

COMMERCIAL STANDARDS MONTHLY

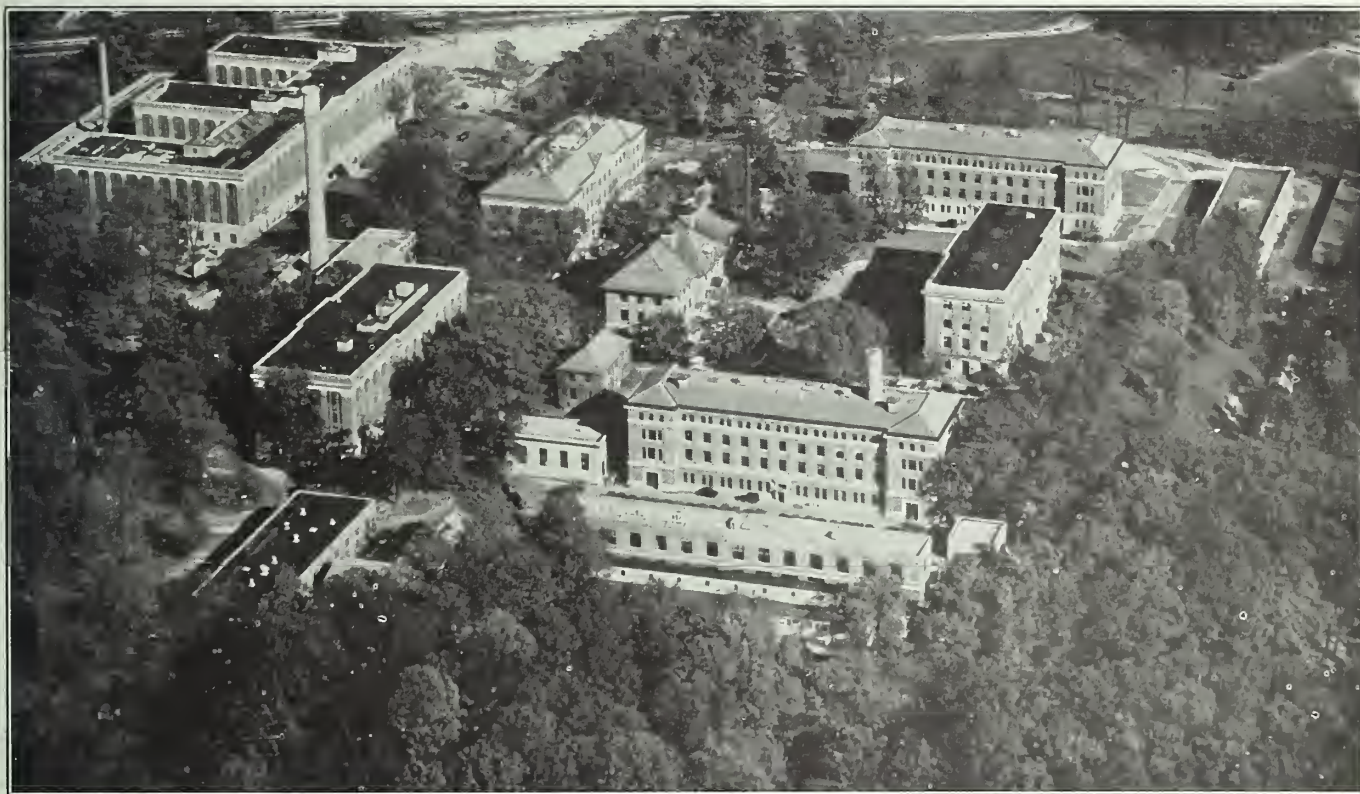
BUREAU OF STANDARDS

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*A Review of Progress in
Commercial Standardization and Simplification*



AIRPLANE VIEW OF NATIONAL BUREAU OF STANDARDS

ISSUED BY THE NATIONAL BUREAU OF STANDARDS OF THE
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U. S. DEPARTMENT OF COMMERCE

R. P. LAMONT, Secretary

NATIONAL BUREAU OF STANDARDS

GEORGE K. BURGESS, Director

COMMERCIAL STANDARDS MONTHLY

S. F. TILLMAN, Editor

DIVISIONS OF THE COMMERCIAL STANDARDIZATION GROUP

DIVISION OF SIMPLIFIED PRACTICE, EDWIN W. ELY.

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

BUILDING AND HOUSING DIVISION, J. S. TAYLOR.

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

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

DIVISION OF SPECIFICATIONS, A. S. McALLISTER.

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

DIVISION OF TRADE STANDARDS, I. J. FAIRCHILD.

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

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

Except where otherwise indicated, for further information address

BUREAU OF STANDARDS

WASHINGTON, D. C.

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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*.

Value of Standardization in Mining Industry

...and...

Development of Standards in Mining Industry

DEVELOPMENT of standards of equipment and practice in metal mines is reviewed¹ by Lucien Eaton, mining engineer, in which he states that national standards are possible, and with a minimum of change may be applied to mining throughout the world.

Probably the highest degree of standardization in the mining industry, he said, is in the equipment and practice on the surface and underground in the Tri-State zinc district in Missouri, Oklahoma, and Kansas, which has resulted in low costs. The standardization campaign inaugurated and carried on by the American Mining Congress is an endeavor to coordinate the work done in the different districts, so that each may have the benefit of the others' experience, and that the benefits of uniformity and simplicity in design of equipment and in its use, in so far as local conditions will permit, may be enjoyed by all.

The development of standards for the coal industry is likewise reviewed¹ by J. M. Hadley, secretary of the standardization division of the American Mining Congress, who said that standardization is dynamic, not static. A standard of practice or of equipment represents the best thought of an industry and furnishes the best means to eliminate wastefulness and to promote efficiency.

The coal industry, he pointed out, has national standards covering among other subjects, safety rules for installing and using electrical equipment, mine drainage, and ventilation, miscellaneous coal handling equipment, and the use of explosives in bituminous mines. Many projects remain to be completed, and many more have been proposed for consideration. The fulfillment of the program for coal lies in the general use of the standards by every coal company and their assistance in formulating new standards as needed.

¹ December, 1930, issue Mining Congress Journal.

BREEDING GUINEA PIGS AS "STANDARDS" FOR USE IN RESEARCH

Economic Value of Edible and Draft Animals to be Aided by Research with Stabilized Inbred Stock

By H. C. McPHEE, in Charge, Genetics Investigations, Bureau of Animal Industry, United States Department of Agriculture

Standardization has in recent years become a dominant note of American business activities.

Likewise, in the livestock industry, it has long been considered feasible to attain increased progress in breeding operations with commercial animals, including cattle, swine, sheep, poultry, and horses, if we could "standardize" or eliminate variation in the many factors affecting their economic value.

Take, for example, search for the factors responsible for quality in meats. Some of these factors defy present standards of measurement and call for new ones. Many are interrelated. How can one know whether the flavor of a piece of beef is due to the animal's age, its ration, its disposition, its sex, its breeding, or to a combination of several or all of these factors?

It is quite evident that an animal's characteristics can be due only to three things—breeding, feeding, and environment. There are no other factors that enter into the picture. Livestock investigators, too, have long agreed that it is essential to have all conditions identical in the several lots of an experiment except the variable which is being studied.

It has been a relatively simple proposition to see to it that the different lots in an experiment were furnished the same feeds. Likewise it has been altogether possible to eliminate variables in environment. But when we have come to the factor of breeding, control over our investigational work has weakened. Here we have encountered difficulty.

It is becoming increasingly apparent that in much of our livestock research it is not sufficient merely to compare two animals of the same breed. We must compare animals of known blood lines within the breed—animals which are homozygous (implying uniform hereditary factors) to the extent that if we find a peculiar muscle structure, or cell formation, or arrangement of connective tissue, or marbling of fat in one animal, we may count on these same characteristics having been present in the second animal before the differences in feed or environment, whichever we are studying, began to make themselves felt. Only in such a way will entirely dependable results be obtained.

But how can this be attained? The problem is far from simple. However, results being secured in a study of the effects of inbreeding on guinea pigs, which has been carried on continuously since 1906 by the Bureau of Animal Industry, of the Department of Agriculture, lend considerable weight to a belief that it can eventually be attained with our commercial animals.

Twenty-three strains or families of guinea pigs were started in 1906 by brother-sister matings of carefully selected stock. At the same time a portion of this stock was kept as a control, within which the mating even of second cousins has been avoided.

The same close degree of inbreeding has been continued to the present time. Altogether nearly 40,000 individuals have been recorded. Differences in ability to stand such close inbreeding were very early shown

by several of the original families. After nine years of inbreeding, five families became exhausted because of such serious decline in vigor as to greatly reduce their ability to raise young and to the decreased fertility of the few that were raised. For similar reasons three more families became extinct in 1917.

Five families are still in existence. Of them one is now in its thirtieth generation, another is in its twenty-ninth, and all have passed their twentieth. Each family has come to have its own peculiar combination of traits, good, bad, or indifferent. They have become standardized for certain well-defined characteristics.

For example, with respect to weight, while each family has become differentiated from the others in average, within rather close limits, its weight holds fairly constant. The same is true for rate of gain. The quality of color transmitted by each family has become fixed, but not the quantity. Litter size has been the most constant factor and the least affected by inbreeding.

Let us consider some of the characteristics that have become fixed in these families: Family 2 is characterized by small size at birth, at weaning age, and at maturity. On the other hand, it shows low mortality of young, is early maturing, and produces the least number of abnormalities. In addition, it is the most regular breeder of the five and second in resistance to tuberculosis.

Family 13 produces the largest size at birth, at weaning age, and at maturity, but is the slowest maturing of all five families. It produces the largest litter size and comes third in resistance to tuberculosis, but has a rather high mortality of young and produces the largest proportion of abnormalities.

Medium size at birth and weaning age, but small size at maturity characterizes individuals of family 32. They mature rapidly, but not so rapidly as pigs from family 2, show low resistance to tuberculosis and high mortality at all ages. Members of this family are infrequent breeders, and produce small litters.



Four generations of family 35

The young pair at the right is descended from 19 generations of matings of brother with sister. Their parents, grandparents, and great-grandparents were all found to be alive and are shown in the picture. There is little if any genetic variation left in this stock. The variation in pattern, which persists, seems to be due to nontransmissible irregularities in development.

The outstanding characteristic of family 35 is its very marked resistance to tuberculosis, leading the other families in this respect. Members of this family, however, are very susceptible to pneumonia and show

rather high mortality. They rank second in size at birth, weaning age, and at maturity, but show rather slow maturity.

Family 39 is the most rapidly maturing, and produces large litters, but is most infrequent in breeding of the five. In size it is small at birth, weaning, and maturity. It is characterized by low resistance to tuberculosis and shows high mortality at all ages.

It is significant to note that while these families have become fairly well standardized for such characteristics as I have mentioned above, this standardization has in no way resulted in the development of any one superfamily. Quite as many undesirable characteristics have become fixed as those that are desirable, tending to keep all of the families on about the same level of excellence. A close study of the data has shown that there is, in general, no correlation between the ranking of a family in one respect and in another, indicating that the differentiation was not merely in general vigor, but represented the fixation of some chance combinations of characteristics in each family. Until such time as we are able in our breeding work to fix only desirable characteristics and eliminate undesirable ones, our problem will lack complete solution. Whether this is possible of attainment remains to be seen.

There is no ignoring the fact that such close inbreeding as has been practiced in this study has resulted in a decrease in vigor in all respects. On the other hand, an extensive series of crosses between inbred families has resulted in marked improvement in every element of vigor, in some cases surpassing the control stock, indicating that nothing had been permanently lost by long-continued inbreeding.

To my mind the most significant result that has been secured in this research is that we have succeeded in reducing variations among the individuals of these five guinea pig families to rather definite limits, so that in their use in experimental work we feel reasonably sure that variations occurring in the characters we are studying are due to some cause other than heredity.

As a consequence, in our experimental work involving the use of guinea pigs it is now possible for us to practically duplicate hereditary variation with individuals from the same inbred strains or families. Genetically, we can depend upon individuals of these families being homozygous for certain basic characteristics, which offers us a firm foundation upon which to build other investigational work in the problems of the livestock industry. Such animals are already being used in special nutrition and histological research, research for which animals of known breeding and minimum variation are required.

From the standardization of known blood lines in guinea pigs to similar standardization in the breeding of cattle, or hogs, or sheep may seem a far cry, but there can be little doubt that the results thus far secured with these laboratory animals offer real encouragement along this line. We know that heredity acts much the same in the larger animals. Certain important physiological conditions supposedly hold equally true for all animals.

Although it will undoubtedly take a long time and much effort to reach the desired goal, it now seems altogether possible eventually to develop strains of farm animals homozygous in their blood lines for the factors affecting their economic value.

BRITISH STANDARD FOR BRONZE WIRE REVISED

Some Slight Changes Have Been Made in Specification for Bronze Wire and Cadmium Copper Wire

A slight revision of the specification for bronze wire and cadmium copper wire has recently been issued by the British Engineering Standards Association, it has been learned. The revised portion of the specification mainly affects the resistance per mile of bronze wire. This revision has been found necessary in view of the fact that since the issue of the original specification the resistance per mile of bronze wire manufactured to the specification has been found to be considerably lower in some instances than the resistance of wire manufactured heretofore. This is probably due to the addition of a certain amount of cadmium to the bronze billets.

Bronze wire having these characteristics is unsuitable from the point of view of the British General Post Office, since trouble would inevitably occur when balancing A and B lines for resistance in the eventuality of coils of wire from different manufacturers being used on the same work. As a safeguard against

this state of affairs, a minimum value for the resistance per mile for this class of wire has been inserted in the specification in addition to a maximum value.

As regards the cadmium copper wire referred to in the same specification, the same need for a minimum resistance does not arise, since the variation in resistance from the standard value is, in practice, not very large. Another modification to the specification relates to the weight of coils of the 40-pound wire. The revised weight allows a wider latitude to the manufacturer in making up his coils, thus largely reducing the waste, which has, in the past, been found to be a somewhat serious matter in the case of this particular size of wire.

The specification in question (B. S. Specification No. 175) is one of a series of specifications for overhead line wire material for telegraph and telephone purposes, this series being published in a single volume by the British Engineering Standards Association as specifications Nos. 174-181.

ACTIVITIES OF THE AMERICAN STANDARDS ASSOCIATION

A. S. A. Announces New Officers for Safety Code; National Standard Specifications for Vegetable-Tanned Leather Belting to be Prepared

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:

New officers of A. S. A. Safety Code.

Dr. L. W. Hatch, of the New York State Department of Labor, has been selected as chairman of the A. S. A. Safety Code Correlating Committee for the year 1931, W. S. Paine, of the Aetna Life Insurance Co., and Col. J. P. Jackson, of the New York Edison Co. becoming vice chairmen. The executive committee of the correlating committee will include these officers and, in addition, L. F. Adams, of the General Electric, W. D. Keefer of the National Safety Council, and M. G. Lloyd, of the National Bureau of Standards. The secretary of the committee is P. G. Agnew, secretary of the American Standards Association.

Rotating electrical machinery.

Two A. S. A. standardization projects, one on synchronous converters and the other on rotating electrical machinery, have been combined under the title "Rotating Electrical Machinery"; both will hereafter be in the hands of the same technical committee. The American Institute of Electrical Engineers and the National Electrical Manufacturers' Association are jointly responsible for the technical direction of this committee. This action is in line with the aim to produce a large number of standards for rotating electrical machinery under one technical committee to assure agreement among the standards approved in all essential respects.

The project on rotating electrical machinery was formed from four separate projects covering direct-current, alternating-current, induction rotating machinery, and fractional-horsepower motors.

The technical committee on rotating machinery has progressed rapidly on that part of its work which covers efficiency and losses, and in anticipation of the addition of synchronous converters to its work, included this subject with the others covered by the report on efficiency and losses.

Line insulators for voltages.

A consolidation of the work on line insulators for voltages not exceeding 750 and power-line insulators for voltages exceeding 750 in the hands of a single committee has been approved by the American Standards Association. Both of these projects are under the technical leadership of the American Institute of Electrical Engineers and the National Electrical Manufacturers' Association.

The future course of the work of standardization of insulators will be to add the following topics to the work remaining before the committee on power-line insulators:

1. One-piece porcelain insulators.
2. Strain insulators and spools.

3. Threads for pins and insulators, including gages, tolerances, etc. The last-mentioned topic is also to include a coordination between the threads commonly used on porcelain insulators with those used on glass insulators.

Standard zinc coating.

The American Tentative Standard Zinc Coatings on Structural Steel Shapes, Plates, and Bars and their Products (G8c-1930) has been approved by the standards council.

The standard was submitted for A. S. A. approval under the proprietary sponsorship method by the American Society for Testing Materials. It includes designations of specific grades of structural steel, grades of galvanizing spelter bath, maximum amount of impurities allowed in the molten zinc bath, a specification limiting embrittlement of the steel, requirements governing weight of zinc coating, and a test for uniformity of the coating.

Track bolts and nuts.

The new American Standard for Track Bolts and Nuts has just been published and may be purchased from the American Standards Association, 29 West Thirty-ninth Street, New York, N. Y.

Government Printing Office member body.

American Standards Association announces the affiliation as one of its member bodies of the United States Government Printing Office. The Government Printing Office becomes the eighth branch of the Federal Government to be included in the association's membership; the other branches being the Department of Agriculture, Department of Commerce, Department of the Interior, Department of Labor, Navy Department, War Department, and Panama Canal.

B. L. Wehmhoff, technical director, will represent the Government Printing Office on the standards council of the A. S. A. with A. E. Hanson, superintendent of construction and maintenance, as alternate.

