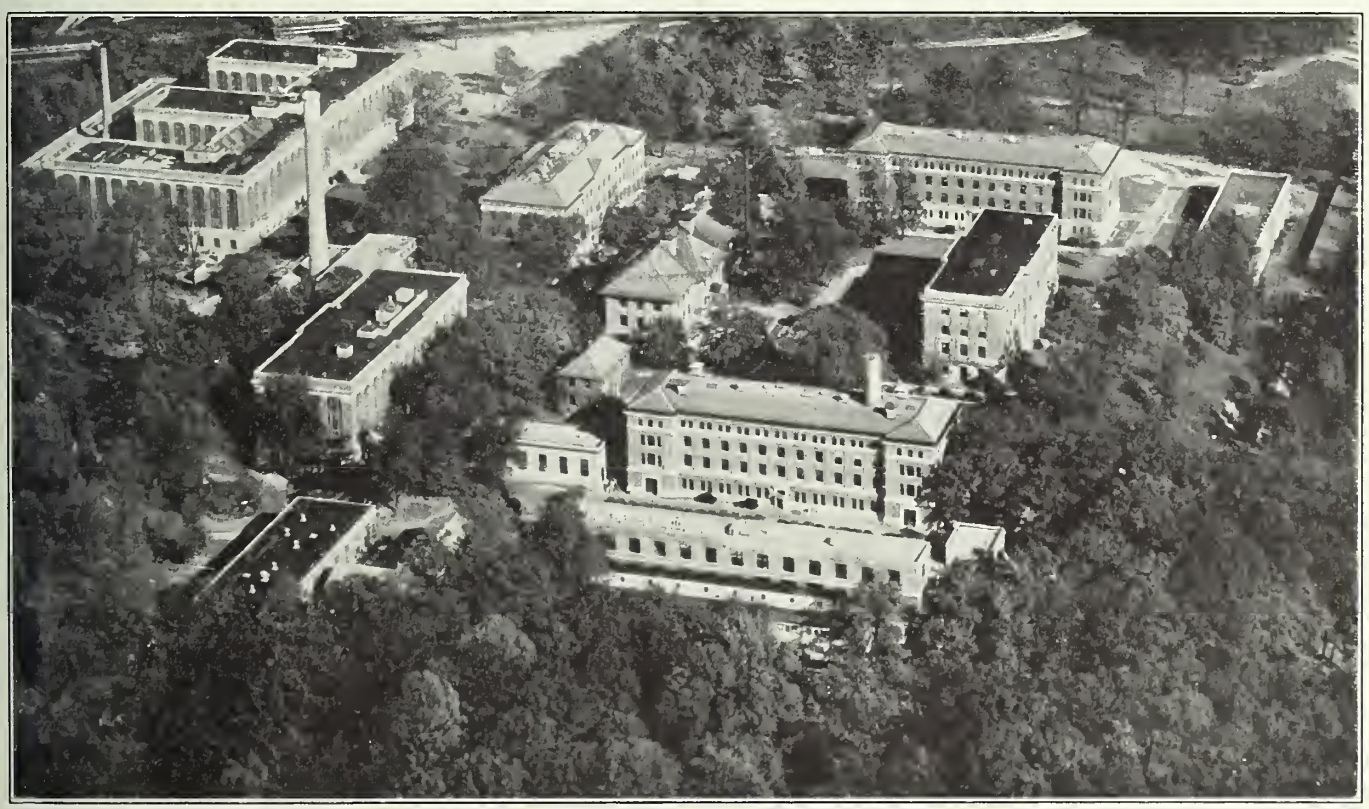
COMMERCIAL STANDARDS MONTHLY

A Review of Progress in Commercial Standardization and Simplification



AIRPLANE VIEW OF NATIONAL BUREAU OF STANDARDS

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

Vol. 6, No. 8 FEBRUARY, 1930

U. S. DEPARTMENT OF COMMERCE
R. P. LAMONT, Secretary
NATIONAL BUREAU OF STANDARDS
GEORGE K. BURGESS, Director

COMMERCIAL STANDARDS MONTHLY
S. F. TILLMAN, Editor

DIVISIONS OF THE COMMERCIAL STANDARDIZATION GROUP

DIVISION OF SIMPLIFIED PRACTICE, EDWIN W. ELY.

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

AMERICAN MARINE STANDARDS COM'TEE, A.V. BOUILLON.

The American Marine Standards Committee was organized to promote simplification of practice and elimination of waste in the marine and allied industries. It is composed of individuals, corporations, societies, Government departments, public bodies, or other organizations or groups engaged in building or operating ships, port facilities, and related activities. It works in close cooperation with official agencies, but its activities are controlled by an executive board elected annually by and from the membership. For further information, write direct to the secretary, A. V. Bouillon, Room 713, Department of Commerce, Washington, D. C.

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

DIVISION OF TRADE STANDARDS—Continued.

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.

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 producers involves the compilation 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 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.

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.

COMMERCIAL STANDARDS MONTHLY

A Review of Progress in

Commercial Standardization and Simplification

VOLUME 6 WASHINGTON, D. C., FEBRUARY, 1930 NUMBER 8

CONTENTS

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 newspapermen, 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.*

93407—30——1

SEEK
UNIFORM HOTEL EQUIPMENT

Texas Hotel Association Favors Simplification of Commodities Used by Hotel Industry

THE TEXAS HOTEL ASSOCIATION recently approved a resolution indorsing the application of simplified practice to commodities used by the hotel industry. The resolution states that "in recognition of the helpful cooperative services of the division of simplified practice in its efforts to promote standardization and the elimination of unnecessary variety in sizes, dimensions, models, etc., in many commodities which are consumed by the hotel industry, and recognizing that said elimination of unnecessary varieties does result in simplifications and savings in hotel operation, the Texas Hotel Association does hereby wish to go on record with an indorsement of the program of work of the division and to pledge our hearty support in the work."

"Furthermore, we desire to go on record with a recommendation to the incoming board of directors of this association, that it appoint from the membership of this association a committee to be known as the Texas Hotel Association Simplified Practice Committee, with instructions and authority to study the program of work of the division of simplified practice, to investigate the possibilities of simplification in certain commodity lines which are in great demand by hotels, to make recommendations to the division of simplified practice, and to work closely with the division in setting up simplified practice schedules in any commodities that it believes would result in benefits to the hotel industry."

Roland Burge, president of the association, in conformity with the resolution, has informed the division of simplified practice that such a simplified practice committee has been appointed by the Texas Hotel Association. R. Bruce Carter, of the Lamar Hotel, Houston, is chairman of the committee, other members being W. C. O'Leary, of the Warwick Hotel, Houston; S. C. Fuller, of the Beaumont Hotel, Beaumont; and C. A. Schlotter, of the Jean LaFitte Hotel, Galveston.

It is the purpose of this committee to keep in touch with Ernest Tutt, district manager for the Department of Commerce at Houston, relative to the details of contemplated variety surveys. On the occasion of the November 4 convention of the Texas Hotel Association, Mr. Tutt fully described the service and facilities the division of simplified practice.

DEVELOPMENT OF SIMPLIFIED PRACTICE OUTLINED

"What It Is and What It Offers to Industry"; Division of Simplified Practice Now Eight Years Old; So Far Has Assisted Industry In Promulgating More Than 100 Simplified Practice Recommendations

R. L. Lockwood, *Division of Simplified Practice*

Before discussing any of the specific projects handled by the division of simplified practice, it may be interesting to go back a little and mention some of the questions that come up when a new project is being formulated and the ways in which we try to answer those questions.

Our work involves constant contact with industrial and commercial organizations in almost every field. Few individuals with whom we deal for the first time have the slightest conception of the character or purposes of our work. One of the most common misconceptions is that we have a regulatory or police power of some sort. This misconception must be removed before real progress can be made on any project. Curiously enough, it often has to be removed twice during the course of a project, and for entirely different reasons.

When a new project comes up, usually in the form of a suggestion for reducing the number of varieties in a certain commodity, our first move is to get in touch with the manufacturers of that commodity, either personally or by correspondence. In either case, we emphasize at the beginning that we have no regulatory or police power and that we do not initiate projects. If our initial contact with manufacturers indicates that the majority consider the suggested project to be sound, we arrange a preliminary conference, where the manufacturers can get together and discuss it informally.

Question of regulatory power up again.

Again the question of regulatory power comes up, and we find that many individuals have a vague fear that "the Government" is going to force them to disclose information about their business, or to change their practices or products in a way which they fear will be injurious. If we succeed in allaying this suspicion and the project itself is sound, it usually goes on through our regular procedure.

A detailed survey is made to show quantity of demand for each size or type of product made by the entire industry, and a committee of manufacturers formulates a simplified list of sizes or varieties, usually much smaller than the existing number of varieties but sufficient to cover all ordinary and reasonable demand. The division then calls a general conference and invites manufacturers, distributors, representative users, and others interested in the particular commodity. If the groundwork has been properly done, the simplified list is approved by those who attend the general conference, usually by unanimous vote, and becomes thereby a simplified practice recommendation, subject to written acceptance by the industry as a whole.

Adherence to recommendation.

At this point the question of regulatory power often comes up again, but from a different angle. Having agreed among themselves on a simplified list of varieties, the manufacturers face the problem of securing adherence to the recommendation, and in almost every project one or more of them ask whether it is not possible for "the Government" to enforce such adherence.

Again we have to thoroughly plant the idea that we not only have no such authority but that the fundamental philosophy of simplified practice is based upon voluntary cooperation. Even after the recommendation has been in effect for a considerable time we are often urged to take some action which will force a purchaser or manufacturer to adhere to it. To sum up this question of regulatory power, certain elements in an industry at first fear that we will apply such power, and at a later stage in the project they fear that we will not.

Definition of simplified practice.

Another question that invariably comes up, particularly during the early stages of a project, is that of defining simplified practice. We are often asked to define standardization itself. We find that the word "standardization" is very loosely used to describe a broad field of activity, ranging all the way from work in pure science to methods of wrapping packages. In our own work we try, as far as possible, to avoid using the words "standardization" or "standard," using "simplification" or "simplified practice" instead.

President Hoover once expressed the distinction between the two in somewhat the following terms: "Standardization is a positive approach to a problem, its function being to determine and establish definite standards of design, materials, or performance. Simplification is a negative approach, its function being to select from existing standards those which are of the greatest importance, and concentrate production on those."

In other words, true standardization is creative, while simplified practice is selective. Certain features of railway practice offer striking illustrations of the distinction between the two.

Railroads have individual systems.

In the early days of railroading each road determined its own track gage to suit its particular needs or desires. As the railroads expanded interline business developed, thereby necessitating interchangeable standards. The railroads got together and adopted what is now called standard gage for track. This was one of the first examples of true simplified practice on a nation-wide scale.

True standardization consisted in the determination by engineers of the exact distance between rails and of other features, such as height of couplers above rail. From the standpoint of simplified practice, however, it did not matter whether the distance between rails is 4 feet 8½ inches or some other figure; the essential feature is uniformity.

Considering technical standardization and simplified practice in this way, as distinct activities, another difference appears. The bulk of technical standard-

ization work is done by individuals or individual firms, in designing new products or perfecting existing products. On the other hand, practically all simplification is the result of group effort, not only among the manufacturers of a product but among distributors, users, and all others interested in that product. Simplified practice has been applied to the product of certain individual firms, but its maximum benefits can be secured only when it is applied throughout an entire industry.

Technique has been worked out.

While the technique of simplified procedure has been fairly well worked out in practice and involves taking a certain definite sequence of steps, this procedure itself is little more than a set of tools designed to perform certain work. The tools alone will not do the work; they must be intelligently operated and applied to a great many highly diversified jobs.

In any general conference or other meeting there are likely to be as many different kinds of individuals as there are individuals. The only thing we can be assured of is that no two will be alike individually or collectively. Even a meeting of a relatively small group engaged in the same line of business will include individuals who have a tremendous range of actual knowledge and not much intelligence.

On the other hand, there will be others who may have less factual knowledge but extremely high intelligence. Some of the most interesting discussions develop at meetings which include a representation of many different interests, such as meetings of chambers of commerce and similar organizations. In the course of such meetings we are often asked very pointed questions as to the real value of standardization as a whole or of simplified practice as part of it.

At a recent meeting held in a middle western city an economist started a discussion along these lines, expressing the opinion that the whole idea of standardization and simplification, useful though it might be to industry, was deplorable from a social standpoint. He based his opinion on the theory that standardization of material objects tended to bring about drab uniformity in everything and to standardize the human mind.

He claimed that the standardized product made in a standardized factory and sold under high pressure to the public by standardized salesmen was making American minds conform to one standardized mold, and a rather undesirable mold. In fact, he went so far as to condemn all forms of mass or group effect as undesirable, for the same reasons.

Expressions were not based on facts.

In the course of the discussion the outstanding feature was that few of the opinions expressed were based on any real facts. It happened that we had also been studying this angle of the situation and had found at least one kind of measuring stick which seemed applicable. It was based on the growth of certain industries in which standardization is a negligible factor, and in many of which it does not exist.

They include the business of art dealers, interior decorators, antique dealers, orchestral instrument dealers, certain publishers, and a few professions, such as architecture and landscape gardening. An investigation covering a group of these highly individualistic activities showed that within the past 10 years the rate of growth in each of them has greatly exceeded the average growth of business as a whole. In some cases it has been two or three times as great.

If these facts prove anything at all, they prove that Americans are becoming more interested in those commodities and activities which involve individuality, taste, or artistic expression, as indicated by the fact that they are willing to pay for them. We are all familiar with the tremendous development of the so-called "luxury trades" during the past decade. It would not have been possible to release the capital and labor for those trades had it not been for the enormous increase in per capita production during the last 10 years, amounting to more than 40 per cent, and due in large part to the application of standardization and simplification in everyday commodities.

Work of the division explained.

The work of the division of simplified practice, since its organization some eight years ago, has been confined largely to manufactured commodities. The division has cooperated with industry in the development of more than 100 simplified-practice recommendations, covering a wide range of commodities in ordinary everyday use.

Each recommendation concerns at least two groups in a given industry and sometimes three or more. The manufacturers are directly interested, for every manufacturer knows that if other things are equal it costs less to make a small number of varieties in large quantities than to make the same total quantity in a larger variety and few quantities of each. Distributors can always be counted upon to support any project which permits them to reduce inventories, turn over their stock faster, and give their customers better prices or better service.

The question of the value of simplified practice to the ultimate consumer who pays all the bills is not always so easy to answer. If, however, a simplification project saves money to manufacturers, distributors, or both, the savings are sure to be reflected either in retail price, service, or quality, so long as industry remains competitive.

Specific instances on record.

Certain specific instances are on record showing benefits to the consumer in each of these three ways. Occasionally the question of the effect of simplification on labor conditions is brought up. Some years ago it was studied by officers of the American Federation of Labor, who found that concentrating production on a few items in large and steady demand tended to smooth off the peaks and valleys of production operations, since manufacturers could make goods for stock and be assured that those goods would be salable.

This, in turn, tended to stabilize labor conditions and to reduce fluctuation and turnover. William Green, president of the American Federation of Labor, wrote a letter to the division expressing approval of simplified practice on behalf of organized labor.

New opportunities disclosed.

Opportunities for simplified practice in manufactured products still seem unlimited, but within the past year or two there has been increasing evidence of opportunities in another and closely related field. Economical production is not the whole of industry.

Economical distribution is just as essential, and in too many industries it has lagged far behind production, both as to methods and equipment.

Many commodities in everyday use are turned out by mass-production methods at phenomenally low cost, only to pile up cost, necessary and otherwise, in a long, slow, and often erratic journey through the channels of distribution. Most of the expense and waste in distribution is caused by lack of coordination, which, in turn, results from lack of centralized control.

A manufactured article is produced in a highly organized factory where every operation is intensively studied and all operations integrated so that the whole plant functions like a single machine. But coordination and integration too often stop when the product leaves the factory in a truck or railroad car. At this point a cycle of related but usually uncoordinated operations begins. By the time the product has been loaded into and unloaded from cars, trucks, barges, or ships from four to twenty times, its final cost may be absurdly out of proportion to its production cost, and yet not a cent of value will have been added, except "utility of place" secured by the actual transportation.

$8,000,000,000 wasted annually.

About a year ago Dr. Julius Klein, Assistant Secretary of Commerce, estimated that waste in distribution costs the country at least $8,000,000,000 a year; one-twelfth of our national income; about $275 for every family in the United States. This estimate includes all the so-called intangible wastes, such as useless advertising, duplicated sales effort, and cross-hauling of similar commodities.

Waste in physical distribution alone has been estimated by several competent groups at not less than $3,000,000,000 a year. It includes waste in time, labor, and material in the multifarious operations that take place after a product leaves the final machine or process in a factory and before it is in the hands of the final consumer ready to be used.

A recent survey of distribution cost in 20 commodities showed that freight charges amounted to only 10 per cent of total cost of physical distribution, whereas packing, handling, loading, unloading, and rehandling, each repeated several times, accounted for the other 90 per cent.

In other words, transportation, the one part of physical distribution which creates any real utility, costs only 10 per cent of the total. The other operations, which add nothing whatever to value, cost 90 per cent of the total, and it is in these operations that the greatest waste occurs. Our railroads have worked miracles during the past 10 years in speeding up and reducing the cost of transportation. Manufacturers sometimes complain that if they could get a reduction in freight rates their problems would be solved. The fact is that in most commodities a reduction of 10 per cent in freight charges, which would ruin the railroads, would reduce physical distribution cost only 1 per cent, total distribution cost less than one-half per cent, and scarcely affect retail prices at all.

Reducing cost of distribution.

Standardization and simplification can do comparatively little toward reducing the intangible wastes of distribution, but can do much toward reducing the cost of physical distribution. Simplified practice in production has resulted from the cooperation of all groups in a given industry to reduce the variety of products.

These very same groups, producers, distributors, and users, control among them every process and operation incident to distribution except transportation. They control all the factors in which the greatest waste occurs. Within the past two or three years many industries have begun to recognize that simplification of the product itself is only part of the job. The same kind of cooperative effort can with equal facility be applied to eliminating waste in distribution.

The logical point of attack is found in the machinery, tools, and other equipment used to handle materials and goods between the factory and the consumer, and this includes all types of containers and packing materials. Standard equipment tends in itself to bring about standard methods and processes.

Division interested in general field.

The division of simplified practice began work in this general field about two years ago. A conference of shippers, carriers, and warehousemen was held under the joint auspices of this division and of the transportation division of the Bureau of Foreign and Domestic Commerce of the Department of Commerce. It aroused wide interest in the subject, and resulted in establishing committee machinery to study the possibilities along several different lines. The field was obviously tremendous. Some individual firms and a few groups had established certain standards for their own use, but in the whole distribution field there was only one universally accepted dimensional standard. That was the minimum inside width of a standard railroad freight car.

Work on container sizes.

Within a few months after the conference, work was under way in two or three different lines. One of the most important was that of container sizes. A study of manufactured commodities indicated that the great majority require more than one container. The first or "primary" container is that in which a unit of the product itself is packed, such as a pasteboard box containing biscuits, tooth paste, or shoes.

A quantity of primary containers with their contents are packed in a "secondary" container, usually forming the "retailer unit." In some cases a third container is required, usually a packing box or crate, which is the "shipping" container. The diversity of primary containers is enormous, in size, shape, and material. There is less diversity in the material of secondary containers, but still great diversity in size and shape.

Shipping containers are still less diversified in material, but unnecessarily so in size and shape. Projects now in hand include a considerable number of primary containers, such as glass bottles and jars and pastboard boxes, also a few secondary containers.

Material-handling project.

Shortly after the conference mentioned above, work was also begun on certain types of material handling and transportation equipment. It happened that the practice of shipping goods on skid platforms was rapidly growing and that the manufacturers were

anxious to establish interchangeable standards between skid platforms and lift trucks.

