar lined clothes closet and the precautions to be observed in the storage of clothing.

Following a general conference of the industry, at which time the standard was submitted for approval, the bureau circulated it to the industry in mimeographed form. Following the receipt of satisfactory acceptances of the recommendation, it was prepared for publication. The published pamphlet on the standard may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.



## NAVIGATION METHODS NEED TO BE STANDARDIZED

### Naval War College Authority Cites Need for Standardization of Two Methods Now in Use

By Commander ARCHER M. R. ALLEN, *United States Navy*<sup>1</sup>

The question as to whether navigation is an art or science is still in dispute among those who follow the sea, but if making a landfall with a big liner on a dark foggy night is a science, it has many of the attributes of an art and requires qualities in the navigator which are not necessarily acquired by purely scientific training.

However, the mathematical side of navigation is scientific and the primary requirement is accuracy. Standardization improves accuracy and every good navigator eventually standardizes his own work. He selects his favorite form of solution and sticks to it, and in piloting he gives greater weight to the methods with which he has been most successful.

So much depends on his accuracy that he is slow to discard old and tried instruments and turn to new ones with which he is not familiar and in which he therefore has little confidence. In spite of this conservatism there has been constant development in both solutions and instruments until we are to-day reaching a point where standardization in records and in the use of new instruments, such as the fathometer, is one of the few factors still to be improved. That there is still work to be done in this field can be clearly seen by a comparison of the definitions and procedure advocated by the two standard works on this subject published in this country.

The American Practical Navigator, commonly known as Bowditch from its original author and published by the Hydrographic Office in the Navy Department, has always forged slowly but steadily ahead and has, under the able direction of George W. Littlehales, endeavored to keep pace with modern developments as fast as they have been accepted and proved by the majority of seagoing men.

The department of navigation at the United States Naval Academy in Annapolis, faced solely with the object of training midshipmen, has been able to advance even more rapidly, as it has not been required to consider the large body of merchant navigators for whose particular use Bowditch is prepared. Its textbooks, written as a rule by naval navigators, have always included not only the older methods but the new ones as well, and it has exerted far more influence than is usually appreciated on the advancement of the knowledge of this subject. The present textbook prepared by Capt. Benjamin Dutton, United States Navy, entitled "Navigation and Nautical Astronomy," has not only been very successful at the academy but is also in great demand outside the naval service.

An examination of these two publications shows, however, a very important point requiring standardization which is particularly apparent to those who are constantly using a work of this character. In Bowditch "dead reckoning is the process by which the position of a ship at any instant is found by applying

to the last well-determined position the run that has since been made, using for the purpose the ship's course and the distance indicated by the log." In Dutton the following definition is found: "Dead reckoning position. The position obtained by using the true course and speed as given. Dead reckoning is carried from noon to noon or from the departure to the following noon, when the departure occurs after noon."

Thus using the Bowditch method a new departure is taken from every fix obtained and the dead reckoning as such soon becomes so involved with position lines and fixes that by the following noon the navigator has no idea of how far his ship has deviated from the plain dead reckoning during the period covered. It may be argued that this information is of no particular value either to the navigator himself or to the captain in checking the final position, but I believe the opinion held by most navigators is to the contrary.

The basic reason for favoring the Dutton method is that the factor of refraction so frequently vitiates otherwise entirely accurate and carefully worked up observations. It is therefore far safer to have one course line or series of positions based solely on the course and speed carried steadily along as the ship proceeds. Positions by observation should show a variation from this basic line commensurate with the effect of the wind at the time and the ocean currents in the locality as indicated by the pilot chart.

If they do not, it is a matter for immediate investigation. This is far more readily seen when the dead reckoning is carried along from noon to noon, proceeding steadily through the two periods when variations in observation positions are most likely to occur. These two periods are the afternoon and evening twilight series and the morning twilight and morning series. If the sun and star fixes obtained at these times indicate a consistent variation from the corresponding dead-reckoning positions, it tends to indicate good observations and careful work. If not, then the computations should be checked, and if found accurate, more care should be exercised in selecting the horizon conditions, greatest weight being given to sights taken when the horizon conditions are found to be the best. That this source of error should constantly be considered by the careful navigator is clearly shown by the following examples:

Commander L. V. Kielhorn, United States Coast Guard, in his article on "The Summer Bisectrix," published in the United States Naval Institute for September, 1928, cites the case of a forenoon series in which there was a variation of 11 miles between his star and sun lines of position. He was at the time about 60 miles north of Porto Rico early in the month of June. A subsequent landfall showed the sun line to be correct. The author of this article has noted the same type of error off the Virginia Capes, but the difference was only about 5 or 6 miles. Coming just

<sup>1</sup> Commander Allen is on duty with the Naval War College, Newport, R. I.



before landfall, however, this can be a very serious matter.

Another case was brought to my attention in the Caribbean, about 30 or 40 miles off Colon, in February or March. Two navigators on the same ship observed the sun at about the same instant. Every detail of their work was correct, but a landfall a few hours later showed them 15 miles in error. This was due to a false horizon which looked like a good one to both of them. Cases of this kind are much more frequent than most navigators realize and are responsible for many of the wide variations in the position reports of ships in company, particularly around the Panama Canal in both oceans.

Another point for discussion in this connection is why adjust the two positions at noon when one of the positions is usually obtained by moving a morning longitude line forward to a noon latitude line. In some ships these two lines are all the observations used as the morning sun horizon is usually the best of the day and there is least chance for error in the latitude obtained at noon. The navigator usually does his best work at this time and is in a better position to watch the ship's movements than at any other period of the 24 hours. Therefore, as stated above, coming as it does midway between the two periods in the day when most observations are taken it is the logical point for such an arbitrary readjustment.

The best data for figuring dead reckoning can be obtained from a properly adjusted gyroscopic compass and an independently driven log or distance recorder also kept properly adjusted. When the distance recorder is attached to the main shafts it is not satisfactory as it fails to take into account the slip of the screws which is the most difficult factor to properly estimate on account of the constantly varying conditions of wind and sea. The elimination of the personal estimate that usually enters so extensively into dead reckoning makes this way of doing it far more satisfactory in every way. When handled by the Dutton method it gives an excellent mechanically constructed backbone for the navigator's work.

A careful study of these two methods shows that Dutton carries the same positions along, but under the names of estimated positions and fixes. But in his method there are two distinct tracks, one based on pure dead reckoning and one on every possible bit of useful information that can be employed to fix the ship's position with the utmost accuracy.

It is believed by the writer that further discussion of this subject will tend to crystalize ideas so that the two authorities can eventually be standardized as a further step in the development of this most useful art, the application of which by Christopher Columbus in the greatest voyage of all time, gave to the then known world two new continents.

## GRADE MARKING OF LUMBER

### Federal Procurement of Grade-Marked, Certified, and Inspected Lumber

Federal purchasing agencies buy lumber in accordance with forms of bids set forth in Bulletin No. 109 issued from the Office of the Chief Coordinator under date of July 9, 1930.

Hardwood lumber must be (a) graded in accordance with the latest rules of the National Hardwood Lumber Association, and be accompanied by a certificate of grading issued by that association, or (b) be inspected by an inspector from a Federal department or establishment.

Softwood lumber must be graded in accordance with the latest rules of the association whose rules are applicable, and (a) each piece must bear the association grade mark, the mill identification mark, and the national tree mark, or (b) be accompanied by a certificate of grading issued by that association, or (c) be inspected by an inspector from a Federal department or establishment. In making awards, where there are tie bids, preference is given to lumber covered by bid A over bid B, and bid B over bid C.

Indorsement of the above-noted procurement methods of the Federal Government has been given by President A. C. Dixon and Secretary Wilson Compton, of the National Lumber Manufacturers Association.

Mr. Dixon has stated that the 8-year cooperative program between the lumber trade associations, the Department of Commerce, and other Government agencies was designed to protect buyers of lumber in the same manner that the pure food law protects buyers of food; to improve operating practices among

lumber manufacturers in order that they might meet the rigid requirements of this program; and to stimulate sales of lumber since, under the plan for certifying grades, lumbermen operating under the plan could guarantee satisfaction to buyers and remove doubt as to quality of materials. No other way has been devised to enable the nontechnical buyer of lumber to be assured that he would receive what he paid for. Nonassociation mills can have the benefit of association certification of quality at cost of inspection or can join associations providing the quality of their product is such that it can be guaranteed by the associations. The cost of such membership is nominal, being in the Douglas fir producing area 10 cents per 1,000 feet.

No possible good to the lumber industry or to the buyer of lumber can come from breaking down a plan designed to protect both from the efforts of unscrupulous sellers who sell one grade and deliver a lower one or from the practices of unskilled operators who are unable to manufacture according to approved practices.

Doctor Compton pointed out that the American lumber standards, developed under Government auspices, approve of the principles of the grade marking of lumber to insure observance of quality standards and of car tally cards certifying to the quality of car shipment contents. The organized lumber industry as represented by the National Lumber Manufacturers Association has, during the last four years, put into practice in the manufacture, grading, and shipment of



softwood lumber of every species in every lumber region the essential provisions of the American lumber standards. In this connection it has instituted systematic methods, through grade marking, certified car shipments, and association certificates of inspection, of guaranteeing purchaser and consumer the quality and quantity of lumber specified and received. All manufacturers, whether belonging to associations or not, have access to American standard grading and sizes, car tally cards, and association inspection cer-

tificates. Any mill observing American lumber standards places itself on a par with any standard-observing mill belonging to an association.

Doctor Compton expressed the conclusion that the specifications issued by the Government are not prejudicial to any lumber manufacturer because of his membership or independence of a trade association, although nonmember mills, of course, can not mark their lumber with the registered trade-marks of associations.

## STANDARDS FOR REFRIGERATION OF FISH

### Increasing Trend Is Toward Uniformity of Method

By J. M. LEMON, *Associate Technologist, Bureau of Fisheries*

The complete developments of standards for the application of refrigeration to sea food is not, as yet accomplished. There are certain recognized practices which are considered favorable to progress in the industry, and others which are not to be recommended.

It has been proved by experiments, and is borne out by actual practice, that shipments of fish, refrigerated by direct contact with ice and packed in boxes, arrive at their destination in a superior condition and often find a more ready market and sell for a higher price than do those which are packed in barrels. The boxes used for packing are generally made in certain standard sizes and the shape varies with individual box manufacturers. On the other hand the barrels which are used for packing fish for shipment are generally secondhand and have previously been used for the shipment of other commodities, such as sugar or salt pork.

It has also become a recognized fact that fish which are frozen at very low temperatures are in every way superior to those frozen at temperatures slightly below the freezing point. At the present time, firms which are freezing fish are employing temperatures varying between 15 and 50° below 0° F., each firm using a temperature considered by it to yield the best product. It is generally conceded that there is a point in this 35° range at which fish can be frozen economically and rapidly enough to yield a product which would meet the requirements for quick-frozen fish. At the present time this standard temperature has not been found.

The temperatures at which frozen fish are stored until they are marketed vary between 5 and 20° above 0° F. It is not improbable that there is a certain temperature within this range of 15° that will give the desired results and affect the quality of the product the least. It can be determined, by scientific research, whether or not there is an optimum temperature.

The handling of fish which are to be frozen is being reduced gradually to methods which are considered good practice, and for this reason may eventually be accepted as standard. It has been found by practice that a standard size pan in which fish are packed for freezing is more economical than the use of pans of miscellaneous sizes. The reasons for this are quite apparent, since pans of odd sizes would slow up the packing process and would not lend themselves to efficient placing in the freezing rooms.

The size and general construction have been determined by actual practice, and it has been found that the shape of the bottom should be rectangular. The

width should be about two-thirds of the length and the height about one-sixth of the width. The average weight of these pans when packed with fish should be about 35 pounds each. The fish which are frozen in these pans form a cake and remain in that form when removed. The cakes are packed for storage and shipment in wooden boxes of the proper dimensions to contain 100 to 200 pounds each. Standardized conveying systems have been adopted by many of the firms operating freezers, which transport both the full and empty pans to various parts of the plant. Machinery for scaling, skinning, and filleting fish has been adopted, and is constantly being improved. This is another indication of the general trend toward uniformity and standardization.

Certain sizes and shapes of packages and containers in which frozen fillets are being marketed are showing increased popularity with the public, the producers, and dealers in these products, thus indicating a distinct tendency toward standards. The most popular package for wholesale distribution is one constructed of corrugated board, insulated on the inside and having a capacity of 15 pounds, bearing the trade-mark of the producer on the outside. The fillets are individually wrapped in trade-marked and branded parchment paper. Frequently a sheet of cardboard slightly larger than the fillet, containing instructions for handling and, in many cases, recipes for cooking, is included in the package.

It has been found that these cartons when sealed can be shipped surprisingly long distances without any appreciable deterioration, even though no additional refrigeration is used.

Other types of packages which are growing in use are the 1-pound cartons containing fillets wrapped in a transparent wrapper and frozen in the carton. Five and ten pound cartons containing fillets individually wrapped in transparent wrappers and frozen in the packages are also being introduced.

At present there are no standards for grading fish which are to be frozen and placed in cold storage for future use. This works to the disadvantage of both the producer and the purchaser. A system should be devised which would grade the fish of each species into classes according to size, and which would eliminate all fish which are not strictly fresh from the freezing process. The purchaser could then order the size and species of fish most suited to his need and thus eliminate considerable waste.



## VIBRATION BOARD FOR TESTING AIRCRAFT INSTRUMENTS

New Vibration Board Developed by National Bureau of Standards

By W. G. BROMBACHER, *National Bureau of Standards*

Aircraft instruments are normally subject to vibration in service. No precise data are available on the frequency and amplitude of this vibration, but it is well known that the amplitude varies greatly for different airplanes. It is assumed, however, with considerable reason, that the fundamental frequency of the vibration is the same as the rate of rotation of the engine.

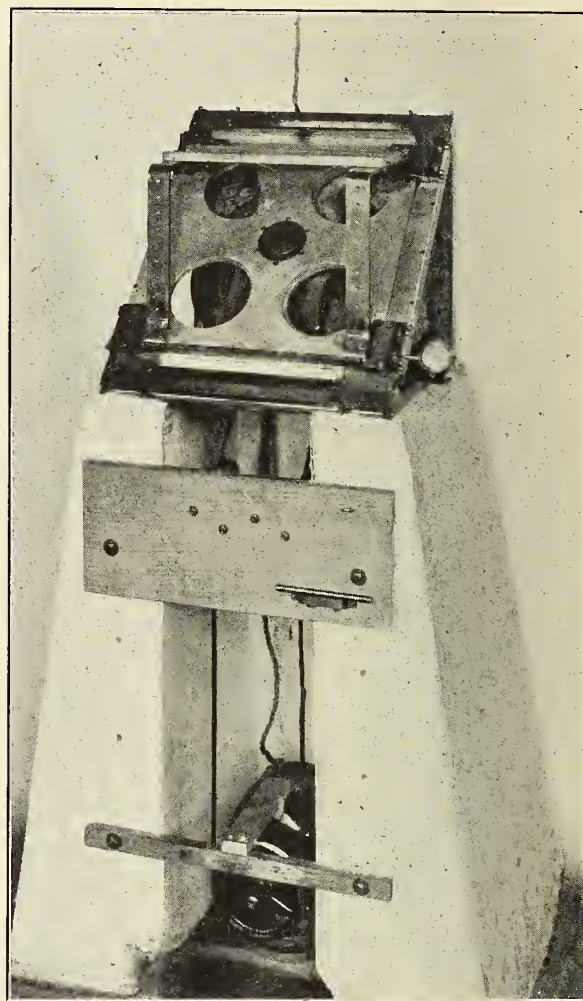
The performance of the instruments is much affected by vibration. Parts, such as pointers and machine screws, may become loosened if precautions are not taken. If the free period of the instrument mechanism is the same as that of the vibration to which it is subjected, the life of the instrument is likely to be very short, and further when this occurs the instrument itself is ordinarily unreadable. Vibration causes wear on the pivots, especially in magnetic compasses, which greatly affects performance. In fact, experience has shown that vibration with excessive amplitude has, in general, a deleterious effect on the performance of instruments, while, on the other hand, a small amount of vibration is beneficial in that it largely eliminates the effect of friction.

In view of the serious effect of vibration on instruments it is obvious that purchase specifications should contain a vibration test. The current Army-Navy specifications require that an apparatus be available for securing circular vibrations with a frequency range from 100 to 2,000 per minute with a double amplitude, or total excursion, of one thirty-second of an inch in a plane at an angle of  $45^\circ$  with the horizontal. This vibration was chosen because it is roughly equivalent (determined by touch) to a vibration which may be called "severe" in an airplane, and also because it is easy to secure mechanically. Further, it gives components in all of the directions in which airplane vibrations would probably affect an instrument. It is known as the "standard" vibration.

The National Bureau of Standards in cooperation with the Bureau of Aeronautics, United States Navy, has developed and constructed a vibration board for subjecting instruments to the above-described vibration. The vibration board previously used in testing aircraft instruments consisted of a mounting board supported by springs, which was set into vibration by means of a rotating unbalanced weight. The vibrations of such a board can not be easily controlled, since the amplitude depends also upon the frequency.

In the new vibration board the desired amplitude is obtained by means of an adjustable eccentric. The shaft of the eccentric is set at an angle of  $45^\circ$  with the horizon and is rotated at the desired frequencies by a variable speed motor. An aluminum plate about 17 inches square, upon which the instruments are mounted by suitable brackets and panels, is connected to the eccentric. This plate is supported at two parallel edges by a second aluminum plate, which in turn is connected to the base at its other two parallel edges. The plates are in each case supported by linear ball

bearings and are free to move parallel to the supporting edge. This connection gives the plate attached to the eccentric the required  $2^\circ$  of freedom of motion. The driving motor is mounted 3 feet away from the board and except for the ball bearings, the apparatus is made of nonmagnetic material, in order to minimize magnetic effects which are undesirable in testing com-



*National Bureau of Standards vibration board*

The apparatus is mounted on a concrete pillar with the driving motor below. The speed control, not shown, is about 15 feet away. The brackets and top plate (with four large holes) have a circular vibration in the plane of the plate.

passes. The instruments are mounted in the normal operating position; that is, with the dial vertical and properly oriented.

Instruments are, in general, given two vibration tests. In the first test they are subjected to a vibration of constant frequency and amplitude for three hours, during which the instruments are held by suitable means at a normal service reading. The change in scale errors resulting from the vibration is taken



as the criterion of the effect, in addition to obvious results, such as loose parts. In the second test they are subjected, while held at a normal service reading, to a number of frequencies between 1,000 and 2,000 per minute and the amplitude of the pointer vibration

is noted. This tests the instruments for a possible undesirable value of the free period.