Vegetable-tanned leather belting.

The organization of a technical committee to undertake the establishment of national standard specifications for vegetable-tanned leather belting has been approved by the A. S. A. standards council. The American Society of Mechanical Engineers will assume leadership for the technical work which will cover the preparation of specifications for vegetable-tanned leather belting including raw material, construction, marking, and physical and chemical tests. The project is the result of a general conference on the subject held at the request of the American Society of Mechanical Engineers in February, 1930. At that time a number of existing specifications were reviewed, and the need for a national standard unifying these specifications was pointed out.

It was stated that the quality of any leather belt depended largely upon the character of the leather used in its construction. The selection of suitable sec-

tions from hides for use in belt construction depends almost entirely upon personal experience and mature judgment, which can not easily be translated into terms readily understood by a novice. Several large users of leather belting, among which are the United States Steel Corporation, the New York Central, and Norfolk & Western Railroads, supplement their belting specifications by maintaining resident inspectors in the plant of the manufacturer. This practice, however, was considered too costly to be followed by the average purchaser. Attention was called to the fact that the maintenance of a resident inspector by the United States Navy Department had been discontinued with the adoption of Federal Specification 37 for Vegetable-Tanned Leather Belting. The practice of the American Petroleum Institute of permitting the

use of the A. P. I. monogram on belting supplied by manufacturers when guaranteed to be in accord with A. P. I. specifications, was also mentioned. The opinion was expressed that both of these groups were receiving satisfactory products.

Later discussions of the subject by members of a special conference committee revealed the fact that belting manufactured from vegetable-tanned leather comprised approximately 90 per cent of the belting produced, the remaining 10 per cent being made from leather prepared by a "mineral" and a combination "mineral-vegetable" tanning processes. For this reason it has been decided to undertake first the development of specifications for vegetable-tanned leather belting, although leather prepared by the other two tanning processes may eventually be given consideration by the sectional committee.

STANDARDS FOR CANNED FOODS DISCUSSED

Tentative Standards Drafted by Department of Agriculture for Canned Peas, Pears, and Peaches Reviewed at Conference

Tentative standards drafted by the Department of Agriculture for canned peas, pears, and peaches were discussed December 15, 1930, at a conference of more than 60 representatives of canners' associations and canners held at the department in Washington. Suggestions for improvement of the standards were presented.

W. G. Campbell, director of regulatory work for the department, presided at the opening of the conference and explained that the department had proposed standards based on a system of exact measurement of the qualities of the foods. He stated that the method of exact measurement is necessary to the enforcement of the so-called canners' amendment to the food and drugs act, enacted at the last session of Congress.

A proposal that the standards might better be based on the "score card" system, now in use in Wisconsin, which is based on inspectors' judgments of the qualities of the foods rather than on mathematical measurements, was supported by H. R. Burr, executive secretary of the Wisconsin Canners Association, and by F. M. Shook, of the Tri-State Packers Association.

Changes in the proposed method of labeling substandard products also were considered, the suggestion being advanced that the latter part of the proposed designation "below United States standard—legal-wholesale" might be taken to mean that the Government was guaranteeing the legality and wholesomeness of the specific product. It was suggested that "not illegal—not unwholesome" might obviate this possible inference.

Dr. W. B. White, chief of the food control office of the department, read sections of the standards and invited comment. Doctor White stated orally after the conference that the promulgation of final standards will be deferred until after the National Canners' convention. It is hoped, however, he said, to have the standards completed so that they can be applied to the first of the 1931 pack of vegetables and fruits.

Various suggestions for improvement of the tentative standards were advanced at the conference, including the objection that the proposed standard for pears might throw all canned Kiefer pears into the substandard class because of their content of gritty matter, while permitting Bartlett pears to be graded as standard; and that the minimum size requirement might work a hardship on canners of Michigan peaches and other fruits, which were said to be of high quality, but of comparatively small size.

GOLD MEDAL AWARDED NATIONAL BUREAU OF STANDARDS

Spain Awards Diploma of Honor and Gold Medal to Bureau for its Exhibition of Scientific Processes at Sevilla, Spain, 1929-30

The National Bureau of Standards has been awarded a gold medal and diploma of honor by the Upper Jury of Award of the Exposicion Ibero Americana at Sevilla, Spain, 1929-30, for its exhibition of scientific processes and products.

Striking features of this exhibit were: The photo-electric visitor counter, actuated by interruptions of a ray of light, designed and constructed at the National Bureau of Standards; photographs of the planet Mars, showing how the bureau's expert measured the temperatures of the snowcapped poles of Mars; a model (with miniature airplanes) showing the principle of the radiobeacon; high-precision gages, designed and manufactured at the bureau; rare sugars, including levulose (the sweetest of all sugars) produced at the bureau by a new special process; transparencies illustrating the bureau's work on fire prevention and fire resistance; optical glass, including finished optical parts; and new by-products developed from agricultural waste.

MEASUREMENT OF THERMAL CONDUCTIVITY

Thermal Conductivity of Electrical Insulating Materials Determined by Comparison with Standard Sample

By A. T. McPHERSON, *National Bureau of Standards*

The thermal conductivity of electrical insulating materials is an important consideration in designing electrical machinery and in determining the safe loads for power cables. Heat resulting from the electrical resistance of conductors must be dissipated at a sufficiently rapid rate to prevent their reaching a temperature which would scorch or destroy rubber, varnished cambric, fiber, or other organic insulating materials.

Direct measurements of thermal conductivity are difficult and require the services of a physicist of particular training as well as special facilities and equipment. Consequently, such measurements are beyond the scope of many electrical testing laboratories which need or would like to obtain thermal conductivity data on insulating materials. To meet this need, a simple method has been developed by the National Bureau of Standards in cooperation with a committee of the American Society for Testing Materials, whereby the thermal conductivity of a material may be ascertained, not directly, but by comparison with a standard sample of which the conductivity has been previously determined in a laboratory equipped to make absolute measurements of heat transfer.

Essential features of the method.

In principle the comparative method for determining thermal conductivity is the thermal analog of the potentiometer method of comparing electrical resistances. Samples of sheet material, of known or unknown conductivity, are placed one above the other between two metal plates—one plate heated, and the

other cooled. When uniform heat flow is established, the temperature gradients across the specimens are inversely proportional to their respective thermal conductivities. The only measurements required are the thickness of the samples, and the determinations of temperature by means of thermocouples. The apparatus is simple and easily assembled and operated. The method is practicable for use in any electrical testing laboratory, and will yield results which are sufficiently accurate for all ordinary purposes of electrical design.

Several experimental sets of standard samples have been made and calibrated at the National Bureau of Standards. A set of standards covers a range of conductivities so that each important electrical insulating material may be compared with a standard of approximately the same thermal conductivity. The standard samples are made from rubber and graphite in varying proportions; the higher the percentage of graphite, the greater the conductivity. These standard samples have remained constant over the period of three or four years that the investigation has been in progress, and can probably be used over a longer period without the necessity of recalibration.

The procedure for the comparative method of measuring thermal conductivity was described under the title "Tentative Method of Test for Comparing the Thermal Conductivities of Solid Electrical Insulating Materials" in the report of the American Society for Testing Materials Committee D-9, June 23, 1930.

INCREASING SAFETY OF MILK THROUGH PREVENTIVE MEASURES

Sole Reliance Upon Pasteurization for Safety in Milk Not Sufficient

Sole reliance upon pasteurization may result in milk production of substandard quality, according to the Office of Milk Investigations of the United States Public Health Service. (The story on Standard Milk Ordinance and Code, by Dr. Leslie C. Frank, of the Public Health Service, appeared in the December COMMERCIAL STANDARDS MONTHLY.)

Production precautions, such as tuberculin testing, investigations for typhoid carriers, and sterilization, constitute factors in milk safety much as pasteurization does. Neither means is sufficient by itself to safeguard the milk supply. Both must go hand in hand.

Although pasteurization is a very efficient means of increasing the purity of milk, the fact that many believe it is the only essential means has resulted in the neglect of other very important factors. A policy which abandons production precautions and relies solely upon pasteurization is not sound. There can be no doubt that pasteurization, if properly applied, will

prevent milk-borne infections. Pasteurization in this respect is superior to raw-milk precautions. But, on the other hand, the pasteurization process is not always properly applied. It is designed and operated by human beings. Occasional slips in operation are inevitable.

Suppose production precautions are abandoned entirely or largely; suppose many of the cows are not tuberculin tested, and high percentage of tuberculosis exists in the herd; suppose no precautions are taken against typhoid carriers on the farm; if, then, a failure in the pasteurization process does occur, the last safeguard is down and the consumer is left defenseless, said the announcement of the Public Health Service.

Pasteurization is not expected to be a substitute for cleanliness which prevents the entrance of dirt and bacteria, nor of cold which prevents the rapid increase of bacteria, but merely to supplement these measures. Inspection of dairies is also a necessary measure.

WHAT THE NATIONAL BUREAU OF STANDARDS HAS DONE IN RESEARCH FOR THE PRINTING INDUSTRIES

Researches Have Resulted in Improved Bookbinding, Electrotyping, Printing Plates, and Paper

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

The outstanding element of industrial progress today is the use of measurement in the precise control of the details of design and process. We build desired properties into materials almost at will and are less inclined merely to seek specific materials which, at the outset, have such properties. We mold the quality of a material as we mold its form. The National Bureau of Standards was drawn into industrial research as were other research institutions because of the intimate and growing union of science and industry.

The bureau has made researches in buckram for binding, electrotyping, printing plates, and paper. To sum up its experience is to say that measurement is the modern method of discovery, record, planning, and application. We measure the need and make to measure the things which are to meet the need. It was this which made the bureau a factor in some of the researches of interest to the printing industry. While not in any sense a bureau for printing research, its expert staff, with unique facilities, met with some success in a few problems of particular interest to printers, problems submitted to the bureau by industry or by the National Government.

In the early days the bureau was one of the few laboratories then existing in the Government service. It became perforce a utility bureau where laboratory work was needed.

An early research.

A very simple type of early research was the choice of buckram as a substitute for sheep-leather binding of Government publications. The author recalls when an act of Congress still prescribed binding in sheep leather. Serious complaints led the Joint Committee on Printing to request the National Bureau of Standards to investigate the properties of certain selected buckrams and other binding cloths, 22 in all, to develop criteria and facts for selecting the most suitable binding cloth for Government publications.

The bureau was asked also to study how insects attack bookbinding cloth and to find a remedy, if possible. Colonies of "croton" or water bugs (*ectobia germanica*) were cultivated under bell jars with uniform strips of all the samples of buckram and other binding cloths. With plenty of air and water but no food, they were forced to attack any edible substance on the samples. After many days' exposure some

cloths were stripped of coating, others were unattacked—presumably in the order of edibility.

The experience, twice repeated, established that the cloth coating was distasteful, and that choice was not by accident, imitation, or force of habit. The weight of the coating or its content of indigestible matter did not affect the choice. The nature of the fabric had no effect upon the choice, since the bugs did not eat the fabric, but only the nutritious materials of the coating. It was thought that, perhaps, poisons might immunize the cloths. Quinine and strychnine were attacked as readily as samples treated with pure

water, without harm to the bugs. Chrome yellow, containing lead and chromic acid, both poisons, apparently was not fatal nor was it avoided by the bugs. The test results were so uniform that the immune buckrams were selected as bug resistant.

The test data comprised yarn count for warp and weft, thickness, bone-dry weight, changes in weight and dimension of warp and weft at 65 and 100 per cent humidity, tensile strength, stretch, folding and wearing endurance,

and light fastness. The bureau eliminated cloths attacked by the bugs, those showing fading or undue moisture absorption (as being liable to mold), and one showing excessive friction (unfitting it for library use). The remaining samples showed adequate wearing endurance. The results were critically reviewed by experts in bookbinding before a final choice was made.

Action by Congress and the Joint Committee on Printing enabled the Public Printer to use the new buckram chosen as the most suitable binding material (the famous No. 666, "Government document buff bug-proof buckram") as a substitute for split sheep leather, which it resembled closely in color and had to match on library shelves. This buckram, it was said, cost a third, and lasts three times as long, a net economic gain of 800 per cent resulting from a relatively simple research.

Other researches.

Standardized control of electrotyping solutions was developed for the International Association of Electrotypers, and with their cooperation, in 1914. Copper electrotyping solutions were then controlled by rule-of-thumb. Simple methods of analysis or shop control were rare or unknown.

The outstanding element of industrial progress is the use of measurement in the precise control of design and process. Desired properties may be built into materials at will. The National Bureau of Standards was drawn into industrial research because of the growing union of science and industry. It has successfully solved some of the problems of the printing industry. This article, in which the writer deals with bureau researches in binding materials, electrotyping, printing plates (particularly chromium plating), and paper was read at the First International Conference of the Technical Experts in the Printing Industry held in Pittsburgh.

By experimental research were developed the measured controls, or conditions under which copper deposits could always be made of uniformly highest quality. The results have been in steady nation-wide demand ever since.

In a recent new and interesting research the permissible rate of copper deposition was doubled. It was discovered that phenol (carbolic acid) permitted more rapid copper deposition and gave harder copper deposits. Plants can now deposit the required thickness of copper in half the time previously needed.

In a similar research standardized control and operation were worked out for nickel. A very simple electrotyping solution with only two constituents was found to yield better results than many complex solutions then in use.

The World War cut off the supply of molding wax for electrotyping (chiefly Austrian ozokerite from Galicia). Ozokerite deposits in Utah were not yet exploited. The bureau found suitable admixtures for Utah ozokerite to give it the necessary properties, and this led to its successful use in the American electrotyping industry.

The need of satisfactory quality graphite led to a bureau research on its properties. New test methods were devised for determining the suitability of deliveries for electrotyping purposes. The results were published and embodied in specifications now accepted generally by graphite dealers, so that deliveries of graphite became notably more uniform and satisfactory to the industry.

Registration of color plates.

The accurate registration of color plates is the subject of another bureau research of importance to printers. In making electrotypes for color printing where curved plates are needed, trouble arises when they fail to register. The cause is dimensional inaccuracy, changes in the paper, or defective presswork. To discover what factors affect plate dimensions, a method was devised to measure accurately any dimensions upon either flat or curved plates.

A special gage designed at the bureau measures the distance between any two points on any curved plate. Precision treatment thus possible will surely yield methods for the accurate control of the factors which govern perfect registration. Commercial electrotypes are now called upon to furnish plates to fit as many as 20 diameters of cylinders, and plates of three or four different thicknesses on the same sized cylinder. It is hoped that research here may reduce the number of sizes, simplify operations, save expense, enhance the accuracy of registration, and thereby improve the quality of printed work.

Intaglio plates for printing our national paper currency have for 10 years past been the subject of research by the Bureau of Standards in cooperation with the Bureau of Engraving and Printing. The first research developed a successful electrolytic process for reproducing printing plates from original engraved master plates. In the Bureau of Standards process the negative or "alto" plate is made, not by intermediate impression in lead or wax, but by direct electro-deposition. Upon this "alto" plate, the "basso" or finished replica of the original plate is deposited. The process is so exact, so sensitive, that all significant

lines and also even the finest perceptible scratches of the original polish are faithfully reproduced.

The plates were cheaper than case-hardened steel plates, produced equally good impressions, but had shorter life. The Bureau of Standards, therefore, decided to use chromium plating, which proved a most interesting and successful enterprise. To lengthen the service life of electrolytic plates, a thin coating (about 0.0002 inch) of chromium was added to the nickel surface. Chromium—the hardest metal known, as measured by abrasion resistance—gave the new plates a much longer life, often four times that of previous plates.

Electrolytic plates were made of alternating nickel and copper layers to a total thickness of about 0.06 inch. This shell is soldered to a steel plate to give the needed thickness and strength. The newer plates, however, consist entirely of electrodeposited iron, except for thin layers of nickel and chromium on the printing surface. This process is designed to save material cost and simplify grinding and soldering. It is now on a semicommercial basis at the Bureau of Engraving and Printing.

The net result is that the life of paper currency now printed excels all previously produced and the plates cost much less. Three-quarters of all paper currency is now printed from chromium-plated electrotypes. Similar plates are being used for printing Government securities and postage stamps.

Two interesting points may be added. First, electrolytic plates have deeper and more sharply defined lines than the master plates themselves since the edges of each engraved channel naturally take thicker deposits than the bottom of the channel. The second point is that the chromium film when worn may be removed from the plate electrolytically by simply reversing the current in a suitable bath. The plates can then be recoated with chromium and the process repeated until the steel or nickel under the chromium wears away.

Researches in paper.

Paper making is an industry still in the making. The properties of paper are responsive to pulp treatment and process details. It is the task of the paper experts of the bureau to find out how to enhance any desirable characteristic of paper. Desired results are now sought and found by research as deliberately and as successful as we plan and build a house. A chief factor in this success is the bureau's unique facilities for research, including a complete experimental paper mill in which every detail of the paper-making process may be conducted under measured control.

Increased life was added to our national currency paper by improved processing of the pulp in a research by the Bureau of Standards in cooperating with the Bureau of Efficiency and the Bureau of Engraving and Printing. It is known that with the same mix, different paper makers will produce papers of different quality. Empirical process is responsible for such diversity. Accident, rather than intent, however, may produce an occasional very low quality with an equally rare run of superlative quality. Therein experimental research and mill experience differ. In the mill a high quality may be attained without the possibility of its being regularly reproduced.

If a chance success can not be reproduced, it is lost to the world and rediscovered only by chance. The musician's chance harmony, "the lost chord," could not be recalled. In research, however, success is reproducible, since it is recognized good practice to record the measured conditions of each experiment. These make success reproducible. Science aims to have no "lost chords." An unexpectedly high quality is made permanent by reproducing it under the measured conditions which first produced it.

