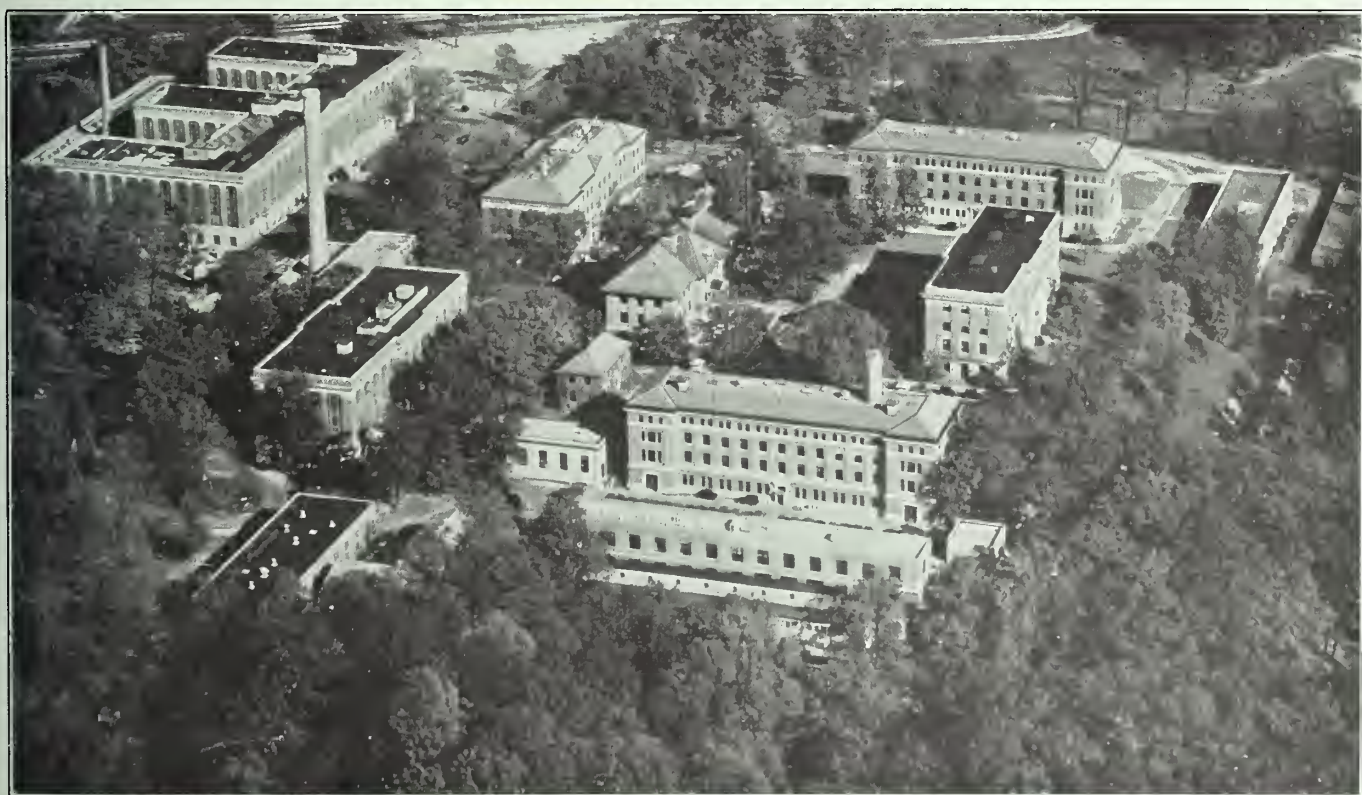


BUREAU OF STANDARDS

COMMERCIAL STANDARDS MONTHLY



*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. 6



DECEMBER, 1930

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

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WASHINGTON, D. C.

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AN INVITATION TO VISIT THE BUREAU OF STANDARDS

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 returns 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.

A cordial invitation is extended to all citizens interested in scientific progress to visit the laboratories of the 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.

GEORGE K. BURGESS, *Director.*

Advocates Uniform World Standards for Food

*Austrian Official Says Food Standards Is General
World Question of Highest Importance*



HE subject of food standards has become a general world question of highest importance, in the opinion of a food official of the Austrian Government, Dr. Adolf K. Schugowitsch, as expressed to the Assistant Chief of the Bureau of Chemistry and Soils of the United States Department of Agriculture, Dr. C. A. Browne.

There is immediate need for an international conference to consider adoption of uniform world standards for at least some of the foods that are shipped between countries, Doctor Schugowitsch, who is chairman of the Austrian board preparing an official volume on food standards, stated to Doctor Browne, according to a report of the latter's tour to various foreign countries which has been issued by the Department of Agriculture in its Official Record.

Fundamental research along certain lines of agricultural chemistry is further developed in Europe than it is in the United States, according to Doctor Browne, who recently returned (October 6) from a 17-month leave of absence spent in a general study of some of the applications of chemistry to agriculture in various foreign countries.

In Vienna Doctor Browne had an opportunity to discuss pure-food questions with Doctor Schugowitsch, chairman of the board of editors of the *Codex Alimentarius Austriacus*, the official volume of food standards of the Austrian Government, a new edition of which is under preparation. Doctor Schugowitsch expressed the opinion that because of the increased facilities of commerce and intercommunication the whole world has now become as one country, each nation exchanging its food products for those of another.

The subject of food standards, therefore, has become a general world question of the highest importance, and it is Doctor Schugowitsch's belief that there is immediate need for an international conference to consider the adoption of uniform world standards for at least some of the foods that are constantly shipped from one country to another.

STANDARD CONTRACT FORMS

Adoption of Standard Contract Forms Has Promoted Economy and Efficiency in the Government Service

By Maj. E. W. CUSHING, *Assistant to the Chairman Interdepartmental Board of Contracts and Adjustments*

The importance of standardizing Government contracts will be appreciated when some of the conditions found to exist at the time the Interdepartmental Board of Contracts and Adjustments was organized are mentioned.

Departments and independent establishments of the Federal Government were requested by the board to furnish copies of their existing contract forms, and several hundred were received. An examination of these forms disclosed that they did not conform to any standard rules.

They varied in size and appearance; there was a diversity of terminology and phraseology in clauses of similar intent common to most contracts; there was lack of uniformity in type, arrangement of the clauses, and of orderly sequence in stating the obligations to be assumed. It was discovered that many of these contract forms contained provisions whereby the contractor was obliged to assume all risks, which tended to greatly increase the cost of Government work.

Defects in contracts.

As an illustration of these defective provisions, a department of the Government in soliciting bids for excavation work announced the result of borings made at the site, indicating sand and gravel. Relying upon this test a contractor submitted a bid expecting to use a steam shovel in the excavation work. However, he found under the soil numerous trunks of great trees deposited there by some ancient flood and was unable to use the steam shovel, thereby increasing the cost of the work to many times the price of his bid. He endeavored to recover from the Government the additional cost, but somewhere in fine print the contract contained a provision to the effect that the bidders were expected to examine the site and satisfy themselves as to the nature of the material which the Government did not guarantee. Because of this provision he could not recover and was forced into bankruptcy.

In another case it was disclosed that a contractor who had submitted a bid on a large construction project had estimated the cost, added a fair profit, and had then included an extra \$10,000 in his bid. When asked by the contracting officer why he had added this \$10,000 he replied that the contract had 10 paragraphs of fine print which he had not read and probably would not have understood if he had read them, and that he had added \$1,000 for each paragraph in order to play safe.

Many such contracts contained a provision requiring the contractor to sign a full and complete release of any and all claims arising out of the contract before he should receive his final payment. This was a one-sided provision which often prevented the contractor from receiving his final payment of a large sum that was admittedly due him because of some amount in dispute. His only alternative was either to forego his right to assert his claim for the amount in dispute or to postpone the receipt of the final payment pending

adjudication of the disputed claim—a delay of a year or more in some instances.

Another unsatisfactory provision found in some of these contracts was one which reserved to the Government the right to suspend the whole or any part of the work and required the contractor, without expense to the Government, to protect the work properly during such period of suspense with the possibility of increased cost of labor and material when work should be ordered resumed, but denying him any damages for the delay.

In order to remedy the conditions mentioned, the Interdepartmental Board of Contracts and Adjustments was created by the Bureau of the Budget on November 22, 1921 (and organized the following January), for the purpose of standardizing the forms of contracts and methods of contract letting by the Government.

The War Department Contract Board prepared a proposed standard form of contract for construction and supplies, and after careful study and consideration of the form by the Interdepartmental Board it was concluded that it would be advisable to draft two standard forms, one for the construction of public works and the other for the procurement of supplies. Tentative drafts of these forms were sent to contractors, architects, engineers, manufacturers, and dealers for comment and constructive suggestions.

Legal questions.

In the course of the study the board discovered that there were numerous statutes—an accumulation of years of legislation—describing different formalities and different methods of procedure to be complied with by the various departments and independent establishments of the Government, and a committee was appointed to compile these statutes. Approximately 225 laws relating to public contracts were found and these were published by the board in 1922 and distributed throughout the Government service. This publication is entitled "Compilation of the Principal Federal Statutes Relating to Public Contracts."

A study of these numerous statutes convinced the board that there should be a new contract law enacted that would establish uniform procedure in one short act and repeal many of the existing statutes, some of which were obsolete. Accordingly, the chairman appointed a committee of the board in 1923 to prepare such a new public contract law, which is now before the Judiciary Committee of the House of Representatives and is known as H. R. No. 5568.

Standard lease form.

In the meantime, the board proceeded with its work of standardization. The first standard form drafted by the board was the standard form of Government lease, known as standard form No. 2, which was approved by the President and issued pursuant to Budget Bureau Circular No. 109 on June 1, 1923.

One of the unfair provisions contained in many Government leases and omitted from this standard

form was a reservation by the Government of the right to cancel the lease at any time upon a certain number of days' notice. This was contrary to commercial practice, made the Government an undesirable tenant, tended to increase rentals, and often prevented the leasing of desirable premises. The standard form of lease was drafted in cooperation with the National Association of Building Owners and Managers, whose members represented the owners of many of the large office buildings of the country. It is a simple form that is mutually fair and protects the interests of both parties. It took the place of 75 or more different forms theretofore used. On January 12, 1924, a circular letter was issued to the heads of the departments and independent establishments giving information relating to the use of this standard form of lease.

Time consumed in drafting forms.

The drafting of the standard forms of contract for construction work consumed a great deal of time as the members met only once a week and this work was additional to their regular duties. Furthermore, it was difficult to harmonize the views of the contracting officers because of different procedures existing in their various departments.

On November 19, 1926, six standard forms for construction work were completed by the board and approved by the President. In order to avoid duplication, three of these forms (the standard instructions to bidders, standard form of bid bond, and standard form of performance bond) were so drafted as to be equally applicable for use with the contract for the procurement of supplies.

It was also provided that the invitation for bids, the bid, and the instructions to bidders should not be incorporated in and made a part of the construction contract, as they are the preliminary papers on the basis of which the contract is prepared and executed. This is a departure from previous practice and avoids encumbering the contract with unnecessary papers.

The various articles in the construction contract form relating to changes in the plans and specifications, unusual conditions at the site, inspections, delays, liquidated damages, and payments to contractors, have all been carefully drafted to make them fair and equitable both to the contractor and to the Government.

On June 29, 1927, the board completed seven additional standard forms for the procurement of supplies, which were likewise approved by the President. It was deemed advisable to have two forms of contracts for supplies—one a short form to cover many of the informal purchases and another to be used where a large amount is involved and deliveries cover a considerable period of time. It was the policy of the board in drafting these forms to simplify the lan-

guage, to make clear the exact obligations to be assumed by the contractor, and to omit unnecessary hazards and unfair provisions.

The next standard form promulgated was the contract for telephone service, which was issued on March 1, 1929. This form was prepared in the Office of the Chief Coordinator in cooperation with representatives of the telephone companies and of the General Accounting Office. On the same date, March 1, 1929, the board completed three additional standard contract forms for the procurement of coal. These were developed after numerous conferences with the representatives of the Government who were engaged in purchasing this commodity and in cooperation with numerous dealers in coal.

All of these standard forms were issued by Budget Bureau circulars which required their use without deviation by all departments and independent establishments of the Government, with the proviso that if it should be necessary to deviate from the forms to meet statutory provisions or other conditions specifically applicable to any particular department or establishment the proposed deviation would be submitted to the contract board for consideration and recommendation to the Director of the Bureau of the Budget for his approval. There have been some requests for deviations from these forms that have been approved. There use has disclosed some desirable amendments, and as a result the board is now engaged in a revision of the forms which it is contemplated will improve them for general use.

The adoption of standard contract forms by all Government departments and independent establishments has promoted economy and efficiency in the Government service. While the benefit to the Government can not be stated in dollars and cents, the great value of this movement for standardization can be appreciated by considering the excellent features of the standard forms. The application of the principles of good design in forms, including the determination of size, style of printing, quality of paper, and arrangement of text, has done much to reduce the clerical work involved in their use. Their use has also greatly facilitated the settlement of accounts in the General Accounting Office.

Other advantages in the use of standard forms are reduction in printing costs, making complete forms available to Federal activities whose own forms were deficient in some important respects, and facilitating business between the Government and the commercial world through the elimination of the varying and confusing conditions formerly existing.

The drafting of new contract forms, revising those already drafted, and advising departments and establishments upon their contract problems is the work upon which this contract board is now engaged.

REDUCTION IN TYPES OF GLASS JARS

Recommendation Reduces 20 Sizes of Cottage-Cheese Jars to 3

Instead of the existing 20 sizes and types of glass jars for cottage cheese and sour cream, there will now be 3, following the action taken by a general conference of the industry, held October 23, 1930, in Cleveland, Ohio, in approving a proposed simplified practice recommendation.

The schedule, as recommended by the conference for adoption by the industry, provides for the 8, 12, and 16 ounce jars as regular stock items in glass containers for the marketing of these products. This simplified list of containers will become effective March 1, 1931.

The tentative recommendation, as submitted to the conference, was drafted jointly by the standardization committees of the International Association of Milk Dealers and the Glass Containers Association of America.

REVIEW OF ANNUAL REPORT OF BUREAU OF STANDARDS

Notable Research Results Achieved During Past Fiscal Year

One of the most important developments during the past fiscal year at the National Bureau of Standards was the realization, after many years' effort, of the Waidner-Burgess absolute standard of light which may eventually supplant the carbon lamps now used as standards of candlepower by the various nations, according to the annual report of Dr. George K. Burgess, Director of the Bureau of Standards, to the Secretary of Commerce, covering the fiscal year ending June 30, 1930.

The brightness of the interior of a tube of fused thorium immersed in a bath of pure platinum at its freezing point has been found equal to 58.84 candles per square centimeter. The difficulties attending the actual setting up of this standard have been very great, but they have all been surmounted, so that the process has been reduced to one of mere laboratory routine. A recommendation has been made by the bureau that this standard be accepted by the International Committee on Weights and Measures as a new international standard of light.

An event of great significance in the engineering world was the signing of a bill by the President on May 14 creating a national hydraulic laboratory to be located at the bureau, said the director in his report. (A sketch entitled "National Hydraulic Laboratory," by H. N. Eaton, appeared in the June, 1930, issue of the *COMMERCIAL STANDARDS MONTHLY*.) This laboratory will study fundamental problems of hydraulics, including flow of rivers and open streams, and will test all kinds of hydraulic machines and instruments. A committee to draw up plans for the laboratory has been appointed.

Continuing, the report of the director states that developments in the radio field require the highest attainable precision in measurements of frequency. By means of a special installation of four quartz oscillators and auxiliary machinery, including automatic photographic apparatus, it is now possible at the bureau to measure radio-frequency with an error of only about 2 parts in 10,000,000.

To aid the aeronautic industry a special laboratory has been set up at Arlington, Va., in which each new type of commercial airplane engine is subjected to an endurance test for the aeronautics branch of the Department of Commerce. Certificates are granted by the department only for those engines which meet the bureau requirements. Three engines can be tested at one time at present and equipment for a fourth test stand will soon be installed.

The development of radio aids to air navigation is briefly touched upon. These have been described in recent publications of the National Bureau of Standards. Methods of lighting the airways and landing fields have also been studied and many tests have been made on the special light alloys used in constructing airplanes and airships. To determine the effect of repeated vibration on duralumin, a special machine is in use in which the specimen is floated on air and is caused to vibrate by a high-speed air stream at a rate of 210 cycles per second. Through the use

of this machine it is possible to carry tests to 200,000,000 cycles or over.

Researches.

Through an extensive cooperative investigation on the properties of railroad rails during the period of fabrication it has been found that, owing to the low ductility of certain kinds of steel at the temperatures at which rails are rolled, there is a tendency for the formation of nuclei within the rails from which transverse fissures may later develop in service. Certain changes in the manufacturing procedure are suggested as a means of correcting the evil.

Experiments on the tanning of sole leather have shown that chrome-tanned leather retanned with vegetable material will wear from 25 to 27 per cent longer than ordinary vegetable-tanned leather. The effect of sulphuric acid on leather and paper has been studied and it has been shown that acid, in amounts commonly present in the atmosphere of large cities, has a very serious deteriorating effect.

The importance of using thoroughly purified fibers in paper intended for permanent records has been brought out. A study of old newspapers has shown that with the substitution of raw wood pulp for the more highly purified materials a marked decrease in the permanence of the paper took place. Many papers issued 30 or 40 years have almost completely deteriorated. In the semicommercial plant maintained by the National Bureau of Standards and Iowa State College at Ames, Iowa, wallboard one-half inch thick and twice as strong as any on the market has been produced from cornstalks. The process is now being used commercially.