Further information on the vibration board can, upon application to the National Bureau of Standards, be secured by those specifically interested.

## PERSONNEL INFORMATION STANDARDS

### United States Civil Service Commission Standardizes Its Informational Service

By EDWARD L. BENNETT, *United States Civil Service Commission*

The personnel information system of the United States Civil Service Commission extends from the main office in Washington to 13 district offices, thence to 5,000 local boards of examiners in that many cities, and from these branches to the public. It reaches to Alaska, Hawaii, Porto Rico, the Philippine Islands, and the Canal Zone.

An effort is made not only to supply personnel information regarding the Federal civil service when such information is requested, but also to bring to the attention of the public opportunities for Federal employment and other matters which may be of general interest. Standardization of personnel information intended for general distribution is effected by the preparation, at the main office or one or another of the district offices, of uniform examination announcements, posters, bulletins, news releases, etc.

It is a fundamental principle of the civil service law that all citizens be given equal opportunity, in accordance with their qualifications, in the competition for Federal positions. It is, therefore, important that an inquirer in Waco, Tex., or Bangor, Me., be given substantially the same information regarding the civil service as one in Los Angeles, Calif., or Cincinnati, Ohio.

The impracticability of attempting to standardize oral personnel information to an extended degree at 5,000 places is obvious, and, in so far as possible, information issued by the local boards of examiners is in standard printed or mimeographed form. Examination announcements, for instance, contain information concerning required qualifications sufficiently full and clear to meet any ordinary question which may arise.

It is not possible, however, to conduct such a widespread personnel information service exclusively

through the medium of current circulars, and, accordingly, provision is made for instruction in fundamentals of those who give information, as to qualifications, to the public. Basic information for the use of local boards of examiners is given in a 60-page manual prepared especially for the purpose.

Detailed instructions in connection with the dispensing of current personnel information are given to local boards from time to time in mimeographed form. In most cases, these instructions are transmitted through the district offices because conditions vary in different districts, and it has proved more advantageous for local boards to contact with district offices than directly with the main office.

Similarly, the examining boards are instructed to refer inquiries which they can not answer to the district offices rather than to the main office. Ordinarily disposition of such matters can be accomplished by the district offices. Even in the event that it may be necessary to refer an inquiry or suggestion to the main office, the comment of the district manager is often needed.

When a complaint is made or a question arises in one place which is likely to be repeated in a number of places, all local boards are advised promptly as to what their action should be in a similar case.

Boards of examiners are carefully instructed at the time of their organization with particular reference to their personnel information and examining work. From time to time inspections are made by field examiners and such further instructions are given as may be needed.

While boards of examiners are cautioned not to attempt to give personnel information in connection with subjects which they are not qualified to discuss, they are urged to familiarize themselves with their proper field of information and to make an endeavor to dispose of as many inquiries as possible.

## WROUGHT-IRON PIPE NIPPLES

In order that the Commercial Standard for Wrought-Iron Pipe Nipples, CS6-29, might be made to conform with the dimensions for wrought-iron pipe recently adopted by the American Society for Testing Materials and to include a definition for wrought iron approved by that body, a proposed revision of the commercial standard incorporating these changes was circulated to the industry for

written acceptance on recommendation of the standing committee.

Acceptances, representing a satisfactory majority of production, having been received, and no active opposition having come to light, the National Bureau of Standards has announced the success of the revised Commercial Standard for Wrought-Iron Pipe Nipples, CS6-31. The standard is effective for new production on May 1, 1931. Printed copies will be available in due course.



## ROMANCE OF ENGINEERING MATERIALS

### Modern Prophet Makes His Predictions with Aid of the Test Tube, the Microscope, the Slide Rule, and Testing Machine

By Prof. H. F. MOORE, *University of Illinois*<sup>1</sup>

We ordinarily think of the days of prophets and soothsayers as past, but this is not so. True it is that styles in prophets have changed—greatly changed—since the days of the Witch of Endor and the Delphic Oracle. The prophets of olden time in performing their official duties mumbled incantations, brewed magic messes, and made wise cracks about the arrangement and the significance of the intestines of freshly slain fowls. The prophets of to-day make predictions with the aid of the test tube, the microscope, the slide rule, and the testing machine.

A large group of these modern prophets make a business of predicting how steel, brass, aluminum, concrete, brick, wood, and rubber may be made to serve satisfactorily as materials for buildings, locomotives, automobiles, airplanes, sewers, and bridges. As in the ancient world there were schools and fraternities of prophets, so in the modern world the prophets gather into associations and societies, and the American prophets of the strength and durability of materials are gathered—some 4,500 strong—into the American Society for Testing Materials.

In that much discussed book, "The Outline of History," H. G. Wells recognizes one fact which most of the older historians have failed to see, namely, that one important element in our modern civilized life is the fact that to-day we have available very many materials whose strength can be predicted and controlled.

The builders of the ancient world had to take materials as they found them in nature. Even the makers of the famous Damascus and Toledo blades were largely dependent on the occurrence in nature of fortunate combinations of ingredients in the ores near at hand. They used many a weird rule of thumb in tempering their steel, and kept no record of their failures.

When we think of the marvels of modern applied science we naturally think of dramatic marvels—the giant locomotive, the light but powerful airplane engine, the 125,000 horsepower dynamo, the 60-story skyscraper—but not one of these would have been possible unless there had been developed strong, durable, workable materials out of which to build them. We all cross bridges, walk under trolley wires, ride in automobiles, and the personal safety of each one of us is dependent a score of times a day on the strength of the material in bridge or house or automobile or steel rail.

Not only are we all vitally concerned with our physical safety, we are also greatly concerned with the cost of living—the cost of clothing, of household goods, of farm implements, with the amount of the taxes we must pay to keep up sewer systems, pavements, waterworks. Now a very large factor in determining these costs is the wisdom used in selecting suitable materials,

materials whose money cost, strength, and durability are well balanced.

How can you tell the wearing quality of the leather in your children's shoes, Mrs. Housewife? What kind of draintile is really cheapest in the long run, Mr. Farmer? How can you be reasonably sure of the lasting quality of the paint on your house, Mr. Homeowner? Mr. or Mrs. or Miss Taxpayer, is your city engineer seeing to it that the material which is going into your city pavements is good material, material which will last, and yet is not excessively high in first cost? Can you tell whether he selects the material on the basis of careful tests or lets contracts on the basis of friendship, or the glib promises of a salesman?

But just what kind of tests do these modern prophets of structural stability use in their ritual prediction? Many kinds. Watch the operation of a big concrete mixer on a job of road building. Every once in a while a young chap comes along, takes a bucket or two of concrete from the sticky stream pouring out from the mixer, and pours this sample of concrete into molds in which the concrete hardens into cylinders about the size and shape of a large baking powder tin. Then after, say, a week these hardened cylinders are "tested to destruction"; that is, squeezed to bits in a huge press which is fitted with heavy platform scales to weigh the pressure applied. If the sample cylinders do not withstand a sufficiently high pressure the concrete job is condemned, and it must be torn up and the job done over again.

But sometimes material can be tested without destroying a sample of it. If you get a chance to examine the crank shaft of an automobile engine you will find somewhere on it what looks like a little dimple. That "dimple" is the test mark resulting from pressing a two-eighth inch steel ball against the shaft with a pressure of 6,600 pounds. The harder and stronger the steel, the smaller the dimple. If in the factory a shaft comes to the inspector in which the test dimple is too large, that shaft goes back to be tempered over again.

Of course, the chemist with his test tubes and balances and ability to tell what ingredients are present in any material, and how much of each, is one of the fraternity of materials prophets. If the chemist did not inform the rail mill when there is too much phosphorus in the steel being rolled, we would have many more railway accidents than we do, and if the chemist did not keep the rubber manufacturer posted on how much sulphur there is in the rubber we would have much more tire trouble on our week-end trips, and goodness knows we have enough in spite of his best efforts.

The women folks know what a mess men folks make of matching colors, especially these new-fangled colors which look so much alike to the masculine eye, and so different to the feminine. Good news! The men who

<sup>1</sup>The author is research professor of engineering materials at the University of Illinois, and is past president of the American Society for Testing Materials.



are testing textiles and paints have come to realize their limitations, and have taken up very seriously the scientific measurement of color, and soon we hope to be able to match colors to suit even women's exacting requirements.

We must not omit mention of the prophets who use the microscope and show just how metals are made up of little crystalline grains, nor of the newest of the schools of materials testers who make the X ray show up hidden flaws in the inside of material and also show the pattern of arrangement of the molecules in a solid particle of which 300 end to end would just be visible to the most powerful microscope.

The development of the science of testing materials is a comparatively recent thing. Perhaps the first systematic testing of materials was done some two and a half centuries ago in connection with insuring a standard quality of coinage. That gigantic figure in the scientific world, Sir Isaac Newton, did not think it beneath his dignity to spend many of the best years of his life developing standards for metals and processes in the British mint. However, the idea of systematically testing the common materials of everyday use is quite recent. The trouble of the early railroads with axles and rails was a great factor in encouraging such testing. The Prussian State railways back about 1850 and our own railways in "the gay 90's" began to demand materials whose strength and ductility were not merely glibly promised by the maker or by his salesman but were shown to exist by actual tests.

Speaking of buying materials on the reputation of the maker without further testing, I remember in my boyhood days the quality of steel in our jackknife blades was judged by the reputation of the maker's name. Back in New Hampshire the boy whose knife blade bore the name Jonathan Crooks was sure he had a superior article. Actually it was not at all difficult to stamp the name Jonathan Crooks on an inferior blade, and many blades so stamped were sold.

Fifty years ago there were very few standards tests or specifications for any of the ordinary materials in use; to-day there are some 10,000 well-recognized standards for materials. We may decry overstandardization, but certainly we should have to do without very many of the modern conveniences if standardized, predictable materials ceased to be produced.

Now, it is obvious that before any test, whether of strength or wear or color, can be accepted as a standard test for a material it must be shown that the test really shows the presence or the absence of the desired service qualities in the material. Some spectacular tests really tell very little about these qualities. There used to be a superstition that if an elephant would set foot on a bridge the bridge was safe. The huge animal was credited with a mysterious and infallible sense of safety. As a matter of fact the slow steady tread of an elephant would not be nearly so likely to cause the bridge to fail as would the banging of a heavy motor truck, and no one ascribes "an infallible sense of safety" to either the truck or its driver.

But tests which are made with scientific apparatus and which seem scientific may be as lacking in reliability as the elephant test. For example, the resistance of a metal to corrosion is sometimes prophesied from the results of a test in which it is dipped in

strong acid for a few moments. The amount of metal dissolved in the acid is taken as a measure of its corrodibility. As a matter of fact, a low loss of weight in this test is no proof whatever that the metal will resist ordinary rusting in air and smoke and rain for long periods of time.

Sometimes material is tested by being subjected to two or three times the load it will have to stand in service and if it withstands this test load without fracture it is judged fit for use. This sort of overload testing is rather dangerous. It can not be safely assumed that because heavy overload is safely carried once, an ordinary load can be carried thousands of millions of times. That one heavy overload may have started tiny cracks in the material and under thousands of repetitions those cracks may spread—like the crack in a glass show case—until a shaft or a beam suddenly snaps in two without warning. Most of the failures of materials in airplanes and high-speed machinery are of this class. "Fatigue of metals" is the name given to the destructive action of these spreading cracks.

Railway inspectors remove axles from locomotives and from elevated and subway cars after a certain distance has been run and examine them minutely for evidences of the beginnings of such cracks, and if the smallest crack is detected the axle goes to the scrap heap.

Before putting much confidence in the statement that a material has been "tested" it is well to find out whether it has been tested by standard methods, methods recognized by some of the scientific bureaus of the Government or by some technical society. It has come to be recognized that in devising tests and standards for materials it is vitally important that the interests of both manufacturer and consumer be considered. If the consumer alone is allowed to write specifications for a material he is likely to set up a number of fussy requirements which do not add much to the reliability of the material, but which do add greatly to the cost. On the other hand, if the manufacturer alone is allowed to write specifications, he will almost certainly see to it that the materials shall be easy and profitable to produce. These statements are no reflection on the morals of either consumer or producer; they simply recognize the fact that every man naturally overemphasizes his own viewpoint.

In the American Society for Testing Materials the standards for materials and methods of test are prepared by some 50 committees—committees for steel and iron, for other metals, for concrete, brick, textiles, timber, rubber, etc. The rules of the society require that on each committee there must be representatives of both the manufacturer and the consumer. Rarely does the society accept the recommendations for a new standard unless there has been practical unanimity between manufacturers and consumers; that is, a proposed test or specification does not get recognized until a representative group of manufacturers and consumers has talked it over and decided that it is reasonable, safe, and useful.

Most of the actual testing of materials is not at all romantic to watch. However, the test of a material for strength is an interesting sight to watch. A piece of steel, aluminum, or copper is fastened in a powerful machine and is pulled. It stretches, "necks down" like a piece of molasses candy, and finally



breaks in two with a loud bang. A block of concrete is compressed and finally splits into fragments. A timber beam is bent into a flat bow and finally cracks or splits noisily.

However, to the materials-testing prophet the romance of his work lies mainly in what that work means to the millions of men and women who are daily users of materials. He visualizes the aviator successfully handling his plane in the air, trusting confidently that the tested material in his wings, his engine, and his propellor will withstand the severe strains of flying; and in spite of the newness of the art of building airplanes, this confidence is rarely misplaced. The materials tester visualizes men and

women everywhere protected to an almost unbelievable extent against accidents in the home, on the street, in cars, and automobiles by the use of safe tested materials. He visualizes the farmer, the housewife, the taxpayer given full value for the millions of dollars expended for the materials used in building roads, sewers, water pipes, buildings, clothes, railway cars, autos, and airplanes. He rejoices that he has a part in increasing the safety and comfort, and in lessening the dangers of our modern mechanized life, and that he is giving folks more leisure and less anxiety so that they will have more energy available for developing the beautiful and good in their lives, if they will only be wise enough to do so.

## AMERICAN MARINE STANDARDS

### Marine Standards Approved for Deck Drain, Cleats for Ships, Bollards, and Cleats for Docks

The following current information relating to developments in certain marine standardization projects under the auspices and procedure of the American Marine Standards Committee has been furnished by that association.

*Deck drain, trap type, with stop valve.*—This standard was approved for promulgation by the executive board on January 29. The standard is a fitting applicable to low decks in which a gravity drain is desirable under favorable service conditions but where inflow might occur when the vessel is under propulsion or in rough weather. It is in effect a development of a standard deck drain with trap previously promulgated, by adding a stop valve.

*Cleats for ships.*—This standard, approved January 29, comprises three types of light cleat in sizes 10, 13, 16, 20, and 24 inches and one type of heavy cleat in sizes 16, 20, 24, 30, 36, 42, 48, and 54 inches. These standards cover all of the regular cleats likely to be required on merchant ships and floating equipment.

*Bollards and cleats for docks.*—Four standards, comprising five sizes of single bollards, cleats, and bollard-cleats, also three sizes of double bollards, intended to constitute a complete series of standard mooring fittings for wharves and piers, were approved January 29.

*Rolled steel shapes for shipbuilding.*—A ballot vote of the membership is being obtained on proposed

standard lists intended to cover all ordinary requirements of rolled-steel shapes for construction of merchant ships. These lists comprise essential sizes of equal angles, unequal angles, bulb angles, channels, I beams, H sections, T sections, Z sections, Z-hatch section, cope iron sections, and bulb plates. Although the lists as presented cover shapes primarily intended for riveted construction, all concerned are invited to suggest standard shapes for welded construction for possible inclusion in a final draft of standards.

*New publications.*—The following have recently been distributed: A. M. S. C67, Care and Operation of Oil-Burning Apparatus and Handling of Fuel Oil on Ships, and A. M. S. C71, Uniforms for Merchant Marine Officers—Specifications of Garments and Insignia.

These complete the group of numbers 1 to 75, inclusive, of these publications comprising 124 standards classified as follows: Hull details, 63; engineering (machinery) details, 33; ship operation details and supplies, 27; and special subjects, 1. Classified and alphabetical indexes covering all of the standards comprised in this group are off the press and will be distributed at an early date. Further information desired regarding these standards is obtainable upon application to the secretary of the American Marine Standards Committee, Department of Commerce, Washington, D. C.

## BUILDERS' TEMPLATE HARDWARE

As a result of a survey among the manufacturers to determine adherence to the Commercial Standard for Builders' Template Hardware, CS9-29, a summarized report was released recently indicating that among reporting manufacturers, 60.5 per cent of production conformed to the requirements of the standard. It provides rather complete dimensional standards and tolerances for the staple types and sizes of door hinges with fixed locations of screw holes, offsets, and other details. It also covers the details of a standard

lock front and strike for use with staple types of locks in a standard "sinkage" on hollow metal doors.

It is apparent, from the replies received, that this standard has not been in use for a sufficient time to become thoroughly well established; however, it is evident that considerable effort is being made by the manufacturers toward eventual conformity with the standard, and that its use is helpful to the industry.

In accordance with the recommendation of the standing committee, which was appointed by the general conference to consider comment, the existing standard was reaffirmed, without change, for another year beginning September 18, 1930.



## STANDARDIZATION IN AERONAUTICS

### Standardization Has Been Important Factor in Aiding the Work of the Aeronautics Branch of the Department of Commerce

By CLARENCE M. YOUNG, *Assistant Secretary of Commerce for Aeronautics*

Standardization and uniformity are ultimate results of careful planning, consistent action, and unity of thought toward the achievement of a definite goal. The elimination of mistakes and sometimes costly errors are results of uniform policies and plans of procedure. Standardization of procedure is recognized as being the most practical and economical plan in nearly all activities concerned with repeated action.

The formulation of definite rules and policies for guidance in activities where repetition is involved, aids in eliminating false steps and fallacious courses which are costly both in their consumption of time and in their effect upon policies of sound economics. In attempts to exclude these evils, standardization has become one of the most valuable assets to business and other organized activities.

Aeronautics, being one of the newest industries, offers untold possibilities for the establishment of standard practices. As a new industry, it is inevitable that a few unsound and uneconomical practices may creep in without warning in some of its many phases. Many of these evils can be eliminated by standardization, which most certainly has a definite place in the field of aeronautics.

Standardization methods are needed for the guidance and assistance of the new industry as it grows in order to bring about sound economic practices and to exclude unwarranted mistakes. The trial-and-error method has no permanent place in established industry, and aeronautics, although still young, may definitely be placed in that category.