Durability is a prized merit in national paper currency. Longer life of the paper saves not only paper stock but also the repeated labor required to protect, handle, print, and authenticate paper money—all costly. This made the research for added durability both attractive and promising. Folding bills for the purse or pulling them in handling calls for folding strength and tensile strength, respectively. By a planned technique these two basic properties were greatly enhanced. The specification for currency paper calls for folding endurance of 3,000 double folds. The bureau produced experimental paper for our currency with a folding endurance averaging more than 5,000 double folds and some specimens having a folding endurance of 8,000 double folds.

The new technique for improving currency paper was based upon expert knowledge of the effects of beating upon the paper fibers. To brush the fibers clean—"teasing them out," as the paper maker puts it—produces fibrillas at both ends and sides of the individual fibers. Beating them also crinkles the fibers. The two effects combined govern the felting or weaving quality which makes the paper strong. With these facts in mind, the beater rolls were adjusted to slow beating, thereby loosening the fibers gently without cutting them. A study of former currency paper disclosed unsuitable beater action which cut the fibers too short, making the paper brittle.

The distance of the beater roll from the bedplate was varied according to a definite schedule controlled by a time meter. The rolls were lowered slightly by steps until the fibers were completely brushed. Vari-

ous mixes were tried. The winning composition was a 75-to-25 linen-cotton mixture, selected as best to use for paper currency on the basis of experimental results.

An important aim in the research was to secure a printing surface soft enough yet firm enough to absorb the ink without fiber "pick-up" on the plates. This was accomplished. Another point brought out in this research is becoming better known to research men, namely, that quality is often dependent more upon the physical structure than upon composition. For example, the strength of a paper depends most upon how well the fibers cling together; hence the importance of beating control to produce ideal crinkle and fibrillas. Incidentally, when this basis was developed the first run in the bureau's experimental mill was almost as good as the best produced since.

In translating the bureau's technique to the paper mills, it was found that it would produce commercially and uniformly the same high quality of paper, and no other technique has been found which will duplicate this quality. It is notable that this doubling the durability of currency paper did not increase its cost.

The ideal printing research brings together the scientific laboratory man, the practical engineer, and the facilities of industry for full-scale service tests. If we apply science in the research, continuous ever-accelerating progress is possible. Every ounce of material, every machine part or tool, every motion or reaction in a process is amenable to improvement by research. Research, therefore, should leave no sector uncovered. If all branches of science are mobilized in such a comprehensive program of research, the printing industry may hope for results comparable in enterprise with recent achievements in radio, aviation, motion pictures, and television.

As production passes over to the automatic power-driven machine, brain power is increasingly being transmuted into more perfect planning and design of materials, devices, processes, product. Here the chief essential is research and the accurate specific data and facts which research discloses.

INDUSTRIAL ELIMINATION OF WASTE CAMPAIGN PLANNED

Special Effort to be Made by A. S. M. E. to Interest Smaller
Plants in Campaign for 1931

Plans for the 1931 campaign on the elimination of waste have been prepared by the national committee of the American Society of Mechanical Engineers. As usual the particular effort will be directed toward having industrial plants throughout the country hold elimination of waste campaign meetings during April. This campaign will be of the same type that has hitherto been so successful, each department of a company making up its own waste-exhibit boards, and so stimulating suggestions from employees as to ways and means of eliminating waste, and decreasing production cost.

As part of this campaign, the committee will try to interest those in charge of smaller plants, and explain how they may stage campaigns in their factories without too great an expenditure of time and money.

W. J. Barrett, industrial engineer of the Metropolitan Life Insurance Co., who has been appointed to take charge of this branch of the work, is planning a group of effective posters which any small plant may purchase.

The committee having been invited to hold sessions at the Management Congress and Materials Handling Meeting, scheduled to be held in Cleveland, Ohio, during the week of April 13, 1931, decided to hold one evening and probably one afternoon meeting. The National Industrial Equipment Exposition will be held at the same time.

The dictionary on disposal of waste materials, which is being prepared by the committee, is progressing splendidly. The nucleus of this dictionary consists of about 130 items contributed by Thomas Owens, of the Westinghouse Electric & Manufacturing Co. To these have been added more than 100 items received from about 30 other companies. A special effort is being made to get further contributions from other companies before the dictionary is published.

STANDARD PRESERVATIVES FOR FISH NETS

Bureau of Fisheries Conducting Tests to Complete Standardization of Practices in Fish-Net Preservatives

By W. T. CONN, *Technologist, Bureau of Fisheries*

The factory value of new webbing for replacement or addition to that already in use in the United States for commercial fishing is about \$5,400,000 annually. In figuring the cost of nets, however, labor, transportation, net manufacturers' costs, and accessories must be added, which would raise the above total considerably. Most of this "gear" is treated with a preservative of some nature, but losses under present conditions are still excessive. Certain standard preservatives are in use, and the problem of research is to establish more efficient preservative treatments.

Many types of nets are utilized in the commercial fisheries. These are used in waters varying widely in salinity, temperature, mobility, and in content of animal, bacterial, and vegetable life. Webbing, of the type employed for trap nets, is made from heavy cotton and must resist deterioration from all causes when exposed for periods of several months. While a preservative of light weight is desirable, it is not essential, as is evidenced by the common practice of tarring this class of "gear." In contrast, however, gill-net webbing, which is made from light-weight linen and cotton, is exposed for only a day or two at a time and must be light and flexible. Therefore, any preservative for this type of "gear" must be light in weight to allow the thread to flatten when struck by a fish. From the foregoing, it is evident that there is little possibility of one preservative treatment being practical for all types of nets.

Over a period of several years, the technologists of the Bureau of Fisheries have conducted many hundreds of tests in typical fishing waters with the objective in view of producing superior preservatives

which will increase the resistance to deterioration from the various destructive agencies. With increased knowledge of the regional and seasonal effects upon nets it is probable that standard preservatives may be developed for each type of "gear" when it is used under known conditions of salinity, temperature, water currents, and presence of destructive organisms.

Standardization of net-preservative ingredients is possible at the present time. As an example, copper cleate, which is valuable as a preservative component, and which rarely exists as a pure chemical, has been found to react favorably if it is free from acids and if it has a copper content of not less than 8 per cent. Coal tar is used extensively for the preservation of heavy nets. There is a wide variation, however, in quality of coal tar as purchased on the market, but work is in progress with the objective of developing specifications which will insure high-quality material to the discriminating buyer.

Field investigations have developed a wide range in the types of apparatus and methods for applying tar and similar materials to nets. Many operators are assuming a serious fire risk when tarring nets to-day, and most of them are heating tar in a manner that destroys a portion of its most valuable properties. In order to overcome the objections to present practice, an apparatus has been designed which should eliminate all objections to the present methods of tarring.

While complete standardization of practices in net preservation is apparently not yet solved, facts developed from research in this field should point the way toward a few improved methods of preservation which should, in turn, considerably reduce present costs of nets.

OIL COMPANY BUYERS APPROVE STANDARD FORM

A proposed standard form to be used as a guide in field purchases of lumber, and a similar form for use in buying from supply houses, were tentatively approved by the Oil Company Buyers Group of the National Association of Purchasing Agents at the meeting held in Tulsa, Okla. Sample forms have been distributed which are to be subjected to the test of actual use before final ratification or revision at the 1931 convention of the National Association of Purchasing Agents which will be held in Toronto, Canada, in June.

The object of the new form is to combine on a single sheet, (11 by 12 $\frac{3}{4}$ inches) all information required in asking and giving quotations on the material in question, and eliminating superfluous data sometimes included in the routine developed by individual companies. In this way it is expected that the adoption of the new standardized method will be a distinct advantage to both buyer and seller.

BRITISH STANDARDS FOR CRANES TO INSURE SAFETY

The use of timber is prohibited in any stress-bearing part of new standards for derrick cranes, power-driven and hand-operated, and for traveling jib cranes (contractors' type), just announced by the British Engineering Standards Association.

The object of these specifications is to secure the general observance of such fundamental principles as appear desirable to insure reliability and safety without hampering the freedom of the crane maker in his selection of the most appropriate design for the purpose in view.

The derrick-crane specifications provide for the Scotch derrick, the Guy derrick, and the tower derrick types of cranes, now largely used in building operations. The factors of safety and allowable working stresses specified are applicable to cranes intended for ordinary duty. Higher factors of safety and lower working stresses are recommended for duties of greater severity, or where there is a liability to accidental overloads, as in dock side, quarrying, and magnet cranes.

ECONOMIC ASPECTS OF FUNDAMENTAL RESEARCH

Commercial Value of Fundamental Research Not Always Apparent

By H. L. CURTIS, *National Bureau of Standards*

The economic aspects of any subject depend to a considerable extent on the point of view of the person considering the subject.

Likewise there may be a difference of opinion concerning the meaning of fundamental research. Hence, it seems desirable to define both "economic" and "fundamental research." The term economic is defined in dictionaries, the following definition having been taken from the Standard Dictionary:

Relating to the science that treats of the development of material resources, or of the production, preservation, and distribution of wealth, and of the means and methods of living well, for the State, the family, and the individual.

In this article, economic will refer particularly to the latter part of the definition, namely, the means and method of living well.

The following is the author's conception of fundamental research: Fundamental research is that branch of research which attempts to determine the basic laws governing natural phenomena and to evaluate the constants of nature which are required for a quantitative expression of the basic laws.

The field to be covered by the subject which has been chosen is very narrow, but its limits are not clearly defined. On the one hand, there may be a great difference of opinion as to whether the results of a given experiment have any economic value; that is, have improved our method of living. On the other hand, there is no exact criterion for telling whether a research is fundamental. However, there are certain experiments which admittedly have economic importance and which are fundamental. The present article will be confined to a discussion of these researches.

Perhaps the best way of evaluating fundamental research is by considering some historical examples. In the opinion of the author, the research which has had the greatest economic value was the experiment of Galileo in dropping balls of different weight from the leaning tower of Pisa. To appreciate the importance of this, one must understand the method of thought during the Middle Ages. No man considered making an experiment for himself. If some matters were in question, he consulted the authorities. If Aristotle had made any statement on the subject, the matter was completely settled.

In fact, the writings of Aristotle were given almost as much importance by the church of the Middle Ages as were the sacred writings. Any statement which depreciated a saying of Aristotle was heresy. Aristotle

had said that the velocity with which a body falls depends upon its weight. For nearly 2,000 years that statement had been accepted as a fact without any attempt to prove it. It was Galileo who did more than any other man to break down this dependence upon authority, for the two balls which he dropped from the leaning tower of Pisa, one weighing 10 pounds and the other 1 pound, reached the earth at the same time. So important was this experiment that from the scientific point of view the end of the Middle Ages may be said to date from that day in 1589 when Galileo first performed his experiment.

A second example illustrating the importance of fundamental research is Oersted's discovery in 1820 of the magnetic effect of the electric current. Oersted's discovery was somewhat of an accident. He had been lecturing to a class concerning magnetism, and toward the end of his lecture introduced some experiments with electric currents. At the end of the lecture a few students more curious than the others stayed to see additional experiments.

Oersted first held a wire, through which current was flowing in a vertical direction, near a magnet and showed that the current had no effect on the magnet. He then held the conductor carrying the current parallel to the magnet and to his surprise the magnet was deflected. Oersted immediately made further experiments, and within a short time developed the laws of the magnetic action of a current.

This was a very fundamental series of experiments, but Oersted did not make any economic application of his discovery. It required other men with a different point of view to make the application. One of the men to see an important application of this fundamental work was Professor Morse, who about 12 years after Oersted's discovery started experiments on the electric telegraph. In a few years Morse had perfected his telegraph, but could not interest financiers in the subject. It was not until 25 years after the original experiments of Oersted that Congress appropriated money for opening the first telegraph line between Washington and Baltimore in 1844, over which President Tyler sent the famous message, "What hath God wrought." In this instance the politicians were wiser than the financiers.

Another example of fundamental research which has had far-reaching economic value was the discovery of electromagnetic induction by Faraday in 1831. Faraday was much impressed by the analogies between electricity and magnetism. It was well known that

The economic aspects of fundamental research have been brought out by a number of historic examples. The first example mentioned is that of Galileo's experiment of dropping balls of different weight from the leaning tower of Pisa. This so changed the method of thought that our present scientific and technical development has been possible. Other examples cited are the discovery of the magnetic action of the electric current by Oersted, the discovery of electromagnetic induction by Faraday, and the more recent work on liquification of gases, the discovery of radium, and the production of electromagnetic waves. A brief application to the bureau's work is indicated.

when a magnet was brought into the neighborhood of a piece of iron, the iron temporarily became magnetic, so Faraday reasoned that an electric current brought into the neighborhood of an electric circuit might cause a current to flow in the neighboring circuit.

He accordingly set up a circuit containing a galvanometer and placed near it a second circuit containing a battery, but as batteries in those days were expensive, he left the circuit open until he was ready to make observations. When ready he closed the key of his battery and was much gratified to find that his galvanometer deflected, but was greatly surprised to find that the deflection quickly returned to zero.

Faraday always recorded results of his observations in great detail, so that as soon as his galvanometer returned to zero, he released his key in order to make a record of what had happened. To his great surprise, the galvanometer then deflected in the opposite direction, again returning to zero in a short time. In this way, electromagnetic induction was discovered. At the time it seemed to be of nothing more than scientific interest. It was almost half a century before it had any extensive economic application.

Few of our electrical industries would be in existence to-day if the principle of electromagnetic induction were not known.

Many men now living remember how the scientific thought of the last decade of the nineteenth century was modified by the results of fundamental researches. There was the liquefaction of the "permanent" gases; the discovery of radioactive substances, particularly radium; the discovery of X rays; and the production of electromagnetic waves, which laid the foundation of wireless, or radio as it is known to-day. The economic value resulting from these fundamental experiments is not that which was predicted in 1900.

For example, liquid air, which had been produced by the researches of Dewar, Kammerlinghones, Olszewski, and Wroblewski, had been made commercially available in 1900 by the work of Linde. Much was expected of liquid air by all classes of people. Financiers and others could readily be induced to put money into projects which involved its uses. However, the results of more than a quarter of a century have not justified the expectations. The uses which have been found for liquified gases are not those which were originally expected.

It is very difficult to evaluate the economic importance of radium, which was discovered by M. and Mme. Curie. It has never been of great commercial importance, yet the discovery of radium more than any other one thing has completely changed our conception of atoms, and has indirectly contributed to much of our recent progress along all chemical lines. In 1900 the atom was considered to be a small round marble with strings attached at certain points whereby it was possible to tie one atom to one or more other atoms. The discovery of radium made this conception untenable. To-day an atom is treated as a complicated system, far more complex than our solar system.

Since 1900 economic uses of X rays, which were discovered by Röntgen in 1895, have slowly advanced, but there have been no sudden or remarkable develop-

ments. The economic importance has steadily increased, but the development has been along these lines which one might have predicted a quarter of a century ago.

In 1900 electromagnetic waves were being experimented with in some of the university laboratories. The story of their discovery and advancement to economic importance is one of the most interesting in the realm of science.

Between 1865 and 1870 Clerk Maxwell, an English mathematical physicist, was interested in developing the differential equations for the magnetic and electrostatic fields. He was surprised at the similarity of the equations which he developed for the two types of fields, and concluded to solve them as a pair of simultaneous equations. As a result of this solution he developed the electromagnetic theory of light. At the time there was very little experimental evidence to show that his theory was correct. One of his important calculations was that the square of the index of refraction of a material should equal its dielectric constant. For a few materials, this relationship held, but for many others it did not.

For many years relatively few physicists accepted Maxwell's electromagnetic theory of light. After 20 years of discussion, during which Maxwell died, Hertz decided to put the theory to an experimental test. In 1888 he was able to produce electromagnetic waves, and the science of radio was born. However, more fundamental research was needed before radio could become of economic importance.

Edison first noticed that a hot body would not retain an electric charge as long as a cold body, when the body was highly insulated in a vacuum. It remained for Richardson and others to develop the laws of the emission of electrons from hot bodies and thus lay the foundation for the electron tube of to-day, without which the commercial development of radio would have been impossible.

The examples which have been given demonstrate clearly the economic value of fundamental research. However, the conclusion can not be drawn that all fundamental research will immediately be of economic importance. Often many years must pass before mankind reaps any economic advantages as a result of an increase in knowledge, and even then the advantages may not be large. But it is only by increasing knowledge in every possible direction that a proper foundation can be laid on which to build an expanding economic structure.

There are many fundamental researches in progress at the National Bureau of Standards. It is quite impossible to make any accurate estimate of their economic importance. It is, of course, the hope of every research worker that his results may be of use to mankind. However, it is well known that the man who is engaged on fundamental research is not in any position to know how it can best be used in a commercial way. Very often the man who produces a result of far-reaching importance does not live to see the value of his work appreciated by mankind. Hence, many years must elapse before the work which the bureau is doing can be properly evaluated.

It is impossible to know along what lines research is most likely to bring results of economic value. As there are relatively few men who are deeply interested in fundamental research, it would seem that society might well give to such of these men as are qualified for it an opportunity of experimenting along those lines in which they are interested. Moreover, many

researches require the cooperation of investigators of quite different training, so that the development of men to become research executives is a matter of importance.

The best methods of fostering fundamental research should be given careful consideration by all public-minded citizens.

CURRENT NEWS FROM AMERICAN SOCIETY FOR TESTING MATERIALS

Reports of Various Committees Show Results Obtained in Developing Standard Specifications for Industry

The following current information relating to activities of various committees of the American Society for Testing Materials engaged in formulating specifications has been furnished by that society.