Xylose has been successfully manufactured in an experimental plant at Anniston, Ala., and possible uses for this new sugar are being studied. The experimental sugar refinery at the bureau has been operated on the first stage of the process of producing levulose from Jerusalem artichokes, and the next step, the actual crystallization of the sugar from its water solution, will be undertaken very shortly.

Under the auspices of the American Society for Testing Materials, a cement reference laboratory has been established at the bureau to standardize testing procedure and methods in the numerous cement laboratories throughout the country. Inspection trips are made by the personnel of this laboratory, and their services have been in constant demand.

In the field of optics progress is recorded on the mapping of spectral lines and in particular in search for a new and better fundamental standard of wave length. A series of filters has been developed by which the character of artificial light sources can be changed to that of sunlight, and one of these has been recommended for adoption as an international standard by the Seventh International Congress on Photography.

A continued investigation on which progress is recorded deals with the development of methods for the fractionation of petroleum and the identification of

its constituent hydrocarbons. This work involves laboratory technique of extreme difficulty, but good progress has been made and several publications issued.

Cooperation with other organizations.

In cooperation with the American Petroleum Institute, the American Gas Association, the Underground Pipe Products Institute, and the Cast Iron Pipe Research Institute, a beginning has been made of an extensive field investigation of protective coatings for underground pipe lines. This work supplements similar work which has been in progress for several years on the corrosive effect of soils on underground pipe.

The investigation which the National Bureau of Standards has been conducting in cooperation with the American Society of Mechanical Engineers and other organizations on the determination of the properties of steam has formed the basis for a revision of the steam tables by international conferences in London and Berlin.

The Post Office Department is a branch of the Government which is making increasing use of the bu-

reau's facilities. Considerable time has been spent in studies of automatic machines which have been proposed to the department for adoption in its mechanization program. Among these were mail meters, where safeguards against fraud are of importance.

During the period under consideration, as covered by the report in question, an interesting extension of the bureau's simplified practice work has taken place. In the past this has been confined almost entirely to production, but recently simplified practice methods have been extended in the fields of distribution and consumption and important progress is being made on the simplification of containers and packing methods. Satisfactory progress is also recorded in the fields of specifications and commercial standards, standards having been adopted for a wide range of products from dress patterns to fuel oils.

The division of building and housing has cooperated with the new construction division of the Department of Commerce on many problems connected with the Government's program of public construction.

STANDARD MILK ORDINANCE AND CODE

Four Hundred Cities in Twenty-three States Adopt Code—Majority of Cities use Degrading Method to Uphold Code

By LESLIE C. FRANK, *Bureau of the Public Health Service*

Centralized organization of a given project accomplishes more and costs less than an unorganized system. The plan of decentralized, local milk control has been tried in the United States without national organization for the past generation. It has not given all the people of the United States as clean, or as safe milk supplies as they should have.

A survey of 430 American cities conducted by the Public Health Service in 1929 and in 1930, discloses the fact that American municipal milk supplies comply to an average extent of only about 61 per cent with advisable public health requirements for raw and pasteurized milk. Some municipalities have excellent milk ordinances and splendid milk supplies, while others have nonstandard milk ordinances. There are almost as many different types of ordinances as there are cities.

It may, therefore, be held that the cheapest and most effective way for the citizens of the United States to secure clean, safe milk might be to set up an adequate Federal milk law and to enforce it rigidly with Federal milk inspectors. However, this country is dedicated to the principle of the maximum practicable degree of self-government. In this country we believe, and rightly so, that we should foster local self-dependence.

The Public Health Service believes that, so far as possible, every municipality should control its own milk supplies, but that all municipalities should attempt to secure the effectiveness of centralized administration, and at the same time the advantages of local self-government, by a voluntary program of standardization of legislation and method.

Standard milk ordinance.

To assist in realizing this ideal, the Public Health Service has formulated a standard milk ordinance and code, which it recommends for adoption and enforce-

ment by municipalities. This ordinance contains generally accepted specifications for grade A raw and grade A pasteurized milk, and provides that when either of these specifications is violated by a given milk supply the local health officer shall either require that milk supply to be labeled with one of the number of lower grade labels, depending upon the nature of the violation, or as an alternative, shall bar it from the market by revocation of permit.

Either of these two enforcement methods, if properly executed, will yield a high quality milk supply. It is somewhat easier to use the first method than the second, because it frequently is difficult for the health officer to convince a jury that the offender should cease selling milk altogether because he has violated some one of the less important items of sanitation. Therefore, the majority of the cities adopting the standard milk ordinance use the degrading method of punishment. This method is just as effective as the other. It owes its effectiveness to the sales resistance introduced by the lower grade label.

During the past seven years the standard milk ordinance has been enacted by nearly 400 American cities located in 23 States. The Public Health Service has recently completed surveys of 247 of these cities and has found that the average degree of compliance with grade A requirements in these standard ordinance cities is 88 per cent as compared with an average figure of 61 per cent for 183 nonstandard ordinance cities.

The total milk-drinking population, embraced in the surveys thus far, is more than 13,000,000 and the data secured constitute such convincing evidence of the effectiveness of the plan of voluntary standardization of milk control that it seems reasonable to believe within the next 10 years the vast majority of American municipalities will have affected a voluntary standardization of the public health control of milk supplies.

THE NATIONAL BUREAU OF STANDARDS

The Congress of the United States Has Organized the Bureau for the Benefit of the Government and the Nation; Scientific and Technical Divisions Outlined

By DR. GEORGE K. BURGESS, *Director, National Bureau of Standards*

The act, "*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Office of Standard Weights and Measures shall hereafter be known as the National Bureau of Standards,*" establishing the bureau in 1901 thus defines its functions:

That the functions of the bureau shall consist in the custody of the standards; the comparison of the standards used in scientific investigations, engineering, manufacturing, commerce, and educational institutions with the standards adopted or recognized by the Government; the construction, when necessary, of standards, their multiples and subdivisions; the testing and calibration of standard measuring apparatus; the solution of problems which arise in connection with standards; the determination of physical constants and the properties of materials, when such data are of great importance to scientific or manufacturing interests and are not to be obtained of sufficient accuracy elsewhere.

The bureau is authorized to exercise its functions for the Federal, State, or municipal Governments, scientific societies, educational institutions, firms, corporations, or individuals within the United States. Fees are charged for services except to the Federal or State Government.

The Congress of the United States has interpreted the organic act very liberally in making appropriations for work it desired to have done at the bureau for the benefit of the Government and the Nation. It might be well to emphasize here that Congress has conferred upon the bureau no police powers. Its findings thus stand on their own merits and are accepted by voluntary cooperation. It follows that the bureau's responsibility is thus increased to make sure its results are trustworthy, but it can issue no orders, and its findings are in no sense mandatory or binding on any one.

The total bureau personnel, including all persons officially connected with it was 1,180, August 22, 1930. Of these, there were 712 engaged in the scientific and standardization work, which includes 50 employees on a part-time basis, and 100 research associates stationed here by 45 industries.

The bureau is organized for administrative purposes into nine scientific and technical divisions, a standardization group of four divisions, together with the office, plant, and shop units.

Scientific divisions.

The scientific divisions embrace the subjects of weights and measures; electricity (including radio), heat and power, optics, chemistry, mechanics, and sound. The technical divisions include organic and fibrous materials—paper, rubber, leather, and textiles; metallurgy; clay and silicate products—glass, cement and concrete, refractories, stone, pottery, etc.

In the standardization group are the nonlaboratory divisions of simplified practice, building and housing, specifications, and trade standards.

On the weights and measures division the country depends for uniformity and exactness in instruments

and devices based on the fundamental units of length, mass, and time. The standards maintained at the bureau are the official standards of the country. This division tests great quantities of apparatus for the Federal and State Governments, as well as for manufacturers and users. The work ranges in scope from the smallest measurable quantities up to railroad test cars of 100,000 pounds capacity—for the calibration of which the bureau maintains a master track scale at Chicago and three test cars, with weights in 10,000-pound units, which cars travel about the country testing railroad and shippers' weighing scales. A uniform basis of measuring freight schedules, totaling over \$4,500,000, is thus maintained. The mechanical industries manufacturing interchangeable parts, such as for automobiles and typewriters, are greatly helped by the work of this division, which is compelled in some cases to be able to measure lengths as closely as one-millionth of an inch (twenty-five one-millionths of a millimeter) for gages used by these industries.

In the various branches of the electrical industry, the manufacture of instruments and machines, power generation and distribution, communication, and illumination, the demands for accuracy are no less exacting. For example, the requirements of radiobroadcasting have increased a thousandfold in the last five years, and the bureau has now to maintain its standard frequencies constant to at least 1 part in 1,000,000, an accomplishment requiring the most elaborate scientific research. It is perhaps a surprising fact that as an industry becomes more highly developed, because of scientific research, its demands on the Government bureau for aid become greater than those of less highly developed industries. As a consequence our largest division is that devoted to electricity.

The heat and power division maintains the temperature scale for the country, testing thermometers and pyrometers reading from the lowest to the highest attainable temperatures used in scientific research and by industry; carries out investigations on heat insulating and fire-resisting properties of materials; and tests of automotive and airplane engines, the latter in the laboratory under conditions simulating flight at altitudes up to 30,000 feet, as well as lubricants and fuels.

The optics division controls the testing of all imported sugars, the largest single source of customs revenue, studies optical instruments, and problems in photography, atomic physics, spectroscopy, radiation, and applies optical methods in constructing and measuring the most exact length standards used in scientific investigations.

The work in chemistry is largely testing supplies for the Government departments, but there is also a great deal of research work, particularly relating to petroleum, soaps, inks, cement, illuminating gas, and electroplating.

The heavy engineering work relating to bridges, masonry, and building construction is carried out by

the division of mechanics and sound, which divisions also concerns itself with airplane design, aeronautical instruments, the characteristics of soundproofing materials, and the acoustics of auditoriums. If a new building material, for example, is submitted for examination, the bureau is in a position to carry out almost any test one can suggest, including not only a chemical or microscopic examination, but also determinations of specific weight, porosity, effect of heat and cold on permanence, fire-resisting and sound-resisting qualities, expansion properties, electrical conductivity, magnetic behavior, as well as its strength under any load up to 10,000,000 pounds.

In the metallurgical division attention is being given to methods of combating or eliminating the harmful effects of corrosion, but, perhaps, the most important problem now before this division is the study of the cause of the rupture of wires in the suspension cables of two large bridges that had to be completely dismantled, fortunately before the bridges were actually put into service.

Some of the clay industries of the United States are in a serious condition, partly on account of foreign competition, and partly because of a dearth of competent technologists in these industries. The bureau's clay and silicate products division, in addition to helping these industries all it can, has become in effect a school for the industry, a fact which indicates another important rôle of the Government laboratory, namely, to train men in methods of scientific research for the industry.

Concrete and cement are used in the United States in enormous quantities, and there are about 300 industrial laboratories testing these products. During the past year there has been established at the bureau, in cooperation with the American Society for Testing Materials, a cement reference laboratory, financed half by the industry and half by the Government, for the purpose of standardizing the work of these 300 industrial establishments, with most gratifying results.

The clay and silicate products division has also shown manufacturers of optical glass how to make large disks, by producing a disk 70 inches (117.8 cm) in diameter for an astronomical observatory, a contract no American manufacturer would undertake to fill.

A division of particular interest is that charged with the study of rubber, textiles, paper, and leather. Here the bureau has small manufacturing plants for all but leather, where any desired variations in the processes of manufacture can be tried out one at a time, a procedure which is often prohibitive on a mill in operation in an industrial plant.

A determination of the fundamental properties of materials is largely a matter of research, and the practical application of knowledge thus obtained to the development of industrial standards constitutes an important part of the bureau's work in cooperation with industry.

The bureau's work in the field of standardization has been favored by the close cooperation of manufacturers and technical societies, with the result that numerous standards of quality and performance have come into general use. These standards furnish a practical means of control for industrial processes with respect to quality of product and serve as an equitable and definite basis for commercial transactions. Aside from the obvious desirability of securing

commodities of standard and uniform quality, the use of standard specifications has been found to introduce a marked economy, particularly when purchases are made on a large scale.

As an example of standardization affecting the rubber industry may be mentioned the case of pneumatic tires for automobiles. Here the bureau, in cooperation with the Rubber Association of America, undertook a practical investigation of tires with respect to material, design, and performance. The result has been a very decided increase in the efficiency, durability, and uniformity of tires, and the development of a Federal specification according to which all Government purchases are made, and which has been adopted by numerous States and other consumers as a basis for the award of contracts. The experimental work involved in the development of this specification required special endurance machines designed to simulate road conditions. These machines, operating under conditions that have been standardized, are being used both for routine performance tests (in connection with contracts) and for experimental testing (in cooperation with manufacturers) to determine the effect of change in design and construction.

The rubber industry is one which especially requires the services of a variety of well-trained scientists. This is partly due to the fact that the process of making rubber products from raw rubber is complex, and, further, that the whole rubber industry of the world is in a state of change and development. Consider, for illustration, the manufacture of the tire, which is the largest single rubber product; the mileage and life of tires have increased remarkably in the past decade. This development has been the result of concerted efforts and studies of many skilled scientists, both in pure and applied fields. Two types of scientific workers are required for the successful development and maintenance of the rubber industry—one type includes those concerned with the control of production and manufacture, who are necessarily employed directly by the various industrial concerns; the other type includes those trained in fundamental sciences, who are concerned with the broader problems of the rubber industry, with research on rubber, and with the practical applications of the results of research. These latter can best be employed by the Government for the benefit of the industry as a whole.

The development of the rubber industry stimulates the growth of other industries which furnish products used in rubber manufacture, such as cotton, carbon black, mineral fillers, resins, and waxes.

The building up of the rubber industry directly affects the production of raw rubber. Not only are larger quantities required, but the production is also influenced to change from a forest industry to a plantation industry, in the interests of greater efficiency, concentration of production at desired points, and greater uniformity of raw material.

The study of rubber by Government scientific laboratories affords opportunity for research on gums related to rubber, such as guttapercha, balata, and chicle. A broader knowledge of these materials would probably lead to their increased production and cultivation on plantations and to their wider and more extensive use in industry.

With respect to leather, laboratory research has shown that a cheap material derived from the waste liquor of sulphite pulp mills has definite tanning

properties. Tanning investigations showed that sulphite cellulose extracts could be blended with ordinary vegetable tanning materials and used to produce heavy leathers with satisfactory physical and chemical properties.

The commercial significance of the application of this work in the tanning industry is indicated by an estimated saving in tanning costs of from 10 to 20 per cent. Other factors of importance are that its use will conserve material now largely wasted and help to solve stream-pollution problems caused by the dumping of the waste liquors into the rivers. Its use will also make the tanning industry less dependent upon imported tanning materials and tend to compensate for the loss of domestic chestnut wood extract, the source of which is being depleted by blight.

It was demonstrated in another investigation at the bureau that chrome-tanned sole leather wears approximately twice as long as vegetable-tanned sole leather, but has certain disadvantages as to firmness and water resistance. An investigation is now under way to overcome these disadvantages by retanning chrome with vegetable extracts and by the use of waxes and mineral fillers. Vegetable tanning materials are now largely imported from South America.

Textiles are an important item of commerce in all American countries. Most of the countries produce one or more of the textile fibers, manufacture fabrics from them, and import or export textiles. In the United States the producers of textile fibers and the users of finished textiles, as well as the manufacturer, are benefited by the work of the textile section of the National Bureau of Standards. Scientific studies at the bureau of the relationship between construction of yarns or fabrics and the properties of the articles made from them aid the manufacturer in his effort to produce the most serviceable articles and insure to the user the quality of the textiles that he buys. The development of a reliable test method for such special properties of textiles as color and the permanence of color, thermal transmission, air permeability, stiffness, and resiliency is another contribution of the textile section. Important improvements in the maintenance of textiles, including laundering and dry cleaning, have been worked out. The work of the textile section is directed toward a solution of those broader problems which usually are not studied by the manufacturers, but on which the future of the industry largely depends.

The paper section of the bureau is constantly studying the possibilities of different plant fibers as paper-making materials. An extensive study of carao fiber from Brazil showed that this material has unusual possibilities as a raw material for the manufacture of high-grade writing papers. Again, at the request of the Siamese Government, tests were made of rice straw, lalang grass, and banana trees, all of which are abundant in Siam. The results were so satisfactory that a commercial paper mill was built there to utilize these materials. The results of similar tests are constantly furnishing information to the industry. A great amount of wood pulp for newsprint is imported. The discovery of a new source of raw material for newsprint in abundant quantities or the development of processes for making newsprint from the materials now unused would be of inestimable value and it is likely that these and other

services to the industry can be accomplished by Government research laboratories.

There is another important field of industrial research in which the bureau is active, namely, the utilization of waste-land products.

