

COMMERCIAL STANDARDS MONTHLY

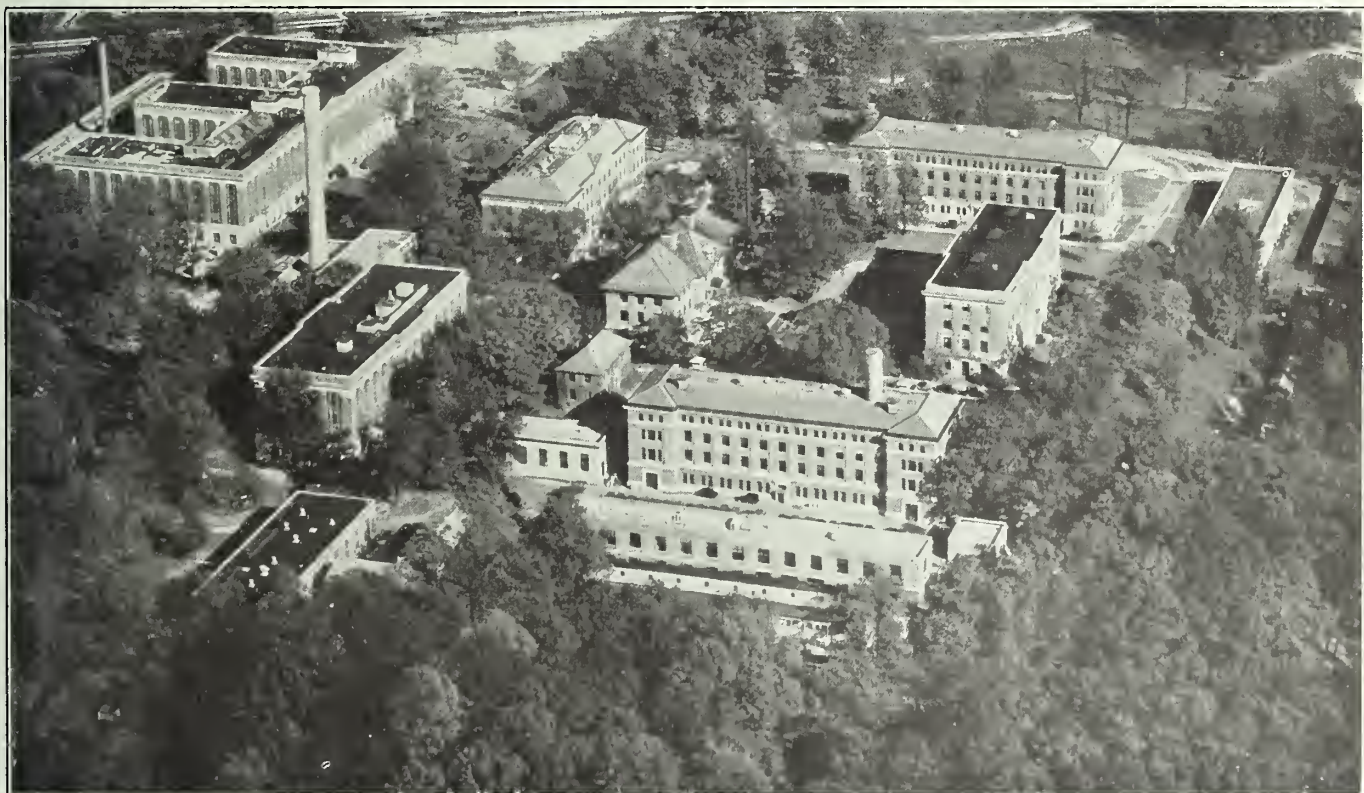
BUREAU OF STANDARDS

OCT 4 1930

LIBRARY



*A Review of Progress in
Commercial Standardization and Simplification*



AIRPLANE VIEW OF NATIONAL BUREAU OF STANDARDS

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

Vol. 7, No. 4



OCTOBER, 1930

U. S. DEPARTMENT OF COMMERCE

R. P. LAMONT, Secretary

NATIONAL BUREAU OF STANDARDS

GEORGE K. BURGESS, Director

COMMERCIAL STANDARDS MONTHLY

S. F. TILLMAN, Editor

DIVISIONS OF THE COMMERCIAL STANDARDIZATION GROUP

DIVISION OF SIMPLIFIED PRACTICE, EDWIN W. ELY.

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

BUILDING AND HOUSING DIVISION, J. S. TAYLOR.

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

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

DIVISION OF SPECIFICATIONS, A. S. McALLISTER.

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

DIVISION OF TRADE STANDARDS, I. J. FAIRCHILD.

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

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

Except where otherwise indicated, for further information address

BUREAU OF STANDARDS

WASHINGTON, D. C.

COMMERCIAL STANDARDS MONTHLY

A Review of Progress in Commercial Standardization and Simplification

VOLUME 7

WASHINGTON, D. C., OCTOBER, 1930

NUMBER 4

CONTENTS

FEATURE ARTICLES

	Page
Clay products improved by Federal research.....	118
Massachusetts has 300 local safety committees.....	98
Measuring consistency of plastic materials.....	115
Need for standardization of electrical controls.....	114
Production standards applied to motor vehicle maintenance.....	119
Safety responsibility law to curb reckless driver.....	109
Safety work in compressed gas industry.....	101
Standard elevator regulations.....	122
Standardization in welding industry.....	107
Standardization movement in South Africa.....	117
Standardization of biological stains.....	116
Standardizing Army engineering equipment.....	102
Standardizing storage and property accounting.....	99
Standards for dry skim milk.....	113
Standards for screw threads fixed by national commission.....	105
Standards in gas industry.....	112
United States Navy a pioneer in standardization.....	111
What weights and measures mean to the housewife.....	103

TRADE STANDARDS NEWS

	Page
Standard approved for red-cedar closet lining.....	127

STANDARDIZATION NEWS

Aggressive merchandising.....	127
A. S. T. M. activities covering gypsum products.....	121
National Bureau of Standards to conduct survey to improve its assistance to governmental purchasing.....	113
"Car card" certification for lumber shipments.....	117
Current activities of the American Standards Association.....	125
Higher silicon allowed by revised standards.....	100
Labels for eggs increases sales.....	110
New tentative standards adopted for copper-base alloys in ingot form for sand castings.....	110
Preventing fire casualties.....	115
Specifications for nonmetallic minerals published.....	126
Standardization briefs.....	120
Status of Federal specifications.....	127

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.*

MASSACHUSETTS
has 300
LOCAL SAFETY COMMITTEES

*Many Local Municipalities Cooperate
in the Work*

We have established more than 300 local safety committees in the various cities and towns throughout the State of Massachusetts. They are carrying on investigations in an effort to devise and put into effect methods that will prevent many of the accidents now occurring upon the streets and highways.

Many municipalities are cooperating in this work, as are the various State departments. Steps have already been taken to make regulations and signs more uniform throughout the State, thus simplifying the movement of traffic for both the motorist and pedestrian. All the municipal agencies are doing a great deal to prevent accidents. This safety work is a personal matter, and every one, both motorist and pedestrian, must assume the responsibility that is his own by practicing precaution at all times.

Many boys and girls are injured on the streets. By crossing them carefully at all times, by using the proper cross walks, by obeying the signal of the traffic officer, and by refraining from playing in the streets the young people will be doing their part in this great work. Boys and girls who are now pedestrians will soon be automobile drivers. It is important that they know how to think and act safely. If they begin now by forming safety habits they will grow up to be citizens of the Commonwealth, prepared to assume the responsibilities which go with capable citizenship.

FRANK G. ALLEN
*Governor, Commonwealth of
Massachusetts*

+

STANDARDIZING STORAGE AND PROPERTY ACCOUNTING

Veterans' Bureau Supply Service Has Found That Standardization of Equipment and Simplification of Property Accounting Have Reduced Costs

By JOHN D. CUTTER, Assistant Director, Supply Service, Veterans' Bureau

In the storing and warehousing of supplies at supply depots and field stations of the Veterans' Bureau, standardization of equipment and simplification of methods are carried out. All items of standard supplies are stored by classification stock number in separate sections, material and supplies being so arranged that the old stock is used first and by following this order of progression spoilage, deterioration, and wastage are reduced to a minimum.

The standardized and simplified methods of warehousing used by large commercial concerns have been adopted with the result that at the present time the Veterans' Bureau is conducting its storage and distribution operations at a lower cost than that obtained in commercial concerns.

All Government departments are required to maintain an adequate property accounting system. The processes of accounting begin with procurement of property and terminate with its disposal. In maintaining accountability records for the property and supplies purchased the Veterans' Bureau has adopted simplified methods which were developed by its own personnel which has effected a saving of approximately \$100,000 a year through personnel reductions with increased efficiency and accuracy of records, the maximum result being secured at the minimum cost. The problem of the Veterans' Bureau has been to evolve a simplified, uniform, accounting system that will accurately record the receipt, location, movement, and final disposition of each item of property procured for use in Washington, D. C., and its field stations in the United States and foreign possessions. Inventories of bureau property and supplies cover some 21 classifications which include 10,000 separate items and a total of millions of units.

Fundamentally all systems of property accounting are based upon the principle that property received becomes a debit until dropped by proper credit following disposal. All debits and credits must be substantiated by vouchers containing prima facie evidence of the propriety and authenticity of each transaction. At each regional office and hospital of the Veterans' Bureau there is a bonded property custodian in whom accountability for public property is solely vested. Under his direction and supervision all property is received, stored, safeguarded, issued, and accounted for.

Bureau adheres to Government principles.

With respect to the above outline, the Veterans' Bureau, of course, adheres to principles commonly followed by all Government agencies. During the eight years from 1920 to 1928, partially successful efforts were made to adapt existing procedures to bureau uses, but it finally became apparent that a truly simple and effective system could never result from modified, borrowed practices. It became necessary to discard methods which were archaic and to evolve an entirely new system based upon the bureau's own particular problems and conditions. Within the past

three years, step by step in order not to retard current operation or impair availability of existing records, there has been introduced a simplified system which is not only far more dependable, but which eliminates fully 85 per cent of the clerical work. The major changes are briefly discussed below:

Unposted voucher method.—Property expended or permanently installed at time of receipt is theoretically picked up and dropped on one voucher without posting, thereby eliminating three operations. A 10-item voucher accomplished in one operation by this method avoids 30 or more additional, separate postings and voucher operations, yet furnishes a complete record of the purchase, receipt, and proper disposal of the property.

Skeleton postings.—Property record cards used by other Government agencies and formerly by the Veterans' Bureau, contained columns in which were recorded the date of transaction, voucher number, unit price, quantity received or issued, balance remaining on hand and total money value. For articles received, the bureau's revised property record cards merely show unit price, quantity received and voucher number. For articles issued the unit price is omitted. For articles either received or issued the date, balance, and total money value have been eliminated in all cases.

This system has eliminated the possibility of original errors becoming cumulative, thus necessitating a recheck of the past transactions to effect a correction. The new system furnishes all the data essential to the proper and permanent accountability record and stock balances can be determined at any time by subtracting total credits from total debits and, if desired, the total value can be ascertained by merely multiplying the credit balances of the items by the unit price.

In the event that additional information regarding any transaction is desired it can be secured from the voucher file, which is serially numbered, the numbers agreeing with the entries on the card and the occasions when it becomes necessary to refer to this voucher file are so few that it is surprising why departments have for years religiously copied this plethora of data on property record cards at untold labor, expense, and duplication of effort.

Daily progressive inventories.—A complete physical inventory of any large activity is an enormous task and its taking is complicated by so many problems incident to continuing operation while the inventory is in progress that the completed inventory is seldom dependable. After studying methods employed by commercial organizations and other Government agencies, only three systems were found which could possibly be considered, and each of these systems had serious disadvantages. It became necessary to work out a method differing fundamentally and radically from any system in known use. This method is now in successful operation and is referred to by the Veterans' Bureau as the "standard inventory."

When a factory takes inventory it usually suspends operation, assigns all available personnel to the task and conducts a rapid, simultaneous inventory of all departments. This method is not possible in bureau operation. Hospitals, regional offices, and other activities must maintain continuous uninterrupted service, and the task of conducting a physical inventory during such operation is too great to be accomplished in any short period.

This "factory" method was one of the three considered and discarded. Another was accomplished once and sometimes twice a year. Its taking necessarily extended over a period of from 30 to 90 days, depending upon the size of the activity. As items were counted results were turned in to the property office, where it then became necessary to keep adding and subtracting from these figures at each incoming and outgoing movement of stock until the inventory was 100 per cent complete. This system required continuous paper adjustments with the result that errors due to the human element inevitably crept into these suspended final results so that when the inventory was completed it was invariably an inaccurate compromise between physical count and clerical arithmetic.

A third scheme considered and discarded was known as the "stock-plus-receipt" method. For all items of property not actually in his storehouse the property custodian holds memorandum receipts from the operating departments. Theoretically his accounts are perfectly balanced if quantities on hand plus items on receipt equal the total balances of which he is accountable. A make-shift inventory may be conducted by counting the items in stock and adding the paper balances shown on memorandum receipt, but this will not reveal shortages in the departments and merely straightens out the property custodian without determining the true condition of the property on memorandum receipt for which the department heads have signed up and for which they are held responsible.

The inventory method finally worked out and adopted by the Veterans' Bureau requires each property custodian to conduct a complete physical inventory once a year, but allows him to perform an equivalent percentage of the total task during each working day of the year. This splits the task into small, easily performed, separate units. In this manner each item is inventoried independently of every other item and all suspended totals and suspense records are eliminated. The inventory, instead of being conducted under pressure during the closing month or months of a

year, progresses in an orderly, scientific manner as a part of the daily duties of each employee concerned in its taking.

At the end of each month reports are made of the items inventoried and adjustment vouchers are submitted by the station to take care of any shortages or overages discovered during the month. By the end of the year the entire task has been completed without turmoil, confusion, or disruption of normal activities. The monthly reports furnish valuable operating and statistical information. Losses, breakages, and expenditures can be worked out on an accurate, comparative basis. Depreciation in inventory values can be ascertained, weak spots in station accounts detected and promptly remedied. When a new hospital, or one already in operation requires equipment or supplies it can readily be determined what is available at other stations, and unnecessary purchases may be avoided.

Positive identification of property by a system of numbering.—Property record cards are maintained alphabetically and numbered serially. Duplication of cards and discrepancies in nomenclature are averted by requiring that all inventories, property vouchers, and memorandum receipts show card numbers as well as description of items.

Other methods.

In connection with the above methods for simplifying and unifying property accounting processes there are a number of minor improvements not mentioned in this article which interlock admirably with the general scheme and which in the aggregate considerably reduce work, hasten final action, and increase accuracy in all branches of the supply section. During the past three years in which these methods have been experimentally introduced and finally perfected under actual working conditions at more than 100 activities the average accuracy of property records has increased from less than 50 to almost 90 per cent.

By the end of the calendar year 1930 it is expected that the general average of accuracy will be between 95 and 99 per cent. These percentages are determined by field auditor-supervisors who visit each station once a year, examine and verify the property records, and ascertain the ratio of error in the accounts examined. Accounts which are only 50 per cent accurate might just as well be 100 per cent inaccurate. Accounts above 90 per cent in accuracy mean that 9 times out of 10 they can be absolutely depended upon and that in the tenth case the putative inaccuracy is probably relatively so small as to be practically immaterial.

HIGHER SILICON ALLOWED BY REVISED STANDARDS

A. S. T. M. Announces Revisions of Several Specifications Covering Steel Products

In revising the A. S. T. M. specification for structural steel for forge welding, allowance has been made for higher silicon content by agreement between purchaser and manufacturer, according to an announcement of the American Society for Testing Materials. The society also announces the formal adoption of a number of other revisions in the standard specifications for various steel products. Among these are the specifications for commercial quality hot-rolled bar steels and cold-finished bar steels and shaftings ap-

plicable to the screw-steel grades increasing the sulphur content to provide better machineability.

The selection of test specimens in specifications for lap-welded and seamless steel and lap-welded iron boiler tubes, and the tolerances for this material have been modified, and specifications for alloy-steel bolting material for high-temperature service have been limited to cover bolting stock up to and including 2½-inch diameter.

The society further announces that a number of tentative standards and tentative revisions to standards have been adopted as standard, there having been no criticism during the past year to the tentative specifications.

SAFETY WORK IN COMPRESSED-GAS INDUSTRY

Manufacturers Association Has Worked for Standardization of Equipment to Promote Safety

As the compressed-gas industries grew and the number of gas containers in use began to increase rapidly, it became apparent to the industries' pioneers that some coordinated action should be taken to protect the property rights of the manufacturers in their container equipment, and also to establish just and uniform regulations in all parts of the country (Federal, State, and local), to govern the transportation, storage, and use of compressed gases and their containers.

This realization grew into concerted action which resulted in the incorporation early in 1913 of the Compressed Gas Manufacturers' Association. Since that time the organization has grown until it represents to-day manufacturers whose production amounts to approximately 97 per cent of all the compressed gas manufactured and shipped on the common carriers within the United States and Canada; also gas manufacturers in Mexico, Guatemala, France, England, Switzerland, Holland, Russia, the Philippine Islands, the Hawaiian Islands, Australia, and India.