This project has been described in detail in previous issues of the COMMERCIAL STANDARDS MONTHLY. Committees are at work on other kinds of handling and transporting equipment. Within the very near future several of the container projects will reach the point where they must be coordinated with projects covering handling and transportation equipment.

The skid-platform project, which resulted in establishing standard clearance dimensions, has since been revised to include certain standard over-all lengths and widths for skids to be used in shipping goods. Further progress has been made on the commercial side in the organization of a centralized agency, operating along similar lines to the Pullman Co., to furnish, handle, transport, and store skid platforms, renting them to shippers and other users.

The standard sizes covered by the simplified practice recommendations will be adopted for nation-wide skid service, which will mean that thousands of types of containers will be modified in size and shape to fit the new standard freight skid.

Retail field much concerned.

The bulk of this effort to simplify materials, machinery, and equipment used in distribution is being directed toward eliminating waste in the great majority of commodities sold at retail, for it is in the distribution of such commodities that the greatest wastes occur. They include not only manufactured products in many fields but food products as well, in which waste in distribution is a serious drain on the entire community.

It has not been an easy task to convince producers of widely diversified commodities that such commodities can be packed and assembled to fit the same shipping containers used by other industries. A recent investigation, however, covering five very different commodities, showed clearly that simplification of primary, secondary, and shipping containers, coordinated with simplification of handling and transportation equipment, would permit the shipment of all five kinds in packages of the same length, width, and maximum height. These commodities were soap, typewriters, biscuits, shoes, and tooth paste, and in each case the study covered one of the largest manufacturers of the commodity.

Industry closely watching progress.

The whole program of simplification and coordination in this field is being closely watched by industrial and commercial executives throughout the country. A general plan of coordination and integration is gradually emerging from the previous chaotic condition. There is every reason to believe that the next few years will show greater advantages in reducing waste in distribution than any previous period during the past 20 years.

The results accomplished by simplified practice in production are recognized not only in this country but abroad. The methods and procedure by which these results have been accomplished have been thoroughly worked out and tested, and can be applied with equal success to the processes and operations involved in distribution.

SWITCHBOARD SAFETY IMPROVED BY RESEARCH

Design of Resistors Used in Testing Current Transformers Described

Considerations of safety to the switchboard attendants and of convenience in station wiring have led to the universal practice of separating the meters and instruments used in the sale and control of electrical energy from the dangerous high-voltage alternating-current circuits by which such energy is now transmitted.

This is accomplished by instrument transformers which serve to reproduce in their low-voltage secondary circuits a reduced replica of the electrical conditions existing in their primary high-voltage circuits. If the meter indications are to be accurate, the reduction factor of the transformers must be known with accuracy as a result of careful comparisons with some more fundamental type of apparatus maintained in some standardizing laboratory.

In testing transformers used in the measurement of large alternating currents the usual basic standard is a resistor which must be so proportioned as to carry the large current without getting excessively hot and yet must be so shaped that the magnetic field produced by the current will not introduce errors in the measurements.

The January number of the BUREAU OF STANDARDS JOURNAL OF RESEARCH contains a paper giving the fundamental principles on which the design of such standard resistors should be based and describing the special apparatus which has been constructed at the bureau for making precise measurements of alternating currents up to 2,500 amperes.

SOUTH AFRICA AND STANDARDIZATION

Increases Efficiency of South African Industries Standardization

In review of industrial expansion in the Union of South Africa, in the October issue of Industrial and Commercial South Africa, standardization is cited as one of the most important means of increasing the efficiency of South Africa's industries.

"While in regard to producers' goods standardization has made some progress in the Union owing to the development of buying on specifications," the review states, "very little progress has been made in the matter of coordinating the standards of consumers' goods. Individual brands and trade-marks, to be sure, do indicate standards of quality, but where these are absent or abused by irresponsible manufacturers a great deal of harm is done to consumers who have no means of testing the quality of goods before they are bought.

"In general, there is great need for research into this problem of standardization of product, and perhaps the Government should assist in this matter, for many beneficial results may be derived therefrom by producers as well as consumers." (A. S. A. Bulletin.)

STANDARDIZATION IN JAPAN

Japan Initiated Standardization Programs More Than 20 Years Ago; Explanation Given as to Procedure Followed in That Country; Metric System to Become Effective July 1, 1934

By Shoji Konishi

It is too evident to require an explanation that standardization of engineering materials and manufactures would bring about, in a narrow sense, improvements to the management of a factory and, in a wide sense, the growth of a country's industry. Hence all the leading industrial countries have been endeavoring for many years to accomplish this work, which has made a marked progress, with the outbreak of the World War, through the activity of the national standardizing bodies, and the establishment of an international organization, a pending question for the last several years, has been realized.

The origin of standardization in Japan dates back more than 20 years, but it is only several years since standardization on general engineering materials was started. Above all, the most important is the Engineering Standards Committee, established in 1921, and other bodies engaged in standardization work, with the cooperation of the said committee or independently, have been limited to the Electrotechnical Commission formed in 1910 and one or two others.

It is a matter for rejoicing, however, that individual factories and industrial bodies which are helpful to the central organization recently show a steady increase in number. Nevertheless, the condition in general being still behind as compared with those in Europe and America, the following report is based on the work of the Engineering Standards Committee, describing an outline of the work of the committee, and avoiding technical details as to the conditions of deliberation and approval of the standards.

"Standardization in Japan," by Shoji Konishi, mechanical engineer, Bureau of Industry, Department of Commerce and Industry, Tokyo, Japan, is based on his paper, "Engineering Standardization in Japan," which was presented before the World Engineering Congress held last October in Tokyo. A second article on the same subject will appear in the next issue of the Commercial Standards Monthly.

History of standardization in Japan.

The first instance of standardization in Japan is the approval of the standard testing method of Portland cement used by the Government in 1905. In 1910 the Japanese Electrotechnical Committee was formed, and has been engaged in standardization of the designations, specifications, etc., of electrical machines and apparatuses.

In 1913 the specification for cast-iron water pipe was decided by the Water Supply Association, and after making a number of modifications this specification was approved as the Japanese engineering standard in 1927, which has been adopted to the municipal water supplies.

In 1916 the Association of Steel Works decided on the standard specification for the quality of steel and dimensions of rolled steel; in 1918 investigation as to the standard types of vessels was made under the control of the Department of Communication; in the same year investigation as to engineering materials and machinery was made by the associated society of 13 academies. In June, 1917, the Government decided on the adoption of the metric system as the standard weights and measures, as a result of deliberation made by the committee for weights and measures and engineering standards, which was discontinued at the end of 1920 in view of the necessity of providing a permanent organization for engineering standards, and the Engineering Standards Committee was established in April of 1920.

Other kindred organizations.

There are other organizations which started investigation as to standardization about the same time with the establishment of the said committee. Among them the Associated Society of Building Materials, established in 1920, has investigated as to standardization on timber and lumber, bricks, etc.; the Electrical Association has been engaged in the investigation of transformers, etc.; the Osaka Limit Gage Society, established in 1924, commenced study on limit gages; and the Society of Naval Architects started investigation as to parts of ships in 1925. All of these bodies have been greatly helpful to the committee. Besides, the Association of Chemical Industry, which has been engaged in the study of oils and paints since March, 1927, is expected to render a great help to the progress of the work.

Committee's plan of organization.

The committee is put under the superintendence of the Minister of Commerce and Industry, and is charged to investigate and deliberate on the subjects relating to engineering standardization. The committee consists of the said minister as president, one vice president, and members not exceeding 70 in number, provided that temporary members may be appointed, if necessary.

The vice president at present is the Vice Minister of Commerce and Industry, and the members and temporary members are appointed among the chief engineers, heads of the bureaus, senior engineers of the seven departments of the Government, as well as the managing staffs of the academies, associations, industrial bodies, and factories concerned, the total number being more than 70. The committee is di-

vided into four sections, under which there are 33 subcommittees and terms and wording committees jointly met by all the sections.

Progress of work.

The work of the committee is carried on in accordance with a general principle that such items as may be related to the important industries and already produced in large amounts but found by the consumers in various quarters, official and private, inconvenient and disadvantageous in production, consumption, and transaction, owing to the lack of uniformity, shall be taken up in preference to others, with an additional study on general or collateral subjects, such as test pieces, preferred numbers, methods of analyses, limit gages, drawings, etc.

Deliberation is made on drafts submitted by the members of the committee or bodies concerned, taking materials furnished by various quarters, as well as the results of special experiments, into consideration, and, if necessary, consulting with the trade concerned. The drafts decided by the subcommittee shall be amended in accordance with views of various circles and be brought before the general meeting through the sectional meeting. The decision of the general meeting shall be reported to the Minister of Commerce and Industry. The texts of the drafts are subject to adjustments to be made by the terms and wording committee before or after the general meeting.

Has approved 85 standards.

During a period of about seven and one-half years beginning with the first general meeting held in October, 1921, and ending on March 31, 1929, seven general meetings and 652 (756 days) sectional and subcommittee meetings were held, thereby approving the following 85 standards.

Civil engineering.—Common bricks, hollow bricks, fire bricks, earthenware pipes, roofing tiles, Portland cement, blast-furnace cement, stones, and slates.

Mechanical engineering.—Diameter of wire, thickness of sheet metal and their designations, tensile test pieces, leather belts, keys, metric screws No. 1, metric screws No. 2, Whitworth screws No. 1, hexagonal nuts (metric screw threads), hexagonal nuts (Whitworth screw threads), screw threads for pipes, screw threads for couplers, rivets, files, Morse taper-shank twist drills, straight-shank twist drills, Morse taper shanks and sockets, dimensions of pulleys for power transmission, and heating radiator.

Electrical engineering.—Electrical copper wires; screw-type bases and sockets for electric lamps; small single-phase, oil-immersed transformers; brushes for electric machines; small 3-phase induction motors.

Shipbuilding.—Hatch cleats; eye plates; ring plates; ring bolts; fire bars (for vessels); mooring pipes; closed fair leaders; chain cables.

Ferrous metallurgy.—Steel forgings; steel castings; malleable cast iron; foundry pig iron; seamless steel tubes for water-tube boilers; dimensions of seamless steel tubes for boilers; seamless steel tubes for locomotive boilers; seamless steel tubes for general purposes; gas pipes; dimensions of gas pipes; structural steel for bridges, buildings, etc.; structural steel for shipbuilding; structural steel for boilers; structural steel for locomotives and cars; permissible variations in the dimensions and weight of structural steel; standard steel bars; standard steel bars (hexagonal); standard steel sections; cast-iron water pipes.

Nonferrous metallurgy.—Copper plates; brass plates; aluminum plates; copper bars; naval brass bars; brass forging bars; brass bars for high-speed screwing and turning; high-tension brass bars; seamless copper tubes; lead tubes for water; seamless brass tubes for general purposes; seamless brass tubes for locomotive boilers; seamless brass tubes for condensers; seamless brass tubes for condenser-tube ferrules.

Chemical industry.—Method of analysis for copper; method of analysis for zinc; method of analysis for iron and steel; determination of carbon; method of analysis for iron and steel; determination of silicon.

Wood industry.—Timber and lumber; charcoal.

Miscellaneous.—Preferred numbers for dimensions; preferred geometrical numbers.

Articles on engineering important.

The great importance of engineering articles used and produced by the Government in the industrial circle is one of the special features of standardizing work in Japan. Not only the amounts of the engineering articles as such are considerably large, but there are differences between the articles used for military and general purposes and also according to different departments and bureaus. Consequently the standards now in practice and future policies of the Government have a close relation to the establishment of new standards.

The metric system law enacted in July, 1924, enforceable on and after July 1, 1934, provides that all new standards shall be in accordance with the metric system. Especially those items whose uses are less related to foreign-made ones, such as the dimensions of timber and lumber, bricks, roofing tiles, stone and earthenware pipes, as well as new dimensions which do not vary much from the old, and the application of metric system thereto is not inconvenient in practical use, shall be expressed by round numbers of metric dimensions.

Many of our industries, however, having been introduced from Great Britain and the United States, machines and tools made in those countries have been imported to a considerable extent; and there are parts of machines to be used with imported and homemade machines and also homemade machines and materials which are still insufficient to meet the entire demand, and it is still found necessary to continue the import of certain articles from abroad, especially from Great Britain and the United States.

Consequently, in the standards for such items as screws, structural steel, steel tubes, drills, etc., two series of inches converted into metric dimensions and of purely metric dimensions have been provided, or metric dimensions modified with the inch system have been mixed in with these standards in order to meet the requirements in a transition period. Thus certain standards which ought to be simplified appear to have been complicated; but it is needless to say that the condition has been simplified considerably as compared with that prevailing at present, which is extremely complicated with the great variety of dimensions based on the inch and metric systems.

Standards of other nations are models.

Furthermore, in establishing the Japanese standards, efforts are being made so that they may, in as

many respects as possible, be in line with the standards now in practice for similar articles decided by the standardizing bodies in Europe and America and new standards yet to be established by them in the future. It should be noted that our work in indebted especially to the standards of Great Britain and the United States, which have many merits worth while adopting to our standards, as well as those of Germany, Switzerland, etc., which are most advanced in standardization among the metric countries.

In the next issue of the COMMERCIAL STANDARDS MONTHLY the writer will outline conditions as to the deliberation and approval of the principal standards in Japan. The second article will follow closely that of the first, so that the continuity will not be broken.

ECONOMIC PRODUCTION QUANTITIES

Speaker Discusses Problem in Its Practical Operation Outlines the Advantages to be Expected

In connection with the recent annual meeting of the American Society of Mechanical Engineers, the management division devoted a session to "economic production quantities." C. H. Best, of Eli Lilly & Co., discussed the problem from the point of view of its practical operation and enumerated the advantages which can be realized from the use of economic lot sizes.

He summed these up by stating that, in his company's case "the number of production units has been decreased by one-half, even though the business has been growing rapidly; that satisfactory production control can be obtained at a reasonable cost; that the use of economic quantities has increased the opportunity for utilizing material handling equipment; that inventories have been reduced by more than one-fifth; and that the rate of turnover of capital has been increased by 20 per cent."

By controlling quantity through the method mentioned above, quality through standards, and variety of product through simplified practice, management is able to attack the waste problem from three different but complementary angles, with the result that a balanced and profitable production program should be assured.

WROUGHT-IRON RESEARCH

New Process for Wrought Iron Studied by the Bureau of Standards

A report published in the Bureau of Standards Journal of Research gives information on the comparative properties of wrought iron made according to the recently developed "Ashton" method and the similar product made by hand puddling.

Test results indicated no marked or significant differences between the two irons. The product made by the new process appears to have all the "earmarks" usually associated with the name wrought iron. The new-process iron, in the tests carried out, was more uniform in its structure than was the hand-puddled product; on the other hand, its tensile strength was slightly lower, but the ductility was higher. No significant differences in corrosion resistance of the two irons were revealed by the corrosion tests carried out.

To one interested in the history of metallurgy wrought iron has been a fascinating subject since the beginning of the art. Present-day manufacturing methods for wrought iron have not changed greatly for over a century. The need for more economical methods and processes, leading to increased production and lower costs, has long been realized. Various methods for reproducing the operations of puddling mechanically have been developed, and some used commercially with success.

The "Ashton" process was brought out recently for wrought-iron manufacture and differs radically from the others in its operations, though perhaps not in principle. It is now being used commercially. In this process no attempt is made to use the changes which are accomplished in the puddling process as ordinarily carried out, but are brought about as separate operations. The raw material (pig iron) is melted and refined in a Bessemer converter as in the manufacture of steel.

Slag—the characteristic structural constituent of all wrought iron—is then incorporated into the refined molten iron by pouring the iron into a bath of molten slag. The resulting "ball" resembles in all essential respects, except size, a ball of wrought iron made by hand puddling. The ball after squeezing so as to compact it and expel the excess slag is hot-rolled into shape for the manufacture of pipe or other commercial products.

BUILDERS' HARDWARE

Draft of Recommended Commercial Standard for Builders' Hardware (Nontemplate) Now Before Industry For Acceptance

In accordance with action of the advisory committee on the standardization of builders' hardware, and with the approval of the standing committee, a recommended commercial standard for builders' hardware (nontemplate) was circulated on January 27 to producers, distributors, and consumers of this commodity for written acceptance. The recommendation is to become effective upon announcement of official acceptance by the industry.

The recommended commercial standard comprises all the recommendations and types as listed in simplified practice recommendation No. 18 (1st revision), with numerous additions and changes approved by the standing committee.

The central object of the commercial standard is to establish standard nomenclature, definitions, and descriptions for various items of builders' hardware throughout the United States and to set up standard finishes and finish symbols which will be recognized and followed throughout the industry. Among the new finishes listed as standard are the following: USP, Primed for painting; US2C, Cadmium plated; US26, Chromium plated; and US26D, Dull chromium plated.

Exit bolts, locks, and latches are included among the new groups of standard items. Exit bolts, locks, and latches are used mainly on exit doors to theaters and other buildings where the public gather.

93407—30——2

INDUSTRY EVALUATES SIMPLIFICATION FOR SHOVELS, SPADES, AND SCOOPS

Prior to Adoption of Simplified Practice, Industry Manufactured 5,000 Varieties of Shovels; the Simplified Schedule Now Calls for 2,178 Varieties; More Than 96 Per Cent of Production Is in Conformity With Simpified Practice Recommendation No. 48

J. F. McNeil, *Division of Simplified Practice*

While there are no statistics on the subject, it is safe to estimate that half of the world's workers do their daily tasks with either a pencil or a shovel. Moreover, there is a surprisingly precise individual taste in these two tools. Most people have a decided preference as to type, style, etc.—but there were more than 5,000 varieties of shovels. That was approximately the possible variety prior to 1923. In that year the manufacturers decided to undertake a program of simplification designed to eliminate, as far as possible, the waste caused by unnecessary diversity. They felt that their purpose could best be effected through the concerted action of manufacturers, distributors, and users acting in cooperation with the division of simplified practice of the Bureau of Standards, Department of Commerce.

A simplified practice committee was appointed by the manufacturers to make a survey of the production and sales records with a view to the establishment of a simplified schedule. The data thus secured were used in preparing definite recommendations which were submitted for discussion at the first general conference held at Atlantic City, N. J., October 19, 1925. Here the manufacturers' program as applied to the simplified list of multiples and sizes was adopted, and at the same time action was taken with regard to finishes and grades.

Under this plan the new grade A took the place of the former grade A, and the new grade B took the place of the old grade B, and the new grade C supplanted what were formerly grades C and D. With regard to finishes the conference unanimously voted to eliminate all finishes except black on all items with the exception of molders' shovels, in which the finishes were limited to black and full polished. A modification of this program was necessary, however, because, due to the opposition of some to the elimination of polished finishes, it was impossible to secure signed acceptances from 80 per cent of the production capacity of the industry.

Second conference held in 1926.

A second general conference was held at the Department of Commerce, Washington, D. C., April 29, 1926. This conference reaffirmed the recommendation of the previous conference as applied to multiples, sizes, and grades. It was the consensus of opinion that there existed an unnecessary diversification of finishes and that it would be desirable and feasible to eliminate those for which there was little demand. A resolution was unanimously adopted, recommending that the industry, through the standing committee, work toward the elimination of as many of these finishes as possible.

A standing committee composed of representatives of manufacturers, distributors, and users was created to maintain contact between the industry and the division of simplified practice and to determine the adequacy of the recommendation through an annual review.

July 1, 1926, was selected as the date on which this recommendation should become effective.

Revisions.

On June 15, 1927, the standing committee unanimously recommended the addition of two types of shovels to the then existing schedules, the total reduction in variety being from 5,178, or 57 per cent. The success of the original program on grades and sizes prompted the manufacturers' representatives to place before the entire committee a proposal to include a section on finishes. This section was adopted, and now appears in the revised edition of the recommendation, which became effective July 1, 1927, and which was subsequently reaffirmed by the standing committee May 28, 1928.