The Committee on Steel is considering new specifications for steel castings with special compositions and heat treatments, and is developing specifications for sheet steel for freight cars and for steel plate of fire-box quality. Considerable progress is expected during 1931 on the comprehensive program covering the preparation of specifications for all types of pipe. Requirements for materials for steam and oil service to withstand temperatures up to 1,000° C. are being considered as are also specifications for high-carbon and alloy-steel tubes. The subcommittee on steel for welding has gone carefully into the requirements of steel for fusion welding and has prepared a list of present A. S. T. M. specifications covering materials that is believed can be welded satisfactorily by the usual fusion processes now in general use. This list, which appears in the current report of Committee on Steel, is not considered final, and any suggested additions thereto or comments and criticisms will be welcomed by the committee.

The Committee on Magnetic Analysis has under way an investigation on the correlation of magnetic properties with toughness as indicated by impact tests. The experimental work is nearing completion. In addition, various members of the committee are carrying on independent researches in the field of magnetic analysis.

The Committee on Iron-Chromium, Iron-Chromium-Nickel, and Related Alloys. Because of the importance of welding alloys, falling within the scope of this committee, a fact-finding subcommittee has been appointed to survey the field. This special committee has prepared a tabulated list of questions which will be submitted to the American Welding Society to determine whether work of this kind is now being undertaken, and if not, the desirability of entering upon such studies. The subcommittee on chemical analysis is considering the development of methods of analysis of alloys falling within the scope of the committee.

The Committee on Metallography is making a careful review and comparison of the Standard Methods of Metallographic Testing of Iron and Steel, and the Standard Methods of Metallographic Testing of Non-Ferrous Metals and Alloys, with a view to making the methods consistent in those sections where the procedures are similar, and bringing the methods up to date. The set of standard micrographs for grain size

of grain diameters, ranging from 0.010 to 0.200 mm prepared last year, has been incorporated in the Standard Rules Governing the Preparation of Micrographs of Metals and Alloys. X-ray studies of the specimens used in preparing the standard grain size micrographs are being continued. A special subcommittee has been appointed to consider the preparation of standard micrographs of tool steel, showing various degrees of spheroidization and contamination by inclusions. As the result of a recommendation by the committee on correlation of research, the committee is considering undertaking a correlation of data relating to the crystalline structure of metals as compared with their strength and ductility and other physical properties.

The Committee on Clay and Concrete Pipe is preparing a revision of the Standard Specifications for Clay Sewer Pipe and also a revision of the Standard Specifications for Cement-Concrete Sewer Pipe. The purpose of the revision under consideration is to strengthen and broaden the specifications, to make them clearer and more definite on several points, and to make them conform more closely with the present needs of engineers and the advancing methods of pipe manufacture. The committee has undertaken, in connection with the preparation of new specifications for reinforced-concrete pipe, a field survey and study of existing reinforced-concrete pipe structures, involving an examination of approximately 191 such structures, varying from 24 to 108 inches in diameter, for the purpose of securing performance data under service conditions.

The Committee on Gypsum has outlined a very ambitious program of activity for its subcommittees during 1931. The investigation of the uses of gypsum and anhydrite as a retarder for Portland cement will be continued and an effort will be made to correlate the work by different investigators throughout the world. A revision of the Standard Specifications for Gypsum Plaster Board to include additional sizes of boards other than those included in the specifications is now under consideration. Changes in the methods of testing gypsum plaster board and gypsum wall board are also being considered.

Committee on Slate. The activities of the committee are devoted to determining and accurately measuring the physical and chemical characteristics of slate. This work is in charge of 10 subcommittees and considerable progress has been made during the past year. The studies of water absorption of slate are still in progress at five different laboratories and additional tests are being made to determine the relation of the effects of drying on the strength and elasticity

of slate. The subcommittee on abrasive hardness has perfected a machine for comparative tests of the wearing qualities of various materials. Results obtained by this machine will be checked by determining the actual wearing of the materials on stairways. The subcommittee on machining and workability has in the past been instrumental in introducing to the slate industry the wire saw for cutting out blocks of slate. It is now cooperating with the manufacturer of a new alloy (of remarkable hardness and cutting ability) to be used in slate finishing mills. The subcommittee on utilization and performance proposes to investigate the heat insulating qualities of a slate roof and also to determine the stresses that occur in a slate shingle

when in actual use on a roof. The subcommittee on standardization of samples has studied the type and number of test specimens best suited for certain types and uses of slate and has prepared recommendations for structural (machine) slate and for roofing slate.

The Committee on Natural Building Stones has prepared some proposed definitions of terms relating to natural building stone which will be submitted to the society at the next annual meeting for publication as tentative. The subcommittee on testing procedure is considering the development of testing procedures for making tensile, shear, and elasticity tests, and freezing and thawing and other weathering tests of building stone.

NEW BRITISH STANDARD FOR LIGHTING FIXTURES

Standard Defines Common Terminology

Taking cognizance of the need for a common terminology for describing and comparing the characteristics of lighting fixtures, the British Engineering Standards Association has announced a standard British Standard Classification of Symmetrical Light Distribution from Lighting Fixtures.

Light distribution is first classified by reference to the class of lighting for which a fixture is intended, and secondly by the character of the light distribution curve. In its present form, the method is only applicable to lighting units which give a symmetrical light distribution.

The new standard first defines the polar curve of light distribution, the solid of light distribution and symmetrical and asymmetrical light distribution. Symmetrical distributions are then classified as direct general, semiindirect, and direct, while the further classification, which is necessary to obtain a general character of the light distribution, makes use of the ratio between the width and height of a rectangle, which just incloses the polar curve in the hemisphere containing the major portion of the flux. Finally, this ratio, which is known as the frame ratio, is used to define five classes ranging from extra narrow to extra wide. The method of arriving at the frame ratio is described in detail in an appendix.

STANDARD YEARBOOK FOR 1931

New Yearbook Shows Progress in World Standardization

The Standards Yearbook for 1931, which will be released shortly, is more than a summary of interesting news. It covers broadly the developments in standardization all over the world during 1930.

Standardization is, in principle, applied science; in practice, the basis of efficiency.

Included among the special features for the 1931 Yearbook is a symposium on standardization in transport. American experts in transport have contributed a series of interesting special articles on research as an aid to such standardization. These relate to research and experiment in aviation, automotive and highway development and safety, railroads, pipe lines, elevators, marine navigation, speech and power transmis-

sion, and the important activities of the Government and other agencies engaged in promoting standardization in transport on land and water and in the air.

The volume also describes standardization activities of the Federal Government; an annual bibliography on standardization prepared by the Library of Congress; standardization activities of municipal, county, and State purchasing agencies; standardization programs of American technical societies and trade associations; and a summary of the work in standardization conducted by the special national standards associations of the various countries—an important and broad-scale picture of standardization.

World-wide cooperation by international organizations in solving international standardization problems is reviewed in a special chapter.

The Standards Yearbook, in addition to its other standardization features, includes summaries of important national and international standardization activities and accomplishments of the Government standardizing laboratories of England, France, and Germany, and of the National Bureau of Standards for the United States.

The Standards Yearbook, 1931, may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price \$1.

FIRE WARNING BY ODORS IN METAL MINES

A disagreeable odor, shot through ventilation lines at the rate of thousands of feet per minute, will be used to warn miners of fire in all metal mines complying with the provisions of the American Standard Code for Fire Fighting in Metal Mines. The standard has just been approved by the American Standards Association following its submittal by the National Fire Protection Association and the American Mining Congress, sponsors for the joint technical committee which has been working on the standard under American Standards Association auspices since early in 1925.

Provision is made in the standard for measures to be taken for the prevention of fires, fire-fighting equipment, fire-fighting personnel, and warnings of fires.

In addition to the use of a disagreeable odor as a warning signal, the standard also provides that in mines equipped with electric lights the engineers shall also flash all electric lights nine times in three series of three flashes each. Since trouble may develop in the electrical system, however, the odor signal is considered to be the more reliable warning.

ANTIFREEZE SOLUTIONS FOR THE PROTECTION OF MOTR-CAR COOLING SYSTEMS

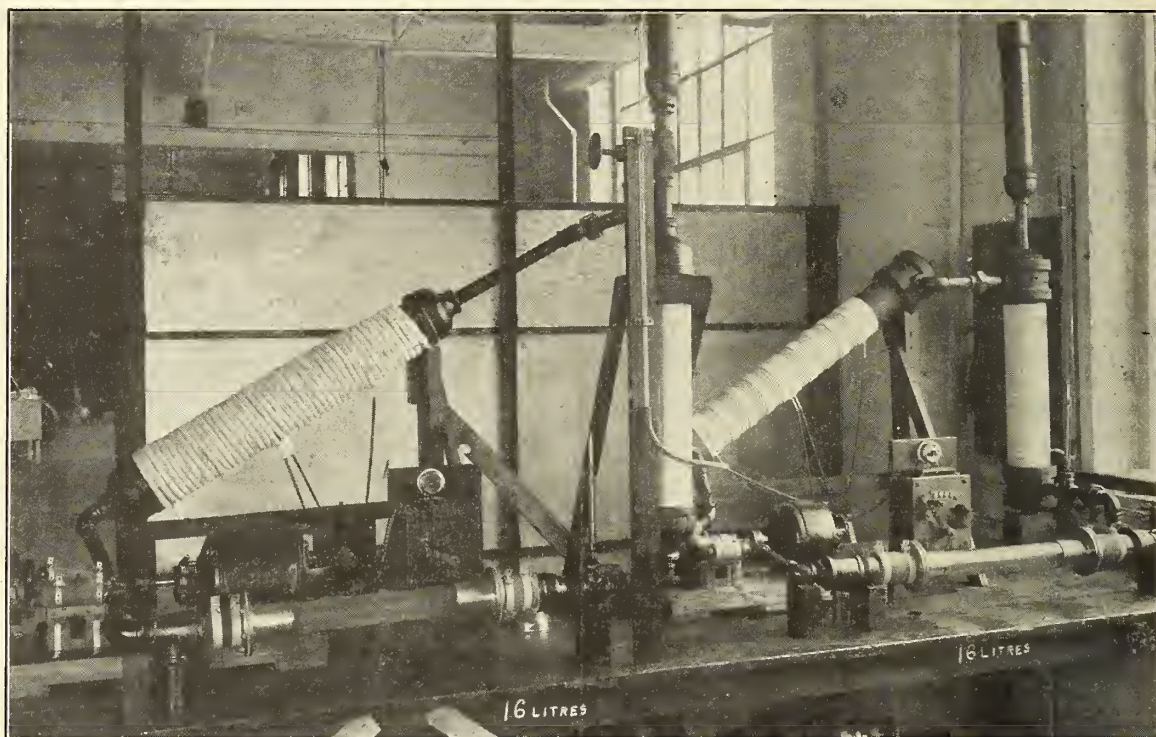
National Bureau of Standards¹ Shows Advantages and Disadvantages of Various Commonly Used Protective Agents

The enormous increase in the number of automobiles operating throughout the winter, brought about largely by the almost general adoption of the closed car, is causing a great demand for antifreeze mixtures to protect cars of the water-cooled type.

During recent years a number of so-called compounds have been placed on the market and, since they are not easily lost by volatilization, they have become

The bureau's investigations of the corrosive effects of various solutions upon the metals commonly employed in radiator construction showed that practically all salt solutions (such as calcium chloride or magnesium chloride) exert appreciable corrosive effect while solutions of organic materials (such as sugar, alcohol, or glycerin) cause no more corrosion than ordinary tap water.

National Bureau of Standards laboratory apparatus simulating the cooling system of water-cooled automobile engine



Laboratory apparatus, simulating the cooling system of a water-cooled automobile engine used in making tests of antifreeze mixtures to determine the corrosive act on of various solutions upon metals commonly used in cooling-system construction is shown in the illustration

increasingly popular and have replaced to some extent the use of the temporary antifreeze solutions. The most commonly used of the "permanent" mixtures are glycerin and ethylene glycol, and these have been thoroughly investigated by the National Bureau of Standards.

The first requirement of an antifreeze solution is that it shall not injure either engine or radiator by freezing at the lowest temperature which may be encountered. To be satisfactory, such a solution should cause no damage to the cooling system through corrosion or solvent action and should circulate freely at the lowest operating temperature.

¹ Letter circular No. 28, Antifreezing Solutions for Automobile Radiators, will be mailed free upon request to the National Bureau of Standards, Washington, D. C.

The most satisfactory antifreeze for automobile radiator use which the bureau has tested are all alcohols. This group includes denatured alcohol, wood alcohol, or menthanol (synthetic wood alcohol), glycerine, and the glycols.

Denatured-alcohol solutions are the most generally used radiator solutions. The chief objection to this alcohol, however, is that it continually boils out of the solution and must be replaced frequently in order to maintain adequate protection against freezing. Another disadvantage in its use is the fact that the boiling points of denatured-alcohol solutions are appreciably lower than the boiling point of water so that average cylinder temperature tend to be lower in winter than in summer. Further criticisms of denatured-alcohol solutions are based on the unpleasant

odor of certain denaturants and the fact that nitrocellulose finishes are particularly likely to become spotted in case alcohol is splashed or spilled on them.

Wood alcohol or methanol solutions are more volatile and have lower boiling points than the corresponding denatured alcohol solutions, thus making most of the objections to denatured alcohol apply with even more force to wood alcohol. On the other hand, about 10 per cent less wood alcohol is required for protection against freezing at any given temperature. Wood alcohol, however, sometimes contains free acid which is objectionable, and for this reason should not be used unless it is known to be free from acids. In addition to its unpleasantness, the fumes from wood alcohol may be harmful.

Glycerin, having a high boiling point and being practically nonvolatile up to the boiling point of its 50 per cent aqueous solution, will last for an entire season without further addition, provided the cooling system is free from leaks. The volume of the solution when cold should be somewhat less than the full radiator capacity, otherwise the expansion of the liquid when heated will cause it to overflow with consequent waste.

If desired, the glycerin solution can be drawn off at the end of the season and saved for further use. The trade-mark "radiator glycerins" are diluted and contain 40 per cent of water. The colorless c. p. (commercially pure) glycerin and commercial grades of yellow distilled glycerin are equally satisfactory for radiator use. Crude glycerin on the contrary is undesirable, as it usually contains salts, which promote corrosion.

The more concentrated glycerin solutions are distinctly more viscous than the corresponding solutions of denatured alcohol at low temperatures. This may be a disadvantage with certain types of cooling systems in very severe climates, but, under average conditions, distilled glycerin appears to be superior to denatured alcohol for radiator use.

The addition of about half a gallon of glycerin and a half gallon of denatured alcohol to water makes a solution which gives slightly more initial protection against freezing than would be obtained by adding a gallon of glycerin or a gallon of alcohol alone.

The customary use of a glycerin-alcohol-water solution has the disadvantage that both alcohol and water will evaporate from such a solution at different rates and it becomes a difficult matter to determine how much of each should be added to replace the evaporated loss. On the other hand, where the winter temperature seldom goes below 0° F. a 35 or 40 per cent glycerin-water solution will ordinarily give adequate protection. In case of exceptional drop in temperature it might be economy to add some alcohol for temporary additional protection rather than to add more glycerin.

Ethylene-glycol solutions give more protection against freezing than either glycerin or denatured alcohol solutions of the same strength. Like glycerin, ethylene glycol is practically nonvolatile at operating temperature and its solutions are noncorrosive. Unlike glycerin, ethylene-glycol solutions are only slightly more viscous at low temperatures than denatured-alcohol solutions of equal concentrations. Hence, solutions of ethylene glycol appear to be superior to denatured-alcohol solutions under all circumstances and, at least for very severe climates, to offer some advantages over distilled glycerin solutions.

Ethylene-glycol solutions can be used for an entire season without further addition of glycol and also may be drawn off at the end of the season and saved for use again. The same precautions mentioned in the case of glycerin should be taken in filling the radiator, otherwise the expansion of the liquid when heated will cause it to overflow. The specific gravity of ethylene glycol is not high enough to necessitate mixing the glycol with water before it is put into the radiator.

Trimethylene-glycol solutions, and diethylene-glycol solutions have also been used in automobile radiators, but neither of these glycols is as effective as ethylene glycol in lowering the freezing point of water. Diethylene glycol resembles denatured alcohol and wood alcohol in attacking nitrocellulose finishes.

It is important in using any antifreeze that the cooling system be absolutely leakproof. Radiator hose, head gaskets, etc., should be perfectly tight before introducing the solution. Next in importance is to use the right amount of the solution in proportion to the capacity of the cooling system.

REVISION OF FEDERAL SPECIFICATIONS

Nineteen Specifications Being Considered for Any Necessary Revision

Nineteen Federal specifications have been submitted for revision during the past month, 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.

New designation	Commodity	F. S. No.
N-B-121.....	Barley, pearl.....	636a.
N-F-451.....	Flour, buckwheat.....	642a.
N-F-461.....	Flour, graham (whole wheat meal).....	643a.
N-H-541.....	Hominy, lye, canned.....	462.
DD-R-51.....	Rags, cotton, mixed (for) wiping machinery (sterilized).....	259b.
EE-Y-131.....	Yeast.....	389.
FF-S-111.....	Screws, wood.....	52a.
HHH-C-571.....	Coffee.....	161b.
HHH-T-91.....	Tea.....	649b.
LLL-T-791.....	Turpentine (gum-spirits of turpentine, steam-distilled wood turpentine, and sulphate wood turpentine).....	7b.
TT-D-651.....	Drier, paint, liquid.....	20a.
TT-T-271.....	Thinner, paint (for) semipaste paints.....	16.
TT-T-291.....	Thinner, paint, volatile mineral spirits.....	17.
TT-V-71.....	Varnish, interior.....	22.
TT-V-121.....	Varnish, spar, water-resisting.....	18b.
ZZ-H-451.....	Hose, fire, cotton, rubber-lined.....	38b.
ZZ-H-481.....	Hose, oil-suction and discharge.....	63c.
-----	Oils, petroleum, crank case (for internal combustion engines other than aircraft and Diesel).....	2d.