Working with safety in the industries as its objective, the association has extended its efforts to include standardization of equipment and practices that further this purpose.

The compressed-gas industries are highly specialized in the arts and crafts of safety, since their problems of distribution and delivery of products are of such a nature that safety is always paramount to other considerations. Unlike most industries, and due to the unusual nature of their products, they find their greatest concern in transportation, which naturally means that the transportation equipment must be flawless and must conform to strict specifications in order to guarantee its integrity. It is estimated roughly that better than 50 per cent of the total capital investment of these industries is in their transportation equipment, which consists of cylinders, tank cars, etc. Generally speaking, title of ownership of these containers remains permanently with the gas manufacturer, it being the usual practice to loan the container to the gas purchaser until the content is consumed, after which the equipment is returned.

Industry cooperates with others.

Through cooperation with the Interstate Commerce Commission and its advisory body—the Bureau of Explosives—regulations have been established that govern every phase of the shipment of compressed gases on carriers in interstate commerce. Likewise specifications for each type of container have been developed and have been made mandatory by action of the Interstate Commerce Commission, for the construction of all containers used in interstate traffic. Constant research has been conducted by committees of the association to develop methods of determining the wall thickness of a cylinder by means of simple and practical tests.

The result of this work is intended to establish further safety features in that it permits the gas manufacturer to detect thin walled or corroded cylinders

and eliminate them from service, thus removing cylinders that are potentially hazardous.

In developing the tests necessary to obtain these results many sizes and types of cylinders were used. It was found that in all the standard types of high-pressure containers, it was practical to determine the wall thickness by means of measurement of the volumetric elastic expansion under pressure and to set maximum expansion limits for each type, such a maximum limit indicating a corresponding minimum effective wall thickness. Thus, if the elastic expansion of a cylinder subjected to the prescribed test pressure reaches or exceeds the permissible expansion limit, it indicates that there is not sufficient effective wall thickness, and the cylinder must be removed from service.

Two technical papers have been published by the association giving in detail the development of the various factors considered in the study of these problems, and the mathematical relations of the factors involved.

Few serious accidents.

It has been the experience of the compressed-gas industry that the few serious accidents that have occurred in connection with the handling, use, and storage of gases have been almost invariably the result of abuses to container equipment or mishandling of one kind or another. To obviate occurrences of this nature the association has prepared and circulated a set of rules for the "Safe Handling and Use of Compressed Gas Cylinders." Literally thousands of these regulations have been distributed through the member companies with the result that accidents due to such abuses have been almost eliminated. These recommendations covered general precautions pertaining to safe practices in the handling of all types of gas cylinders and also specific precautions to be observed in the case of the individual gases. The proper care to be observed in the use of regulators and other equipment was also given consideration.

In the early days of the compressed-gas industry it was not unusual for the manufacturers to use types of valves, outlets, and corresponding connecting nuts for equipment that varied in such a degree that it was possible to connect gas cylinders with consuming equipment designed for gases of entirely different characteristics. This was undoubtedly a hazardous period, although the industries can boast of eliminating these irregularities with exceptional orderliness.

Standardization of valve outlet threads and connections through the mutual cooperation of the association's member companies has resulted in the adjustment of valve equipment design and a degree of standardization that makes interchange of equipment impossible, a safety feature that has eliminated a truly potential hazard.

The Compressed Gas Manufacturers' Association has always maintained contact with other organizations mutually interested in the safety of industry, and has cooperated with these organizations in the promulgation of safety codes and regulations of numerous kinds.

STANDARDIZING ARMY ENGINEERING EQUIPMENT

Army Has Standardized Many Items of Equipment Formerly Considered Necessary as "Special" Manufacture

By Maj. H. H. STICKNEY, U. S. A., Chief, Supply Section, Office of Chief of Engineers

When section 5a of the national defense act was enacted June 4, 1920, the Assistant Secretary of War was charged with the supervision of the procurement of all military supplies and the assurance of adequate provision for the mobilization of matériel and industrial organizations essential to our wartime needs.

This and other provisions of the act have caused to be set up in the supply branches of the Army—that is, the Ordnance Department, Quartermaster Corps, Corps of Engineers, Signal Corps, Air Corps, and the Chemical Warfare Service—organizations to prepare plans for industrial mobilization. These studies have resulted in the adoption of commercial items and standards to military needs wherever possible. The adoption of a commercial item practically assures prompt quantity production in an emergency. The Corps of Engineers is fortunate in that practically all its items of equipment have a counterpart in the commercial field, or can be nearly reduced to commercial standards.

Studies have been initiated resulting in new and revised specifications following commercial practice in the following instances:

Bags, sand, burlap.—Jute is a strategic raw material—that is, a material produced entirely outside the continental limits of the United States. Studies have been made of commercial substitutes and it has been found that Osnaberg cotton, cotton cement bags, and cotton flour bags present substitutes equal to or better than the jute bag. The only reason jute bags are procured in peace time is because they are cheaper. It has also been found that there are certain commercial bags, such as potato, plaster, calcium chloride, sugar, and flour bags, already being manufactured and in stock, which can be used until production can be reached on the standard bag.

Specifications revised.

The standard burlap sand bag specification has recently been revised to conform more nearly to commercial practice of manufacturers. The standard size is 14 by 26½ inches, which, if strictly followed, can not be cut economically from 40-inch burlap. The bulk of the burlap imported is 40 inches wide. The tolerances have been changed so as to allow cutting 40-inch burlap into strips 25½ and 14½ inches wide and allowing two sizes of bags in one order. The area of the bag must be not less than 365, nor more than 382 square inches when laid flat. This prevents the manufacturer from taking the minus tolerances in both length and width in the same bag. Packing and sewing requirements were changed, resulting in additional economies. The changes have caused the price to be reduced from between 6.7 and 7 to 4.8 cents per bag.

Celluloid.—Celluloid is no longer used for the manufacture of triangles, scales, protractors, and similar items. It has been found that fiberloid is more durable and will withstand storage conditions in the

Tropics, whereas celluloid in a short period will disintegrate entirely. A study is now being made of pyralin as a substitute for fiberloid so as to increase the source of supply of this class of material.

5 kw generating sets.—The old standard 5 kw generator set was entirely special. It was heavy for its capacity, weighing some 2,100 pounds, and was comparatively expensive. A survey was made of the commercial field, which resulted in the adoption of a commercial standard manufactured by several different firms. These sets have proven eminently satisfactory, are of light weight—650 to 750 pounds—are reliable, and above all are procurable in quantity in case of an emergency. Their price is about two-thirds that of the old special set. A similar investigation is being made to find a commercial pumping set suitable to our needs.

Pontoon equipment.—The floating-bridge equipment of the Corps of Engineers is one of the few items of equipment that has no counterpart in commercial life. The boats, balk (stringers), chess (flooring), trestles, and vehicles, must, of necessity, be adapted to this special task. However, certain commercial items have been adopted in part with resultant economy and assured production.

Wagons.—Commercial trailers have been found eminently suitable, with minor modifications of the superstructure, for transporting boats, balk, chess, and other items of this equipment. The original design of these wagons was special throughout, and the cost per wagon was about \$2,000. Several commercial designs are suitable, and when adopted will involve a cost of between \$700 and \$800 per wagon.

Lumber substitute.—Considerable study has been made of the various woods suitable for balk and chess. It has been found that Douglas fir is well suited for both purposes and can, of course, be obtained in quantity. Redwood of select grades (prime structure) can be used for chess. These two woods take the place of white pine which is becoming difficult to procure and increasingly expensive.

Steel boats.—The steel boat is being tested to determine its suitability as a substitute for the present wooden boat. If it proves satisfactory, manufacture will be expedited and the rapid deterioration found in the wooden boat will be eliminated.

Portable pile driver.—Before the organization for control of industrial mobilization plans was operating efficiently, this branch developed a portable pile driver which functioned properly but lacked mobility; its main drawback was its special nature. Its procurement would be impossible in the first months of an emergency. A plan was developed to use a truck crane, portable leads hung from the crane boom, a large air hammer, a portable air compressor, and various air tools. This group of equipment can drive piles, place stringers, caps, and flooring, and, with the air tools, can do practically all the work incident to building a pile bridge with power-driven equipment. It

can also be used to operate a quarry, excavate earth, load and unload heavy materials, and to perform many other tasks previously performed by man power in the Army. The items that make up the plant are all made commercially and can be procured during the initial stages of the war in the desired quantities.

TNT demolition blocks.—During the World War, crystalline TNT was compressed into a ½-pound rectangular block having a density of 1.46, with a cross section $1\frac{1}{8}$ by $1\frac{1}{8}$ inches, and a length of approximately $3\frac{1}{4}$ inches. These blocks were coated with a thin plate of copper by an electrolytic process, and the finished product cost from 80 to 90 cents per pound. Within the last two years, it was found that the war stocks of blocks were nearly depleted and it would be necessary to purchase additional stocks. Investigation disclosed that all the electroplating machinery developed and used during the war period had been junked. No civilian manufacturer or Government arsenal was prepared to manufacture blocks by this process.

Following the policy that commercial products should be used to the greatest possible extent, an attempt was made to discover a method of coating the blocks of compressed TNT which would be either strictly commercial or at least an adaptation of some peace-time product. Among the methods suggested were dipping in Duco, wrapping in cellophane or

paraffin paper, and inclosing in a box of bakelite, cardboard, or fiber board. Finally it was decided to use a 5-ply fiber-board box made by winding 0.006 fiber board around a mandrel and paraffining the inside.

The ends of the box are made of sheet iron, tinned and lacquered. A hole is punched in one end to register with the recess in the TNT block so that a detonator can be inserted without removing the block from the box. These boxes are very tough and furnish a more satisfactory covering than even the copper plate. The container is commercial, and can be produced in any quantities desired.

The initial order manufactured by this process will cost about 55 cents a pound, including the TNT and an amount sufficient to amortize the plant, buildings, and machinery necessary for manufacture. Later orders will undoubtedly be considerably cheaper and thus effect a substantial saving in the manufacture of the demolition blocks and at the same time assure quantity production in an emergency.

The examples furnished above indicate the trend of thought which has resulted from the policy of adapting commercial standards to military use. In none of these cases has there been any evidence of decreased efficiency, but, on the contrary, the equipment has been found, in most cases, to be the equal of, if not superior to, the special designs formerly considered necessary.

WHAT WEIGHTS AND MEASURES MEAN TO THE HOUSEWIFE

City Sealers Prevent Fraud and Institute Punitive Action Against Violators

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

It has frequently been said that what a person doesn't know won't hurt him.

Whether or not this is logical, it is nevertheless a fact that oftentimes what a person doesn't know is helping him a very great deal. This is particularly true in the case of many of the activities of government—Federal, State, and local.

The knowledge of the average citizen relative to government is largely confined to those activities with which he or she has personally come into contact or conflict. Everyone knows more or less about the local police department, because the police officer is very much in evidence, especially at busy street crossings. The local fire department, too, plays such a spectacular part in the life of the community that its activities are universally understood, and heard as well.

But who knows about the work of the local inspector of weights and measures? And how many would recognize him, if they saw him? He, however, does or can play a very important, if unobtrusive rôle in the community. Just as the policeman protects our persons, the fireman our property, so does the weights and measures official protect our pocketbooks. It is about his activities that I want to tell you.

What is known as "weights and measures supervision" is participated in by every branch of government—Federal, State, county, city, and town. The purpose of this supervision is to insure that whenever commodities or services are bought on the basis of

weight, measure, or count, the determination of quantity involved in the exchange shall be equitably made.

Let us first take up foodstuffs and consider only sales at retail; that is, to the ultimate consumer, usually the housewife. The weights and measures official is charged with the duty of visiting every retail establishment selling food, and of there testing the scales, weights, and measures in use, approving only those which are correct according to the official standards which he carries with him; where necessary, he instructs the dealer in the requirements of the weights and measures law as applicable to his particular business; he makes check weighings and measurements on packages of merchandise ready for delivery, whether put up by the local dealer or by a distant manufacturer; and he promptly investigates the complaints of customers who believe that any irregularities exist in the weighing or measuring practices of the establishments at which they trade. To the householder, this protection is invaluable; to the merchant the service is no less important, because under such supervision he is assured that he and his brother merchants are all on the same basis and that quantity determination is no longer an element in his competition.

Scope of duties.

But weights and measures supervision is not confined to retail sales of foodstuffs; it extends to every field, embracing wholesale as well as retail transactions.

Fuel, ice, building materials, textile material, manufactured articles of a multitude of kinds are weighed or measured commercially, and the equipment used and the accuracy of the quantity determinations are all under the supervision of these officials known as sealers or inspectors of weights and measures.

An important field of governmental activity? Unquestionably so, reaching deeply into the business and lives of our people, and yet this work is so little known that the jokesters who invade almost every field have left weight and measures practically untouched, and our favorite comic strips almost never deal with the subject.

We might note, however, that we have both "liquid" and "dry" measures, and that there is a tendency to legislate for the prohibition of both—"wet" and "dry" measures—and to substitute, where possible, sales by weight alone. In this connection, there is recalled a magazine cover depicting two young people riding in a taxicab; the young lady seemed to be enjoying her ride greatly, but the young man appeared horrified by the mounting reading on the taximeter. The artist had excellently portrayed every detail except the taximeter; this he had drawn with the flag in the "vacant" position in which the instrument would not register any fare at all! His understanding of taximeter operation compares, unfortunately, with that of many purchasers of ordinary commodities, who are quite as much in the dark as to how the scales over which they buy should operate.

In the United States the Congress has left the regulation of weights and measures almost entirely to the control of the individual States, although the Congress has constitutional authority for such regulation. There are a few Federal laws, such as those standardizing barrels, hampers, and baskets for fruits and vegetables and requiring statements of net contents on certain packages of foods, but, aside from these, all weights and measures regulatory authority arises from State laws or local ordinances, and is exercised by officers of the States or their subdivisions, 49 major administrative units to harmonize.

National Bureau of Standards custodian of standards.

The National Bureau of Standards, of the Department of Commerce, is the custodian of the national standards of weight and measure, and verifies the accuracy of the primary standards of the States; these latter are used by the States to standardize the testing equipment belonging to and used by their respective State, county, city, and town departments of weights and measures, so that an unbroken chain extends from the devices used in trade back to the national standards maintained by the bureau in Washington. Unfortunately, not all States have seen fit as yet to undertake active supervision over commercial weighing and measuring devices and methods, but the work is gradually being extended.

Before 1905 there was no concerted movement to coordinate the work of the States to bring about uniformity, and the divergence in the requirements of different sections was very marked. In that year, however, there was organized the National Conference on Weights and Measures, which from very small beginnings has grown to be truly national in its scope.

Originally conceived for the primary purpose of promoting uniformity among the States, the national conference has come to be recognized as a body whose conclusions represent the best weights and measures thought in the country. Without any authority to enforce its conclusions, the conference has nevertheless brought about a tremendous improvement in conditions, entirely through the cooperation of its members in putting into effect in their respective jurisdictions the conclusions arrived at by the conference each year.

In addition to the development of a model law on weights and measures and codes of specifications and tolerances for many classes of commercial equipment, the national conference has become a clearing house for weights and measures information of all kinds. At its annual meetings in Washington, officials from all sections of the country describe their problems and their accomplishments for the purpose of receiving and giving assistance to each other. Here are a few typical examples:

One State department of weights and measures uncovered a series of frauds in connection with the sale of lubricating oil which were being carried on in one of the principal cities of the State. There were more than 200 companies selling this product in this city. Seventeen firms were prosecuted for selling 29 gallons in containers marked to hold 34 gallons. No suit was contested, and \$19,000 was returned to buyers.

Another inspector, a city official this time, reported the results of check-up measurements made on gasoline purchases. Serious shortages were found in a number of cases, and prosecutions followed. The inspector estimated that prior to his drive against dishonest pump operators, the motorists of his city had been suffering a loss of \$549 a day due to short-measure gasoline, a sum sufficient to operate 1,000 cars.

Other frauds uncovered.

Other officials have reported the results of their surveys on a wide variety of commodities. Under laws requiring that bread be sold only in loaves of certain specified standard weights, loaves are reweighed at frequent intervals to see that the provisions of the statute are being adhered to. Cartons of butter, supposed to contain a net weight of 1 pound, are found at times to be deficient in weight; often the investigation of such a condition will lead back through numerous steps to the creamery or butter-printer primarily responsible for the shortage, perhaps in another State from that in which the retail packages were first examined, requiring the cooperation of the officials of both States before the situation is cleared up.

Flour is another commodity on which the weights and measures official receives frequent complaints, sometimes unjustified, the apparent shortages being caused by the natural loss of moisture, and there being no actual shortage of nutritious ingredients. One State, under a recently enacted statute, has been re-measuring hundreds of thousands of yards of sewing thread to establish the correctness of the claimed yardage. The weighing of loads of fuel is one of the important winter activities of the weights and measures official; this may be done following complaint by the purchaser of suspected shortage, although a great deal of reweighing is done at the initiative of the official

himself, as a part of his general supervisory program. Loads of fuel are stopped on the street, on their way to the customer, and the driver is caused to proceed to a convenient scale for check weighing; legal action follows if necessary.