A survey of production, conducted prior to the committee's latest meeting, showed that at that time more than 96 per cent of the shovels, spades, and scoops were being made in conformity with the simplified-practice recommendation.

Results.

After the simplification had been in effect for about a year the Department of Commerce requested a statement from the acceptors of the program as to the accruing results. The following are excerpts from some of the replies:

"On account of the simplified-practice program our inventories have been substantially decreased," said a

This review of the benefits derived from adherence to provisions of Simplified Practice Recommendation No. 48, Shovels, Spades and Scoops, is the tenth article of the series prepared for the Commercial Standards Monthly. Through the development of this particular simplification, industry reduced the variety of the commodity from 5,000 to 2,178. Shovel users find greater convenience and economy in buying the varieties listed on the simplified schedule, and manufacturers and distributors find that the recommendation has effected reductions in inventories.

Complimentary copies of these 10 summaries can be secured in mimeographed form from the Division of Simplified Practice, Bureau of Standards, Washington, D. C.

large eastern manufacturer of shovels. "The service which we have been able to render our customers has been decidedly increased and economies have been effected all along the line.

"Our customers have expressed themselves as quite favorable to the project and our program is believed to be very much worth while."

"The present program as adopted by the manufacturers of shovels, spades, and scoops," another manufacturer reported, "has now been in effect since July 1, 1926, and during that period up to date has proven most satisfactory, and unquestionably has tended to reduce the manufacturers' cost by reason of the elimination of so many odd sizes and grades, which elimination represents about 5 per cent of the sales volume."

A distributor of plumbers', steam fitters', and mill supplies and tools wrote: "We have already noticed a great benefit. We formerly used to carry a surplus stock of these items which did not move quickly, and now, as many of these various types and patterns have been eliminated, we can readily see that it is going to effect a big saving in the course of a year."

"We have noticed a much smaller invoice in shovels," a hardware dealer in the Mid-West replied.

"We are strictly in favor of the continuance of your program, and feel that the benefits will become greater and greater as time goes on."

"The sizes which we are using have been included in the simplified practice, or at least the sizes of the rough sheets from which the finished product is made are those that were adopted as standards," the purchasing agent of one of our large railway systems said. "We are in sympathy with the efforts which your department has made to bring about simplified practice, and if the manufacturers call attention to any special sizes that we are ordering, suggesting standard sizes instead, we will be very glad to endeavor to change our requirements to permit the purchase of these standard sizes."

It is apparent from the foregoing quotations that tangible benefit is being derived from the application of the simplified practice recommendation. The outstanding benefits recorded are: Reduction of inventory, release of storeroom space, less capital tied up in slow-moving stock, quicker deliveries, and an increase in turnover.

Simplified Practice Recommendation No. 48, Shovels, Spades, and Scoops, can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents a copy.

PUBLISHERS TURN TO STANDARDIZATION

Trade Press Has Shown a Growing Recognition of the Wastes in the Publishing Business Through Lack of Standardization and Research; Reference Is Made to Mechanical Operations and Production Machinery

Business men in fields closely related to advertising have generally tended to scoff at or distrust the value of standardization when carried out by consumers as a means of guiding their purchases, particularly when the dominance of nationally exploited trade brands was threatened by the possibility of the purchaser's making comparative tests and analyses, and doing his buying under specifications.

Lately, however, the publishing trade press has shown a growing recognition of the wastes in the publishing industry through lack of standardization and research. For example, J. E. Murphy, production manager of the *Minneapolis Tribune*, in *Editor and Publisher*, urges laboratory tests for all materials and machines used by newspapers and deplores the lack of quality standards in this billion dollar business.

"Publishers and production managers of daily newspapers in the United States are not giving enough attention to the standardizing and improving of the mechanical operations and production machinery which are used in the printing of the millions of lines of national and local advertising carried daily in these newspapers. There are no generally accepted standards for any of the materials we use to reproduce this advertising. We have no general appropriation under a central directing source to be used for necessary research work. We have no central chemical laboratory, and are associated with no commercial laboratory operating for our purposes to measure, test, and analyze our materials with a view to forming definite standards for them," he said.

"The work done by the Government Printing Office in cooperation with the mechanical department of the American Newspaper Publishers' Association is a step in the right direction, but it is only one step where a series of continual strides are necessary."

The statement of Murphy is noteworthy in that he is apparently among the first to recognize that even in the publishing and advertising business, research and standardization, guided by intelligent analysis of the consumer's requirements, are necessary for the establishment of rational guides for purchasing products of an essentially technical or engineering character.

NEW BOOKLET ON METAL PARTITIONS FOR TOILETS AND SHOWERS

Simplification Project Approved and Booklet on Sale

The division of simplified practice of the Bureau of Standards has just announced the release of the printed booklet on Simplified Practice Recommendation No. 101, Metal Partitions for Toilets and Showers.

An examination of this booklet, copies of which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents each, reveals the establishment by the industry of center-to-center dimensions for toilets, dressing room, and shower inclosures, together with a simplified list of stock sizes for partitions, fronts, doors, posts, and hardware.

Dimensions which fulfill the requirements for typical inclosures, door clearances, the style of fronts, and the height off floor of partitions, doors and backs, and a list of sizes, gages, and finish of panel sheet steel for doors and partitions, are also included in this recommendation.

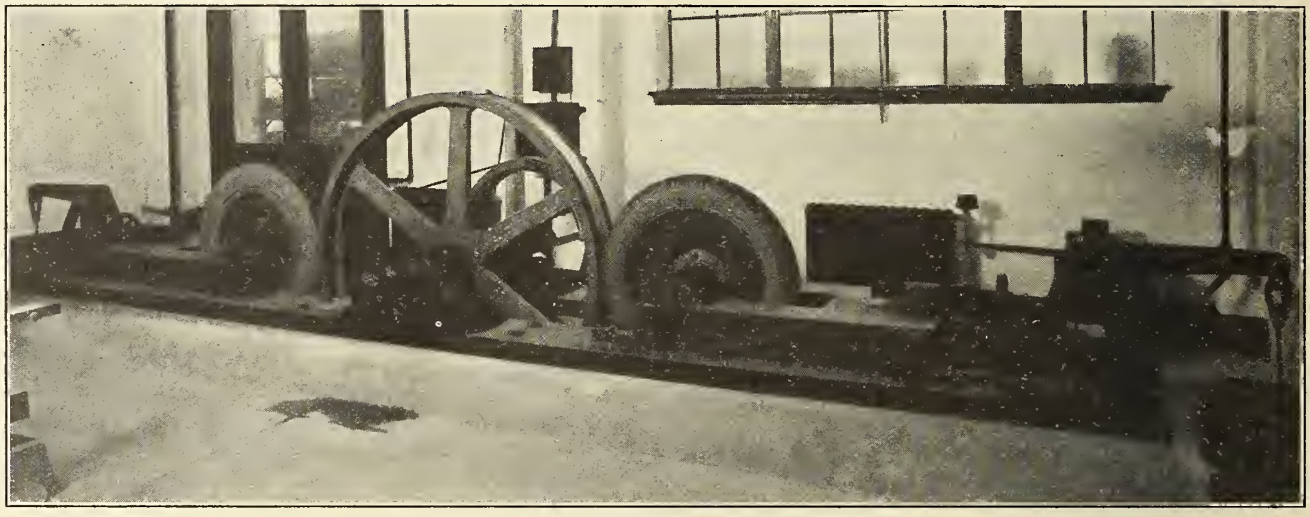
DURABILITY OF RUBBER PRODUCTS IMPROVED THROUGH RESEARCH

Tests and Analyses Made by Bureau of Standards on Materials to Determine Most Suitable Varieties for Specifications

P. L. Wormeley, *Chief, Rubber Section*

The activities of the National Bureau of Standards in matters relating directly to the rubber industry have been divided between work in connection with the inspection and testing of supplies purchased by the various Government agencies; the preparation of specifications, the development of laboratory equipment and methods of test; investigations relative to the physical, electrical, and chemical properties of rubber and rubber products; and experimental work involved in a study of the design and performance of automobile tires.

This work had its beginning in 1908, when investigations were undertaken in connection with the inspection of certain Government supplies.



Endurance tire test machine

The test wheel is a flat-faced pulley 1/400 mile in circumference which is driven at a surface speed of 30 miles per hour. The tire is mounted on a wheel free to revolve on a spindle and carried on a movable carriage and pressed against the drum with the desired axle load. Three cleats are bolted to the face of this wheel at 45° left and right hand, and at 90°, respectively. The inertia of the load applied is great enough to prevent any appreciable movements of the tire axle when the cleats strike the tire. The cleats are made by cutting longitudinal pieces ¾ inch high from a 2⅞-inch diameter shaft or what is equivalent, from a size 2½-inch pipe.

The laboratory equipment available at that time and the existing methods of test and analysis were altogether inadequate for an exact and expeditious determination of the physical and chemical properties of rubber goods. It was necessary, therefore, to direct particular attention to the development of testing apparatus and methods of analysis as a first step in the program of standardization.

The laboratory facilities of the Bureau of Standards are available without charge to State and municipal governments, but tests are not made for the public except in special cases where the necessary equipment is not to be found incommercial laboratories. A fee covering the actual expenses of the work is charged in each case.

Bureau made tests for Panama Canal purchases.

The large quantities of rubber goods required by the engineering forces in constructing the Panama Canal were purchased in accordance with the results of tests made at the Bureau of Standards.

This bureau has for 20 years acted in an advisory capacity for the various Government departments in furnishing specifications for miscellaneous materials, and in making reports covering the results of tests in connection with supplies furnished on contract or samples submitted with competitive bids.

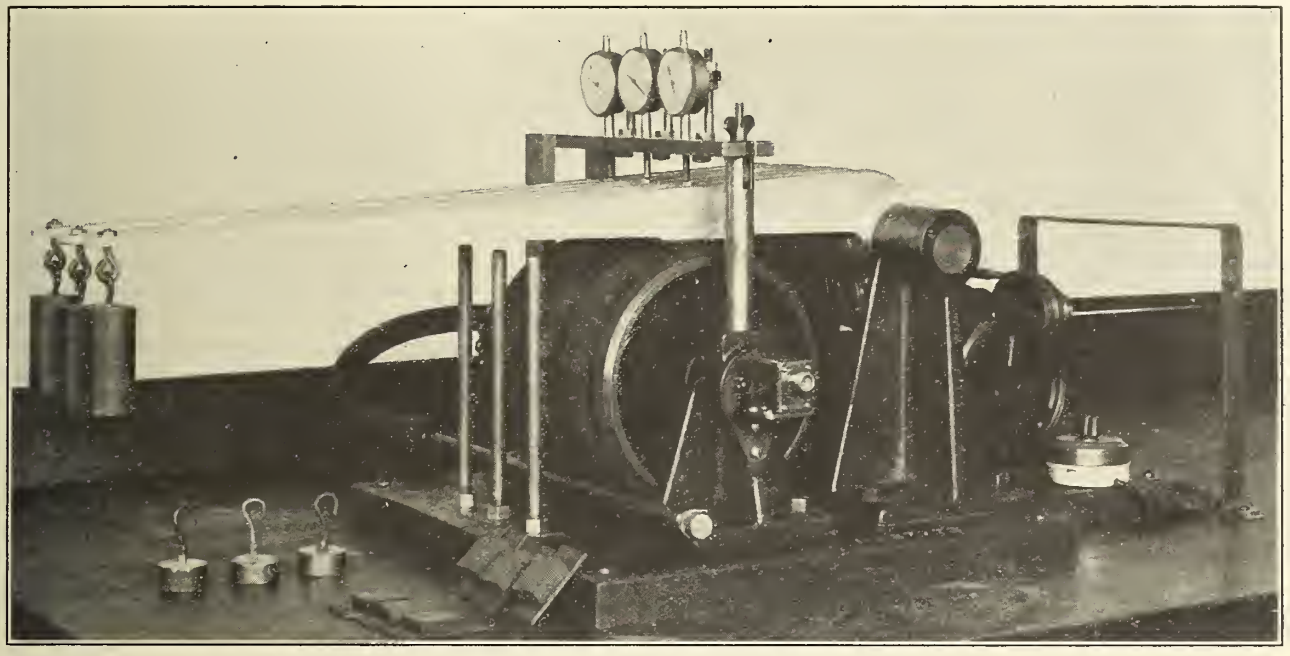
The General Supply Committee, created by act of Congress June 17, 1910, and functioning under the direction of the Secretary of the Treasury, is charged with the important responsibility of contracting for miscellaneous supplies required by the executive departments and other Government establishments in Washington. The bureau's active cooperation with the General Supply Committee and its close working contact with the various Government departments and technical societies have resulted in the accumulation of valuable information that is now serving a very useful purpose in the revision of old specifications and in the development of new ones.

Specifications board formed in 1921.

The Federal Specifications Board was organized under authority of Circular No. 42, Bureau of the Budget, dated October 10, 1921. The duties of the board are to compile or adopt and promulgate standard specifications for materials and services and to bring the Government specifications into harmony with the best commercial practice wherever conditions permit. The Director of the Bureau of Standards is ex officio chairman of the Federal Specifications Board.

For several years past a great deal of effort has been devoted by the rubber section of the bureau to experimental work required in the development of Federal specifications for various rubber products, such as automobile tires, footwear, hose, packings, and rubber medical supplies.

Aside from the obvious desirability of insuring commodities of standard and uniform quality, the establishment of standard specifications has introduced a marked economy in Government purchases, particularly in the case of certain items involving large expenditures, such, for example, as automobile-tire equipment. It has been estimated that the annual saving to the Government on this item alone is at least $500,000. At the present time all Government purchases of tire equipment are made on the basis of performance tests conducted in the laboratories of the bureau.



Machine for measuring the abrasive resistance of tire treads

Automobile tire designing.

The design of an automobile tire presents an intricate engineering problem, and the various details of construction have a distinct bearing upon the performance of a tire on the road. The bureau has conducted extensive investigations dealing with the durability of automobile tires and with the power loss, or energy dissipated as heat, when tires are operated under different conditions of axle load, speed, and inflation pressure.

The experimental work required special endurance machines designed to simulate road conditions and electrical dynamometers for measuring accurately the energy losses. The endurance machines, operating day and night under conditions which have been standardized, are now being used both for the testing of tires bought on Government contracts and for experimental testing in cooperative work with manufacturers to determine the effect of different changes in tire design and construction.

Other reasearches have been concerned with the influence of tire design on the fuel consumption of automobiles and of the effect of reclaimed rubber on the wearing quality of tires. The average motorist probably does not realize that in driving on a level road at a normal speed of 25 miles per hour the power consumed in flexing the tires, or, as is commonly said, in overcoming their rolling resistance, represents roughly 20 per cent of the power developed by the engine.

These investigations have shown that the energy wasted in the modern cord tires is approximately 25 per cent less than in tires of fabric construction and that the power loss is very greatly increased by underinflation of the tires. The detailed results of this work have been presented in the technologic publication of the bureau.

Test procedure a problem.

One of the problems of great practical importance that has thus far defied all attempts at solution is a dependable laboratory test procedure for measuring the resistance teo abrasion of rubber compounds, such as are used in the manufacture of automobile tires.

Some years ago the bureau undertook an investigation of this subject, and tests were made for the purpose of determining the relative abrasive resistance of tire treads. This work, which formed the subject matters of Bureau of Standards Technologic Paper No. 294, was received with much interest by the rubber industry and served to establish certain fundamental features of design for laboratory test machines. A large number of tests have since been made with a machine of improved design, and there is every reason to believe that the problem will be brought to a successful conclusion in the near future.

A problem of the greatest importance that is receiving attention relates to the aging properties of rubber. Progress has been made in an investigation to determine the effects of heat, sunlight, and oxygen on the physical properties of rubber compounds. A review of detailed results appears in Technologic Paper No. 342, entitled "The Aging of Soft Rubber Goods."

Experiments are under way to develop a more dependable accelerated aging test that will enable one to predict the aging properties of a rubber compound. Consideration is also being given to the use of so-called antioxidants, which are organic substances designed to prolong the life of rubber. Present indications point to the more extended application of this class of materials.

A recent investigation of "guayule" rubber made in cooperation with the Continental-Mexican Rubber Co. has shown that, by an improved process of treatment in its preparation, this rubber compares favorably with plantation Hevea rubber. Hevea rubber comprises about 95 per cent of the world's supply. The more extended use of guayule rubber would prove an economic advantage to the United States, as the shrub from which it is produced can be successfully grown in the Southwestern States, California, and in Mexico. The results of this investigation have been published in Technologic Paper No. 353.

PROTECTION FROM LIGHTNING

Losses to Country Arouse Renewed Interest in Adequate Safeguards

Realization of the losses in the United States as a result of lightning, which is considered to be responsible for most tank fires in the petroleum industries, has awakened a general interest in proper standards of protection. In the petroleum business, as in the protection of ordinary buildings, many inadequate protective installations have been made. However, by the application of the proper principles and standards of construction it is believed that losses from lightning can be greatly reduced.

Reports show that the number of fatalities from lightning in the United States is approximately 500 a year. From the ratio of deaths to injuries where both are known, the number injured is said to total about 1,300 a year. The same reports show that approximately nine-tenths of these casualties occur in rural districts, which include towns and villages having 2,500 inhabitants or less. Thus, it would seem that the lightning hazard is by far the greatest among persons engaged in outdoor pursuits.

However, according to the Bureau of Standards, the number of fatalities from lightning is insignificant in comparison with the number from all other accidental causes, which for 1925 was 90,341. The actual danger from lightning is, in general, very small, except under certain circumstances of exposure out of doors, which as a rule can be avoided. Within buildings of considerable size and dwelling houses of modern construction cases of injury from lightning are relatively rare. They are more frequent in small, unprotected buildings of the older type. Isolated schoolhouses and churches where numbers may congregate during thunderstorms present a considerable lightning hazzard if unprotected.

The use of lightning rods to prevent fire losses from lightning has been quite extensive, and from such data as are available it seems evident that existing lightning-rod installations cause the present total of damage to be much less than it would be if they were removed. Moreover, extension of the use of properly installed equipment would decrease the damage that now occurs. However, it would not be financially profitable to equip all buildings indiscriminately.

Survey made in Iowa.

The proportion of farm buildings equipped with lightning rods is not known except in Iowa, where a careful estimate indicates about 50 per cent. In the years 1919 to 1921, in that State, 28 rodded buildings were destroyed by lightning, the loss amounting to $87,979. In the same period 503 other buildings were destroyed, the damage totaling $1,060,668. The value of rodded buildings lost was only 7.7 per cent of the total, although the number exposed was about 50 per cent.

Without reference to the condition of the protective equipment, which in some cases is defective, assuming at a reasonable estimate that there are as many protected as unprotected farm buildings, the ratio of destruction is 1 rodded building to 57 not rodded.

In determining how far to go in providing lightning protection the following factors should be taken into consideration: Frequency and severity of thunderstorm, value and nature of building and contents, local conditions, relation to insurance premiums, personal hazards, and indirect losses. The fundamental theory of lightning protection for a building is to provide means by which a discharge may enter or leave the earth without passing through a nonconducting part of the structure, such as wood, brick, tile, or concrete.

EARPHONE BATTERIES

General Conference Adopts Simplified List of Sizes of Cells and Batteries; Project Has Support of American Federation of Organizations for the Hard of Hearing

A general conference of manufacturers, distributors, and users of earphone batteries was held in Washington on December 20, 1929, to consider the simplification of this commodity. The conference adopted a simplified list of sizes of cells and batteries and the industry is being circularized for acceptance. Batteries of the type covered by the recommendation are used with instruments employed by the hard of hearing.