Wastes from the corn and sugarcane plants are similar in nature in that they involve the stalks and leaves, and the cob in the case of corn. At least 100,000,000 tons of these products are commercially available annually in the United States, but are wasted and await the call for conversion into valuable products. The cornstalk consists of a very light inside pith and an outside fibrous shell. The pith is readily separated by a special machine and is being converted in semicommercial studies into insulating materials resembling cork products. The fibrous shell is being made into a variety of crude and refined cellulose products. By simple maceration a gel is formed which, on drying, yields a tough, horny product called maizolith. It is suitable for making gears, bushings, electrical fixtures, and other products requiring toughness, strength, and electrical insulating properties. By means of chemical and distintegrating methods, the shell fibers are separated and somewhat purified. The pulp is run over screens and separated from the water in continuous felts from one-fourth to 1 inch thick. These are dried in the form of loose boards which are cut to size to form wall board for insulating the walls and ceiling of houses. They may be waterproofed and fireproofed. They may be painted and can also be covered with plaster for interior finish. The thick boards may be used to insulate the interiors of refrigerator cars, household refrigerators, and ice-houses. The wet, loose porous sheets may be steam-heated under pressure to form a strong cornstalk lumber. Similar products made from bagasse have wide markets.

The cornstalk fibers give good grades of pulp with proper chemical and physical treatments. Newspapers and book papers have thus been made. As side products, xylan adhesives and carbon black are obtained.

When further refined, the pulp yields a high-grade, pure alpha cellulose, which has been used to make transparent glassene papers, viscose, and rayon textiles.

The cotton plant is the source of millions of tons of wastes, such as the stalks, burrs, leaves, seed hulls, and their adhering short fibers or fuzz. Only the cottonseed hulls find use; namely, as a low-grade cattle feed or roughage. Over 1,500,000 tons of cotton seed hulls are produced annually in this country. Work by the bureau has developed commercial possibilities for separation and utilization of the fuzz and the broken shells called cottonseed bran. The fuzz or very short cotton fibers can be readily purified by chemical treatments to form pure alpha cellulose suitable for manufacture into rayon, nitrocellulose films and plastics, lacquers, cellulose acetate, and high-grade paper.

The hull bran has been found to contain about 40 per cent of pentose sugars, especially xylose. Although this sugar has been sold for \$100 a pound, laboratory and semicommercial work by the bureau has shown that it can be made on a practical scale for less than 25 cents a pound. Work is under way to convert the xylose into sugar alcohol and acetone, furfural, and other products by chemical and fermentation methods. Its possible use in human and animal foods is being

investigated in cooperation with medical and animal experimenters.

The simple processing of the cottonseed bran into a palatable sweet roughage for mixture with the cottonseed protein cake as a cattle feed, offers attractive possibilities.

The bran can be converted directly into plastic resins by treatment with phenolic bodies and used in manufacturing many kinds of molded products, such as electrical fixtures, rollers, chair backs, table tops, and the like.

The protein cake from the cotton seed is used largely as a cattle feed and fertilizer. It offers attractive possibilities for purification into high-grade nitrogen products suitable for use in human food, plastics, and adhesives.

Straws and hulls from wheat and oats and other cereals are wasted annually to the extent of tens of millions of tons. Work is under way to convert the straw into high-grade pulp and paper products. Already they are used in low-grade papers and box board. Oat hulls are the source of the new and widely used commercial chemical furfural entering into plastics and binders for abrasive wheels and electrical apparatus. The straws offer possibilities for production of producer gas for household use by fermentation, combustion, and distillation methods.

These new industries, which are converting the waste products of the farm into useful articles, are

the direct results of laboratory research. They are bringing increased returns to our farmers, providing employment for labor in new local factories, and providing the great mass of consumers with things not heretofore readily available.

Finally, the divisions having to do with business management of industry, carry on their work wholly through voluntary cooperation. Thus the division of simplified practice, concerned with aiding industry to reduce the numbers, varieties, dimensions, and styles of engineering and industrial commodities has issued 113 simplification projects with an adherence to them of over 86 per cent by the interested parties resulting in savings of several hundred millions of dollars. The specifications division is codifying and trying to simplify the multiplicity of specifications extant, and encouraging the buying at least by public agencies, of commodities certified as to quality by the manufacturers. The desires of industry for new commercial standards are being handled by the division of trade standards, and the division of building and housing is concerned with building codes, economical small house construction, zoning problems, and other matters important to the home owner and builder.

The bureau also, in cooperation with national associations, is active in problems relating to safety codes, rules, and regulations in the several industries and in relation to the public.

A. S. T. M. REVISES SEVEN STANDARDS AND APPROVES THREE NEW TENTATIVE STANDARDS

Seven A. S. T. M. tentative standards have recently been revised and three new tentative standards have been approved, according to information received from the American Society for Testing Materials. These standards are listed below:

Revisions.

Specifications for brass ingot metal, graded and ungraded, for sand castings.

Specifications for aluminum-base alloy sand castings.

Specifications for aluminum-base sand casting alloys in ingot form.

Specifications for concrete aggregates.

Methods of sampling and testing lacquer solvents and diluents.

Specifications for soluble nitrocellulose.

Specifications for amyl alcohol (synthetic).

The new specifications for copper-base alloys resulting from the revision of the tentative specifications for brass ingot metal have also been adopted by the Non-Ferrous Ingot Metal Institute. It is expected that the new specifications will result in considerable simplification of the specifications now used in the industry.

Tentative specifications.

Methods of compression testing of natural building stone.

Methods of flexure testing of natural building stone.

Test for absorption and apparent specific gravity of natural building stone.

PERIODIC REVISION OF STANDARD TYPEWRITER TYPE WOULD AID IN DETECTING FRAUDS

Information has come to the National Bureau of Standards that numerous documents have been declared fraudulent because they were written on typewriting machines that did not carry a certain style of type before a definite known date. It would no doubt contribute to the interests of justice if the various typewriter manufacturers would make slight changes from time to time, perhaps once in five years.

This would mark a definite date in the typewriting of that particular machine. It is understood that most typewriter manufacturers now make type by the plate system, and changes can be effected without a sacrifice of material and at a small cost.

Some manufacturers, the National Bureau of Standards is informed, have made these changes in the process of improving machines and in some instances for the definite purpose of marking a date. It can easily be understood that a change in even one character in an inconspicuous part would accomplish the purpose. The National Bureau of Standards will cooperate in connection with this matter in any way that is practical that will contribute to the interests of justice.

When changes are made, if specimens properly authenticated, are deposited with the bureau, they will be dated and put on file and made available in photographic form for future use. The bureau can not undertake to enter into any litigation except in cases when the interests of the Government are involved, but will simply be a custodian for certain reference material.

"CANNERS' BILL" TO ESTABLISH NEW FOOD STANDARDS

McNary-Mapes Bill Authorizes Conspicuous Label for Substandard Products

By W. G. CAMPBELL, U. S. Department of Agriculture

The McNary-Mapes bill, which amended the Federal food and drugs act and which was passed by the last session of Congress, authorizes the Secretary of Agriculture to determine, establish, and promulgate from time to time a reasonable standard of quality, condition, and/or fill of container for each generic class of canned food, except meat and its products, and canned milk. It also authorizes the Secretary of Agriculture to prescribe a form of a statement which must appear in a conspicuous manner on each package or label of canned food falling below the standard and which will indicate that such canned food falls below such standard.

The word "class" means, and is limited to, a generic product and does not mean a grade, variety, or species of the generic product. By "canned food" is meant food hermetically sealed in containers and sterilized by heat.

Since the passage of the amendment, the food and drug administration of the Department of Agriculture has been formulating standards for some of the staple products. Material progress has been made in preparing tentative drafts of standards for the following canned products: Tomatoes, corn, peas, string beans, peaches, apricots, apples, pears, cherries, and salmon. Before these standards can be put into form suitable for public hearings, a large amount of laboratory work will be necessary to determine certain physical and chemical constants essential to enforce the standards.

The food-control laboratory of the administration is devoting much attention to this work. Some of the factors being considered are: Size, texture, color, consistency, blemishes, and the presence of extraneous material. The aim, so far as practicable, is to devise simple and accurate methods of measurement that can be applied readily by the canner and distributor and interpreted readily by the consumer. Existing commercial grades are of little value in formulating standards under the McNary-Mapes amendment, because they are based largely on individual and expert judgment of qualities which do not lend themselves to accurate measurement and which are frequently local in scope. The standards under the McNary-Mapes amendment must be national in scope, must be equally applicable in all localities, and must be sufficiently accurate to withstand possible court action.

Due consideration to trade practice.

Consideration will be given to trade practice and consumer understanding as to what constitutes a standard product. Public hearings will be held at which the tentative standards will be discussed. Announcements of these hearings will be made, giving sufficient time to those interested to arrange to be present or represented. If additional information is brought out at the hearings, the standards will be revised when necessary and submitted to the Secretary of Agriculture for adoption and promulgation. At the present rate of progress it is anticipated that

hearings on some of the standards will be held before the end of the year. The amendment provides a period of 90 days after the promulgation of each standard before it becomes effective.

The amendment, as passed, in no way relaxes the enforcement of the Federal food and drugs act. It actually widens the scope of that law. Foods which fall below the established standard may not violate the act in any respect. Like standard products, they must be honestly labeled, must be pure and wholesome, and, in addition, must bear a label clearly announcing their substandard quality.

The food and drug administration is devoting much time to determining the form of this statement. It was obviously the intent of Congress that the required labeling shall clearly inform the purchaser that the product does not conform to the standard, but it is also apparent that the designation should not be of such a stigmatizing character as to convey the impression that the product is unfit for food. The amendment recognizes that there are classes of canned-food products which, while not of a quality entitling them to be sold as U. S. Standard, are none the less legal under the food and drugs act if sold under an informing type of label.

All interests cooperating.

The food and drug administration has sought from many sources—including manufacturers, distributors, and consumers—suggestions as to the proper designation for substandard goods to be recommended for adoption by the Secretary of Agriculture. Numerous suggestions have been received. Although no official decision has been reached, many of those who have been consulted believe that the simple statement "Below U. S. Standards," conspicuously displayed on the label, will meet the requirements of the law. It is urged that this statement has the merit of brevity.

Those who propose it believe that, as the result of the interpretation which the Department of Agriculture will make public, it will be accepted promptly by the consumer and used intelligently in purchasing canned goods. Although the suggested designation has not been acted upon by the department, it is undoubtedly one of those that will be advanced for discussion at the public hearings.

From the standpoint of the housewife, the enactment of this amendment should be advantageous in that she will be able to buy canned foods with a much more definite knowledge of their quality than has heretofore been possible. If her means are limited she can select goods of substandard quality at a reduced price, with a full knowledge of their character but with assurance that they are pure and wholesome and have satisfactory food value.

If, on the other hand, her means permit a more expensive article, she is assured, through the label, against the unwitting purchase of a substandard article.

WHY DO SHOES WEAR OUT?

Leather Quality Depends on Breed of Animal, How It Lived, When Killed, How Stored and Tanned

By HENRY D. HUBBARD, *National Bureau of Standards*

Leather is made from skin. Skin toughness built to withstand the stress of active life is translated into similar service for man in the form of leather. The Persian saying, "The world is clad with leather to him who wears a shoe" is the basis of a great industry—shoemaking. The wearing quality is a primary trait of sole leather, on which a billion-dollar industry is built.

The National Bureau of Standards aims to improve leather, make shoes last longer, find out why they wear out, cheapen leather costs by new methods and materials, enable leather makers to use each part of the hide for its most appropriate purpose, study the useful properties of leather, embody them in quality standards defining basic requirements for each use, and develop reliable tests and devices—in brief, to place the manufacture and use of leather on a new scientific basis with the fullest cooperation of the leather industry and its technical association.

Why do shoes wear out?

The leather laboratory of the National Bureau of Standards is answering the question "Why do shoes wear out?" One sole of a pair of shoes may wear out faster than another, not because the walker has bad walking habits, but because it is cut from a different part of the hide and the two do not match in wearing quality. If the sole is cut from the back of the steer it will outlast one cut from the flank because it is stronger, tougher, and more durable. The back section may last twice as long as the flank leather. Shoemakers are being told to match their soles for a given pair of shoes to give the wearer equalized wearing quality.

In view of the wide variation in the wearing qualities of leather from different parts of the hide, complete data were obtained. Leather from the portion over the kidney showed the best wear while on the belly edge the wearing quality was found to be only 73 per cent. If the best service is required, it is thus shown to be important to specify from what portion of the bend soles shall be cut.

Hides were completely cut up into sole shapes and the test results reported numerically and topographically, giving a most interesting and valuable scientific analysis of the dependence of wearing quality upon location on the hide.

A notable aspect of the bureau's leather research is that it stimulates the entire leather industry to co-operate on its basic problems; to promote progress; to reduce costs; and to improve its product.

The response of the industry is shown by the co-operation of the Tanners' Council, in the study of the effect of acids on leather; the American Belting Association, in the work on leather belting; the Calf Tanners' Association, in the study of the methods of curing as well as the properties of calf leather; and the American Leather Chemists Association's co-operation on measuring the useful properties of leather.

Breed of animal important.

Leather quality depends on breed of animal, how it lived, when killed, how stored, and tanned. Many factors require investigation. Since the finished leather integrates these factors, the study of leather in actual service is an important kind of research—the service test.

Tests of sole leather by actual wear in walking, however, take a long time. A laboratory apparatus was, therefore, developed to duplicate actual service. The National Bureau of Standards' "walking machine" simulates the wear which a pedestrian gives the soles of his shoes. Such a laboratory test speeds up the wear as measured by the volume of leather lost by abrasion.

The sole leather testing machine imitates the abrasive friction to which sole leather is subjected in walking. It permits accelerated testing. The equivalent of several months of actual wear of shoes is obtained in 24 hours' operation or 40,000 revolutions of the machine.

On request of a State government the bureau investigated devices and methods for measuring the area of skins and hides. Inspectors of weights and measures had given little, if any, attention to these instruments.

No standard test of leather-measuring devices had been devised; tolerances had not been established; and no comparative study of the various types of such devices had been made; although hundreds of millions of dollars' worth of hide and skin products are involved annually.

A bureau technologist studied the principle of leather-measuring devices and sources of error. He found that such errors usually favored the buyer. A suggestive design was worked out and a procedure for performance tests was devised. The test results on 3-wheel measuring machines were published with typical calculation of essential factors.

PORTUGUESE INSTITUTE TO MAKE OFFICIAL TESTS IN FIELD OF ELECTRICITY

By a decree of the Portuguese Government, issued in February, 1930, the Instituto Superior Tecnico, of Lisbon, has been assigned the function of making all official tests and calibrations in the field of electricity. This will include tests of electrical instruments, machines, and apparatus.

The Instituto Superior Tecnico is a school of engineering, but the laboratories for carrying on official tests will be completely independent of the present laboratories used for purposes of instruction. The testing laboratories will be installed in new buildings and will have modern equipment. Some sections of the laboratory are already outfitted; others are being planned for establishment in the near future.

STANDARDIZATION OF OIL AND GAS PIPE LINES

Standardization Means Economic Installation and More Efficient Operation

By E. L. RAWLINS, *Natural Gas Engineer, United States Bureau of Mines*

Standardization of pipe lines for the transmission of oil and gas implies more economic installation and more efficient operation. Such standardization is now in an early state of development. Facilities for transmission of oil and gas in their relation to each other are dependent upon many complex factors, and standardization at this time is primarily a process of eliminating nonefficient and uneconomic practices rather than of recommending particular equipment and methods for construction and operation. Present codes relating to oil and gas transmission refer more particularly to the pipe than to pipe-line construction methods; however, these codes are flexible and permit the recognition of development in the science of pipe manufacture.

Specifications have been prepared jointly by the Special American Petroleum Institute Committee on the Standardization of Specifications for Steel and Iron Pipe for Oil Country Tubular Goods and the Technical and Research Committee of the Natural Gas Department of the American Gas Association for line pipe which satisfy the requirements of both the petroleum and the natural-gas industries. These specifications apply to welded and seamless steel and welded iron tubular goods for pipe-line purposes, and include manufacture of pipe, chemical properties and tests, physical properties and tests, standard weights and lengths, workmanship and finish, inspection and rejection, and gages for screw pipe.

Research is an important factor in the development of pipe manufacture and pipe-line construction equipment. Some research projects contributing to this development are:

1. Welding research is contributing much to better standards for welded line construction, especially to the development of the technique for welding high-carbon steel.

2. The use of electric welding for pipe lines in recent years has aroused considerable interest, and its further application is being studied by manufacturers and individual pipe-line companies.

3. A study of the effect of high phosphorous steel for welded line pipe is now being conducted by the National Bureau of Standards for the American Society of Testing Materials and the American Petroleum Institute.

4. In both oil and gas transmission, thought is being directed toward definite specifications of pipe and other equipment for withstanding higher pressures than in the past.

5. Experimentation by individual companies, assisted by manufacturers, relating to the use of different kinds of joints has not only resulted in a better understanding of such usage, but has also resulted in the development of more efficient joints. The selection of a particular type of joint, or a combination of types for a pipe-line installation, depends upon the conditions of the installation and the preference of the designing engineers.

6. The American Petroleum Institute and the National Bureau of Standards are cooperating in an intensive research program on protective coatings to resist corrosion. This work is helping, first, to develop a code on the application of hot bituminous coatings, which is being followed to a large extent by many pipe-line companies, and second, to permit a more intelligent selection of sections of pipe-line requiring protection.

The practices of individual companies in their construction work on the transmission of oil and gas show definitely the trend toward the elimination of uneconomic and nonefficient practices.

In the oil and gasoline industries, pipe-line construction methods are practically standardized; that is, all lines recently constructed have been solidly welded from one end to the other. On the other hand, the oil and gasoline pump stations are not so definitely standardized; they are subjected to personal preference as to types of pumps and methods of operation. An automatic oil-pump station, which is a permanent exhibit at the International Petroleum Exposition in Tulsa, Okla., is an example of research which tends to evolve more efficient and reliable equipment.