Such examples could be multiplied almost indefinitely, but what has been said is sufficient to indicate the character of that large group of the weights and measures official's duties which are generally spoken of as "supervisory" to distinguish them from the "mechanical" duties which have to do strictly with the devices for weighing and measuring.

From what has been said of these supervisory activities, the impression should not be gained that short weighing and measuring, and fraud in connection with sales of commodities, are generally, or even widely, practiced. Records of weights and measures departments show that the percentage of inaccurate equipment, the percentage of package goods deficient in quantity, and the number of individuals who resort to unethical or dishonest practices, are relatively small. By far the large majority of those engaged in trade are inherently honest in their business dealings and en-

deavor to give their customers what they pay for. But carelessness, lack of knowledge of legal requirements or of the correct use or maintenance of equipment, and the inevitable deterioration of mechanical devices combine to produce an aggregate loss to the buyer which is large enough to be of real importance; add to this the possible effects of the operations of that small, but by no means negligible, percentage of people who are unscrupulous in their dealings, and the total losses which might be sustained by purchasers will reach a surprising figure.

These losses it is the job of the weights and measures official to prevent. How well he is to succeed depends upon the support which he receives in the administration of his department. Sufficient funds must be provided so that the department will be adequately manned and equipped. But even with adequate personnel and equipment something more is necessary for complete success—the department must have the co-operation and help of the community which it serves. A nation is said to have the government it deserves; a community can have fair dealings in trade if they are desired.

STANDARDS FOR SCREW THREADS FIXED BY NATIONAL COMMISSION

Bolts, Nuts, and Screws Hold Important Place in Everyday Life; Standardization Vital for Interchangeability in Use; First Step in This Respect Taken in 1864

By W. H. BEARCE, *Secretary, National Screw Thread Commission*

To one unfamiliar with industrial and engineering construction problems, the establishment of a national commission to standardize so simple a product as screw threads, ordinary bolts and nuts, that can be bought in the nearest hardware store or "5 and 10," might at first thought seem unnecessary or even ridiculous. A ½-inch bolt is a ½-inch bolt, isn't it? A machine screw is a machine screw, and a stove bolt a stove bolt. What more is necessary?

Upon consideration of the important part played by bolts, nuts, and screws in holding together practically everything used in engineering, industry, transportation, and everyday life we may well conclude, however, that the demands upon these products are such as to make their uniformity and reliability of very great importance.

The United States leads the world in that type of mass production commonly known as interchangeable manufacture. Under this method of production a large number of manufactured articles or parts are made so nearly alike as to dimensions that parts can be taken at random from a large number of similar parts and when assembled with other articles or parts similarly taken at random from a large number the various parts will go together and fit and function as intended, without selection and without subsequent change of dimensions.

Limiting dimensions and inspection.

This system of manufacture involves the setting up of definite limiting dimensions for such articles or parts and an adequate system of inspection or gaging to insure that all parts that are accepted as satisfac-

tory will, in fact, be within the prescribed dimensional limits.

Successful interchangeable manufacture, therefore, rests upon two major requirements: First, that the dimensional limits be correctly established; and second, that the system of gaging be such as to insure that all parts that are within the prescribed limits are accepted as satisfactory and all parts outside these limits rejected as unsatisfactory.

Screw threads have, of course, been manufactured in large numbers for many years, but until comparatively recent years there was no attempt to make bolts and nuts to accurately specified dimensional limits. In the absence of such limits interchangeability in screw threads was impossible.

The initial accomplishment in the standardization of screw threads in the United States was the report under date of December 15, 1864, of the special committee appointed by the Franklin Institute on April 21, 1861, for the investigation of a proper system of screw threads, boltheads, and nuts to be recommended by the institute for adoption and general use by American engineers.

Thread system recommended.

In its report this committee recommended a thread system designed by William Sellers. This thread system specified a single series of pitches for certain diameters from one-fourth inch to 6 inches, inclusive. The threads had an included angle of 60° and a flat at the crest and root equal to one-eighth of the pitch. This system came into general use and was known as the Franklin Institute thread, the Sellers thread, and commonly as the United States thread.

The accomplishments realized in the adoption of the Franklin Institute, or United States Standard thread, in 1864 were brought about largely by the great need of standard threads by American railroads for the development of their lines and equipment. In May, 1868, this thread was adopted by the United States Navy.

In recent years numerous organizations have carried forward the standardization of screw threads. The American Society of Mechanical Engineers, the Society of Automotive Engineers, sectional committees organized under the American Standards Association, the National Bureau of Standards, the National Screw Thread Commission, and prominent manufacturers of specialized threaded products have been the chief influences in standardization of screw threads in this country.

While the United States standard thread system fulfilled a great need in the period of the development of our great railway systems, it did not fully meet the requirements of modern manufactures because of the need for additional standard sizes and pitches developed in other industries, and especially because of the need for definitely specified limiting sizes of threaded parts. To fulfill the first of these needs a thread system having finer pitches than the United States standard system was recommended by the Society of Automotive Engineers, and a machine-screw thread series which provided smaller sizes of screws than the United States Standard threads was recommended by the American Society of Mechanical Engineers. The progress of machine design and manufacture has established an extensive use of these fine-thread series.

The difficulties encountered in obtaining enormous quantities of war material needed by the United States Government during the World War pointed out to Government establishments, as well as manufacturers, the need of definite and complete specifications for material required. Such specifications should be so written that the qualities desired in the product are stated in terms of definite measureable standards, and defined by the largest tolerance limits compatible with the satisfactory use or performance of the articles or material for the purpose intended.

The standardization of screw threads, involving as it does the specification of sizes which are necessary to industry, the elimination of unnecessary sizes, and the securing of interchangeability, is especially important because of the use of enormous quantities of screw threads in all varieties of mechanisms. Such standardization is important to the user of a machine, as well as to the manufacturer, as the user should be able to buy locally a screw or nut for replacement in case of breakage or wear.

Elements considered in screw-thread fit.

A screw-thread fit can not be accurately made with the same facility as the fit of a plain hole and shaft. In the fit of a plain hole and shaft only three elements are taken into account in securing a given class of fit, namely, cylindricity, diameter, and length; whereas in a screw-thread fit it is necessary to consider cylindricity, length, major diameter, pitch diameter, minor diameter, angle of thread, and pitch or lead. A variation in any one of these elements of a screw thread may prevent a satisfactory fit, so that it is

much more difficult to make a good screw-thread fit than it is to make a plain bearing fit.

Screw Thread Commission established.

Through the efforts of several of the engineering societies the National Bureau of Standards, and prominent manufacturers of screw-thread products, a petition was presented to Congress requesting the appointment of a commission to investigate and promulgate standards of screw threads to be adopted by manufacturing plants under the control of the Army and Navy and for adoption and use by the public. As a result of this action the National Screw Thread Commission was authorized by an act of Congress approved July 18, 1918 (Public act No. 201, H. R. 10852, 65th Cong.). The original term of six months was twice extended by subsequent acts and on April 16, 1926, the commission was established as a permanent body.

The commission is composed of nine members, with the Director of the National Bureau of Standards ex-officio chairman of the commission. Of the other eight members, two are appointed by the Secretary of War, two by the Secretary of the Navy, and four by the Secretary of Commerce. Of the latter four, two are from nominations by the American Society of Mechanical Engineers and two from nominations by the Society of Automotive Engineers.

The screw-thread standards adopted and promulgated by the Screw Thread Commission are mandatory upon certain departments of the Federal Government. The commission has had the fullest cooperation of engineering societies, standardizing committees, manufacturers, and users of screw threads, threading tools and gages, and the standards adopted by the commission have been accepted by industry to such an extent that they are in fact, as well as in name, American National Screw Thread Standards.

Activities of the commission.

The commission has given its attention primarily to the establishment of thread series, dimensions, and tolerances, and a classification of screw-thread fits suitable for all ordinary fastening purposes. The classification of fits is on the basis of a uniform minimum tapped hole for all fits, with unilateral tolerances on each threaded member. That is, all variation in the tapped hole or nut is from a minimum or basic size to above that size, and all variation in the bolt or screw is from a maximum size to below that size. The tolerance, or amount of variation, permitted in the size of each member is dependent upon the class of fit specified.

The 1928 report of the commission (Mis. Publication Bureau of Standards No. 89) also contains tentative specifications for class 5, stud fit, which is intended to apply to threaded studs to be permanently set in place, as in engine blocks, etc. Tables contained in the commission's report give the limiting dimensions for each size of bolt and nut and for all classes of fit.

The report also contains detailed specifications for small-hose threads, fire-hose threads, pipe threads, threads for electrical fixtures and fittings, threads for electric-lamp bases and sockets, threads of special diameters, pitches and lengths of engagement, acme threads, threads for cutting and welding torches,

wood screws, dimensions of boltheads, nuts and wrench openings, and much material on threading tools, gages, and methods of gaging.

Two sections of the 1928 report of the commission have been published separately in convenient form for shop use. These are "American National Screw Thread Tables for Shop Use. I. Standard Threads" (Mis. Publication, Bureau of Standards No. 98), and "II. Special Threads" (Mis. Publication Bureau of Standards No. 99). These may be purchased from the

Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each. The complete report may also be purchased from the Superintendent of Documents, for 50 cents a copy.

While most of the work originally contemplated by the commission has now been completed, there are still many special problems in screw-thread standardization that may well engage the attention of the commission to the end that progress in standardization may keep pace with progress in industry.

STANDARDIZATION IN WELDING INDUSTRY

Welding Important Production and Repair Process; Scope and Functions of American Welding Society Reviewed

By WILLIAM SPRARAGEN, *Technical Secretary, American Welding Society*

Welding has now been accepted by industry as one of its most important production and repair processes. Whereas, welding some 12 years ago was employed principally to repair broken parts of machinery, it is now regarded as the standard method of joining metal pieces in general manufacturing and production work.

At first welding was limited to use on small or less important parts, but, as favorable experience soon showed the desirability, its field of application was gradually extended to heavier and more important construction and repair work. Welding is employed for an almost limitless number of applications, from the manufacture of such small articles as watch stems to the largest metal-fabricated structures—ships, locomotives, trunk oil and gas pipe lines, buildings, aircraft structures, bridges, gas tanks, and machinery of all kinds, including the largest turbine electric generators.

Development of welding applications was so rapid that the new art did not always show to the best advantage. The apparent simplicity of gas and arc welding led to its use by untrained workmen and engineers and in applications where the design of the joint between the parts to be joined or the nature of the material were not entirely adaptable to welding by the particular method used. Consequently, some unsatisfactory work was done which resulted in delaying the day when engineers and the public at large were willing to accept welding with full confidence.

Organized to benefit industry.

This condition was recognized by a number of far-seeing men interested in the conservative development of welding, and as a result the American Welding Society was formed in 1919 for the broad purpose of putting the welding art on a sound, scientific, and engineering basis. It was appreciated that only with such a foundation could welding ever be recognized as a thoroughly reliable process and be accepted for general employment in industry.

The American Welding Society is an organization of individuals and companies and corporations interested in welding by any process—either as manufacturers of welding equipment and supplies interested in the com-

mercial acceptance of the art or as users concerned with its efficient application.

Cooperative efforts extend field of application.

The American Welding Society offers (1) an opportunity for personal association with the leaders of the industry and exchange of information and ideas; (2) means to keep informed up to date on the latest developments in the welding field; (3) opportunity to assist, through cooperative effort, in increasing the knowledge of welding and extending its applications; and (4) assisting in the development and use of codes and standards.

With the complexity of modern industry it is necessary for people working in the same field to get together, as progress can be best made through such cooperative effort rather than by individual genius. It is necessary that the work of the society be conducted on a high plane of dignity and free from the stain of commercialism.

Standards and codes developed.

The American Welding Society has come to recognize the value of specifications and standards; for example, in the early days, a wide variety of nomenclature and definitions were in vogue. Welding experts did not talk the same language. To meet this need a committee was appointed to draw up standard nomenclature, definitions, and symbols. Not only has the matter of the common language been successfully solved, but standard symbols enable the draftsman to specify clearly and concisely the type, location, and size of welding to be used, thereby eliminating confusion and expense. Other standards developed by committees of the society or its research department known as the American Bureau of Welding, include standard tests for welds, standards for arc welding apparatus, specifications for welding wire and gages for measuring dimensions of welds.

In the matter of codes, the society has also taken a leading and active part. The first code issued by the American Society of Mechanical Engineers for pressure vessels included some very restrictive measures against welding. The society, through its research department, immediately carried out an exhaustive series of tests which furnished authentic data to back up the society in its demands for a more

lenient code which would be fair to welding. These demands led to the appointment of a conference committee which has resulted in the drafting of a new code which increased the maximum allowable fiber stress for a double V weld to 8,000 lbs./in.² when made under proper procedure specifications. In the structural welding field the society has taken the initiative and issued a building code which has been adopted by several important cities and which is being used by other legislative bodies in drawing up codes in this field. In cooperation with the American Standards Association, a code is in preparation dealing with pressure piping. Another committee is at work preparing standard qualifications for welders for all the important industries using welding.

The need for supplying simplified, authentic information which can be used by the student welder or engineer has also been duly recognized. Instruction manuals have been prepared for arc, resistance, and thermit welding, and outline courses of training have been prepared for the use of instructors.

Research work developed by experts.

The research work of the society is conducted under the auspices of a separate board, known as the American Bureau of Welding. This board is also affiliated very closely with the National Research Council, and has representation from some 15 leading scientific and engineering organizations.

The purpose of the bureau is to bring to bear on the solution of welding problems the latest scientific knowledge and the scientific method of attack. To this end, the cooperation of all interested scientific and engineering organizations has been enlisted. It also provides an organization whose reports and pronouncements are accepted the world over as sound and absolutely free from commercial bias.

The work of the bureau is carried on through research subcommittees which handle specific problems. Members of these committees are interested experts representing both the scientific and practical side, and include also business men. In this way there is brought to bear on the solution of complex welding problems the best talent that is available. Through the work of its committees the bureau has acquired during the past few years a world-wide reputation as an authentic source of welding information.

The combined cost of the investigations conducted under the auspices of the bureau will total several hundred thousands of dollars. Results are made available through publication to all members of the society.

The bureau and its various committees have issued some 50 reports. Some of these deal with practical problems, such as pressure vessels, structural steel, rail joints. Others are concerned with the fundamentals of welding and the "reason why" of various phenomena involved in welding, as, for example, study of nitride needles, nondestructive tests for welds, strength of welds at elevated temperatures, metallographic structure of welds and distribution of stresses in certain types of joints.

These investigations have enabled those interested in welding to extend its applications, to apply the processes most effectively and to convince engineers and legislative bodies of the reliability of welds when made under proper procedure.

Section and national meetings.

An opportunity for the interchange of knowledge, presentation of papers, and discussions through section and national meetings. There are at present organized some 13 sections in important industrial centers. Others will be formed. Many of these hold monthly meetings in season. The national meetings are held, one in New York during the latter part of April and the other outside of New York, which is known as the fall meeting. The latter, during the past five or six years, has been held in connection with a national exposition on welding at which are demonstrated the latest developments in welding apparatus, materials, and the application of welding.

Publications report society activities.

The principal publication of the society is its monthly Journal, which is distributed to all members. It includes papers giving accurate information on the application of welding in a wide variety of fields. Research and technical reports are also included. Important papers presented before national and section meetings are published regularly, as are also news items of society and section activities, and actions taken by the society through its various committees, officers, and board of directors.

A membership directory is issued each year giving full information concerning society activities, the names and addresses of all members and reports of the principal committees of the society.

Cooperates with engineering organizations.

In the conduct of its work the society cooperates with many important national organizations. These activities include joint meetings, research work, preparation of codes and standards, and matters of similar nature. A partial list of the organizations with which the society is cooperating, or has cooperated with in the past, includes the National Research Council, American Society of Mechanical Engineers, American Standards Association, American Society of Civil Engineers, American Institute of Electrical Engineers, American Electric Railway Association, and American Institute of Steel Construction.

Opportunities for a wider field of usefulness on the part of the sections have developed recently through the formation, in some of the larger centers, of affiliated local organizations. Not only has such local affiliation brought about greater cooperation and unity among engineers—highly desirable objectives—but it has given the welding engineer a higher standing in civic and municipal affairs. It has also saved much duplication of effort and expense and has increased the attendance and interest at meetings.

Moreover, in its research work the society has established contacts with leading university and governmental laboratories. This has resulted in bringing to the attention of a large number of students the possibilities of welding.

Scope of activities.

It would be impossible to give a complete word picture of the ramifications of the society activities. Some of its aims may be briefly summarized as follows:

1. To collect and make available authentic and up-to-date information on welding, gas and electric arc cutting, and to be recognized as the authoritative source of such information by manufacturers in the

welding field, users of the process, engineering societies, and legislative bodies.

2. To provide a means for the interchange of knowledge and experience to aid in the solution of the problems of the welding art—technical, ethical, and commercial—through cooperative effort.