The program was developed by a committee of representatives of manufacturers of batteries and earphones and organized users. C. A. Gillingham, of the National Carbon Co., was chairman of the committee, and was retained as chairman of the standing committee. The project has the indorsement and support of the American Federation of Organizations for the Hard of Hearing. Some of the results which may be expected to follow the adoption of the recommendation are as follows: (1) There would be sufficient business in each of the standard types to make it possible to produce them economically; (2) they could be carried in stock, thus speeding up delivery service to the customers and the users; (3) there would be enough profit in the business to justify producers of batteries making the necessary investigations to improve their quality materially, and produce a type best adapted for earphone service; (4) it would enable the final consumer of the battery to purchase them more conveniently, since wider retail distribution would be possible in the case of a standardized battery.

SIMPLIFICATION AND THE LIFT TRUCK

Lift-Truck Concern Applied Simplification 10 Years Ago. Simplification Found to Benefit Public as Well as Manufacturers

By T. F. Moriarty

The idea of simplification, as applied to production in the factory, has always appealed to us, and as far back as 10 years ago we practiced the art with decided success. At the time our organization took up the lift-truck business it was a toddling youngster just grown out of the infant stage. Certain practices seemed to us rather crude, and we determined that when the first opportunity presented itself we would effect a change.

Our company, which on January 1, 1926, merged with another, had been the pioneer manufacturer of lift trucks. The original line included just one type, made in four sizes. Only to a small extent were parts on the various sizes interchangeable, and complete redesigning was necessary to permit an original type to be made in a different width or length.

This situation prevented many concerns from enjoying the benefits of the lift-truck system which was a boom to hundreds of firms for which it earned big dividends in reduced time labor costs. The four sizes would handle the loads of most firms, which were prospects for the equipment, but there were numerous others who were compelled to wait for special sizes to be built.

Produced second type.

The necessity for an extension of the line was quickly recognized, and a second type was put on the market a few years after the first appeared. At the same time other manufacturers appeared with their models, and the output of several factories found its way all over the country and into foreign lands. The new type afforded more firms an opportunity to put their materials on skids and to eliminate rehandlings, because the new line offered 12 distinct models as against 4 made in the original type.

We made further advancement toward simplification in the lift-truck industry by reducing in number the parts that had to be changed in order to assemble trucks in various sizes. Yet the sizes equivalent to the original four were most in demand, because hundreds of firms were using those sizes and had built thousands of skids for use with the trucks. Those sizes had become standard for the lines of business in which the lift-truck system had made its greatest progress. To-day, when hundreds of sizes in varying capacities are available, the specifications of the original four models are closely adhered to in the industrial plants and places of business where the system was welcomed in its infancy.

Public approves of simplification.

Simplification appeals to us for other reasons than merely saving money in our factory. We feel that it benefits the public (our customers) as much as it does ourselves. Our aim in bringing out our first type of truck was to provide a design that would permit building all sizes at that time in use, with the smallest number of different parts, and at the same time allow the addition of new sizes as the need for them developed.

As we saw it, there were great things ahead for the lift-truck industry and we wanted to be prepared. We felt that simplification, applied principally to the engineering department, was going to be valuable, and over all these years we have found no reason to believe otherwise.

In the early days of our company it was the practice among lift-truck makers to build generous quantities of each size in the catalogue. This caused no difficulties until other sizes were introduced, and the few models had grown to a score or more. Then it was realized that to continue the plan of having a large number of each size in stock would mean the investment of a great deal more capital, because stocks had to be heavy. As we saw it, this meant greater expense which had to be passed along to the customer in the price of each truck.

Need for large stocks eliminated.

The simplified design of our line eliminated the need for big stocks. All the parts, with the exception of side rails, were interchangeable on the various models. More important yet, the parts were finished with extreme care and could be assembled in short order even by an inexperienced workman. As a result of this arrangement it was possible to build trucks the day an order was received and to paint them and ship the following day. This was not necessary very often, as a small stock of completed trucks, especially in fast-selling sizes, were kept on hand for rush orders.

We saw clearly that simplification in our business meant smaller stocks of parts and of finished models. It meant improved service for the customer, as a shortage of parts rarely occurred because such wanted

This article, by T. F. Moriarty, 6261 Cortelyou Street, Cincinnati, Ohio, was submitted by him in the Shaw simplification contest. The author has written his article from an interview with Walter C. Stuebing, president of the Stuebing-Cowan Co., of Cincinnati, Ohio, and Holyoke, Mass. Incidentally, Stuebing was one of the leaders in developing the simplified practice recommendation for lift trucks and skid platforms. A review of this recommendation, by Victor Whitlock, of the United States Daily, appeared in the October number of the Commercial Standards Monthly.

parts were tied up in assembled trucks in the stock room. One bad feature of maintaining large stocks of assembled trucks was the "robbing" or borrowing of parts necessary for rush orders from models in the stock room. The expense of taking off and making replacements later was an important item.

Simplification meant a big cut in our stock of parts because of their being interchangeable on the various models; it meant less pattern cost; it offered economies in administration, in sales, and in publicity; with the result that it was possible to produce good trucks to sell at lower prices and better trucks to sell at the prices then in effect. It has been our experience that every time simplification has registered an advantage for us the users of our equipment have also benefited.

Simplification was not lost sight of when improvements were made from time to time in our various types. As time went on, experience showed that our equipment could be made to do a better job for our customers by redesigning certain parts and by adopting new principles. There was no hesitation on our part. The changes were made in order that customers with our trucks in service could also benefit by the improved features.

Redesigning made possible the furnishing of new parts in place of the old and has eliminated many difficulties that face manufacturers of equipment who did not put the proper value on simplification when their products were being improved.

Has your company applied simplification, thus effecting worth-while savings?

Why not tell the readers of the COMMERCIAL STANDARDS MONTHLY about it?

Organizations engaged in developing standardization programs; industries and individual concerns interested in the promulgation of simplified practice recommendations are cordinally invited to submit news on such activities for consideration by the editor.

Improvements added to old models.

As a result of our policy, users of our trucks can consult a parts list, make out an order for replacements, and be sure that every part received is what they want for their trucks. Service on repair orders has been speeded up, for the factory knows exactly what parts are suitable, and because of the interchangeability of parts complete stocks can be maintained without a large investment of capital.

Customers have been given the opportunity of bringing their old models up to date, as the improved features can be applied to their machines in their own plants at a reasonable cost. This feature has reacted favorably for our firm, as it has advertised the important improvements in our trucks and has emphasized that we have kept abreast of the time.

The merger of the two companies about four years ago gave us increased opportunities to apply the principles of simplification. Here we were with two complete lines of trucks, each line preferred by thousands of industrial and commercial firms. A careful check of each line was made and certain models were easily eliminated without affecting the standard practice of users. Gradually certain types were made interchangeable, so that certain major parts could be used on both types. This made possible consolidated purchases of material for side rails; steel for pins, shafts, and axles; and roller bearings for wheels. In the item of bearings alone a saving of 45 per cent has been made through placing one large order instead of two smaller ones.

Not a move was made that simply meant savings for us, through reduced costs, for we insisted that the quality of our products be maintained. In some cases the changes have meant an improvement in the type where the part was altered.

Overhead costs reduced.

Simplification in administration has meant lower costs through reduction of overhead. The combination of two firms into one permitted broader guaranties, so that the item of chance is eliminated in this line for users whose conditions are unusual. The economies contributed by simplified administration have meant added profits large enough so that after the first year the company found it possible to pass these economies along to the users in the shape of reduced prices.

A higher quality of product, a saving to the customer, and improvement of the service in every phase are the fruits of our policy of simplification as practiced extensively during the past several years. Moreover, the use of the lift-truck system has been extended; firms who felt that their business was not adapted to the use of lift trucks and skids have investigated, and a start has been made. Simplification in various industries and the use of certain sizes of trucks and skids have encouraged transportation companies to participate in the savings offered by the use of the system.

Shipments on skids.

Hundreds of firms in various lines are shipping their products on skids, which results in great savings through the elimination of packing cases and in the labor of packing and unpacking. These shipments must be handled by steamships, freight stations, and motor-truck firms, who can do so with only a small investment in trucks, because when the lift truck was new it was standardized in a few sizes. This same idea, or art as it might be called, will have a far-reaching effect on the future of the lift-truck industry. Without simplification, the use of the system would be confined to the few lines of business to which it was originally introduced.

Simplification has made possible the offering of our line of trucks in 600 different sizes, yet requiring only a small number of standard parts plus varying lengths of flat steel, and round shafts. Simplified standard lift-truck units will permit exchanging loads between industrial plants and jobbers, between paper houses and printers, between wholesalers and retailers, between transportation companies, shippers, and consumers.

It is not too much to say that in the near future lift trucks and skids will be found in all large commercial establishments, in hotels for handling incoming supplies and baggage, in libraries, hospitals, and other public institutions. Simplification certainly has enlarged the field for the lift-truck maker.

FUEL OIL

New Printed Booklet, "Domestic and Industrial Fuel Oils," Describes Their Properties From Consumer's Viewpoint

The printed edition of the commercial standard specifications for fuel oil has recently been released by the Bureau of Standards. This publication is designated "Domestic and Industrial Fuel Oils, Commercial Standard CS12-29." Copies are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents per copy.

This specification covers 6 grades of fuel oil, numerically designated from 1 to 6; the first 3 being principally for domestic or house-heating purposes, while the last 3 are generally considered for industrial use. Requirements and tests are prescribed for the following important characteristics of the various grades:

Flash point.—The temperature to which an oil must be heated in order to give off sufficient vapor to form an inflammable mixture with air. The minimum flash point is usually fixed by law to guard against the fire hazards that would be introduced by the use of highly inflammable oil. Maximum flash points are specified to insure the proper ease of ignition.

Water and sediment.—Impurities in fuel oil, the presence of which is very undesirable. Water reduces the heating efficiency of an oil and must be evaporated off, while sediment is likely to cause clogging of the burner.

Pour point.—The lowest temperature at which an oil will flow under prescribed conditions. It is included in the specifications so that oils may be secured that will cause no difficulty in handling or use at the lowest temperatures to which they may normally be subjected.

Distillation.—Tests which give an index as to the volatility of an oil. The 10 per cent point is the criterion of ease of ignition, and the 90 per cent point and end point are specified to make sure that the oil will burn completely and produce a minimum of carbon.

Viscosity.—The measure of resistance to flow. Maximum limits are placed on this property because of its effect on the rate of flow through pipe lines and upon the degree of atomization that may be secured in any given equipment.

Advantages of standard grades.

The use of these standard grades of fuel oils will provide a sound and stable basis of everyday trade for all concerned. The manufacturers of oil-burning equipment will be able to recommend one grade of oil for their particular burner that will be essentially the same wherever it is purchased. The practice will relieve them of numerous complaints against their equipment, which, in many cases, were due not to faulty burners, but rather to the use of oil unsuited to them.

To the householder who buys the fuel oil, standard grades will mean easier procurement. He can buy the grade recommended for his equipment with assurance of satisfactory service, and no longer needs to purchase the lighter and more expensive oils to be on the safe side.

The distributor profits by standard grades in that he can sell one of the several standard grades required by his customers. The grades produce a fair basis of competition and prevent the securing of business on untrue and unfounded claims.

Refiners also benefit.

While last, the refiners are far from least in the benefits to be derived from commercial standard grades of fuel oil. In the first place, they can anticipate a steady demand for the standard grades and are not confronted with requests from many sources for oils of different specifications. However, the greatest influence of standard grades of fuel oil is in the stabilizing effect on the industry as a whole, because anything done to bring about greater satisfaction and convenience in the use of oil as fuel for house heating is a step toward increased consumption and the advancement of the industry.

In brief, the standard grades are those of the industry, developed with the cooperation of burner manufacturers, oil refiners, distributors, and consumers for their mutual benefit. They establish a classification that can be readily understood by all concerned, which is based on the characteristics essential to satisfactory burner performance and heating efficiency.

The consumer no longer has to listen to meaningless arguments on gravity, color, etc., but can purchase with assurance the grade recommended for his particular burner, knowing that the oil distributor and, in turn, the refiner will understand his needs.

PACKING FOR OCEAN SHIPPING

German Committee Issues Revised Manual

A pamphlet on the subject of "Packing for Ocean Shipping," published sometime ago by the German Committee on Economic Production (AWF), has been reprinted in the second edition, according to a news item appearing in the A. S. A. Bulletin. The pamphlet originated from the desire to clarify knowledge of the present methods of packing goods for export. It is illustrated by specific examples showing to what influences goods shipped overseas are subjected, both at sea and when transported in the foreign country. One of the subjects dealt with is the regulations in foreign countries concerning tariffs, as these items have considerable influence on the choice of the kind of packing and the marking. The text is illustrated by pictures.

There is included a list of conventional symbols indicating the way in which export goods should be treated. These symbols are meant to be self-interpreting, in view of the fact that large numbers of longshoremen are illiterate and, therefore, could not be instructed by written indications.

93407—30——3

ADVERTISING AND SIMPLIFIED PRACTICE

Professional Interest in Simplified Practice. "Simplified Lines" Now Featured in Advertising

By S. F. Tillman

Members of the advertising profession are realizing more and more that they have a newer function in their work, that of business analyst and counselor. They and their clients are seeing with greater clarity than ever before that advertising has become more than merely a brokerage agency or a technical art service.

They guide expenditures amounting to billions of dollars annually, but unless their counsel is based on exact and detailed knowledge of facts gained by research its effectiveness is lost. With emphasis on these functions becoming increasingly greater, members of the advertising profession are studying every possibility for assisting their clients to a more rapid rate of turnover and to wise economies which will make for improved stability in their business.

It is interesting to note that some of the members of the advertising profession are tying-in their program with the currently active simplification movement. Under the auspices of the division of simplified practice many industries have adopted simplified practice recommendations, which serve to eliminate the unnecessary varieties, sizes, and dimensions of articles in everyday use. This bringing together of elements of an industry, the manufacturers, distributors, and consumers to consider the facts and to take united action for their mutual benefit, has led to the adoption of remedial measures and the annual saving of appreciable sums of money by all interests.

Revelation by competent industrial experts that a large amount of preventable waste is directly traceable to overdiversification of sizes, dimensions, and varieties of commodities led to the initiation of the service of the division of simplified practice within the Bureau of Standards. This division assists entire industries, manufacturers, distributors, and consumers in weeding out superfluous and unnecessary varieties. It has no, nor does it desire, regulatory nor police powers. Its activity is confined to cooperation with industry in reaching those conclusions which have been defined by industry.

Professional interest in work.

The benefits from simplification make a direct appeal to the advertising profession. The manufacturer finds in the principles of simplified practice an aid in controlling production, inventory, and distribution costs. To the distributor there comes a quicker turnover of stocks, reduced warehouseing space, and smaller losses on dead stock. These benefits, in the final analysis, should reach the consumer.

It will be seen, therefore, that the economic value of simplification and adherence to it by the advertising client is an important matter for the consideration of the business analyst, and it would seem equally important for the advertising client to stress this in his advertising "copy."

Numerous groups which have applied simplified practice in their business have undertaken to "tell the world" that they are following this program of intelligent management. The division of simplified practice has received a number of advertisement clippings exemplifying that action.

"To-morrow's profits must come from to-day's wastes," is a statement that has been used repeatedly by commentators on the simplification movement. Such economies as will come from simplification offer to members of the advertising profession, in their capacities of business analyst and counselor, a subject for serious consideration as they strive to improve and broaden their service to commerce and industry.

COPPER RANGE BOILERS

Replies have been received from manufacturers of copper range boilers to a questionnaire sent out by the division of simplified practice in December. These replies will serve as a guide to the simplified practice committee of the industry in their work of drafting a tentative simplified practice recommendation.

PROPERTIES OF REFRIGERATING AGENTS STUDIED AS BASIS FOR IMPROVING COOLING SYSTEMS

Refrigeration Makes it Possible for Every Section of Country to Enjoy Products from Other Sections at Any Time; Real Service of Refrigeration Hardly Appreciated

By Hugh G. Boutell, *Chief, Information Section, National Bureau of Standards*

The refrigeration industry is a modern development. Even the use of natural ice as a means of preserving foods did not become general until comparatively recent times. The art of refrigeration by mechanical means is still more recent, though, as carried out in plants of comparatively large size, it has been in successful use for many years.

The public's interest in mechanical refrigeration is a development of to-day. A short time ago mechanical refrigeration was associated in the mind of the average citizen only with jokes concerning "cold-storage eggs," and other abominations. That there would ever be a connection between mechanical refrigeration and the transfer of real estate would have seemed impossible, yet to-day "Equipped With Eternal Frost," or some similar slogan, has moved many a stubborn house and secured tenants for otherwise undesirable apartments.

Public does not recognize full service.

Still, the real service of refrigeration to the public is hardly appreciated. Much of our food could never reach our tables if it were not for this great industry. We would be obliged to lead a hand-to-mouth existence, eating only those products which could be grown near at hand and those only "in season."

Refrigeration makes it possible for every section of the country to receive and enjoy the food produced by every other section at any time of the year, and, what is almost equally important, it permits the buying of large quantities of supplies in advance with the assurance that they will be in first-class condition when needed.

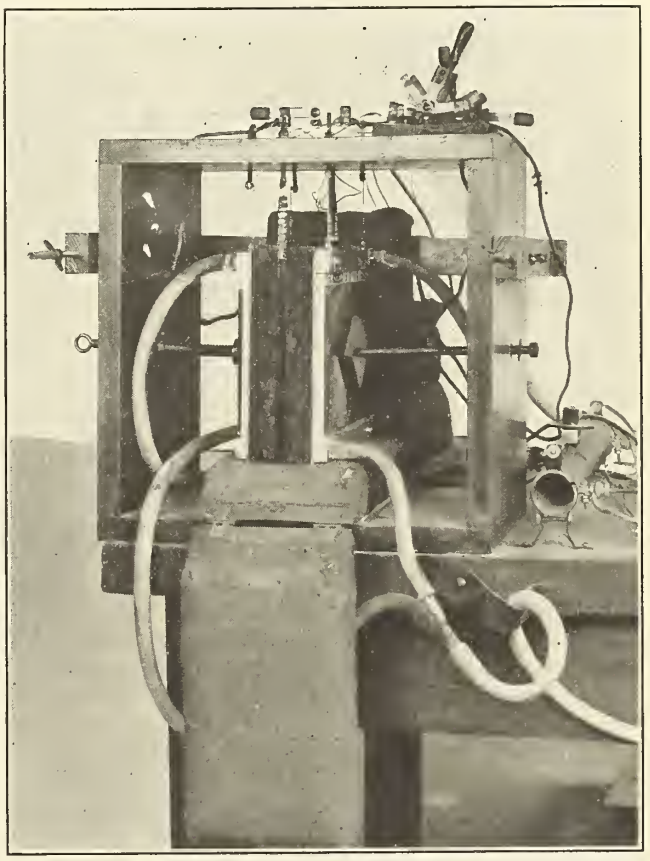
To-day refrigeration engineering is generally accepted to mean refrigeration by mechanical means, as distinguished from the production of cold by natural ice, and it is in this field that most of the work of the National Bureau of Standards finds its application.

Two classes of refrigeration.

Refrigeration plants are divided into two main classes, compression and absorption. In the former, the refrigerant in gaseous form is compressed by a pump, cooled by running water or air in a condenser, and then expanded in coils. During the expansion the refrigerant takes up heat from whatever surrounds it, and it is in this way that the cooling effect is produced.

In the absorption machine the expansion coils and condenser are much the same as in the compression plant. In place of the pump or compressor to draw the gas from the evaporating coils and deliver it to the condenser an absorber and generator are used. The cold gas from the expansion coils is absorbed by a liquid or some other material in the absorber, after which it passes to the generator or still. This is heated either by a flame or by steam which drives off the gas, the latter passing through the condenser and expansion coils as in a compression plant.

Refrigeration plants of either the compression or absorption types may produce the cooling effect by direct or indirect means. In the former case the coils containing the refrigerating medium are placed directly within the space to be cooled, while in the latter these coils are immersed in a tank containing a liquid of low freezing point which is then circulated through the space to be refrigerated.