TRANSMISSION OF STANDARDIZED WAVES OF RADIO IS IMPROVED

National Bureau of Standards Service Designed to Ultimately Eliminate all Interchannel Interference from "Wobbling"

Starting of a new standard frequency service, designed to ultimately eliminate completely interchannel interference caused by the "wobbling" of radio stations from their assigned channels, and also to serve as a means of control for the synchronization of broadcasting stations, has been announced by the National Bureau of Standards.

The first step in this 3-phase program has been started through the transmission of these standard frequency signals on a weekly schedule from the bureau's station, WWV, in Washington. They can be heard and utilized by stations equipped for continuous-wave reception at distances up to about 1,000 miles from Washington, and some of them at all points in the United States. This improved service is a step in the bureau's program to provide eventually standard frequencies available at all times and at every place in the country.

Besides the usual monthly transmissions of specific frequencies, the bureau will add another type of transmission which will be much more accurate than any previous transmissions by the bureau. This transmission will be by continuous wave radiotelegraphy on a frequency of 5,000 kilocycles, and will consist primarily of a series of very long dashes. The first five minutes of this transmission will consist of the general call (CQ de WWV) and announcement of the frequency. The frequency and the call letters of the station (WWV) will be given every 10 minutes thereafter.

Besides this service, the bureau will also continue the transmissions once a month on scheduled specific frequencies. These are also by continuous-wave radiotelegraphy. A complete frequency transmission includes a "general call," "standard frequency signal," and "announcements." The general call is given at the beginning of each 12-minute period and continues for about two minutes. This includes a statement of the frequency.

The standard frequency signal is a series of very long dashes with the call letters (WWV) intervening. This signal continues for about four minutes. The announcements follow, and contain a statement of the frequency being transmitted and of the next frequency to be transmitted. There is then a 4-minute interval while the transmitting set is adjusted for the next frequency.

Information on how to receive and utilize the signals is given in Bureau of Standards Letter Circular No. 280, which may be obtained by applying to the National Bureau of Standards, Washington, D. C. Even though only a few frequencies are received (or even only a single one) persons can obtain as complete a frequency-meter calibration as desired by the methods of generator harmonics.

The 5,000-kilocycle transmissions are from a transmitter of 150 watts power, which may be increased to

1 kilowatt early in the year; they occur every Tuesday except in those weeks in which the monthly transmissions are given. The monthly transmissions are from a transmitter of $\frac{1}{2}$ to 1 kilowatt power; they are given on the 20th of every month (with one exception).

5,000-kilocycle transmissions

1.30 to 3.30 and 8 to 10 p. m., E. S. T., January 6, 13, 27; February 3, 10, 24; March 3, 10, 24, 31; April 7, 14, 28; May 5, 12, 26; and June 3, 9, 16, 30.

Monthly transmissions

Eastern standard time (p. m.)	Jan. 20	Feb. 20	Mar. 20	Apr. 20	May 20	June 22
10.....	1,600	4,000	550	1,600	4,000	550
10.12.....	1,800	4,400	600	1,800	4,400	600
10.24.....	2,000	4,800	700	2,000	4,800	700
10.36.....	2,400	5,200	800	2,400	5,200	800
10.48.....	2,800	5,800	1,000	2,800	5,800	1,000
11.....	3,200	6,400	1,200	3,200	6,400	1,200
11.12.....	3,600	7,000	1,400	3,600	7,000	1,400
11.24.....	4,000	7,600	1,500	4,000	7,600	1,500

The frequencies in the 5,000-kilocycle transmission are piezo controlled, and are accurate to a few parts in a million. The frequencies in the monthly transmissions are manually controlled, and are accurate to a few parts in a hundred thousand.

In November, 1930, field intensity measurements were made of the 5,000-kilocycle transmissions from WWV on 150 watts between Washington and Chicago. The daytime field intensity up to a distance of about 400 miles from Washington was about 100 microvolts per meter, with fading in the ratio 3 to 1. From this distance to Chicago the field intensity gradually decreased to about 10 microvolts per meter peak values, with fading the same as above.

The evening transmissions had a field intensity of about 200 microvolts per meter, with fading similar to that in the daytime. Around 8 p. m. the received intensity was sometimes too low to measure. This happened at distances of from 75 to 150 miles from Washington.

The National Bureau of Standards would like to have detailed information on the reception of the 5,000-kilocycle transmissions, and will appreciate receiving reports from any observers on their reception of these transmissions. Phenomena of particular interest are approximate field intensity, and fading (whether slow or rapid, and approximate time between peaks of signal intensity).

The bureau would also like to receive comments on whether or not the transmissions are satisfactory for purposes of frequency measurement or control. Reports on the reception of the transmissions should be addressed to the National Bureau of Standards, Washington, D. C.

SIMPLIFICATION OF CONTAINERS AN AID TO DISTRIBUTION

Résumé Given of Simplified Schedules Developed in Container Field Under Auspices of National Bureau of Standards

By W. E. BRAITHWAITE and P. H. H. DUNN, *National Bureau of Standards*

In sounding the keynote of the National Distribution Conference held several years ago, President Hoover, then Secretary of Commerce, said that "the outstanding problem of our distribution system can be easily summarized in one question. Can we reduce the margin between our manufacturers and farming producers on one side and our consumers on the other? I am convinced that we can."

What was true then is even more true to-day. The reduction of manufacturing costs has been given considerable thought during the past decade, and substantial savings have been effected through various waste-elimination efforts. It is said that our profits during the coming decade will be based on the elimination of wastes in distribution.

The process of distribution of commodities, particularly of food products, offers a fertile field for further studies in waste elimination. Many wastes can be overcome by voluntary cooperation between the various elements making up specific industries. This work has been amplified by the extension of friendly assistance by various governmental agencies, notably the Department of Agriculture and the Department of Commerce. No studies of this kind would be complete which did not include a survey of possibilities for the simplification of containers.

In considering such a survey it is important that the unit package be studied first, followed by a study of the shipping container and material handling methods, and finally the means of transportation. While each link in the chain of physical distribution of the commodities should be considered independently, the next closely related aspect should be borne in mind so as to insure proper coordination.

The food-producing and distributing industry is among the largest users of unit packages in the United States. It is estimated that the total annual per capita consumption of canned foods in this country is one can per week, or a total of more than 7,000,000,000 cans a year. This includes only canned fruits, vegetables, meats, fish, and milk. If spices, coffee, etc., packed in cans are included, the above figure would be increased about 50 per cent.

No figures are available on the number of unit packages made up in glass, paper, cardboard, and wood, nor are they necessary in order to appreciate the importance which the unit container and its size must play in such a vast volume of distribution. A simplification in sizes of these containers would eliminate wastes all along the line, from the food manufacturer or canner to the retail distributor and ultimate consumer.

In addition to primary containers, secondary, or shipping containers, must be manufactured in a great variety of dimensions and shapes to meet the requirements of the multitude of sizes and types of unit packages. The shipping container is usually handled by a great many more people than the unit package, and

for this reason deserves thorough consideration in any effort toward waste elimination. The shipping container is dependent not only upon the size of the unit packages which it incloses, but also upon the method of transportation and the handling to which it is subjected.

It can be readily seen, therefore, that simplification of containers should play a significant part in the economical distribution of food. "Simplification" as here used means just what its name implies—rendering more simple the production and distribution operations, through reduction in variety of the sizes, shapes, and types of containers. It is not a complicated operation involving minute studies into the physical make-up and characteristics of containers, but rather a commercial expedient which make it possible to determine "the size in greatest demand," or "the sizes which enjoy only a small demand, and which add to avoidable waste."

Considerable work has already been done by the food-packing industries and the distributors of food products in promoting simplification programs for containers and their is still a great opportunity and need for further work along this line. The following simplified practice recommendations for containers, which have been developed under the cooperative procedure of the division of simplified practice of the National Bureau of Standards, may serve as examples of what can be accomplished in this field.

On September 18, 1928, a simplified practice recommendation was approved at a general conference of representatives of the preserving and glass container industries, held under the auspices of the National Bureau of Standards, which resulted in a reduction from 40 or more different sizes of preserve jars to 8 stock sizes; from 25 or more sizes of jelly glasses to 7; and from 6 sizes of apple butter jars to 4 stock sizes, all based on the avoirdupois weight of the food content. It should be noted that although this simplification program is confined to sizes and capacities, the simplification of sizes based on net contents, automatically eliminates a large number of unnecessary shapes.

Another simplification program of interest to the food-packing industries, is that for ice-cream brick molds and machine-filled cartons. At a general conference held in Washington on December 4, 1929, and attended by representatives of manufacturers of ice cream, cartons, molds, and filling machinery, a simplified set of dimensions was approved for the pint and quart machine-filled cartons and for the 2-gallon ice cream brick mold.

The variety in sizes of molds was reduced from 30 to 1. A survey developed the information that at least 31 different sets of dimensions were being used in manufacturing pint cartons. The same condition prevailed for the quart carton. The following dimensions were approved for adoption as standard: No. 1

U. S. standard machine-filled pint, $3\frac{3}{8}$ by $3\frac{1}{2}$ by $2\frac{11}{16}$ inches; No. 2 U. S. standard machine-filled pint, $2\frac{7}{8}$ by $3\frac{1}{8}$ by $3\frac{11}{16}$ inches; No. 1 U. S. standard machine-filled quart, $2\frac{11}{16}$ by $3\frac{1}{2}$ by $6\frac{1}{4}$ inches; and No. 2 standard machine-filled quart, $2\frac{7}{8}$ by $3\frac{1}{8}$ by $7\frac{3}{4}$ inches.

At the joint request of the National Coffee Roasters' Association and the Paperboard Industries Association a general conference was held in March, 1930, at which time a simplified practice recommendation was approved reducing the dimensions of the 1-pound folding box for coffee from at least 100 sizes to 2 sizes. It is confidently expected by members of the industry that adherence to these two sizes will result in advantages alike to producers, distributors, and consumers.

At a recent general conference of representatives of the milk dealers and glass jar manufacturers, the 8, 12, and 16 ounce jars were adopted as standards for use in marketing cottage cheese and sour cream. The variety of jars was reduced from at least 20 different shapes and sizes to 3. One standard size of cap was approved for the three standard jars.

On December 10, 1930, another general conference was held, at which recommendations were approved concerning a simplified list of shapes and sizes of ice-cream cups.

At a general conference held in Atlantic City on November 10, 1929, the bottlers of carbonated beverages, the manufacturers of bottles, bottling machinery, bottle caps, bottle boxes, crates, etc., approved a simplified list of stock bottles for use in bottling carbonated beverages. The list includes definite capacities, heights, diameters, and weight of glass. Minimum and maximum diameters were adopted for each capacity to allow for distinctive or patented shapes.

At the present time the canning industry, through its national association, is working on a simplified list of can sizes for the packing of fruits and vegetables. This list, if finally approved by the industry as standard practice for the trade, will reduce the large variety in sizes now packed to the 27 set forth in the following table, which shows the diameter and height in inches:

$2\frac{1}{8}$ by $2\frac{7}{8}$.	3 by $3\frac{1}{2}$ by $6\frac{1}{4}$.	$3\frac{7}{8}$ by 4.
$2\frac{1}{8}$ by $3\frac{1}{2}$.	3 by $4\frac{1}{8}$.	$3\frac{7}{8}$ by $4\frac{1}{2}$.
$2\frac{1}{2}$ by $2\frac{11}{16}$.	3 by $4\frac{3}{8}$.	$3\frac{7}{8}$ by $4\frac{3}{4}$.
$2\frac{1}{8}$ by 3.	$3\frac{1}{8}$ by $2\frac{1}{2}$.	$4\frac{1}{8}$ by $2\frac{5}{8}$.
$2\frac{1}{8}$ by $3\frac{1}{4}$.	$3\frac{1}{8}$ by 4.	$4\frac{1}{8}$ by $2\frac{3}{4}$.
$2\frac{1}{8}$ by 4.	$3\frac{1}{8}$ by $4\frac{1}{4}$.	$4\frac{1}{8}$ by $4\frac{1}{4}$.
$2\frac{1}{8}$ by $4\frac{1}{2}$.	$3\frac{3}{8}$ by $4\frac{3}{4}$.	$4\frac{1}{4}$ by $4\frac{7}{8}$.
$2\frac{1}{8}$ by 6.	$3\frac{1}{8}$ by $2\frac{1}{4}$.	$6\frac{7}{8}$ by 7.
3 by $3\frac{1}{2}$ by $3\frac{1}{2}$.	$3\frac{7}{8}$ by $3\frac{1}{8}$.	$6\frac{1}{8}$ by $8\frac{1}{4}$.

In addition to simplifying can sizes, it is the hope of those who are sponsoring the project that a standard system of nomenclature for these sizes of cans will be adopted. It may not appear that, in retaining 27 sizes of cans, the industry has affected a maximum of simplification. However, when it is realized that a study of the industry revealed 64 sizes of cans being used in considerable volume during the year, a reduction to 27 sizes is a substantial first step.

It is expected that these 27 sizes will be submitted to the packers of various fruits and vegetables to ascertain which of the sizes would be the most desirable for the canning of their products. Of course, no one commodity will be packed in all of the proposed 27 sizes, but all the sizes used in the packing of these particular products must be in the simplified list. For example, tomatoes may take 5 of the sizes listed,

asparagus 4, corn 6, etc. Further, it will be possible for the manufacturers of paperboard or wooden shipping containers, used in transporting cans, to adopt a simplified list of over-all dimensions which will adequately serve the needs of the majority of the canners in the country.

In addition to the above examples of simplification programs which have already been developed by the industries concerned, with the cooperation of the division of simplified practice of the National Bureau of Standards, there are a number of food-packing industries now considering the development of simplified practice recommendations for containers used in packing their products. For instance, at the request of the mayonnaise industry, a survey was made recently by the foodstuffs division of the Bureau of Foreign and Domestic Commerce, which showed that mayonnaise was being packed in 22 different sizes of containers. The study further revealed the fact that more than 85 per cent of the volume of production was being packed in 6 of these 22 containers. The Glass Container Committee of the Mayonnaise Products Manufacturers Association of America, submitted a report and recommendation covering the subject of container standardization, at the recent convention of mayonnaise manufacturers.

Other simplification projects have been suggested for such items as shipping boxes for canned foods, cartons and shipping boxes for dried fruits, butter tubs, bottles for maraschino cherries, display cartons and boxes for apples, containers for fish products, and so on.

This résumé of what has been done by the food-packing industries in the interest of waste elimination, through the application of the principles of simplified practice, will no doubt suggest to the reader many more opportunities for simplification of containers. Great potential savings in national effort can be made through such cooperation as has been demonstrated by well-known examples of simplification and standardization. The consequent reduction of manufacturing, selling, and distribution costs, and the release of millions of dollars, formerly tied up in slow-moving stocks, should combine to yield substantial economies.

In recent years the food industry has been looked upon as being more or less "depression proof" because of the constant demand for foodstuffs. However, there are other important factors which make for stabilization in this as well as other industries. To maintain the standing which the food industry has acquired during the past few years it will be increasingly important that more time and thought be given to cost-reducing programs, such as simplification of containers. Such a program, however, need not interfere with the so-called "sales appeal" or distinctive feature of the unit package.

Interest in the package and container simplification movement is now far-reaching and the cooperative procedure of the National Bureau of Standards provides an excellent means whereby packers of food products, the manufacturers of containers, the distributors of food products, the shippers, and carriers may develop and promulgate voluntary simplified practice recommendations for containers.

A. S. T. M. ANNOUNCES TWO NEW VOLUMES OF STANDARDS

Book of its Standards and Tentative Standards Now Being Distributed by the Society

The American Society for Testing Materials has just issued its Book of A. S. T. M. Standards, a triennial publication containing all specifications, methods of testing and definitions fully approved and adopted, and the 1930 Book of A. S. T. M. Tentative Standards, an annual publication, containing those specifications, methods of testing, etc., having a tentative status.

The Book of A. S. T. M. Standards is published in two parts, Part I on Metals (1,000 pages) containing the standards relating to metallic materials, and Part II on Nonmetals (1,214 pages) containing standards covering nonmetallic materials.

Of the 179 standards on metals published in Part I, 105 cover the ferrous metals, steel, cast iron, wrought iron, alloy steel, and ferro-alloys, and 67 relate to the nonferrous metals, nickel, copper, aluminum, etc., and many alloys, while 7 are of general interest.

The standards in Part I, assembled in a sequence determined by the specific materials or products to which they apply, cover steel rails and accessories; wheels and tires; structural and boiler steels; steel for welding; concrete reinforcement steel; bar steels; spring steel and springs; steel castings, chain, forgings and axles; steel tubes and pipe; tool steel, steel for high-temperature service; zinc-coated wire and wire products; wrought-iron bars, castings, plates and pipe; pig iron; cast iron and finished castings; malleable castings; and ferro-alloys.

The specifications in the nonferrous group cover ingot copper, zinc, lead, nickel, aluminum and aluminum alloys, copper wire and cable, brasses and bronzes, solder metal, white metal bearing alloys, copper and brass plates and tubes. Methods are also included for Brinell hardness tests, metallographic testing, preparation of micrographs for metals and alloys and a recommended practice for radiographic testing of metal castings. Definitions of terms relating to wrought iron, to methods of testing to metallography and to specific gravity are also included.