It is debatable as to whether standardization has had any direct effect on the construction of long-distance transmission lines for petroleum products and natural gas. Long pipe lines for the transmission of oil were constructed and used before any definite standardization of the pipe was considered; and the construction of long distance pipe lines for transmission of natural gas has been due mainly to the discovery of large natural-gas fields and the assurance that sufficient reserves of natural gas exist to warrant this construction.

The nature of standardization in construction for natural-gas transmission lines is somewhat different from that for the transmission of other petroleum products because of the many dissimilar problems which are peculiar to natural-gas transmission. Pipe lines, compressor stations, and other facilities are subjected to personal preference of the engineers who design them. Standardization is limited to the equipment which is used to build the pipe line rather than to any method of construction. Operating companies, however, maintain certain standards, but these standards vary so much among different companies that they can not be used as a collective unit. These standards include such items as types of weld and methods of making welds; drip construction and location, dependent upon particular needs; meter installations which, in general, embody the standards advocated by the Technical and Research Committee of the Natural Gas Department of the American Gas Association; length of joints of pipe, the longer joints being considered an advancement for many installations; leakable determinations and elimination; and protection against corrosive action. All of these factors are, of course, subject to research, and more definite and

useful standardization is possible only with continued research and the correlation of research already made.

At present, it is not considered practical to attempt definite recommendations of standardization practices in the construction and operation of natural-gas transmission lines, and to some extent oil transmission lines, that would be applicable under all conditions; there

are too many varying factors that have to be considered. Certain basic practices, however, can be and are being standardized, and the applicability of such basic principles is a distinct asset when used by competent engineers in designing pipe-line installations for the transmission of natural gas and other petroleum products.

CURRENT ACTIVITIES OF THE AMERICAN STANDARDS ASSOCIATION

A. S. A. Announces Approval of Several New American Standards

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.

Symbols for radio communication.

A proposed revision of the Graphical Symbols for Use in Radio Communication has been prepared and is now in the hands of the Institute of Radio Engineers for their consideration and approval. The revision consists entirely of changes proposed for the purpose of making the radio symbols uniform with those under consideration and those previously adopted by the general sectional committee on scientific and engineering symbols and abbreviations.

This revision was prompted by questions raised in a letter to the A. S. A. which reads in part as follows:

Our people, who are very much interested in the abbreviations and symbols, are opposed to the adoption of the radio symbols as they are, pending correlation by the sectional committee with the work of the other subcommittees so as to eliminate duplications of symbols or terms for the same thing. We are particularly concerned about the radio symbols and those for electric power and wiring because, being a manufacturer of both, and using radio devices in connection with electric control, and vice versa, using electric control in connection with radio, particularly the transmitting, we are faced with the necessity of making new prints whenever one of the devices is used which employs a different symbol for radio than it does for electric-power work.

After approval by the Institute of Radio Engineers the revised symbols will be considered by the sectional committee in accordance with the usual A. S. A. procedure.

Pipe flanges and fittings.

A subcommittee appointed by the sectional committee on pipe flanges and fittings has completed a proposed standard on pipe plugs of cast iron, malleable iron, cast steel, and forged steel, which is being widely distributed to industry for comment and criticism.

The proposed standard is based on material originally developed by the Manufacturers' Standardization Society of the Valve and Fittings Industry, and adopted by that society in April, 1929, as a standard practice for use in connection with the American standard for 125-pound and 250-pound cast-iron screwed fittings and the American standard for 150-pound malleable iron screwed fittings.

A draft standard on steel pipe flanges and flanged fittings has been completed by another subcommittee appointed by the same sectional committee. This standard is not complete in-itself, but must be treated

as a supplement to, and used in conjunction with, the American standard for steel pipe flanges and flanged fittings.

Replies to a questionnaire sent out in December, 1929, by a subcommittee of the sectional committee on pipe flanges and fittings have resulted in a draft of a proposed standard on steel companion flanges. The draft is now being circulated to industry for comment and criticism.

Methods of laboratory analysis of coal and coke.

A revision of methods of laboratory sampling and analysis of coal and coke, consisting of minor changes in some of the methods of test, has been approved as an American standard by the American Standards Association.

The changes are the result of investigations of the methods of analysis with a view of increasing their accuracy. Many of the determinations made in analyzing coal and coke are in part empirical in nature and methods of this character require close standardization to secure agreement between different laboratories.

The standards just adopted are recognized and used by most of the large consumers of coal in the United States and are extensively used in purchasing coal under specifications for power production. They are also used by large coal producers who process their coal before marketing to improve its quality. The methods of coke analysis are principally used for evaluating coke for metallurgical purposes.

The revisions were submitted to the American Standards Association by the American Society for Testing Materials, which is the propriety sponsor for the project under A. S. A. procedure.

Analysis of white pigments.

A revision of the method of routine analysis of white pigments recently approved by the American Standards Association, clarifies the method of calculating and expressing the results of the analysis in terms of metallic lead and zinc, lead oxide, zinc oxide, and lead sulphate. The revision was proposed by the American Society for Testing Materials.

Prevention of fires in metal mines.

A code for the prevention of fires in metal mines, providing for fire-fighting equipment, fire-fighting personnel, and for warnings of fire has just been approved as an American recommended practice by the American Standards Association.

The code includes detailed requirements for surface-water supply and hose equipment and underground-water and water-supply equipment. Amer-

ican standard hose and American standard screw threads are specified.

Under the section entitled "Fire-Fighting Equipment" the code also covers the use of fire extinguishers and sprinkling systems, oxygen-breathing apparatus, and provides for the frequent testing of this equipment. It makes provision for at least one competent man in each mine, especially trained as leader in the use of the oxygen-breathing equipment, and recommends that at least 5 per cent of the underground personnel be trained in the use of the breathing apparatus.

Fire-resistant housing for electrical equipment, testing of circuit breakers at regular intervals to insure cutting off of power in case of a short circuit, the establishment of fire breaks or fire-resistant areas, and fire-resistant shafts or compartments carrying power lines are included in the requirements.

A telephone system, a series of bells, flashing of lights, and the introduction of a stench fluid into the ventilation air lines are provided as fire signals.

Code for mechanical refrigerators.

Domestic refrigeration and refrigerating apparatus used in the manufacture and processing of materials,

such as in ice-making plants, cold-storage warehouses, ice cream and dairy plants, packing houses, and chemical plants, and also the cooling systems of theaters and other buildings, are covered in the provisions of a national safety code for mechanical refrigerators which has just been approved by the American Standards Association. For details of this standard see Safety Code for Mechanical Refrigeration contained elsewhere in this magazine.

Radio engineers join association.

The Institute of Radio Engineers, which has been active in national standardization work for some time, has joined the American Standards Association as a member body. The institute is represented on the sectional committee which revised the standard specifications for dry cells and batteries, and on the sectional committee which developed the American standard table of preferred numbers. It is also represented on the sectional committees on scientific and engineering symbols and abbreviations, and standards for drawing and drafting room practice, and is joint sponsor with the American Institute of Electrical Engineers for the sectional committee on radio.

PRINTED PAMPHLET ON STANDARD FOR SPECIAL SCREW THREADS NOW AVAILABLE

The printed pamphlet entitled "American National Special Screw Threads, CS25-30" has been released by the Government Printing Office, and was distributed to the acceptors of record on October 22.

The commercial standard makes available for convenient shop use the most important screw-thread dimensions and tolerances for classes 1, 2, 3, and 4 fits of the American National 12-Pitch Thread Series, as well as other screw threads of special dimensions, pitches, and lengths of engagements. The tables given therein comprise the essential dimensions as adopted by the National Screw Thread Commission and are recommended primarily for shop use.

The pamphlet includes a brief history of the project as developed by the National Screw Thread Commission, which body is to serve as the standing committee. It also includes a list of acceptors of the standard. Copies of the pamphlet may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 15 cents per copy.

LUMBER SIMPLIFICATION IN AUSTRALIA

An improved product and reduction in costs of manufacture of native lumber are being sought after by Australian sawmillers, according to information received from James E. Peebles, American trade commissioner at Sydney, Australia.

It is reported that Australian millmen are going over their production methods and making a careful study of dry-kiln methods. An effort is also being made to arrive at a simplification of sizes of commonly used stock and to eliminate all unnecessary handling and intermediate marketing charges.

Heretofore, it is reported by the trade, native lumber used in buildings has shown marked tendencies

to warp due to improper manufacture and seasoning. This is quite evident, states Trade Commissioner Peebles, in native flooring.

NATIONAL STANDARD FOR TESTING POWER-LINE INSULATORS

Permits Authoritative Testing to Determine the Reliability of Insulators

A further step in the nation-wide protection of high-voltage electrical transmission lines which have been put into service throughout the country during the past several years to carry power at voltages as high as 220,000 was taken on October 15, with the approval by the American Standards Association, of a national standard for testing power-line insulators.

This standard, prepared through the cooperation of the American Institute of Electrical Engineers, the National Electrical Manufacturers Association, the National Electric Light Association, the National Bureau of Standards, and other organizations concerned with high voltage transmission assures against insulator failure the lines carrying an increasing percentage of the Nation's power supply.

The standard will enable laboratories in New York and California to use the same authoritative tests to determine the reliability of insulators. In several of the laboratory tests voltage applied to the insulator is increased at the rate of 10,000 volts every 15 seconds until failure occurs. The final voltage must be far above the greatest voltage which the insulator either singly or in series with other insulators will be required to withstand.

It is pointed out that the suspension insulators used for cross-country transmission lines must be tested not only for their resistance to high voltages but also to the tremendous stresses set up by wind and by the ice which may cover the lines in winter, especially since the transmission towers, from which the lines are suspended by means of the insulators, are in some places as much as a mile apart.

STANDARDS FOR HIGHWAY AND TRAFFIC CONTROL

Uniform Laws and Regulations Proposed by National Conference on Street and Highway Safety Will Stem Tide of Traffic Accidents

By C. W. STARK, Assistant Manager, Transportation and Communication Department, United States Chamber of Commerce

Standardization of highway and traffic control has been the subject of intensive study during the past six years, and much progress has resulted. The development of these standards has been effected largely by the National Conference on Street and Highway Safety under the chairmanship of the Secretary of Commerce, with the cooperation of the national associations directly interested in the traffic problem, and the service in committee work of public officials and private citizens from every part of the country and representing every interest affected. The National Conference of Commissioners on Uniform State Laws has collaborated in the preparation of the Uniform Vehicle Code, and that body and the American Bar Association have indorsed the code.

From a general statement of desirable uniform principles adopted by the First National Conference on Street and Highway Safety in 1924, the plan of standardization has resolved itself into three parts—uniform State motor vehicle legislation, uniform municipal traffic ordinances, and uniform street and highway traffic signs, signals, and markings.

The first of these standards, the Uniform Vehicle Code, was drafted in 1926. It consisted of four acts—a uniform motor vehicle registration act, a uniform motor vehicle antitheft act, a uniform motor vehicle operators' and chauffeurs' license act, and a uniform act regulating traffic on highways. This subdivision of the code recognized widely varying degrees of control of motor-vehicle operations or need therefor in the different States, and made it possible readily to adopt parts of the code for which a given State was ready.

Act IV, that regulating traffic on highways, included certain basic rules of the road necessarily applicable to cities and towns as well as to the open country, but left the details of urban traffic control mainly to the individual municipalities.

The model municipal traffic ordinance was developed by a committee of the conference in 1928. The model ordinance repeated certain provisions of the State code applicable particularly to municipalities, but embraced mainly matters not covered in Act IV of the code, such as parking regulations and details of pedestrian control. It defined the meaning of traffic signs and signals and laid down certain conditions under which they might be erected, but did not provide engineering specifications for them.

Standard markings.

In 1926-27 the American Association of State Highway Officials and the United States Bureau of Public Roads, recognizing the need for uniformity in highway signs and markers, through a joint committee prepared a manual for such signs and markers. Late in 1926 the American Engineering Council undertook the preparation for the national conference of a manual on street traffic signs, signals, and markings, and

this was developed in harmony on the one hand with the above-mentioned manual for rural highway signs and markers and on the other hand with the requirements regarding signs and signals of the Model Municipal Traffic Ordinance. This manual, which involved study of installations and operations in more than 100 cities, was completed early in 1929.

In 1929-30 a committee of the national conference, organized for the purpose, reviewed all of these standards and submitted them with recommended revisions to the Third National Conference on Street and Highway Safety held in May, 1930. These were approved by the conference with other revisions, and the amended Uniform Vehicle Code was approved by the National Conference of Commissioners on Uniform State Laws and the American Bar Association at their annual meetings in August, 1930.

Changes in codes.

A notable change made in Act IV of the Uniform Vehicle Code was the incorporation therein of a large part of the Model Municipal Traffic Ordinance. In the four years from 1926 to 1930 prevailing sentiment advanced from a belief that each municipality, large or small, must be allowed to control its traffic in accordance with its peculiar conditions, with a minimum of interference by State law, to one that the basic considerations in virtually all traffic matters except the details of parking restrictions and prohibitions are essentially the same in all communities and should be standardized by State law. The New Jersey legislature took the lead in this direction in 1928 in its State law, and Wisconsin and New York did the same in 1929.

Twenty-five States have adopted at least one act of the Uniform Vehicle Code or have revised their existing laws to bring them into closer harmony therewith. Pennsylvania, Delaware, and Arizona have adopted the entire code with slight modifications in some particulars. North Carolina, Virginia, North Dakota, Idaho, and New Mexico have adopted all but the Operators' and Chauffeurs' License Act. Michigan, Wisconsin, Minnesota, Louisiana, and South Dakota have adopted the Act Regulating Traffic on Highways.

California, by successive revisions of its existing laws, has brought them into substantial harmony with the code. All of the New England and North Atlantic States, with the exception of Maine and Delaware, had operators' license laws with mandatory examinations, in substantial harmony with the code, prior to the drafting of the code, and Delaware has since adopted the code. Maine, New Hampshire, New Jersey, Washington, and Oregon have brought their rules of the road into closer harmony with those of the code. Maine, West Virginia, South Carolina, Michigan, Indiana, Wisconsin, Nebraska, Washington, and Oregon have adopted license laws for drivers, but without the

mandatory examination feature deemed essential to the full effectiveness of the law. Numerous other States require licenses without examination for chauffeurs only.

In addition to all municipalities in New Jersey, New York, and Wisconsin, which are brought under the Model Municipal Traffic Ordinance by State law, some 30 or 40 cities have remodeled their traffic ordinances in substantial harmony with the model ordinances. The traffic authorities of an equal or greater number of cities have adopted the manual on street traffic signs, signals, and markings, while practically all of the State highway departments have adopted the manual for rural highways.

The National Conference on Street and Highway Safety has constantly emphasized the great importance of uniform standards for highway and traffic control, both from the standpoint of safety and that of expediting traffic. The motor vehicle has wiped out local and State boundaries, and variations in traffic rules inevitably result in misunderstanding, disrespect for the law, accidents, and chaos.

Uniformity, with enforcement, means assurance and respect for the law for every motorist desiring to operate properly; it means orderly flow and the expediting of traffic, and it certainly offers promise of a stemming of the tide of traffic accidents with their appalling destruction of property and loss of life.

STANDARDIZATION ACTIVITIES OF THE CONCRETE STEEL REINFORCING INSTITUTE

Institute Formed to Carry on Promotional, Research, and Standardization Activities in Behalf of Industry

By R. W. JOHNSON, *Engineer, Concrete Reinforcing Steel Institute*

The Concrete Steel Reinforcing Institute was organized for the purpose of carrying on promotional and research work and of standardizing materials used in reinforced concrete construction.

One of the important accomplishments in the field of standardization and simplification has been the establishment of a simplified list of sizes of steel reinforcing bars and spiral rods and the formulation of standards for the various grades of steel. This movement was sponsored by the institute with the cooperation of the division of simplified practice of the National Bureau of Standards, and resulted in the adoption of the simplified practice recommendation relating to these commodities. In line with the requirements set forth in the recommendation, the institute is continuing work with its members and other interested bodies to help maintain the new adopted standards and to improve present conditions in the industry.

Following the simplification of sizes for bars and rods, the institute adopted standard weights for billing bars sold on theoretical weights, thereby enabling all its members to bill on the same basis. It is now considering the adoption of two or more standard types of deformed bars replacing many different standards now in use which will assist rolling mills to decrease the cost of manufacture with a resulting benefit in savings to the members of the institute.

Through promotional work the institute is urging the universal observance of its Code of Standard Practice, including the standard bar contract, in eliminating causes for dispute which have heretofore arisen between buyers and sellers.

Adopted building code.

In cooperation with the American Concrete Institute, this organization adopted a joint building code, allowing economical concrete design. This code has already been adopted or permitted by special ruling in many cities. The institute is directing its efforts to secure the adoption of the joint building code in many other cities, among which are New York, Chicago, Detroit, Pittsburgh, Minneapolis, and Boston, as well as in smaller cities and in several States. This code has become the standard for reinforced concrete

throughout the industry and has been found satisfactory where it has been adopted.

The institute is rendering a real service to its members by means of lecture courses, by disseminating facts concerning the technical development of reinforced concrete. These courses cover the design of both large and small buildings, costs, and other topics. The institute also arranges group meetings from time to time to discuss marketing problems.