3. To be the agent of the industry in cooperative research on important technical problems, and to serve as a common spokesman of the industry in matters pertaining to its welfare.

4. To provide opportunities for social intercourse, and thus to promote a better understanding among manufacturers, users, and scientists in the welding field, and to foster a spirit of cooperation for the common good.

5. To encourage the development of welding through improvements in present applications and expansion of its uses into new fields, and to develop technical and ethical standards for the welding industry.

SAFETY RESPONSIBILITY LAW TO CURB RECKLESS DRIVER

Standard Code Would Tend to Reduce Accidents

By OWEN B. AUGSPURGER¹

With more than a third of the motor-vehicle owners in the United States and half of those in Canada now operating under one or more of the essential principles of the safety responsibility law, substantial progress can be reported in securing international recognition for a legislative weapon designed to curb the reckless driver, without penalizing the great majority of careful drivers.

In advancing this law, which has already proven most effective, major attention was given to the problem of preventing accidents, rather than financial protection for those injured. In other words, protection against financial loss has been made secondary to the humanitarian aspect of safeguarding life, limb, and property.

Earlier experiments sought to assure compensation for accident victims and with this one objective overlooked the fact that this assured compensation removed the incentive so necessary to decrease the number of accidents, the incentive of being adjudged a careful driver and remaining free from the penalties that fall on the negligent. Later experiments have proven that it is possible to penalize the criminal minority and, under the fear of permanent suspension of driving rights, force them to compensate victims and assure their future responsibility. To accomplish this end, all legislation should undergo the acid test of the effect it will have in promoting safety.

The committee sponsoring the safety responsibility law, directed its attention to the fact that the use of fast-moving vehicles on the highways may be made dangerous in the hands of careless drivers, or even in the hands of the careful who fail to respond properly to an emergency.

Effect since law was advanced.

Twenty months have passed since the law was advanced as a result of careful study and long deliberations. During this time 12 States have enacted the law or amended existing laws to bring them in harmony with its various provisions, while the Province of Ontario, Canada, after one of the most comprehensive studies of the subject ever undertaken by any agency, has accepted all its principles. This Canadian Province has 50 per cent of the total motor-vehicle registra-

tions in the Dominion. The State of New York, which led the way in the adoption of this law in the United States, has 10 per cent of the Nation's registered motor vehicles, or more than 2,000,000. When it is considered that the problem has challenged the best minds in the legislative field since the advent of the automobile, there is every reason to regard with optimism the endorsement so far given the safety responsibility law.

The Congress of the United States has lifted the safety responsibility law from the list of various proposals advanced as a means of promoting safety in the District of Columbia. Although this measure died on the Senate calendar with the adjournment of the last session of Congress, it had already been passed by the House and will be a live topic with the convening of the next session in December.

Briefly summarized, the law which embodies four cardinal principles, provides, first, a universal drivers' license law; and in this day and age it is difficult to believe that this demand will meet with any sound opposition. Second, a mandatory suspension of the driving privileges of all persons convicted of serious violations of the motor-vehicle laws until proof of future financial responsibility has been established. This is in addition to penalties under the State motor-vehicle code. Third, it provides for the suspension of the driving privileges of all persons against whom a final judgment establishing the driver's negligence has been legally rendered and who have failed to meet the judgment, this suspension to remain in effect until the judgment has been satisfied and a guaranty of future responsibility established. Fourth, it provides for the insertion in the drivers' license law of every State, a proviso which will prevent the issuance of a permit to any person whose right to drive is at that time suspended in any other State, thus in effect providing for the interexchange of suspension rulings as between the States and rendering the disability nationally reciprocal.

Experiments were carefully watched.

Prior to the formulation of this suggested model for legislation, the Nation had watched experiments with compulsory automobile insurance. Massachusetts was in the limelight with this plan. Every car owner was required to carry public liability insurance as a pre-

¹ The author is a member of the American Automobile Association National Executive Committee and chairman of the National Committee of Seventeen, which drafted the safety responsibility law.

requisite to his right to operate a motor vehicle. From its inception the American Automobile Association opposed this drastic step, and based its opposition on two things: First, it would not promote safety, and, secondly, as a consequence of the first, it would impose a financial burden on the careful driver as a penalty for the negligence of those who were reckless and irresponsible. Moreover it resulted in politics entering a field in which there should be no politics and paved the way for alleged fraudulent claims and the co-called ambulance chaser. An effort is now being made to overcome these conditions.

Compulsory insurance is not an issue. The Massachusetts law, the English, and the New Zealand law, as well as the safety responsibility law, include some form of insurance, but the latter is based upon the idea of using compulsion in a reasonable manner, without oppressive legislation that would affect the innocent equally with the guilty, the careful equally with the reckless, and the financially responsible equally with the financially irresponsible.

Leading up to the adoption of the safety responsibility law in the Province of Ontario, was an exhaustive study of all phases of the problem by a Royal Canadian commission. It was headed by Hon. Mr. Justice Hodgins, eminent Canadian jurist and student of law. This commission, after a comprehensive consideration of every phase of insurance in its relation to

motor-vehicle accidents, whole-heartedly indorsed the safety responsibility law. To quote Justice Hodgins:

I have definitely concluded, after much consideration, that legislation introducing compulsory insurance in any form into any community, should not go the whole length that the State of Massachusetts did, but should proceed rather on the lines of the safety responsibility law and should be largely based on the American Automobile Association's bill, so far as it provides for compulsory insurance on the occurrence of important breaches of the highway traffic act or criminal law or the causing of fatal or serious injuries.

The Massachusetts law and the safety responsibility law fundamentally differ. In the case of the former all motorists are required to insure on a certain day, while the latter leaves the car owner alone until he has been convicted of a serious violation of the existing traffic or criminal code or has caused serious or substantial injury through an accident. Then it is required that he provide security against future casualties and, as a further condition of the restoration of his license, that he shall pay the damages caused by the accident in which he has brought himself within the scope of the legislation.

This difference serves to make the safety responsibility law more logical and less oppressive, and it has the merit of affecting only motorists who have demonstrated that they are negligent or careless drivers. Thus it is not a penalty on the responsible citizen for the acts of the irresponsible.

NEW TENTATIVE STANDARDS ADOPTED FOR COPPER-BASE ALLOYS IN INGOT FORM FOR SAND CASTINGS

Non-Ferrous Ingot Metal Institute Sponsors Research Associate to Study Alloys

New specifications for copper-base alloys in ingot form for sand castings have been accepted as tentative by the American Society for Testing Materials. These specifications represent a complete realignment of the specifications covering copper-base alloy ingot metal and are the direct outgrowth of a survey during the past few years, by a special committee of the society, of the many alloys in this field, in an endeavor to develop specifications that would greatly simplify the present conditions.

This survey was prompted by the desirability of having specifications available for use as a basis for price quotations in trade papers, and to improve the existing condition that definitions of alloys in ingot form, upon which price quotations in the trade papers are based, are exceedingly lax. The special committee was accordingly organized, consisting of producers, consumers, general interests, and trade-paper representatives. The committee was assisted through the whole-hearted support of the Non-Ferrous Ingot Metal Institute. Through the membership of that institute, information was received concerning the alloys at present in use and the uses to which these alloys are put. More than 600 alloys were reported upon.

At the suggestion of the joint committee the Non-Ferrous Ingot Metal Institute also sponsored a research associate at the National Bureau of Standards to study certain of the alloys within each of the classifications, with the object (1) to provide the industry

with more complete information regarding the alloys in use, (2) to be used as a guide in greatly reducing the number of alloys used, and (3) to be used as a guide in revision of present A. S. T. M. specifications.

Based upon the survey, the specifications for brass ingot metal were completely revised to include a more extended list than in the previous specification, and to formulate more practical and workable specifications. The list includes 15 alloys. These, it is believed, through conscientious effort, education, and determination, may be used in place of the more than 600 alloys now in use by the industry.

These specifications are published as tentative in order that they may serve until further knowledge is obtained through the work of the research associate, and through experience, after which the specifications will again be reviewed and possibly amplified.

LABELS FOR EGGS INCREASES SALES

Greater sales and, in some cases, premium prices for eggs sold under the New England quality label, in conformity with the New England Council farm marketing standards, are reported by New Hampshire poultrymen, who are enthusiastic over the use of the label, according to the New England News Letter for August, 1930.

Price premiums ranging from 4 to 10 cents, depending on whether the eggs are sold at wholesale or retail, are being received by some of the producers. All of the 35 producers in southern and central New Hampshire, who are using the label, believe that it is stimulating sales and helping to establish their product with the customer as one of high quality, wholly dependable from week to week.

UNITED STATES NAVY A PIONEER IN STANDARDIZATION

Materials and Fittings for Naval Vessels Have Been Standardized

By Capt. HENRY WILLIAMS, U. S. N., Maintenance Division, Bureau of Construction and Repair, Navy Department

With naval vessels plying the seven seas, far from sources of supply of materials, the need for standardization was realized long ago, and the Navy has been consistent in advocating and practicing standardization for many years. Practically all of the materials that enter into the construction of a man-of-war have been standardized and are purchased under standard specifications. Similarly, fittings, appliances, and equipment all have been standardized and are listed in the Federal Standard Stock Catalogue in such a manner that they can be ordered according to an item number as the sole description with assurance that the article desired will be received.

The small boat outfits of naval vessels offer a good illustration of the methods employed. These boats are built according to standard plans and each standard boat of a type is practically identical with every other of the same type, no matter whether construction is at a navy yard on the East coast or the West coast. The engines are of standard type and dimensions and installed in the same manner. Parts are interchangeable and spares may be ordered from any one of the several supply depots. Materials of construction, deck fittings, canopies, fuel tanks and piping, fire-extinguishing systems, lighting installation, etc., are all standardized and interchangeable.

While it is not possible to standardize the construction of men-of-war to the extent that it has been done for the small boats, all of their materials and fittings have been so standardized and many of them are interchangeable. For example, if a ship goes to a navy yard in a damaged condition requiring extensive hull repairs, the yard officials can proceed with the assembly of materials with the assurance that those in stock will be entirely suitable. The steel in the structure is purchased according to detailed specifications giving physical and chemical requirements for each kind of steel used.

Structural parts may be replaced with assurance that the strength of the hull and its parts will not be impaired and affected by the new materials. Airports, stanchions, deck fittings, furniture, galleys, steam kettles, cooking utensils, anchors and chain, plumbing materials, piping, flanges, valves, boat davits and fittings, and other parts too numerous to classify are all made according to standards and thus are easily replaced from stock materials.

Benefits from standards.

Besides the advantages of standardization, from the point of view of ease of replacement of damaged and worn out parts, from materials and articles in stock, there is a very great benefit to be gained in the assurance that materials used will be those that have been determined to be most effective and economical; for example, it was the custom formerly to issue to ships the raw materials for painting, leaving to the best judgment of the painter the mixing of the materials to make paints as required for use. More than 20

years ago it was decided that this procedure was not the most economical nor efficient, and since then paints have been issued ready mixed for use according to formulas which have been determined to be the most effective and most economical for the various purposes for which required.

The Navy has been a pioneer in this regard in standardization of ready-mixed paints. Now it is almost universally the practice in the trade to sell paints mixed, ready for application, according to formulas which have been determined to be the most effective. The Navy maintains paint-manufacturing plants in several of the navy yards, and experiments continue with new materials and formulas in the effort to improve their product.

The National Bureau of Standards has been of great assistance in this work, as well as the technical organizations of the manufacturers' associations. As a result of this practice naval ships are painted uniformly and economically and always appear to the best advantage. In this connection the standardization of paint has resulted in the saving of many millions of dollars to the Government, as not only the Navy Department has profited by the use of these standard paints but the Merchant Fleet Corporation and other branches of the Government draw their paint supplies or utilize the standard formulas developed by the Navy.

Navy cooperates with others.

The Navy Department has always cooperated freely with the National Bureau of Standards, the American Society for Testing Materials, the American Standards Association, and with other technical societies in the preparation of its standard specifications in order to obtain the materials best fitted for its purposes and to conform so far as practicable to commercial practice.

In selecting for its use the appropriate grades of commercial material the Bureau of Construction and Repair of the Navy Department collaborated with the leading manufacturers and representative trade associations. Several years ago this bureau revised its entire system of lumber purchase by adopting the standard grading rules and requirements of the national lumber associations. This policy has resulted in a more uniform quality of lumber purchased and, in addition, a net saving of more than \$200,000 a year, due to the elimination of nonstandard requirements.

Similarly, by cooperation with the Hemp Brokers Association and the United States Department of Agriculture the Navy purchases of hemp for the manufacture of manila rope have been placed on a sound, as well as economical, basis.

In preparing purchase specifications for materials the Navy selects standard commercial grades in all cases where such commercial grades are suitable for the work in question. This is of great benefit and economy, whether purchasing in large quantities for stock or in small quantities for urgent repair.

Outstanding examples of Navy Department leaflet specifications covering grades of material comparable with standard commercial grades are: Wire rope, nails, machine screws, bolts and nuts, corrosion-resisting steel, paint materials, pipe and tubing, sheet-

ing and sheets, thread and twine, fire hose, glass, canvas, and both hand and machine tools.

Not only has the Navy profited by this policy of standardization, but the commercial world and the trade similarly have been benefited.

STANDARDS IN GAS INDUSTRY

Gas Industry Has Always Functioned According to Approved Specifications or Standards

By ALEXANDER FORWARD, *Managing Director, American Gas Association*

The gas industry has many ramifications which extend from the procurement of the raw materials for production, through the various processes of modification right into the appliances installed on customers' premises where the ultimate product is utilized.

Geology and mining play an important part in the selection of the raw materials suitable for conversion or the extraction of an already finished product from the depths of the earth; an intimate knowledge of combustion, and its application in changing solid and liquid raw materials to the conveniently handled gaseous form, is essentially based on the fundamentals of physics and chemistry; so also is the processing to which the gas is subjected after production in order to render it suitable for commercial and domestic utilization as well as recover valuable by-products. Measurement, storage, and distribution, the latter whether a few miles locally under normal holder pressure or many hundreds of miles under high pressure, are operations dependent almost entirely upon the well-established laws of physics.

It will, therefore, readily be seen that in the production of gas the question of standards has always played an important part. From its inception, more than a century and a quarter ago, the manufactured-gas industry, for example, has always functioned, in all its activities, according to specifications or standards. The majority of such requirements, particularly as to quality, were originally self-imposed, such as candlepower, later displaced by heating value, purity with regard to freedom from hydrogen sulphide and minimum sulphur compounds, as well as limited ammonia content. Later, as regulatory bodies were created and municipal legislation enacted, these specifications of quality were incorporated into the requirements of State and municipal regulatory bodies.

In the production of gas, for example, either at the point of manufacture or place of extraction from the earth, meters are used for indicating and recording the respective volumes of the product handled. The quality also, as expressed in terms of heating value (British thermal units) is also determined, and in both these instances measuring devices and thermometers as calibrated by the National Bureau of Standards, are employed for standardization of the installed equipment.

Association correlates activities.

The American Gas Association, as the national body of a united gas industry, coordinates and correlates the manifold standardization activities of a great and widespread industry. Much of this is accomplished by cooperating in the work of the American

Standards Association, the U. S. Department of Commerce through its Bureau of Standards and Bureau of Mines, U. S. Public Health Service, and other recognized Government and commercial agencies. In its own laboratory, the American Gas Association practices standardization to a marked degree in that specifications of quality and performance for all types of gas-using equipment are prepared by appropriate and representative committees to which the respective appliances must conform; such conformity must be clearly apparent upon investigation and practical test at the American Gas Association testing laboratory, Cleveland, Ohio.

In preparation of the specifications of quality and performance by representatives of the gas companies, manufacturers of equipment, interested departments of the United States Government collaborate.

As a result of all this, the industry now has available for its customers, appliances which are known to be safe and satisfactory in all respects, a condition which is indicated by the laboratory seal of approval thereon: such equipment is to be found in the showrooms of the companies and dealers throughout the land and is gradually forcing the inefficient and sometimes dangerous equipment off the market and so out of the homes of the people.

Among the more important and immediately tangible results from the standardization activities of the American Gas Association, none are probably more striking than the successful operation of the testing laboratory and its performance requirements which have resulted in vastly improving the quality of performance. Similar requirements have been adopted by the gas fraternity of the Dominion of Canada, and a laboratory approval seal is there effective. Recommendations for comparable work are well under way in the French gas industry, both of these developments largely being the results of visits of inspection paid by Canadian and French engineers.

Another outstanding development is the American Gas Safety Code which was sponsored by the National Bureau of Standards and the American Gas Association, covering the gas installations in buildings and promulgating a code which it is hoped will go far toward securing uniformity.

Association cooperates with other societies.

The gas industry has actively participated with the Department of Commerce undertaking for the standardization of boilers used for storing heated water for domestic purposes; the gas industry adopted the standards adopted and agreed upon at the conference be-

tween gas representatives, plumbers, and manufacturers.