New standard specifications were adopted during 1930 for steel tie plates, iron and steel chain, gray-iron castings for valves, seamless copper tubing, bronze and hard-drawn copper trolley wire; several specifications for galvanized wire and wire products and specifications for zinc (hot galvanized) coatings on structural steel shapes and plates.

Included in addition to these specifications are new standard methods of sampling rolled and forged steel products for check analysis and test methods for galvanized wire and wire products and a test for change of resistance with temperature of electrical heating materials. Standard specifications for open-hearth steel rails, concrete reinforcement bars, steel pipe and boiler tubes, hot-rolled bar steels and cold-finished shafting, malleable castings and wrought iron bars, plates, and pipe that were revised during the year have also been included.

Part II. The 251 standards in Part II cover the following miscellaneous groups of nonmetallic mate-

rials and products: Cement, lime, gypsum, concrete and concrete aggregates, brick and refractories, pipe and drain tile, hollow building tile, paints, pigments, shellac, varnishes, petroleum products and lubricants, bituminous and nonbituminous road materials, coal and coke, timber and timber preservatives, waterproofing and roofing materials, insulating materials and rubber products, textile materials, and thermometers for general use.

Included in this volume are new standards adopted during 1930 comprising specifications for paving and building brick, sand-lime brick, wall, floor, and partition hollow clay tile, Keene's cement and gypsum plasters, gravel for bituminous concrete, several specifications for tar cements for road application, tolerances for cord-tire fabrics, and fabrics other than tire cord, methods of testing concrete aggregates, gypsum and gypsum products, analysis for color of paints, tests for sulphur in gasoline, melting point of petrolatum, test for autogenous ignition temperatures of petroleum products, mechanical analysis of coal and test methods for electrical porcelain. The specifications for Portland cement revised to include higher tensile strength requirements and the methods of testing cement changed by the inclusion of tolerances on weights and dimensions of apparatus are also included. Of particular interest are the revised standard specifications for structural wood, joist and planks, beams and stringers, posts and timbers.

Book of tentative standards.

The Book of Tentative Standards (864 pages) contains 155 tentative specifications, methods of test, definitions of terms, and recommended practices, 28 relating to metals and 127 to nonmetallic materials and products. The tentative standards are issued for one or more years with a view to obtaining criticism. Although in the trial stage of A. S. T. M. procedure, they represent the latest thoughts of the committees on the subjects covered and are, therefore, being applied in the various industries. Many of the tentative standards are frequently used in conjunction with the A. S. T. M. standards.

Included in this volume are 21 new tentative standards developed during 1930. In the metals group are new specifications for austenitic manganese-steel castings, open-hearth iron plates, aluminum alloy (duralumin) sheet, aluminum-manganese alloy sheet and magnesium-base alloy castings, aluminum-base alloy castings and ingots, and copper-base alloys in ingot form and a method of test for thermoelectric power.

A specification for high-early strength Portland cement is an important contribution to the construction field, as are also new specifications for reinforced-concrete pipe and reinforced-concrete culvert pipe, and specifications for gypsum sheathing board and timber piles, and glazier's putty and test methods for natural building stone, and a flexure test for concrete.

Of interest in the automotive field is the test for dilution of crank-case oil and a test for vapor pressure

of natural gasoline. A test method is also included for comparing the thermal conductivities of solid electrical insulating materials. New tentative specifications have also been developed for several lacquer solvents and diluents, namely, amyl acetate, amyl alcohol, butyl propionate and ethyl lactate. Revisions were also made in 25 of the tentative standards developed in former years in order to keep them abreast of current practice.

An index (110 pages) of all A. S. T. M. standards and tentative standards has been prepared and is being distributed without charge. The index is a compilation, under appropriate key-word subjects covered by

the standards, of titles of all standards, together with volume references to the publications in which they appear, namely Parts I and II of the 1930 Book of the A. S. T. M. Standards and 1930 Book of A. S. T. M. Tentative Standards, and the annual proceedings.

The index is designed to be of service to those familiar with the society's standards in locating specifications, methods of test, or definitions in the bound publications in which they appear, and as well, to those interested in ascertaining whether the society has issued any standards on a specific subject. The index will be found of great assistance in locating desired references.

HAZARDS OF ELECTRICITY

Committee of National Safety Council Investigates Accidents at Low Voltages

"Kill the circuit lest the circuit kill you" has been suggested as a slogan for the electricians of industrial plants by a representative committee which has been investigating accidents which occur at ordinary voltages and which presented its report at the last Annual Safety Congress.

Both the National Safety Council and the National Electric Light Association have been collecting reports of fatal accidents during recent years, and these accidents have been analyzed by the committee. Only accidents occurring at low voltages have been included in this report. By "low voltage" is meant something less than 750 volts. This, consequently, includes the voltage of the ordinary street-car trolley circuit, the voltage commonly used for electric lighting, and also the voltages used in industrial work, such as 220 or 440 volts.

Only fatal accidents were considered by the committee which analyzed 213 such cases, of which 132 occurred at not more than 120 volts. These cases were classified as industrial or domestic, and they were also classified according to the conditions of installation and use.

Combining the two sets of records given in the report, the following table is found for fatal accidents where not more than 240 volts was involved.

Classification by location

Industrial locations:	
Portable cords and lamps.....	38
Portable appliances.....	14
Exposed wires.....	26
Exposed switch.....	3
Ungrounded parts.....	3
Working with parts alive.....	13
Miscellaneous.....	8
	105
Bathtub cases.....	23
Other portable appliances.....	6
Wet basements or earth.....	22
Miscellaneous.....	17
	68
Other locations.....	14
Total.....	187

Classification according to conditions

Involving defective equipment.....	80
Equipment damaged at time of accident.....	11
Involving code violation.....	14
Exposed wires.....	27
Handling live parts.....	19
Aerials and other amateur.....	9
Other improper procedure.....	16
Not otherwise classified.....	11

187

The largest group of industrial fatalities are those resulting from the use of portable lamps and extension cords. In some cases a brass-shell socket has been used and has become alive; in other cases the cord has become worn until it exposes the conductor to contact. Most of these cases arise where the victim is standing upon the ground or some wet surface; where he is working inside of a boiler, or some similar job which affords a good connection to ground under conditions where the victim's hands are liable to be wet with moisture or perspiration.

The second largest item in the industrial group is exposed wires. Many of these involve traveling cranes, and only two were on lighting circuits.

Repair or maintenance work carried on without first killing the circuit is responsible for 13 deaths.

A dozen years ago the exposed switch was causing frequent fatalities. This condition has been largely remedied, and only three cases are recorded here.

In three other cases failure to ground equipment as called for by the two national codes was responsible for a fatality. In two of these cases wet floors were involved, and in the third a water pipe. One was at 110 volts. These show clearly the conditions which make grounding important—dampness, plumbing, any voltage higher than lighting circuits.

Of the domestic cases, those involving the bathtub head the list. Most of these cases involve the use of electric heaters, the insulation of which or of the connecting cord is defective and which is handled with wet hands. In one case a curling iron provided the

contact with the circuit. Portable appliances in other locations account for six more fatalities. Two of these occurred in bed. In one case an electric heater set fire to the bedclothes and burned a child fatally. In the other case a man was found dead with an electric blanket wrapped around him and wet with perspiration.

Twenty-two other fatalities were due to contact with live parts while in wet basements or on the ground. All of the domestic fatalities occurred at approximately 110 volts.

Conclusions.

At least one-third of the fatalities may be attributed to defective materials, such as lamp cord not properly maintained, and an additional 5 to 12 per cent are due to installations not in accordance with standard practice as represented by the National Electrical Code. Ten to fifteen per cent of the fatalities are due to handling live parts and about 8 per cent more to improper practices, from which are excluded the ignorant handling of radio aerials and a few disastrous amateur experiments.

Let us now consider how many of these accidents could have been avoided. In the first place, a goodly percentage would not have occurred if proper forms of extension cord had been used and had been properly maintained; that is to say, cords replaced when they become worn to the point of exposing the conductors. We can not too strongly urge that both for industrial use and also for domestic use where wet locations are involved, only a sturdy portable cord, such as type S, should be used, and when used with an extension lamp a guard should be furnished around the lamp.

We strongly recommend also the grounding of portable devices of all kinds and at all voltages when used in wet locations. Portable motor-driven appliances operated at more than 150 volts, as commonly found in industrial plants, are required to have their frames grounded by a rule of the National Electrical Code. When used in wet places we consider it desirable to ground them even at lower voltages.

In industrial plants emphasis should be placed upon the practice of killing circuits before work is done upon them, even when the voltage is low, as with lighting circuits. Unless this practice is followed, workmen are likely to handle live parts in wet locations or under other conditions where the hazards are greatly increased, yet are not generally appreciated. It is especially desirable that when work is done directly upon the ground, as, for instance, underneath the cellarless house, so common in the South, switches should be first opened to kill any circuits worked upon, and moreover the extension cords used should be of the type referred to above, which are especially approved for such conditions. Too much emphasis can not be placed upon the statement that in wet places live parts must not be touched, nor, indeed, should any parts be touched that may become alive due to defective insulation or other cause. It would seem that in wet places the frames of all fixed and semiportable equipment should be grounded regardless of voltage. This is a good practice to follow with such apparatus as washing machines used in the household as well as the equipment used in industrial establishments.

It is evident to members of the committee that a large majority of the low-voltage fatalities could be avoided by proper precautions; that is, by the use of the most suitable materials available for the purpose, installation according to code rules, and the precaution of killing circuits before working upon them. Unfortunately it is not generally recognized that a real hazard exists from low voltages under those conditions which are particularly favorable to shock, such as standing on wet or metal surfaces and touching conductors with wet skin. The necessity for taking additional precautions under such conditions needs to be broadcast both in the industrial plant and in the home.

Electrical fatalities are not large when compared with those arising from motor-vehicle traffic, from the handling of materials, in building construction, and other specially hazardous occupations. We do not want, however, to sacrifice even a single life when such sacrifice can be avoided, and we realize that many of the cases here under consideration can be avoided by disseminating the information which will lead to proper precautions being taken.

STANDARDIZATION MOVEMENT PROGRESS IN FRANCE

Five Committees Report on Their Activities

Five committees, appointed by the Machinery Standardization Commission of France, have reported the results of their October session, according to word received from American Trade Commissioner Thomas Butts at Paris. Commissioner Butts states that the next International Standards Conference will be held in Copenhagen, Denmark, May 4 to 16, 1931, with the following commodities listed on the agenda: Iron and steel, fittings, technical drawings, aeronautics, rivets, screws and bolts, and ball bearings.

The committee on screw threads has prepared for final publication a specification relating to bolt holes. Other standards in preparation by this committee include threads of less than 3 mm, and bolt and screw head sizes.

The committee on small tools has prepared for final publication standards for double-tooth milling machines and keyway milling machines, to correspond with standards Nos. C.N.M. 62 and 63 for keyways.

The committee on distinguishing markings on drills has recommended that no system showing whether drills are made of carbon steel or high-speed steel be established unless it includes marks of origin.

The committee on machine elements has defined the dimensions of large and small chains on hoisting equipment. It has also completed, in collaboration with the association of manufacturers of transmission equipment, standards for transmission keys, coupling boxes, and bearings.

The committee on technical drawings has prepared for final publication a standard for the symbolic representation of rivets. It has also agreed upon the colors to be employed in the standard "canalization colors" and standard sizes for paper used for technical drawings, which is 310 by 297 mm.

NEW SPECIFICATIONS FOR GASOLINE ADOPTED

New Natural Gasoline Specifications, as Adopted by the Natural Gasoline Association, to Become Effective in 1932

New specifications for the grading of natural gasoline have been adopted by the Natural Gasoline Association of America. The new specifications will become effective on January 1, 1932, but are optional in use during 1931.

The new specifications were designed to enable the refiner to buy blending stock with far greater accuracy than in the past. Knowing the volatility characteristics of his straight-run product the refiner will be able to order exactly the grade of natural gasoline which will give him maximum volatility with freedom from vapor lock with a minimum blending requirement. Present specifications permit a wide variation in natural gasoline within a given specification.

The specifications committee of the association has been working on the new grading for more than a year. It has conducted a good deal of research, and has consulted with refiners in all parts of the country as to what they would like to have in the way of specification buying guides.

The fact that the new specifications will not become effective until the beginning of 1932 means that for 1931 both the old and the new grading systems will be in effect, and their use will be optional. The association's board of directors, however, thinks the new ones will supersede steadily the old ones as the industry becomes more familiar with them and recognizes their superiority.

The board hopes that the old system will have faded from the picture before the end of 1931, and that the new specifications will have become firmly established by the time they become official.

The change from the old to the new grading system involves primarily the specifications defining the volatility of natural gasoline. The new system makes use of the Reid vapor pressure, the A. S. T. M. per cent evaporated at 140° F. and the 90 per cent evaporated at 275° F. The old grading system made use of gravity and distillation loss for this purpose. A few minor changes were made in other specifications in the interest of standardization.

SIMPLIFIED SCHEDULE PROPOSED FOR DENTAL LATHE GRINDING WHEELS

General Conference of Industry to Meet in June to Consider Proposed Simplified Practice Recommendation

Ten sizes of dental lathe grinding wheels for regular stock production, instead of the 80 sizes produced during past years, are provided in a tentative simplified schedule proposed by the American Dental Trade Association. The proposal covers a range of sizes from 1½ inches diameter by ¼ inch thickness to 3 inches diameter by ½ inch thickness, and stipulates that wheels be square-edged and have ¼-inch arbor holes.

At the request of the industry, the National Bureau of Standards, through its division of simplified practice, made a survey to determine the extent of diversification in production of this commodity. The report of survey by the bureau, which was submitted to the manufacturers, was used as the basis for development of the proposed simplified schedule. The simplification and standardization committee of the American Dental Trade Association met November 20, 1930, in Chicago, Ill., at which time the tentative proposal was considered.

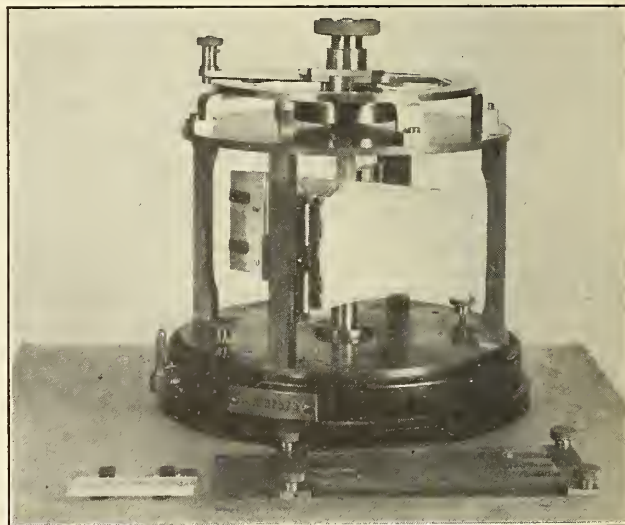
The committee of the industry has given no consideration at this time to abrasive grain size, and all sizes of wheels will be manufactured, as heretofore, in grain sizes ranging from coarse to fine. The current simplified-practice recommendation for abrasive grain sizes (S. P. R. No. 118), will afford the industry a basis for grain classification should it be found desirable.

The association's committee has asked the cooperative services of the National Bureau of Standards in arranging a general conference of all interested ele-

ments of the industry to consider the tentative recommendation. This conference will be held at White Sulphur Springs, W. Va., next June, on the occasion of the annual convention of the American Dental Trade Association.

NEW TESTING INSTRUMENT FOR CLOTH

The device shown above, developed and used by the National Bureau of Standards, is employed in determining the stiffness and resilience of samples of cloth,



these qualities being factors affecting drape. In the tests, each sample is mounted on the ends of two intersecting plates, one of which is movable. A calibrated spring measures the force required to fold the sample. This device is called a "flexometer."

BRITISH ASSOCIATION ANNOUNCES NEW STANDARDS

Items Covered Are Attachment of Circular Metal-Cutting Saws for Cold-Working, Short Link Wrought-Iron Crane Chain, Wrought Light Aluminum Alloy Sheets and Strips, and Wrought Light Aluminum Alloy Tubes

Five standard dimensions for circular saws are provided for the British industries by a new standard covering the attachment of circular metal cutting saws for cold-working, according to an announcement of the British Engineering Standards Association. The association's announcement also includes data respecting standards for short link wrought-iron crane chain, and wrought light aluminum alloy sheets and strips, and wrought light aluminum alloy tubes.

The specification for the saws relates to dimensions of the center hole and arrangement of the pinholes by which circular saws are fixed to the sawing machine, thus securing interchangeability of saws. Saws from 10 to 60 inches in diameter have been grouped into five standard ranges of diameter and for each the center hole, number of pins, and the pitch circle of the pins are given.

The standard for short-link wrought-iron crane chain provides for the supply of crane chain from $\frac{5}{16}$ inch up to $1\frac{1}{2}$ inches of two qualities, "standard" and "special." The former covers normal supplies and the latter is intended for particularly arduous service, such as for shoveling, or in conditions where

public safety is of paramount importance, such as for use on a crane in use on building work adjacent to a public thoroughfare. Requirements are laid down covering the quality of material, dimensions or links, workmanship, and weight. Testing requirements are included covering the mechanical properties of the chain, such as strength and elongation and also to ascertain the quality of the material used in the manufacture of the chain. An appendix is added to indicate the requirements which must be satisfied with regard to the type of testing machine used.