A special committee of the institute has devoted months of study to a proposed quality mark for certified new billet steel. This quality mark, rolled into each bar, will assist purchasers in obtaining reinforcing bars made in accordance with recognized specifications. The institute has also in the course of preparation a form of licensing agreement for its members, permitting them to use the quality-certification trade-mark on steel which measures up to the required standards of grade and quality.

To make trade-mark effective.

For the purpose of making the quality trade-mark effective, the institute is inaugurating a campaign to educate the users of reinforced steel to insist on quality marked bars in their purchase specifications.

The institute initiated the trade practice conference conducted for the industry by the Federal Trade Commission, under which trade practice rules were adopted to eliminate unfair trade practices and to stabilize methods which are legally proper.

The Concrete Reinforcing Steel Institute is actively cooperating with the American Concrete Institute, American Society for Testing Materials, Portland Cement Association, Rail Steel Bar Association, and other technical societies in the development of standards and specifications for use in the reinforcing concrete industry.

It has issued several publications dealing with reinforced concrete building design, a bar card showing standard weights for bars, and other literature for promotional work. The institute has now in course of preparation other publications dealing with designs for tall buildings, quality marking of reinforcing steel, and fireproof construction building.

WIND PRESSURE ON LARGE CHIMNEYS

A Major Element in Determining Cost of a Large Chimney is the Amount of Wind Pressure Which the Chimney is Likely to Withstand

By HUGH L. DRYDEN and G. C. HILL, *National Bureau of Standards*

One of the major elements determining the cost of a large chimney, such as those used in connection with steam power plants, is the amount of wind pressure which the chimney is to withstand.

Many specifications are drawn up in which the chimney is required to withstand a wind of 100 miles per hour, but since there are many opinions and little knowledge as to the wind pressure imposed by a wind of this speed, the different bidders often design for different loads and, therefore, do not bid on structures of the same strength. Because of industrial traditions, the builders of concrete chimneys, for example, assume a different wind pressure than do those of brick chimneys for the same wind speed. In many instances it is felt that the values of wind pressure used are too high, thus increasing the cost without corresponding benefit.

Wind-tunnel measurements.

For several years, an investigation of the wind pressure on chimneys and other cylindrical structures has been in progress at the National Bureau of Standards. Measurements have been made on cylinders 8 inches and 12 inches in diameter in the large wind tunnel in winds up to 70 miles per hour. The pressures at many points on the surface of the cylinder have been measured by drilling small holes through the walls and connecting the holes through tubes in the interior of the cylinder to a pressure gauge in the observation room of the wind tunnel. The wind blowing past the cylinder exerts the same pressure on the air column in the hole and tubing as on the surface near by. The pressures are measured by balancing them against the weight of a column of kerosene.

Suction effects on chimneys.

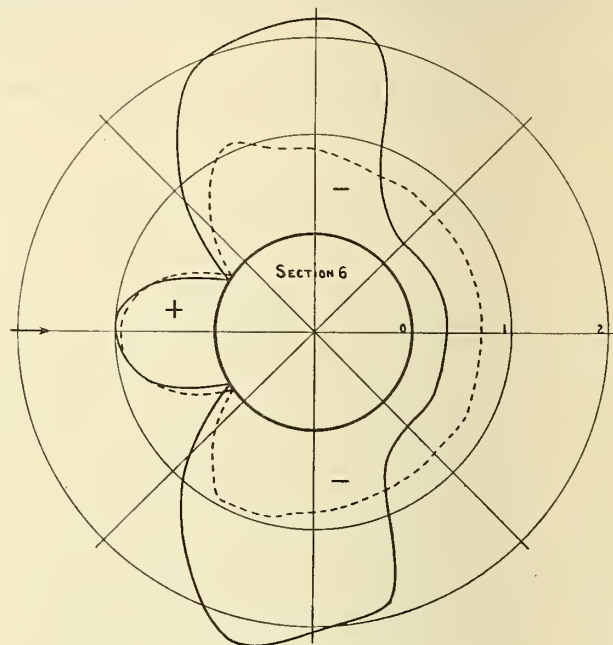
The manner in which the pressure is distributed around the cylinder is very interesting but puzzling to the layman. The pressure is increased above the normal atmospheric pressure over less than one-quarter of the total surface. Over the rest of the surface the pressure is decreased below the normal atmospheric pressure. This decrease in pressure is sometimes spoken of as a "suction" or "vacuum," but it should be remembered that the air still presses on the cylinder to a smaller degree than the normal pressure. We live at the bottom of an ocean of air and its weight presses on us continually with a pressure of over 2,000 pounds per square foot. The suction encountered in windstorms correspond to a reduction of this normal pressure by a few tens of pounds per square foot. These comparatively small pressure changes cause large forces when acting on large areas.

Type of distribution changes with wind speed.

The measurements on large cylinders at high speeds show a change in the manner of the distribution of pressure. The amount of the reduction in pressure on the rear of the cylinder becomes less, and that at the sides greater than would be inferred from measurements on smaller cylinders or at lower speeds.

The chimney tends to be squeezed in on the windward side and drawn out at the sides to an elliptical form with the long axis cross wind.

Such deformations are sometimes observed on thin-walled steel stacks in high winds, and in the design of such structures it may be necessary to consider the distribution of wind pressure around the circumference.



Distribution of pressure on 8-inch cylinder

Model tests not reliable in this case.

The changes referred to are shown graphically in the chart. The direction of the wind is shown by the arrow and the regions of increased and decreased pressures are designated by plus and minus signs. The pressures are plotted radially outward from the base circle; the dotted line for a speed of 40 ft./sec.; the solid line for a speed of 80 ft./sec. In order to facilitate the comparison of the shapes of the diagrams, the actual pressures in pounds per square foot have been divided before plotting by the pressure exerted at each speed in the open end of a tube facing the wind. Because of the readjustment of the flow around the chimney indicated by this chart, model testing in the wind tunnels does not give reliable information on the pressure on large chimneys 10 to 20 feet in diameter. It has been necessary, therefore, to supplement the model testing by measurements on large structures in natural winds.

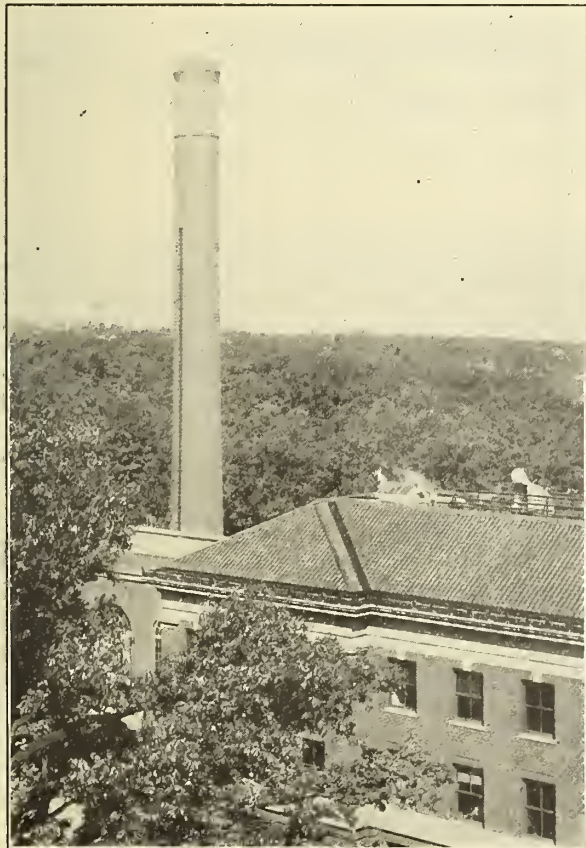
Special stack built for outdoor measurements.

As a preliminary to measurements on an actual chimney, an experimental stack 10 feet in diameter and 30 feet high of light construction was erected on the roof of one of the buildings at the National Bureau of Standards.



Experimental stack, 10 feet in diameter, 30 feet high, erected for measurements of wind pressure in natural winds

The pressures at 24 stations around the circumference at a single elevation were measured. The wind speed was determined by an instrument mounted on top of the stack. In addition, the entire stack was supported on four pressure capsules connected to pressure gauges so that the overturning movement could be directly measured. The stack remained in place and observations were made at intervals over a period of several years, but as a result of continual racking it



The power plant chimney of the National Bureau of Standards

was finally blown from the roof in a wind exceeding 60 miles an hour.

Power-plant stack used for measurements.

When a new power plant was constructed at the National Bureau of Standards, provision was made for measurement of the wind pressure at a single elevation. A view of the stack and its surroundings looking toward the northwest—the direction of the most frequent high winds—is shown in the illustration. The dark line running down the stack is a group of 24 pipes leading to the pressure gauge and the holes are located about 2 feet above the top of the pipes. The stack at this point is 11.8 feet in diameter. The wind vane on the roof of the building to the left carries a wind velocity instrument, but the velocities are more accurately obtained from the distribution of pressure on the stack.



The observer's station on the power-plant chimney

The 24 pipes lead to the observation station shown in illustration. Each of the 24 pipes ends in a valve and the handles of the 24 valves are connected to a single operating lever. The outlets of the valves are connected to the pressure gauge on the table by rubber tubing. The valves whose outlets point downward are for draining water from the pipe lines. The operator may observe the pressures continuously and shut off the 24 lines when the wind is fairly high and steady. The gauge may then be read at leisure.

Tests indicate effect of length-diameter ratio.

A comparison of the results of the measurements on the slender power-plant stack with those made on the relatively short experimental stack shows that the wind pressure on a chimney at a given wind speed increases as the ratio of the height to the diameter increases. Further experiments will be necessary to determine the wind pressure on a chimney of any length-diameter ratio satisfactorily.

However, in the case of chimneys having an exposed height which does not exceed ten times the diameter, it is safe to assume that at a wind speed of 100 miles per hour the wind pressure is not greater than 20 pounds per square foot of projected area.

INDUSTRIAL HAZARDS STUDIED FOR SAFETY OF WORKER

Enormous Growth in Development of Industries Creates New Problems for Health Workers

By Asst. Surg. Gen. L. R. THOMPSON, *United States Public Health Service*

The United States Public Health Service through the Office of Industrial Hygiene and Sanitation, conducts investigations of health hazards in industry. Problems under consideration at the present time relate to dust, ventilation, illumination, smoke pollution, industrial poisons, and allied questions.

Measurement of the effect of particular conditions on the health of the worker has involved several different approaches, including the physical examination, X rays, sickness records, and mortality. In certain cases differential blood counts, electroscopic findings, etc., are also employed. In each of these cases standardization is of first importance. In the case of sickness, it is necessary not only to have standard forms and procedure for classifying disabling sickness, but to have an idea of the normal sickness experience of industrial workers. The latter is being obtained through current reports of sick benefit associations and through special investigations. These methods are supplemented in special studies by observations on a group of comparable workers, who are not exposed to the specific hazard under consideration. In the case of physical examinations, a standard form and technique have been developed, extending to the physiological determinations and the record of impairments. Instruments used in special determinations, such as the photoelectric cell for illumination read-

ings, and electroscopes for finding the amount of radium in the body, are calibrated with the help of the National Bureau of Standards.

In connection with studies of the effect of dust on the health of a worker, an effort has been made to establish limits of dustiness below which no harmful results are noted. These data are made available for the use of industrial concerns. Standard methods of ventilation for dusty processes, such as that of sand-blasting, are being worked out, including determinations of the most efficient rates of air flow.

The work has already proven its worth to industry in this country. Especially since the war there has been an enormous growth in the development in this country of industries, such as new artificial silk factories, new dye processes, and more extensive mass production in older types of industries, such as the steel mills and motor factories. In many cases processes are developed using various chemical gases, and humidity and atmospheric conditions under which man has not been employed before. It is necessary for the health of the worker and the success of the industry to know what dangers may develop, what the safe limits of atmospheric pollution are, and the most advantageous method of securing safe working conditions by ventilation and air conditioning or selection of employee.

STANDARDIZATION IN THE LIGHTHOUSE SERVICE

Service Has Adopted Standard Buoys, Coloring, and Other Items of Equipment

By G. R. PUTNAM, *Commissioner of Lighthouses, Department of Commerce*

It is probable that no organization has under its jurisdiction more diversified engineering activities than are found in the Lighthouse Service and in none is the need for uniformity more essential, for to the Lighthouse Service is delegated the task of safeguarding the water routes over which the ships of commerce travel, with the responsibility for human lives and merchandise.

Since the organization of the American Marine Standards Committee for standardizing various marine construction details, the work has progressed steadily and about 100 different publications for standards of ship construction details and fittings have been promulgated with the cooperation of the various shipyards and marine industries.

These standards and others which are now in process of adoption will be of great economic benefit to the marine field. While their use is not mandatory, their adoption will simplify specifications and enable vessel owners to obtain the same class of construction or replacement in widely different localities, thereby producing uniformity in details which does not now exist generally.

The Lighthouse Service has found it increasingly evident that standardization has received the approval of many shipyards and the classification societies in that they are offering to use these standards in their designs. The Lighthouse Service desires to cooperate in furthering this work which will eventually result in better and safer methods of construction. There are many other ways in which the Lighthouse Service has found it possible to standardize its work. Several examples will be cited.

Standards effected.

Certain types and sizes of buoys for use in all locations have been adopted, for the manufacture of which standard specifications are used. This results in a uniformity of design which is necessary, if confusion to shipping is to be avoided, and provides a standard of quality of workmanship for all contractors to follow, and with which all inspecting officers are familiar. Drawings are made on standard size sheets with standard title, standard forms of advertisement, proposal, instructions to bidders, and contract.

The distinctive coloring of buoys according to a prescribed standard has been in practice for many years, that item of standardization having been authorized by an act of Congress in 1850, so that passing up the coast or entering a bay, harbor, or channel, red buoys with even numbers will be passed on the starboard (right-hand), black buoys with odd numbers on the port (left-hand). On lighted buoys the light on the red buoys is red, and on the black buoys white. It is desirable that reasonable uniformity in buoyage eventually be extended to embrace all maritime countries of the world, and an international conference on this subject is to be held within the near future.

In the field of radio, marked progress toward standardization has been made by this service. Standardization of tube type transmitters is being continued and has resolved itself into three major channels—the use of three general power ranges, the adoption of master-oscillator-power amplifier circuits, and the clock control of apparatus.

Power ranges have been divided into local low-power transmitters with output ratings not exceeding 10 watts, intermediate power stations with ratings from 100 to 200 watts, and primary stations rated at 500 watts. The use of master oscillator power-amplifier circuits is becoming more general, all new equipment being so designed, and considerable progress has been made in replacing and modifying other circuits in older equipment. Transmitters for such circuits are being built with all keying and control apparatus incorporated in the same frame and panel, greatly

facilitating the replacement and duplication of apparatus.

Clock control of radiobeacons is in operation at a large proportion of the stations maintained by the Lighthouse Service, and, in addition, group synchronization of radiobeacons for conservation of frequencies and the reduction of interference has made much progress, about 40 per cent of the stations being so controlled.

When electric lamps in lighthouse lenses first came into general use, many different shapes and sizes were purchased. The Lighthouse Service has now eliminated many of the sizes originally tried out and is confining its purchases to a small group which cover all the needs of the service so far as navigational purposes are concerned. This procedure follows closely the program of standardization carried out by the lamp manufacturers, who have discontinued many types and sizes.

Lighthouse lenses have also been standardized. All lighthouse lenses are classified according to orders or sizes, and a moderate number of different sizes supplies all the needs of the service. The steel towers for minor lights throughout the service are standard, and it is now possible to procure such a skeleton tower for the height required, using the same drawings and specifications for all.

The benefits from the use of the standards already adopted are important. Not only are substantial economies in the initial cost and future maintenance of engineering equipment effected, but the efficiency is materially increased.

STANDARD RADIO-FREQUENCY SERVICES PROVIDED BY THE NATIONAL BUREAU OF STANDARDS

Bureau Will Furnish Information on How Signals May Be Used in Checking Frequency Meters, Piezo Oscillators, or Other Frequency Measurement

By E. L. HALL, *National Bureau of Standards*

Among the standards for electrical measurements which are maintained by the National Bureau of Standards are the standards of radio-frequency. These standards are the basis of the maintenance of broadcasting stations upon their assigned frequencies. This application is but one of a number of their uses.

The purchase and exchange of various commodities can not be carried on without standards of weight and measure, and money standards. The need of a standard for something like radio, which can not be seen, may not be so clear. In the case of radio it happens that standards are indispensable, for without them men talking and seeing by radio in one country would interfere with men similarly engaged in another country.

While radio-transmitting equipment at one place can interfere with radio-receiving equipment at such great distances, the need is even greater for shorter distances. The problem is not only of national interest, but of international importance.

The standards of radio-frequency are made available in two ways—first, by the testing of instruments sent to the bureau's laboratories in terms of these

standards; second, by the broadcasting of frequencies of known value from a radio-transmitting station located at the bureau.

The frequency standards submitted to the bureau for test are known by various names, such as frequency meters, wave meters, and piezo oscillators. The first two names are applied to the same instrument, which usually consists essentially of a variable air condenser and a carefully constructed coil of wire, with an indicating device to determine when the instrument is in resonance with radio-frequency current.

The piezo oscillator is a more recent and more accurate device, the frequency of which is determined primarily by the dimensions of a small plate or disk cut from a quartz crystal. The quartz plate is associated with the circuits of a vacuum tube, forming a source of constant frequency.

Testing service limited.