Another striking example of successful standardization and whole-hearted cooperation is the uniform simple and standard resuscitation practice worked out in conjunction with the U. S. Public Health Service and involving highly technical and medical research work. As a result, information in a conveniently handled and readily learned form has been spread broadcast throughout the country giving in simple

language precise instructions for the application of the Schaefer prone pressure method for artificial respiration. As a result numerous lives have been saved.

From the foregoing it will be seen that the gas industry, through its national organization, the American Gas Association, is a firm believer in standards and their commercial as well as technical application. An attempt has been made to describe some of the work in which the association is most actively participating.

STANDARDS FOR DRY SKIM MILK

Industry Promulgates Standards for Dry Skim Milk

By D. H. PROCTOR, *American Dry Milk Institute*

Drying milk has been a known practice in the dairy industry for several decades, but it was not until 1916 that the amount of milk powder manufactured warranted a place in the United States census reports. At that time production approximated 16,500,000 pounds.

In 1925 the American Dry Milk Institute anticipated the need for an agency to gather reliable statistics at frequent intervals, and to stabilize and promote the development of the industry along healthful lines. In that year the production reached 73,317,000 pounds, an increase of about three times the 1916 figure. Indications are that the 1930 production will approximate 180,000,000 pounds.

Since a principal objective of trade associations is the establishment of standards of quality, the American Dry Milk Institute took steps toward this end almost at the outset. As opinions varied on what should constitute fair and practical requirements for the several grades, this matter received immediate attention and the setting up of acceptable methods of analyses followed.

The first comprehensive report of the standards committee submitted in 1927 suggested a scale of requirements on skim-milk powder which was classified for human and animal consumption. The two classes were determined by methods of manufacture and quality. At that time it was felt that further work was justifiable and the results obtained by the committee should be published. Approximately two more years were devoted to the detailed requirements for three grades of powder, each distinguished by its method of manufacture.

Pamphlet released in 1929.

In November, 1929, the booklet, *The Grading of Dry Skim Milk*, was published by the institute as the

joint work of the members of the standards committee. Simultaneously, the entire membership of the institute subscribed to an advertisement published in all the business and trade magazines, and pledged themselves to support the standard grades that were published, and offered their product in conformity to those standards.

The establishment of standards presupposes a testing agency or body. Subsequently a laboratory was set up in the institute, where impartial and accurate analyses are made of samples submitted by manufacturers and users, and a routine trade sampling is carried on with a view to determine, with some degree of accuracy, the quality of powder offered to the trade.

Three standards promulgated.

Briefly, the system embraces three grades or standards—"extra," "standard," and "third," with consideration given to the method of manufacture; that is, the other requirements being uniform, the solubility requirement varies in stringency for the spray, vacuum drum, and roller dried powder. "Extra" grade calls for lower fat content, moisture, acidity, solubility index, and bacterial count than the "standard" grade, while all powder that falls short of the "standard" grade requirements is classified as "third" grade, and declared unfit for human consumption.

Dry skim milk is highly hygroscopic; that is, its moisture content increases when exposed to the air. Hence the pamphlet on grades gives very specific instructions as to the methods of taking samples, in order to safeguard the system of grades and quality.

Since the specifications were published definite improvement is noted throughout the industry and is reflected in a more acceptable and increased consumption of the product.

NATIONAL BUREAU OF STANDARDS TO CONDUCT SURVEY TO IMPROVE ITS ASSISTANCE TO GOVERNMENTAL PURCHASING

The National Bureau of Standards is planning to conduct a survey for the purpose of determining the best method for rendering the maximum possible assistance to Federal, State, county, and municipal Governments who are engaged in making their purchases out of tax money.

Questionnaires have already been sent to all of the officers of the various governments requesting information relative to the methods employed by them with reference to purchases made of materials, equipment, and supplies for the operation of their various bureaus, departments, and public institutions, and also for the construction and maintenance of highways throughout the country. It is hoped that the information to be received from replies to the questionnaires will be of value to the bureau in its efforts to aid these governments.

NEED FOR STANDARDIZATION OF ELECTRICAL CONTROLS

Great Diversity in Control Devices Prevents Their Economical Use

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

Some of the most interesting romances of modern industries are the great developments made in the use of electricity in our steel mills. Application of electricity has advanced hand in hand with the developments in the manufacturing of steel and, undoubtedly has made possible many of our present economic steel-mill practices. One of the greatest advantages of the application of the electric motors accrues from the ease, flexibility, and accuracy with which the drive may be controlled.

In the period of keen competition any change in conditions or any development which affects cost is naturally of vital importance. That may be one of the main reasons for the present-day trend toward greater use of automatic control. Installation of automatic control in most cases reduces the labor cost, and it removes from the operator the repetitive duties which have to be executed thoughtlessly. By doing this, automatic control improves the work of the man by giving him more time to think and less chance to become tired.

While great strides have been made in the standardization of steel mill auxiliary motors, the control problem has held a secondary place with the result that each control manufacturer offers control varying in many details from any other manufacturer's product or layout. Present lack of control standardization makes control diagrams very difficult for an average electrical man to understand, because manufacturer's methods differ so greatly.

In each steel mill to-day a relatively small number of electrical men are sufficiently familiar with magnetic control diagrams to be able to read any diagram placed before them. As a result, in the great majority of plants usually only a few repair men are qualified to work on magnetic control boards, and even they are generally familiar only with some particular make or type of control. When they are called to work on a different type of control it results in slow progress, because the man has not only to familiarize himself with the new diagram and the arrangement of the units, but he also has to find out the meaning of the symbols used. Even though a steel plant may want to standardize on one manufacturer's equipment, there is always a certain amount of apparatus of other makes that gets in around the mills on more or less important applications. This condition applies to controllers probably more than any other class of electrical equipment.

Need for standardization.

There is a long-felt want, and it would be of great assistance to the electrical men working on magnetic controllers in our steel mills and of material saving in

time and money to these mills, if the various control manufacturers would standardize on the nomenclature, symbols for wiring diagrams, schematic diagrams, and the general arrangement of apparatus on the control board.

As an illustration of the present-day practice let us take a reversing controller and compare the diagrams of some of the manufactures who build steel mill auxiliary control equipment. It is interesting to note that, due to lack of standardization, numbering of wiring varies many ways. Some show the sequence of contractors and scheme of main connections, while others make up a separate diagram showing the line diagram.

The forward and reversing contactors are designated by some manufacturers as "F" and "R," while others use "1F" and "2F," "1B" and "2B," or "1F" and "2F," "1R" and "2R," and still others call them "No. 1 and No. 4—No. 2 and No. 3." The accelerating contactors likewise are known as "R2—R3," "2R—3R," "1A—2A," or "No. 11—No. 12," etc.

To further illustrate the present lack of standardization, a certain contactor is now being spoken of as (1) line contactor, or (2) circuit-breaker contactor, or (3) negative-line contactor, or (4) contactor for opening the side of the line opposite the reversing contactors. On the wiring diagrams some of the control manufacturers represent this contactor by the letter "M," while others call it the "CB" or "No. 5" contractor.

Various standard programs.

Some of the larger steel plants which maintain engineering and drafting departments make up their own standardized diagrams to meet their plant requirements. In a plant using many hundred magnetic controllers the cost of making these diagrams is considerable, even though many of the panels are duplicates. In smaller plants which are without facilities for this kind of work it is almost impossible to get this redrawing of diagrams taken care of. Since the manufacturer has to make a diagram for each different control panel he supplies, the expense of making these diagrams standard in regard to symbols and general arrangement and to include all the necessary information would be small indeed and would save the duplication of this work in the steel plant as well as the expense involved.

Operation delays can be reduced if the maintenance electrician is entirely familiar with the control for which he is responsible. If he has ready access to the blue prints of these panels, and is taught to study same and use them in a case of trouble, valuable time may often be saved. If the maintenance electricians are to be expected to study these diagrams, then they must not only be made as simple as possible but must be made in standard form, so that they are easily understood and can be readily followed.

MEASURING CONSISTENCY OF PLASTIC MATERIALS

Numerical Values of Certain Constants Ultimate Goal of Research

The study of the laws of flow, especially of plastic materials, and the measurement of their consistency, has become of such great interest in a variety of industries that the Society of Rheology has been formed to consider these subjects. The first meeting of the society was held at the National Bureau of Standards, December 19 and 20, 1929.

Consistency may be defined as the property which determines the flow-pressure relation, or, in more general terms, the distortion-force relation. The simplest case is that of a liquid where the rate of flow is proportional to the pressure and the viscosity may be expressed by a single numerical value. With mushy, colloidal, or plastic materials like grease, paint, nitrocellulose solutions, putty, or moist clay, there is no such proportionality, and at least two numerical values are required to define the more complicated flow-pressure relation.

The simplest and most general method of measuring the consistency of a plastic material is by forcing it through a capillary tube under constant pressure. Successive observations must be made at different rates of flow but at constant temperature. The rate of flow is then plotted against the pressure-producing flow, and the resulting flow-pressure graph approximately defines the consistency at the given temperature. The Bulkley consistometer, developed at the National Bureau of Standards, and described in the April, 1930, issue of the *Journal of Rheology*, is one of the most convenient types of apparatus for obtaining data required for a flow-pressure graph.

To standardize the capillary-tube method, so that identical results could be obtained in different laboratories, one method of procedure would be to duplicate the capillary exactly and report merely the time of flow for a given volume of material under standard conditions. This is the method adopted with the Saybolt viscometer for measuring the viscosity of petroleum oils. Another method of procedure would be to determine certain constants of the material which will define the consistency and which will be independent of the method of test and of the dimensions of the apparatus. As yet, however, there is no accurate formula available, either theoretical or empirical, by which the factors necessary to define consistency may be calculated from the flow-pressure graph in such a manner that the numerical values obtained will be absolutely independent of the dimensions of the capillary. Such a formula is available only when the rate of flow is proportional to the pressure.

Thus at present, although substantial progress has been made and methods are available which are in many cases sufficiently accurate for plant control, the measurement of the consistency of plastic materials is in the early stages of development. We are far from the standardization of methods of test or of units of measurement. It is not as yet even certain how many or what factors are needed to define the consistency of a given material. The ultimate goal is to obtain numerical values of the factors of consistency and values which will define consistency and can be obtained not only capillaries of different diameter but also by entirely different methods of test.

PREVENTING FIRE CASUALTIES

Estimated 6,000 Persons Die Annually From Fire

Roughly, there are some 4,000 persons in the United States who meet death in their homes by fire each year. It is customary to hear the annual fire toll expressed in millions of dollars because excellent facilities are available for appraising the loss in dollars. The loss expressed in fatalities and casualties is no less significant, although it can only be expressed roughly as about 6,000 deaths and 14,000 injuries, two-thirds of the deaths and half the injuries occurring in places of abode, including dwellings, apartments, and hotels.

The loss of life and limb by fire, especially in homes, is cause for serious thought as to measures for prevention. All those measures known to be effective in reducing property loss by fire are, of course, effective also in reducing loss of life. Additional safety measures may be resorted to for the protection of life. Chief among these are exits and means of escape.

Safeguards for the home against fire may be suggested by the following classifications:

1. Reducing to a minimum sources of ignition. This includes careful habits in respect to fire and excellent maintenance of those pieces of apparatus normally

containing fire, such as furnaces, flues, stoves, heaters, lights, etc.

2. Construction designed to retard the spread of fire, including slow-burning building construction, fire-resistive roofs, and walls and stops against the communication of fire between various spaces in a building.

3. Exits and means of escape for persons, including means of egress through widely separated parts of a building, inclosed stairways between floors, and exterior escapes.

4. Fire-extinguishing equipment, including readily available pails of water in the home, hand fire extinguishers, and automatic sprinklers in basements, kitchens, and flue spaces in the attic.

5. Means of summoning help, including readily available telephones, near-by fire-alarm boxes, and automatic fire-detection devices.

When awake, the human machine is probably the most sensitive of all fire-detecting devices, and if the telephone or fire alarm is promptly used to summon help, much fire loss may be avoided. Fire, however, may gain important headway before persons asleep in a building discover it. This opens a field for automatic fire-detection devices, signaling competent assistance that has not yet been thoroughly exploited as a means of avoiding casualty from fire.

STANDARDIZATION OF BIOLOGICAL STAINS

Dyes Employed in Microscopic Work Are of Decided Importance and Have Presented Their Own Problems in Standardization

By H. J. CONN, *Chairman Commission of Standardization of Biological Stains, Geneva, N. Y.*

The best-known uses of dyes are for coloring cloth and foods. There is, however, one other purpose for which dyes are employed that is extremely important, even though the quantities thus used are almost infinitesimal in comparison with those employed for textile purposes. The use in question is to make extremely minute objects visible when examined under the microscope. Dyes thus employed are known as biological stains. Their standardization has presented much more complicated problems than those involved in that of textile dyes or food colors, but these problems seem at last to be under way of satisfactory solution.

The standardization of biological stains has been accomplished through an unofficial body of scientists in cooperation with the manufacturers who have voluntarily agreed to accept the standards proposed. To explain the situation, a little discussion of the history of the movement seems necessary.

Source of biological stains.

Before the recent war all biological stains, like other dyes, were obtained from Europe, and nearly all of them came from one German concern. This concern was supposed by scientists to manufacture these stains, but it is now realized that they probably really purchased commercial dyes and submitted them to a very crude and empirical sort of standardization. On account of the small quantities of dyes employed in this manner the stock already in America at the beginning of the war was in most instances enough to last until after the armistice.

The real difficulties of American biologists in obtaining dyes for microscopic work came, therefore, during the few years following the war when the pre-war stocks were becoming exhausted and the embargo prevented fresh importations. At about this time the dealers in biological supplies found it necessary to obtain dyes from various sources, often unreliable, and to sell them as biological stains. The result was very frequent dissatisfaction on the part of the users; and American stains very quickly fell into disrepute among biologists, although, as a matter of fact, many of these unsatisfactory stains were actually of foreign manufacture.

Importance of biological stains.

The seriousness of this situation arose from the importance of biological stains, as can be shown by mentioning a few of their uses. Without the use of dyes, neither the diphtheria organism nor the tubercle organism could be distinguished from other kinds of bacteria, and, accordingly, the rapid diagnosis of these two diseases would no longer be possible. When a tumor suspected of malignancy is being removed, a small piece of it is usually examined under the microscope to see whether or not it is actually cancer and to guide the surgeon as to the extent of operation necessary.

Beside these obviously important uses of stains and their utilization in other similar methods of diagnosis, they are also employed in a countless number of different ways in microscopic research, assisting biologists in understanding the human body in learning the nature of its diseases, and in suggesting methods for their control. Without dyes for use in microscopic work, much of the modern progress in the biological sciences would have been impossible.

In such work absolute reliability of the dyes is imperative, as one must be sure that results obtained with one lot may be duplicated with another. As such standardization did not exist after the World War, and as it was quickly discovered that it had in fact never existed, American biologists took the matter in their own hands and decided to remedy the situation.

Procedure followed.

The work on this problem started with the American Society of Bacteriologists, but it quickly aroused the interest of the National Research Council under which a project was begun with the cooperation of several of the national biological societies. The result was to establish an independent body, affiliated with the National Research Council, and known as the Commission of Standardization of Biological Stains. This commission is an organization which derives its authority by officially appointed representatives of the following societies: American Association of Anatomists, Society of American Bacteriologists, Botanical Society of America, American Chemical Society, American Medical Association, International Association of Medical Museums, American Association of Pathologists and Bacteriologists, and American Society of Zoologists.

The work undertaken has involved considerable research as well as the routine testing of stains. This, of course, means expense. Very fortunately the work at the start attracted the attention of the Chemical Foundation, with the result that constantly increasing financial support from this organization has been secured for the work.

Great number of dyes of value.

There are somewhere between 50 and 100 dyes known to be of value in microscopic work. Attention was given first to those most frequently used, but gradually the work is being extended to include also some of the dyes less commonly employed as stains. The standardization of each individual stain has presented a research problem in itself. The various stains are, therefore, handled in different ways, but, briefly, the general method employed in their standardization is as follows:

The manufacturer submits to the Biological Stain Commission a sample of each batch when it is ready to be put on the market. The stain commission has it given an optical analysis at the laboratory of the color and farm wastes division of the United States

Department of Agriculture (where one of the commission's assistants is located) and then sees that the sample is tested by one or more biologists, skilled in some technic calling for this stain, to learn whether it gives satisfactory results in actual use. If it does, the manufacturer is allowed to sell it under a special label stating that it has been approved by the stain commission for certain definite purposes. Dyes thus labeled are known as certified stains.

Rejection of dyes.

Dyes that are rejected as biological stains are ordinarily entirely satisfactory as textile dyes. In the case of a stain that is rejected, therefore, the manu-

facturer either reworks the batch to make it more satisfactory to biologists or has it sold for ordinary technical use, according to whether the company has a commercial outlet available for this particular dye.

This method of standardization has been adopted because one can not as yet absolutely predict from the physicochemical characteristics whether or not any dye will be satisfactory as a biological stain. At the present time, however, the stain commission is in co-operation with the Army Medical Museum in drawing up physicochemical specifications which will probably be considered by the Federal Specifications Board.