The specifications for wrought light aluminum alloy sheets and strips, and for wrought light aluminum alloy tubes, set out the chemical composition of the alloy, and provide for the taking of samples for an analysis; the heat-treated condition in which the sheets, strips, and tubes are to be supplied is given; tolerances on the thicknesses of the tubes are stipulated; while the physical properties are defined by tensile tests, the procedure for selecting and preparing the material for test being detailed. In an appendix to the standards are given notes on the heat treatment of wrought light aluminum alloy.

UNIFORM STANDARD LOG RULE FOR TIMBER

On Rule Should Replace Variety Now in Use

By ALLEN W. CORWIN, *County Sealer of Weights and Measures, Wellsville, N. Y.*

In the sale of "saw logs" it is often desirable to sell the logs by "board-foot" measurement before the logs are sawed into lumber, the board foot being the common unit of measurement for lumber and representing a section of board 1 foot square by 1 inch thick. For this purpose a scale or rule is used, called a log rule. By measuring the diameter and length and making proper allowance for defects, the number of board feet in the log is determined, and payment is made by this measurement. This system is also used for estimating the quantity of standing timber.

There are more than 50 different log rules in this country showing widely different readings. Some rules are quite accurate and fair, while others like the "Doyle" are very inaccurate, as lumber is now sawed, and especially unfair to the seller of small logs, although having quite a wide use.

Comparison of log rules.

Log rule	Log 12 feet long, 12 inches diameter	Log 16 feet long, 8 inches diameter
	Board feet	Board feet
Maine or Holland.....	78	44
Vermont State.....	72	44
International.....	70	40
Wisconsin State.....	60	30
Scribner.....	59	25
Doyle.....	48	16

Some of the advantages of having a uniform standard log rule are:

1. The adoption of a standard log rule would no doubt result in the selection of an accurate rule and eliminate the unfairness now existing in sections where inaccurate rules are in use. This would prevent losses of millions of dollars to sellers of small logs that have been caused by the use of unfair rules.

2. Estimates of reforestation projects and other standing timber would be uniform; as it is now, some States using log rules of very low readings on small logs and others using quite accurate rules, the estimates of the same quantity of timber might differ by as much as 100 per cent.

3. It would prevent disagreements and litigation caused by the use of different log rules. Often the buyer uses one rule and the seller another, each claiming the correctness for his own favorite log rule.

Views of Chapman quoted.

In his book, *Forest Mensuration*, H. H. Chapman, of the Yale School of Forestry, said, in the chapter on Choice of a Board-Foot Log Rule for a Universal Standard, that—

The Doyle rule must be rejected because of its glaring inconsistencies and the Doyle-Scribner rule, because it combines the worst features of both rules. The use of the Maine and the Spaulding rules is confined to single States, and the Massachusetts rule is for a special form of product; that is, round-edged timber.

This leaves the Scribner, preferably in Decimal C form, as the only logical rule now in wide use, which is applicable to the measurement of square-edged lumber. If the admitted irregularities of the Scribner rule are deemed so serious as to justify its rejection, its successor should not be chosen from among the other rules in common use, but should be a rule based on a formula and tested to conform to actual conditions of sawing. For this purpose, the International $\frac{1}{4}$ -inch rule is probably as perfect a rule as will ever be required in commerce. This rule is especially valuable for logs below 12 inches and above 28 inches, in which classes the Scribner rule is defective. There is nothing to be gained by further efforts to construct new "perfect" log rules.

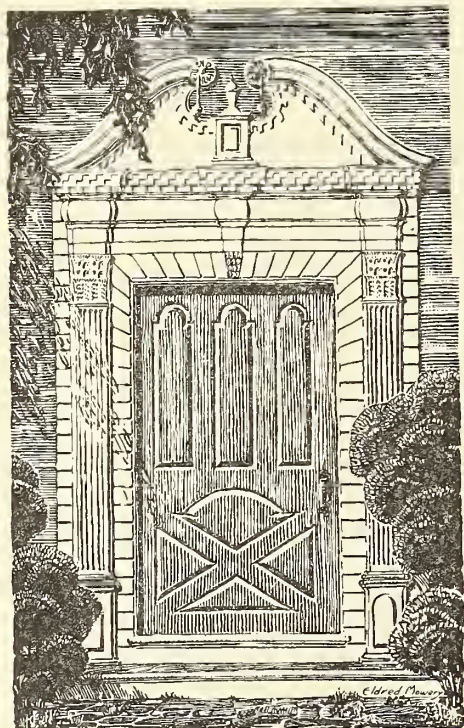
The Federal Land Bank of Springfield, Mass., after an investigation of practically all log rules, found the International to be, by far, the most accurate, and adopted it for use in their work covering several States. New York State, in an effort to correct the

unfairness and dissatisfaction caused by the use of log rules of widely different readings, has recently enacted a law making the International $\frac{1}{4}$ -inch kerf log rule the standard for use in that State.

The International $\frac{1}{4}$ -inch kerf log rule is a comparatively new rule, developed in 1917 by Judson F. Clark from his International $\frac{1}{8}$ -inch rule produced in 1900. The $\frac{1}{8}$ -inch rule would be open to objection for general adoption as it would overscale the product of most small mills. This International rule is considered by authorities to be one of the most accurate log rules, being formed from a scientific formula which is accurate for all sizes and lengths of logs, and checks very closely with the actual mill tallies. It does not make the largest scale of any rule, as shown by the tables, but is fair to both the buyer and the seller.

HOW TO JUDGE A HOUSE

"How to Judge a House" is the name of a new 84-page book intended for the prospective home buyer, just announced by the National Committee on Wood Utilization of the Department of Commerce. The book is written in light, readable style, and takes the



HOW TO JUDGE A HOUSE

prospective home buyer on a tour of inspection throughout the house—from basement to attic. Every important feature of construction and design is treated in pointing out in each instance how to judge the workmanship and materials. A special feature of the book is the fact that it sets forth short cuts to economy without sacrificing good construction and

design. The book may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents a copy.

OPTICAL EQUIPMENT IMPROVED

New Laboratory to Permit Greater Precision

The production of more accurate lenses and other optical surfaces will be made possible by the completion early in this year of a new underground laboratory at the National Bureau of Standards.

The making of fine lenses, mirrors, prisms, flats, and other surfaces demands the best temperature control of the production process and the most accurate measurements. In an astronomical telescope, for example, the surfaces (usually four in number) of the lens must not depart from the true curves worked out for them mathematically by more than five or six millionths of an inch.

The high degree of precision required for first-class optical surfaces can not be imparted to the glass by machinery; the final "figuring," as it is called, must be done by hand. Comparatively few people possess the manual skill necessary for such work, and even the expert optician is at a great disadvantage unless provided with proper equipment and surroundings. Freedom from vibration and from temperature changes in the laboratory are essential.

For more than 10 years the opticians at the National Bureau of Standards have labored under a considerable handicap in producing the optical parts needed in the bureau's work. The optical shop has been situated in the industrial building, a structure of factory type, subject to vibration, dust, and marked temperature changes. For the most exacting optical work, a room 24 feet long, 17 feet wide and 12 feet high, has now been excavated from the east end of the South Building. This has involved some difficulties in cutting through heavy brick and concrete walls with the minimum disturbance to other work going on in the building, but when completed, the new room will provide the bureau with an excellent optical workshop and testing space.

UNFAIR COMPETITION OF SUBSTANDARD GOODS

Marketing Substandard Goods, Not Identified as Such, Exerts a Demoralizing Influence

In an address delivered at the organization meeting of the Broom Institute, Washington, D. C., January 14, 1930, A. F. Allison, president of the National Standards Council (Inc.), called attention to the need for a certification label, tag, or mark attached to each article in a form to insure easy identification at the time purchase is made by the consumer-buyer.

In order to show that standardization is not a new or untried idea, Mr. Allison said that over 250 years ago Sir Josiah Child, a London merchant, writing in the year 1665, gave as one of the important reasons why the Dutch were then successfully challenging British trade supremacy: "Their exact making, whose standards are so well known that merchants will buy without opening."

What is standardization? The dictionary tells us that to standardize is: "To determine the strength, scale value, etc., by comparison with some standard." This definition does not make uniformity a requirement of standardization. Comparison is the important factor, and comparison is, of course, impossible without some basis of measurement or description.

The three blind men who went to "see" the elephant, one feeling only the elephant's trunk, another only the elephant's legs, and the third, the elephant's tail, each describing the elephant later as he "saw" it, were no wider of the mark than many a consumer-buyer to-day trying to arrive at a sensible basis for selection and purchase of commodities.

Elephants need not be uniform in color, or in size, but every elephant has certain standard characteristics. If you know the standard description of an elephant, you will not be fooled into buying a rabbit, thinking you've got a bargain elephant.

Purpose of standardization.

There has been a good deal of misunderstanding and misinterpretation of the meaning and practical purpose of standardization, as applied to consumer-goods, which are commodities, such as brooms, blankets, garments, etc., ready for consumer use.

Standardization, as we are now applying the term, simply is a method whereby merchandise can be broadly graded into two classifications—standard and substandard. It should not and does not imply that all standard goods shall be made exactly alike. It does establish a broad specification or description which represents a minimum standard and goods that do not equal or exceed these minimum specifications, are substandard.

In an interview published by the New York Times November 23, 1930, Mr. Allison said:

Taking the majority of lines of merchandise sold over the retail counter to consumers, it is probable that in no case is the percentage of substandard goods less than 10 per cent of the total, and from this the percentage may easily run as high as 60 per cent. * * * The sale of substandard goods, not identified as such when offered to the consumer, not only displaces an approximately equal volume of legitimate merchandise but also exerts a tremendously depressing influence upon

marketing conditions involving all the many varieties of unfair competition.

Since the appearance of this interview in the New York Times, comments heard from many manufacturers, retailers, and consumers agree with his estimates as to the volume and marketing effect of substandard goods. Several of Mr. Allison's correspondents say that, in their judgment, few industries would show a percentage of less than 35 per cent substandard goods.

Overproduction.

Overproduction, in many industries, is frequently said to be the cause of bad business conditions. Whenever there is evidence of strong, sustained demand for any article, manufacturers in that line increase their production, and new factories are equipped and soon add to the available supply. As production begins to overtake the demand, competition grows keener, price reductions are made to maintain volume, sharp practices become the rule instead of the exception, and down goes the market into the quicksands of fake values and fake goods.

The broom industry, like many others, to-day faces a general condition of this kind. Yet, in all probability, if the entire market for brooms could be surveyed, and if an analysis could be made showing exactly the number of dozens of each type of broom required to meet the present demand, the production of brooms of standard or better than standard quality would prove to be less than 60 per cent of the total requirements. In other words, substandard brooms sold because falsely represented, have absorbed fully 40 per cent of the market which should be open to the manufacturers making brooms of at least minimum standard quality.

Destructive competition.

There can be no stabilization of market conditions in an industry as long as it permits the substandard producers to operate without check or hindrance.

Destructive competition is a disease that spreads without effective resistance throughout an industry which has failed to establish the protection of nationally recognized standards for its goods.

There are many practical reasons to appreciate the possibilities and necessity for a standardization program in the broom industry. Among other statements made to Mr. Allison repeatedly by a dozen or more representative broom manufacturers are the following: (1) Your factory capacity is greater than present demand; (2) you have an intolerable burden of prison competition, which represents about one-third your total production; (3) the percentage of substandard brooms made and sold is steadily increasing, and as volume of substandard goods goes up, your earnings go down; and (4) speculative purchases of raw materials no longer offer you good opportunities to maintain earnings to offset decline in manufacturing profit.

The problems of the broom industry are not unique. Many other industries are facing exactly the same

conditions, and standardization is rapidly being accepted by practically all industries as the one best way to overcome many of their long-standing difficulties. There has been a great deal of research work, and much progress made in the field of standardization. This has all been constructive and valuable, but, particularly in respect to consumer goods, standardization programs have not yet been made fully effective. For several years, the problem of how best to make standardization reach the consumer, and thereby benefit the competent manufacturer and distributor, has been the subject of careful study and analysis.

"A new broom sweeps clean."

Mr. Allison said:

No broom manufacturer has ever claimed credit for inventing the old but always good slogan, "A new broom sweeps clean." But they have not hesitated to use it, and very properly so, as good slogans, like all good ideas, are at their best when kept busy.

In this meeting to-day you have a fine opportunity to apply your slogan to your own activity. Organize your Broom Institute with its broom standards—that's your "new broom" for the job you have to do in cleaning up your industry. Sweep out the dirt and dust, and the cobwebs spun by the spiders of suspicion and misrepresentation, and let in the sunshine of progress and prosperity.

STANDARDIZATION BRIEFS

Gas thermometer.—A gas thermometer is being built at the National Bureau of Standards for the establishment of a scale of temperatures to -259° . At present the International Temperature Scale extends only to liquid-air temperature (-190°).

Dry-cleaning solvent.—Specifications for dry-cleaning solvent and for glycerin for use in the manufacture of explosives and for industrial uses have been submitted by the Federal Specifications Board for adoption and promulgation.

Laundry soap.—A revision of Federal Specification P-S-591 (original No. 32) for ordinary laundry soap has been submitted to the Federal Specifications Board for adoption and promulgation. This revision involves changes in form and in the method of sampling, and contains a provision regarding the odor of the material.

Inspecting farm products.—In growing and packing farm products that are put up according to grade standards, William B. Duryee, secretary, department of agriculture of the State of New Jersey, suggested the need for inspection by a disinterested agency, to see that these products conform to the prescribed and advertised standards.

Bronze screwed fittings.—The Manufacturers' Standardization Society of the valve and fittings industry has recently issued the 1930 edition of its standard covering bronze screwed fittings for 125-pound steam pressure. The society has also issued a new standard covering bronze screwed fittings for 250-pound steam pressure.

Oversize cooling coils.—Oversize cooling coils should be used in commercial installation wherever air circulation will permit. The larger the vertical surface area on the cooling coil, the higher the temperature at which the coil may be operated, thus minimizing the formation of frost which decreases the cooling efficiency.

Industrial codes.—Industrial codes are formulated in Massachusetts by the department of labor and industries. One of the duties of the department is to investigate hazardous conditions affecting the health and safety of employees, and to establish reasonable rules and regulations for the protection of employees against such hazards.

Platinum resistance thermometer.—The platinum resistance thermometer, which is the basis for the International Temperature Scale for the measurement of low temperatures and the generally used thermocouple, is a special type that is being investigated at the National Bureau of Standards in an effort to determine and extend the limits of accuracy in the measurements of low temperatures.

Measuring pulsating gas flows.—On December 16, 1930, a meeting was held at the National Bureau of Standards in cooperation with the American Gas Association to discuss the plans for taking up the problem of measuring pulsating gas flows. The study of this problem will aid those making measurements of gas to obtain a greater degree of certainty in their measurements.

Optically plane surfaces.—The optical shop of the National Bureau of Standards has recently completed three optically plane surfaces on fused silica which are 6 inches in diameter and which do not depart from a true plane by more than three 10-millionths of an inch. Such precision surfaces are necessary for the calibration of end gages to be used in the production of interchangeable parts.

Stainless steel.—With the widely increasing use of stainless steel, especially for architectural purposes, the question of how the corrosion-resistant properties shall be determined in the laboratory for specification purposes becomes an important one. The National Bureau of Standards is cooperating with the American Society for Testing Materials, through Committee A-10 in the study of a number of commercial tests intended for this use.

Uniform bathing rules.—To promote greater sanitation in bathing pools, the Ohio State Health Department has suggested uniform regulations governing public swimming pools for adoption by the general health districts of Ohio. Included in the proposed uniform rules is a proviso that no public swimming pool shall be constructed, or changes made in an existing pool, until the plans have been approved by the board of health and a permit issued.

Standard hose couplings.—The rubber products committee of the Federal Specifications Board is preparing specifications for standard hose couplings for use in connection with various types of rubber hose that are required by Government departments. The committee, in cooperation with hose and coupling manufacturers, has formulated proposed requirements for steam and water hose couplings, and these specifications are now being reviewed by the Government agencies and by manufacturers.

Standard solvent.—As a result of a recent survey among the manufacturers to determine adherence to the Commercial Standard for Stoddard Solvent, CS3-28, a summarized report was issued on December 18, 1930, indicating that among reporting manufacturers 80.8 per cent of production conformed to the requirements of the standard. In accordance with the recommendation of the standing committee, the existing standard was reaffirmed, without change, for another year beginning March 1, 1931.

Cleansing materials.—Revised specifications for 13 types of cleaning materials have been submitted to the Federal Specifications Board for adoption and promulgation. These specifications were formulated by a technical committee from the Government personnel, with a member of the National Bureau of Standards staff as chairman. The original specifications were issued as Bureau of Standards Circulars Nos. 123, 124, 125, 126, 127, 128, 130, 132, 193, 194, 195, 369, and 370.

Classification of screw-thread gages.—The classification of screw-thread gages into classes X, Y, and Z in the 1928 Report of the National Screw Thread Commission has been the subject of criticism at various times. As a basis for developing a new classification, a comparison of various proposals has been prepared by the National Bureau of Standards and issued as N. S. T. C. No. 150 of the National Screw Thread Commission, entitled "Thread Gage Classification and Ratio of Maximum Gage Decrement to Product Tolerance."

Dry cells and batteries.—The new American Standard for dry cells and batteries which was approved by the American Standards Association on September 9, 1930, has now been issued in printed form by the association. It is designated by the number C-18-30. In the preparation of this specification by a sectional committee, the National Bureau of Standards served

as the sponsor. The specifications are also published in the National Bureau of Standards series of circulars.

Labeling food and drugs.—The campaign of the Food and Drugs Administration of the United States Department of Agriculture to persuade purchasers to read the labels carefully on the foods and drugs which they buy, to assure themselves of obtaining the quantity and quality of product which they want, is proving highly successful. Scores of home-economics departments in colleges and schools are teaching the idea, and tradesmen, food and drug manufacturers, publishers, and physicians are also encouraging the project.