Either of the above devices can be calibrated at the bureau and then be set up in a testing laboratory and used as a reference standard of radio-frequency. The bureau has to limit the amount of such testing which

it undertakes. Its radio tests are limited to special tests for the Government, tests of instruments which are in turn used as standards for testing considerable numbers of other instruments, tests of importance to the bureau as a matter of research, tests of piezo oscillators for transmitting stations, and a few other tests for which special reasons arise. The bureau does not, in general, make radio tests which can be obtained from commercial or other testing laboratories. The majority of radio tests made by the bureau are upon frequency standards intended for use in transmitting stations and testing laboratories or for manufacturers' standards, because reliable standards are especially needed for such tests.

It is of importance that radio stations operate accurately upon their assigned frequencies, as otherwise one station interferes with another, causing difficulty at the receiving station in getting the desired signals. This difficulty is well known to all broadcast listeners. However, when interference is obtained, it does not necessarily follow that the broadcast stations are not operating on their assigned frequencies.

It is of course essential that a radio-testing laboratory have suitable frequency standards available in order that tests may be made for other parties. Manufacturers of radio equipment also must have suitable frequency standards so that their products may operate within the frequency tolerances required.

Standard frequency signals.

The second method by which the frequency standards are made available is by means of transmitted signals on previously announced radio-frequencies. The bureau's service of this kind began in 1923; standard frequency signals were sent twice a month until July, 1926, when the transmissions were reduced to once a month. Eight frequencies are transmitted on a specified night, usually about the 20th of the month, beginning at 10 p. m. and closing at 11.32 p. m. These transmissions are announced in the newspapers and in technical magazines.

Twenty-three different frequencies are transmitted in three groups. These frequencies extend from 550 to 7,600 kilocycles. These signals can, in general, be received east of the Mississippi River, and are available to anyone caring to make use of them. The bureau will furnish information as to how the signals may be used in checking frequency meters, piezo oscillators, or other frequency-measuring equipment.

By means of these transmissions the national frequency standard is made available to a large number of persons who could not possibly be served by the limited laboratory facilities and personnel at the bureau. Experiments are now in progress to increase the extent of the standard frequency transmission service.

STANDARDIZATION BRIEFS

The Millwork Institute of California is cooperating with the architects in California in the interest of a certified woodwork program.

The Japanese Standards Association is now operating under the new Bureau of Rationalization, which is a division of the Department of Commerce and Industry.

A code of ethics outlining the proper methods to be employed by members in their business relations with each other has been adopted by the National Engineering Inspection Association.

The German Standards Association has announced that up to September 22, 1929, a total of 4,121 standards had been finally approved by the national body and 1,291 were in the course of development.

The Russian Standards Committee announces the organization of an International Standardization Bureau, which will act as the official channel for the cooperation of that committee with the national standardizing bodies in other countries.

Standard trade customs to govern transaction between buyers and producers of steel castings have been formulated and adopted by the Steel Founders' Society of America. These standards were issued in booklet form together with replicas of standard sales contract, order acceptance form, and quotation sheet.

The bag, case, and strap leather group of the Tan-ners Council of America has requested the cooperation of the National Bureau of Standards in establishing standards as the basis of everyday trade.

Several standards for pipe fittings to be promulgated shortly, if no objections are raised, have been announced by the machinery standards commission of France, according to information received from American Trade Commissioner Thomas Butts, at Paris, France. These standards form part of a series on pipe construction.

Radiations from the heavier rare gases are being investigated at the National Bureau of Standards for their suitability as wave-length standards. Most of the xenon lines appear to be simple and narrow, but a few of them are complex; the latter are being studied in detail with the hope that the cause of this hyper-fine structure can be established.

In an effort to standardize the size and quality of several different kinds of tape, and manufacturers of this commodity have enlisted the cooperation of the National Bureau of Standards in their desire to establish and promulgate standards for the tape industry covering the following: Shoe tapes, notion tapes, tailoring tapes, and untreated electrical tapes.

The National Bureau of Standards has just announced that Simplified Practice Recommendation

No. 35, Steel Lockers, has been reaffirmed, without change, by its standing committee, for another year. A survey of production, conducted prior to the revision meeting, indicated the degree of adherence to this recommendation to be approximately 78 per cent.

It has just been announced by the National Bureau of Standards that Simplified Practice Recommendation No. 53, Steel Spiral Rods, has been reaffirmed, without change, for another year. A survey of production, conducted prior to the revision meeting, revealed that approximately 92 per cent of this product is being made in accordance with the recommendation.

It is estimated that 45,000,000 pounds of casein, which is made from skim milk, were consumed in the United States during the past year, in providing the smooth coating that adds to the attractiveness of printing papers. Improved methods of manufacture, together with many labor-saving devices and better process for better products, has brought about a new interest in the production of casein.

Standardization of highway materials and methods of construction has been accomplished during the past few years by the American Association of State Highway Officials. The American Society for Testing Materials has also accomplished much along the line of standardization of highway materials and methods of tests. Many of the State highway departments are following the standards set up by these two agencies.

On January 17, 1931, a research conference on electroplating will be held in Chicago under the auspices of the research committee of the American Electroplaters Society and the Chicago branch of the society. The principal subject for discussion will be the formulation of standards for electroplating, including the material used in plating and the plated products. All persons interested in this field are invited to attend this conference.

The committee on insulating materials of the American Society for Testing Materials met in Washington, D. C., on November 12 and 13. The committee appointed a subcommittee under the chairmanship of Dr. Dean Harvey of the Westinghouse Electric & Manufacturing Co. to make a survey of the field of insulating materials of commercial importance, which are now being considered by the committee. Suggestions will be gladly received.

The Clay Products Association is conducting a co-operative investigation of sewer-pipe joints at the University of Illinois where it maintains a research fellowship, the efforts of which are directed toward the processes of manufacturing vitrified clay products, wall coping, and flue lining. It is also carrying on another line of research at the Iowa State College on the effect of wide and V-shaped trenches on trench loads.

In France, the procedure followed in establishing national standards has been considerably reorganized. The permanent committee on standards has now been succeeded by a main committee on normalization. Its function will be to formulate rules to be followed in establishing national standards, to arbitrate among the different French standardizing bodies, to give official sanction, if necessary, to standards prepared by the French Standards Association, and to make national standards. This committee will include representatives from the different Government departments, and industrial and technical bodies.

A meeting on the simplification of textile machinery parts was held by the simplified practice committees of the textile machinery industry in New York on November 12. These committees were appointed in 1929 following a general meeting of manufacturers to discuss the need for undertaking a project in this field. The program being developed by the committees, includes taper and parallel paper cones, spools, bobbins, shuttles, spindles, etc. Excellent progress is being made with the work. It is expected that the preliminary investigation will be completed in the near future, and that a general conference of all interests will be called before the end of the current fiscal year.

The committee on insulation of the National Research Council held its annual meeting at the National Bureau of Standards on November 7 and 8, with about 100 engineers and scientists present. Several papers, describing researches now in progress in various Government, college, and commercial laboratories were presented. In some of these papers the results of researches on the fundamental properties of insulating materials were reported; while others described tests on engineering structures, such as high voltage cables, in which insulation is the most important factor. The next meeting of the committee will be held at Harvard University in November, 1931.

At the October 9 meeting of the standards committee of the A. I. E. E., there was received a report constituting a revision of recommended practice for electrical installations on shipboard, section 45 of the A. I. E. E. standard series. These revisions, while extensive as to material affected, involve no fundamental changes. The recommendations, originally called the marine rules, appeared in their first edition in 1920 and in revised form in an edition of 1927, which the present edition will supersede. The standards committee approved the revisions as submitted to them and, on their recommendation, the board of directors acted likewise on October 15, 1930. The work of issuing the new edition will begin at once.

Recent comparisons of resistance coils show the National Bureau of Standards ohm to be slightly smaller than the corresponding unit as maintained at the National Physical Laboratory and the Physikalisch-Technische Reichsanstalt. The British "international" ohm is about 23 parts in 1,000,000 larger than the bureau's; while the German unit is about 14

parts in 1,000,000 larger. The bureau's volt lies between the British and the German, being larger than the German unit by about 60 parts in 1,000,000, and smaller than the British by about 20 parts in 1,000,000. Combining the values for the two basic units gives a value for the watt 2 parts in 100,000 larger in Great Britain, and 13 parts in 100,000 smaller in Germany than in the United States. These values agree within 1 part in 100,000 with those estimated on the basis of previous comparisons.

A large fire loss results annually from ignition of combustible walls, partitions, and ceilings from stoves and their flues. Building codes of different cities vary greatly in the required spacing of such appliances from walls and ceilings and in the protection required for the combustible construction exposed. The National Bureau of Standards was requested to make investigations and to conduct tests to serve as a basis for recommended requirements. A study was made of conditions of buildings where fires have resulted from stoves, furnaces, and their pipes, and compilations were made of current building-code require-

ments. During the past year experimental set-ups were assembled to determine temperatures on exposed surfaces from stoves and furnaces and measurements were taken of temperatures obtained with actual installations in buildings.

The National Bureau of Standards has announced that the required degree of acceptance has been received to the revised Simplified Practice Recommendation No. 95, Skid Platforms, and that this revision may, therefore, be considered as in effect. According to the revised simplification program, as approved by the industry, the over-all dimensions of platforms for No. 1 skids used for shipment will be not less than 32 inches wide by 54 inches long, nor greater than 33 inches wide by 54 inches long. Further, the over-all dimensions for platforms of No. 2 skids used for shipment will be 42 inches wide by 60 inches long. It is recommended that the clear height from bottom of runner or other supports to under side of platform be either 8 inches or 12 inches, and that the minimum horizontal distance between inside of runner or other supports be 29 inches.

STANDARDIZATION OF EXPORT PRODUCTS IN HAITI

Standardization Commission Created to Grade Export Products; Specific Government Grade Marks Compulsory

By ROBERT F. MARTIN, *Formerly Director, Department of Markets, Port-au-Prince, Haiti*

In 1929 the Haitian Government took note of the serious losses being incurred in its export trade due to a lack of recognized specific standard grades for its products.

A detailed survey of the situation showed that the exporter had been sending year after year specimens of the various products he expected to ship during the following season to foreign importers. The importer, upon receipt of the subsequent shipment, compared it with the specimen and generally found the shipment inferior. In order to overcome this deficiency, a group of foreign importers endeavored to establish a guide for the exporters, asking them to try to conform to certain indefinite and vague classifications in use at their local market, but this was not accepted.

The outcome of this endeavor was (1) the exporter was restricted from shipping to those to whom he had previously sent samples, (2) trade disputes were a common outcome of all transactions (almost a third of all coffee shipments in one year resulted in disputes), (3) the foreign importers had established themselves as sole judges in these disputes and withheld part of the payment due each shipment to assure prompt collection of any disputed discount in price, and (4) very little general trade development work could be done as each exporter had a different kind of product to offer.

In view of this situation, efforts were made to have all the exporters adopt uniform standard grades. After considerable discussion the general opinion was found that in order to be effective the various grades

would have to be established by the Government, and their application made compulsory. Accordingly, a proposed law was drawn up and offered to the trade for criticism and discussion. This was finally recommended, with few minor changes, and offered to the Government for adoption.

Standards law adopted.

On June 12, 1929, the Haitian Government adopted a comprehensive law, making the grading of export products compulsory in accordance with Government specifications or standards. A standardization commission was created to study the best grades for each product and upon the recommendation of this commission, the President was empowered to put into effect by a decree, the specific grades for a particular product.

It was then provided that export declarations and containers were to be marked with a specified Government grade mark. This grade was to be verified in the customhouse and if it did not conform with the official grading of the product, it would not be passed for shipment, but would be withdrawn for remarking at a lower grade or further preparation to bring it up to the declared grade.

Coffee, being the most important product, the commission focused its attention on this product. Hearings were held in all ports. Finally it was decided to recommend, for the first few years, a system of grading based solely upon the degree of freedom of the product from foreign matter, such as stones, and from visible specific defects, all of which should be definitely determined.

On September 7 the President issued a decree putting into effect, October 1, 1930, seven specific grades for coffee, and providing for the grade marks which had to be applied to each bag by the exporters before entering their coffee at the customhouse for verification and export.

Immediately, instructions were given the customhouse graders who were charged with checking the actual grade of samples drawn in the customhouse with the grade declared by the exporter in his export declaration and in the marks on the bags. Instructions were also given by demonstrations to the importers. Sets of standard grades were made up and deposited in the customhouses and at the Haitian consulates in all important foreign market centers.

There was a little confusion at first, to which was added the early attempts of some exporters to prepare their coffee so that it would barely fulfill the requirements of a certain grade, with the result that it was usually found deficient and had to be taken back and marked at a lower grade or further prepared. These difficulties soon subsided. In the meantime both the foreign importers and Haitian exporters became con-

vinced that the Government verification of the grade was effective and could be relied upon.

Results of standardization.

Only one year's experience with the coffee grades has been sufficient to cause the program to be considered a success by the trade. It has resulted in the practical disappearance of the unprofitable trade disputes, there having been only two or three cases during the year compared with hundreds the year before. Because of the improved preparation of the coffee, the standardization program has been responsible for a large share in an increase of 17 per cent in the comparative price of the coffee, which added \$1,400,000 during the year to the rather restricted purchasing power of the country.

The planned expansion of the application of standard grades to the other export products is progressing as rapidly as possible under the existing conditions. By presidential decree, upon the advice of the standardization commission, official grades for cacao were established and made effective on October 20, 1930, thus adding the second product to the list.

STANDARDIZED SCALES FOR LIVESTOCK

Accuracy and Reliability of Weights Obtained for Livestock Improved where Recommended Scales Were Installed

By C. A. BRIGGS, *Livestock Weight Supervisor, Bureau of Animal Industry, United States Department of Agriculture*

Scales for livestock, approved by the Bureau of Animal Industry and offered for sale by the manufacturers, have been standardized. Scales are now catalogued and selections can be made to obtain equipment suitable in character and capacity for different kinds of weighing done at public stockyards. This was not previously the case.

In 1923, shortly after the packers and stockyards act went into effect, an examination of the scales used for weighing livestock at the principal markets in the country showed that scales of large capacity and old design were in general use for weighing all classes of livestock.

For instance, a scale of 120,000 pounds capacity was used for lots of lambs, ranging from a single lamb weighing 60 pounds or less, to carload lots of 22,000 pounds. The smallest step in the indication on this scale was 10 pounds. The beam capacity was greatly in excess of the largest loads weighed over the scale and had a vastly more disproportionate relation to the smaller loads weighed.

Study of the subject disclosed that at one time, in the development of the livestock industry, most animals were consigned and weighed in carload lots. The habits and methods used in the early days persisted until they no longer met the new requirements. The average draft of livestock weighed dropped from about a carload to an average of four heads per draft at many of the large representative markets.

Frequently the animals were weighed singly. In only a few instances was this change in the character of weighing considered in choosing and installing new scales. When these matters received Government attention, as a result of the passage of the packers and

stockyards act, the scales in use did not correspond with the drafts of livestock weighed.

Fixing standards.

A study was made of weighing requirements. Through the cooperation with stockyard companies and scale manufacturers, data were secured covering the various points that had a bearing on the matter.

A series of scales were set up covering the various requirements of livestock weighing. The platform dimensions were chosen and the beam capacities associated with them were fixed. It was found possible to include scales capable of meeting all ordinary requirements in a list of about eight scales; three of which consisted of the same scale parts with differences in the platform dimensions corresponding to the different areas needed for carloads of cattle, hogs, and sheep, and in the beams chosen.

In order to maintain maximum simplicity and reduce the cost of the scales to a minimum, a guiding idea in setting up the list of livestock scales was to choose them, if possible, from designs already manufactured, and adapt them to livestock weighing. A series of livestock scales was set up without necessitating an entirely new series of scales in the manufacturers' designs and catalogues.

The list established in 1924 has proved excellent, and the accuracy and reliability of the weights obtained for livestock have been improved where scales were installed in accordance with the recommendations. The only change made was soon after the issuance of the first list, in the addition of a scale designed for weighing single cattle. This was the result of the experience of a western stockyard in weighing

large, refractory bulls where the need developed for a slightly larger scale than that used for hogs and sheep.

Recommended scales.

The list of livestock scales recommended by the Bureau of Animal Industry, which administers the packers and stockyards act, is as follows:

Service	Species	Beam capacity	Minimum division of beams	Platform dimension
		<i>Pounds</i>	<i>Pounds</i>	<i>Feet</i>
Carload.....	Cattle.....	40,000	5	26 by 14.
	Hogs and calves.....	30,000	5	30 by 14.
	Sheep.....	20,000	5	30 by 14.
Small drafts.....	Cattle, calves, hogs, and sheep.....	4,000	1	10 by 6.
	Large cattle.....	4,000	1	14 by 8.
Drive-in scale for livestock received by truck.....	All species.....	16,000	2	16 by 9.
Cripple scale.....	do.....	2,000	1	6 by 4.

With new scales installed, stockyard companies in some instances have used beams with 2-pound minimum graduations where 1-pound minimum graduations are recommended. However, it is believed time will eventually bring about the use of the 1-pound minimum graduation provided in the list.

The platform dimensions may be regarded as approximate; individual manufacturers may supply the same platform areas with slight changes in the dimensions and yet be regarded as meeting the recommendations.

The standardization of livestock scales represented in the foregoing list is an example of the present-day idea of securing standardization through simplification and with a minimum of trade disturbance. New and special scale designs limited to livestock weighing were avoided, and scales were selected from those which had other regular uses in industry.