The necessity for standardization in aeronautics is becoming more and more apparent. The airplane has abolished boundaries of travel. In the period before the advent of the locomotive and automobile the distance which could be traveled in a day was measured in tens of miles. To-day it is measured in thousands. It is possible to fly across the country in less time to-day than it took to travel 100 miles in the days before fast means of transportation came into existence.

#### Department formulates plans.

With a full knowledge of the necessity of standardization, the Aeronautics Branch of the Department of Commerce has carefully planned its work along well-defined and clearly-outlined courses of action. It employs standardization in its establishment and maintenance of airways, rules and regulations governing air traffic, in its requirements for the construction and operation of aircraft and engines, in its licensing of pilots and planes, in its operation of communication systems along the airways, and in nearly all of its other activities. These functions of the Aeronautics Branch are carried out by specified methods, with the result that confusion and unwarranted consumption of time and money have been eradicated.

The Aeronautics Branch proceeds through the use of standard plans in the establishment of its airways from the time that the survey is made until the last intermediate field is lighted and ready for operation. It has also standardized its operation and maintenance of the airways after they have been established. It has formulated certain plans of action and policies to follow which have resulted in uniformity throughout. It employs the same type of equipment on all of its airways and operates them all in an identical manner.

In the establishment of the Federal airways system, standardization has been definitely chosen as an ally; a choice which has been well justified. This choice has resulted in the establishment of 15,000 miles of airways, uniform in their equipment, so that an airman who has used the airways in the eastern portion of the United States will find airways nearly identical in nature and operation in the Western States. He will find the same type of 24-inch, 1,000,000-candle-power beacon light every 10 miles. He will find the same general type of intermediate landing every 20 or 30 miles with the same type of equipment in the State of California that he found in New York.

All intermediate fields are built according to standardized plans. They all are marked with a 50-foot white circle at the intersections of the runway center lines, with white panels 20 feet long and 2 feet wide extending from the outside of the circle along the runway center lines to indicate the landing directions.

The lighting is uniform on all intermediate fields, consisting of boundary lights, a beacon light, course lights, range lights, obstruction lights, and illuminated wind indicator. A standard 24-inch revolving beacon is provided at each field, with the exception that in mountainous or isolated regions it is sometimes necessary to install electric or acetylene beacons. The airman may expect to find the fields lighted and marked in an identical manner, for landing either by day or by night.

The airman will also find the same type of service rendered by the automatic telegraph typewriter circuits, furnishing him with the same type of weather information in all parts of the country. The radio-communication stations and equipment which are used for the broadcasting of the information gathered for him by the automatic telegraph typewriter circuits are standardized to a very high degree; they are even housed in buildings which are built to standards.

#### Safety through standardization.

The standardization has resulted in features of safety and reliability which have been justified on many occasions. It has made it possible for air transportation, both scheduled and private, in nearly every section of the country to proceed over the Department of Commerce airways in as regular and uniform a way, as do automobiles over arterial highways. The



procedure employed in establishing and maintaining units has been carefully planned and the work is divided among different units of the airways division, as follows: Survey, weather and communications, construction, and radio.

The survey unit determines airway routings, selects sites for beacon and landing fields, and concludes all negotiations for licensing these sites and for conditioning the fields for use by aircraft. The construction unit arranges for the purchase and shipment of all lighting equipment and supervises its erection and installation under contract or by airways division field forces. The weather and communications unit selects, establishes, and supervises the operations of airways weather reporting stations and airways communication stations. The radio unit designs, procures, and supervises the erection and installation of radio equipment for communications stations and radiobeacons. All units have definite methods and standards to guide them.

Standardization is employed in the regulation of aeronautics, to protect the flying public and the aeronautic industry by obviating as far as possible insufficiently trained pilots and unairworthy aircraft.

All of the regulatory functions of the aeronautics branch are coordinated under the director of air regulation. The director of air regulation and his staff are primarily concerned with the construction and operation of civil aircraft in all its phases. By determining and enforcing definite standards of safety, this organization has established and maintained public confidence, and thereby played an important part in the phenomenal growth of air commerce and of the aircraft industry. This work includes the inspection and approval of airplanes and flying schools; the examination and licensing of pilots, mechanics, and flying school instructors; and all field work in connection with engineering inspection.

The Aeronautics Branch has standardized its licensing of pilots to the extent that certain requirements must be met before the license is issued. Before the student is allowed to take instruction it is required that he pass a physical examination and procure a student permit.

An airplane to be eligible for general commercial use shall comply with the airworthiness requirements of the air commerce regulations, which constitute a set of rules embodying requirements for structurally airworthy aircraft which serves as a guide to the aircraft industry as to what will be required on new designs.

The manufacturer submits to the Aeronautics Branch the design of the aircraft he proposes to build. When this design has been approved the manufacturer is required to present for inspection an aircraft built to that particular design. The aircraft itself is not only examined to determine if it is built according to the design submitted, it is also checked for details in design, workmanship, and materials to see that certain standards of airworthiness have been complied with.

The aircraft is then weighed and thoroughly flight tested to make sure that it satisfies the stability requirements of the Aeronautics Branch. Even the factory is inspected to determine whether it is suitably manned and equipped to produce aircraft similar to the design submitted.

### **Manufacturer's certificate.**

When the Aeronautics Branch has decided that its requirements have been fully complied with the manufacturer is issued an approved type certificate which entitles him to build aircraft of exact similarity to an approved model, which aircraft is then eligible for commercial licenses, so long as the workmanship, materials, and design are adhered to according to required standards and are found by periodic inspection to be in airworthy condition.

The air-commerce regulations provide that all airplanes engaged in interstate commerce shall be equipped with power plants of a type approved by the Aeronautics Branch. Although there are no standard requirements as to weight per horsepower or fuel or oil consumption per horsepower-hour for these engines, they are required to meet certain standards of design, material, workmanship, and performance.

Before engines are approved they shall demonstrate their efficiency by actual test. Principal among the tests to which each individual type of aircraft engine is subjected by the Aeronautics Branch is a 50-hour "endurance run." This test is run off in 10 different periods of 5 hours each. Before the engine is submitted to the Aeronautics Branch for test it shall have been run for at least 25 hours by the manufacturer.

### **Air traffic rules.**

In a continuation of its policy of supervising aircraft for the protection and safety of those who use them, the Aeronautics Branch has placed in effect air-traffic rules governing the operation of aircraft. These rules, which form a part of the air-commerce regulations, shall be complied with by all aircraft, licensed or unlicensed, whether flown privately or engaged in interstate or intrastate commerce, and at all times. The air-traffic rules form a standard of requirements for the navigation, protection, and identification of aircraft, and include rules as to safe altitudes of flight and rules for the prevention of collisions.

Realizing that a suitable, economical, and comprehensive plan for the radio requirements of aviation should be adopted, certain frequencies have been set aside solely for the use of aircraft, and rules governing their use have been placed in effect.

For the purpose of surrounding air lines engaged in the scheduled transportation of passengers in interstate commerce, with all possible safeguards and with the view of providing air transportation with virtually the same uniformity of operation as is now enjoyed by the major railroads and steamship services, the Department of Commerce has prepared and promulgated a supplement to the air-commerce regulations requiring the operators of scheduled air-transport services in interstate commerce to obtain from the Secretary of Commerce a certificate of authority to operate such service.

The certificate of authority is issued only to those operators who effect complete compliance with the regulations and in the interpretations thereunder. These regulations constitute a standard or code of minimum requirements governing the operation of scheduled interstate air-passenger routes and are expected to bring about unprecedented records of safety and reliability in this phase of civil aeronautics.



These requirements specify, among other things, that aircraft shall be provided with suitable instruments and equipment; that they shall be adaptable to the nature of the service involved; that an adequate number of qualified airmen be employed; and that the equipment be maintained in a certain manner.

Realizing that there exists an urgent need for the development of standard signal systems suitable for both day and night use, for controlling air traffic on and in the vicinity of airports, and for communicating special information to pilots, the Aeronautics Branch has organized a special research committee to study such systems. This committee is making a comprehensive study of the subject and will report its findings and recommendations.

### Uniform laws.

The Aeronautics Branch is encouraging the adoption of uniform laws by States in order that the requirements to be met by aircraft and their operators will be the same throughout the United States. The adoption of uniform State laws will go a long way toward developing and simplifying the operation of aircraft on a nation-wide basis.

In an effort to bring about uniformity in airport field rules throughout the United States, the Aeronautics Branch has prepared a set of suggested rules for adoption by owners of airports and landing fields. The uniform field rules have been printed in bulletin form and have been given wide distribution.

Standardization is also employed in the classification and approval of schools giving instruction in flying, which are classed as flying schools, ground schools, or ground and flying schools. These schools are examined and rated by the Aeronautics Branch upon application.

The Aeronautics Branch endeavors to bring about a certain amount of standardization in the design and

construction of airports. Under its airport rating regulations, the department will rate airports, on application, as to the general equipment and facilities; the effective landing area, and the aeronautic lighting equipment. The ratings are designated by symbols, such as "A1A" which is the highest rating given. However, the regulations set forth the minimum requirements for each rating and, hence, it should be borne in mind that airports limited to the requirements for an "A1A" rating will not necessarily be adequate to meet the needs of every community or service. In addition to bringing about a certain amount of standardization in the design and construction of airports, the rating serves to indicate clearly to a pilot who is not familiar with the rated airport, the extent of the facilities available.

Obviously, the adoption of standard practices has proved extremely beneficial in the activities of the Aeronautics Branch. The order, lack of confusion, and the absence of complexities in the execution of its many functions are due in a large part to the early realization of the need for well-defined policies, plans, and programs of action.

The merits of standardization are well demonstrated in the thousands of miles of airways established by the Aeronautics Branch which have helped to make it possible for air transport to be operated more than 100,000 miles on schedule every 24 hours, safely and reliably, and for aircraft employed in private and miscellaneous operations to be flown untold thousands of miles in safety. They are again shown in the great degree of airworthiness attained in present-day aircraft; in the efficiency of power plants, and in the competency of pilots.

As the aeronautic industry continues to grow, standardization will play an ever-increasing part in the development of sound business practices and in the elimination of waste.

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## THE NEW STANDARDS YEARBOOK FOR 1931 JUST ISSUED

400 Pages of Standardization News in the Fifth Edition

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The Standards Yearbook for 1931, outlining the activities and accomplishments of not only the Federal Government but also those of States, municipalities, and trade associations, is just off the press.

A special feature of the book for this year is the symposium on standardization in transport. Experts in many lines contribute articles. These relate to research and experiment in aviation, automotive and highway development and safety, railroads, pipe lines, elevators, marine navigation, the transmission of speech and power, and the important activities of the Federal Government and other national agencies engaged in promoting standardization in transport on land and water, and in the air.

In addition, the book contains outlines of the standardization activities of the Federal Government; an annual bibliography on standardization, prepared by the Library of Congress; standardization activities of municipal, county, and State purchasing agencies; standardization programs of American technical societies and trade associations; a summary of the work in standardization conducted by the special national

standards associations of the various countries—an important and broad-scale picture of standardization. World-wide cooperation by international organizations in solving international standardization problems is reviewed in a special chapter.

The 1931 Standards Yearbook is the fifth edition of the document. It is the standardization reference book, summarizing and bringing up to date, under one cover, the reports of current standardization activity and accomplishment of hundreds of technical organizations in the United States and around the world. It is designed to keep all interested in standardization well informed and in touch with all the important developments in America and the nation-wide developments in standardization in other countries. An important feature is the review of the year's scientific and technical achievements of the standardizing laboratories of England, France, Germany, and of the United States.

The Superintendent of Documents, Government Printing Office, Washington, D. C., now has the book on sale. The price is \$1 per copy.



## THE STANDARDS ASSOCIATION OF AUSTRALIA

### Organization Receives Support of the Government; Technical Work Carried on in Two Divisions, Namely, Standards and Simplified Practice

By W. RAYNER HEBBLEWHITE, *General Secretary, Standards Association of Australia*

The Standards Association of Australia was formed in 1929 by the amalgamation of the Australian Commonwealth Engineering Standards Association (founded 1922) and the Australian Commonwealth Association of Simplified Practice (founded 1927). It is the body officially recognized as the authority for promulgating national standards in Australia, and receives the indorsement of the Commonwealth and State Governments and their departments, and of the professional, industrial, trade, and commercial organizations of Australia.

The association has complete autonomy, but in order that the Commonwealth Government may be kept informed of the association's progress and its requirements and may thus be enabled the more effectively to render assistance, a liaison has been provided through the Council for Scientific and Industrial Research, which is under the ministerial control of the vice president of the executive council of the Commonwealth Government.

The association is governed by a council comprising representatives appointed by the Governments of the Commonwealth and each State, the Institution of Engineers, Australia, Australasian Institute of Mining and Metallurgy, Australian Chemical Institute, Royal Australian Institute of Architects, Federated Master Builders' Association, Australian and New Zealand Railways Conference, Associated Chambers of Manufacturers of Australia, Associated Chambers of Commerce of the Commonwealth of Australia, Bureau of Steel Manufacturers of Australia, and the Federal and State store-purchasing departments.

The technical work of the association is directed by two divisions—standards and simplified practice—and by a special committee for power survey, which is engaged in a survey of the power resources of the Commonwealth and their development and coordination.

In the standards division, specifications are drafted by sectional committees of the usual representative character, and these, as necessary, appoint sub-committees and panels for the allocation of specific sections of work. In order to secure suitable collaboration in the preparation of specifications that are of general interest to two or more sectional committees, each of the committees concerned appoints representatives to a coordinating committee whose decisions are, however, referred back to the parent sectional committees for indorsement.

Specifications, when drafted, are printed and circulated widely in proof form for public comment prior to final review and publication. In preparing standard specifications, the national and institutional standards of other countries are studied in order that no unnecessary departure shall be made from the best current practice. In particular, it is the policy of the

association to follow British standard practice as closely as local conditions and requirements will allow without detriment.

The simplified practice division does not, as a rule, appoint permanent committees. After a careful staff investigation of any project, and compilation of statistical data as to relative production and sales numbers, a report on the position is placed before a representative conference, and a draft recommendation approved. It is then reviewed by similar conferences in other States of the Commonwealth. The final stage in the drafting is the coordination of State views for the issue of a recommendation representing the consensus of opinion throughout the Commonwealth. Before final adoption a recommendation must receive the indorsement of 80 per cent of suppliers by volume of trade. The procedure is based on that established by the division of simplified practice of the National Bureau of Standards of the United States.

#### Association aided by others.

The association receives recognition from all the principal organizations representing scientific, technical, industrial, and commercial interests and from governing authorities. Assistance is rendered both financially and by voluntary technical service. The Federal Government contributes the greater part of the association's total revenue and some State governments assist in lesser degree. All are officially represented both on the council and on technical and administrative committees, the senior technical officers usually being appointed.

Local government authorities give similar recognition in proportion to the extent of their operations. Organizations and firms, besides contributing the services of their officers in committee work, enroll as subscribing members of which there are about 350. The rate of subscription is voluntary, subject to a minimum annual fee of about \$10 for individuals and \$15 for commercial interests, and ranges up to a maximum of \$500 for private corporations or \$5,000 from the combined railway systems for departmental bodies. Technical societies and universities give every possible support, in some instances appointing their own committees to collaborate with those of the association.

The association has published 135 approved specifications and reports and an additional 30 draft specifications have been issued for criticism. Of these, about 60 deal with the electrical industry, 40 with the paint and varnish industry, and 30 with railway permanent way and rolling stock. In smaller numbers the others relate to iron and steel, cement and concrete, pipes and fittings, plumbing accessories, machine parts and accessories, chemical industry, and other subjects.

#### Codes of growing importance.

A section of considerable and growing importance is that classified under the general and somewhat



inadequate title of safety codes. In addition to codes of procedure for safeguarding human life and property, there are those which embody also considerations of design and erection. Such are the model regulations dealing, respectively, with concrete and reinforced concrete structures and with steel-frame buildings. There are also codes for lift installations, cranes and hoists, and boilers and unfired pressure vessels. The foregoing and a code of electrical wiring rules are in course of preparation, some being now prepared for draft issue.

Two of particular importance are the boiler code and the wiring rules. The boiler code has been prepared during the past two years with the assistance of a great number of departmental officers and private experts in order to remedy the disabilities attending the use of uncoordinated and somewhat inadequate regulations in force in the respective States of the Commonwealth. The code will be a comprehensive compilation dealing thoroughly with boiler and unfired pressure vessel design, erection, maintenance, and inspection.

The electrical wiring rules, in general use in Australia, were framed by The Institution of Engineers, Australia. Recently, at the request of the institution, the association undertook the revision, extension, and subsequent direction of the rules. A draft of the new rules is now about to be issued and will be influenced by the results of recent investigation and by modern developments in the electrical industry.

No simplified practice recommendations have yet been published, but good progress has been made with a number of projects, many of which indicate striking possibilities of reduction in diversification similar to that which has attracted world-wide attention to the simplification achievements of the United States of America.

The banking and allied interests in Australia, notwithstanding the characteristic conservatism of such bodies, have enthusiastically adopted the principle of simplification as applied to bank checks and other documents, and a most interesting recommendation on this project is likely to be published very shortly. Other subjects under attention and well advanced are plywood door panels, road-gully gratings, shovels, sheet-metal guttering, ridging, and downpiping, laminated steel springs for automobiles, and building-material classification.

Of the reports of the power survey committee, that relating to the coal resources of Australia is of particular interest. The latest figures available have been included in this report, which deals comprehensively with the geological and geographical distribution of the various coal fields, the chemical and physical characters of the different coals, and the suitability of such coals for various purposes and industries. A report on power alcohol treats the subject from the point of view of a potential source of power in the Commonwealth. A further report describes progress in the development of combustion of Victorian brown coal.

The association has in course of printing a handbook of loose-leaf form. Periodical supplementary leaflets for inclusion in this will give particulars of progress and additions to the list of publications. Annual reports are also issued, the first being the report for the association's activities to June 30, 1930.

In international activities the association is represented by its power survey committee, which is by Government authority the Australian National Committee for World Power Conference, and by its electrical committee, which is the Australian Committee of the International Electrotechnical Commission. These two committees are actively participating in their respective international movements.

## KNIT UNDERWEAR RECOMMENDATION APPROVED

**Standard for Knit Underwear, Exclusive of Rayon, Provides Methods of Measurement and Standard Measurements**

Standard methods of measurement and standard measurements for the guidance of producers, distributors, and users of knit underwear, in order to eliminate confusion resultant of the diversity of measurements and methods now in use, and to establish a uniform basis for guaranteeing full size of the garment, is provided in a proposed commercial standard for knit underwear (exclusive of rayon) which was approved by a general conference of the industry, held February 19, 1931, at the National Bureau of Standards.