Apparatus for testing thermal conductivity of insulating materials showing two specimens of cork board inserted and the apparatus partly closed

Complicated apparatus required.

It is obvious that any system of mechanical refrigeration requires the use of considerable apparatus which is necessarily rather complicated. For many years it did not appear possible to design small plants which would be sufficiently "fool proof" to run for long periods without attention. However, greater technical skill, refinements in manufacturing processes, and particularly the revolutionary changes which have been effected by mass production have

now made possible mechanical refrigeration units of very small size.

The result is evident in the numerous highly successful household refrigerators now on the market. Even railroad cars used for the transportation of perishable foodstuffs are being equipped with mechanical refrigeration. In one of these systems a master car contains the refrigeration plant, the other cars in the train serving merely as cold-storage rooms, while in another system each car operates as a unit. Cars of this type have been used to transport frozen fish from the eastern seaboard to every section of the country.

While, as just stated, it is undoubtedly true that the greater portion of the rapid development of mechanical refrigeration in recent years is to be attributed to improved manufacturing methods, yet it is certain that some of this has been the result of increased knowledge of the properties of refrigeration media, such as ammonia, carbon dioxide, sulphur dioxide, etc., and of insulating materials.

Standard constants are fundamental.

The so-called standard constants play a fundamental part in the refrigeration industry. It is not possible to design even a moderately successful refrigeration plant without an accurate knowledge of the physical properties of the cooling agent to be employed. One of the primary duties of the bureau is to determine the values of these standard constants.

A dozen years ago the need for more extensive and precise tables of the properties of ammonia led the bureau to undertake an investigation which required eight years to complete, and which for thoroughness and high accuracy has never been equalled. Essentially, the investigation required heat measurements under carefully controlled conditions, so that only heat given to or taken from the fluid intentionally would be measured. All ordinary heat losses had to be eliminated.

The construction of the calorimeter with its surrounding baths was in itself a major piece of work involving scientific design of the first order and high skill on the part of the instrument maker. The preliminary work was long and tedious, yet the results justified all the time spent on the project and the smoothness with which the final measurements were made bore witness to the careful thought given to the plan and construction of the apparatus.

The results of the above work took the form of tables and graphs of the thermodynamic properties of ammonia which are now recognized as international standards. With these complete and accurate data at his command, the refrigeration engineer has been able to design machinery on a more precise basis. This work was so well though of by the refrigeration industry abroad that the Societe Internationale du Froid awarded the sum of 15,000 francs to the National Bureau of Standards in recognition of its services. This fund is being administered by the National Research Council, and is being used to complete tables of the properties of methane, another important refrigerating medium.

Trouble occasionally encountered.

In the case of absorption plants trouble is occasionally experienced because of the formation of foul gases within the system which attack the metal of pipes, valves, and other parts, causing rapid corrosion. The bureau investigated the matter and discovered that there are two causes for the formation of these gases—air leaks and the use of impure aqua ammonia.

The former cause is indicated by the formation of nitrogen, the latter by hydrogen. The remedy for air leaks, of course, lies in keeping every part of the system tight, while corrosion caused by impurities in the aqua ammonia may be prevented by adding potassium dichromate to the extent of 0.2 per cent of the weight of the aqua ammonia charge. A method was also worked out for estimating the amount of carbon dioxide (an objectionable impurity) present in the ammonia.

Calcium chloride brine is one of the solutions often employed in refrigerating plants which use the indirect method of cooling. The bureau conducted an investigation of chemically pure and of commercial calcium chloride solutions and determined their specific heats at various densities and at temperatures from −31° to +68° F. Two independent methods were employed, and energy and temperature measurements were made electrically. The work stands, after 20 years, as authoritative.

Insulating materials important.

Insulating materials are almost as important in the refrigeration industry as the refrigerant itself. The bureau has pointed out that great improvements could be made in the ordinary household refrigerator using ice if such insulation as is used for mechanical units were employed. It has studied the heat transfer through most of the commercial insulating materials and has issued a letter circular on the subject.

This circular letter gives the weight of the material in pounds per cubic foot and the thermal conductivity in B. t. u. per hour, per square foot, and temperature gradient of 1° F. per inch thickness. The lower the conductivity the greater is the insulating value of the material. In the circular it is explained that there is no essential difference between insulating against "heat" and insulating against "cold." In general, however, a refrigerator should be much better insulated than a house, both to save refrigeration and to maintain a lower temperature on the inside.

For instance, an ordinary household refrigerator should have the equivalent of not less than 2 inches of insulation. The moisture-resisting quality of the insulating material is also an important matter in choosing substances for refrigeration insulation. So far the bureau has not found any material which is in any sense water or moisture proof. All absorb more or less moisture, and when in a completely saturated state their insulating value is lowered many times.

In conclusion, it is of interest to note that the American Society of Refrigerating Engineers has developed a standard test for ordinary household refrigerators. Eventually it is expected that each refrigerator will be provided with a uniform name plate on which the temperatures of the various compartments and ice consumed in a given time will be indicated. The value of such information to the purchaser is obvious.

ECONOMIES TO USERS OF COMMERCIAL STANDARDS

Uniform Basis of Purchase and Satisfactory Assurance That Delivered Goods Equal or Exceed Specification Requirements Found in Commercial Standards

By I. J. Fairchild, *Chief Division of Trade Standards*

The National Association of Purchasing Agents, public utility purchasers, and, in fact, all professional purchasers, in their desire to obtain the maximum value in performance or service for each dollar expended, require three things: First, a uniform basis of purchase, acceptable alike to the producer, distributor, and the purchaser, and set down in black and white—in other words, a nationally recognized specification; second, ample competition among bidders; and, third, satisfactory assurance that delivered goods equal or exceed the specification requirements.

In abbreviated form, these three requirements may be stated like this: (1) An acceptable basis for purchase, (2) ample competition, and (3) assurance of delivered quality.

It may safely be assumed that, as a group, professional purchasing agents are committed to the policy of using specifications as a uniform basis of purchase, and therefore the first major problem confronting the purchasing agent is the preparation or selection of a suitable specification for a given commodity.

Variety of specifications exist.

In most lines there is a bewildering variety of specifications sponsored by individual manufacturers, technical societies, associations, and prepared in some instances from a one-sided point of view. Some of these exploit a special claim by an individual manufacturer, others cover special requirements of a particular group of users, and still others are prepared from the technical point of view, with little or no regard to the economies of the situation or the fundamental principles of purchasing.

If the professional purchaser attempts the preparation of a specification to suit his particular needs, he is frequently shocked by the absence of authentic information. He is confronted with a conglomeration of conflicting claims and clever jockeying for position on the part of the producers, and he endeavors to boil down the thin and watery advertising sap to obtain the residual competition sugar, the presence of which is evident.

His immediate questions are, What shall be included in the specifications? What omitted? Can it be checked? Almost any requirement that he sets down is likely to limit competition to some extent. But why elaborate? One knows only too well that most of the trials and tribulations of the purchasing agent originate in the preparation or selection of a specification. No doubt, many long for an authoritative statement, or some place to turn for authentic information on proper specification requirements and tests for a given commodity.

Checking deliveries.

The checking of deliveries for conformity to the specification requirements is another major problem of the purchasing agent. What tests shall be employed? What is the recognized method of test? Is the value of this delivery sufficient to warrant a complete laboratory test? Will the delay incident to testing be prohibitive or objectionable? If so, how can we be assured that we have received satisfactory quality?

With these questions in mind let us consider the method of developing and establishing commercial standards. They may, of course, be proposed by any group sufficiently irritated by existing conditions to devote the necessary time and effort to the preparation of a specification. The cooperation of the Bureau of Standards is obtained only upon written request, lest there be any impression of Government interference in business.

Taking the ordinary case as an example, let us assume that the conflicting claims of the manufacturers have brought about a continuous lowering of quality to obtain increased volume, which has acted as a boomerang on the producers by reducing demand for the commodity as a whole. Driven by the formidable tide of public opinion, the producers hasten to repair or rebuild a foundation of quality, service, or performance which has been permitted to disintegrate by inattention and neglect.

Having requested the cooperation of the Bureau of Standards, they pool their past experience and initiate research to plug the holes in available knowledge of the commodity and as soon as practicable select or formulate a specification which is known, at that stage, as a "proposed commercial standard."

Copies are prepared in large numbers and transmitted to all known producers and to distributors and consumers for careful consideration and criticism. Also the proposed commercial standard is published in the trade papers and readers are invited to submit their comments by correspondence or to attend the general conference and present their suggestions in person.

General conferences.

A representative of the Bureau of Standards presides, as a neutral referee, at the general conference

This paper was delivered by I. J. Fairchild on the occasion of the sixth annual conference of the public utility group of the National Association of Purchasing Agents, held last month at the Bureau of Standards. It is printed in the Commercial Standards Monthly for the information of those unable to attend the conference last month.

and endeavors to elicit all pertinent suggestions and criticisms in order that the standard as finally adopted may be in a form acceptable to all branches of business directly concerned in the commodity.

After arranging the details to its satisfaction the general conference adopts the proposed commercial standard and from that time forward it is known as a recommended commercial standard. The general conference also appoints a standing committee, representing all branches of the business, which is charged with the specific duty of initiating and coordinating suggestions for revisions, in order that the commercial standard may be kept continually abreast of progress in the industry.

The verbal approval by the general conference is not considered final, but is regarded as authority for circulating the recommended commercial standard to producers, distributors, and consumers for written acceptance. They are asked to sign on the dotted line, signifying that the commercial standard will be made their standard of practice for one year and that they will use their best effort in securing its general adoption.

Publication of standard.

When acceptances have been received representing at least 65 per cent of production by volume, and provided there is no active opposition from any group directly concerned, an announcement of success of the project is circulated to industry, and the specification is given a serial identification number for easy reference and published as a commercial standard.

It is customary to print 2,500 copies of each commercial standard and circulate them to libraries, organizations of producers, distributors and consumers, all acceptors of the project, and others who may specifically request a copy. Additional copies are available through the Superintendent of Documents, Government Printing Office, at a very nominal price, usually not to exceed 5 or 10 cents per copy, with reduced rates for quantity purchases.

Self-certifying labels.

The central point of interest is the self-certifying label or certificate by means of which the consumer is assured that the quality, service, or performance value of the product equals or exceeds the requirements of the commercial standard. The term "Self-certifying" is used to indicate a label bearing a complete, concise, and comprehensive statement that the article to which it is attached complies in every respect to the requirements and tests of a nationally recognized standard such as the commercial standard.

A. F. Allison, president of the National Standards Council, and secretary of the International Association of Garment Manufacturers, in a paper delivered before the January meeting of the General Federation of Women's Clubs, said:

> Labels are ancient institutions. In the days of chivalry the Sir Knight, brave and bold, proudly rode forth to battle or tournament bearing his family trade-mark (coat of arms) on his armor and wearing the golden spurs which certified to all beholders that he had met, at least, the minimum standard requirements for knighthood.
>
> Just as the golden spurs were evidence that the wearer had passed the tests required to maintain at least a minimum standard of fitness for knighthood, so in our modern life widely recognized labels serve as evidence tending to prove that the commodity complies or exceeds an established standard. But what of the false knight, the imposter who wears the golden spurs to aid his selfish purpose without having earned the right? The more valuable the label or trade-mark the greater temptation is offered to the weak, ignorant, or unscrupulous imitator.
>
> A mark or insignia has been devised by the National Standards Council which will be used by manufacturers under license terms which provide for inspection of plant and products and penalties for any misrepresentation. Products bearing the National Standards Council mark or tag must comply with or exceed the requirements of the United States Commercial Standard.

Tag has code index number.

The tag adopted by the National Standards Council bears these words: "Guaranteed full size, complying with U. S. Commercial Standard CS15–29 (or any other number), National Standards Council (Inc.) No. 12345." The latter number is a code index to the manufacturer to preserve the line of responsibility for such garments as are sold under the distributor's label.

The label copyrighted by the Wallpaper Association reads as follows: "The manufacturer guarantees this wall paper to meet requirements of U. S. Commercial Standard CS16–29 issued by U. S. Dept. of Commerce." This label is used on the backs of wall paper samples. On the margin of the wall paper delivered to the job there appears this statement: "Conforms to specification No. CS16–29, U. S. Department of Commerce." A large distributor has just issued one and three-fourth million copies of a spring and summer wall paper catalogue for 1930.

This catalogue contains approximately 90 samples of wall paper, 72 of which bear the self-certifying labels based on the commercial standard. The remaining 18 do not bear the label, indicating that a demand is still anticipated for wall paper which will not meet these exacting requirements.

Standards for clinical thermometers.

Clinical thermometers are now sold accompanied by a certificate which includes the following statement: "We the undersigned manufacturers hereby certify that our registered clinical thermometer marked No. 123456 will meet all the requirements and tests specified in United States Department of Commerce Commercial Standard CS1–28 for Clinical Thermometers."

Other examples might be cited, but it is believed that these are sufficient to illustrate the significance of the self-certifying label based on commercial standards.

The natural skepticism of the purchasing agent impels the question "How far can I depend upon such a label?" It may be said that a label certifying that the goods conform to or exceed requirements of a given specification, the provisions of which are susceptible to definite physical proof, will constitute a part of the sales contract whether or not a memorandum of the sale exists in writing. The self-certifying label, then, enables the purchaser to reject the goods in the event of noncompliance with the specification or to recover in the event a discrepancy is discovered within a reasonable time.

It is reasonable to suppose, also, that the manufacturers will be watching their competitors for any violation of the integrity of the self-certifying label and will report collectively through their organization, or individually, to the Federal Trade Commission any manufacturer taking unfair advantage of the self-certifying label. In general, it is safe to say that the present weapons against the misuse of such

self-certifying labels are so powerful and the penalties so great as to allay any fears of serious difficulty from that source.

Economies to users.

May we now revert to the questions raised at the beginning of this article, which were variations of the broader question, "What does the commercial standard accomplish for the purchasing agent or user?"

The commercial standard practically eliminates for the purchasing agent time and trouble required for preparation or selection of a proper specification. The commercial standard either increases the utility value of the goods received or lowers the price by increasing competition. The commercial standard, particularly for the purchaser of small quantities, reduces the need for laboratory tests and provides a basis for acceptance in those cases where the delay incident to tests is prohibitive.

From a slightly different point of view the economies to users may be stated as follows: Representing, as it does, the authoritative, composite experience of the industry, the commercial standard provides a uniform basis for purchase, thoroughly recognized and acceptable to all. Having been accepted in writing as the standard of practice by a majority of producers, as well as large numbers of distributors and consumers, it widens and increases the amount of real competition among bidders. Having been published and recorded as a public document available to all, it forms a satisfactory basis for self-certifying labels or certificates to assure the buyer that delivered goods conform to the specification requirements.

CHINAWARE TESTED AT BUREAU OF STANDARDS

Foreign and Domestic Ware Compared on Impact Machine for Resistance to Chipping and to Impact

Chinaware for use in the various Government departments and bureaus is purchased upon Federal Specifications which cover certain required physical properties, such as size, weight, amount of water absorption, and strength. The strength is measured by testing the ware on an impact machine which enables one to determine the probable strength of the ware in service. Two tests—resistance to chipping and resistance to impact—are made. Such a testing machine has been in use at the Bureau of Standards for some time. The principal feature of this machine is a swinging pendulum to strike the ware with blows of increasing force, measured by the weight of the pendulum and the distance through which it falls, until the test piece breaks. The average of six tests is taken as indicating the strength of the ware.

A modified form of this impact machine has been designed and built to determine the reliability of the old machine and eliminate certain difficulties encountered in its use.

Comparative study of foreign and domestic ware made.

In cooperation with 24 manufacturers of domestic ware and 4 importers of foreign ware who furnished the ware used to make the tests, a comparative study of the two machines and of domestic and foreign ware has been made. The domestic ware included one brand of semiporcelain and three brands of vitrified ware. The samples of foreign ware were made in England, France, Japan, and Czechoslovakia.

The data obtained in this study seem to show that the two machines give almost the same values for the strength of the ware. There appears to be no definite relation between the thickness of the ware and its strength or between the percentage of water absorption and strength. Domestic ware seems to be stronger than foreign-made ware. Some of the domestic semiporcelain (earthenware) bodies appear to be stronger than foreign-made vitreous ware. Chipping values do not seem to bear any direct relation to the impact values. This may partially be attributed to the design of the edge and the angle of inclination of the rim.

Economies effected through improved methods of production.

Competitive tests such as these tend to cause the manufacturers to improve continually their methods of production, resulting in the production of better and stronger dinner ware. There are several commercial laboratories in the United States equipped to make these tests on chinaware, and the larger users are following the lead of the Federal Government and demanding that their purchases meet specified qualities. The economies effected in the elimination of losses by breakage by having an accurate basis for buying is benefiting the whole trade, and the entire public gains a material benefit as a result of these simple tests. It is also a matter of interest that American manufacturers of chinaware can produce ware that is just as durable as foreign-made ware.

ELASTIC SHOE GORING

Simplification Accepted by Industry; Now in Effect For New Production

Simplified Practice Recommendation No. 112, Elastic Shoe Goring, which has been in the acceptance stage since the general conference on July 23, 1929, has received sufficient support to insure its initial success, and will go into effect forthwith. The recommendation has been approved by 100 per cent of the manufacturers and by manufacturers who use more than 80 per cent of the annual output of the material in the making of shoes, slippers, etc.

There originally existed a need for the recommendation, and this unusually high degree of support is evidence of the fact that the committee in working out the details of the program took into consideration the requirements of all elements of the industry. Robert Taylor Dawes, of the Thomas Taylor & Sons Co., Hudson, Mass., was chairman of the simplified practice committee and of the standing committee. The Webbing Manufacturers' Exchange cooperated in the development of the program. The program will result in a reduction of 16 qualities of shoe goring to 5 and 70 varieties to 29.

ICE-WARNING THERMOMETER FOR AIRPLANES

A Temperature-Actuated Switch, Which, Controlling a Red Light On Instrument Board of Airplane, Warns Pilot of Critical Ice-Forming Temperature Range

A device which may find application as an indicator of the temperature range in which ice may form on an aircraft has been developed by the Bureau of Standards. It is essentially a temperature-actuated switch which controls a red light on the instrument board of the airplane. The thermal switch is located on a strut or otherwise exposed in the free air stream, while the indicator is installed in a convenient place in the cockpit. The light, behind the red window, appears only at temperatures from −4° to 0° C., which, according to tests by the National Advisory Committee for Aeronautics is the critical ice-forming temperature range. This indicator warns the pilot with a minimum of mental effort on his part, the moment that his ship has entered a flying level at the temperature of which the clear, dangerous type of ice may form. For ease in installation on the ship the instrument is made up in a unit with its own battery, using pocket flashlight cells of standard size. These are located in the small box which contains the red warning lamp. The contact points are made of coin silver. The lower contact, attached to an insulating sheeting of bakelite, is made cresent-shape so that the switch arm can easily ride over it without jamming as the temperature increases or decreases.

The time lag of this instrument is somewhat greater than that of a minimum-temperature recorder, shown on page 323 of the September, 1929, issue of Instruments, but, on the other hand, the rather thin aluminum base of the instrument, to which the bimetal coil is securely attached, serves as a good radiator, so that the resulting time lag of the entire instrument may not be considered excessive.

Ice indicator to warn pilot when temperature reaches dangerous point at which ice may form on his plane

It consists of a bimetallic strip thermal element mounted on the strut and a lamp indicator with self-contained batteries on the instrument board.

Flight tests satisfactory.

Tests in the laboratory on a standard vibration board and in an automobile over rough roads when the temperature was 0° C. both showed that the bimetal coil with its attached switch arm is sufficiently stiff to function properly when subjected to severe vibrations. Flight tests, made through the courtesy of Roger Scott, operations manager of Hoover Field, Washington, D. C., during last December showed that the instrument will function satisfactorily in airplanes.