STANDARDIZATION IN THE MARINE FIELD

American Marine Standards Committee Formed to Assist Marine Industry to Bring About Collective Standardization

By A. V. BOUILLION, *Secretary American Marine Standards Committee*

The movement to bring about collective standardization in the marine field was initiated at a conference held at the Marine Exposition in November, 1922, under the auspices of the American Marine Association. Prior thereto standardization of shipfittings and equipment had been practiced only by individual shipbuilders, ship owners, and manufacturers, although attempt was made by the Emergency Fleet Corporation to establish some national standards in carrying out the war shipbuilding program.

The conference was suggested by the Department of Commerce to discuss the possibility of simplification of practice and elimination of waste in the marine industry with the idea that waste in construction, maintenance, and operation of ships could be reduced through unification of design and specifications for numerous fittings, materials, and items of equipment susceptible to standardization.

A committee was appointed, which met at the Department of Commerce in December, 1922, and tentatively planned steps to form a permanent organization. Subsequent meetings resulted in the organization in June, 1923, of the American Marine Standards Committee, as a national association of marine and related interests, to be self-governed through the annual election, from and by the membership, of an executive board.

The field of activities comprises design, construction, and manufacture of hulls, machinery, equipment, and fittings for ships and port facilities and their maintenance and operation, particularly in relation to the merchant marine of the United States. The objects are (a) to encourage, promote, adopt, and promulgate standards, rules, or recommendations, to bring about simplified practice in the marine field; (b) to cooperate with any individual or group en-

gaged in the study or promotion of simplified practice in fields of engineering, commerce, and industry here and abroad on projects affecting the marine industry.

At the outset the marine industry was at a low ebb and inclination was lacking to undertake the work at its expense. This was overcome through cooperation of the United States Shipping Board and the Department of Commerce. The former supplied a secretary and the Department of Commerce furnished office facilities, assistance, and incidental expenses for organization and administration. This arrangement has since prevailed and the results achieved have been made possible only through this governmental cooperation. However, all concerned have liberally responded to requests for data, technical service, travel expenses to meetings, and, in some cases, staff members of various organizations have devoted much time to the work.

Most of the members of the original committee have been repeatedly elected to the executive board. This has made possible a continuity of policy conducive to good progress.

The technical activities are carried on under the direction of technical committees. The secretary's office is the clearing house and correlating center for the administrative and technical activities. Four technical divisions have so far been organized—viz, hull details, engineering (machinery) details, ship operation details and supplies, port facilities—each of which is headed by a technical committee, the members of which are recruited at large independently of the membership. The governing rules are flexible and permit simple procedure under all circumstances. The subjects dealt with are greatly diversified.

STANDARDIZATION OF STEEL-MILL AUXILIARY MOTORS

Multiplicity of Standards for Direct-Current Magnetic Controllers

By JOHN F. KELLY, *Managing Director, Association of Iron and Steel Electrical Engineers*

Great strides have been made in the standardization of steel-mill auxiliary motors, and to-day motor manufacturers have available a few frames, all of uniform design, and each frame with a fixed horsepower and speed to take care of the entire field. Manually operated controller applications are likewise taken care of by a few standard sizes of controllers.

In the case of d. c. magnetic controllers, however, there is no such thing as a standard rating nor a standard line of equipment; that is, one manufacturer may have a standard for a certain application, but the equipment involved is usually considerably different from another manufacturer's standard for the same job. As a result, there are a multiplicity of standards, any of which can meet the conditions of the application. Controllers are designed to take care of the functions not incorporated in the motor design in order to enable the latter to operate under the specified conditions of the load.

It has been said that with the proper application of control, motor troubles and mill delays are few. Control is said to be the heart and brain of any electrification, and if the brain does not or can not function properly, how then may we expect satisfactory results out of the very best motors? We may even go further and say that, with proper control, almost any motor can give better performance with lower maintenance. Of all the industrial applications of electric controllers, none involve more severe service than steel-mill auxiliary controllers. Motors are started and stopped frequently, usually under heavy loads, and in most cases must respond to quick acceleration.

Drafting specifications.

In making up specifications for auxiliary steel-mill drives, it is relatively easy to cover the motor characteristics required so as to enable any motor manufacturer to quote intelligently on a motor suited for the intended application. It is a different situation, however, when requisitions are being prepared for the d. c. magnetic-control apparatus. There are so many

details involved that very often incomplete information or specifications are issued, which not only necessitate considerable correspondence between the control manufacturers and the purchaser, but in a great many cases apparatus is furnished that does not adequately meet the requirements, nor is the apparatus what the purchaser intended it should be when planning the installation.

In preparing requisitions for the purchasing department for d. c. magnetic control apparatus it is necessary to state whether the control is for reversing or nonreversing, plugging, or dynamic braking service. Then, again, it is necessary to state the required number of accelerating points, which depend on the application, and likewise to determine the types and number of protectives features, such as overload and undervoltage protection. Also in applications involving shunt or compound wound motors, it is necessary to decide whether shunt-field failure and shunt-field protective relays should be used. These possible variations are great, and unless detailed information is given, a wide selection of equipment must be furnished, which may or may not properly meet the desired operating conditions.

Control guide forms.

For this reason some of our larger steel mill plants have control guide forms available, which they use in specifying new control equipment, but this is by no means universal even in the larger plants. In the majority of cases, however, operating men have rather limited ready-reference guides to follow in writing control specifications, with the result that many a motor is operating with a control that is unsuited to the application, or the drive is equipped with inadequate means for proper protection.

For the convenience of the purchasing agents, steel mill engineers, and their assistants, the Association of Iron and Steel Electrical Engineers has compiled a set of guide forms which will be of material assistance in preparation of requisitions for d. c. magnetic control apparatus.

A. S. T. M. NOW HAS 427 FORMALLY ADOPTED STANDARDS

With the adoption to date of a total of 46 new standards and 55 revisions of existing standards, the American Society for Testing Materials now has 427 standards that have been formally adopted. In addition, it has 155 classified as "tentative standards."

With the total number now aggregating 582, the lists of standards prepared annually should be of considerable assistance to the society's members, aside from the annual index, in locating any standard desired. The list appears in the current A. S. T. M. Yearbook, in both parts 1 and 2 of the book of A. S. T. M. standards and in the book of A. S. T. M. tentative standards.

ADHERENCE TO EXISTING STANDARD FOR BRASS PIPE NIPPLES REAFFIRMED

As a result of a recent survey among the manufacturers to determine adherence to the Commercial Standard for Brass Pipe Nipples, CS10-29, a summarized report was issued on October 21, indicating that among reporting manufacturers 100 per cent of production, as regards grade of pipe stock, conforms to the commercial standard, and 96.3 per cent as regards stock sizes and lengths.

In accordance with recommendation of the standing committee, the existing standard was reaffirmed, without change, for another year beginning July 1, 1930.

STABILITY OF PAPER TOWELS

Paper Towels Tested for Loss of Absorbency during Storage

Some difficulty has been experienced by the Government in purchasing paper towels that will prove satisfactory for use after a period of storage. The purchase specification generally used is similar to that suggested in Bureau of Standards Circular No. 294. The difficulty in most instances is found in towels that have complied with the specifications when received, but have deteriorated to such an extent after a short period of storage, that their absorbency is so reduced as to be unsatisfactory. The tests of weight, bursting strength, and absorbency do not seem sufficient to assure the purchaser that a paper towel will prove satisfactory if not used within a period of four months or so. Little is known at the present time of the effects various storage conditions have upon the rate of absorption, or the influencing factors which tend to produce a change in the absorbency. Further results in study of this problem have been obtained.

To study the effects of storage conditions upon paper towels, 17 different samples of towels, representative of the different types, were obtained from various manufacturers. The towels were tested for weight, bursting strength, tensile strength, and absorption as received. Samples were then stored in the paper section of the National Bureau of Standards for periods of 1, 2, and 4 months, respectively. At the completion of each period the samples were tested for bursting strength, tensile strength, and absorption. Four sets of towels were selected from each lot for a heat-treatment test. The periods of heat treatment for the different sets were 3, 24, 48, and 72 hours, respectively, and the temperature used was 100° C.

The heat-treatment tests were made to determine the effect of heat upon the rate of absorption and strength, and to find which period of heat treatment would approach the effect of natural aging during storage for 4 to 6 months. In this manner it was hoped to develop

an accelerated aging test that would indicate the behavior of a paper towel when stored under natural conditions.

It was found that the values for bursting strength and tensile strength did not change appreciably for any period of natural aging up to 4 months or for heat treatment up to 72 hours. This would indicate that the strength is not appreciably affected during normal storage periods. The absorption values show clearly that some towels changed rapidly in absorbency over a period of four months natural aging, while other towels did not change appreciably within this time of storage. The differences in absorbency of different towels on aging were not related to the fiber composition in any respect. A low initial rate of absorption seems quite advantageous, for as a rule such towels were the most stable.

There is a fair relation in the order of grading between the artificial aging and natural aging. In general, the most stable towels under natural aging were the most stable under the heat treatment. The 3-hour period of heat treatment seems more drastic than the four months natural aging period and is probably commensurate with some time greatly in excess of any normal storage period. Possibly a shorter heating time would more nearly approximate the effects of natural storage.

In general, rosin and acidity are low in the samples having the better absorbency values and increase as the absorbency decreases. This relation of rosin and acidity to absorbency also gives an approximate indication of the stability of the towels, for acidity and rosin are highest in the least stable samples.

The results obtained so far in this investigation are sufficient to justify further study of the relation of the rosin content, acidity, and heat treatment tests to the loss of absorbency, and additional tests of this kind are in progress.

TENNESSEE STANDARDIZES ITS HIGHWAY EQUIPMENT

Amount of "Replacements" Carried in Stock Reduced Through Standardization

By E. L. COILE, *Assistant Maintenance Engineer, Tennessee State Highway Department*

We are in an age of standardization which may be applied to equipment, machines, signs, pavements, and methods. There may be danger of carrying it too far in design, making the standards do where individual design would be more successful, but in maintenance there are many places where standardization will effect great economies and produce the needed results in a very satisfactory manner. The following two examples illustrate the advantages of standard parts in maintenance equipment.

In 1928 the Tennessee State highway department was servicing 10 makes of blade graders doing maintenance and carried a stock of 6 different lengths of blades, namely, 6 foot, 7 foot 3 inch, 8 foot, 9 foot, 10 foot, and 12 foot. The different makes required

in most instances a different blade because of either its shape or the spacing of holes for attachment.

Thirty-seven types of blades differing in lengths, bores, and shapes were carried in stock to service two thirds of the graders in use. The other third were serviced by special orders as new blades were needed. Headquarters garage carried at one time seven carloads of blades and two division garages a corresponding supply, making a total of \$250,000 worth of blades on hand to service two-thirds of 427 graders in use.

At best, the service was not complete and there were necessary delays in getting blades for more than 100 pieces of equipment. Had there been no change in methods, the trouble would have been greatly augmented when the number was increased to 555 in 1930.

Standardization began in 1929.

Standardization was begun in 1929 and was completed in 1930, and the department is now carrying six sizes as follows: 6, 7, 8, 9, 10, and 12 foot lengths, and only six sizes of blades are necessary for 100 per cent service.

The weights are standard, sizes are standard, and the borings are standard, conforming to those adopted by the National Association of State Highway Officials. Four carloads of blades are distributed to four division garages in the State, and the total cost of stock is \$66,000. The needed supply is servicing 100 per cent of the graders in use. Headquarters garage, instead of carrying seven carloads of blades, carries one carload, and the other garages have cut their supplies in proportion. The change from 37 types of blades to the 6 now carried is not only a saving in time and money invested, but in storage space and ability to render immediate service to the field. Additional standardization is possible, making the blades even more serviceable.

At the present time, the 10 and 12 foot blades are made in two sections and are bevelled on one end, which is unnecessary from a working standpoint, making them rights and lefts. Were the ends identical there would be no rights or lefts, and since one side usually wears more rapidly than the other, the blade could be shifted, getting more even wear and longer services from each one. This change would in no way decrease the usefulness of the blade, but it would increase their useful life.

Work of standardization on this piece of equipment has shown what can be done and with the application of time and study, similar standardization may be made of other machines. During the last few months, we have been studying the rock crusher and making changes toward standardizing this equipment.

Crushers.

At the present time, the maintenance department is operating 76 rock crushers throughout the State.

They are equipped with individual bucket and elevator chains carrying in pitch with each model and size. As a consequence, when a break occurs, the garages can not furnish immediate repairs without carrying an excessive amount of chain in stock. It is an individual matter for each few pieces of equipment. In the near future, it is the hope of the department to standardize on one or two sizes of chains for all portable crusher equipment, to standardize on bucket sizes and types so far as possible and to standardize on screens so that equipment will be interchangeable and can be serviced with a small stock of parts on hand.

The 76 crushers are equipped with 17 different sizes and weights of chains to operate the buckets and screens. This department does not suggest that chain manufacturers make only one type of chain, but it does suggest that manufacturers of portable equipment adopt standard sizes of chain and standard buckets and bucket attachments for crushers of approximate like capacity. It is also suggested that such equipment as head and tail shafts, idlers, idler shafts, and take-up boxes be standard for similar sizes.

At the present time, screens have been standardized to a 30-inch diameter, using three sections which separate the stone into two sizes and take out the dust. This size screen will separate the particles from a crusher having a capacity of 150 cubic yards or maximum 1½-inch material per 10-hour day. When a larger capacity crusher is used, a larger diameter screen can be obtained, but preferably the length of the standard can be increased by additional standard sections.

Since the servicing of the equipment is as important an item as first cost and adaptability to use, it is essential that the equipment be as easily serviced as possible. This can be done by limiting the number of parts to a minimum and making these parts as nearly standard as their functions will allow.

STANDARD SIZE HOLIDAY GREETING CARDS URGED

Post Office Service Discourages Use of Nonstandard Sizes

Every effort is made by the Post Office Department to discourage the use of nonstandard-size greeting cards and envelopes, which tend to retard the smooth flow of the work in post offices. The use of such nonstandard cards and envelopes necessitates special handling, and should be discontinued in the interest of speeding up the service, especially during holiday seasons.

Attention is called, said a recent announcement from the Post Office Department, to the campaign carried on by the department to discourage the use of small and irregular-sized greeting cards and envelopes in the mail. Postmasters are urged to make every endeavor to secure the cooperation of manufacturers, dealers, and the public in the elimination of such cards and envelopes, in order that the Postal Service may be relieved of the burden of handling them and the mails thus speeded up.

The small cards and envelopes seriously retard and interfere with the smooth flow of the work in post offices. Frequently they can not be run through the cancelling machines, thus requiring the cancelling of the stamps by hand and other extra handlings in the course of their facing, distribution, etc. Moreover, the addresses are likely to be obliterated by the cancellation mark; they do not fit the separating cases in use throughout the Postal Service, and can not be tied securely with letter packages. Furthermore, there is not sufficient space for directions for forwarding in cases where forwarding is necessary.

An attempt is being made to avoid the use of large greeting cards and their envelopes, because if they exceed the standard size, especially in width, which is approximately 4 inches, they can not be conveniently handled in the separating cases and are likely to be cut by the package strings and thus become mutilated.

The Post Office Department suggests that in no case should cards or envelopes be smaller than 2¾ by 4 inches. A larger size, such as that of the Government postal card, is considered preferable, but they should not exceed approximately 4 by 9 inches. It is also desirable that the cards and envelopes be made of white or light-colored paper.

CURRENT ACTIVITIES OF THE AMERICAN MARINE STANDARDS COMMITTEE

Recent Changes in Status of Marine Standards Reviewed; New Members Approved; Proposed Standards Submitted

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

Fire-hose couplings.

A suggestion was recently received that a type of fire-hose coupling be adopted for ships, similar to that specified by the British Board of Trade, which requires only a quarter turn to tightly connect the hose. This type of connection was advocated as being far superior to the American threaded type, especially when hooking up a hose at night. After due consideration, it was deemed advisable to adhere to the American (national) standard fire-hose coupling screw thread, approved by the American Standards Association in May, 1925, and indorsed by the American Marine Standards Committee for use on ships, in order to cooperate in its universal use in the United States. It was concluded, however, that a standard type of coupling as to external design should be adopted in order to accustom ship crews to its use and avoid the confusion or delay in emergencies apt to result from the prevailing variety of types. Efforts will be made accordingly to develop a standard coupling and spanner for ships.

New publications.

Publications of the committee relating to the following standards were distributed during the month of November, 1930: Metal frame berths and accessories for ships; locks and accessories for ship doors; bolts and catches for ship doors; sash hardware for ships; fair-water caps for propeller hubs, and diatemaceous earth.

New members.

At a recent meeting of the executive board of the committee, the following new members were approved: Alaska Steamship Co., Seattle, Wash.; American Car & Foundry Co., Wilmington, Del.; Atomite Corporation, Portland, Oreg.; Boston & Lockport Block Co., East Boston, Mass.; Boston Port Authority, Boston, Mass.; Allan Cunningham, manufacturer, Seattle, Wash.; The Dravo Contracting Co., Pittsburgh, Pa.; Ingersoll-Rand Co., New York, N. Y.; The Thomas Laughlin Co., Portland, Me.; Maritime Officers' Club, Seattle, Wash.; The Maryland Dry Dock Co., Baltimore, Md.; J. W. Millard & Bro., consulting naval architects, New York, N. Y.; Port of Seat-

tle, Wash.; The Stanley Works, New Britain, Conn.; Yale University, Sheffield Scientific School, New Haven, Conn.