The proposal is to be submitted to the industry for written acceptance. After a sufficient number have indicated, in writing, their willingness to adhere to the standard, and no serious objections are raised, the bureau will publish it as an official standard of the industry.

In addition to the provisions of the standard as mentioned above, there is contained a system of stand-

ard symbols for designating different models or types of knitted underwear to be used in marking underwear boxes. Symbols other than those proposed can be added from time to time as necessity arises, but it is believed that the present proposal about covers the field completely.

An important section of the standard is devoted to Suggested Method of Washing Wool and Wool-Cotton Knit Underwear.

On recommendation of a representative from the rayon industry, the conference agreed to set aside all items of rayon knit underwear for consideration separately by a later conference, since the rayon industry is endeavoring to standardize measurement for all the major items of knit underwear.

Subject to the acceptance of the standard, in writing, by the industry, the conference provided that it should become effective January 1, 1932.



## STANDARD APPROVED FOR COLORED SANITARY WARE

General Conference Approved Proposed Standard Which is Now to be Submitted to Industry for Signed Acceptance

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For many years manufacturers of colored sanitary ware have encountered costly problems due to the multiplicity of colors that are expensive to manufacture, impracticable to stock, and unsatisfactory to sell. The increasing variety of colors has resulted in a lack of harmony especially when one manufacturer supplies, for example, the porcelain lavatory, another the enameled iron bathtub, and still another the vitreous china water-closet bowl.

The first step in a program to clarify this condition has been taken in the development of a commercial standard covering colors to be used as a guide in the production of plumbing fixtures and allied products, made of vitreous china, porcelain (all-clay), enameled iron, metals, wood, or glass. The proposed standard was presented to a general conference of the various component parts of the industry held January 23, 1931, at the National Bureau of Standards, and approved by that conference for submittal to the industry for acceptance.

According to W. Keith McAfee, chairman of the Manufacturers' Advisory Committee on Colored Sanitary Ware, the development of individual colors for special pieces, as for example, drinking fountains, and the matching of colors for special work, will not come within the scope of this commercial standard. At the same time he pointed out that it is not the purpose of this recommended standard to retard initiative on the part of individual producers or to act as a brake on the introduction of new colors. Rather is it intended to provide an authoritative reference to the recommendations of the industry as a whole based on composite experience of the producers.

The conference recommended six colors as standard for sanitary ware to be designated as follows: SC-11, green; SC-20, orchid; SC-30, ivory; SC-40, blue; SC-51, light brown; and SC-60, black. It was further stipulated that the standard median shade samples should be retained at the National Bureau of Standards. Duplicate reference median shade samples may be obtained from the secretary of the Manufacturers Advisory Committee on Colored Sanitary Ware as a basis for production control.

This committee has fixed light and dark limits of shades for each color, and samples are to be retained at the National Bureau of Standards. Such samples will be available to the industry only for the settlement of disputes. While any shade within these lim-

its will, no doubt, conform with the requirements, the industry will make every effort to have finished items conform as nearly as possible to the selected median shades.

The committee recommended to the industry, through the agency of this standard, that secrecy in connection with the subject of colored glazes and enamels be eliminated. In order that manufacturers may have a thorough understanding concerning colored glazes, formulas, firing temperatures, and other related information have been filed with the National Bureau of Standards, and will be available upon request.

"In the standardization of colors for sanitary ware," said G. W. Wray, of the division of trade standards of the National Bureau of Standards, under whose auspices the conference was held, "it should be borne in mind that an absolute match of shades is neither possible nor necessary, but the shades should match as nearly as the differences in the character of materials, lighting conditions, and manufacturing processes permit. Perhaps the most difficult problem to contend with in color matching arises in trying to match one type of colored surface with another of an entirely different texture.

"Certain coloring materials possess qualities that alter their appearance under different conditions of production," he said, adding that "daylight is usually considered white and is the proper type of illumination under which colors should be examined. Daylight, however, is variable throughout the day. Colors that match in natural light are often different when compared under artificial light. Colorists have more or less universally adopted north skylight as standard for matching colors." He emphasized the point that no attempt should be made to match colors from memory.

In accordance with the procedure of the National Bureau of Standards, the recommended commercial standard, as approved by the conference, is to be mimeographed and mailed to all elements of the industry. When a satisfactory majority have signed the acceptance form and returned it to the bureau, and in the absence of active opposition, the recommendations will be officially promulgated by the Department of Commerce in printed form. The recommendation, subject to the written acceptance by industry, is to take effect July 1, 1931.

## SCANDINAVIAN STANDARDS FOR PLANED LUMBER MOLDINGS

The multiplicity of moldings for planed lumber in the Scandinavian countries have caused many inconveniences for both foreign and domestic consumers. In 1929 the interested parties in Sweden, Finland, and Norway organized to prepare a Scandinavian standard "Norges Industriforbund" (The Norwegian Manufacturers Association) was asked to formulate a proposal. This proposal, which was distributed some

time ago, was discussed at a recent meeting in Oslo, attended by delegates from Sweden and Norway. Although not represented at the meeting, Finland has agreed to accept the findings of the Oslo meeting.

After several days of discussion, the delegates agreed to certain standards for moldings. Representatives of Swedish and Norwegian woodworking machinery builders who were present at the meeting agreed to the proposals. Detailed specifications are to be published.



## STANDARD PRIMARY RADIO-FREQUENCY

### Beat-Frequency Recorder Determines Constancy of Oscillators; Automatic Camera Photographs Counters

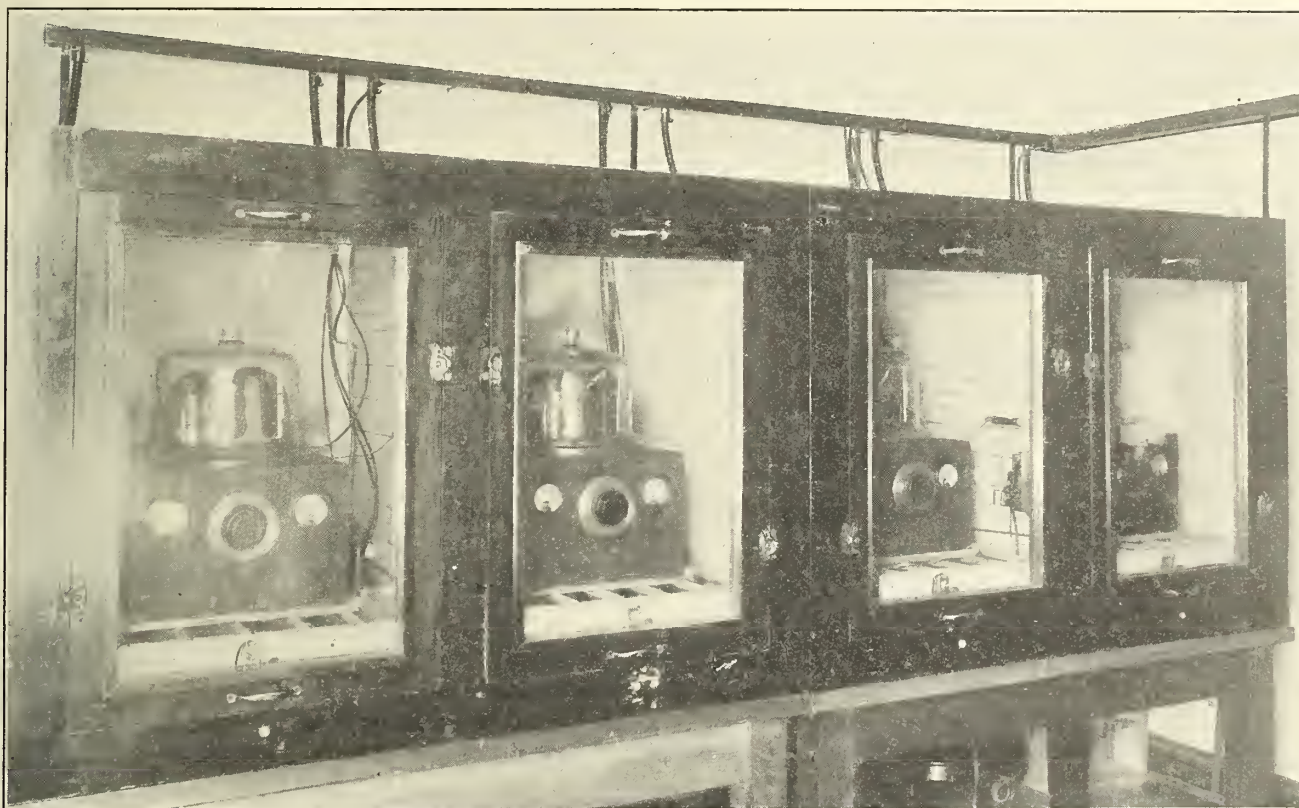
By CHARLES G. McILWRAITH, *National Bureau of Standards*

The orderly operation of the whole system of radio-communications is dependent on the accurate maintenance of frequency by each transmitting station. The communication channels are so crowded that if transmitters were allowed to wander from their assigned places in the frequency spectrum chaos would result.

To maintain a sufficiently constant frequency, a transmitter must possess a frequency meter of such accuracy that a few years ago it would have been

paratus whose purpose is to indicate and record the performance of the oscillators.

Each oscillator has a frequency of 100 kilocycles; that is, 100,000 cycles per second. The frequency of each oscillator is controlled by means of a piezo-electric plate of crystalline quartz. Because temperature has a marked effect on the frequency of vibration of a quartz plate, it is necessary to protect these plates from temperature changes. This is done by putting



*The four standard piezo oscillators mounted in their temperature-controlled cases*

considered a most precise laboratory instrument. Hence, laboratory standards for use to-day must be of extraordinary accuracy. Indeed, the most accurate frequency measurements now are of the same order of precision as the best spectroscopic results, which have long been considered the ne plus ultra of physical measurements.

The National Bureau of Standards is the national standardizing laboratory; hence, it maintains in its radio section, a primary frequency standard whose accuracy is much higher than any of the frequency meters in commercial use. The apparatus was designed and built by a commercial organization, and has been described in several publications. It consists essentially of four independent standards (see illustration), each of which is an oscillator or source of radio current, and a large group of associated ap-

the plate in an aluminum-walled chamber, provided with an electrical heater and a thermostat. The thermostat is a refinement of the device of the same name used for regulating the operation of a furnace, and maintains the temperature inside the aluminum chamber nearly constant, the variations being less than  $1/100^{\circ}$  C. To protect the plate from large changes in room temperature, the regulated chamber and the circuits associated with it are placed in a box where the temperature is regulated by a coarse thermostat, the variations being about  $1^{\circ}$  C.

Since atmospheric pressure has an effect on the frequency of the crystal, it is placed under a bell jar, and the air partially exhausted. This protects it from changes of pressure, and also serves as a convenient means for making small adjustments in the frequency of the crystal.



The voltages of the filament and plate supply to the vacuum tubes, used in the circuits associated with the crystal, also have a small effect on its frequency, so they are automatically regulated.

#### Determining the constancy of oscillators.

To determine how constant the four oscillators are, use is made of a beat-frequency recorder. The fourth oscillator is arbitrarily chosen as a reference point with which to compare the others. The beat frequencies between the first and fourth, second and fourth, and third and fourth oscillators are indicated by the recorder, and a supplementary device counts the beats by means of electrically operated counters. An automatic camera photographs the counters at the end of 1,000-second intervals. In 1,000 seconds each oscillator makes approximately 100,000,000 oscillations. By counting the beats, it is possible to detect variations of one part in 100,000,000.

To determine the absolute value of the frequency of any one oscillator, use is made of a device called a submultiple generator. This consists of a vacuum-tube oscillator purposely made unstable. A frequency, which is an exact harmonic of that of the oscillator, is injected into the grid and plate circuits. The conditions being right, the submultiple generator will then allow itself to be controlled by the injected frequency and will oscillate at an exact submultiple of the injected frequency.

By using two such circuits the 100-kilocycle current from the piezo oscillator is stepped down to 1 kilocycle, without introducing any unknown variations

whatsoever in the frequency. The 1-kilocycle current is amplified and runs a synchronous motor, which is geared to a clock. The gearing is such that when the input to the motor is 1 kilocycle; that is, when the frequency of the crystal is 100 kilocycles exactly, the clock keeps mean solar time. Knowing the rate of gain or loss of the clock, one can easily calculate how much above or below 100 kilocycles the crystal frequency is. The clock is rated against the clocks at the Naval Observatory by means of radio time signals from station NAA. Apparatus for automatically taking these time signal records is installed.

The results obtained have been gratifying. The apparatus has been in operation about a year. The frequency is known at any time to about 2 or 3 parts in 10,000,000. The oscillators show random variations of about 1 part in 10,000,000.

The net result is that the National Bureau of Standards has a group of four oscillators, the frequency of each being known to better than 1 part in 1,000,000, and each having random variations of about 1 part in 10,000,000. By means of the automatic beat-frequency recorder, a constant watch is kept on the behavior of each oscillator with respect to the group of four. If one oscillator goes bad, it can be detected at once.

However, if the four oscillators keep their relative positions, it is safe to assume that they have all remained constant, as the chance that four independent units should all go bad at the same time, in the same direction, and by the same amount, is infinitesimal. Thus, the nation's primary frequency standard carries its own checking device to detect mistakes or error in operation.

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## INDUSTRY NEEDS UNIFORM SAFETY MEASURES

### Safety Engineer of A. S. A., Says Several States Have Already Approached Problem Through Adoption of National Standards

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At least 1,000 deaths, 125,000 injuries, and a money loss of \$40,000,000 is the annual toll exacted because of needless disagreements in the industrial safety regulations of the various States. This statement was made by Cyril Ainsworth, safety engineer of the American Standards Association in an address before a joint meeting of the Safety Engineers' Club of Baltimore and the Baltimore section of the American Society of Mechanical Engineers.

The States which prepare their own local safety regulations, instead of agreeing on national safety codes, place an obstacle in the way of effective guarding of industrial machines by manufacturers of the machines, he declared. Their adherence to national industrial safety codes, he said, would inevitably be followed by better mechanical guarding of hazardous machines and a substantial reduction in the yearly industrial accident toll, which at present amounts to 25,000 deaths, 3,000,000 injuries, and approximately \$1,000,000,000 in money loss to workers and employers.

Responsibility can be definitely placed on the States because the machine-tool industry has declared itself

"ready and willing to do all that it can toward the equipping of machines with adequate guards at the point of manufacture as soon as there is brought about some degree of harmony in existing regulations."

Such a statement is a definite challenge to the entire accident-prevention movement and to all those associated in any way with the movement. There are many indications that the challenge is being accepted and met. The action taken by the industrial commission of Maryland in adopting, verbatim, 20 national safety standards; that taken by Nebraska in basing its recently adopted standards on the national standards; that taken by such States as Pennsylvania, New Jersey, New York, Ohio, California, and several others in basing their regulations on the national standards and adopting many standards without change, are concrete evidences of progress that is being made.

In addition, many States, including Virginia, West Virginia, Maine, Tennessee, and Idaho, have appointed commissions to consider the necessity and desirability of passing legislation that will permit the adoption of national safety regulations, he said.



## HOME REPAIRS AND EMPLOYMENT

### National Bureau of Standards Aids in Relieving Unemployment

By C. O. CHRISTENSEN, *National Bureau of Standards*

An important relationship exists at present between home repairs and the employment situation. Stimulating home repairs tends to create employment. In this connection the National Bureau of Standards has assisted governmental and civic committees by preparing home-repair lists for use in promoting odd-job employment through direct-mail and personal contact with home owners.

The bureau, in its regular work on building practice and home builders' problems, answers requests for information on such points as repairing leaky basements, leaky roofs, and the use of the best construction methods. It prepared National Bureau of Standards Letter Circular No. 287, particularly to assist home owners. This pamphlet lists most of the available material issued through Government organizations and national trade associations covering home building and home maintenance.

A manuscript prepared by a member of the bureau staff entitled "Care and Repair of the Home"<sup>1</sup> was written to aid the home owner in the upkeep of his house, to enable him to make simple repairs when necessary, and to better understand the house construction. The book contains practical information on inspection and repair of walls, roofs, basements, doors and windows, weatherstripping, etc.

In the organization of the President's Emergency Committee for Employment the need for a separate women's division was early recognized. Among the important tasks of the local committees on employment which have been organized in more than 300 cities and towns to stimulate "Spruce-up-your-home" campaigns have been practical attempts to bring together the unemployed worker and the available job. The committee organization strongly believed that jobs are better than relief and that odd-job employment is especially important at this time.

<sup>1</sup> The book is now being published in paper covers by the National Bureau of Standards and also in cloth-bound form by a commercial publisher.

Not only is the home improved at a small expenditure but the men who receive badly needed pay spend it promptly, thus getting the money into general trade channels at once. In accordance with the plans of the President's Emergency Committee for Employment, the National Bureau of Standards prepared a detailed "Check List For Possible Repairs and Improvements in the Home and Its Equipment," which was based on the book "Care and Repair of the Home." This pamphlet calls attention to many small items of upkeep and repair which ordinarily might not be observed. The check-list idea has been used extensively in different cities by local groups in furthering the "Spruce-up-your-home" wise-spending campaign.

Typical examples of local committee work are as follows:

The Mayor's Committee on Stabilization of Employment in Buffalo, N. Y., for instance, sends a mailing card to home owners which lists various odd jobs around the house. These jobs are checked and the card is returned to the committee. Return cards which are inclosed with household bills from the public utilities are to be mailed to the women's division of the local committee requesting either men or women workers at a specified time and price per hour.

Washington has a local committee composed of 64 civic groups—The Federation of Citizens Association Special Committee on Unemployment. This committee also uses the card check list system for readily locating odd job employment.

Springfield, Ohio, offers a specific instance of odd job stimulation. This city reports an increase of 48 per cent in alteration permits for October, 1930, against October, 1929.

The check list has been especially helpful to the smaller cities where local employment organizations are not maintained. On February 1, 1931, this committee had directly reached 20,000 home owners with the check list. This number, it must be remembered, is only supplementary to a much larger circulation issued directly through the local committees.

## STANDARD CUT LUMBER FACILITATES CONSTRUCTION

A radical departure from standard construction for apartment partition walls has been developed by a firm of architects in Seattle, Wash., according to an announcement made last month by the National Lumber Manufacturers Association. Lumber, tongued-and-grooved, 2 by 6, is mostly cut to length for partition use before it is first used in forms for the concrete construction. After it has been used in shoring, bracing, stringers, and soffit boards, it is taken down and built into mill construction partitions.