BRITISH STANDARD FOR SOLID AND SPLIT TAPER PINS

This standard deals with solid and split taper pins, giving their chemical composition and their dimensions, and specifying how they shall be subjected to tensile and bending tests. A table shows the variations in diameter (at the large end of the pin) from $\frac{1}{16}$ to $\frac{5}{8}$ inch, with the length in inches varying from $\frac{1}{2}$ to 6 inches. (A. S. A. Bulletin.)

FIRE-RETARDANT SURFACE TREATMENT FOR WOOD SCAFFOLDING

Property Loss Resulting From Serious Fires in Scaffolding of Buildings Creates Need for Fire-Retardant Treatment. Tests Undertaken to Develop Most Desirable Method

Several serious fires in the scaffolding of buildings and bridges during construction have resulted in large property loss and delay in completion. Of those recently occurring in buildings can be mentioned the Sherry-Netherlands Apartment Hotel, Fifth Avenue Aeolian Building, and the Riverside Church, all in New York City.

Preliminary tests.

The Bureau of Standards has received frequent inquiries relative to methods that can be employed to decrease this fire hazard, and some tests were undertaken employing several types of treatments meeting the special conditions involved. Impregnation or coating with many of the chemicals generally used to produce a fire-retardant condition are objectionable on account of irritating effects on hands of workmen, particularly in case of injury. Also no coating can be applied to the surface of the timber so opaque that it obscures defects that have a bearing on strength.

Preliminary tests with various chemicals applied to the surface of the wood indicated that the penetration into the wood was insufficient to obtain any appreciable fire-retardant effect. Of acceptable surface coatings, sodium silicate (water glass) appeared promising, and further ignition and spread-of-flame tests were conducted with this treatment.

Ignition tests.

The specimens for the ignition tests consisted of pieces of short leaf or loblolly pine, Western pine, or Douglas fir, 10 inches square and ¾ inch thick, and for the spread-of-flame tests the specimens were 2 inches wide, 18 inches long and ¾ inch thick. Except for a 3-inch length on one end of the long specimens, they were coated on all sides with one brush coat of sodium silicate of specific gravity 1.38, thinned with water to specific gravity of 1.33.

The ignition tests were conducted by applying safety-match flames, 1-inch yellow Bunsen burner flames, and 8-inch blue Bunsen burner flames for periods of one minute to the corner, edge, or flat side of the specimen. Burning continuing for one minute or more after removal of the igniting flame was considered as ignition. Ignition using safety matches was obtained in 63 per cent of the trials with the untreated specimens and in 14 per cent of the trials with the treated specimens, the results being averaged for the three species of wood. Specimens exposed to the weather for about three weeks and subjected in this time to three rains were ignited in 39 per cent of the rials. With the 1-inch Bunsen flame ignition obtained in 78 per cent of the trials with the untreated specimens and in 3 per cent when coated with sodium silicate. The 8-inch Bunsen flame gave 97 per cent ignition with untreated specimens and 12 per cent when treated.

In the spread-of-flame tests with the pieces held vertically the untreated 3-inch portion was ignited with a Bunsen burner flame and the spread of flame on a 12-inch length of the treated portion noted. Taken as an average for the three species the flame spread over the 12-inch marked length of the untreated specimen was 8 inches and only over 0.7-inch length for the treated pieces.

Effectiveness of the treatment.

The effectiveness of the treatment was somewhat greater for the Western pine and Douglas fir than for the short leaf or loblolly pine, due possibly to greater penetration. An additional coat would undoubtedly have increased the fire retardant effects considerably. The tests with the specimens exposed to the weather indicated loss of a considerable amount of the coating in three weeks' time, hence, the treatment can be considered useful mainly for inside scaffolding.

Fine sand was applied on the coating of some of the specimens before it dried. The amount was not sufficient to affect appreciably the fire retardant effect of the treatment, but it increased the roughness of the surface to an extent that more than counteracted any slipperiness produced by the sodium silicate. For scaffolding the sand can be applied for this purpose to the wearing surfaces.

GERMAN STANDARDIZATION PROGRAM IS EXTENDED TO COVER HAND TOOLS

German standardization work, which has been especially active in fields not yet extensively dealt with by other standardization bodies, except that of Soviet Russia, is now beginning to extend into the field of hand tools, such as nail pullers, pincers, linemen's wire cutters, combination pliers, telegraph pliers, and wiremen's small pliers.

The proposed standards cover dimensions in so far as they are important; a tolerance on the basic dimension; design and form; and material, with a standardized designating symbol for each type and size. (A. S. A. Bulletin.)

GERMAN STANDARDS FOR ELECTRICAL INSTALLATION MATERIALS

Published Collection of German Standards Now Available

A new book, Installation Material (DIN Taschenbuch 13), containing a collection of German standards, reduced to half the linear size and bound in a volume for handy reference, covers the rules and regulations for the construction and testing of installation material up to a nominal voltage of 750 volts. The various sections of the book cover basic standards, structural parts, line material, tubes for wiring and accessories, commutators, fuses, outlets and switch plugs, sockets and bases for incandescent lamps. (A. S. A. Bulletin.)

STATE PURCHASING AND STANDARDIZING AGENCIES

Fifty-one Purchasing Agencies Operate in the 48 States and the District of Columbia; Massachusetts and Pennsylvania Have More Than One Agency Each; Provisions For Testing of Commodities Purchased on Specifications

By R. A. Martino, *Division of Specifications*

Methods employed by States in the purchase of equipment and supplies for the operation of the several State governments differ in some respects, although in practically every case provisions have been made for the testing of commodities purchased on specifications. A few of the agencies have established laboratories of their own, while others make use of the laboratories of commercial agencies or those of the State highway departments.

Several of the States have adopted the centralized system of purchasing, the last one organizing this system being Wisconsin under an act passed by the legislature of that State in September, 1929.

In the 48 States and the District of Columbia there are 51 purchasing agencies, 25 of which were created by legislative action, 2 were self-appointed, and 1 was organized by the governor of the State. Two separate and distinct purchasing agencies are in operation in the State of Massachusetts, while three are engaged in purchasing in Pennsylvania.

System in vogue in Massachusetts.

In Massachusetts the State purchasing bureau, composed of heads of the various State departments, recommends to the State purchasing agent such of the commodities as must be purchased by him for use by the departments.

All commodities bought on specifications are tested in the laboratory connected with the purchasing bureau and by outside agencies when necessary. The bureau also engages the services of six chemists, who are constantly occupied in testing materials submitted with bids and testing samples of materials delivered on bids. By action of the Governor of Massachusetts, the department of mental diseases is entrusted with carrying forward work relating to the standardization of hospital construction, equipment, supplies, and administrative procedure, as well as purchasing food for 15 hospitals under State control.

Pennsylvania has bureau.

The bureau of standards and purchases of the State of Pennsylvania formulates and establishes standards and specifications for all articles, materials, and supplies, subject to approval by the administrative boards, departments, and commissions, and by State institutions, before such standards and specifications can become effective. Much of the test work is conducted in cooperation with the State agriculture and State highway departments and the National Bureau of Standards. All equipment and supplies required for the operation and maintenance of institutions under the jurisdiction and control of the State department of health are purchased by this department.

The Pennsylvania State Stewards' Association, created at the request of the governor, is composed of superintendents and stewards of State institutions, hospitals, and normal schools. Its main function is to deal with matters relating to institutional operation and to develop specifications, subject to approval by the State departments of welfare, public construction, and properties and supplies, for use by State-owned institutions. This organization adopts the specifications promulgated by the Federal Specifications Board.

Method used in District of Columbia.

The purchasing method employed by the District of Columbia's purchasing office is similar to that of the Federal Government, in that all purchases are based as much as possible on the schedules of supplies compiled annually by the General Supply Committee.

Items not covered by these schedules are bought on contracts based on Federal Specifications, and in the absence of Federal specifications the purchasing agent is empowered either to select specifications from other sources or to formulate others. In some instances the specifications of the United States Department of Agriculture are used when making purchases of foodstuffs.

Buying for 26 States.

Purchasing agencies in 26 States buy for all departments of the State government, 3 for all departments except the educational, 10 exclusively for penal and charitable institutions, 2 exclusively for the legislative bodies, and 1 for hospitals alone.

Purchases are based on written specifications in 16 States and in a like number of States commodities are bought both on specifications and on trade brands. Specifications are formulated by purchasing agencies in 19 States and 6 make use of nationally recognized specifications of technical societies. In 13 of the States the specifications used relate largely to foodstuffs, in 9 to printing and stationery, in 8 to textiles and clothing, and in 7 to building and road materials.

In 12 States the purchasing departments have set up their own laboratories to determine the quality of goods purchased by them, and 6 of these also make use of college laboratories. Commercial laboratories are employed exclusively by 2 agencies and 2 others use the Federal Government laboratories. Thirty-one of the agencies make use of the college laboratories for at least part of their commodity-acceptance testing, while others engage the services of the laboratories of the State highway departments.

California system under department of finance.

The bureau of purchases of California is under the direct control of the department of finance. The bureau formulates rules and regulations for purchasing for all institutions, departments, commissions, State schools, and offices of the State, with the approval of the director of finance. This bureau cooperates with the chemical, physical, research, and pure food and drugs laboratories in the formulation of standards and specifications for equipment, materials, and supplies.

The heads of the various State institutions in Indiana comprise the State joint purchasing com-

mittee through which all purchases are made, using whenever possible, the specifications promulgated by the Federal Specifications Board. The committee does not maintain its own testing laboratory, but makes frequent use of the laboratories of the State universities.

Articles purchased for the various units of the State of New Jersey are done so by the statehouse commission, consisting of the Governor, treasurer, comptroller, and a purchasing agent. In numerous cases the commission formulates its own specifications and determines the quality of goods so purchased by tests conducted either by the State laboratories or those of commercial agencies.

North Carolina established bureau in 1925.

The executive budget act of 1925 created a State budget bureau in North Carolina, but no power was given to the bureau to regulate and control the purchases for some 70 organizations making up the State government. Up to 1929 each organization maintained its own purchasing officer, and with the exception of coal, no arrangements had been made by any officer for the testing of commodities to determine whether or not they complied with the specification requirements or with samples submitted with bids.

However, in 1929, the executive budget act was amended in order to give to the budget bureau the power of supervision over all bureaus, commissions, departments, and institutions, and in a majority of cases all purchases are made and contracts based on written specifications. Testing is now being conducted by the budget bureau in cooperation with the North Carolina State College of Agriculture and Engineering.

Rhode Island system.

Under the State Welfare Commission of Rhode Island functions the purchasing department, the power of appointment and control of which rests in the commission. It is the duty of the purchasing agent to formulate specifications and make purchases for all penal, correctional, and charitable institutions maintained by the State, and also to buy for any department of the State when requested to do so.

In this State the testing of commodities is handled on a slightly different basis than in other States. Oleomargarine is analyzed and tested monthly by the drug department; coal tests are conducted quarterly by the fuel department; while meats, groceries, canned fruits, and other edibles are carefully examined and tested by the purchasing department at time of delivery, before they are turned over to the institutions for consumption.

System in Colorado and Maine somewhat similar.

Methods of purchasing equipment and supplies for State-owned institutions in Colorado and Maine are somewhat similar in that in each States there has been organized a purchasing agents' association consisting of purchasing agents of institutions whose purpose is to standardize on commodities commonly used by the State institutions and to make purchases by pooling the necessary requirements for each institution.

Among the States which have no organized purchasing agencies may be mentioned Louisiana, Mississippi, Missouri, and New Mexico. In these States the head of each department manages and operates his office independent of any other branch of the State government, and makes such purchases as are required for carrying on the work of his office.

However, in Louisiana, there has been created by the governor a board, consisting of five men appointed by him, to administer the affairs of the port of New Orleans. This board maintains a well-equipped laboratory for testing fuel oil, gasoline, lumber, sand, cement, and other commodities. It also makes use of the laboratories of Tulane University for testing concrete slabs and cylinders, and reinforcing steel.

Although Nevada maintains no organized purchasing agency, it does maintain a board, composed of the governor, lieutenant governor, secretary of state, comptroller, and treasurer, ex officio, and a clerk, for the purpose of purchasing all supplies required by the various State offices in the capitol.

State highway purchasing.

Some idea of the magnitude of the expenditures being made by the State and Federal Governments in improving and maintaining the highways of the country can be gained from the fact that the total length of the highway system already improved with Federal-aid funds now exceeds 78,000 miles, of which more than 7,000 miles were improved during the fiscal year 1929. The estimated cost of the 9,526 miles of road under construction in the United States in July, 1929, was $238,158,495, which included Federal funds in the sum of $96,500,347.

The problem of constructing and maintaining the nation-wide system of highways has been entrusted by the several States to State highway departments and commissions. In every State standards and specifications have been prepared for practically every type of material entering into highway construction, the specifications used being in conformity with those formulated by the American Society for Testing Materials, the American Association of State Highway Officials, and the United States Bureau of Public Roads, and formally approved by the United States Secretary of Agriculture for use in connection with Federal-aid road construction.

In nearly every State the highway department or commission was created either by an act of the legislature or by action of the governor.

Purchase specifications.

In 40 of the States the purchases made by the highway departments are based on written specifications; 11 of these departments buy partly on trade brands, and in no case has it been reported that purchases are made exclusively on trade-brand or trade-name articles.

Thirteen of the State agencies make use largely of nationally recognized specifications, 16 highway departments do so in part, and 11 formulate their own specifications. In 11 cases the specifications are prepared by individuals and in 7 by conference of the officers of the interested departments. State laboratories are used for commodity-acceptance testing by 42 agencies, college laboratories by 28, and commercial laboratories by 11. Many of the agencies make use of State, college, and commercial laboratories in various combinations; in some cases for test work only, while in others they are used for investigational and research purposes.

Typical examples.

A few typical examples of the usual procedure followed by a majority of the highway departments in purchasing and testing materials used in road construction are given below.

The State Highway Commission of Indiana requires the chief engineer to prepare and to place on file in the office of the commission standard specifications for three or more distinct types of modern highways, of which at least three shall be hard-surface types. The commission supplies project engineers in charge of construction with the necessary equipment with which to make such field tests as are practicable, and maintains its own laboratory for the purpose of conducting analyses and tests of all materials entering into the construction and maintenance of roads and bridges. Liaison is also maintained between the laboratory and the engineering experiment station and testing laboratories of Purdue University.

Two laboratories are maintained by the Michigan highway department, one at Ann Arbor in cooperation with the University of Michigan and the other at the Michigan College of Mines at Houghton. All commodities purchased by the department are tested in the laboratories. Steel bought outside of the State is tested by commercial laboratories designated and employed by the department. Cement samplers are located at various mills, and inspectors are stationed at stone and gravel plants and at certain concrete and clay pipe plants. The highway department through its laboratories also undertakes to make tests for counties, cities, and other State government subdivisions.

Vermont samples road materials.

Road materials for use in Vermont highways are sampled by the highway department inspectors on the various projects and at different plants where material is purchased. Also samples are sent to the department's own testing laboratory, except tests involving compression tests of over 50,000-pound load, which are handled by the laboratories of the University of Vermont.

In Virginia the State department maintains its own division of tests, which is equipped to make both chemical and physical tests of materials used in road construction. Steel superstructure, reinforcing steel, creosote, cement, and other materials manufactured outside of the State are tested and inspected by commercial firms at the sources of supply.

Highway survey conducted.

Methods of purchasing, accepting, servicing, and retiring highway construction and maintenance equipment by the several highway departments are many and varied. An effort to eliminate unsound policies in the purchase of equipment and to standardize purchasing methods along practical and efficient lines has been undertaken by a joint committee composed of representatives of the American Road Builders' Association and the American Association of State Highway Officials, working in cooperation with the United States Bureau of Public Roads, and the National Bureau of Standards. Below there is given some information compiled from replies received to questionnaires recently submitted by the joint committee to the several States.

Twenty-two of the States reported having laws covering the purchase of highway construction and maintenance equipment. Of these, 9 place the authority for the purchasing with the State purchasing agents or commissions; 7 with the State highway commission or director of public works; 2 with the State finance board, and 3 require merely that there be competitive bidding.

Twenty-five of the States operate on the budget system, the expenses generally being budgeted on the basis of previous experience.

Thirteen States reported the purchase of equipment through the State purchasing agents and 25 through the highway departments or commissions.

Thirty of the States reported having equipment divisions, 8 reported not having any division, and 5 reported using various agencies as substitutes for equipment divisions. Of those maintaining equipment divisions, 3 make their purchases through the State purchasing agents.

In 21 of the States use is made of general specifications for equipment, in 9 detailed specifications are used, and in 11 both general and detailed specifications are used at times. In 41 States cost and service records of equipment are kept. Twenty-one of the States require tests of equipment offered for sale, 13 require inspection, and 6 reported having no fixed rule in this respect.

Assistance given to counties and townships.

Seven of the State highway commissions reported that they are assisting counties and townships in purchasing road construction and maintenance equipment by buying such equipment through their organizations and 35 stated that they did not do so.

The officers of 14 highway commissions expressed the belief that purchases for townships, counties, and districts could be handled to better advantage by clearing through the central departments of the commissions, 6 expressed the belief that this could be done in part, and 22 expressed their doubts as to the desirability of doing so.

In 37 States the highway officials expressed the opinion that model specifications, inventory, equipment service, and cost record forms would be useful in controlling their equipment operation and purchase routine; 6 stated that they might well be used in part; and 8 said that they would not be useful.

FEDERAL SPECIFICATIONS INDEX

Alphabetical Index and Numerical List of Federal Specifications Issued by the Federal Specifications Board

Circular of the Bureau of Standards, No. 378 (1929), giving an alphabetical index and numerical list of Federal specifications promulgated by the Federal Specifications Board, is now off the press and copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents per copy. This circular supercedes Circular No. 371, issued in 1928.

NATIONAL MANAGEMENT CONGRESS TO MEET IN MARCH

One Session for Discussion of Elimination of Waste. Continuation of Program Necessary for Industrial Progress

The March 3 session of the National Management Congress, which will be held at the Hotel Stevens in Chicago, will be devoted to a discussion of elimination of waste. This session will be the first opening meeting of the committee's 1930 elimination-of-waste drive.

The month of April has again been set by the committee as the time for the annual "National Elimination of Waste Campaign." This movement, which began last year, has grown very remarkably and has become even international, as the committee has assisted groups in Australia, China, England, and Russia by supplying information about campaigns conducted in this country. During April of last year a large number of companies put on an exhibit waste campaign within their factories and an even larger number are expected to cooperate this year.

The first notable campaign to reduce wastes in factories by displaying waste exhibit boards was put on by the Westinghouse Electric & Manufacturing Co. in 1926 as a part of Management Week. The remarkable success of the campaign in reducing waste and securing better cooperation from employees caused the companies to make it an annual event and brought this method into prominence. Since then notable elimination of waste campaigns have been run by the Newport News Shipbuilding & Drydock Co., subsidiaries of the United States Steel Corporation, the Oakland Motor Car Co., and a number of others.

Sponsored by American Society of Mechanical Engineers.

Early last year an Elimination of Waste Committee was sponsored by the management division of the American Society of Mechanical Engineers, with the American Management Association cooperating to coordinate this growing movement. It was then decided to advocate definitely an annual "National Elimination of Waste Campaign" for April, and the movement immediately won splendid support throughout the country.

According to an announcement of the Elimination of Waste Committee of the A. S. M. E., 29 West Thirty-ninth Street, New York, N. Y., a paper will be presented to the session on March 3 outlining the problem of waste in an industrial plant. This will be followed by a second paper giving methods of attacking this problem, and then there will be a number of short papers by companies that have held exhibit campaigns, who will give concrete examples of savings due to their campaigns and suggestions made by employees.