STANDARDIZATION MOVEMENT IN SOUTH AFRICA

Movement Has Cooperation from All Interested Elements

By Prof. JOHN ORR, *Witwatersrand University, Johannesburg, South Africa*

In a short statement it is not possible to trace all the details of the progress and development of standardization in South Africa during the past 30 years. The value of the work done by the main committee and various subcommittees of the South African branch of the British Engineering Standards Association is being more widely recognized by the Government departments and public bodies in South Africa every year.

The subcommittees in existence at the present time are the mechanical, the electrical, the civil and architectural, and the chemical subcommittees, while subcommittees on agricultural implements and testing of blasting fuzes (explosives) are being formed.

This branch of the British Engineering Standards Association consists of representatives of practically each Government department, each mining house, each municipality, and the various technical societies and, in addition to considering and criticizing where necessary each draft specification received from the parent body in London, keeps in view the question as to how existing standard specifications for mate-

rials, paints, etc., might require to be modified to suit the climatic and other local conditions. It affords every encouragement to manufacturers and consumers to adopt the following specifications which it has prepared within recent years, as well as those adopted by the parent body: Lime (S. A. No. 3, 1926); Coal sampling (S. A. No. 4, 1923); Coal analysis (S. A. No. 5, 1924); White metal alloys (S. A. No. 6, 1928); Soaps for industrial purposes (S. A. No. 7, 1925); and Water pipes and fittings (S. A. No. 8, 1925).

While realizing that a vast amount of work yet remains to be done, the South African branch continues to work in the direction of having the British Engineering Standards generally adopted throughout South Africa. Much of the success in this connection is due to the valuable assistance so freely given by the members of its committees, and the cordial cooperation of the Government departments, mining houses, municipalities, and other public bodies. This is indeed the predominating feature of the standardization movement which is so prominently identified with the development of South African industries.

"CAR CARD" CERTIFICATION FOR LUMBER SHIPMENTS

Consumer Identification of Lumber by National Marking System Explained in Booklet on "Know the Lumber You Use"

It is only recently that it has become possible for the consumer to assure himself of the grade, nominal size, species, and quality of the lumber he purchases. This innovation is resulting in marking boards and timbers with grade marks that consumers can understand and interpret in terms of their specific needs and in stamping them with consumer-protecting marks carrying an organized industrial guaranty.

By way of explaining what this means to the consumer and how it operates and how it came about, a booklet—"Know the Lumber You Use"—has been published by the National Lumber Manufacturers Association.

"Know the Lumber You Use" lists the various grades provided by American Lumber Standards and notes the qualities that characterize each grade. It explains how these basic grades have been applied by all recognized associations of softwood-lumber manufacturers to the peculiarities of particular species and how these associations stand responsible for expert standard grading at the mills. It tells of the nationally used "trade-mark" applied by leading mills to accurately graded lumber, under license of the National Lumber Manufacturers Association, as an assurance of the entire organized industry that the lumber will meet specifications or command a refund. And it explains the further assurance offered carload buyers through the "car card" system of grade and tally certification for such shipments. An interesting illustration shows how a log is cut up for different qualities and sizes of lumber.

CLAY PRODUCTS IMPROVED BY FEDERAL RESEARCH

Various Stages of Research on Clay Outlined

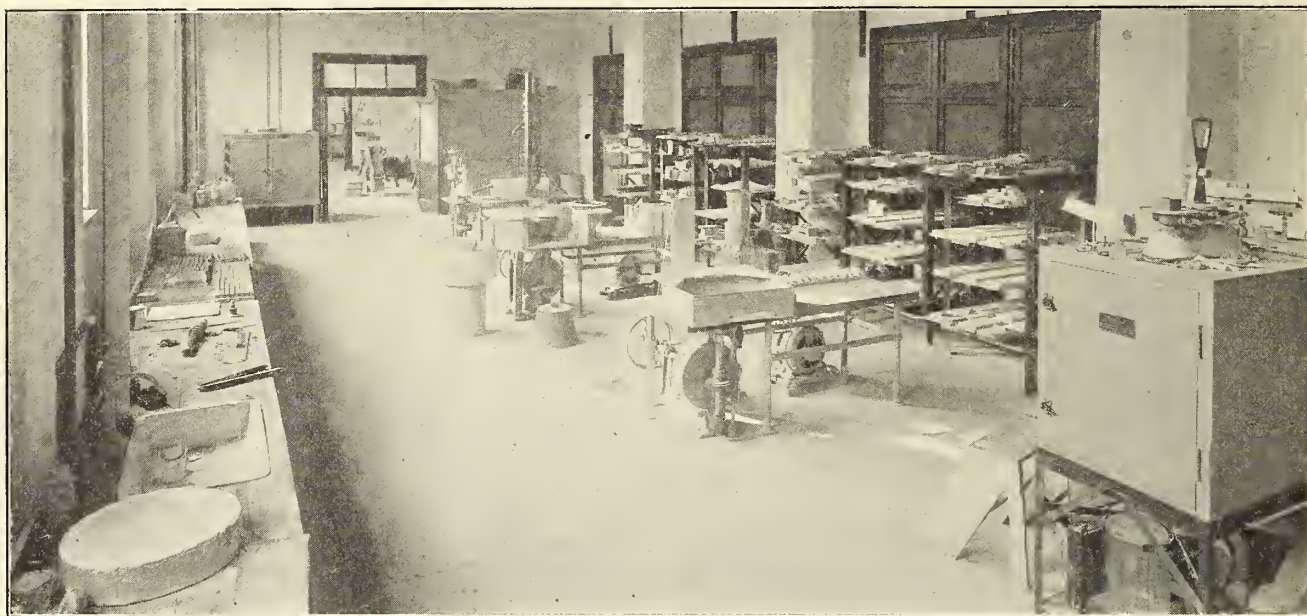
By HENRY D. HUBBARD, *National Bureau of Standards*

Clay, the raw material, responds remarkably to measured processing, as research discloses through experiment and measurement.

Clay is the basis of a group of industries ranging from brick to ornamental porcelain. Intensive research on the properties of clay and their controls is modern. In 1910 Congress made such research a bureau function. The basic properties and data concerning them underlie all uses of clay. The great variety of clay products adds specific problems in large numbers.

lengthening the flying time for a single flight. Porcelain failure meant plane failure. To illustrate, during the war airplanes failed mostly because of motor failure. Motor failure occurred because spark plugs failed. Spark plugs failed because the porcelain body of the plug failed. New bureau formulas were developed and given to the industry to lengthen the life of the air-motor spark plugs.

An early publication of the bureau's clay laboratories had to do with the control of clays through colloidal chemistry. Then came studies in the technique



Laboratories in which clay is prepared and formed for ceramics research at the National Bureau of Standards

The National Bureau of Standards' research chemists and ceramists were carried into the fields of colloidal chemistry to find ways to govern the quality and utility of clay. By suitable blending, chemical and heat treatment, it was found possible to produce any quality of clay desired.

Domestic clays equal imports.

The fiction that only imported clays were suited to certain uses was challenged by the processing of domestic clays in the bureau's laboratories. Research disclosed the very qualities supposed to be distinctive of the special clays from abroad.

The development of methods of controlling the quality of clays made possible the use of vast clay banks which until then had been worthless. A Congressman from a large clay-bearing State said that the entire cost of the National Bureau of Standards from the beginning would not equal the value of its researches on clays.

Bureau contributes new formula.

A new formula for porcelain was one of the National Bureau of Standards' contributions toward

of brickmaking. That science could tell something to an industry thousands of years old was a discovery. Experiments threw light on preheating treatment, burning times, temperatures, mechanical working, chemical treatment of the clay, mixtures, and the like.

The chief ceramist assisted in conducting schools for managers and foremen in several clay-products fields. He visited plants, cooperated with other experts in the industry, and added precision to the measured control of each detail until the product was so controlled that quality could be invariable and of the predictably high quality desired.

Qualities of brick studied.

Meantime the desirable qualities of brick were studied, tests developed, and specifications drawn. Tests were made of built-up walls of brick with various methods of bond. Fire tests were made. The most elaborate fire tests of columns ever made are reported in a bureau publication showing the manner of failure to guide engineers in the effective design of columns. Tests were made on 16-foot columns with 40-inch square sections, set in various mortars. A crushing force was applied and measured in the 10,000,000-

pound testing machine of the bureau. In such tests, observation of the manner of failure as well as a study of the failed structure is important.

Scientific papers published.

Fascinating results of research often emerge. To duplicate a porcelain glaze, the formula and firing temperature range must be known. To discover these by looking at the glaze is crystal gazing worth while. The bureau's expert petrographer with his microscope was able to observe the crystal form and measure its distinctive angles and so to identify the material and measure the crystal size, which tells of the firing tem-

perature. Details of the method are given in one of the scientific papers published by the bureau covering its ceramic work. As a result, the petrographer, by inspection under the lens, can duplicate any formula and firing temperature from a sample as small as a pinhead.

An important problem studied and reported upon was the effect of firing temperatures on the viscosity of clay. Resistance to deformation is a trait which must be relied upon to keep the shape of clay intact during firing. Data obtained aided in making allowance for or controlling such resistance to deformation.

PRODUCTION STANDARDS APPLIED TO MOTOR-VEHICLE MAINTENANCE

Standardization of Operating Equipment Results in Substantial Savings

By H. B. HEWITT, *Engineering Assistant Vice President—Operation, Mitten Management*

The application of production standards to the maintenance of passenger cars has been fostered by car manufacturers. This policy represents the foresight of manufacturers to establish maintenance on a par with factory production. The owner has benefited through this policy by a more uniform car performance and reduced operating costs.

Passenger-car maintenance is simplified by having to deal with a very few different makes or models in one repair shop; therefore, repair men can become highly skilled and special tools, jigs, and gages can be developed or in many cases can be exact duplicates of those used in the original production of the car, all of which tends to improve maintenance and reduce costs. It is to the economic interest of fleet operators to standardize equipment as completely as the service requirements will permit.

The standardization of operating equipment reflects a saving in every department as compared to operations including a variety of types and makes of vehicles. In Philadelphia there is one fleet of 1,000 taxicabs, all exact duplicates in construction, and a fleet of 416 busses, the chassis of which are practically duplicates, and the bodies are divided into three types to meet the variations in service requirements; two hundred 71-passenger double deck, one hundred and twenty 33-passenger single deck, and ninety-six 29-passenger parlor coaches.

The maintenance of these fleets is quite simple as compared with another bus fleet operating in the Eastern States, which has 51 different makes and models, and another taxicab fleet with 8 different makes and models.

Tools and equipment.

Probably the most remunerative means of applying production standards to maintenance is by the use of adequate tools and shop equipment. It is much easier, more productive, and more economical to train labor to use tools and equipment for the production of maintenance as well as for the manufacture of apparatus than to obtain the results by their application of ingenuity and mechanical skill.

The psychological effect of rapid production and ease in obtaining it is stimulating to the entire organi-

zation. The value of machine tools and equipment can not be correctly calculated from their direct production of saving in labor, although these factors alone are frequently considered.

There is an economic limit to the purchase of tools and equipment and their liquidation. In the retail maintenance business they may be paid by direct charge for their production. In an operating maintenance shop tool investments are carried as equipment capital and the earnings dissolved in maintenance cost. The proper coordination of tool equipment and operating equipment is largely a matter of experience, foresight, and judgment supplemented by an investigation and analysis of the value of each device.

Repair methods.

Standardization of repair methods is in accord with standardization of equipment. It amounts to training the personnel to maintain one type of equipment in a single manner. This calls for centralization of instruction. To bring about this condition a manual known as Standard Practice is used in Philadelphia. It is compiled by the engineering personnel and distributed to all garage and shop foremen. The purpose is to accumulate and disseminate all data under one centralized form.

All subjects pertaining to maintenance and garage and shop procedure are included. The standard clearances and tolerances are specified. The contents are bound in loose-leaf form to facilitate additions and revisions. All copies are called in for examination at regular intervals.

The value of standard practice is advantageous in maintaining standardization of constructive maintenance, particularly where design changes are to be effected when repairs are necessary. In constructive and progressive maintenance the standard-practice manual serves as a record of changes which have been effected in the past.

In the preparation of standard-practice data brevity is essential. This is attained in many cases by the use of drawings which are inserted in the form of photostats on a standard-size sheet. This manual serves as a record to which all foremen can be held responsible for the proper execution of repairs. It

adds flexibility to the organization in transferring and promoting men. It instills confidence in their ability. It is also a great time saver for the executives and members of the engineering department, as it eliminates hours of individual instruction and many group meetings.

As production standards are applied to motor-vehicle maintenance to a greater extent, the character of the work done in automotive repair shops will become a commercial adaptation of manufacturing methods and in many cases the results will be remanufacturing rather than maintenance.

STANDARDIZATION BRIEFS

Standardization of the details of the so-called "doctor test" for sweetness in gasoline and kerosene has been made by technologists of the Atlantic Refining Co. The "doctor test" has been used for many years by refiners in this country, but under conditions never properly standardized.

Two grades of aviation gasoline in place of five is the hope of the petroleum industry, members of the Society of Automotive Engineers were told at the organization's national aeronautic meeting held in Chicago during the last week of August.

Tests made by the office of superintendent of weights and measures of the District of Columbia during the last fiscal year resulted in the condemnation of 3,363 weighing instruments.

The secretary of the North Carolina State board of equalization has suggested the use of standardized valuations of certain classes of property in making the quadrennial assessments.

The National Bureau of Standards announces the reaffirmation by industry of the simplified practice recommendation (No. 8-29), covering range boilers and expansion tanks. The program will, therefore, be in effect for another year.

The latest compilation of signers of the National Code of Practices for marketing refined petroleum products shows that they now number approximately 16,000. This represents the growth in one year, according to records of the American Petroleum Institute, the code having become effective July 25, 1929.

The technical committee on rubber products has been directed by the Federal Specifications Board to formulate specifications for airplane tires and tubes. Steps are being taken to ascertain the tire-equipment requirements of the various Government agencies. When this preliminary work has been completed, detailed specifications will be prepared with the cooperation of the tire manufacturers' committee of the Rubber Manufacturers Association.

Specifications for automotive storage batteries, which have been in preparation for some time, have been approved by the Federal Specifications Board

for promulgation. The specifications are now being printed.

The National Bureau of Standards cooperated with the Coast Guard in preparing specifications for some submarine cables which will be used to connect light-houses to shore stations. Preliminary specifications were prepared, and then a conference called of several manufacturers to discuss the drafts. Final specifications will give a cable which is expected to be much superior to that previously purchased, with no increase in cost. In addition to improvements in materials for the regular type of cable, the bureau suggested a new type. Specifications for this type were prepared at the same time as for the regular type. Bids have been received which show that the proposed type is somewhat cheaper than the regular type. The Coast Guard expects to purchase a few miles of the new type in order that it may be given a service test.

At a recent meeting of the Mixer Manufacturers Bureau, held in Milwaukee, the problem of producing the best quality of concrete desired in construction was discussed, which led to the adoption of four standards for mixing concrete. These specifications are merely in the development stage, intending to serve as a guide for architects and engineers in producing the best products possible, and for manufacturers in designing and arranging their equipment to meet the requirements set forth in the specifications.

The Diesel Engine Manufacturers' Association has issued a booklet entitled "Standards of the Diesel Engine Manufacturers' Association." The text embodies the results of considerable study on the part of executives and engineers associated with companies actively engaged in the manufacture of Diesel engines. This booklet contains several chapters dealing with standard principles of business, standard practices, notes on the selection and installation of stationary Diesel engines, and standard definitions.

Items relating to nationally recognized specifications to be included in a proposed revision of the National Directory of Commodity Specifications has already reached 6,900.

A standard X-ray ionization chamber has been devised and set up at the National Bureau of Standards for the purpose of calibrating X-ray dosage meters used by physicians in the application of X radiation to the treatment of cancer and other diseases.

About 1,200 specifications for metals and metal products are to be reproduced in the draft of the third volume of the Encyclopedia of Specifications, an official publication now being compiled by the National Bureau of Standards. Of these, 930 relate to ferrous metals and 270 to nonferrous metals.

The accuracy of measurement of time and radio-frequency are both advanced by new equipment installed in the National Bureau of Standards radio laboratory. The equipment is a primary standard of frequency which is proportional to the reciprocal of time. The standard is based on the piezo-electric vibration of quartz. The accuracy of the order of 1 part in 10,000,000, which is 10,000 times the accuracy required five years ago in this field.

Information relating to their standardizing and specification-making activities have already been received from many of the more important technical societies and trade associations for the 1931 Standards Yearbook. Information is being received from the first of the foreign national standardizing associations, the correspondence with which is being conducted by the American Standards Association.

A committee of the Structural Steel Board of Trade, New York City, has just completed a study of required tolerances in the accuracy of the erection of steel work on elevator shafts. One inch from the true

plumb is the normal variation and this has been adopted as standard for buildings up to 20 stories. Above this, an allowance of one thirty-second of an inch per story is permitted, with a maximum variation of 2 inches.

An extensive study is being made of measures for providing safety for X-ray workers and patients from the harmful effects of X rays and high-voltage shock. Standard safety regulations are being formulated for national adoption and will be proposed for international adoption.