The typical partition consists of the 2 by 6's set up vertically, making a solid 2-inch wall. For sound-re-

sistant partitions, this wall is covered with sound-insulating material on both sides and plastered. For minor partitions it may be lathed with wood lath. Where wood lath is used, it is furred out by lath strips set vertically at about 16-inch centers, and the whole nailed through to the 2 by 6 inch core.

This construction is extremely solid, sturdy, and resistant to fire and sound; but being thinner than standard hollow walls, effects a saving in space. All the floor formwork is used in the partitions. The only waste consists of the cleats and possible odd lengths, most of which are used up in the partitions over doorways, etc. The wall is almost air tight, even before lath and plaster are applied. The construction is simple. Workmen are able to go through with the various steps quickly.



## STANDARDIZATION MOVEMENT IN CANADA

### Cooperative Policy of Canadian Engineering Standards Association with Industrial Representatives Aids Solution of Various Industrial Problems

By B. STUART MCKENZIE, *Secretary, Canadian Engineering Standards Association*

The object of all manufacturers is to sell their product, and business prosperity depends upon the activity of the buyer. The buyer, or the purchasing agent, is therefore a most important personage, and one whose friendly cooperation in industrial affairs should be cultivated. It is particularly expedient that close relations be established and maintained between purchasing agents' associations and national standardizing bodies, for the prime object of these latter bodies is to bring the buyer and seller into friendly contact, and thus enable them to come to an understanding which will be of mutual financial benefit. This results in good quality and fair prices, encourages buying, and is thus a great factor in promoting an active market.

In any discussion of the industrial standardization movement the subject of specifications comes at once into the picture. The main work of all standardizing bodies consists in preparing and encouraging the circulation and adoption of industrial specifications which can be relied upon, which adequately cover the situation, and which have been carefully thought out by all the parties concerned—that is, by both manufacturers and users and the necessary technical advisers. Specifications should, therefore, be practical documents, not scientific treatises; should be brief and above all be characterized by their eminent common sense. There is a feeling of security in the use of such a specification, for since it has been prepared by the cooperative effort of all interests, it is bound to be more comprehensive and accurate than one prepared by individual effort.

An industrial specification may be defined as "the concrete expression of an agreement between manufacturers and users as to design or quality of a manufactured article, which agreement has been reached by friendly conference and is recommended for adoption as being in the best interests of all concerned." Too much emphasis can not be laid on the idea of "friendly conference," for in this way only can suspicions be allayed, misunderstandings cleared up, and a reasonable solution of the particular problem obtained.

Practically all standard specifications covering material include provisions for tests, which have been devised as the result of long practical experience. It is most important that buyers should become familiar with these tests and to that end purchasing agents, inspectors, and designing engineers are advised to consult together frequently. In most cases purchases are made with cost as the prime consideration, but performance or durability is after all the ruling factor. The first cost of an article may be twice that of a similar article but it may last three times as long, so that the more costly article is in the end the more economical. There is at the present time a marked tendency in the preparation of specifications to use performance as a basis rather than design or chemical composition.

#### Procedure in Canada.

The Canadian Engineering Standards Association is a cooperative industrial body, not a department of the Dominion Government as many believe, having been incorporated in 1919. It has no authority to enforce its standards on industry, and does not desire any such authority. Any assumption of authority would destroy that cordial feeling which now exists between the organization and its industrial friends, a relation which the association uses effort to foster.

Under its cooperative policy, the association is enabled to enlist the services of industrial representatives in the solution of various industrial problems. It is in a position to call friendly conferences at which all parties interested may freely express their views. As the association is not operated for any profit, and is entirely nonpartisan, it is enabled without prejudice, to freely circulate and encourage the adoption of the reports or specifications which are published as a result of these conferences.

Industrial standardization is closely allied to another great industrial movement known as simplified practice or waste elimination. It is therefore quite consistent that a national standardizing body should include this in its work. Briefly, simplified practice consists in the elimination of unnecessary varieties in any one manufactured article.

Manufacturers find that they are making and trying to sell many varieties of some specific article which are subject to infrequent call and, being slow moving, take up valuable storage space. A smaller range would serve the buying public equally well, but the larger range is bought mainly because it is in the catalogue. If the manufacturer can effect an economy by eliminating varieties, without prejudicing the interests of his customer, a great saving for both may be the result. The manufacturer can thus manufacture for stock with the assurance that his product will meet the market, and in slack times is enabled to keep his staff busy. The customer, on the other hand, is assured of quicker delivery on his orders and profits from the lower prices resulting from the reduction in overhead and storage charges which the manufacturer has been able to make.

The association has made a start in this field and hopes greatly to extend its operations. An established list of machine screws was issued in 1929 which reduced the variety in this product from 43 to 21, but which still provides a practical working list that will adequately meet the needs of the designing engineer. Work is now being done on similar lists covering cap and set screws, machine, carriage, and plough bolts, machine bolts and nuts, etc. The association has also sponsored a simplified list for square and round bars for reinforcing concrete, reducing the variety from 18 to 11, in sizes ranging from  $\frac{1}{4}$  inch to  $1\frac{1}{4}$  inches.

This list has been approved by both manufacturing and construction interests, and is now practically standard in the construction field. In the electrical



field the specification for incandescent lamps includes dimensions for standard screw sockets, the varieties of which have been reduced from 179 to 6 by standardization. A specification for control cable for power houses provides for the identification of 15 conductors by the use of not more than two colors and a single design in the braid. Previously as many as three different colors were used at one time and each manufacturer had his own range of braid designs.

#### Association's functions.

These brief references show the possibilities which are open for future endeavor in the fields of standardization and simplification, and indicate the important rôle which can be filled by a national standardizing body. The functions of such a body as exemplified by the work of the Canadian Engineering Standards Association, may be briefly summarized as follows:

1. Promoting friendly relations between manufacturers and users.
2. Assisting manufacturers to effect economy in manufacturing, and thus giving the user the advantage of lower prices.

3. Showing the user the value of standard specifications and the wisdom of buying to a smaller range in variety.

4. Relieving the user of the necessity of preparing his own specifications.

5. Solving industrial problems by conferences in which all interests are represented.

6. Drafting of rules for the protection of life and property.

7. Promoting uniformity in manufacturing practice and quality of material throughout Canada.

It would be quite impossible within the compass of a brief article to give a detailed account of the work which is being carried on in Canada by the national standardizing body. It is hoped, however, that sufficient information has been given to demonstrate the fact that industrial standardization and simplification can be of financial benefit to those who understand and apply intelligently the principles underlying these two great movements. Canadian industries are, therefore, consulting their best interests by cooperating with their own national standardizing body and supporting it in every way possible.

## ACTIVITIES OF THE AMERICAN STANDARDS ASSOCIATION

### News of the Month Shows Progress in Standardization

The following current information relating to developments in certain standardization projects under the auspices and procedure of the American Standards Association has been furnished by that association:

*Testing woven textile fabrics.*—A standard for "methods of testing woven textile" fabrics has just received the approval of the American Standards Association, following submittal under the proprietary sponsorship method by the American Society for Testing Materials. The standard covers, to quote the scope of the project, "General methods of testing woven textile fabrics, exclusive of materials requiring special treatment (for which specific methods of test will be described applicable for that material and such special methods shall take precedence over the general methods), and exclusive of cord fabric used in manufacturing tires."

In a sense the new standard may be considered as a revision of the former American tentative standard, "methods of testing cotton fabrics," which was discontinued when it was found desirable to widen the scope in order to include specifications for tolerances for hose ducks and duck belts. The word "tolerance" in this case must not be understood in the same sense in which it is used in limiting gaging practice. The definition of tolerance, according to standard No. D23-027 of the American Society for Testing Materials, is given as the "limits within which a textile must come in its specified characteristics in order that it shall constitute a good delivery on contract. They may be classified as the allowable limits of the quantitative characteristics of the fabric as defined in the specifications." In mechanical engineering practice the term "tolerance" represents the zone between the limits within which a product may vary and still be acceptable.

*Dimensions of Woodruff keys.*—American standard dimensions for Woodruff keys, keyways, and cutters have been approved by the American Standards Association, following submittal by the American Society of Mechanical Engineers, which is in charge of the technical committee on this subject. The intensive study given to this standard during its development appears to assure its meeting the needs of industry.

The standard covers a series of 27 keys of various thicknesses having radii of curvatures ranging from one-fourth to three-fourths of an inch. This series is said to cover 90 per cent of the requirements of the entire consuming industry. A simplified method of indicating Woodruff key sizes has been incorporated in the standard. Instead of using an unrelated series of numbers and letters or combinations of the two, a system has been developed in which one series of digits represents the nominal width of the keyslot or cutter, rising by  $\frac{1}{16}$ -inch increments, and a second series of digits representing the nominal diameter of the keyslot or cutter rising by  $\frac{1}{4}$ -inch increments. Two numbers, one from each series in the order stated above, give the number assigned to the particular standard key.

*Code for lighting school buildings.*—A revision of the code for lighting school buildings will soon be under way. The Illuminating Engineering Society and the American Institute of Architects, sponsors for the project, have advised the American Standards Association of their decision to undertake the revision. The first step in the revision will be the appointment of representatives to form a special committee which will prepare suggestions to be placed before the sectional committee when it is fully organized. The cooperating organizations which participated in the preparation of the original code have again been



requested to appoint representatives on the sectional committee.

*Safety code for coal-pneumatic cleaning plants.*—A safety code for coal-pneumatic cleaning plants has been approved by American Standards Association as an American standard. The standard includes specifications for the construction of the building in which pneumatic screening and cleaning equipment and driers are located, the arrangement of the screen room and the rooms in which the pneumatic jigs or tables are located. It also gives detailed specifications for the ventilation of all parts of the building in which the process of coal-pneumatic cleaning is carried on and specifications for methods of dust collection.

Reference is made to the National Electrical Code in connection with electrical installations for light, heat, and power. The code states, in a discussion of the types of systems, that "pneumatic-coal cleaning systems employ air pressure and evacuation and are subject to the hazards incident to the creation and distribution of dust, explosive in air when ignited. The two principal parts of the apparatus which create the dust and which also may be the means, unless properly designed and operated, of distributing dust are: (a) Screens, shaking and/or vibrating screens and revolving screens; (b) pneumatic jigs or tables for separating the pure coal from the refuse."

The new code was developed by the sectional committee on dust explosion hazards under the sponsorship of the United States Department of Agriculture, and the National Fire Protection Association. It is

the sixth of the series of codes developed by this committee. The others being: Safety code for the installation of pulverized fuel systems, safety code for pulverizing systems for sugar and cacao, safety code for the prevention of dust explosions in starch factories, safety code for the prevention of dust explosions in flour and feed mills, and safety code for the prevention of dust explosions in terminal grain elevators.

*Standardization of foundry equipment.*—A project for the standardization of foundry equipment, to be jointly sponsored by the American Foundrymen's Association and the American Society of Mechanical Engineers, will be undertaken by the American Standards Association. This decision was made recently by the A. S. A. Standards Council on recommendation of a special committee. Several months ago when the request for the project was transmitted to the American Standards Association it was suggested by the American Foundrymen's Association that this project might include the standardization of many types of foundry equipment. Color markings of foundry patterns have already been standardized by the American Foundrymen's Association, and a report on this subject, published in 1926, has been widely used.

Two projects under American Standards Association procedure concerning foundry practice have been under the leadership of the American Foundrymen's Association. These are the safety code for the protection of industrial workers in foundries, and the standards for outside dimensions of plumbago crucibles for nontilting furnaces in nonferrous foundry practice.

## NEW AND REVISED PUBLICATIONS OF THE NATIONAL BUREAU OF STANDARDS

**American Standard Specifications for Dry Cells and Batteries.** Specifications for dry cells, prepared by the National Bureau of Standards with the cooperation of manufacturers and users, were first published as an appendix to the bureau's circular No. 79, Electrical Characteristics and Testing of Dry Cells. They were later promulgated by the Federal Specifications Board as its specification No. 58. The second edition was approved by the American Standards Association as an American standard on February 27, 1928. Since that date a revision has been carried out concurrently by a technical committee of the Federal Specifications Board and a sectional committee working under the procedure of the A. S. A. This circular gives the specifications in the form adopted by the sectional committee and approved by the American Standards Association. (Circular of the Bureau of Standards No. 390. Price 5 cents.)

**Builders' Hardware (Nontemplate).** The printed pamphlet entitled "Builders' Hardware (Nontemplate)" Commercial Standard, CS22-30, has been released and distributed to acceptors of record. The main object is to establish standard nomenclature, definitions, and descriptions for regular items of builders' hardware, as well as standard finishes and finish symbols, which will be recognized and followed throughout the industry. (Price 10 cents.)

**Determination of Carbon in High Sulphur Steels by Direct Combustion.** Oxides of sulphur are formed in the direct-combustion method for carbon in steel, and cause positive errors if they are not removed. The absorbents commonly used for this purpose, as well as promising new ones, have been tested. A description is given of the absorption train that has been developed at the National Bureau of Standards as well as one that has been developed by the Jones & Laughlin Steel Co. (Research Paper No. 240. Price 5 cents.)

**Hospital Plumbing Fixtures.** This is the published simplified practice recommendation, adopted by a general conference May 22, 1929, covering types, sizes, and varieties of hospital plumbing fixtures. It became effective for new production on January 2, 1930. A period of one year, January 2, 1931, was allowed manufacturers to clear the then existing stocks of discontinued fixtures. (S. P. R. No. R106-30. Price 10 cents.)

**Importance of Particle Size in Samples of Certain Metallurgical Materials.** The sampling of certain metallurgical materials gives rise to particles that differ in size and in composition. The extent of the differences is shown in this pamphlet, and the procedures that must be followed in selecting the sample for analysis are outlined. (Research Paper No. 237. Price 5 cents.)

**Isolation of the Isomers of Hexane from Petroleum.** This paper describes the isolation of four of the five isomers of hexane from an Oklahoma crude petroleum. The fifth isomer, 2,2-dimethylbutane, was not found. It was found that ordinary fractional distillation concentrated the hexanes in a set of constant-boiling mixtures, the other constituents of which were ring compounds. These constant-boiling mixtures were broken up by distillation after the addition of an alcohol which was later removed from the distillates by washing with water. In this way, aided by equilibrium melting, the following four hexanes were obtained and identified: 2, 3-dimethylbutane, 2-methylpentane, 3-methylpentane, and *n*-hexane. The following constants were determined for each hexane: Boiling point, freezing point, specific gravity, and refractive index. The freezing points found for two of the hexanes appear to be the only ones on record. They are, for the air-saturated hydrocarbon,  $-143 \pm 0.5^\circ \text{C}$ . for 2-methylpentane and  $-118 \pm 0.5^\circ \text{C}$ . for 3-methylpentane. The eutectic for the system  $\text{CO}_2$ -2-methylpentane is  $-153 \pm 0.5^\circ \text{C}$ . (Research Paper No. 239. Price 10 cents.)



**Measurement of Sound Absorption.** This paper contains a brief discussion of the theory of reverberation measurements. The reverberation room is described, and details are given as to the method of measuring sound absorption by means of the ear. Methods are also described by which sound absorption can be determined from oscillograph records or by the use of an attenuator box and vacuum tube voltmeter. (Research Paper No. 242. Price 10 cents.)

**Measurement of Surface Temperature.** After a brief discussion of some of the methods which have been used for measuring surface temperatures, the paper describes a surface thermometer of the thermocouple type which was successfully used for measuring the temperatures of steel rails during the periods of heating before and after welding. A compensated type of thermocouple, for more precise measurements at temperatures below 400° F., is also described, and results obtained in measuring the temperature of a drying roll are given.

**Photo-Ionization of Caesium Vapor by Absorption Between the Series Lines.** Measurements by the space-charge method have been made on photo-ionization resulting from a small continuous absorption between the series lines. Results are expressed in terms of relative sensitivity  $I(\lambda)/I(3,200)$ . At 0.064 mm pressure  $I(\lambda)/I(3,200)$  increases from 0.0003 at 3,750 Å to 0.07 at 3,250 Å.  $I(\lambda)/I(3,200)$  increases roughly as the square root of the pressure throughout this wave-length range. On the short wave length side of 3,500 Å the effect decreases with increasing temperature of the vapor, the effect being reduced to half for a 70° rise in temperature. On the red side of 3,500 Å there is little, if any, temperature change. Results other than the temperature effect can be explained on the hypothesis that the absorption between lines is purely atomic as there is some line absorption far from the line center. However, the temperature variation indicates a molecular origin and leads to an estimate of 0.26 electron volts for the work of dissociation of  $Cs_2$ . Other results can be qualitatively explained on the same hypothesis. (Research Paper No. 234. Price 10 cents.)

**Strength of Welded Shelf-Angle Connections.** Shelf angles for transferring loads from floor beams to columns in steel-frame buildings were welded to H-section steel columns. The angles on the different specimens varied in width, thickness, and length. In some of the specimens the vertical leg of the shelf angle was placed against the web or flange of the column and was fastened to the column with fillet welds of the edges of contact. These types of specimens were: (a) Single weld at heel of angle, (b) welds at heel and toe of angle, (c) welds at ends of angle, (d) welds at heel and ends of angle, and (e) welds at heel, toe, and ends of angle. However, in the specimens of type F the angle was made of such a length that it filled snugly between the flanges of the column and was fastened to the column with fillet welds at both ends of the angle. The inner face of the vertical leg of the angle was placed 2 inches from the center line of the column web.

The specimens were tested to destruction in the 10,000,000-pound testing machine of the National Bureau of Standards. They were placed in the machine in an inverted position so that the outstanding legs of the angles rested on 6 by 6 inch

steel bearing blocks placed on the lower platen of the machine. In testing all of the specimens, except type F, the inside faces of the bearing blocks were placed one-half inch from the face of the column to simulate end clearance in the floor beam. For type F the bearing blocks were placed under the entire width of the horizontal legs of the angles.

Increasing the width of the vertical leg of the angle increased the maximum stress for specimens welded only at the ends, type C. There were no definite indications that the width of the vertical leg of the angles affected the strength of the other types of specimens. Neither the thickness nor the length of the angles appeared to have much effect on the unit strength of the specimens.

Self-angle connections in designing which the stresses are those recommended by the Code for Fusion Welding and Gas Cutting in Building Construction, prepared by the American Welding Society, will have a factor of safety of about 4, provided the welds are reinforced as much as the welds on these specimens. (Research Paper No. 230, price 10 cents.)