At the exposition which is to be held at the Hotel Stevens there will be a special booth given over to exhibiting the prize waste-elimination boards of various large companies that have had campaigns.

VAPORIZATION OF GASOLINE

Easy Method for Determining Readiness With Which Gasoline Vaporizes Discovered by Bureau of Standards

The Bureau of Standards has found an easy method for determining the readiness with which gasoline vaporizes. Now the oil refiner can obtain this information on his product without the use of any special tests.

At every stage in the production, storage, transportation, and use of gasoline it is necessary to know how readily it will vaporize. Millions of gallons of gasoline, fresh from the stills, are stored in large tanks having small openings to the air. The gasoline vaporizes, some more than others, and thousands of dollars worth of good motor fuel is lost. The tank cars used for shipping on the railroads must conform to certain regulations, based on the ease with which the gasolines vaporize. If the gasoline used by the motorist in winter does not vaporize enough he will have difficulty in starting his engine. If his gasoline vaporizes too readily he will be annoyed, especially in summer, by frequent engine stoppage.

The Bureau of Standards made experiments on a large number of fuels to determine the temperatures at which a small bubble was formed in the gasoline. These temperatures are called bubble points and indicate the ease with which the gasoline vaporizes. It was discovered that the bubble point temperature at atmospheric pressure is identical with the temperature at which 10 per cent of a gasoline is evaporated in a simple distillation test used by all oil refiners. A low 10 per cent point indicates large losses on storage, but easy engine starting in winter. Under summer operating conditions it indicates the tendency to boil in the carburetor.

So using the 10 per cent point as a criterion the refiner can produce gasoline for easy starting in any climate, and gasoline which will not boil at any summer temperature.

GENEVA CONFERENCE ON HOSPITAL EQUIPMENT

French International Committee on Standardization of Hospital Equipment Urge Greater Standardization of Equipment for This Industry

The fourth session of the International Permanent Commission for the Standardization of Hospital Equipment was held in Geneva in October. Resolutions were adopted with regard to the standardization of field stretchers, to vehicles on wheels, and to airplanes, and with regard to the study of efficient horse-drawn and motorized vehicles for transporting the sick and wounded. Information is now being collected from the several army administrations regarding the following items about vehicles: Weight, dimensions (length and width), illumination, means of supporting stretchers, efficiency shown in time of war, etc. (A. S. A. Bulletin.)

FOUR MARINE STANDARDS ANNOUNCED

American Marine Standards Committee Considers Four Proposed Marine Standards; Wire Ropes for Marine Uses, Standard Locks for Ship Doors, Standard Practice in Ship Hull Construction, and Care and Operation of Oil-burning Apparatus and Handling of Fuel Oil on Ships. Members of New Executive Board Announced. Committee Will Coordinate Rules for Design and Construction of Marine Boilers and Pressure Vessels

The American Marine Standards Committee has under consideration four proposed marine standards, according to the secretary, A. V. Bouillon, room 713, Commerce Building. These are as follows:

Wire ropes for marine uses.—A tentative final draft of proposed general specifications has been prepared, and is under consideration by the technical committees on hull and ship operation details. This is due to receive final action at an early date.

Care and operation of oil-burning apparatus and handling of fuel oil on ships.—A preliminary draft of proposed standard instructions recently circularized has brought comment and suggestions from various sources. The subject is to be submitted for final action at an early date, with probability that a final draft will be developed for promulgation.

Standard locks for ship doors.—A preliminary draft of proposed standard specifications has been generally approved, subject to minor alterations, and is to be presented for promulgation at an early date. Fourteen standard locks are contemplated.

Standard practice in ship hull construction.—A tentative final draft of standard instructions is under consideration by the technical committee on hull details, the National Council of American Shipbuilders, and others concerned. If the results are favorable, the draft will be presented for promulgation.

Executive board elect for 1930.

The recent annual election by the membership resulted in the election of the following members to the executive board for 1930: Edwin C. Bennett, naval architect, New York, N. Y.; Maj. Gen. Lytle Brown, Chief of Engineers, United States Army, Washington, D. C.; Homer L. Ferguson, president and general manager Newport News Shipbuilding & Dry Dock Co., Newport News, Va.; Theodore E. Ferris, naval architect and marine engineer, New York, N. Y.; Hugo P. Frear, vice president Marine Engineering Corporation, Philadelphia, Pa.; Capt. R. D. Gatewood. manager United States Salvage Association (Inc.), New York, N. Y.; William Francis Gibbs, vice president Gibbs & Cox (Inc.), New York, N. Y.; Edward C. Gillette, superintendent of naval construction, Bureau of Lighthouses, Washington, D. C.; Dickerson N. Hoover, supervising inspector general United States Steamboat Inspection Service, Washington, D. C.; Capt. Charles A. McAllister, president American Bureau of Shipping, New York, N. Y.; S. D. McComb, manager Marine Office of America, New York, N. Y.; Robert W. Morrell, M. E., consulting naval architect and marine engineer, New York, N. Y.; Edward P. Morse, president Union Dry Docks (Inc.), Morse Plant, 11 Broadway, New York, N. Y.; E. H. Rigg, naval architect, New York Shipbuilding Co., Camden, N. J.; Rear Admiral George H. Rock (C. C.), United States Navy, chief, Bureau of Construction and Repair, Navy Department, Washington, D. C.; Dr. Herbert C. Sadler, dean of Colleges of Engineering and Architecture, University of Michigan, Ann Arbor, Mich.; Col. E. A. Simmons, president Marine Engineering and Shipping Age, New York, N. Y.; Henry G. Smith, president National Council of American Shipbuilders, New York, N. Y.; Rear Admiral J. G. Tawresey, United States Navy (retired), Bureau of Operations, United States Shipping Board, Washington, D. C.; Joseph J. Tynan, general manager Union Plant, Bethlehem Shipbuilding Corporation (Ltd.), San Francisco, Calif.; and H. B. Walker, president American Steamship Owners' Association, New York, N. Y.

The chairman, vice chairman, and secretary for the current year are to be appointed at the board's first meeting. Administrative committees for the current year are then to be appointed by the chairman.

Active projects for marine standards.

The secretary recently issued a quarterly report in which there were listed 25 projects, comprising hull, engineering, and ship operation details, and 4 projects appertaining to port facilities.

Special committee appointed.

As a result of a conference between a committee delegated by the Society of Naval Architects and Marine Engineers with the Secretary of Commerce, a special committee has been appointed to coordinate existing activities and produce single standard rules. The following interests and their representatives are comprised in this special committee: Dr. D. S. Jacobus, The American Society of Mechanical Engineers; B. E. Meurk, American Steamship Owners' Association; Charles F. Bailey, National Council of American Shipbuilders; Prof. H. L. Seward, Society of Naval Architects and Marine Engineers; John L. Crone, Steamboat Inspection Service; and Henry C. K. Meyer, American Marine Standards Committee.

UNDERGROUND LIGHTING

British Specification Promulgated for Underground Lighting Fitting For Use in Mines

This British specification deals with fittings, including well glasses, intended for use with British standard vacuum tungsten filament lamps, with a maximum rating of 60 watts (the dimensions of these lamps are given in an appendix).

The standard does not apply to gas-filled lamps, because a larger globe is necessary to prevent overheating in this case. The following items are dealt with: Material, provision for grounding, lamp holder, dimensions of well glasses, rubber channel rings, well glass clamping rings, well glass guards, attachment of metallic covering of cables, provision for sealing the dielectric of cables, and finish. (A. S. A. Bulletin.)

CURRENT ACTIVITIES OF THE AMERICAN STANDARDS ASSOCIATION

Current Status of Pending Projects Reviewed—Pipe Flanges and Fittings, Standardized Lettering, Standardization of Keys and Keyways, Electrical Definitions, Leather Belting, Mechanical Projects, Safety Code for the Prevention of Dust Explosions, and Gas Mask Canisters

Companion flanges and marking for pipe fittings are the subjects of two questionnaires being submitted to industry by a subgroup of the sectional committee on "pipe flanges and flanged fittings." The results of the questionnaire will be used by the subgroup as the basis for their work.

J. Roy Tanner, chairman of the subgroup on "companion flanges," accompanies the questionnaire on this subject with the note: "Throughout the six years since the dimensions of the steel fitting standards became available, in the absence of a basic standard for companion flanges, various types of these flanges have been used, among which were flanges with high hubs, with low hubs, with inverted hubs, and without hubs. Flange facings and joints of various types also have been used with these flanges. To assist the subgroup in the completion of its work, it is desired to secure first-hand information as to the performance in service of these flanges, together with that of bolts, joints, valves, fittings, etc., made to comply with the American steel flange standards."

W. J. Morrison, chairman of the subgroup on "markings for pipe fittings," writes, in submitting this questionnaire on markings, "standardization of markings for pipe fittings has long been talked of but never attempted. At this time, however, there is an urgent demand for the standardization of markings for use on the new American Standard pipe fittings * * *. There are three questions involved: (1) What markings are necessary, (2) can they be put on the fittings, and (3) how should they be applied?"

> To afford an expansion in national standardization work, the A. S. A. has had its finances underwritten for a period of three years. By this arrangement the A. S. A. will spend a total of $150,000 annually. The growth of industrial standardization in this country has been very rapid, and, with this additional fund at its disposal, the A. S. A. expects immediately to start expanding the work of providing authoritative national standards.

Standardized lettering.

A draft standard on lettering has been prepared by a subcommittee of the sectional committee on standards for "drawings and drafting-room practice." The subcommittee is under the chairmanship of T. G. Crawford, supervisor of drafting, General Electric Co. The draft is based upon the results of a questionnaire, of which 500 copies were distributed to all branches of industry. An introduction to the draft says:

> At one time it was the general opinion that lettering should be sloped as in script, thereby combining uniformity and speed. A number of letter forms have been promulgated, but, in apparent contradiction to theory, the vertical letter has been adopted by many of the larger manufacturers as being the type of lettering that tracers can make legibly and uniformly. As in script, sloped letters invariably carry personal characteristics of the individual. This feature is not so noticeable where vertical letters are used. It is also noticeable that vertical lettering produces work which is more legible in the blue prints.
>
> In a questionnaire recently sent to the industries and educational institutions it developed that the industries are in favor of the vertical lettering, and the educational institutions of the inclined letters.
>
> In making recommendations for a universal type of lettering it seems desirable to be governed by the group which uses it in practice.

Standardization of keys and keyways.

A proposal to establish standard dimensions of plain and taper square and flat keys, and plain and gib-head taper keys, is being voted upon by the sectional committee on the standardization of shafting (B 17).

The following standard dimensions are being considered:

Diameter of shaft (in inches)	Size of key	Diameter of shaft (in inches)	Size of key
6½	1⅝ by 1⅛	11	2¾ by 1¾
7	1¾ by 1⅛	12	3 by 2
7½	1⅞ by 1¼	14	3½ by 2¼
8	2 by 1⅜	16	4 by 2½
9	2¼ by 1½	18	4½ by 2¾
10	2½ by 1⅝	20	5 by 3

The result of the vote will determine whether this series is to be established as standard or whether a preference exists for some other series of sizes.

Electrical definitions.

Dr. A. E. Kennelly, of Harvard University, has been appointed chairman of the recently organized American Standards Association Committee on Electrical Definitions. Dr. Kennelly will represent on the committee, in addition to the American Institute of Electrical Engineers, which will act as sponsor for the project, the National Academy of Science, the Society for the Promotion of Engineering Education, and the American Association for the Advancement of Science. The work of the committee will be divided among 14 subcommittees, as follows: General (elemental, fundamental, and derived terms, units, etc); rotating machinery; transformers (including induction regulators and reactors); switching equipment; control equipment; instruments, measurement, and testing; transmission and distribution; traction; illumination; communication (wire); communication (radio); electrochemistry and electrometallurgy; welding; and miscellaneous. There are 43 members on the committee representing 29 organizations.

Leather belting.

A general conference of manufacturers, distributors, and users of leather belting will be held under the auspices of the A. S. A. at 10.30 a. m., February 6, 1930, in room 1105 of the Engineering Societies Building, 29 West Thirty-ninth Street, New York, N. Y. The conference is being called at the request of the special committee which met on May 7 to con-

sider the proposal for the standardization of leather belting made by the American Society of Mechanical Engineers.

The conference will determine primarily whether or not the standardization of leather belting should be undertaken. If standardization is favored the following questions will be considered: (1) To recommend a scope for this standardization activity, and (2) to ascertain what organizations desire representation on the sectional committee should it be decided that the development of American standards for leather belting is desirable.

Among the organizations which have been invited to send representatives to the conference are: National Electrical Manufacturers Association, Bureau of Standards, United States Navy, Power Transmission Association, Society of Automotive Engineers, American Railway Association, American Society of Mechanical Engineers, American Leather Belting Association, International Trade Press, and Textile Machinery Manufacturers Association.

Mechanical projects.

A tentative decision on the proposed standard taper series for machine tapers has been reached by technical committee No. 3 of the general sectional committee on "Standards for Small Tools and Machine Tool Elements." The series decided upon is made up of 3 sizes having one-half inch taper, 5 sizes of Morse tapers, 1 size with 0.623 inch taper, and 10 sizes having three-quarter inch taper.

Adoption of the new spindle nose recommended by the technical committee on chucks and chuck jaws of the general sectional committee referred to above, was furthered when representatives of the builders of turret, automatic, and engine lathes, meeting with the committee, agreed to recommend to their companies that they adopt the new spindle noses. The committee reports that "while no official action has been taken, each of the automatic lathe builders, most of the turret lathe builders, and the Monarch Machine Tool Co., one of the largest builders of the engine lathes, are making arrangements to get these new spindle noses into production." The Pratt & Whitney Co. has agreed to manufacture the necessary gages for use in this connection.

The general sectional committee on "Standards for Small Tools and Machine Tool Elements" has added a subcommittee for the standardization of splines and splined shafts, and designated C. W. Spicer, of the Society of Automotive Engineers, as temporary chairman. Subcommittees were also appointed for the standardization of electric welding dies and electrode holders, and for the standardization of the dimensions of milling machine tables.

Safety Code for the prevention of dust explosions

The American Standards Association has approved as an American Standard, the revision of the "Safety Code for the Prevention of Dust Explosions in Pulverizing Systems for Sugar and Cocoa." This code prepared by a sectional committee under the joint sponsorship of the United States Department of Agriculture and the National Fire Protection Association was unanimously approved by the members of the committee, under the chairmanship of David J. Price, of the Department of Agriculture.

The provisions of the code cover location of pulverizing systems, construction of buildings, access to these buildings, power, lighting, preventive measures, housekeeping, and fire protection.

Safety Codes for the Prevention of Dust Explosions cover, in addition to pulverizing systems for sugar and cocoa (Z 12b—1930), installation of pulverized fuel systems (Z 12a—1927), prevention of dust explosions in starch factories (Z 12c—1927), prevention of dust explosions in flour and feed mills (Z 12d—1928), and prevention of dust explosions in terminal grain elevators (Z 12e—1928).

Gas-mask canisters.

A safety code for the identification of gas-mask canisters (K 13—1930) has been adopted as an American Tentative Standard by the American Standards Association. This code was unanimously approved by the 18 members of the sectional committee which prepared it and by the National Safety Council, sponsor for the project.

The purpose of the code, according to an introduction to the standard, "is to provide protection against accidental injuries arising out of misunderstandings in the identification of suitable gas-mask canisters selected for use in connection with gas masks worn by men who are required to enter atmospheres containing dangerous quantities of harmful gases, vapors, smokes, or mists (singly or in combination), or dusts in combination with any of these. By establishing a uniform practice those who may have occasion to use gas masks will acquire a knowledge of the identification colors and marks and will thus be assisted as much as possible in selecting proper canisters for specific conditions encountered."

The committee recommends that: "The manufacturers of gas-mask canisters, falling within the scope of this code, shall see that all canisters of their manufacture are properly colored and marked in accordance with these requirements before they are delivered to their customers. All who issue or use gas masks, falling within the scope of this code, shall see that all gas-mask canisters purchased or used by them are properly colored and marked in accordance with these requirements before they are placed in service and that the colors and markings are properly maintained at all times thereafter until the canisters have completely served their purpose."

To spend $150,000 annually.

Announcement that the underwriting of the finances of the American Standards Association for a period of three years, to permit a total annual expenditure of $150,000 for the association's work is now being completed, is made by William J. Serrill, president of the association. This fund permits an increase of $80,000 in the 1930 budget over the previous budget of the association, and is expected to result in an expansion of national standardization work affecting practically all industries.

The fund is being underwritten by a large group of industrial organizations. The underwriting was arranged by a committee consisting of James A. Farrell, president of the United States Steel Corporation; Gerard Swope, president of the General Electric Co.; George B. Cortelyou, president of the Consolidated Gas Co. of New York; and F. A. Merrick, president of the Westinghouse Electric & Manufacturing Co.

Because of the rapid growth of the industrial standardization movement in this country, the underwriting was planned to permit immediate expansion of the work of providing authoritative national standards, while permanent financing is under way. It is expected that this financing will be completed during the 3-year period of the underwriting.

Has adopted 160 national standards.

Up to the present time the ASA has adopted approximately 160 national standards, and 190 other national standards are being formulated. The association provides the machinery by which all of the producing, distributing, and consuming groups concerned with a standard may cooperate in its preparation. The foremost technicians of all groups are thus brought together to pool their knowledge for the benefit of all. More than 2,000 individuals representing 800 cooperating organizations are in this way working on technical committees under the procedure of the association.

An important feature of the association's work is the adoption of national safety codes, which are used voluntarily by industries and also as the basis for State and municipal safety regulations and for the regulations of insurance companies in numerous States. Among the most important of these codes are: The National Electrical Safety Code, The Code for Mechanical Power Transmission, and several codes for mine safety.

As the result of the recent affiliation of the American Home Economics Association with the American Standards Association, the latter body has also begun important standardization work on projects of direct concern to the ultimate consumer, such as refrigerators, sheets, and blankets.

PACKAGING OF FLASHLIGHT BATTERIES

Conference Approves Plan for Packaging Large and Small Flashlight Cells; Recommendation Now Before Industry for Acceptance

A general conference on packaging of flashlight batteries was held in Washington, D. C., on December 20, 1929, and approved a plan for packaging large and small flashlight cells. The recommendation of the conference has been referred to manufacturers, distributors, and organized users for approval and will be published as a simplified practice recommendation if adopted by those concerned.

The need for a uniform system of packaging was suggested by Dr. E. L. Newcomb, secretary of the National Wholesale Druggists Association. At his request, the division of simplified practice called a meeting of manufacturers of flashlight cells, and with their cooperation developed the proposal which was approved at the general conference. In accordance with the usual procedure of the division, the conference approved the appointment of a standing committee for the purpose of enlisting the support of producers, distributors, and users to maintain interest and adherence by keeping the program abreast of current requirements through periodic revision.

VITREOUS CHINA PLUMBING FIXTURES

Draft of Recommended Commercial Standards Before Industry For Acceptance

The recommended commercial standard for vitreous china plumbing fixtures was circulated during January among producers, distributors, and users for written acceptance. This recommended commercial standard covers additions and corrections proposed as the first revision of simplified practice recommendation No. 52.

Although the recommendation includes a simplified list of variety of vitreous china plumbing fixtures, the primary purpose is to establish nomenclature, definitions, and grading rules as a basis for marketing the commodity, and, therefore, upon request of the industry, the revision is being handled as a commercial standard project.

As compared with simplified practice recommendation No. 52, the recommended commercial standard incorporates a number of additional requirements intended to clarify the general understanding between producers and consumers. For example the following: "Integral traps in vitreous china water-closet bowls shall provide a water seal of not less than 2½ inches in depth, and for all other classes of vitreous chinaware integral traps shall provide a water seal of not less than 2 inches in depth."

The recommended commercial standard also incorporates more severe restrictions as to grading of water-closet bowls, low tanks, and lavatories, as well as a number of additional dimensional standards to provide a greater degree of interchangeability between goods produced by different manufacturers, so as to permit a greater competition among the manufacturers of brass trimmings.