Simplified practice recommendation No. 111-30, Color for School Furniture, is now available in printed form. The program applies to color for school seating, general school furniture, and laboratory furniture. The color selected by the industry is known as School Furniture Brown, and fixed light and dark limits of shades within this color are designated. Master color blocks in different woods used in the manufacture of school furniture are used in the preparation of duplicate color blocks for matching in manufacturing and for sales purposes. The duplicate color blocks, properly certified, are prepared and distributed by the standing committee in cooperation with the National School Supply Association. Printed copies of the recommendation may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a cost of 5 cents each.

A. S. T. M. ACTIVITIES COVERING GYPSUM PRODUCTS

Adoption of New Specifications and Several Revisions Announced

New specifications, and revisions of existing standards for various gypsum products and methods of testing thereof, have been adopted by the American Society for Testing Materials. These include changes in the method of determining the consistency of calcined gypsum. Several series of tests were conducted, using various instruments, and a modified vicat apparatus was found to be the most desirable from the standpoint of accuracy and ease of manipulation. It has, therefore, been adopted as standard in place of the Southard viscosimeter.

Other changes made in the standard methods of testing gypsum and gypsum products include substituting a 2-inch cube for the 2 by 4 inch cylinder when determining the compressive strength of calcined gypsum, neat and sanded. It was felt that a cube on account of its facility in molding will give more accurate and uniform results.

So as to eliminate the possibility of dry-outs occurring in specimens used for determining the compressive and tensile strength, the standard methods of testing were changed so as to require the specimens to be retained in the molds in moist air until thoroughly hardened, but not less than 24 hours.

Since the adoption of the standard methods of testing gypsum and gypsum products in 1927 the standard size of gypsum plaster board has been changed from

32 by 36 inches to 16 by 48 inches. The standard-size specimen for determining strength is 12 by 18 inches. It is therefore impossible to obtain a sample for testing with the load applied parallel to the fiber in the surfacing. Inasmuch as these boards are applied with the fiber in the surfacing running at right angles to the supports, the strength of the board with the load applied parallel to the grain in the paper is not so important. Until sufficient data has been obtained on the newer-sized boards, which will permit a complete revision of the specifications for gypsum plaster board, a note was added to section 26 of the standard methods of testing gypsum and gypsum products omitting requirements for test strength with load applied parallel to the fiber of the surfacing.

Revision in section 2, grading, of standard specifications for gypsum plastering sand was made after carefully considering the specifications which had been prepared by a joint committee composed of representatives of national organizations interested in the production and use of plaster materials. The revised specifications insure a better grade of plastering sand.

The tentative specifications for Keene's cement and for calcined gypsum for use in the preparation of dental plasters, with several slight changes, were adopted as standard.

There were a number of inconsistencies found in the sections on sampling and on packing and marking of the standard specifications for calcined gypsum, gypsum plasters, gypsum molding plaster, and gypsum pottery plaster. These have been revised and the specifications adopted as standard by the society.

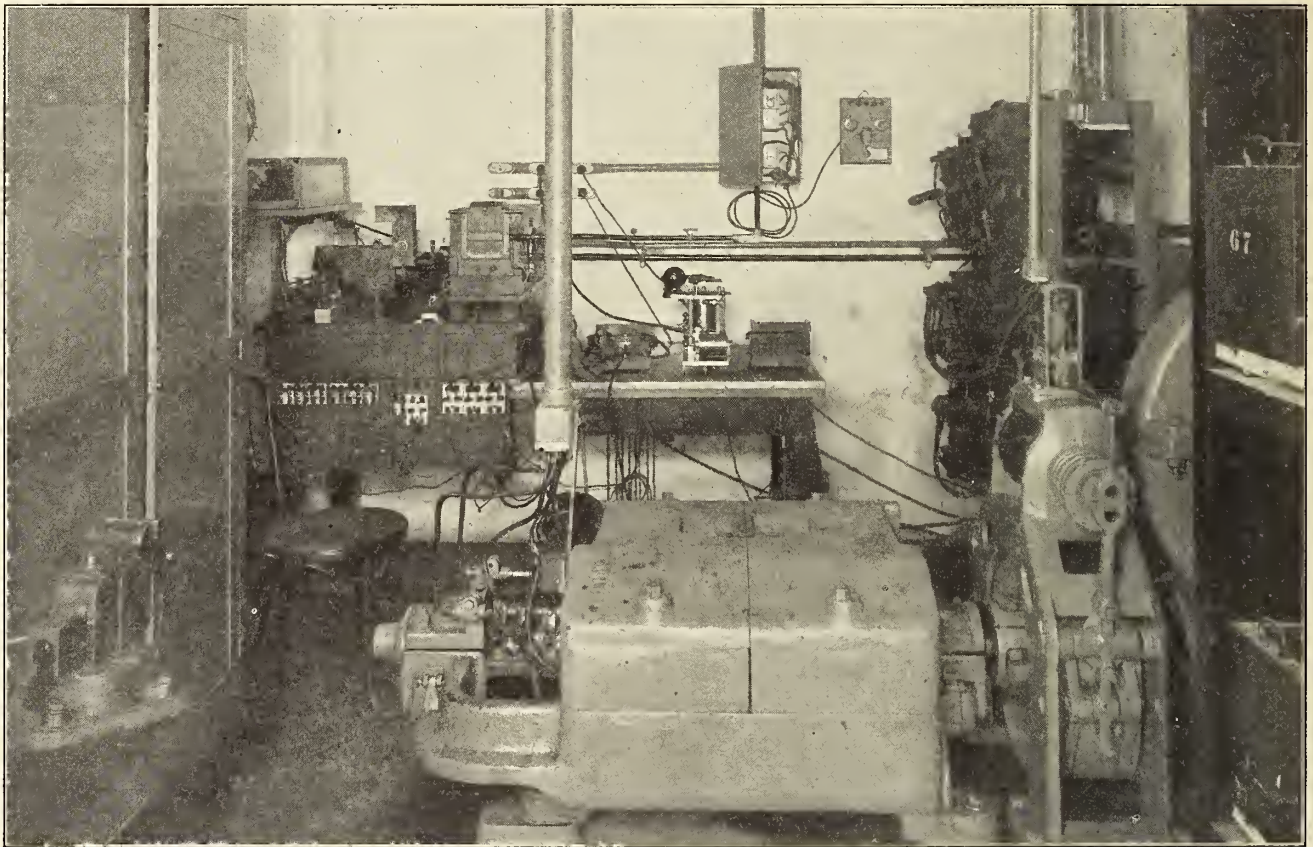
STANDARD ELEVATOR REGULATIONS

Elevator Accidents as a Source of Material for Drafting Elevator Codes; Economic Advantages of Uniform Regulations

By J. A. DICKINSON, *National Bureau of Standards, Safety Sectional Committee for the Elevator Safety Code*

Because vertical travel is the only type of transportation which is universally provided without cost to the passenger, the average person is apt to lose sight of the elevator as a primary means of transportation. In a large city a study of building traffic has shown that the number of passengers carried each day in elevators exceeds the total carried by all other forms of transportation.

and serious accidents occurring in the elevators of this country. Approximately 6 per cent are due to this cause, and this percentage is steadily decreasing due to the use of higher factors of safety in the supporting cables, more uniform materials, better safety devices, and closer supervision and inspection of equipment. Occasionally cars do fall, and the safety devices provided for stopping such cars fail to operate or do not



General view of elevator research laboratory, National Bureau of Standards

This may come as a distinct surprise to many readers. However, when one considers that mail carriers, telegraph messengers, salesmen, and solicitors are making dozens and sometimes hundreds of visits in the course of a day, the number of rides of such passengers becomes astoundingly high. This, of course, adds considerably to the daily total of passengers handled. Similarly, the average office worker will use the elevator for at least four trips per day, and where lockers or washrooms are located on other floors, this number may be considerably increased.

The average elevator passenger, if asked, would probably say that the greatest hazard in riding an elevator is that due to the parting of the cables. Strangely enough, accidents due to falling cars are rather an insignificant percentage of the total fatal

operate in time to stop the car before it reaches the bottom. However, these accidents are of minor importance when considering the entire question of elevator accidents.

Greater percentage of accident causes.

By far the greater percentage of all elevator accidents occur to passengers entering or leaving the car, and in practically every case involves only one passenger. The use of interlocking devices will prevent the movement of the cars away from the landing when the hoistway doors are open or unlocked, and conversely, will prevent the opening of the door except when the car is standing at the landing. This group includes approximately 75 per cent of all of the accidents occurring in the United States.

While the modern elevator is safe, when compared to other forms of transportation, the number of accidents would materially decrease as a result of the universal application of a good safety code.

Practically all large cities and many of the larger States have passed ordinances or acts of legislature covering the engineering requirements for elevators. Unfortunately, there are probably more than 100 different codes in the United States. The reason for this is perhaps best explained by prevalence of the belief that personal experience is the best teacher. In other words, many of the rules in such codes have been written as the result of some major accident involving a number of local persons. Such individual accidents may have little or no significance from the point of view of requirements to secure the greatest general safety.

These local accidents probably explain why many codes fail to require interlocks, although going into considerable detail as to other less important equipment. While the principle of drafting a code to correct conditions which have caused individual accidents seems to be logical, a far better way to determine such requirements is a study of elevator-accident statistics; particularly when such statistics cover a larger number of installations over a considerable period of time. Codes based on local accidents are in many cases unbalanced; that is, undue stress is laid on certain structural or performance requirements, while other items which should be given attention are entirely overlooked.

There apparently is a feeling in some of the smaller cities that their elevator regulations need not be as strict as those in larger cities because there is not the same hazard. It is unfortunately true, however, that the attraction of gravity is very nearly constant all over the United States, and a person walking through a partially opened hoistway door on the tenth floor of a building in Oshkosh will be just as badly smashed up as he would be after falling a similar distance in New York or Chicago.

Wide divergence of requirements.

An unfortunate angle to the present multiplicity of codes is the wide divergence of requirements for the same piece of equipment. For example, the factors of safety hoisting cables may vary from 5 to as high as 12. If the factors of safety are too low, wear will be extremely rapid, and a cable which is apparently in fairly good condition at the time of inspection may fail before the next inspection, because it is operating at a stress high enough to cause rapid deterioration. Conversely, if the factor of safety is placed too high, the building owner may be penalized by being required to buy cables of too large a size at a price considerably above that of cables which would give adequate safety over a reasonable period of time. It might be said in passing, however, that in most cases factors of safety on elevator equipment have not been too high. In fact, in many cases, considering the nature of the stresses involved, particularly the impact stresses during starts and stops, such factors have been low in comparison with structural engineering practice.

This wide range in requirements for the same piece of apparatus has one exceedingly unfortunate commercial aspect. At the present time there is, aside

from the question of motors and controls, no real standardization in the elevator industry. When a contract for an elevator or a bank of elevators is placed it is necessary for the manufacturer to study most carefully the city or State regulations governing that particular installation, so that practically every job is built especially to meet local requirements. The question will naturally be asked, Why do not manufacturers build to a high enough standard to meet all State or municipal regulations? In the case of high-speed, high-rise passenger elevators this is done: that is, in many cases they build to factors of safety far beyond that required by many local codes and ordinances, and at the same time provide many safety devices or features that are not called for in the local code.

Competition among manufacturers.

In the case of moderate and slow speed elevators the manufacturer is probably in competition with other elevator builders, including local concerns, some of whom may be building principally on a price basis.¹ Such a builder, using a factor of safety of 4 on a car frame, would have a marked advantage over a manufacturer doing a national business who would have established his own standards, using a factor of 7 for his cars. The latter will be much heavier, involving stronger cables, heavier counterweights, and a more powerful hoisting engine, all of which costs money. If a manufacturer doing a national business is to compete in a jurisdiction where such competition is encountered, he must build equipment comparable in price to that permitted by the local rules, which obviously will interfere with the standardization of his product.

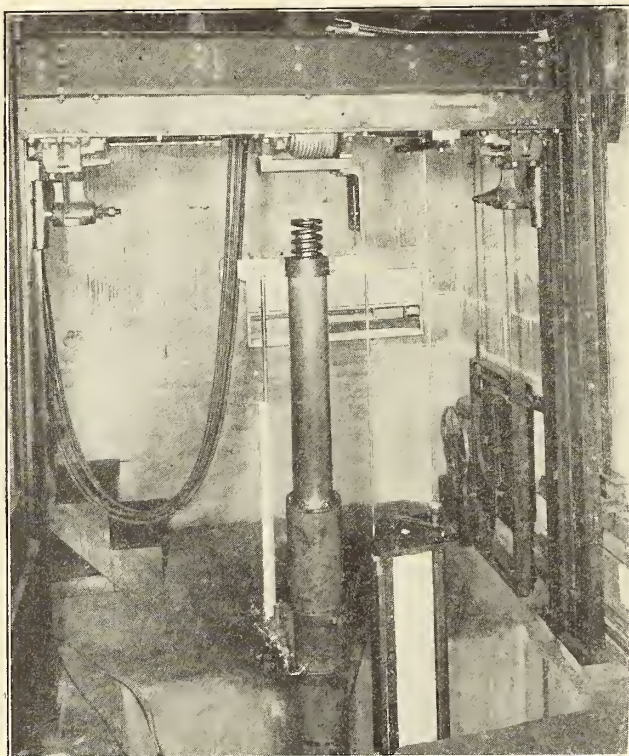
Let us now picture what would happen if the elevator regulations for the various cities and States were uniform in requirement. In such a case the manufacturer could standardize his cars, hoisting engines, cables, and other equipment so that, irrespective of location, the same equipment could be sent out for a given speed and load. Because the equipment would be uniform, the manufacturer could standardize his production to meet a single set of standards rather than attempt to build elevators to meet the requirements of any one of 70 or 80 different codes, and, barring special type or purpose elevators, could use the same equipment for any job calling for a certain load and speed. His entire manufacturing problem would be so simplified that it would ultimately result in large savings in cost of production, which saving ultimately would be reflected in the price of such a product. The present city or State elevator code is, generally speaking, open to the following criticisms: (1) It does not cover all hazards. (2) The safeguards required are not in balanced correlation with the relative importance of the hazards. (3) It arbitrarily sets up certain factors of safety which may be either inadequate or excessively high. (4) Its requirements are in many cases quite different from those of neighboring cities or States. (5) In many codes low factors of safety permit a local builder to build lower-grade equipment and either undersell makers of higher-grade equipment or compel them to build lower-grade equipment.

¹ It must not be assumed from this that all of the smaller manufacturers build to as low a standard as permitted; many such concerns build an excellent product and hold to high engineering standards.

(6) Lack of uniformity in code requirements prevents commercial standardization with its obvious advantages.

Drafting a code.

A code should be drawn by a committee which truly represents all points of view at interest in elevators. Accordingly, the following groups should be included: Enforcement officials (both State and municipal); elevator manufacturers; manufacturers of elevator equipment, such as interlocks and electrical equipment; users of elevators; casualty insurance groups; architects; consulting engineers; various departments of the Federal Government; and fire-prevention



Test shaft in National Bureau of Standards showing oil buffer under test

The paper-coated drum to the right is a chronograph for recording the travel of the car and buffer after impact. The pressure recorder on the left gives a pressure card equivalent to the full length of the buffer stroke.

groups. It is evident that the regulations desired by one group may be quite different from those desired by another group. It is only through a careful consideration of all such divergent views by a representative committee that a fair and workable code can be prepared.

With a view to working out a national standard which could be used as a model for State and municipal codes, a sectional committee was established in 1919 under the procedure of the American Engineering Standards Committee (now the American Standards Association) and sponsorship of the American Society of Mechanical Engineers, to draft an elevator code.

Before this code was prepared, an analysis was made of thousands of elevator accidents covering a

period of about 12 years.² The results of this analysis were used in the preparation of the code, which was published in 1921. It was widely circulated and used as the basis of several city and municipal codes. Subsequently a new edition was issued in 1925 under the joint sponsorship of the American Society of Mechanical Engineers, American Institute of Architects, and the National Bureau of Standards, and likewise widely used as the basis of city and State regulations. A revision is now being prepared and will be available this fall. In these subsequent revisions use has again been made of accident statistics; in some cases thousands of accident records were examined to determine whether or not a particular hazard was of great enough importance to warrant a special rule covering the hazard.

Periodic revisions necessary.

Such periodic revisions are necessary in order that the code may keep pace with the growth and development of the industry. In no other branch of transportation have greater strides been made during the past decade than in the elevator field; this, notwithstanding the remarkable developments in automotive vehicles. The new edition of the code will cover many of these new features and will, in certain cases, permit further development of high-speed, high-rise equipment.

The elevator is the limiting factor in the height of buildings; not because it is not possible to build elevators which will travel higher than those now in existence but because of economic consideration, in balancing space occupied by elevator shafts against space obtainable by added heights. It is not possible to provide adequate elevator service to occupants with present-day equipment beyond a certain limit of height without using such a large proportion of the building area that the building itself becomes economically unsound, a fact that must be given consideration in drafting code requirements.