**Supplementary List of Publications of the Bureau of Standards.** This supplementary list is issued to supplement the information given in Bureau of Standards Circular No. 24. The period covered is from July 1, 1925, to February 28, 1930. (Free distribution.)

**Surface Tension of Soap Solutions and Its Relation to the Thickness of Absorbed Films.** A sharp minimum in the surface tension-time curves of certain soap solutions has been interpreted in the literature as indicating the gradual formation of a surface film possessing the properties of a plastic solid, and having a thickness equivalent to some 10,000 molecular lengths. In this paper the hypothesis is advanced that the formation of the thick film is brought about by chemical action between carbon dioxide from the air and dissolved soap. Surface tension experiments performed in the open air have confirmed the existence of the minimum point observed by previous investigators. However, when solutions prepared in exactly the same manner were tested by the same method in an atmosphere free from carbon dioxide no minimum point was found. The solutions behaved instead in the manner which is characteristic of colloidal solutions in general. These results support the hypothesis advanced above and leave the preponderance of evidence against the existence of a film of extraordinary thickness at the surface of soap solutions. (Research Paper No. 241, price 5 cents.)

Send orders for publications listed above with remittance only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to bureau's Technical News Bulletin, 25 cents per year (United States, and its possessions, Canada, Cuba, Mexico, Newfoundland, and Republic of Panama); other countries, 40 cents. Subscription to bureau's Journal of Research, \$2.75 per year; other countries, \$3.50. Subscription to Commercial Standards Monthly, \$1 per year; other countries, \$1.25.

## SIMPLIFICATION BRIEFS

**Capacity ratings for boilers.**—A survey recently made on capacity ratings for low-pressure steel heating boilers discloses the need for a simplified schedule of such ratings. Following a study of the survey report the Steel Heating Boiler Institute requested the National Bureau of Standards to present the proposal to industry for consideration.

**Ice cream cups and cup caps.**—A summary report of the simplified schedule for ice cream cups and cup caps, recently approved by a general conference of the industry, has been mailed to members of the industry by the National Bureau of Standards for written ac-

ceptance. Contingent upon acceptance in writing, the recommendation will become effective on January 1, 1932.

**Ice cream brick molds and cartons.**—Simplified practice recommendation R120-31 covering ice cream brick molds and cartons has just been announced by the National Bureau of Standards. This announcement was prompted by the receipt of signed acceptances from a sufficient number of manufacturers, distributors, users, and others interested, to insure the general adoption of the program by the entire industry.



*Identification of simplified sizes.*—Efforts of the National Bureau of Standards, through its division of simplified practice, to have all simplified sizes identified in catalogue price lists, etc., so that the purchaser can readily select them, received the unanimous approval of the executive committee of the National Association of Purchasing Agents, at its annual meeting held in New York, February 16 and 17, 1931.

*Full disk buffing wheels.*—The printed pamphlet on the simplified schedule covering full disk buffing wheels (Simplified Practice Recommendation No. R115-30) is now available for purchase from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents per copy. This is the recommendation recently adopted by industry defining the ply and outside diameter of full disk wheels.

*Fast selvage Terry towels.*—The simplification for fast selvage Terry towels (Simplified Practice Recommendation No. R119-31) may be considered effective from March 1, 1931, according to an announcement by

the National Bureau of Standards. Sufficient signed acceptances have been received by the bureau from the industry to insure the general adoption of the recommendation. This recommendation reduced the number of sizes of fast selvage Terry towels from 74 to 6, an elimination of 91 per cent.

*Cupola lining blocks.*—The joint committee on foundry refractories, sponsored by the American Ceramic Society and the American Foundrymen's Association, has requested the cooperative services of the National Bureau of Standards in the consideration of a simplified practice recommendation which will cover the sizes and shapes of cupola blocks, tap-out blocks, and slag hole blocks. The proposal is now in the course of preparation. A survey is being made among refractory manufacturers to ascertain the existing variety in these types of blocks. The compilation of the returns received from manufacturers in the survey will be turned over to the joint committee who will use this information as a basis for the drafting of a tentative simplified practice recommendation.

## FEDERAL SPECIFICATIONS

### Status of 65 Projects Announced

The Federal Specifications Board promulgated 14 specifications during the past month. In addition, 48 specifications were under consideration for revision, and 3 proposed specifications were submitted for criticism and comment.

The promulgations and revisions contain the new identification and classification symbols and title designations in accordance with the system used in the Federal Standard Stock Catalogue. Copies of the specifications (other than those promulgated) and further information relating thereto can be obtained from the Federal Specifications Board, National Bureau of Standards, Washington, D. C.

Copies of the promulgated specifications desired by those in the commercial world and others outside of the Federal Government may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

### PROMULGATED

New designation	Specifications	F. S. No.
C-H-111	Hair, hose, curled	
H-B-151	Brushes, casting	192
H-B-171	Brushes, cuspidor	194
H-B-181	Brushes, dauber, long paddle	195a
H-B-211	Brushes, dust, painters', flat	525a
H-B-216	Brushes, dust, painters', round	526a
H-B-251	Brushes, flowing, badger-hair	512a
H-B-256	Brushes, flowing, skunk-hair	514a
H-B-261	Brushes, flowing, squirrel-tail hair	513a
H-B-626	Brushes, stencil (flag ends preserved)	520a
H-B-636	Brushes, stippling, wall	523
H-B-701	Brushes, varnish, flat (double X thickness)	522a
H-B-706	Brushes, varnish, flat (triple X thickness)	521
HHH-P-611	Potatoes, Irish	271

### REVISIONS

Z-A-611	Apples, canned	604a
Z-A-621	Applesauce, canned	621a
Z-A-631	Apricots, canned	605a
Z-C-301	Cherries, canned	606a
Z-P-191	Peaches, canned	607a
Z-P-671	Prunes, canned	610a
Z-P-201	Pears, canned	608a

### REVISIONS—Continued

New designation	Specifications	F. S. No.
HH-G-71	Gaskets, asbestos, copper corrugated	93
HH-G-76	Gaskets, asbestos, metallic cloth	97b
HH-P-41	Packing, asbestos, rope and wick	487
HH-P-31	Packing, asbestos, metallic cloth, sheet	94b
HH-P-61	Packing, diaphragm	98a
HH-P-91	Packing, fiber, hard, sheet	486
HH-P-106	Packing, flax	101c
HH-P-151	Packing, rubber, cloth insertion	110a
HH-P-171	Packing, spiral, gland, low pressure	104a
HH-P-181	Packing, tucks	113a
PP-C-251	Chickens, dressed (broilers, fryers, and roasters)	267
PP-F-611	Fowl, dressed (fricassee)	267
QQ-L-171	Lead, pig	117
QQ-S-751	Steel, structural (including steel for cold flanging) and steel, rivet, for ships other than naval vessels	469
TT-C-291	Chrome yellow, dry, paste in Japan, paste in oil (lemon, medium, orange)	476
TT-E-531	Enamel, water resisting, red	66
TT-O-111	Ocher, dry, paste in oil, and paste in Japan	12
TT-P-31	Paints, iron hydroxide and iron oxide (ready mixed; semipaste)	13b
TT-P-41	Paint, lithopone, interior, gloss, light tints and white	67
TT-P-46	Paints, lithopone, interior, flat and eggshell finish, ready mixed and semipaste, light tints and white	21b
TT-P-61	Paint, ready-mixed and semipaste, black	14b
TT-P-81	Paint, ready-mixed, and semipaste, olive-drab	10b
TT-P-101	Paints, titanium-zinc, outside, ready-mixed and semipaste, white	278
TT-P-791	Putty	283
TT-R-191	Red lead, dry, and paste	11
TT-Z-301	Zinc oxide, dry, and paste	8
TT-V-51	Varnish, asphalt	19
TT-V-91	Varnish, shellac	376
WW-P-441	Pipe, wrought-iron, welded, black and galvanized	242a
ZZ-I-121	Ice-bags, rubber	217
UU-B-591	Board, illustrating	590
UU-P-226	Paper, detail-drawing	594
DDD-B-51	Bandages, gauze, compressed	298
DDD-T-531	Towels, huck, office (with woven name)	422a
DDD-B-171	Belting, conveyor (stitched duck)	466
DDD-T-551	Towels, turkish	
JJJ-A-711	Asparagus, canned	624a
JJJ-B-181	Beets, canned	626a
JJJ-O-331	Oil, linseed, boiled	475b
JJJ-O-336	Oil, linseed, raw	4b
	Raisins	634a

### PROPOSALS

	Plain and thread plug and ring gages (and Miscellaneous Publication National Bureau of Standards No. 100, of same title).	
	Axes	
	Cabbage, canned	



## THE INTERNATIONAL ILLUMINATION CONGRESS OF 1931

### Great Britain Plans Unique Series of Meetings on Lighting

The regular triennial session of the International Commission on Illumination scheduled to be held in Great Britain in September, 1931, is to be made the occasion of an unparalleled gathering of lighting experts and engineers from all the world, according to plans announced by the British National Committee on Illumination. The formal sessions of the commission are to be at the University of Cambridge, but preceding them there will be held a peripatetic International Congress which will include a large part of England and Scotland in its itinerary. This will give visitors an opportunity to observe the development of lighting and electric service in Great Britain, and at the same time will bring to British industrial and commercial centers messages from some of the world's outstanding authorities on lighting.

Registration for the International Congress will take place in London on the first three days of September, during which time a reception will be held and visits made to places of technical interest. The first session will be held September 4 in Glasgow. Meetings and visits to points of interest will follow in Edinburgh on September 6, 7, and 8; Sheffield, September 9 and 10; Birmingham, September 11 and 12; while on September 13 a tour will be made from Birmingham to Cambridge. The various technical meetings and plenary session of the International Commission on Illumination will be held at Trinity College, Cambridge, September 14 to 19, inclusive.

The dates have been chosen to enable the delegates to attend the 3-day celebration in London of the Faraday Centennial, immediately following the commission sessions. The centennial includes a meeting of the Institution of Electrical Engineers and will be followed in turn by the annual meeting of the British Association for the Advancement of Science.

#### Subjects for the congress.

The following general topics have been designated for discussion at the congress sessions on lighting practice: Factory lighting, office lighting, home lighting, lighting for aviation, lighthouses and buoys, street lighting, traffic signals and motor vehicle lighting, floodlighting, architectural lighting, natural lighting, mine lighting, museum lighting, laboratory technique, and lighting-service bureaus. The national committees which constitute the commission have been asked to obtain papers of international interest on these subjects.

The United States National Committee of the International Commission has been charged with the responsibility for management and direction of four important divisions of the commission's activities. These are: Motor vehicle lighting, factory and school lighting, aviation lighting, and applied lighting practice in fields not otherwise specifically assigned. The need for agreement on some essential features of aviation lighting has already resulted in preliminary meetings abroad under the auspices of the International Commission, and the forthcoming meetings will undoubtedly bring together important specialists in this newer field of lighting. Special attention will

also be given to methods which have been found useful in showing the public how to use light effectively.

Members of engineering societies and others interested in the science and art of illumination are eligible to attend the International Congress. Those interested may obtain full information by application to the assistant secretary of the Illuminating Engineering Society, 29 West Thirty-ninth Street, New York, N. Y.

#### History of the international commission.

The International Commission on Illumination in its present form dates from 1913, but is a continuation of the International Photometric Commission created by an International Congress of the Gas Industry held in Paris in 1900. The Photometric Commission was set up to standardize the methods used in measuring the light from incandescent gas mantles. It held three sessions at Zurich in 1903, 1907, and 1911, and made notable progress on the technical problems of photometry. In particular, it stimulated comparisons of the standards of candlepower used in different countries and thus helped in bringing about agreement on a single unit of light to be used in Great Britain, France, and the United States, beginning in 1909. This unit is still used under the name "International Candle."

The meeting of 1913 at Berlin, at which the organization was changed to the present form, made the scope of the commission broader in two ways. In the first place it took in electrical organizations in addition to the gas associations, and in the second place it turned the activities of the commission toward the study and promotion of the use of light rather than merely its production and measurement. The fulfillment of these plans was naturally delayed by the war, but the work of the commission was revived at a meeting in Paris in 1921, and has been successively enlarged at other sessions held in Geneva, 1924, Bellagio, Italy, 1927, and in the United States in 1928.

The plan of having a general Congress on Illumination to supplement the more technical sessions of the commission was inaugurated in 1928. Delegates from 10 countries were taken on a tour of inspection, including all the larger cities from Boston to Chicago and then attended the convention of the Illuminating Engineering Society at Toronto. Sessions of the commission itself were held at Saranac Inn, N. Y.

While exchange of information regarding the science and art of illumination is now emphasized as the primary object of the commission, some very important standardization projects are still before it. For example, at the 1931 Cambridge session it will consider the status of photometric standards and methods and the establishment of international standards for lamp bases and sockets. On the former project this commission is collaborating with the International Committee of Weights and Measures and several national standardizing laboratories in the hope of removing very serious discrepancies which now exist in the rating of lamps in different countries, and also of securing the use of a single unit of candlepower



throughout the world. On the question of bases and sockets, it is acting jointly with the International Electrotechnical Commission. Two general types of bases (bayonet and Edison screw) are used and will continue in use, but it is hoped to obtain uniformity in the essential dimensions of each type.

The countries represented by national committees in the International Commission are Austria, Belgium, Czechoslovakia, France, Germany, Great Britain, Hol-

land, Hungary, Italy, Japan, Sweden, Switzerland, and the United States of America. Poland has also applied for admission to the commission. The United States National Committee is made up of representatives from the Illuminating Engineering Society, the American Institute of Electrical Engineers, the National Electric Light Association, the American Physical Society, the Optical Society of America, and the National Bureau of Standards.

## A. S. T. M. REPORTS PROGRESS IN STANDARDIZATION

### 1930 an Active Year for Society—Work of Its Committees Reviewed

A review of the American Society for Testing Materials' activities during 1930 presents a general perspective of the society's accomplishments, and serves as an incentive for equal or greater accomplishments in the future, to quote a recent announcement of the society. It was further stated by the American Society for Testing Materials' announcement that the two purposes for which the society was organized were: Research and standardization—research in, and the promotion of, knowledge of engineering materials, and the standardization of materials, specifications, and methods of testing.

The 1930 edition of the Book of American Society for Testing Materials Standards was issued in two parts: Part I on Metals, containing 179 standards, methods of test, definitions, and recommended practices relating to metallic materials; and Part II on Nonmetallic Materials, containing 251 standards, methods of test, etc., relating to nonmetallic materials and products. Included in these publications were not only the 45 tentative standards that had been advanced to standard during the year, but also 55 standards that had been revised in order that the specifications and methods of test appearing in the Book of American Society for Testing Materials Standards would represent the latest thoughts on these subjects.

The Book of American Society for Testing Materials Tentative Standards, an annual publication of the society, contains 155 specifications, methods of test, etc., relating to both metals and nonmetallic materials, was also released during the year.

As a result of its intensive standardization work, the American Society for Testing Materials now has 582 standards and tentative standards. Ten years ago it had 224.

The outstanding phase of the society's standardization activities in 1930 was the establishment of the committee on standards. This committee was organized to promote and to consider general matters of policy regarding the society's standardization activities; to review annually the progress made in standardization, as well as to pass upon proposed new tentative standards offered for consideration between the annual meetings. Under this new procedure, the committee approved the publication of new tentative specifications for high-early-strength Portland cement and three methods of testing natural building stone, as well as the revision of seven tentative standards and methods of testing.

Changes have been made in the standard P. C. E. test by the society to include testing of raw fire clay

and silica cement. Heretofore the test has been limited to the testing of fire-clay brick. Detailed changes have also been approved in the sampling of the test materials and the manner of preparing the test cones to make the test applicable to raw fire clay and silica cement. The reports of activities for the following two committees may be taken as indicative of the American Society for Testing Materials' work.

The American Society for Testing Materials' committee on refractories last year approved the recommendations of the section on heat transmission regarding a standard nomenclature which is the same as that of the National Research Council. This section now is studying methods of measuring heat transmission with the idea in mind of eventually making recommendations for a standard method.

Additional sections are being prepared for the American Society for Testing Materials' manual for interpretation of refractory test data, in an attempt to put refractories tests and methods of reporting data on a sound statistical basis. These are to cover quality control and a discussion of what constitutes good data, in accordance with the original plan of revising and adding to the manual from time to time to keep pace with advances in theory, and to make the manual generally useful.

A cone-temperature conversion table has been approved which now enables users of the test to express their results in terms of either standard pyrometric cones, or temperatures.

The committee on refractories, continuing its policy of establishing a complete series of standard analytical samples for all types of refractory materials, now has in progress with the National Bureau of Standards, the preparation of standard samples of chrome, magnesite, and silica materials of the usual commercial grade. Twelve industrial and private laboratories are cooperating on the project. This will make available a total of nine samples covering the various degrees of highly aluminous materials and plastic and flint fire clays, as well as the three other materials first mentioned.

Several years ago the same committee abandoned its test for the resistance to slagging of refractories, because of the unsatisfactory data which was frequently developed and pointed out at the time the necessity for some fundamental studies of the reaction between various slags and refractories before a new test could be recommended. Eight members of the American Society for Testing Materials' committee on refractories are also members of the American Society of Mechanical Engineers' special boiler fur-



nace refractories, which for several years has had under way a very thoroughgoing study, both in the field and in the laboratory, of the action of coal-ash slags of various fire-clay brick. The work has progressed to the point where it is believed that within the near future the American Society of Mechanical Engineers' committee can recommend a standard test procedure, for at least the field of coal-ash slags and fire-clay refractories, to the American Society for Testing Materials' committee.

Six tentative specifications, relating to galvanized wire and wire products, have been advanced to standard, following a favorable vote by the membership of the society. Standard Methods of Determining Weight of Coating on Zinc-coated Articles has been revised to include an improved method for determining the weight of coating on zinc coated wire. Following are the specifications, published as tentative in 1927 and 1928, for galvanized wire and wire products, which have been adopted as standard:

Zinc-coated (galvanized) iron or steel telephone and telegraph line wire (A111-30).

Zinc-coated (galvanized) iron or steel tie wire (A112-30).

Zinc-coated (galvanized) farm-field and railroad right-of-way wire fencing (A116-30).

Zinc-coated chain-link fence fabric galvanized after weaving (A117-30).

Zinc-coated (galvanized) barb wire (A121-30).

Zinc-coated (galvanized) steel wire strand (A122-30).