Commercial standards of nonmetallies.—The Los Angeles Chamber of Commerce recently organized a new committee to be known as the Nonmetallic Minerals Committee, the principal function of which will be to study and develop commercial standards and specifications of all nonmetallies produced in southern California for the protection of both the producer and consumer. The committee comprises prominent men in the nonmetallic industry in southern California.

Standardization of gas cylinder valve outlet threads.—The Valve Standardization Committee of the Compressed Gas Manufacturers Association has prepared a preliminary report relative to standardization of gas cylinder valve outlet threads. For the purpose of selecting suitable standards of design and threads the various gases have been assigned to 10 different classes. Standards are recommended therein for seven of the classes. This report will be the basis for discussion in the development of national standards under the auspices of the National Screw Thread Commission.

Standardizing colors and fixtures for Army post.—As a means of affecting economy in the administration of the Army post at Fort Francis E. Warren, near Cheyenne, Wyo., orders called for the standardization of colors and fixtures at the post. The standardization of post fixtures ranges from hitching posts to picket lines. The standardization of colors includes the painting of fire equipment, name plates for quarters, and garages at the post. It is believed that this is the first step ever taken to standardize colors and fixtures for Army posts.

Testing resistance to wear of carpets.—A machine for testing the resistance to wear of carpets has been developed at the National Bureau of Standards. Results obtained with it are shown to be reproducible and it is hoped that service tests will show that they will be indicative of the relative serviceability of carpets under ordinary conditions of use. The wear on the carpet is produced by a downward force, a horizontal stress, and a slight twisting motion. They have definite values and may be varied. The rate of wear is evaluated by measuring the change in thickness of the pile of the carpet with a sensitive thickness gage as the test proceeds.

Standard "fluidity" for molten metal.—In all foundry work the temperature at which the molten metal is poured into the molds is an important matter. This factor has a very decided bearing on the complete filling of the mold—a matter of very considerable importance in the cross sections. In cooperation with the American Foundrymen's Association, the National Bureau of Standards is developing a method which, it is hoped, can be recommended and adopted as standard for this purpose, and which will be simple enough so that it can be readily used by the foundryman for determining the "fluidity" of his metal.

Measurements for knit underwear.—The Associated Knit Underwear Manufacturers of America has requested the cooperation of the National Bureau of Standards to establish a commercial standard covering measurements for knit underwear. These specifications cover methods of measuring, standard measurements, tolerances, labels, box sizes, cone colors for single cotton yarns, and suggested methods for washing knitted underwear. A general conference, to which are invited all interested producers, distributors, and users of this commodity will be held at 10 a. m., Thursday, February 19, 1931, in Room 414, East Building, National Bureau of Standards, Washington, D. C.

Inspecting cement testing laboratories.—The cement reference laboratory of the National Bureau of Standards is now preparing for another inspection tour among interested cement testing laboratories. The laboratory was established at the National Bureau of Standards, under the sponsorship of the Government and the American Society for Testing Materials, to secure improvements in the testing of cement. Part of its program is to make inspections of laboratories when so requested. Those laboratories which desire, but have not already requested inspections, should promptly address the Cement Reference Laboratory, National Bureau of Standards, Washington, D. C., in order that advantageous schedules may be arranged for the inspectors.

Standardization of the calendar.—For the past several years there has been agitation to revise the Gregorian calendar in order to make corresponding periods more nearly equal and comparable. Many

plans have been proposed; these, however, are reducible to two: (a) A 12-month equal quarters plan, and (b) a 13-equal months plan, the United States favoring the latter. At the invitation of the League of Nations, a conference will be held in Geneva, Switzerland, October, 1931, for the purpose of considering whether an improved calendar should be established, and if so, how it should be done. The plan is for the delegates of various governments to draw up a protocol or treaty on calendar revision to be submitted to their respective governments for ratification, together with measures for putting it into effect on an agreed date.

Photo-electric signals from master clock.—In connection with the work on the determination of the absolute value of gravity at Washington, it is necessary to have light flash signals every second with a high degree of accuracy. If these are drawn from the clock in the usual way, involving relays in the circuit, the various moving parts necessary will contaminate the accuracy of the signals to the extent of several thousandths of a second. The National Bureau of Standards has, therefore, arranged a plan by which a Neon lamp is caused to flash with every beat of the pendulum of the master clock without any mechanical moving parts in the circuit. This is done by having the pendulum send a flash of light to a photo-electric cell at every beat. The very minute electrical impulse sent out by the cell is amplified until it is sufficiently strong to excite the Neon lamp.

Standardization of fish nets.—The National Bureau of Standards is cooperating with the Bureau of Fisheries in an effort to develop a standard method for measuring the mesh size of fish nets. The mesh size of nets that are legal for use in the waters of any jurisdiction is regulated by the laws of that jurisdiction. These laws differ widely in requirements and in enforcement and there is always more or less uncertainty as to what constitutes a legal net. This is especially true where the same body of water is subject to the regulations of two or more jurisdictions. In order for this standardization project to be brought to a successful conclusion, the following steps will be necessary: (1) The enactment of uniform laws and regulations, (2) the development and use of standard measuring equipment, and (3) the adoption of standard conditions of the net at time of measurement.

SIMPLIFICATION BRIEFS

Soft fiber (jute) twine.—Simplified Practice Recommendation R110-29, Soft Fiber (Jute) Twine, has been in effect sufficiently long to warrant a review of the established simplified list by the standing committee of the industry. A survey is now being made among the manufacturers of this product to determine the extent to which this recommendation is being observed.

Industrial truck tires.—The printed pamphlet on Simplified Practice Recommendation R103-29, cover-

ing industrial truck tires, is now available. Copies of this recommendation, which has been instrumental in establishing dimensions for widths of tires and nominal wheel diameters, can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents each.

Packaging razor blades.—There will be no change in the method of packaging razor blades for the next year. The standing committee of the industry has taken steps to insure this by approving, without

change, Simplified Practice Recommendation No. 69, packaging of razor blades, for another year. Reports from eight manufacturers indicated that their adherence to the recommendation during 1929 was 95 per cent.

Surgical gauze.—The simplified schedule provided for surgical gauze, Simplified Practice Recommendation No. 86, having been satisfactory, the standing committee of the industry has reaffirmed the schedule, without change, for another year. Reports from seven manufacturers of this commodity indicated that 98 per cent of their production during 1929 was in accord with the provisions of the recommendation.

Hospital plumbing fixtures.—The division of simplified practice of the National Bureau of Standards has just announced that the printed pamphlet on Simplified Practice Recommendation R106-30, Hospital Plumbing Fixtures, is now available. Copies of this recommendation, which covers types, sizes, and varieties of fixtures, can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents each.

Varieties of composition books.—Retaining the approved 41 varieties of composition books in Simplified Practice Recommendation No. 84, for composition books, the standing committee of the industry has reaffirmed this recommendation, without change, for another year. The schedule reduced the variety of books from 86 to 41. Reports from seven manufacturers indicated that 98 per cent of their production conformed to the simplified line.

Wrought-iron and wrought-steel pipe, etc.—Twelve manufacturers of wrought-iron and wrought-steel pipe, valves, and fittings have indicated to the National Bureau of Standards that their production during 1929 was 98 per cent in conformity with Simplified Practice Recommendation No. 57, covering these commodities. This information was made public in connection with the action taken by the standing committee of the industry in reaffirming, without change, the recommendation for another year.

Woven wire fencing and fence packages.—Simplified Practice Recommendation No. R9-28, Woven Wire Fencing and Fence Packages, has been reaffirmed, without change, for a period of one year, by the standing committee of the industry, according to an announcement just made public by the division of simplified practice of the National Bureau of Standards. Reports from 11 manufacturers, in reply to a survey of production conducted prior to the revision meeting, indicated that the average degree of adherence to the recommendation by these manufacturers was approximately 98 per cent.

Sizing of aluminum oxide and silicon carbide abrasives.—The simplified practice recommendation recently developed by industry covering allowable

limits for the sizing of aluminum oxide and silicon carbide abrasives for polishing uses and grinding wheels manufacture, has been approved and adopted by the industry as an effective program. According to prominent individuals of the industry it is expected that the adoption of this recommendation will stimulate study of other kinds of abrasive grains and subsequent formulation of additional simplified practice recommendations in this field.

Paper trade institute.—In its paper salesman's training course, the Paper Trade Institute, a division of LaSalle Extension University, calls attention to the following simplified-practice recommendations which have been promulgated by industry with the cooperation of the division of simplified practice of the National Bureau of Standards: S. P. R. No. 22, Paper; S. P. R. No. 92, Hard Fiber Twine; and S. P. R. No. 110, Soft Fiber Twine. Some of the practical problems issued in connection with this course and the model solutions thereof are predicated upon a knowledge of these programs.

Radiobeacon.—A new radiobeacon to guide ships through the straits of Florida is soon to be established at Fowey Rocks Lighthouse, according to the Lighthouse Service of the Department of Commerce. It will be of the most modern type, operating for a regular portion of every hour, day, and night. To prevent confusion with near-by stations, it will be interwoven with their signal times; that is, each station will have its regular exclusive sending time, adjacent stations remaining silent temporarily. The establishment of radiobeacons at lighthouses built on submarine sites, as is Fowey Rocks, has become possible only with the development of apparatus capable of withstanding the vibration often caused by heavy seas pounding against the foundations of the lighthouse.

PROPOSE STANDARD FOR COTTON GOODS FOR RUBBER AND PYROXYLIN COATING

The Cotton Textile Institute has requested the cooperation of the division of trade standards, National Bureau of Standards, in establishing a commercial standard for cotton goods for rubber and pyroxylin coating, based on standards previously published by the Association of Cotton Textile Merchants of New York.

The specification has been adopted by a number of the organizations concerned in the production and finishing of these fabrics, and has been published at length for criticism in the Textile World. It is believed that by these means the most essential functions of the general conference have been satisfactorily performed, and accordingly it is planned to circulate the proposed standard direct to interested organizations for written acceptance.

The specification covers quality, construction, weight, tensile strength, permissible defects, sizing, chemical limitations for certain elements, and test conditions of the cotton sheetings, drills, sateens, and other fabrics covered.

PUBLICATIONS ON BUILDING AND HOUSING

Mimeographed List of Publications Issued by National Bureau of Standards Relating to Building Materials, Home Building, Home Ownership, City Planning, and Zoning

A mimeographed list entitled "Publications of the Bureau of Standards Relating to Building Materials, Home Building, Home Ownership, City Planning, and Zoning," has recently been issued.

The document, which was compiled by the division of building and housing, lists by title all bureau publications dealing with the properties, specifications, tests, uses, and standardization of the various materials entering into the construction of houses and other buildings. Typical publications on materials deal with fire resistance of concrete columns and of hollow load-bearing wall tile, the durability and covering power of paints and varnishes, tests of waterproofing and rust-preventive materials, properties of various types of roofing materials, recommended minimum requirements for plumbing, and maintenance of interior marble.

The simplified practice recommendations listed deal with the standardization of such products as metal

lath, solid section steel windows, softwood lumber, structural slates, concrete building units, and steel reinforcing bars.

Other bureau publications listed give results of studies on the economy, durability, and safety of different types of construction, such as the strength of clay-brick walls and of hollow-tile walls, Portland cement stucco construction, use of reinforced concrete, masonry walls, thermal insulation of buildings, transmission of sound through wall and floor structures, and recommended building-code requirements, including small-dwelling construction.

As the title indicates, there are also listed publications prepared to assist in the improvement of conditions affecting home ownership, including such problems as site selection, and the financing, design, building, equipment, and upkeep of homes.

This document is Letter Circular 290, and is obtainable, upon request, direct from the division of building and housing, Bureau of Standards, Washington, D. C.

SEATS FOR WATER-CLOSET BOWLS

General Conference Approves Proposed Commercial Standard

A general conference of manufacturers, distributors, organized consumers, and other interested organizations, held at the Palmer House in Chicago, Ill., December 10, 1930, approved the Proposed Commercial Standard for Seats for Water-Closet Bowls, as previously adopted by the manufacturers of this commodity on October 28 and 29.

The following finish, type, and shape classifications are recommended as standards:

(a) *Finishes*.—Seats shall be classified according to finish, as (1) varnished seats, (2) sprayed (white or colored) seats, (3) hard-rubber seats, and (4) molded composition seats.

(b) *Types*.—Seats shall be designated according to types as, (1) staple ring seat, with or without cover, (2) staple open front seat, with or without cover, and (3) staple open front and back seats, with or without cover.

(c) *Shapes*.—Plain rim staple ring seats, shall be designated according to shape as, "for staple bowls." Shapes of open front or open front and back seats shall be designated as, for (1) staple round front bowl, (2) for staple extended lip bowl, and (3) for staple elongated bowls.

The recommended standard requires that staple varnished, sprayed, and sheet-covered seats shall be made from not less than $5/4$ ($1\frac{1}{4}$) inch hardwood stock and finished to a thickness of not less than fifteen-sixteenth inch. These will be known as $1\frac{1}{4}$ -inch seats. Staple hard rubber or molded composition seats will be not less than $1\frac{1}{16}$ inches in finished thickness.

The proposed standard covers also the materials, construction, dimensions, types, and weights of hinges. It recommends that all seats bear the name or the trade-mark of the actual manufacturer applied in such manner as to be permanent. Printed labels at least 2 inches wide are to be attached around the rear of the seat between the hinge posts and will bear the

following wording: "This (finish specified) seat is guaranteed by the — Company to conform to Commercial Standard CS-31 issued by the U. S. Department of Commerce. *Caution*.—This label shall be removed only by the ultimate consumer and shall not be used again." This label should soon become the guide-post to the purchaser of staple seats for water-closet bowls by giving assurance of satisfactory service.

A standing committee representing producers, distributors, and users was appointed by the conference to consider annually revision of the commercial standard in the event that such action is desirable and mutually beneficial.

SIMPLIFIED SCHEDULE FOR CAN SIZES APPROVED

A general conference of representatives of manufacturers, distributors, and users of cans used in packing fruit and vegetables, adopted a simplified practice recommendation on can sizes, at a meeting held January 20, 1931, at the Hotel Stevens, Chicago, Ill., under the auspices of the division of simplified practice of the National Bureau of Standards. This meeting was held in conjunction with the annual convention of the National Cannery Association.

The program, as approved, recommends a reduction from the present wide variety of fruit and vegetable can sizes to 27, and, subject to the approval by all interests, will become effective July 1, 1931.

It was suggested at the conference that a survey of the sizes of fish cans now in use be made with a view to the establishment of a simplification program in that field.

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

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The new Journal describes the bureau's research results in science and technology. The union of science and its applications in one journal shortens the lag between discovery and application.

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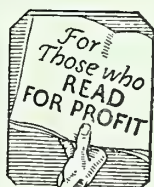
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COMMERCIAL STANDARDS MONTHLY

This new governmental periodical is a review of progress in commercial simplification and standardization. It is the only journal of its kind. It covers the national movement initiated by President Hoover for the reduction of needless sizes and varieties of products and the promotion of voluntary commercial standardization by industry.

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

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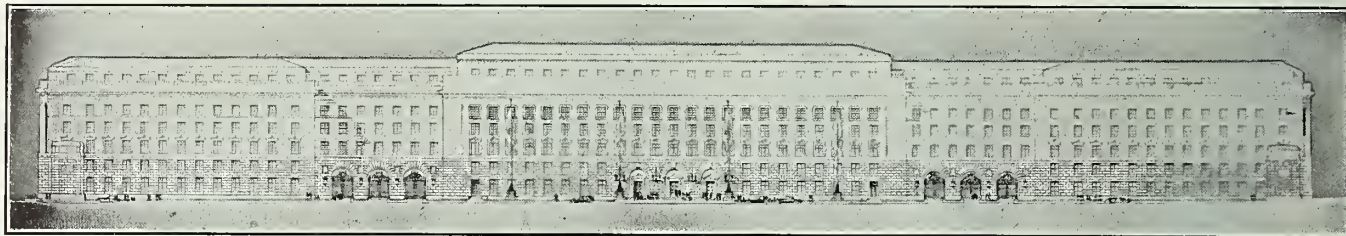
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" * * * this department * * * is devoted solely to aiding and fostering the development of higher standards of living and comfort of our people * * * its ideals are clear: That by cooperation and not by compulsion it should seek to assist in maintaining 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.

Establishment of civil airways and maintenance of aids to air navigation; inspection and registration of aircraft and licensing of pilots; enforcement of air traffic rules; investigation of accidents; encouragement of municipal air ports; fostering of air commerce; scientific research in aeronautics; and dissemination of information relating to commercial aeronautics. (Some of these functions are performed by special divisions of the Lighthouse Service, the Bureau of Standards, and the Coast and Geodetic Survey.)

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.

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

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The collection of timely information concerning world market conditions and openings for American products in foreign countries, through commercial attachés, trade commissioners, and consular officers, and its distribution through weekly Commerce Reports, bulletins, confidential circulars, the news and trade press, and district and cooperative offices in 65 cities. The maintenance of commodity, technical, and regional divisions to afford special service to American exporters and manufacturers.

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The publicity of statistics on imports and exports.

The study of the processes of domestic trade and commerce.

BUREAU OF STANDARDS, GEORGE K. BURGESS, Director.

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Collection and dissemination of information concerning building codes and the planning and construction of houses.

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

BUREAU OF MINES, SCOTT TURNER, Director.

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.

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

BUREAU OF LIGHTHOUSES, GEORGE R. PUTNAM, Commissioner.

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.