Proposed standards.

The following proposed standards were submitted during the past month to technical committees:

Deck drain with stop valve.—This type of drain is intended for decks close to the water line. The valve permits closing of the drain in rough weather to prevent inflow. It is fitted in lieu of or with a check valve on the drain pipe.

Hinged water-tight doors.—Tentative standards comprising alternative welded and nonwelded construction with common standard fittings. A simplified list of standard widths and heights of doors of this type is included in the proposal. The typical construction covered by the alternative designs permits unlimited stiffening and is therefore adaptable to doors for all likely conditions, from light to heavy duty.

Pipe flanges and fittings.—These comprise steel flanges and flanged pipe fittings for three different zones of pressures as follows: First zone, steam up to 125 pounds per square inch, liquids up to 150 pounds per square inch; second zone, steam from 126 to 250 pounds per square inch, liquids from 151 to 300 pounds per square inch; third zone, steam from 251 to 400 pounds per square inch, liquids from 301 to 450 pounds per square inch. The principal features, dimensions, and bolting are generally in accordance with industrial standards now in effect, but differences are under consideration as to facings for joints. Various optional methods for attachment of flanges to pipes are included in the proposal. The purpose of these standards is to concentrate in simple form the essential requisites for unified practice in installation of piping (especially pressure piping) on ships, and to establish common dimensions and features affecting interchangeability of flanges and fittings in general.

Lubricants for ship machinery.—A preliminary draft of proposed standard specifications comprising general information for users and purchasers and defining the characteristics and tests of oils and greases. Thirteen grades of oil and three grades of grease are provided in order to meet various conditions on ships of the merchant marine. The specifications are appended by notes relative to lubricants and their uses, intended for general information and guidance of those concerned in the operation of ship machinery.

COMMERCIAL STANDARD FOR STAPLE PORCELAIN PLUMBING FIXTURES REAFFIRMED

The commercial standard for Staple Porcelain (All-Clay) Plumbing Fixtures CS4-29 was reaffirmed without change for another year beginning July 1, 1930, by the standing committee appointed to consider annually any comment or suggestions as to changes,

in order that it may be kept continually in accord with the desires of the industry and advance in the art.

This reaffirmation followed a survey to determine the adherence to the standard for the year ending June 30, 1930. The survey showed that 95 per cent of production conformed to the requirements of the standard as to regular selection grade; that 100 per cent of the culls had been marked in accordance with the rules; and that 85.8 per cent of the production reported conformed to standard types and sizes.

SAFETY CODE FOR MECHANICAL REFRIGERATION

Rapid Advancement in Art of Refrigeration Necessitates Standing Committee to Revise Code Periodically

The Safety Code for Mechanical Refrigeration, under the sponsorship of the American Society of Refrigerating Engineers, was approved as an American standard by the American Standards Association on October 31, 1930.

The code has been in preparation for a number of years by a committee consisting of technical experts, Government and labor officials, individual representatives from engineering societies, trade associations, manufacturers, and fire and casualty insurance interests.

The code as originally drawn up has been subjected to repeated changes due to rapid advancement in the art of refrigeration which has taken place in the past five or six years. It is expected that the present code will need revision with advancements in the refrigerating industry and for this purpose a standing committee is provided to formulate new rules for new types of refrigerating equipment and uses of new refrigerants as the demand requires.

The code consists of five sections as follows: (1) Definitions, (2) classification of refrigerating systems, (3) industrial and commercial systems, (4) unit systems, and (5) apartment dwelling systems. Each section is complete in itself except where reference is made to other sections.

The intent of the code is to provide reasonable safety for life, limb, health, and property, and applies to the safe installation, operation, and inspection of every refrigerating system employing a fluid which is expanded, vaporized, liquified or compressed in its refrigerating cycle.

The code classifies equipment according to the total weight of the refrigerant contained in or required for the proper operation of the equipment, ranging from class A, 1,000 pounds or more of refrigerant, to class E, 6 pounds or less of refrigerant.

Limitations are made with respect to the various systems employed, type of machinery room, kinds of refrigerant, design and construction of every part of the refrigerating system, including safety devices, pressure and hand-relief valves, stop valves, and gauges, rupture members and fusible plugs, piping, tubing, and fittings to withstand the test pressures prescribed for the refrigerant used.

As most of the refrigeration-producing equipment for the requirements of both the home and the commercial establishment is produced by companies engaged in a nation-wide business, it is hoped that this code may be universally adopted, or its provisions so incorporated in any ordinances or laws that refrigerating machines everywhere may be similar; thereby permitting their manufacture in quantities to supply mechanical refrigeration at a minimum cost.

NEW BRITISH STANDARDS PROMULGATED

Explanation of the tests to determine the performance of certain features of desk-type fans is contained in a new standard for electric fans recently announced by the British Engineering Standards Association. In this standard the dielectric tests and limits of temperature rise are also given.

In a standard for Leclanche cells, as announced by the association, the standard dimensions are given for various classes of cells of the dry, inert, and wet types, together with the appropriate connecting wires and terminals. Standard requirements for the zinc and electrolyte are also given, as well as tests for neutral internal resistance. Polarization and output are given to insure compliance with the standard. One of the features of this new standard is an index dealing with an optional storage test.

A third British standard announced, deals with steel forgings (blooms and castings), and is a revision of an earlier standard. The revised schedule provides for four qualities of material; and embodies certain modifications which experience with the previous standard has shown to be desirable.

STANDARD FOR FELDSPAR NOW PRINTED

Classification Based on Particle Size and Chemical Composition

The printed pamphlet entitled "Feldspar, Commercial Standard CS23-30," has been released by the Government Printing Office, and distributed to the acceptors of record. The commercial standard makes available a definite basis of classification for this important constituent of most ceramic products. The standard establishes a definite classification for production and sale based on particle size and chemical composition.

Under chemical classification, three groups are provided based on composition as it influences use. The three groups comprise:

1. The commonly accepted ceramic or body grades based on silica content and alkali ratio and containing less than 4 per cent soda content.

2. The spars used chiefly for glazing purposes are based on soda content, containing 4 or more per cent.

3. The spars used for glass-making purposes are based on silica, alumina, and iron content.

Standard methods of analysis are given for both chemical and physical properties, and in the latter case the use of sieves of the United States standard series is required. It is anticipated that the standard classifications will clarify much of the misunderstanding within the industry and substitute accurate chemical control for the loose, hit-or-miss methods previously in use. Adherence to the standard methods of analysis will also assist the chemists for both buyer and seller to obtain comparable results.

The pamphlet includes a brief history of the project, a list of acceptors of the standard, and the personnel of a standing committee which was appointed to consider the need for revision in order to keep it abreast with current developments.

Copies of the pamphlet may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents per copy.

MEASURING PERMANENCE QUALITIES OF PAPER

External Deteriorating Influences on Paper Studied at the National Bureau of Standards

Considerable progress has been made in measuring the permanence qualities of the current paper-making raw materials and papers. The tests used for this

purpose are based primarily on consideration of paper as a cellulose material. Apparently a high degree of cellulosic purity, with a minimum of active chemical components, and sufficient strength for the intended use are the prime requirements in paper for resistance to deterioration. The tests show that commercial papers are available, made from both rag and wood fibers, which meet such requirements satisfactorily. Systematic collection and testing of old publications has also shown the importance of cellulosic purity as the papers composed of fibers refined by chemical treatment are generally in good condition, while those containing crude fibers, such as ground wood, are generally badly deteriorated.

Through surveys of library storage conditions, acid pollution of the atmosphere, light, high temperature, dampness, and dust are indicated as the leading external deteriorating influences. The effects of light and of atmospheric components on paper and paper-making materials are undergoing further study in the laboratory.

Studies of the relation of the various paper-making materials to permanence qualities of papers are being made in a practical way by paper-making trials in the bureau paper mill. This work so far has dealt largely with wood fibers having a high degree of cellulosic purity and these have given very satisfactory test values. Studies of paper sizing materials have shown the desirability of limiting, as far as possible, the amounts of alum and rosin used in rosin sizing the papers. On the contrary, glue and starch used for surface sizing the papers appear to give them added protection against chemical deterioration.

The improvement and standardization of test methods used for determination of alpha cellulose, copper number, and acidity, all of which appear to have an important bearing on permanency, are receiving attention and progress in this direction is reported.

NEW AND REVISED PUBLICATIONS ISSUED BY THE BUREAU OF STANDARDS

- Absorption Measurements of the X-Ray General Radiation. RP. 212. Price, 10 cents.
 Addition Agents in Copper Electrotyping Solutions. RP. 228. Price 5 cents.
 A New Crystalline Calcium Chloride Compound of α -D-Gulose and Its Rotation and Mutarotation in Aqueous Solution. RP. 226. Price, 10 cents.
 An Improved Victor-Meyer Molecular-Weight Apparatus. RP. 215. Price, 5 cents.
 Apparatus for the Determination Aboard Ship of the Salinity of Sea Water by the Electrical Conductivity Method. RP. 223. Price, 10 cents.
 Change of Electrical Properties of Rubber and Gutta-Percha During Storage Under Water. RP. 213. Price, 10 cents.
 Chloroplatinate-Chloroplatinite Electrode. RP. 225. Price, 5 cents.
 Compressive Tests of Bases for Subway Columns. RP. 218. Price, 10 cents.
 Feldspar. CS23-30. Price, 5 cents.
 Loaded Paper Shot Shells. R31-30, 4th ed. Price, 5 cents.
 Note on the Individualities of Anhydrofructose and Diffructose Anhydride. RP. 224. Price, 5 cents.
 Resistance of Steel to Abrasion by Sand. RP. 214. Price, 15 cents.
 Review of Calorimetric Measurements on Thermal Properties of Saturated Water and Steam. RP. 210. Price, 10 cents.
 Seams for Copper Roofing. RP. 216. Price, 15 cents.
 Specifications for the Manufacture and Installation of Railway Track Scales for Light Industrial Service. C. 386. Price, 5 cents.
 Standards and Specifications for Nonmetallic Minerals and Their Products, 1930. Price, \$2.75. (Foreign, \$3.05.)

- Terms of the Arc and Spark Spectra of Chromium. RP. 229. Price, 5 cents.
 Thermometric Lag of Aircraft Thermometers, Thermographs, and Barographs. RP. 222. Price, 10 cents.
 Wind Pressure on Circular Cylinders and Chimneys. RP. 221. Price, 15 cents.

Send orders for publications under the above heading with remittance only to the Superintendent of Documents, Government Printing Office, Washington, D. C.

FEDERAL SPECIFICATIONS

Twelve Promulgations, Thirteen Proposals, and Twenty-four Revisions Announced

Twelve Federal specifications have been promulgated during the past month, 13 proposals submitted for criticism and comment, and 24 specifications submitted for revision, according to the Federal Specifications Board. These specifications are now before the Government departments and others interested for comment and criticism.

The specifications submitted for revision also bear the new designation in accordance with the system used in the Federal Standard Stock Catalogue. Copies of the specifications and further information relating thereto, can be obtained from the Federal Specifications Board, National Bureau of Standards, Washington, D. C.

SPECIFICATIONS PROMULGATED

F. S. No.	Commodity	New designation
470	Calcium-carbide.....	O-C-101.
586	Sodium-sulphite, anhydrous (for) photography.....	O-S-606.
554a	Ultramarine blue; dry, paste-in-japan, paste-in-oil.....	TT-U-451.
554a	Mucilage.....	JJJ-M-791.
538	Receptacles, waste paper, fiber, office, and lobby.....	LL-L-R-191.
412	Paste, library and office.....	N-P-101.
36a	Fire-extinguishing liquid, carbon-tetrachloride base.....	O-F-380.
428	Matches, safety (full-size, in boxes).....	EE-M-101.
413a	Padlocks.....	FF-P-101.
	Bone-black, dry, paste-in-japan, paste-in-oil.....	TT-B-601.
	Chrome, green, pure, dry, paste-in-japan, paste-in-oil.....	TT-C-236.
389	Beans, dry.....	JJJ-B-106.

PROPOSALS SUBMITTED FOR CONSIDERATION

	Oysters, canned.....	
	Shrimp, canned.....	
	Crah meat, canned.....	
	Olives.....	
	Cereals (breakfast foods).....	
	Soups, canned.....	
	Thread, silk.....	V-T-301.
	Brooms, fiber.....	
	Mushrooms, canned.....	
	Mustard, prepared.....	
	Bread and rolls.....	
	Lantern slide mats.....	
	Negative preservers, paper.....	

SPECIFICATIONS UNDER REVISION

138	Ferromanganese.....	QQ-F-161.
365a	Fish (flaked), canned.....	
365a	Fish, fresh.....	
365a	Clams, fresh.....	
365a	Salmon, canned.....	
365a	Fish, salted, and fish, smoked.....	
365a	Sardines, canned.....	
365a	Crah meat, fresh.....	
365a	Oysters, fresh.....	
365a	Tuna, fish, canned.....	
501	Carpets and rugs, velvet, plain.....	DDD-C-61.
502	Carpets and rugs, axminster.....	DDD-C-51.
503	Carpets and rugs, Wilton.....	DDD-C-71.
551	Laundry appliances.....	OO-L-131.
609	Pineapple, canned.....	Z-P-351.
615a	Ticking, mattress and pillow.....	CCC-T-351.
637a	Biscuit (hard bread), or hiscuit, canned.....	N-B-351.
638a	Corn meal (white or yellow).....	N-C-521.
639a	Cornstarch.....	N-C-541.
640a	Crackers, soda.....	N-C-561.
645a	Hominy grits.....	N-H-521.
648a	Macaroni, spaghetti, and vermicelli.....	N-M-51.
650a	Cocoa.....	JJJ-C-501.
651	Chocolate.....	JJJ-C-271.

SCIENTIFIC, TECHNICAL, AND COMMERCIAL PERIODICAL PUBLICATIONS ISSUED BY THE NATIONAL BUREAU OF STANDARDS

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" * * * this department * * * is devoted solely to aiding and fostering the development of higher standards of living and comfort of our people * * * its ideals are clear: That by cooperation and not by compulsion it should seek to assist in maintaining and giving the impulse of progress to commerce and industry in a nation whose successful economic life underlies advancement in every other field."

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



THE UNITED STATES DEPARTMENT OF COMMERCE

R. P. LAMONT, Secretary of Commerce

AERONAUTICS BRANCH, CLARENCE M. YOUNG, Assistant Secretary of Commerce for Aeronautics.

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BUREAU OF THE CENSUS, WILLIAM M. STEUART, Director.

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Compilation of statistics of marriage, divorce, births, deaths, and penal and other institutions annually, and of death rates in cities and automobile accidents weekly.

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Establishment of simplified commercial practices through cooperation with business organizations in order to reduce the wastes resulting from excessive variety in commodities.

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Technical investigations in the mining, preparation, and utilization of minerals, including the study of mine hazards, and safety methods and of improved methods in the production and use of minerals.

Testing of Government fuels and management of the Government Fuel Yard at Washington.

Research on helium and operation of plants producing it.

BUREAU OF MINES—Continued.

Studies in the economics and marketing of minerals and collection of statistics on mineral resources and mine accidents.

The dissemination of results of technical and economic researches in bulletins, technical papers, mineral resources series, miners' circulars, and miscellaneous publications.

BUREAU OF FISHERIES, HENRY O'MALLEY, Commissioner.

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BUREAU OF LIGHTHOUSES, GEORGE R. PUTNAM, Commissioner.

Maintenance of lighthouses and other aids to water navigation. Establishment and maintenance of aids to navigation along civil airways. Publication of Light Lists, Buoy Lists, and Notices to Mariners.

COAST AND GEODETIC SURVEY, R. S. PATTON, Director.

Survey of the coasts of the United States and publication of charts for the navigation of the adjacent waters, including Alaska, the Philippine Islands, Hawaii, Porto Rico, the Virgin Islands, and the Canal Zone; interior control surveys; magnetic surveys; tide and current observations; and seismological investigations. Publication of results through charts, coast pilots, tide tables, current tables, and special publications.

BUREAU OF NAVIGATION, ARTHUR J. TYRER, Commissioner.

Superintendence of commercial marine and merchant seamen. Supervision of registering, enrolling, licensing, numbering, etc., of vessels under the United States flag, and the annual publication of a list of such vessels.

Enforcement of the navigation and steamboat inspection laws, including imposition of fees, fines, tonnage taxes, etc.

STEAMBOAT INSPECTION SERVICE, DICKERSON N. HOOVER, Supervising Inspector General.

The inspection of merchant vessels, including boilers, hulls, and life-saving equipment, licensing of officers of vessels, certification of able seamen and lifeboat men, and the investigation of violations of steamboat inspection laws.

UNITED STATES PATENT OFFICE, THOMAS E. ROBERTSON, Commissioner.

The granting of patents and the registration of trade-marks, prints, and labels after technical examination and judicial proceedings.

Maintenance of library with public search room, containing copies of foreign and United States patents, and trade-marks. Recording bills of sale, assignments, etc., relating to patents and trade-marks. Furnishing copies of records pertaining to patents. Publication of the weekly Official Gazette, showing the patents and trade-marks issued.

RADIO DIVISION, W. D. TERRELL, Chief.

Inspection of radio stations on ships; inspection of radio stations on shore, including broadcasting stations; licensing radio operators; assigning station call letters; enforcing the terms of the International Radiotelegraphic Convention; and examining and settling international radio accounts.