In the above specifications the Preece test is recommended for determining only the uniformity of the zinc coating, while stripping tests are provided for weight of coating determinations. In the specifications for line wire, and tie wire, wrap tests have been provided which may be specified by the purchaser as a check on the flexibility and adherence of the zinc coatings. The specifications cover materials regularly obtainable in the open market, and have been

prepared by the society for the mutual benefit of purchaser and seller.

Chain-link fence fabric, widely used for the manufacture of chain-link fence, is resilient and develops high strength under impact and stretching. Prior to 1925 most chain-link fabric was formed from galvanized wire, but about that time several of the larger fence companies more or less simultaneously undertook development work to improve the weather resistance of this type of fence. The outcome of this development work was the introduction of galvanized afterwearing chain-link fence fabric. This new type fabric carries considerably heavier zinc coatings than did the older type.

The specification for zinc-coated steel wire strand contains one or two important revisions, probably the most important of which specifies maximum and minimum diameters of the individual wires of the strand, instead of permissible variations from the diameter of the completed strand. A requirement was added pertaining to the lay of the strand which specifies a length of lay not to exceed 16 times the nominal diameter of the strand in inches.

The new method for determining the weight of coating on zinc-coated wires may be more conveniently and economically performed and with considerably greater accuracy than was possible with the former method, which involved reference to a table, and required the selection of very short lengths of wire for the more important gages. The new method specifies that the sample of wire may be any length over 12 inches, but preferably about 24 inches. This method does not require the use of samples of known length, since, using 0.283 pound per cubic inch as the density of steel, it is only required to determine the diameter of the stripped wire and the ratio of the weight of the coating to the weight of the stripped wire.

## STANDARDIZATION BRIEFS

*Paper purchased by standard specifications.*—The Government Printing Office has successfully purchased all of its paper on standard specifications for many years. During the last fiscal year 52,000,000 pounds of paper were received.

*Color fastness tested.*—Experiments are in progress at the National Bureau of Standards to determine how long the color of wall-paper designs will retain its brilliancy. An apparatus was designed to measure, in 24-hour tests, how much the design will fade in two years.

*Indorsement of labeling by consumer group.*—The certification and labeling plans advocated by the National Bureau of Standards received the unanimous approval and indorsement of the executive committee of the National Association of Purchasing Agents, at its meeting held in New York, February 16 and 17, 1931.

*Automatic "smoker" for testing cigars.*—An apparatus, which automatically "smokes" cigars has been devised by the United States Department of Agriculture for use in testing the burning quality, the

nicotine, ammonia and acid content, and other properties of tobacco, as found in ash and smoke.

*Constant and uniform temperatures.*—In order to extend the range of temperatures that can be maintained constant and uniform, a cryostat is being developed at the National Bureau of Standards, in which liquid air or liquid hydrogen can be made to boil at reduced pressures.

*Standards for meat-packing industry.*—A "Standard Beef Grading System and Packers' Guide," which has been developed after careful research and study by a special committee, has just been issued by the Institute of American Meat Packers, 506 South Wabash Avenue, Chicago, Ill.

*Proposed specifications for motor fuels.*—Study of the proposed specifications for motor fuels of the Federal Specifications Board as they affect State Gasoline standards will be made in the early future by a committee representing the board of directors of the American Petroleum Institute.



*Wire-screen manufacturers organize.*—To promote standardization of wire-screen cloth, a majority of the manufacturers of this product have formed the Wire Screen Cloth Manufacturers' Institute, designating George E. Watson as secretary, with offices at 74 Trinity Place, New York, N. Y.

*British coal sampling.*—For years the subject of sampling and analysis of coal for export has been an important one in England. To meet the problem the British Engineering Standards Association has promulgated a specification (B. E. S. A. No. 404-1930) dealing with sampling and analysis of coal for export.

*Mortgage company insists on lumber grade-mark.*—The Mortgage Guaranty Co., of Los Angeles, Calif., has announced that all houses which it is to assist in financing must have the following lumber specification paragraph: "All rough lumber shall be No. 1, common Douglas fir (Oregon pine). Each piece shall bear the official grade-mark of the West Coast Lumbermen's Association."

*Definitions of magnetic units.*—International agreement on the definitions and names of additional magnetic units was reached by the International Electrotechnical Commission at its meeting in Oslo (Sweden), July, 1930. This constitutes a further important advance in the standardization of electromagnetic units brought about through the efforts of this commission.

*Printing industry conference.*—The second conference of the technical experts in the printing industry will be held on March 16 and 17, 1931, in the new Harding Hall of the Government Printing Office in Washington, D. C. There will be five group conferences covering: (1) air conditioning, (2) paper standards, (3) color, (4) plates, and (5) cylinder diameters. Various papers of interest to the industry will be presented at the conference.

*Association trade-mark.*—A trade-mark consisting of the letters "CW & SPA," have been adopted by the California White and Sugar Pine Association. This action on the part of the association was taken after a representative of the National Lumber Manufacturers Association had pointed out that bids for lumber on the Boulder Dam project were being called for in three classifications, namely, (1) grade, trade and tree marked, (2) association inspected and certified, and (3) Government inspected.

*Radio and sound system to aid ships through fog.*—The United States Lighthouse Service has installed a system which enables a vessel running through fog to determine its distance as well as direction from a station sending out fog signals. The system, of which the radiocompass is a part, requires that the station send out simultaneously both a radio and a sound signal; the difference in the transmission speed of these two signals provides a basis for calculating the distance.

*Octane numbers.*—The automotive power plant section of the National Bureau of Standards has used octane numbers exclusively to express the knock ratings of gasolines since August, 1930, and has begun

making routine fee tests to determine the approximate octane numbers of gasolines submitted for rating. Approximate octane numbers only will be reported until the test apparatus and method of testing have been standardized. The bureau will also test the purity of the iso-octane and normal heptane sold for use as primary detonation standards.

*Binder's board.*—At the request of the Binders Board Manufacturers Association, tests of binder's board are being made at the National Bureau of Standards to assist the association in the establishment of commercial standards for it. The boards produced by the different manufacturers are being tested for weight, thickness, flexural strength, bursting strength, tensile strength, and moisture content. The testing details were arranged in a conference with representatives of the association held at the National Bureau of Standards on January 24, 1931.

*Chronograph.*—The United States Naval Observatory is equipped with a chronograph which is used to compute the infinitesimal errors which may occur between transmission of time signals from the Naval Observatory and their emission by the Naval Radio Station at Arlington. The chronograph, records both the ticks of the master clock which controls the transmission of signals and the sending out of the signal from the radio station. The record sheet shows any deviation from accuracy to one-thousandth part of a second.

*States urged to mark highways.*—Cooperation of State highway commissions throughout the United States in marking highways with suitable characters that can be read by pilots of aircraft flying cross-country is being invited by Clarence M. Young, Assistant Secretary of Commerce for Aeronautics. In a letter mailed to each of the 48 commissions, Mr. Young pointed out that highways afford one of the best landmarks for those who fly, and hence, when properly marked to facilitate their identification from the air, constitute a very helpful aid to air navigation.

*Gasoline knock-rating.*—The following S. A. E. recommended practice, adopted by the Society of Automotive Engineers at Detroit on January 19, 1931, substitutes a single rating scale for the diversity of reference standards hitherto employed by different laboratories in rating the detonation characteristics of gasolines: Gasoline knock-testing results shall be referred back to heptane-octane by using a scale of octane numbers; the octane numbers to be the percentages of iso-octane (2, 2, 4 trimethyl pentane) by volume in a mixture of iso-octane and normal heptane required to match the antiknock value of any given fuel.

*International acceptance of nomenclature.*—An attempt to secure international uniformity in the compilation of industrial statistics has been made by the International Chamber of Commerce, Paris, France. As a matter of practical procedure each specific branch of industry has been studied separately. Attention has centered on ways and means of securing uniformity as to time, and definition of basic factors; the adoption of identical weights and measures, and the



coordination of existing information in various lines such as coal, shipbuilding, cotton, chemical fertilizers, wool, iron ores, wood pulp, semiraw metallurgical products and silk.

*England to have building code.*—Consideration is now being given in Great Britain to the preparation of a national building code, and a special investigation of structural steel has been undertaken by the Department of Scientific and Industrial Research. Funds have been supplied by the British Steelwork Association and the work will be done in consultation with the Institution of Civil Engineers. It is reported that special consideration will be given to the standard specification for steel structures for buildings promulgated by the Canadian Engineering Standards Association.

*Improved cost-accounting methods.*—Under the title, "Costs-Markets-Profits: A Challenge to Industry," the Department of Manufacture, U. S. Chamber of Commerce, Washington, D. C., has released the first of a series of bulletins designed to promote better cost-accounting methods in industry, and especially to stimulate renewed interest in uniform cost methods on the part of trade associations. Since the current business situation has brought home forcibly the need for accurate and adequate methods of cost determination in all lines of industry, trade associations have been placed in a strategic position which enables them to give uniform cost accounting a prominent place on their program of activities.

*Standard anaesthetic ether.*—There has been a progressive improvement in the quality of anaesthetic ether market in this country in recent years, according to the Food and Drug Administration, United States Department of Agriculture. The chief difficulty encountered with anaesthetic ether is its tendency to develop aldehydes and peroxides. Pure anaesthetic ether, as defined by the United States Pharmacopoeia, the standard for drugs under the food and drugs act, contains no peroxides and aldehydes. Any ether entering into interstate commerce and failing to meet the legal standards as to quality and purity is subject to seizure under the Federal food and drugs act.

*Load line safety regulation.*—The Bureau of Navigation of the Department of Commerce has issued detailed instructions to collectors of customs as to the manner of determining the draft of vessels when leaving their ports as applied to the load-line markings based on the salinity of the water, distance from the sea, and the zones of the ports from which the vessels depart. It is expected ultimately to have on record in the Bureau of Navigation a report of the draft of each vessel on each departure from a port in the United States on a foreign voyage. From these drafts it is possible to determine whether the vessel was loaded deeper than her load line permitted.

*Indorsement of grade marking by retail association.*—The thirty-seventh annual convention of the Northeastern Retail Lumbermen's Association, New York, N. Y., January 29, 1931, adopted a resolution indorsing the organized manufacturers' efforts to as-

sist the retailer by grade marking, car certificates, and local inspection service, and urging the manufacturers' associations "to assist in this movement by an intensive publicity campaign with the architects, loaning institutions, and contractors, to acquaint them with the advantages of these facilities, as guarantees of honest grade and tally, inasmuch as one of the greatest contributing factors to the alarming decrease in the consumption of lumber, is the growing lack of confidence in the industry, resulting from fraudulent substitution of grades."

*Standardization in mining industry.*—The "run-of-mine" day at a coal operation witnesses the use of hundreds of standards that are not thought of as such. Several important standards cover bolts, cement, concrete reinforcing, spiral steel rods, fire hose and fire-hose couplings, machine tools, motor ratings, pipe flanges and fittings, pipe threads, rails, rivets, screw threads for bolts, machine screws, nuts and commercial tap holes, shafting, and wire. Seldom, if ever, are these recognized as representing the conscious efforts of some organization or group of organizations to standardize. Wasteful variety in design and construction of mining equipment is inexcusable and expensive.

*Highway code for British motorists.*—A highway code for the guidance of motorists, pedestrians, bicyclists, and drivers of animal-drawn vehicles is provided by the road traffic act now awaiting approval by Parliament, according to advices from Alfred Nutting, of the American Consulate Office in London, made public by the Department of Commerce. Pedestrians are requested to use footpaths where they are provided, to learn the signals used by motorists, and to give signals when they intend to cross the road. On wide highways pedestrians are advised to signal the driver as to which side they expect him to pass. Recommendations for motorists as to speed, priority of traffic, right of way at crossroads, cutting in, and reversing are also pointed out in the code according to the report.

*Optical instrument.*—A new type of optical instrument—the optical coincidence gage—which has been constructed at the National Bureau of Standards will enable one to make measurements in a direction perpendicular to the surface viewed. This instrument is similar to a military range finder except that the two telescopes forming the optical system of the range finder are replaced by two microscopes. The measurement may be made entirely without mechanical contact, and this offers four advantages: (1) Deformation of the test object because of stresses introduced by the gage may be entirely eliminated; (2) by the addition of a periscopic system, measurements can be made to points inaccessible to measurement by mechanical methods; (3) in many cases measurements can be made to moving parts; and (4) measurements can be made of dimensions which terminate at an optical image. The magnification of this instrument is approximately 85, and under favorable conditions, the probable error of a single reading is approximately four one-hundred thousandths of an inch. A second optical coincidence gage has been built for the purpose of adjusting the sound-reproducing mechanism of a motion-picture projector.



# AMERICAN AND FOREIGN STANDARDIZATION ON A NATIONAL BASIS

## Purposes and Scope of National Bodies in 21 Countries Reviewed

By SAMUEL B. DETWILER, JR., *National Bureau of Standards*

Although the need for national standardization in industry had manifested itself during the last century, such work was not carried on in an organized manner until 1901, when there was established in Great Britain a national committee to formulate standards for engineering materials. Other countries were slow to follow this example, so that it was not until 1916 that a second such committee was organized, in the Netherlands. Then, during the World War, the necessity for economy in the purchase of military supplies gave a great impetus to standardization. Other countries adopted the movement, and later decided to try out its advantages in peace-time production as well. When its value as a factor in promoting a country's economic prosperity was generally realized, national standardization spread rapidly, until to-day the work is under way on six continents.

### Names of standardizing bodies and countries.

National standardizing bodies are now active in 21 countries. The following table lists these organizations in the order of their formation:

Country	Name of standardizing body	Year of organization
Great Britain.....	British Engineering Standards Association (BESA)....	1901
Netherlands.....	Hoofdc commissie voor de Normalisatie in Nederland (HCNN).....	1916
Germany.....	Deutscher Normenausschuss (DNA).....	1917
United States of America.....	American Standards Association (ASA).....	<sup>1</sup> 1918
Switzerland.....	Schweizerische Normalien-Vereinigung (SNV).....	1918
France.....	Association Française de Normalisation (AFNOR).....	<sup>1</sup> 1918
Belgium.....	Association Belge de Standardisation (ABS).....	1919
Canada.....	Canadian Engineering Standards Association (CESA).....	1919
Austria.....	Österreichischer Normenausschuss für Industrie und Gewerbe (ÖNIG).....	1920
Italy.....	Ente Nazionale per l'Unificazione nell'Industria (UNI).....	<sup>2</sup> 1921
Japan.....	Japanese Engineering Standards Committee (JESC).....	1921
Hungary.....	Magyar Ipari Szabványosító Bizottság (MISz).....	1921
Australia.....	Standards Association of Australia.....	<sup>3</sup> 1922
Sweden.....	Svenska Industriens Standardiseringskommission (SIS).....	1922
Czechoslovakia.....	Československá Normalizační Společnost (ČSN).....	1922
Norway.....	Norges Industriforbunds Standardiseringskomite (NIS).....	1923
Poland.....	Polski Komitet Normalizacyjny (PKN).....	1924
Finland.....	Finlands Standardiseringskommission (SFS).....	1924
Russia.....	Standards Committee, Union of Socialist Soviet Republics (OST).....	1925
Denmark.....	Dansk Standardiseringsraad (DS).....	1926
Rumania.....	Comisiunea Romana de Normalizare.....	1928

<sup>1</sup> Reorganized in 1928.    <sup>2</sup> Reorganized in 1930.    <sup>3</sup> Reorganized in 1929.

Standardization is also carried on, or has been proposed, in South Africa, New Zealand, India, Dutch East Indies, China, Peru, and Greece.

### Purposes and scope.

- In general, the various national bodies promote "standardization within standardization," functioning in a rôle of centralization, coordination, and liaison. They study standardization from a technical and commercial point of view in every domain of industry, afford an adequate organization and a more ample development for existing standardizing activities, and establish generally recognized standards of

various kinds. Industry is represented in its relations at home and abroad. The latest foreign developments are applied, when helpful, to domestic uses. In short, the national standardizing bodies further the standardization movement in every practicable way as a means of advancing national economy.

### Definitions of terms.

The nomenclature of standardization contains terms whose definitions are synonymous or overlap in a confusing manner. Following the definition used by the American Standards Association, the term "industrial standardization" is here intended to cover: (1) Standards for nomenclature (definitions of technical terms, abbreviations, and symbols); (2) dimensional standards; (3) quality specifications for materials and equipment; (4) uniform test methods; (5) ratings of machinery and apparatus; (6) safety provisions; (7) rules for the operation of industrial apparatus and machinery; and (8) reduction in the number of types, sizes, and grades of manufactured products. This last item is generally designated "simplification" in America, "typification" by the Germans, and "normalisation" by the French and others.

"Unification" has been variously used as a more acceptable substitute for the word "standardization," as a synonym for "simplification," and to represent the unifying process inherent in standardization when introduced into the industrial process. It has been said that unification is a result or characteristic of standardization.

Scientific management, in a broad sense, is founded upon the standardization of equipment, materials, method, and product. With these factors as a basis, scientific management then goes on to emphasize the human element, to set up standards of accomplishment, which systematize, regularize, and routinize the work of the operative.

The term "rationalization" is being generally used in Europe to include the subjects of standardization, simplification, and scientific management. It is defined as "the acquisition and employment of every means which will be conducive to the economic advancement of the country, including standardization of materials and finished products, standard specifications and test methods, improved methods of production and transportation, scientific management, improved office and accounting practice, etc."

### Organization and procedure.

*British Engineering Standards Association.*—The plan of organization and procedure adopted by the British Engineering Standards Association has been followed, in a general way, in the formation of the other national bodies. In the British association, executive power is vested in a central council representative of all interests concerned with standardization. Under its authority function industrial sections covering various branches of industry or different classes of materials. In order to relieve the council of a great



amount of detail work, these sections have recently been decentralized, giving them considerable independence and responsibility.

Upon evidence of satisfactory general interest and after specific request from outside organizations, an industrial section may decide to undertake the preparation of a standard, discussing the broad policy and indicating the lines upon which the work shall proceed. Committees are formed to handle various technical phases of the work. The actual drafting of a project is carried on by so-called panels, or special subcommittees made up from the membership of the technical committees. Completed projects are submitted first to the technical committee, and then to the industrial section, for approval.

The most essential factor in the preparation of a standard is cooperation. With this in mind, the personnel of all bodies functioning under the central council has been carefully chosen with due regard for an equitable representation of producers, consumers, scientists, and Government establishments. Thus it is assured that completed standards will be the product of the closest possible agreement between all groups interested therein.

*American Standards Association.*—The American Standards Association is composed of 43 member bodies, including 26 trade associations, 10 technical societies, and 7 Federal establishments. In addition, about 300 other organizations interested in standardization are enrolled as sustaining members. A board of directors, made up of leading industrial executives, is in charge of administrative work. Standards are approved by a council of representatives of all the member bodies.