Dimensional standards are also incorporated, including over-all and roughing-in dimensions for urinal stalls, top, and back supply pedestal urinals. Mimeographed copies of the recommended commercial standard are available on request.

ARMY SIMPLIFIES ITS STATIONERY

War Department Circular Shows Standard Items to be Carried in Stock by Department

The War Department has applied both simplified practice and standardization in handling stationery and office supplies to be procured, stored, and issued for the military service, according to Bulletin No. 15 of that department. One example will serve to illustrate. In the matter of rubber bands the department has reduced the variety to be carried in stock to three standards. These varieties are carried as standard items of issue and no other varieties will be procured, stored, or issued without the prior approval of the proper authority of the War Department. This procedure not only serves to simplify the handling of supplies, but also reduces the warehouse space devoted to their storage.

INSTRUMENTS TO INCREASE EFFICIENCY AND SAFETY OF AVIATION DEVELOPED BY FEDERAL SPECIALISTS

Measuring Instruments Essential to Successful Flight. Standard Rules and Practices. Deafening Roar in Airplane Cabin Reduced Through Bureau Research

By Henry D. Hubbard, *Assistant to the Director Bureau of Standards*

Measuring instruments are essential to successful flight. They correspond to the five senses of man, except that aircraft instruments are far more numerous. Some 40 aeronautical instruments have been intensively studied by Bureau of Standards experts. Its publication on the subject is the classic reference work in this field.

In the aneroid barometer 28 sources of error were originally found deserving of attention. At first an aneroid altimeter might still register several hundred feet altitude when the plane landed. The lag in registration was dangerous. The bureau's tests and conference with manufacturers have resulted in a material improvement in the prompt response of these basic instruments.

Standard atmosphere chart.

The bureau computed and published a "standard atmosphere chart," giving graphically and numerically the ideal temperature-pressure-altitude relations by which the altitude may be derived from the air pressure.

Instrument flying.

Instrument flying is now recognized as the only method by which flight may be made at all times regardless of air conditions. A systematic campaign is now in progress to educate fliers on this point. This will more than ever give aeronautic instruments the status they deserve as the fundamental controls of the plane in flight.

Improvements were devised by bureau experts on many aeronautic instruments. The bubble sextant as developed is now recognized as the best available means of locating the position of aircraft. For certain purposes a photographic sextant was desired and was invented to order by one of the staff. A rate-of-climb meter was developed and is most useful for flight-test work.

Earth inductor compass.

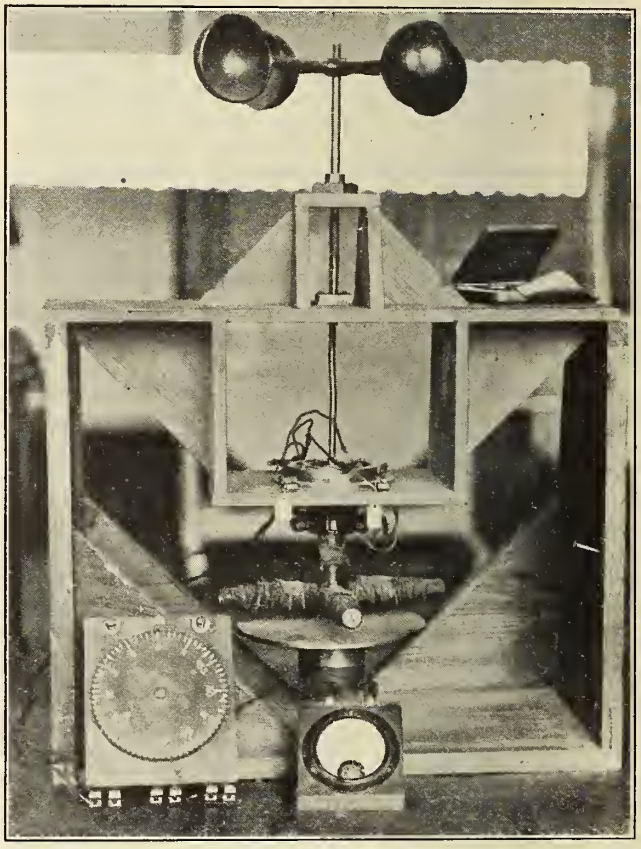
The Bureau of Standards developed the earth-inductor compass, a successful substitute for the mariner's compass of the Chinese. This device is more accurate than the magnetic compass, since its sensitive element may be placed on the tip of the plane or the tail, free from disturbances from the motor, and the indicating element may be placed in the observing position most convenient to the pilot.

A particularly interesting advantage of this instrument is that the needle may be set to read zero for any desired course so that the pilot need only keep the needle at zero in order to fly at a true course, thus relieving him of continually watching the points of the compass card.

Direction-finder principle.

Perhaps the most notable contribution to air navigation ever made was the Bureau of Standards direction-finder principle, with its many applications, including the radiobeacon, the radio compass, the fog-signaling system, position-location system, and other interesting uses.

Much ingenuity has been devoted to the use of liquids to damp the vibrations of instrument parts to promote accuracy and reduce disturbing effects. The bureau's experts have been studying the viscosity of liquids over a wide range of temperature in search of ideal liquids which have minimum change of viscosity with change of temperature. Many tests have been made, and much valuable data gained. Already over certain ranges it is now possible to select suitable liquids for specific uses. Data are being gathered on the elastic properties of materials with a view to enabling the instrument designer to select a metal having elastic properties suited to its uses.



Earth-inductor compass

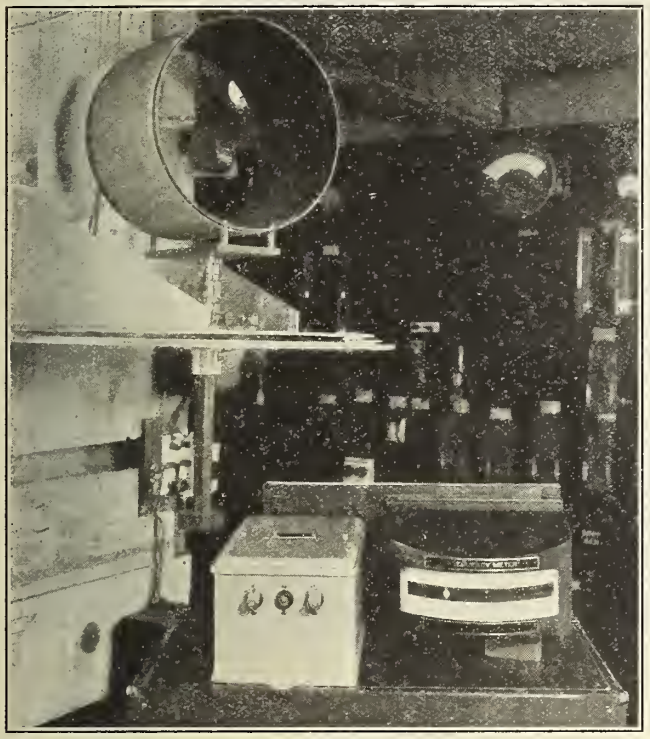
This in the original model invented by Dr. L. J. Briggs and Dr. Paul R. Heyl, of the Bureau of Standards, for guiding airplanes.

Standardizing instruments.

In standardizing aeronautic instruments the bureau duplicates the vibrations of a plane, since the accuracy

of readings of such instruments is affected by vibration. The tests develop whether the errors thus caused are excessive and often how they may be minimized. In the test the instruments are made to vibrate and their readings are compared with those of standard instruments under undisturbed conditions.

The bureau serves as technical referee for altitude-flight records. The graphic records made during the flight are sent to the bureau and the time-temperature-pressure curves reproduced under standard controlled conditions with accurate instruments. The competing records are thus calibrated as a basis for the flight-record award.



Complex coordinator

This is an instrument designed and built by the Bureau of Standards to determine the time of aviators' reaction.

An experimental container for liquid oxygen, developed by a staff member, proved three times more effective than the ordinary vacuum flasks. The idea was that liquid oxygen might be carried in planes to conserve space. Another experimental development was an oxygen supply which delivered the flier an amount controlled by the density of the air, so that the aviator might automatically be supplied with the requisite amount at any altitude.

Tautness meters for wires and fabric in aircraft were devised to measure and standardize their tension, so that the balance of stress-strain may be optimum.

Times gunfire.

A device was perfected to accurately time airplane gunfire between the propeller blades in air combats. Another development was the system of airplane photography through fog. The bluish light of the haze was screened out by a color filter and the plates were sensitized to the red rays. The bureau was able to take photographs of Washington, for example, from the height of a mile in one one-hundredth of a second through haze which obscured the view. Suitably computed plate glass was inserted in an airplane mapping camera, thus cutting the mapping time one-half.

The success and progress of aviation depend upon scientifically measured controls of materials, motors, structual and operating elements, knowledge of air conditions and performance, so that scientific-research laboratories, such as those at the Bureau of Standards, must continue to play an important part in testing and research.

High speeds, mileage, efficiencies, flying by instruments, endurance records, radiobeacons, automatic stabilization, and other modern phases of aviation require basic measuring devices and methods and experimental researches of a new order.

Standard rules and practices.

As in marine navigation, standard rules and practices have evolved through experience, so already aviation has its code of practice to insure safety and effectiveness. Under the sponsorship of the Bureau of Standards there was prepared a comprehensive code of technical specifications for aircraft, construction, and maintenance of flying fields, and the operation of aircraft.

The development of the code occupied four years in preparation and engaged the active cooperation of some 33 engineers and officials of the aircraft industry and of the Government. The subject matter covers airplane design assembly; tests; airplane equipment, maintenance, and operation; signals and signaling equipment; airdromes and airways; traffic and pilotage rules; qualifications for airmen; free and captive balloons, airships; and parachutes.

Saved $1,000 per cruising hour.

When airships were obliged to valve out helium to reduce buoyancy to match the lost weight of fuel burned, the bureau devised condensers to keep the water produced by combustion with a maximum saving, it was reported, of $1,000 per cruising hour.

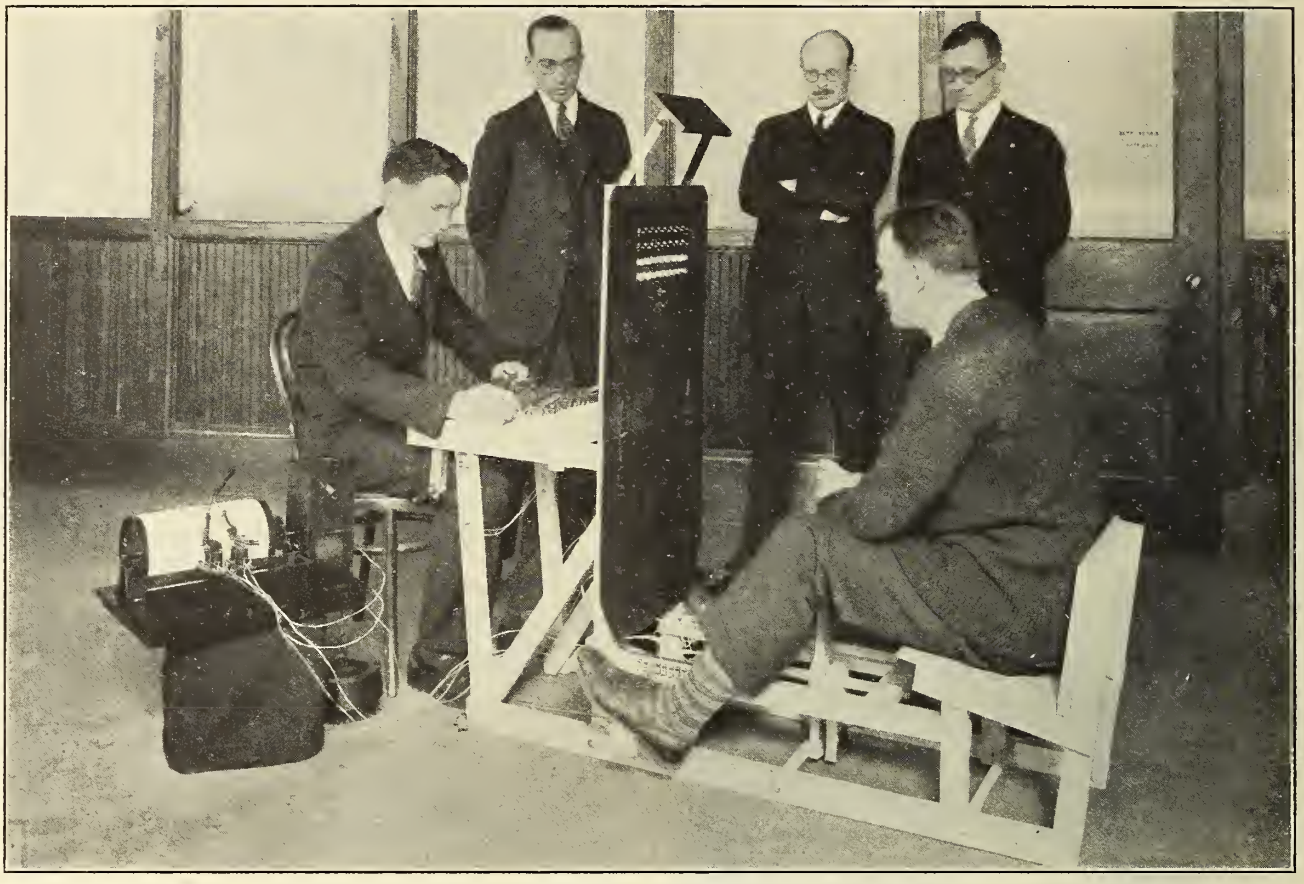
In a recent successful bureau research it was found possible to reduce the deafening roar in an airplane cabin so that ordinary conversation was possible—introducing a new era of quiet and ear comfort in a passenger-carrying aircraft. The results were promptly put into successful practice by plane makers.

The special problems incident to successful telephony between the ground station and the plane were recently solved by the Bureau of Standards and an effective installation completes another chapter of the research program for the first national airway established by the Department of Commerce.

Radiobeacon devised.

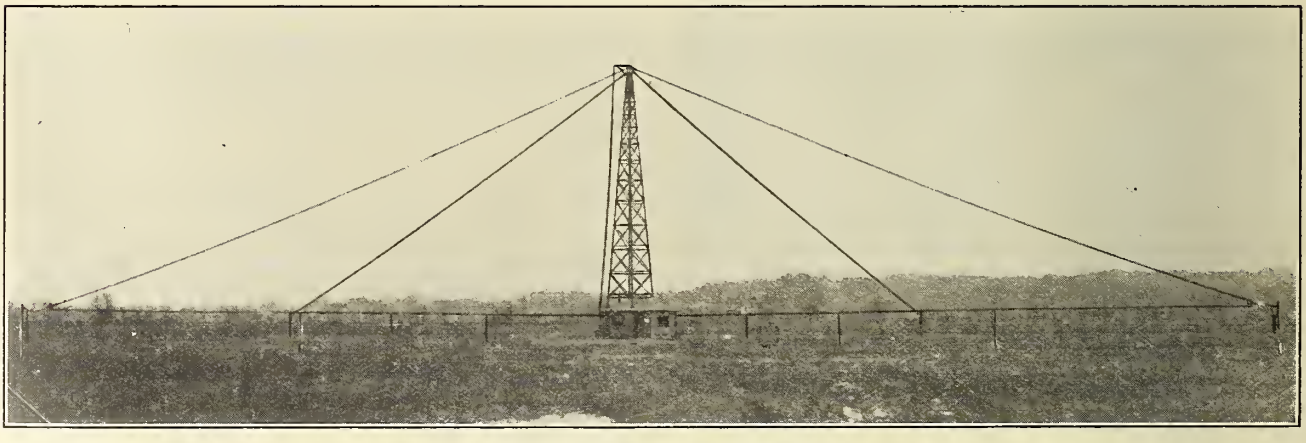
The radiobeacon devised and set up by the bureau for the first national airway is a notable development. The radio airway beacon is in effect a beam of radio laid down to mark a true course. The automatic visual indicator constantly before the air pilot shows him whether or not, and how nearly, he is on true course. This principle is now a basic factor in perfected flight technique. A newly developed system devised at the bureau sets up 12 courses as readily as 2.

The logical next step in aviation is to network the entire country with similar national airways so that above the clouds, at night, or in fog the pilot may navigate the air everywhere as place conscious and as unerringly as a motorist drives through the city streets.



Course-shift indicator

This device shows whether the radiobeacon is sending out the correct course, so that if any error exists it can be corrected at once.



Crossed coil aerial of radiobeacon

This is the original installation at College Park, Md., and consists of 2-coil aerials at right angles sending out alternate signals of different frequency

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

BUREAU OF STANDARDS JOURNAL OF RESEARCH

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.

All engaged in industry and commerce should have available for current use and permanent reference, the Bureau of Standards Journal of Research.

Early in its first year the Journal developed a list of paid subscribers double the anticipated maximum.

This Journal is full of interest to executives and technicians controlling industries and commercial enterprises. It enables them better to promote efficiency by determining the scientific measured controls of process through experimental and theoretical research.

Issued monthly . Price, $2.75 per year

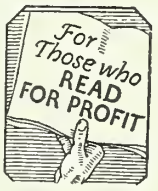
TECHNICAL NEWS BULLETIN

The Bureau of Standards periodical with a WAR RECORD! Started during the dark days of 1917 to keep the Army and Navy and other branches of the Government informed of progress in scientific war research at the bureau. Upon urgent request this publication was continued and expanded to serve the Government, science, and industry.

The TECHNICAL NEWS BULLETIN will keep you informed of current progress in the scientific and technical work of the bureau's laboratories, and gives each month a list of the publications of the bureau. A complete cross index is published with the December issue.

You can not afford to be without the TECHNICAL NEWS BULLETIN. Every article is short and to the point. The busiest executive can afford the time to read it.

Subscription price . 25 cents per year



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."

Subscription price, $1 per year

STANDARDS YEARBOOK FOR 1929

The new Standards Yearbook for 1929 is the third annual issue of a publication devoted to the great and growing field of standardization in its broad aspects. It is a 400-page summary of progress.

Standardization is a world-wide movement. It covers all industries. It is part of the application of scientific methods to industry. Its achievements are of interest and concern to business men and manufacturers as well as to engineers. To the technician it is full of example of methods and results of suggestive and stimulating value. To business men it discloses trends which deeply concern their interest.

NOW READY Price, $1 ORDER AT ONCE

"Standardization is becoming an aspect of all well-ordered activity rather than an incidental activity supplemental to others."

To obtain regularly the above-described publications send your order, with remittance, addressed: Superintendent of Documents, Government Printing Office, Washington, D. C. Foreign prices (countries other than the United States, Canada, Mexico, Newfoundland, Cuba, and Republic of Panama) are: Journal, $3.75; Bulletin, $0.40; Monthly, $1.25; Yearbook, $1.20

"* * * 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.

Taking censuses of population, mines and quarries, water transportation, and religious bodies every 10 years; censuses of agriculture and electrical public utilities every 5 years; and a census of manufactures every 2 years. Compilation of statistics of wealth, public debt and taxation, including financial statistics of local governments, every 10 years; annual compilation of financial statistics of State and municipal governments.

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.

BUREAU OF FOREIGN AND DOMESTIC COMMERCE, William L. Cooper, Director.

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.

The compilation and distribution of lists of possible buyers and agents for American products in all parts of the world and publication of weekly lists of specific sales opportunities abroad.

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.

Custody, development, and construction of standards of measurement, quality, performance, or practice; comparison of standards used by scientific or other institutions; determination of physical constants and properties of materials; researches and tests on materials and processes; and publication of scientific and technical bulletins reporting results of researches and fundamental technical data.

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.

U. S. GOVERNMENT PRINTING OFFICE: 1930