When the first revision of the code was prepared in 1925, it was evident that there was not available sufficient information regarding the performance of certain safety equipment to draw adequate code rules. The committee, therefore, decided to establish a research fellowship at the National Bureau of Standards to study the performance of such devices. Thanks to the whole-hearted cooperation of the industry, adequate financial support was assured, and the work started.

The results of engineering tests on oil buffers were used in the preparation of the section on buffers in the 1930 edition. Work on undercar safeties is now under way and will be available when the next revision is undertaken.

The American Safety Code for Elevators has been prepared with two ideas in view—first, to develop an engineering standard by a national committee in which all groups of the industry are adequately represented so that this standard will be available for such cities and States as wish to adopt it; second, to provide for periodic revisions so that the code is dependent very largely upon the demand from citizens for its adoption. The value of such uniform regulations, we believe, is apparent.

² National Bureau of Standards Tech. Paper No. 202, Results of a Survey of Elevator Interlocks and an Analysis of Elevator Accident Statistics.

CURRENT ACTIVITIES OF THE AMERICAN STANDARDS ASSOCIATION

Specifications Under Consideration

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

Motion-picture standards.

The Society of Motion Picture Engineers has submitted to the American Standards Association for approval as American standard new material which covers chiefly dimensions for the 16 mm home movie film and dimensions for film having a sound track. This new material is an addition to the existing standards which cover dimensions for cutting, splicing, and perforating motion-picture film and for the apertures, projection lens, diameters, and sprockets of motion-picture projectors, and recommended practice in the taking and projection of motion pictures. The Society of Motion Picture Engineers is also formally requesting that it be made proprietary sponsor for motion-picture standards. The request will be submitted to the A. S. A. standards council.

Revision of electrical symbols.

The sectional committee on scientific and engineering symbols and abbreviations of the American Standards Association has issued a revised report on graphical symbols for electric power and wiring. This report is a revision of that issued in March, 1930, and the changes which have been made are a result of the large number of suggestions and criticisms which have been received from interested persons. The report differs from the one it supersedes chiefly in that the symbols for industrial power switchboard control and auxiliary devices have been omitted. The preface states that "this omission is due to the wide divergence of opinion and of manufacturers' practice which have been found to exist. A supplementary report covering the subject is recommended when sufficient accord can be obtained, particularly among the manufacturing companies."

Gas-burning appliances.

Sole sponsorship for a project entitled "Approval and Installation Requirements for Domestic Gas Burning Appliances" has been requested of the American Standards Association by the American Gas Association. The project would have the following scope: Establishment of minimum or basic requirements for safe operation, satisfactory performance, and substantial and durable construction for domestic gas-burning appliances, together with laboratory methods of test for determining compliance therewith.

This request has received the favorable consideration of a special committee which has recommended that the A. G. A. be granted a sole sponsorship for the project with the scope as given above. Final action on this request will be taken at the meeting of the standards council, as well as upon the personnel of the proposed sectional committee. For a number of years the American Gas Association has tested domestic gas-burning appliances in its laboratories, and they have permitted those manufacturers whose devices have

satisfactorily met the requirements of the association to attach the seal of approval of the association. It is now proposed that the requirements of the A. G. A. be submitted to a sectional committee broadly representative of all having an interest in domestic gas-burning devices in order that the requirements may be accorded the status of American standard, thus enabling purchasers of gas-burning devices to know in advance what they may expect from a device bearing the seal of the A. G. A.

Vegetable-tanned leather belting.

It has been recommended to the American Standards Association by the special conference committee organized at the February conference on the standardization of leather belting that standardization of vegetable-tanned leather belting be undertaken. It is suggested that the scope of the project cover, with respect to vegetable-tanned leather belting, raw material, method of manufacture and construction, marking, physical tests, and chemical tests. The committee recommends that Federal specification No. 37 be given careful consideration as a possible basis of development of American standard specifications for vegetable-tanned leather belting.

Code for lighting approved.

The standards council of the American Standards Association has approved the revised edition of the Code for Lighting Factories, Mills, and Other Work Places as American standard. The revised code has been developed under the sponsorship of the Illuminating Engineering Society. The scope is described in the introduction as follows:

* * * A guide for factory owners and operators in their efforts to improve lighting conditions in their factories. It makes available authoritative information for legislative bodies, factory boards, industrial commissions, and others who are interested in enactments, rules, and regulations for better lighting.

The importance of the code is indicated in Part I, Advantages of Good Illumination, in which the effects of good lighting are listed as follows: (1) Reduction of accidents; (2) greater accuracy in workmanship, resulting in improved quality of goods; (3) increased production; (4) less eyestrain; (5) greater contentment of workers; (6) greater cleanliness; (7) more order and neatness in the plant; and (8) supervision of the employees made easier. The figures given under the heading Reduction of Accidents are of great interest to the industry.

The National Safety Council in its publication Accident Facts, 1929, estimates the number of fatalities in the United States arising out of or in the course of gainful employment as 24,000 for the year 1928, and also that during the same period the lost-time nonfatal accidents reached the staggering total of 3,125,000, about 1 accident for every 4 persons engaged in industry, or 1 for every 14 persons gainfully employed.

According to the Travelers Insurance Co. there is warrant for assuming that defective vision and deficient or unsatisfactory lighting installations are con-

tributing factors in 18 per cent of these accidents. Simple computation will show that from these causes industry is being deprived of the equivalent of the services of 35,000 men throughout each entire year due to the lost-time nonfatal accidents, and that the accepted actuarial methods of evaluating fatal accidents will bring the total loss to 125,000 men annually. Compensation-insurance premiums for a plant are based on the amount of the pay roll, and the rate is determined by the accident experience of a given industry, modified by the experience of the particular plant under consideration. With a rate of $1\frac{1}{2}$ per cent the annual premium in the case of 1,000 employees at an average wage of \$40 per week would be \$31,200.

An insurance carrier might on an average pay the claims resulting from four accidents per month in this plant, and meet its own overhead costs, and still have a slight margin of profit. An experience of five accidents per month, one-fifth of them due to improper lighting (a not unlikely event), would probably leave the insurance carrier no option but to increase the rate by 25 per cent. The premium would then be \$39,000, an increase of \$7,800.

If poor lighting costs only \$3 per employee, or \$3,000 per year total, the owner's annual expense for poor illumination actually amounts to \$10,800 of which \$7,800 is required by the insurance company to meet additional accident claims. An expenditure of \$6 to \$8 per year per employee for more adequate illumination might save a large portion, if not all, of the latter amount. The important point here is

the fact that the cost of accidents, due to poor illumination, greatly exceeds the cost of providing adequate illumination.

Savings effected in economy of production by good illumination are estimated to be a significant item to the factory owner. The estimate prepared by the committee in charge of the code assumes that one 100-watt incandescent electric lamp will take care of one operator; that the lamp burns on the average of 2 hours per day, 300 days per year; that the life of the lamp is 1,000 burning hours; and that the operator works 8 hours per day, 300 days per year, at 45 cents per hour. The total cost of maintaining good illumination, including the investment and the annual operating cost, is, therefore, placed at \$6 per man per year. The cost of labor (the annual wages per man per year) are estimated at \$1,080. In an operator, because of good illumination, saves in production or in better quality of product the equivalent of only 3 minutes per day for 300 days, he will offset the annual cost of illumination. Conversely, the operator losing, for example, 30 minutes per day through poor illumination losses \$60 per year, or ten times the cost of providing proper lighting.

Part II of the code includes sections on measurement of illumination; recommended levels of illumination, including tables for various industrial interiors; avoidance of glare; importance of adequate electrical wiring. A Suggested Minimum Regulation to be Established by State Authorities comprises Part III of the code.

SPECIFICATIONS FOR NONMETALLIC MINERALS PUBLISHED

Bureau of Standards Announces New Volume of Encyclopedia Series of Specifications

The division of specifications of the National Bureau of Standards announces the release of a new volume of the encyclopedia series of publications entitled, "Standards and Specifications for Nonmetallic Minerals and Their Products," issued as Bureau of Standards Miscellaneous Publication No. 110.

This publication represents an attempt to present the substance of every available nationally recognized specification for such commodities as are embraced within the numerical classification designations 500 to 599 in the National Directory of Commodity Specifications, issued in 1925 and now in process of revision. The compilation of this directory representing an indexing of a review made of all standards, specifications, simplifications, and testing methods in use in this country, was directed by an advisory board composed of official representatives of 14 national organizations interested in the utilization of specifications. As a second division of the work, this board recommended the compilation of a series of volumes to contain actual copies of specifications, or abstracts, instead of merely titles.

The second part of the work as outlined by the advisory board, in the form of an encyclopedia series, made its start in 1927 with the issuance of the volume, "Standards and Specifications in the Wood-Using Industries." The present publication, "Standards and Specifications for Nonmetallic Minerals and Their

Products," is the second volume of the series. This volume adheres to the method applied in the National Directory of Commodity Specifications, and employed also in the publication, "Standards and Specifications in the Wood-Using Industries," of using a decimal system of classification for commodities. A third volume dealing with standards and specifications relating to ores, metals, and their manufactures is now in course of preparation.

The classes of commodities covered by standards, specifications, and simplifications included in this new book are those for coal, petroleum, asphalt, mineral wax, glass, clay, abrasive materials, asbestos, chalk, mica, precious stones and imitations, sulphur, magnesia, salt, graphite, and other nonmetallic minerals.

Tabulations, abstracts, and cross references have been employed to make the mass of material readily available for the use of engineers, architects, purchasing agents, or others whose interests are served by application of the scientific, methodical, and safe method of marketing them as specification purchasing. For many of the commodities included in this volume there are several separate specifications. Duplication is avoided by the use of an extensive reference system. It should be mentioned that, in using this system, no preference has been given to the standards of one organization over those of another.

This publication, comprising 680 pages of printed material, contains the fruits of standardization and simplification activities in the field of nonmetallic minerals of more than 70 organizations, including technical societies, trade associations, and similar organizations qualified to speak for the industry, and units authorized to represent the Federal Government as a whole.

Methods of testing incidental to the formulation of commodity specifications, which form an exceedingly important part of the work, are conveniently set forth for ready finding. Illustrations and figures where their inclusion clarifies the text, tables making available related and similar specifications and standards, and a tabulation of the requirements for 17 testing thermometers as prescribed by the American

Society for Testing Materials which are used in test methods presented in this volume, are other features set forth in suitable and convenient form.

To permit the reader to take advantage of the proper sources for information concerning the issuance, later revisions or supplemental data of the standards and specifications for nonmetallic minerals, there is also included a list of the organizations, together with the names and addresses of their secretaries or other officers whose standards and specifications appear in this volume.

Copies of "Standards and Specifications for Non-metallic Minerals and Their Products" are sold exclusively by the Superintendent of Documents, Government Printing Office, Washington, D. C., at \$2.75 per copy.

AGGRESSIVE MERCHANDISING

New England Council Recommends Simplification and Standardization for Aggressive Merchandising

The industrial committee of the New England Council has just issued a series of six bulletins on "aggressive merchandising." The object of these bulletins is to suggest to New England manufacturers ways and means of "making the sales dollar produce better net profits." Questions which indirectly suggest simplification and standardization are:

1. Our product—Does it meet nationally recognized standards and specifications for goods of its class or kind?

2. Our sales plan—What items in our line constitute the bulk of our sales? Of our profits? On what items do we lose money? Should we discontinue any of these "loss items"?

3. Are we cooperating with the other members of our industry in meeting the competition of other industries?

4. Our costs—Shall we discontinue some of our less profitable items and concentrate on our more profitable ones?

5. Our results—Is our finished product inventory "turning over," item by item, or line by line, at the most profitable rate for us? For our dealers?

Some simplified practice recommendations originated in New England. Its producers, distributors, and consumers have evidenced their "faith" in simplified practice by accepting many of the existing recommendations. The results and benefits of simplification and standardization to New England industries have been made known by the U. S. Department of Commerce and by the affected groups.

STATUS OF FEDERAL SPECIFICATIONS

Eight Promulgations, Seven Revisions, and Six Proposals Announced

Eight Federal specifications have just been promulgated, 7 submitted for revision, and 6 proposed for promulgation, according to the Federal Specifications Board. The revisions and proposed specifications are now before the Government departments and others interested for comment and criticism. These

specifications also bear the new designation in accordance with the system used in the Federal Standards Stock Catalogue. For copies of the specifications or for further information address the Federal Specifications Board, National Bureau of Standards, Washington, D. C.

SPECIFICATIONS PROMULGATED

F. S. No.	Commodity	New designation
-----	Pipe and tubing; copper, seamless; pipe (standard, iron-pipe size); tubing (for pressures up to 450 pounds per square inch).....	WW-P-378.
-----	Sodium-carbonate; granular (monohydrate crystals).....	O-S-581.
-----	Time-clock systems; electric.....	W-T-411.
-----	Soda; caustic (lye) (for) cleaning purposes.....	P-S-631.
-----	Brushes, scrubbing; deck.....	H-B-531.
-----	Fire-alarm systems; electric, hand-operated.....	W-F-391.
-----	Packing; asbestos, sheet, compressed.....	HH-P-46.
-----	Tires; automobile, pneumatic (2a supplement to ZZ-T-381).....	ZZ-T-381.

SPECIFICATIONS UNDER REVISION

179	Paper; blueprint No. 1, grade (sensitized).....	
179	Paper; blueprint No. 1, grade (unsensitized).....	
10B	Paints; lead-zinc base, ready mixed and semipaste, white and tinted.....	TT-P-121.
227B	Cushions; ring, rubber.....	ZZ-C-796.
364	Spices.....	EE-S-631.
389	Minced meat (part of F. S. 389).....	PP-M-351.
389	Yeast (part of F. S. 389).....	EE-Y-131.

PROPOSED SPECIFICATIONS

-----	Figs; canned.....	
-----	Folders; heavy and extra heavy (calendered).....	
-----	Boxes; wooden, wire bound, empty.....	NN-B-631.
-----	Glycerine (glycerol).....	
-----	Solvent; dry cleaning.....	
-----	Pipe fittings (125-pound brass or bronze).....	

STANDARD APPROVED FOR RED-CEDAR CLOSET LINING

Stipulation Made That 75 Per Cent or More of Each Piece Must Be of Red Heartwood

The acceptance of commercial standard specifications for the grading of red cedar closet lining has been assured by the enthusiastic support of about 90 per cent of the manufacturing trade and numerous large distributors and consumers.

The quality standards established for this commodity represent the efforts of the more progressive manufacturers who are desirous of marketing a high-

quality product that will merit the good will and confidence of the consumer.

While it is hardly to be expected that each prospective home owner will familiarize himself with the requirements of the commercial standard grade of cedar closet lining, he may be protected in his purchases by the application of a manufacturers' label that will guarantee conformity to the established standards.

The buyer, therefore, need not purchase cedar closet lining with a large portion of sap wood (white wood), since the standard grading rules demand that 75 per

cent or more of each piece must be of red heartwood. Other requirements cover standard thicknesses and lengths, matching, and minor defects that are permissible.

October 2, 1930, was fixed as the date on which the standard should become effective. This action was taken by the general conference when the proposed standard was approved. The conference also authorized the appointment of a standing committee representative of all branches of the industry to consider the need of revising the specifications as time requires.



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
Subscription 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.

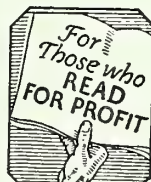
Issued monthly
Subscription price, 25 cents per year

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 1930

The new Standards Yearbook for 1930 is the fourth annual issue of a publication devoted to the great and growing field of standardization in its broad aspects. It gives a 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.

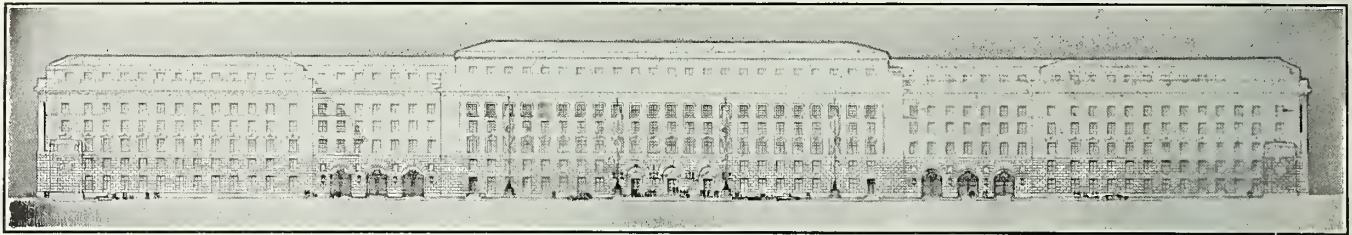
NOW READY Price, 75c. ORDER AT ONCE

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

To obtain regularly the above-described monthly periodicals send your order, with remittance, addressed: Superintendent of Documents, Government Printing Office, Washington, D. C. Foreign prices (countries other than the United States and its possessions, Canada, Mexico, Newfoundland, Cuba, and Republic of Panama) are: Journal, \$3.75; Bulletin, \$0.40; Monthly, \$1.25; Yearbook, \$0.90

"* * * 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 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.