After request by some responsible organization, a standard may be prepared by any one of four general methods of procedure, namely, the sectional committee method, the existing standards method, the proprietary method, and the general acceptance method. By the first procedure, a representative sectional committee is formed either by a sponsoring organization or by the standards council. Standards projects drafted and agreed upon by the sectional committee are returned for approval, in one case, to the sponsor body and then to the standards council, and in the other case, directly to the council. In considering a project for approval as an American standard, the council is concerned not with the technical details involved therein, but with the procedure followed in its formulation, the adequacy of the representation on the sectional committee of manufacturers, distributors, consumers, scientists, and other interests, and the action by which the project has been adopted by the sectional committee and the sponsor.

Existing standards may be submitted to the sectional committee procedure described above, or, upon assurance that they conform to the association's requirements, may be accepted directly by the standards council. Proprietary standards, prepared and revised entirely by the sponsor body, may undergo like treatment.

For simple projects and for cases where sectional committees are deemed unnecessary, there may be employed the general acceptance method of procedure, by which a standard is prepared by a representative general conference, supported by written acceptances

from a majority of those concerned, and submitted to the association for approval.

*German Standards Committee.*—The *Deutscher Normenausschuss* (German Standards Committee) is the German counterpart of the American Standards Association, although it operates on a somewhat different basis, being without fixed rules or procedure, constitutional limitations or formal by-laws. Administration is handled by an executive committee, while a large staff, including many engineers, carries on the business work.

German standards are divided into two classes, "Dinormen" and "Fachnormen." The "Dinormen" include standards covering more than one industry or the industrial field as a whole. "Fachnormen" are standards for subjects within particular branches of industry.

Functioning under the *Deutscher Normenausschuss* are special industry committees representative of all interests concerned, through which, by means of working subcommittees, standards projects are drafted. Any necessary coordination of standards properly belonging under more than one industry is done by the main body. Projects are given wide publicity in the technical press, and criticism thus evoked is taken into consideration. Revised drafts are edited, printed in proof form, and submitted to the executive committee. If approved by this body, they are then published in final form, bearing the symbol, "DIN," to indicate acceptance as standards. "Fachnormen" bear also the symbol of the special industry concerned.

*Other national bodies.*—On the whole, the various national standardizing bodies function very similarly. Their members are representative of all classes of organizations interested in industrial standardization, and, save for a secretary and his business staff, give their services without remuneration. A central executive board lays down the broad lines upon which standardization shall proceed, and gives official approval to completed standards. Under this body operate technical committees covering various branches of industry, which, through their subcommittees, perform the actual work of preparing standards. Projects go through six general stages before final promulgation as national standards, as follows: (1) Determination to undertake standardization, (2) preparation of draft proposal, (3) circulation of proposal for general comment and criticism, (4) submission of revised proposal to executive board for approval, (5) approval as standard by executive board, and (6) publication of standard.

To provide a double assurance that standards are the product of a general cooperation and agreement, various measures are taken by the national standardizing bodies. In Australia and Japan, for instance, drafts of standards are given a wide circulation in proof form. In Austria, Czechoslovakia, Denmark, Germany, Hungary, Italy, the Netherlands, and Poland, proposals are published for general comment and criticism, for suitable lengths of time, in official publications or other technical periodicals. British standards are submitted to the Dominion standardizing bodies in Australia, Canada, South Africa, and elsewhere. The American Standards Association has at present no regular procedure by which



drafts of standards can be published in technical journals, but many of the organizations, which sponsor sectional committees functioning under American Standards Association procedure, themselves take steps to circulate proposed standards, either through technical magazines, or by means of proof sheets.

Czechoslovakian standards undergo a rigorous procedure before their final adoption, to insure their acceptability to all interested parties. The Standards Association requests that each member of the technical committee concerned obtain a written acceptance of a proposal from the organization which he represents. Further, a project must have the unanimous consent of the members of the executive committee before promulgation as standard.

The Canadian Engineering Standards Association has adopted a policy of dealing directly with business firms or organizations, rather than with sponsor bodies. This is believed to establish more cordial and intimate relations with industry, and saves time in the completion of standards.

The Standards Association of Australia has differentiated between simplification and the rest of the standardization movement, having established a division of simplified practice which functions separately from the standards division. This division, whose organization and activities are very similar to those of the division of simplified practice of the United States Department of Commerce, strives for the general adoption of types and sizes of industrial products having the greatest commercial demand. Through the voluntary cooperation of producers, distributors, and consumers, superfluous types and sizes of such products are eliminated, effecting substantial savings to all parties concerned.

In the sense that it is not itself a standards-making body, the Association Française de Normalisation (AFNOR) is not unlike the American Standards Association. The AFNOR centralizes French standardizing activities, makes available to industrial standardization committees—which perform the actual work of preparing standards—the results of its researches, and submits their standards for approval to the so-called Higher Committee on Standardization, a governmental organization which controls French standardization through general instructions transmitted to the AFNOR.

With the object of giving to standardizing activities an adequate organization and a more ample development, the General Fascist Confederation of Italian Industry recently sponsored the reorganization of the Italian national standardizing body, under the new name National Association for Industrial Standardization. Having complete control over standardization in all branches of industry, the new association represents an advantageous transformation and enlargement of the former standardizing committee, which dealt only with subjects in the field of mechanical engineering.

The Russian Standards Committee has been given broad powers in that, besides directing the progress of standardization work throughout the country, it is also authorized to supervise general adherence to standardization laws. As a result, all governmental bureaus of weights and measures, whose principal duty is to verify the adherence of materials for standard

samples, and the bureau of inspection for metals, coal, and chemicals have been subordinated to the standards committee.

In certain of the world's trading centers, more particularly in South Africa, India, the Argentine, Brazil, Uruguay, and Peru, local committees have been organized by the British Engineering Standards Association to assist British industry which depends largely on its export trade. Through these committees, consisting of British engineers and traders, some of the more important British standard specifications, translated into the appropriate languages, have been widely disseminated and are at the disposal of foreign purchasers who may desire to acquaint themselves with British practice.

### Character of work undertaken.

It should be noted that while special interest is shown by the British Engineering Standards Association in quality specifications for materials, and by the American Standards Association in quality specifications, standard test methods, and safety codes, the Deutscher Normenausschuss is particularly concerned with dimensional standardization and simplification. Although some work is going forward in the Australian and Canadian national bodies in the field of simplification, these organizations follow the British example in emphasizing specifications for materials. The Japanese Engineering Standards Committee is likewise chiefly engaged in such work. On the other hand, in most of the continental European countries, such as Austria, Denmark, Italy, Norway, Poland, Sweden, and Switzerland, standardizing activities are patterned after those of the Deutscher Normenausschuss, relating largely to dimensional standardization. In Russia, the work of simplification and dimensional standardization, while recognized as important, is treated as a preliminary step to the establishment of quality standards for materials.

### Government participation in work.

The Government is more or less concerned with national standardization in every country in which such work is carried on. National standardization is a recognized essential to the welfare of an industrial country, and is therefore considered worthy of official encouragement. Further, the Government, as a consuming organization, is a potential user of standards prepared by the national standardizing body, and is consequently interested in their development. This governmental interest is manifested in many countries in the shape of substantial sums donated toward the upkeep of the national standardizing body. Again, in certain countries, the organization and operation of such bodies are controlled by the Government. In this last respect, however, it may be said that governmental participation in the work of the national standardizing bodies is generally limited to representation in their executive councils and various technical committees.

The Russian Standards Committee operates under the Council of Labor and Defense, a governmental organization. Standardization projects are prepared with the cooperation of various consuming interests. Since nearly all the large manufactories are controlled by the State, few difficulties are encountered in introducing completed standards into industry. The Gov-



ernment has sought to enforce adherence to standards by providing penalties for infractions thereof.

The Japanese Engineering Standards Committee was established under the superintendence of the Minister of Commerce and Industry, who serves as its president. The committee functions as a governmental organization for preparing specifications for use primarily by the Government, although steps are taken to obtain the suggestions of technical societies, trade associations, and manufacturing firms when the specifications are being prepared.

French standardization is controlled in a general way by the Higher Committee on Standardization, a governmental body which gives final approval to completed French standards. The work of preparing such standards, however, is carried on by industrial standardizing committees, under the supervision and coordination of the French Standards Association, which itself is privately operated by French industrialists.

Governmental superintendence is confined, in Denmark, to the appointment of the members of the executive committee of the national standardizing body, and in Poland and Sweden, to the appointment of the chairman of the executive committee. The national bodies in other countries are managed, generally speaking, through the initiative of private industry. The Government has little or no control, acting rather in an advisory and cooperative capacity.

The amount of financial support accorded by the Government to the national standardizing bodies varies considerably in different countries. As mentioned before, Russian standardization is handled by the State. Most of the income of the Australian, Finnish, and Swedish standardizing bodies is derived from governmental sources. The Government meets about one-half of the expenses in Denmark and the Netherlands, and one-third of the expenses in Hungary, Norway, and Poland. In Great Britain contributions are arranged on a sliding scale. The Government makes a basic annual grant of £3,000, with a bonus of £1 for every £3 subscribed by private industry in excess of £13,000. The total annual grant, however, may not exceed £5,000.

In Belgium, France, and Germany, most of the funds for national standardization are privately raised, although governmental support may be given in certain instances. The Austrian, Canadian, Czechoslovakian, Italian, and American standards bodies receive very little or no financial aid from the government.

Many governments are making active use of the work of the national standardizing bodies. Included among the countries in which the national standards have been or are being introduced into governmental practice are Australia, Belgium, Canada, Czechoslovakia, France, Great Britain, Japan, Poland, Rumania, and Russia. In some of these countries, the use of national standards is mandatory for governmental departments.

Rumania has created an Office for Rationalization and Standardization, to promulgate specifications for materials consumed by the Government. This office maintains the closest cooperation with the Rumanian Committee for Standardization, and will make use of standards prepared by that body.

## Activity.

Some idea of the amount of work being carried on by the national standardizing bodies may be obtained from the following table, in which are listed, for different countries, the numbers of standards completed and standardization projects under way. From some of the countries late progress reports have not been made available, and the figures given in these instances represent only approximations.

Country	Standardization projects	
	Complete	Incomplete
Australia.....	135	30
Austria.....	434	309
Belgium.....	47	17
Canada.....	32	25
Czechoslovakia.....	57	( <sup>1</sup> )
Denmark.....	66	91
Finland.....	217	500
France.....	190	155
Germany.....	4,412	1,110
Great Britain.....	395	( <sup>1</sup> )
Hungary.....	14	78
Italy.....	132	116
Japan.....	109	45
Netherlands.....	300	150
Norway.....	227	79
Poland.....	272	496
Rumania.....	( <sup>1</sup> )	( <sup>1</sup> )
Russia.....	1,446	( <sup>1</sup> )
Sweden.....	288	184
Switzerland.....	300	50
United States of America.....	168	173

<sup>1</sup> No report.

Most of these standards relate to mechanical and electrical engineering. However, work has also been carried on in such fields as agriculture, automotive practice, chemistry, civil engineering, ferrous and non-ferrous metallurgy, fibrous materials, fire protection, hospital practice, mining, naval construction, and transportation.

The number of standards produced is not always a true indication of the relative activity of a national standardizing body. In Germany, for example, where interest centers largely in dimensional standardization, standards are generally published in single sheets, each sheet covering certain definite dimensions of a single device or commodity. Russian standards likewise relate to details of a particular subject. On the other hand, in such countries as Great Britain and the Dominions, Czechoslovakia, and the United States, a single standard may cover all of the various phases of a given subject.

The use of official labels or symbols to be employed by manufacturers as a guarantee that their products comply with the requirements of nationally recognized standards, is being encouraged by the national standardizing bodies in several countries, among them Canada, Czechoslovakia, Denmark, Germany, and Great Britain. Such symbols are legally protected, and penalties are attached to their misuse.

The Standards Association of Australia has adopted the certification plan as originally developed at the National Bureau of Standards of the United States Department of Commerce. Under this plan, there are compiled lists of manufacturers who have expressed their desire to certify to the purchaser, upon request, that material supplied by them on contracts



based on certain nationally recognized standards and specifications actually does comply with the requirements and tests thereof and is so guaranteed by them. In Australia these lists of "willing-to-certify" manufacturers are being prepared in conjunction with corresponding lists of purchasing authorities who have agreed to adopt Australian standard specifications as the basis of their purchasing.

### International cooperation.

International cooperation between a majority of the national standardizing bodies is now effected through the International Standards Association (ISA), which was established in Zurich, Switzerland, in the spring of 1929. In its membership 18 countries are represented, among them the United States.

The International Standards Association provides for the regular interchange between the national

standardizing bodies of progress reports, standardization proposals, completed standards, and other information. Technical committees have been proposed, or have already been organized, for the promotion of international agreement between national standards for similar subjects, such as paper sizes, technical drawings, small tools, acceptance test pressures for steam boilers, rivets, classification of coals, sieves, traffic signals, petroleum products, and fluid meters.

Great Britain, Australia, and Canada have up to the present not found it expedient to join the International Standards Association, although energetic measures are taken to insure cooperation between their own standards associations. Drafts of British standards are sent to the Dominions for comment and criticism. In the preparation of Australian and Canadian standards, every effort is made for their conformance, wherever feasible, to existing British standards.

### NEW SWEDISH STANDARDS ESTABLISHED

The Swedish Industrial Standardization Committee on November 6, 1930, established as Swedish standards the following revisions developed by the Swedish Industrial Association's Committee on Standards:

Lifting-hooks with pin, BSW, SMS-12A.  
Lifting-hooks with hole, BSW, SMS-13A.  
Lifting-hooks with pin, SI, SMS-14A.  
Lifting-hooks with hole, SI, SMS-15A.

These new editions are printed on standard paper form A4, and include, beside the old tables of dimensions, rules for the tapped holes for lifting-hooks, regulations concerning materials and manufacture, and loads permitted under different loading conditions. The Royal Social Administration prescribes the use of these standardized lifting-hooks for reasons of safety.

The following were also adopted:

Length of screw-threads of malleable iron pipes with cylindrical thread (BSP). SMS-37A. Replaces SMS-37.  
Round-headed rivets for structural iron work, SMS-39A.  
This edition replaces SMS-39, which was provided for use in steam-boiler construction as well as for structural iron work.  
Wheels for shaping and grinding tools, SMS-280-285.  
Axial ball bearings, SMS-287-293. In these tables reference is made to a table of tolerances, SMS-294, which is not ready, although a number is reserved for it.  
Theoretical shape of cogs for cylindrical and conical cog-wheels, SMS-296.  
Threaded pipes, SMS-323.  
Pipes and pipe flanges, in detail, SMS-324.  
Pipes and pipe flanges, summary, SMS-325.  
Steam-pipes, SMS-327.  
Pipe sleeves, SMS-328.  
High-pressure pipes, SMS-329.  
Tubes, SMS-330.  
Heat-conducting tubes, SMS-331.  
Autogenously welded tubes, SMS-332.  
Pressure limits, SMS-333.  
Flange designs, SMS-334.  
Location and number of bolt holes, SMS-335.  
End joints, SMS-336.  
Flanges with groove and tongue, SMS-337.  
Flanges with projection and boring, SMS-338 and 339.  
Flanges of cast-iron pipes, SMS-340-342.  
Flanges of steel pipes, SMS-343-345.  
Flanges with oval threads, SMS-346.  
Flanges with round threads, SMS-347-348.  
Cylinder ends, SMS-349.  
Flanges for rolled tubes, SMS-350-355.  
Welded flanges, SMS-356-357.  
Loose flanges for collar pipes, SMS-358.  
Flange packing, SMS-359-362.

### FOREIGN CONSTRUCTION DIVISION CREATED

Organization of a foreign construction division, effective February 1, 1931, within the Bureau of Foreign and Domestic Commerce, Department of Commerce, has been announced. M. H. Bletz, of Philadelphia, Pa., will be in charge. The new division, with duties technical, informational, and promotional in character, will work in conjunction with the foreign field staff and the various commodity divisions, and coordinate in one office the present foreign construction activities of the Bureau of Foreign and Domestic Commerce. It will collect, review, investigate, and disseminate information regarding foreign construction, potential usage and outlet for American machinery, equipment and supplies, facilities for testing and inspection, domestic and foreign standard specifications, codes and practices in use, etc.

Mr. Bletz, the chief of the division, has been associated with the Bureau of Foreign and Domestic Commerce for six years, and has directed activities in connection with foreign standards, international conferences as well as international fairs and expositions.

### PREPARING ZONING ORDINANCES

The rapidly increasing nation-wide interest in zoning has prompted the Advisory Committee on City Planning and Zoning of the Department of Commerce to issue a short treatise on "The Preparation of Zoning Ordinances."

The purpose of this pamphlet is to present a guide for the use of those who draft zoning ordinances. It is in no sense a model ordinance, although for a few sections, such as the title, preamble, and the section on nonconforming uses, specific wording is suggested. It is designed to aid in the arrangement of simple, logical, practical, and legally satisfactory provisions; to encourage standardization in form; and to point the way to economy of time in the drafting and use of such ordinances. It is not intended as a substitute for a zoning consultant. Local needs are so different and pitfalls are so numerous that a specialist may well be employed when specific problems arise.

A limited number of mimeographed copies of this publication are available from the division of building and housing of the National Bureau of Standards to those interested.



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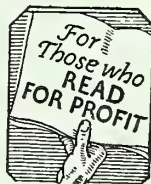
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The Secretary of Commerce in the first issue of this new journal said: "Certain standards, such as those used for weights and measures, \* \* \* have been fixed by legislative enactment. Mandatory standards of this character, however, are few in number when compared with the large and steadily growing volume of standards developed by industry and commerce and voluntarily maintained. \* \* \* The activities of the Commercial Standardization Group of the Bureau of Standards are concerned with standards adopted by voluntary agreement."

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—President Hoover, at the laying of the corner stone of the new building of the U. S. Department of Commerce, June 10, 1929.



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Compilation quarterly or monthly of statistics on cotton, wool, leather, and other industries; annually of forest products; and publication monthly of Survey of Current Business.

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The propagation and distribution of food fish and shellfish, in order to prevent the depletion of the fisheries; investigations to promote conservation of fishery resources; the development of commercial fisheries and agriculture; study of fishery methods, improvements in merchandising, and collection of fishery statistics; administration of Alaska fisheries and fur seals; and the protection of sponges off the coast of Florida.

**BUREAU OF LIGHTHOUSES,** GEORGE R. PUTNAM, Commissioner.

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